

CHELSEA®

WARNING

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

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

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

Offer of Sale

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

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NOTES

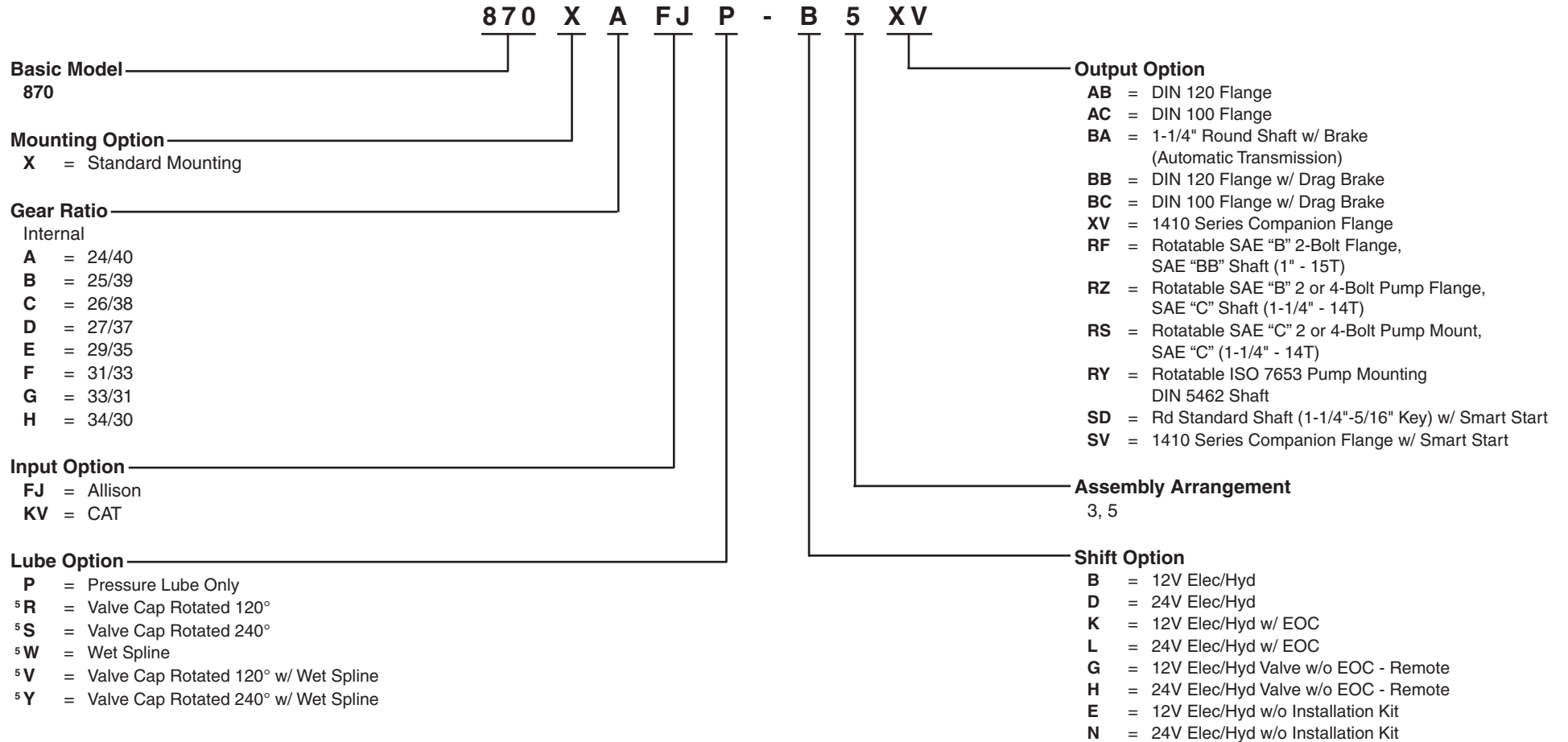
1	Visually inspect parts before assembly for flaws.
2	The item numbers identifying parts are the same item numbers used on the engineering drawings.
3	Ensure tools and fixtures are current and have the required inspection and calibration labels and/or tags.
4	The terms OUTPUT and DRIVE are used interchangeably.
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. 870 Series is HY25-2870-M1/US



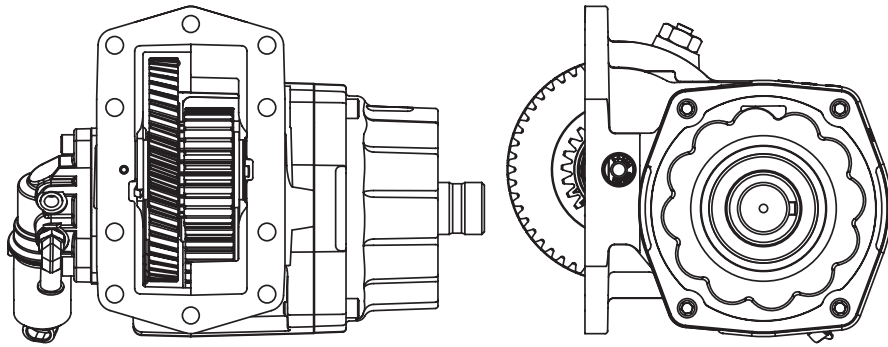
Suggested Tools			
Safety Glasses	Oil Seal Slide	Shop Press	3/16" Hex Wrench
Oil Seal Driver	Pliers	5/32" Hex Bit Driver	Hammer/Mallet
1/2" Socket	1/2" Hex Wrench		

Suggested Service Kits	
Part Number	Description
7170-86X	Stud Kit (Allison)
7170-117X	Stud Kit (Caterpillar)
328948-9X	Gasket & Installation Instruction Kit (All)
329071-79X	Gasket & Seal Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)
329071-60X	Bearing Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)
329071-61X	Bearing Kit ("BA", "BB", "BC" Outputs)
329354-12X	12V Remote Valve Conversion Kit
329354-24X	24V Remote Valve Conversion Kit

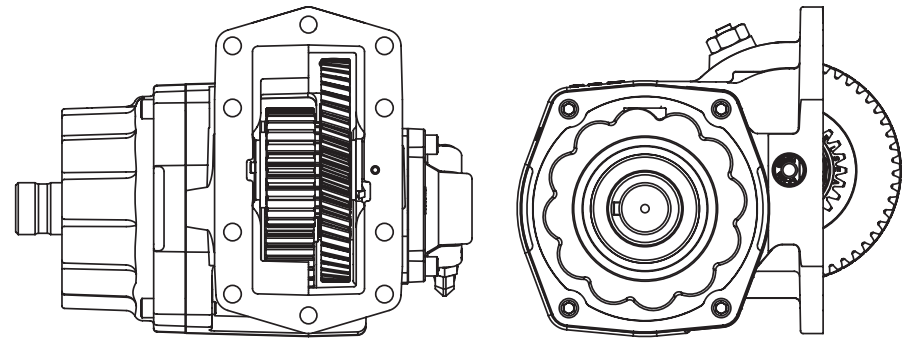
See [Page 36-37](#) for Kits Bill of Materials



⁵ Automatically pressure lubed

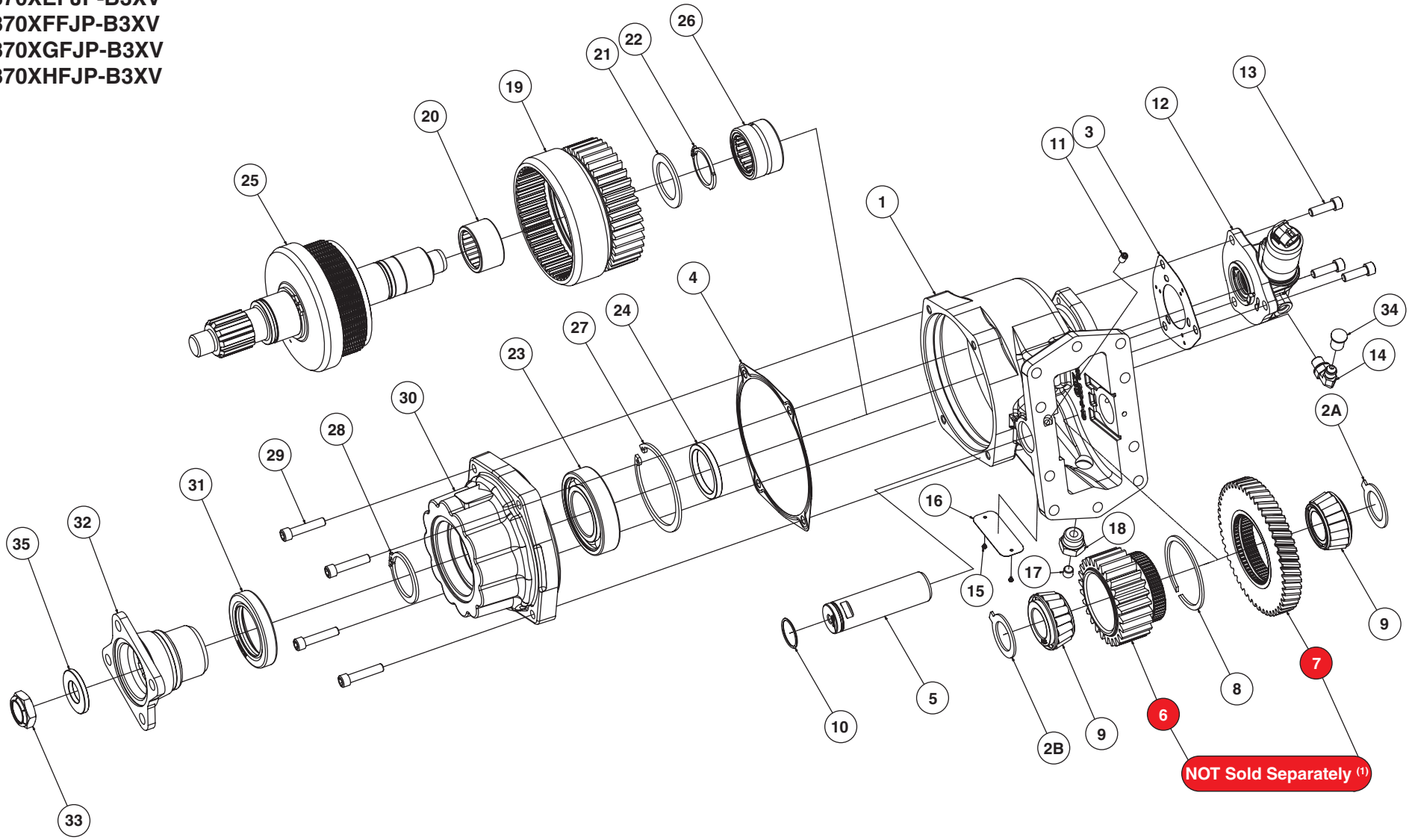


Assembly "3"



Assembly "5"

870XAFJP-B3XV
870XBFJP-B3XV
870XDFJP-B3XV
870XEFJP-B3XV
870XFFJP-B3XV
870XGFJP-B3XV
870XHFJP-B3XV



(1) See Page 24 for other Input Gear Assembly Options

Bill of Materials

**Service Manual
870 Series**

870XCFJP-B3XV

Item	Part Number	Description	Qty.
1	1-P-667	Housing (.312" (5/16") Bearing Cap Bolts)	1
	1-P-764	Housing (.375" (3/8") Bearing Cap Bolts)	1
2A	14-P-82-1	Spacer 1.191" x 1.75" x .080"	1
2B	14-P-82-1	Spacer 1.191" x 1.75" x .080"	1 or
	14-P-82-2	Spacer 1.191" x 1.75" x .085"	1 or
	14-P-82-3	Spacer 1.191" x 1.75" x .090"	1 or
	14-P-82-4	Spacer 1.191" x 1.75" x .094"	1
3	22-P-112	Gasket.....	1
4	22-P-151	Gasket.....	1
5	9-P-99	Idler Shaft	1
NOT Sold Separately ("C" 5-P-1428-3X ⁽¹⁾)			
6	5-P-1439 ⁽¹⁾	"C" Ratio Gear.....	1
7	5-P-1428 ⁽¹⁾	"FJ" Input Gear.....	1
8	380064	Snap Ring	1
9	561026	Bearing - Tapered Cone 1.181" x .9843"	2
10	28-P-42	O-Ring 1.051" x .070"	1
11	378452-7	Set Screw SH .250"-20 x .500"	1
12	329463-12X	12V Valve Cap Assembly.....	1
13	378447-6	Cap Screw SH .312"-18 x 1.000"	3
14	379486	Fitting 90°.....	1
15	378422	Drive Screw.....	2
16	68-P-51	Name Plate	1
17	379231	Pipe Plug .125"-27	1
18	379242	Straight Adapter .125"-27 x .750"-16	1

⁽¹⁾ See Page 24 for other Gear Options

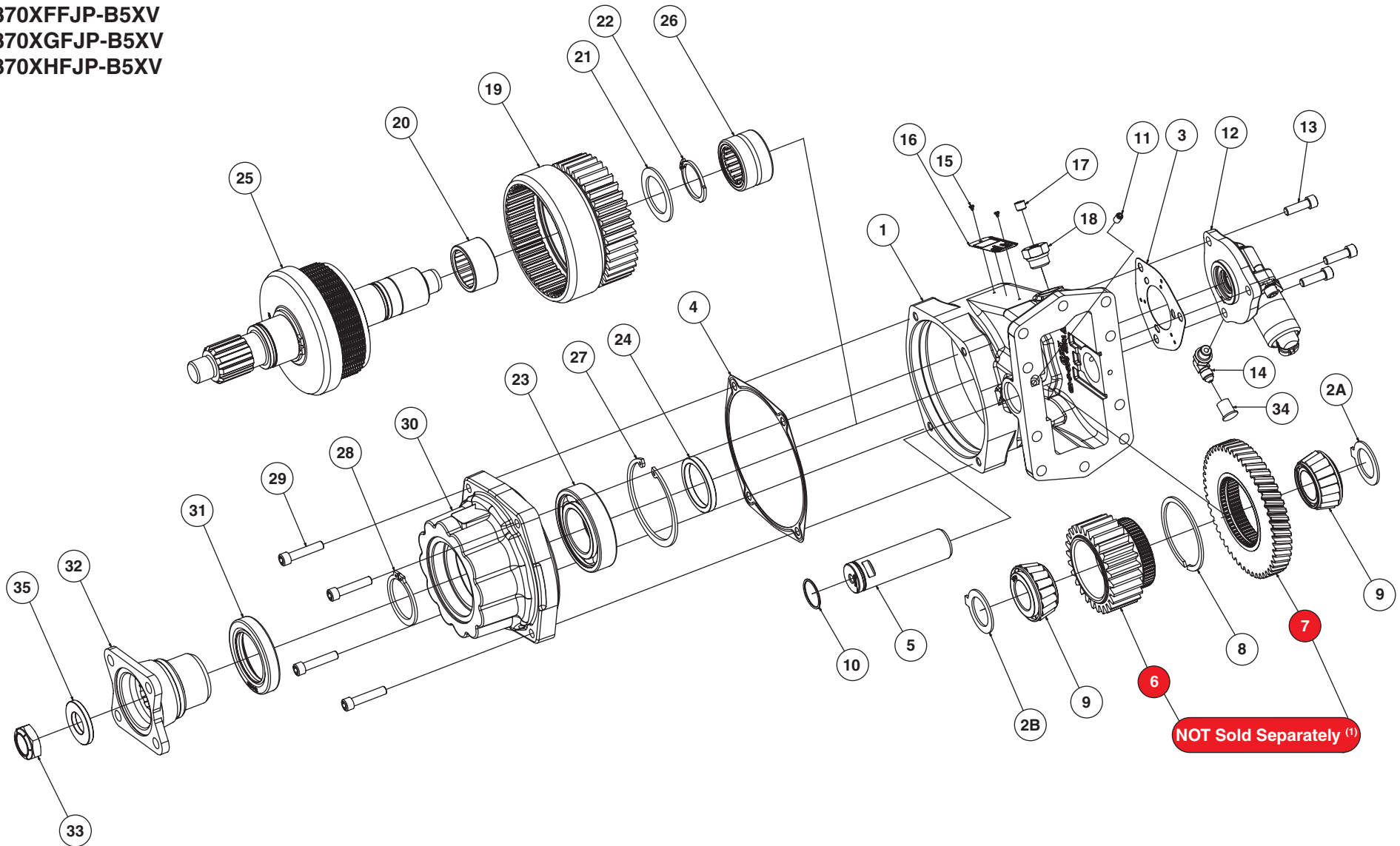
Item	Part Number	Description	Qty.
19	2-P-893 ⁽¹⁾	"C" Output Gear	1
20	560972	Bearing - Needle Roller Assembly 1.500 x 1.875" x 1.000"	1
21	31-P-70	Thrust Washer 1.507" x 2.167" x .094"	1
22	379746	Snap Ring	1
23	550311	Bearing - Ball 1.77" x 3.346" x .748"	1
24	4-P-187	Spacer 1.776" x 2.200" x .239"	1
25	329724-1X	Drive Shaft & Clutch Assembly "XV"	1
26	561047	Bearing - Needle Roller 1.500" x 2.062" x 1.250"	1
27	378263	Snap Ring	1
28	379555	Snap Ring	1
29	378447-8	Cap Screw SH .312"-18 (5/16") x 1.500"	4
	380563-14	Cap Screw FH .375"-16 (3/8") x 1.500"	4
30	21-P-766	Bearing - Cap (.312" (5/16") Bearing Cap Bolts)	1
	21-P-881	Bearing - Cap (.375" (3/8") Bearing Cap Bolts)	1
31	28-P-211	Oil Seal 3.00" x 2.00" x .375".....	1
32	380503	1410 Series Companion Flange	1
33	380486	Nut - Nylon Lock Thin .875"-14	1
34	379564-2	Thread Cap .438".....	1
35	4-P-191	Spacer .885" x 1.75 x .188"	1

Service Kits

Part Number	Description
7171-86X	Stud Kit (Allison)
328948-9X	Gasket & Installation Instruction Kit (All)
329071-79X	Gasket & Seal Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)
329071-60X	Bearing Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)
329071-61X	Bearing Kit ("BA", "BB", "BC" Outputs)

See Page 36-37 for Kits Bill of Materials

870XAFJP-B5XV
870XBFJP-B5XV
870XDFJP-B5XV
870XEFJP-B5XV
870XFFJP-B5XV
870XGFJP-B5XV
870XHFJP-B5XV



(1) See Page 24 for other Input Gear Assembly Options

Bill of Materials

**Service Manual
870 Series**

870XCFJP-B5XV

Item	Part Number	Description	Qty.
1	1-P-665	Housing (.312" (5/16") Bearing Cap Bolts)	1
	1-P-762	Housing (.375" (3/8") Bearing Cap Bolts)	1
2A	14-P-82-1	Spacer 1.191" x 1.75" x .080"	1
2B	14-P-82-1	Spacer 1.191" x 1.75" x .080"	1 or
	14-P-82-2	Spacer 1.191" x 1.75" x .085"	1 or
	14-P-82-3	Spacer 1.191" x 1.75" x .090"	1 or
	14-P-82-4	Spacer 1.191" x 1.75" x .094"	1
3	22-P-112	Gasket.....	1
4	22-P-151	Gasket.....	1
5	9-P-99	Shaft Idler	1
NOT Sold Separately ("C" 5-P-1428-3X ⁽¹⁾)			
6	5-P-1439 ⁽¹⁾	"C" Ratio Gear.....	1
7	5-P-1428 ⁽¹⁾	"FJ" Input Gear.....	1
8	380064	Snap Ring	1
9	561026	Bearing - Tapered Cone 1.181" x .9843"	2
10	28-P-42	O-Ring 1.051" x .070"	1
11	378452-7	Set Screw SH .250"-20 x .500"	1
12	329463-12X	12V Valve Cap Assembly.....	1
13	378447-6	Cap Screw SH .312"-18 x 1.000"	3
14	379486	Fitting 90°.....	1
15	378422	Drive Screw.....	2
16	68-P-51	Name Plate	1
17	379231	Pipe Plug .125"-27	1
18	379242	Straight Adapter .125"-27 x .750"-16	1

⁽¹⁾ See Page 24 for other Gear Options

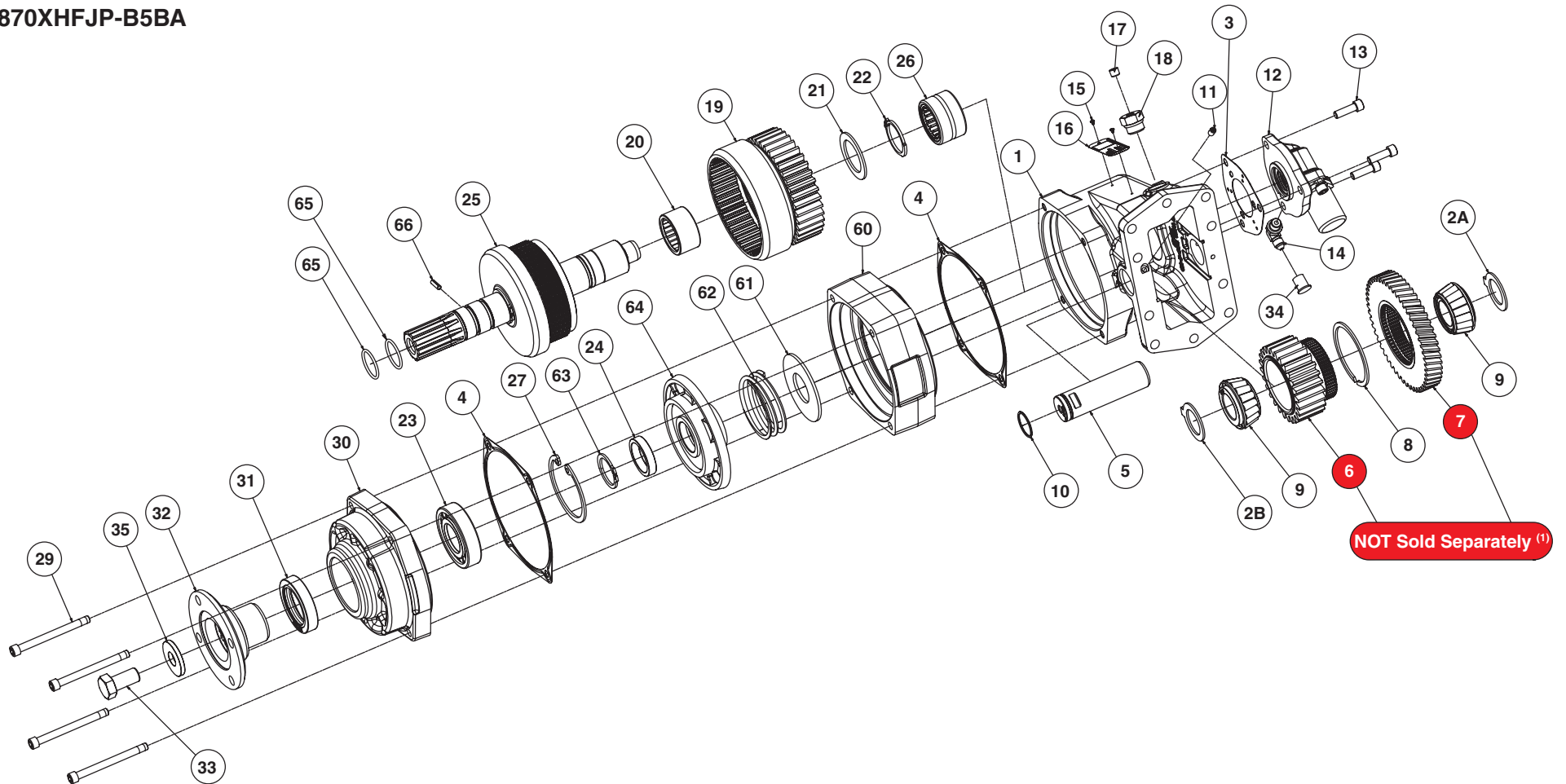
Item	Part Number	Description	Qty.
19	2-P-893 ⁽¹⁾	"C" Output Gear	1
20	560972	Bearing - Needle Roller 1.500" x 1.875" x 1.000"	1
21	31-P-70	Thrust Washer 1.507" x 2.167" x .094"	1
22	379746	Snap Ring	1
23	550311	Bearing - Ball 1.77" x 3.346" x .748"	1
24	4-P-187	Spacer 1.776" x 2.200" x .239"	1
25	329724-1X	Drive Shaft & Clutch Assembly "XV"	1
26	561047	Bearing - Needle Roller 1.500" x 2.062" x 1.250"	1
27	378263	Snap Ring	1
28	379555	Snap Ring	1
29	378447-8	Cap Screw SH .312"-18 (5/16") x 1.500"	4
	380563-14	Cap Screw FH .375"-16 (3/8") x 1.500"	4
30	21-P-766	Bearing - Cap (.312" (5/16") Bearing Cap Bolts)	1
	21-P-881	Bearing - Cap (.375" (3/8") Bearing Cap Bolts)	1
31	28-P-211	Oil Seal 3.00" x 2.00" x .375".....	1
32	380503	1410 Series Companion Flange	1
33	380486	Nut - Nylon Lock Thin .875"-14	1
34	379564-2	Thread Cap .438".....	1
35	4-P-191	Spacer .885" x 1.75" x .188	1

Service Kits

Part Number	Description
7170-86X	Stud Kit (Allison)
328948-9X	Gasket & Installation Instruction Kit (All)
329071-79X	Gasket & Seal Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)
329071-60X	Bearing Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)
329071-61X	Bearing Kit ("BA", "BB", "BC" Outputs)

See Page 36-37 for Kits Bill of Materials

870XAFJP-B5BA
870XBFJP-B5BA
870XDFJP-B5BA
870XEFJP-B5BA
870XFFJP-B5BA
870XGFJP-B5BA
870XHFJP-B5BA



(1) See Page 24 for other Input Gear Assembly Options

Bill of Materials

**Service Manual
870 Series**

870XCFJP-B5BA

Item	Part Number	Description	Qty.
1	1-P-665	Housing (.312" (5/16") Bearing Cap Bolts)	1
	1-P-762	Housing (.375" (3/8") Bearing Cap Bolts)	1
2A	14-P-82-1	Spacer 1.191" x 1.75" x .080"	1
2B	14-P-82-1	Spacer 1.191" x 1.75" x .080"	1 or
	14-P-82-2	Spacer 1.191" x 1.75" x .085"	1 or
	14-P-82-3	Spacer 1.191" x 1.75" x .090"	1 or
	14-P-82-4	Spacer 1.191" x 1.75" x .094"	1
3	22-P-112	Gasket.....	1
4	22-P-151	Gasket.....	1
5	9-P-99	Idler Shaft	1
NOT Sold Separately ("C" 5-P-1428-3X ⁽¹⁾)			
6	5-P-1439 ⁽¹⁾	"C" Ratio Gear.....	1
7	5-P-1428 ⁽¹⁾	"FJ" Input Gear.....	1
8	380064	Snap Ring	1
9	561026	Bearing - Tapered Cone 1.181" x .9843"	2
10	28-P-42	O-Ring 1.051" x .070"	1
11	378452-7	Set Screw SH .250"-20 x .500"	1
12	329463-12X	12V Valve Cap Assembly.....	1
13	378447-6	Cap Screw SH .312"-18" x 1.000".....	3
14	379486	Fitting 90°.....	1
15	378422	Drive Screw.....	2
16	68-P-51	Name Plate	1
17	379231	Pipe Plug .125"-27	1
18	379242	Straight Adapter .125"-27 x .750"-16	1
19	2-P-893 ⁽¹⁾	"C" Output Gear	1
20	560972	Bearing - Needle Roller Assembly 1.500" x 1.875" x 1.000".....	1
21	31-P-70	Thrust Washer 1.507" x 2.167" x .094"	1
22	379746	Snap Ring	1
23	561048	Bearing - Cylindrical Roller Assembly 1.378" x 2.835" x .670" ...	1

⁽¹⁾ See [Page 24](#) for other Gear Options

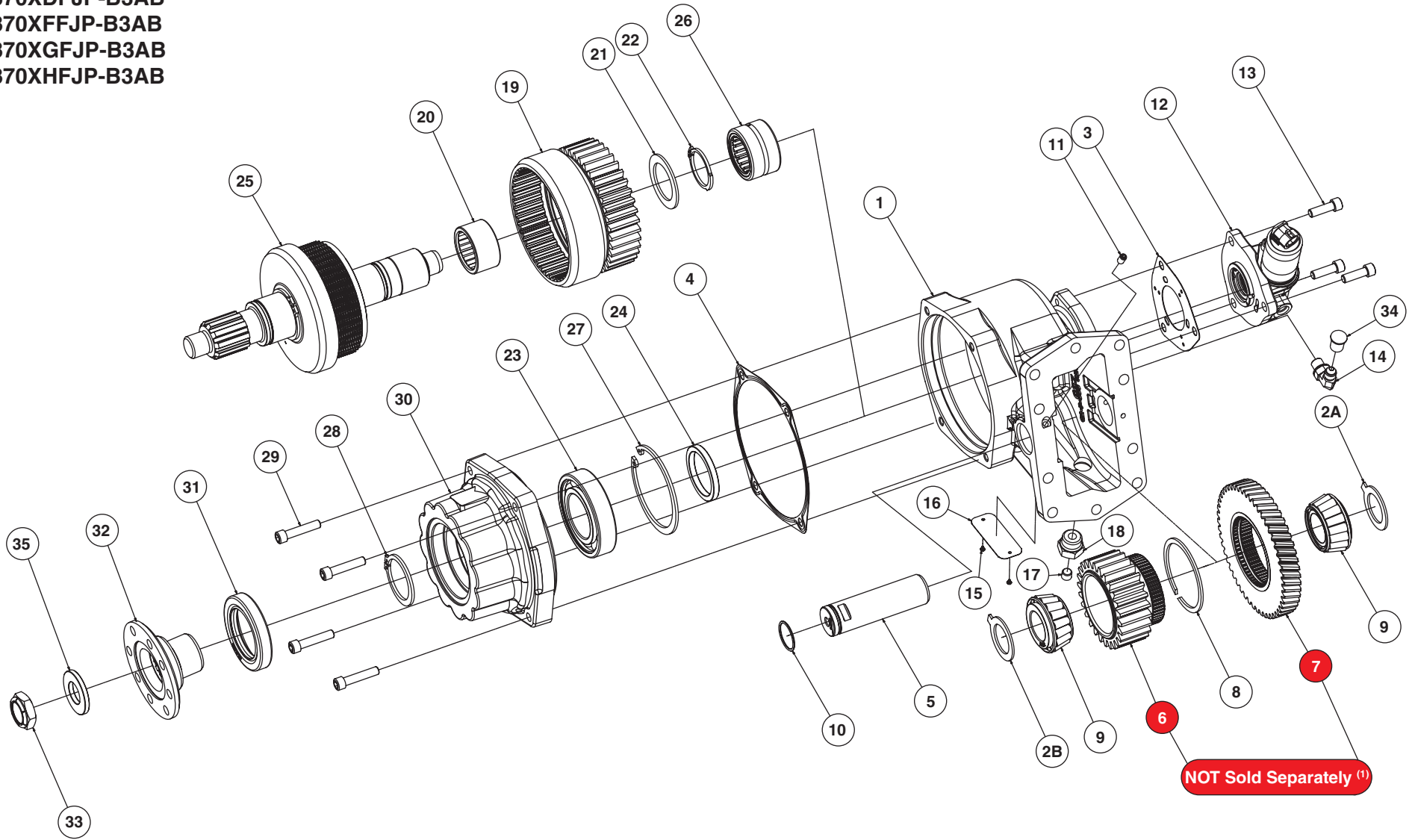
Item	Part Number	Description	Qty.
24	4-P-186	Spacer 1.385" x 1.750" x .365"	1
25	329723X	Drive Shaft & Clutch Assembly "BA"	1
26	561047	Bearing - Needle Roller 1.500" x 2.062" x 1.250"	1
27	378895	Snap Ring	1
29	378447-16	Cap Screw SH .312"-18 (5/16") x 1.500"	4
	380563-28	Cap Screw FH .375"-16 (3/8") x 1.500"	4
30	21-P-773	Bearing - Cap (.312" (5/16") Bearing Cap Bolts)	1
	21-P-884	Bearing - Cap (.375" (3/8") Bearing Cap Bolts)	1
31	28-P-212	Oil Seal 2.506" x 1.750" x .315"	1
32	380081	1410 Series Companion Flange	1
33	378435-7	Hex Head Cap Screw .625"-11 x 1.250"	1
34	379564-2	Thread Cap .438".....	1
35	4-P-130	Washer.....	1
60	23-P-68	Drag Brake Bearing Cap Spacer	1
61	31-P-113	Thrust Washer 1.385" x 3.125" x .125"	1
62	37-P-60	Spring 2.531" x 2.13" x .172"	1
63	378576	Snap Ring	1
64	329410X	Brake Assembly	1
65	28-P-244	O-Ring 1.174" x .103"	2
66	379977	Spring Pin	1

Service Kits

Part Number	Description
7170-86X	Stud Kit (Allison)
328948-9X	Gasket & Installation Instruction Kit (All)
329071-79X	Gasket & Seal Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)
329071-61X	Bearing Kit ("BA", "BB", "BC" Outputs)

See [Page 36-37](#) for Kits Bill of Materials

870XAFJP-B3AB
870XBFJP-B3AB
870XCFJP-B3AB
870XDFJP-B3AB
870XFFJP-B3AB
870XGFJP-B3AB
870XHFJP-B3AB



(1) See Page 24 for other Input Gear Assembly Options

Bill of Materials

**Service Manual
870 Series**

870XEFJP-B3AB

Item	Part Number	Description	Qty.
1	1-P-667	Housing (.312" (5/16") Bearing Cap Bolts)	1
	1-P-764	Housing (.375" (3/8") Bearing Cap Bolts)	1
2A	14-P-82-1	Spacer 1.191" x 1.75" x .080"	1
2B	14-P-82-1	Spacer 1.191" x 1.75" x .080"	1 or
	14-P-82-2	Spacer 1.191" x 1.75" x .085"	1 or
	14-P-82-3	Spacer 1.191" x 1.75" x .090"	1 or
	14-P-82-4	Spacer 1.191" x 1.75" x .094"	1
3	22-P-112	Gasket.....	1
4	22-P-151	Gasket.....	1
5	9-P-99	Idler Shaft	1
NOT Sold Separately ("E" 5-P-1428-5X ⁽¹⁾)			
6	5-P-1432 ⁽¹⁾	"E" Ratio Gear.....	1
7	5-P-1428 ⁽¹⁾	"FJ" Input Gear.....	1
8	380064	Snap Ring.....	1
9	561026	Bearing - Tapered Cone 1.181" x .9843"	2
10	28-P-42	O-Ring 1.051" x .070"	1
11	378452-7	Set Screw SH .250"-20 x .500"	1
12	329463-12X	12V Valve Cap Assembly.....	1
13	378447-6	Cap Screw SH .312"-18 x 1.000"	3
14	379486	Fitting 90°.....	1
15	378422	Drive Screw.....	2
16	68-P-51	Name Plate	1
17	379231	Pipe Plug .125"-27	1
18	379242	Straight Adapter .125"-27 x .750"-16	1
19	2-P-895 ⁽¹⁾	"E" Output Gear	1
20	560972	Bearing - Needle Roller Assembly 1.500 x 1.875" x 1.000".....	1

⁽¹⁾ See Page 24 for other Gear Options

Item	Part Number	Description	Qty.
21	31-P-70	Thrust Washer 1.507" x 2.167" x .094"	1
22	379746	Snap Ring	1
23	550311	Bearing - Ball 1.77" x 3.346" x .748"	1
24	4-P-187	Spacer 1.776" x 2.200" x .239"	1
25	329724-1X	Drive Shaft & Clutch Assembly "XV"	1
26	561047	Bearing - Needle Roller 1.500" x 2.062" x 1.250"	1
27	378263	Snap Ring	1
28	379555	Snap Ring	1
29	378447-8	Cap Screw SH .312"-18 (5/16") x 1.500"	4
	380563-14	Cap Screw FH .375"-16 (3/8") x 1.500"	4
30	21-P-766	Bearing - Cap (.312" (5/16") Bearing Cap Bolts)	1
	21-P-881	Bearing - Cap (.375" (3/8") Bearing Cap Bolts)	1
31	28-P-211	Oil Seal 3.00" x 2.00" x .375"	1
32	380503	1410 Series Companion Flange	1
33	380486	Nut - Nylon Lock Thin .875"-14	1
34	379564-2	Thread Cap .438".....	1
35	4-P-191	Spacer .885" x 1.75" x .188"	1

Service Kits

Part Number	Description
7171-86X	Stud Kit (Allison)
328948-9X	Gasket & Installation Instruction Kit (All)
329071-79X	Gasket & Seal Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)
329071-60X	Bearing Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)
329071-61X	Bearing Kit ("BA", "BB", "BC" Outputs)

See Page 36-37 for Kits Bill of Materials

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Before disassembling any Chelsea PTO, inspect it for wear or fatigue. Do this now so you do not lose valuable evidence during disassembly.

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

Overview: The “BA” Output differs from the “XV” in that the “BA” has extra components for the internal Shaft Brake.

Disassembly – “XV” Output (see pages 5 & 7) & “AB” (see page 11)

1. Output Bearing and Clutch Pack “XV”
 - 1.1. Remove the Flange Nut (33) and Washer (35) that retain the Companion Flange (32). Slide Companion Flange (32) off Output Shaft.
 - 1.2. Remove the four Cap Screws (29) from the Open End Bearing Cap (30), lift the Bearing Cap (30), Gasket (4) and Shaft/Clutch Assembly (25) from the Housing (1).
 - 1.3. Place the assembly in a soft-jawed vise. Support the Shaft above the Bearing surface.
 - 1.4. Use a screwdriver or a seal remover to pry the Oil Seal (31) from the Bearing Cap (30). **Important:** This seal will be damaged during removal. Replace it with a new seal.
 - 1.5. Remove the Snap Ring (28) from the Output Shaft.
 - 1.6. Support the assembly directly underneath the Bearing Cap (30). Using an arbor press, press the Output Shaft through the Bearing Cap (30).
 - 1.7. Remove the Snap Ring (27) and Bearing (23) from the Bearing Cap (30). If the bearing sticks, tap it with a soft mallet and a driver.

Disassembly – “BA” Output (see page 9)

1. Output Bearing and Clutch Pack “BA”
 - 1.1. Remove the Flange Hex Head Cap Screw (33) and Washer (35) that retains the Companion Flange (30). Slide Companion Flange (32) off Output Shaft.
 - 1.2. Remove the four Pump Bearing Cap Cap Screws (29).
 - 1.3. Remove the Bearing Cap (30), Gasket (4), Housing Spacer (60) and remaining Gasket (4).

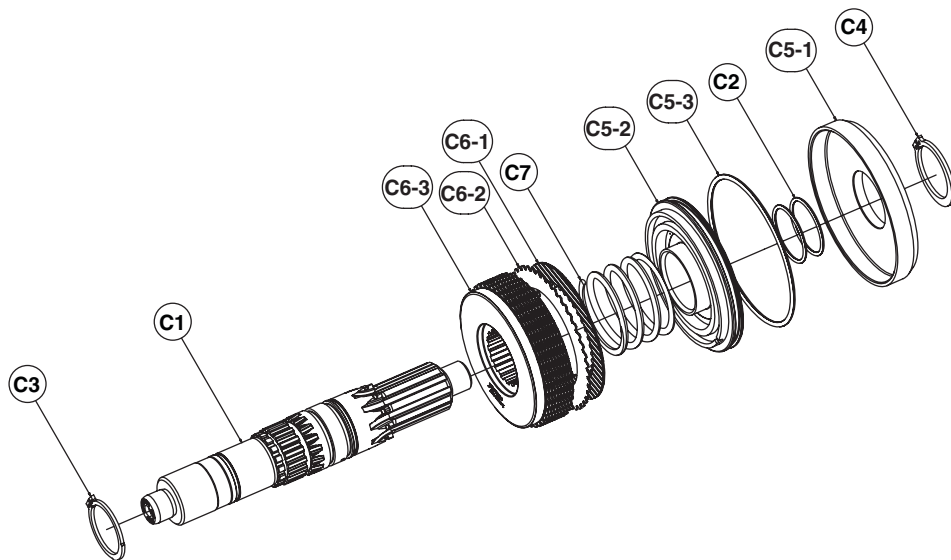
NOTE: The Output Shaft Assembly (25) and Shaft Brake will come out with the Bearing Cap.

 - 1.4. Place the Bearing Cap and Shaft Assembly in a soft-jawed vise.
 - 1.5. Support the Bearing Cap (30) and Shaft Assembly directly underneath the Bearing Cap (30). Using an arbor press, press the Output Shaft through the Bearing Cap.
 - 1.6. Remove the Retaining Ring (27) and Bearing (23) from the Bearing Cap (30). If the bearing sticks, tap it with a soft mallet and a driver.
 - 1.7. Go to [page 16](#) for Shaft Brake disassembly instructions.

CAUTION: When assembling or disassembling the PTO, always wear protective clothing and safety glasses.

Disassembly – “XV” Output & “AB” Output

2. Clutch Pack and Output Shaft
 - 2.1. Remove the Spacer (24) from the Shaft (C1).
 - 2.2. Remove the Retaining Ring (22), Thrust Washer (21) and Output Gear (19). Inspect the Washer (21) for heat damage. Replace if necessary.
 - 2.3. Next, compress the Clutch Assembly (25).
CAUTION: The Shaft Brake and Clutch Pack Assembly are under spring tension. Care must be taken when disassembling. Do not stand directly over the assembly when removing components under pressure.
 - 2.4. Remove the Snap Ring (C4).
 - 2.5. Slide the Clutch Back-Up Cylinder (C5-1) and Piston (C5-2) off the Shaft (C1). Remove the O-Ring (C5-3) from the Piston (C5-2) and discard. Inspect the Piston for galling or scratches.
 - 2.6. Remove the Return Spring (C7). Check it for cracks or breaks. Also remove and discard the two Shaft O-Rings (C2) that seal the Piston (C5-2) and Clutch Back-Up Cylinder (C5-1) on the Shaft.
 - 2.7. Remove and inspect the Clutch Plates (C6-2) and Friction Discs (C6-1). If debris is present, but the Chelsea PTO Gears (C6-3) are not damaged, it indicates possible transmission problems. If the components are burnt or discolored, the problem may be low lubricant levels, misapplication, or PTO engagement at too high an RPM.
 - 2.8. Remove the Clutch Gear (C6-3) off the Shaft (C1). Check it for wear or damage. Replace if necessary. The Snap Ring (C3) can stay on the Shaft (C1) if it is not damaged.
 - 2.9. Remove and inspect Shaft (C1) especially the Bearing surfaces for nicks, scratches, or other damage. The best way to discover these problems is to run your fingernail across the Shaft (C1) surface. If you feel a scratch, replace the Shaft (C1). Also make sure the Pressure Port is clear. Do this by blowing air through the hole.
 - 2.10. Reference main drawing. Using an appropriate driver, press the Internal Needle Bearing (20) from the Output Gear (19). Press against the flat surface of the Bearing (20) outer housing.
 - 2.11. Inspect the Output Gear (19) for cracks, pitting, missing teeth or other damage. Replace if necessary.



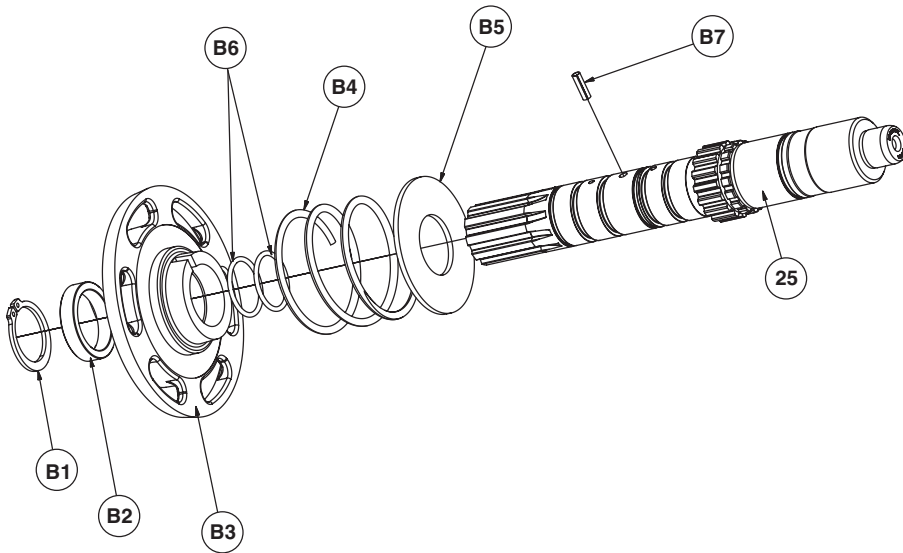
Item	Part Number	Description	Qty.
C1	3-P-1065	Output Shaft 10T Straight (329724-1X).....	1 or
	3-P-1066	Output Shaft 1-1/4" - 14T (329724-2X).....	1 or
	3-P-1067	Output Shaft DIN 8T (329724-3X).....	1
C2	28-P-285	O-Ring 1.597" x .103".....	2
C3	380069	Snap Ring.....	1
C4	379555	Snap Ring.....	1
C5	380110X	Piston Clutch Assembly w/ Ball.....	1
C5-1	380051	Cylinder Clutch Back up.....	1
C5-2	380110X	Piston Clutch.....	1
N.S.	500566-7	.250" Ball.....	1
C5-3	28-P-178	O-Ring 4.484" x .138".....	1
C6	329678X	Gear & Clutch Plates Kit.....	1
C6-1	379485	Friction Disc.....	11
C6-2	380065	Clutch Plate.....	10
C6-3	2-P-858	Output Gea.....	1
C7	37-P-72	Spring 2.14" x 1.729".....	1

N.S. — Not Shown

CAUTION: When assembling or disassembling the PTO, always wear protective clothing and safety glasses.

Disassembly – Shaft Brake “BA”

3. Once the Output Shaft Assembly (25) w/Shaft Brake is removed from the Bearing Cap (30) place Shaft Assembly in a soft vise with the Shaft Brake facing up.
 - CAUTION:** The Shaft Brake and Clutch Pack Assembly are under spring tension. Care must be taken when disassembling. Do not stand directly over the assembly when removing components under pressure.
 - 3.1. While pushing down and holding the Brake Disc (B3) remove Snap Ring (B1).
 - 3.2. Slowly release pressure on Brake Disc (B3) and remove the Spacer (B2), Disc (B3), and Spring (B4) from Output Shaft.
 - 3.3. Next carefully remove and inspect the two O-Rings (B6) from the Output Shaft.
 - 3.4. Remove Spring Pin (B7) from Shaft.
 - 3.5. Remove the Washer (B5) from Shaft.
 - 3.6. Inspect all components for damage or wear, replace if necessary.
 - 3.7. This completes the disassembly of the Brake Assembly. Go to [page 15](#) for Clutch Pack Disassembly.



Item	Part Number	Description	Qty.
25	329723X	“BA” Assembly Drive Shaft & Clutch (3-P-1072 Shaft).....	1
B1	378576	Snap Ring.....	1
B2	4-P-186	Spacer 1.385" x 1.750" x .365".....	1
B3	329410X	Brake Assembly.....	1
B4	37-P-60	Spring 2.531" x 2.13" x .172".....	1
B5	31-P-113	Thrust Washer 1.385" x 3.125" x .125".....	1
B6	28-P-244	O-Ring 1.174" x .103".....	2
B7	379977	Pin Spring.....	1

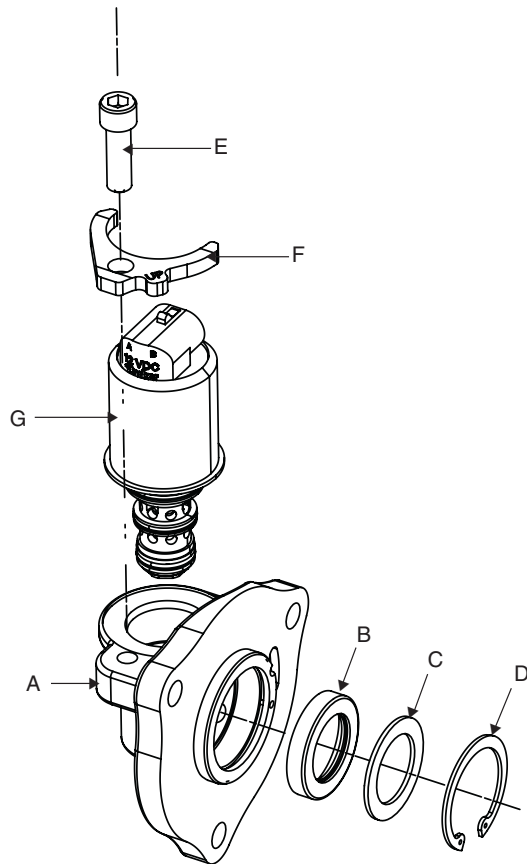
Disassembly

- 4.1. Next, remove Set Screw (11) from Main Housing (1).
- 4.2. Pull the Idler Shaft (5) from the Housing (1) by using a long threaded 3/8"-16 Bolt. Replace Shaft (5) if it is nicked or scratched. Remove and discard the Shaft O-Ring (10).
- 4.3. Remove the Input Gear assembly (6), (7) & (8), one Spacer (2B) and one Thrust Washer (2A). Remove the two Tapered Bearing Cones (9) from the Gear. Inspect Gear Races and teeth for cracks, nicks, heat signs or other damage. Replace if necessary.
- 4.4. Press the remaining Needle Bearing (26) from the Housing (1). **Important:** This Bearing (26) will be damaged during removal. Replace it with a new one.
- 4.5. Inspect the Housing (1) for deep grooves, gouges, and cracks. Make sure sealing surfaces are smooth.
- 4.6. Chelsea strongly recommends that you replace all used Snap Rings, O-Rings, Seals, Bearings and Gaskets with new ones during PTO service. Also replace any worn or damaged components you found during disassembly.
- 4.7. Clean all reusable components.

CAUTION: When assembling or disassembling the PTO, always wear protective clothing and safety glasses.

Disassembly

5. Valve & Cap Assembly
 - 5.1. Remove the three Socket Head Cap Screws (13), Valve Assembly (12), and Valve Cap Gasket (3) from the Chelsea PTO.
 - 5.2. Carefully remove the Snap Ring (D) and Washer (C). Visually inspect the Oil Seal (B) now. If you see signs of wear or leakage, remove the Seal (B).
Important: Do not nick the seal bore. This could result in leakage or further damage to the PTO.
 - 5.3. Remove the Solenoid Valve Socket Cap Screw (E). Use a screwdriver in the shaft seal opening to carefully pry the Solenoid Valve (G) loose from the Valve Cap (A). Be careful not to damage the seal.
 - 5.4. Remove the Solenoid Valve (G) from the Valve Cap (A). Check the O-Rings for damage. If they are damaged, replace the O-Rings.
4. Input Gear Sub-Assembly



Item	Part Number	Description	Qty.
11	329442-12X	Valve & Cap Assembly (12V) ("KV" Pitch Only).....	1 or
	329442-24X	Valve & Cap Assembly (24V) ("KV" Pitch Only).....	1
	329463-12X	Valve & Cap Assembly (12V) ("FJ" Pitch Only).....	1 or
	329463-24X	Valve & Cap Assembly (24V) ("FJ" Pitch Only).....	1
A	34-P-143	Valve Cap	1
B	28-P-119	Oil Seal (Hi Pressure).....	1
C	378811	Washer	1
D	378849	Snap Ring.....	1
E	378447-6	Socket Head Cap Screw .312"- 18 x 1.00"	1
F	379995	Clamp ("KV") Included with 379993 Valve	1 or
	380012	Clamp ("FJ") used with 380011 Valve.....	1
	380124	Clamp ("FJ") used with 380123 Valve.....	1
G	379993-12	Hydraulic Valve (12V) ("KV") (White Connector).....	1 or
	379993-24	Hydraulic Valve (24V) ("KV") (Black Connector)	1
	380011-12	Hydraulic Valve (12V) ("FJ") (White Side Connector)	1
	380011-24	Hydraulic Valve (24V) ("FJ") (Black Side Connector).....	1 or
	380123-12	Hydraulic Valve (12V) ("FJ") (White Connector Top) (New Style).....	1 or
	380123-24	Hydraulic Valve (24V) ("FJ") (Black Connector Top) (New Style).....	1

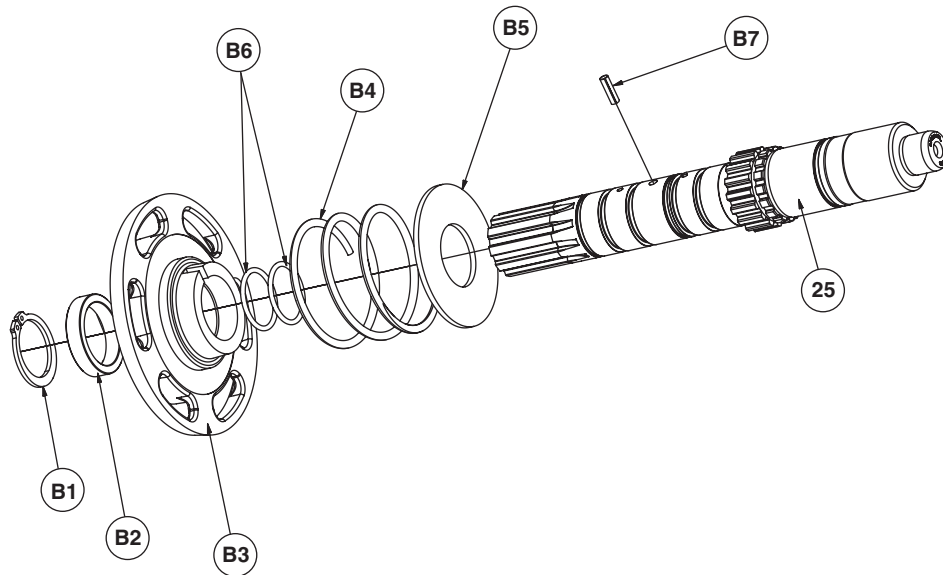
CAUTION: When assembling or disassembling the PTO, always wear protective clothing and safety glasses.

Assembly

Before Assembling the Shaft Brake Assembly, go to [page 19](#) and assemble the clutch pack first.

Assembly – Shaft Brake “BA”

1. Place Shaft (25) in a soft vise with the output end of the Shaft facing up.
 - CAUTION:** The Shaft Brake and Clutch Pack Assembly are under spring tension. Care must be taken when assembling. Do not stand directly over the assembly when assembling components under pressure.
 - 1.1. Install Washer on Shaft (B5).
 - 1.2. Insert Spring Pin (B7) into Shaft.
 - 1.3. Next carefully install the two O-Rings (B6) on the Output Shaft.
 - 1.4. Install the Spring (B4), Disc (B3) and Spacer (B2).
 - NOTE:** The slot on the Brake Disc (B3) must align with the Spring Pin (B7) to install correctly.
 - 1.5. While pushing down and holding the Brake Disc (B3) install a new Snap Ring (B1). Take care not to over stretch the Snap Ring.



Item	Part Number	Description	Qty.
25	329723X	“BA” Assembly Drive Shaft & Clutch (3-P-1072 Shaft).....	1
B1	378576	Snap Ring.....	1
B2	4-P-186	Spacer 1.385" x 1.750" x .365".....	1
B3	329410X	Brake Assembly.....	1
B4	37-P-60	Spring 2.531" x 2.13" x .172".....	1
B5	31-P-113	Thrust Washer 1.385" x 3.125" x .125".....	1
B6	28-P-244	O-Ring 1.174" x .103".....	2
B7	379977	Pin Spring.....	1

CAUTION: When assembling or disassembling the PTO, always wear protective clothing and safety glasses.

Assembly

2. Assembly

2.1. Output Shaft and Clutch Pack Assembly - Standard

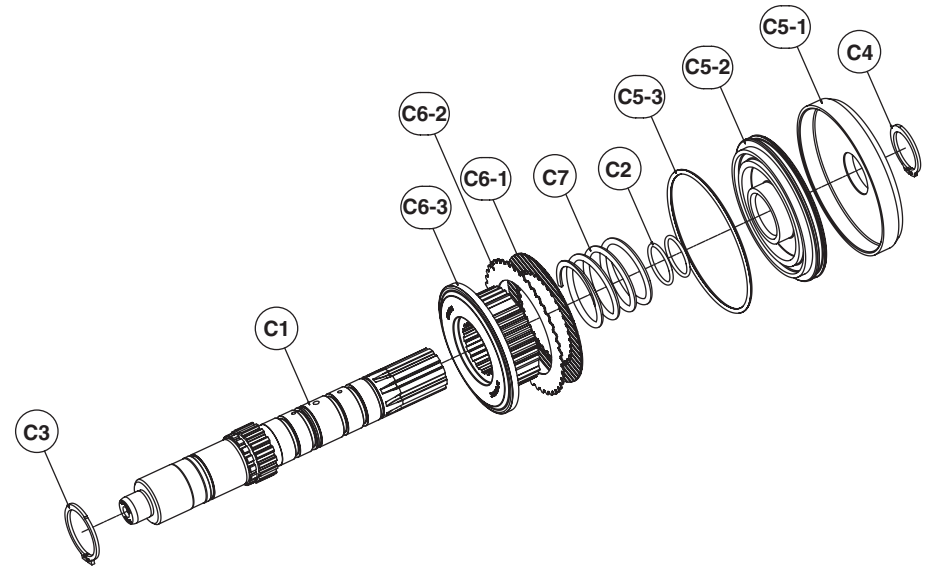
- 2.1.1. If Snap Ring (C3) was removed from the Shaft (C1), install on the shaft at this time.
- 2.1.2. Lubricate the Output Shaft (C1). Secure it in a vise, making certain not to scratch it.
- 2.1.3. Install the Clutch Gear (C6-3).
- 2.1.4. Lubricate the metal Clutch Plates (C6-1). Then starting with a Friction Disc (C6-1) (which has teeth on the inner diameter), alternately stack all the Friction Discs (C6-1) and Clutch Plates (C6-2) (which have teeth on the outer diameter) on the shaft.
- 2.1.5. Install the two O-Rings (C2) on the shaft.
- 2.1.6. Install the Return Spring (C7).
- 2.1.7. Lubricate a new O-Ring (C5-3) and position it on the Piston (C5-2).
- 2.1.8. Install the Piston (C5-2), centering it over the spring. Install the Clutch Back-Up Cylinder (C5-1).
- 2.1.9. Compress the Piston and Clutch Assembly down past the Snap Ring groove. Install a new Snap Ring (C4).

NOTE: If servicing a unit with a Shaft Brake ("BD" output) refer to "Shaft Brake Assembly" [page 18](#).

- 2.1.10. Install the Spacer (24)
- 2.1.11. Lubricate a new Ball Bearing (23) and install it into the Bearing Cap (30). Use a soft mallet and a proper driver to do this.
- 2.1.12. Secure the Bearing with a new Snap Ring (27).
- 2.1.13. Position the Bearing Cap over the Output Shaft. Support the Shaft Assembly in a press, being careful not to damage it. Using an appropriate driver, press on the inner Bearing Race until resistance is felt.
- 2.1.14. Secure the Assembly with a new Snap Ring (63).
- 2.1.15. Lubricate a new Bearing Cap Oil Seal (31). Then using an appropriate Shaft Seal Slide, driver and a soft mallet or press, install it into the Bearing Cap (30).

2.3. PTO Housing

- 2.3.1. Lubricate a new Needle Bearing (26) and install it into the Chelsea PTO Housing (1). Using a proper driver will help ensure that the Bearing is seated properly. Press on the flat side of the Bearing. The rounded side of the Bearing should face away from the Housing (1).



Item	Part Number	Description	Qty.
C1	3-P-1072	Output Shaft 10T Straight Complete Shaft & Clutch Ass'y	1 or
C1-1	3-P-1141	Output Shaft 1.25" Keyed Complete Shaft & Clutch Ass'y	1
C2	28-P-244	O-Ring 1.174" x .103"	2
C3	380069	Snap Ring	1
C4	378576	Snap Ring	1
C5	329179-1X	Piston & Back-Up Cylinder Ass'y	1
C5-1	379323-1	Clutch Back-Up Cylinder	1
C5-2	380057-1	Hydraulic Clutch Piston	1
C5-3	28-P-178	O-Ring 4.484" x .138"	1
C6	329678X	Gear & Clutch Plates Kit	1
C6-1	379485	Friction Disc	11
C6-2	380065	Clutch Plate	10
C6-3	2-P-858	Output Gear	1
C7	37-P-39	Spring 2.552" x 1.985"	1

CAUTION: When assembling or disassembling the PTO, always wear protective clothing and safety glasses.

Assembly

2.4. Output and Flange Assembly Installation

- 2.4.1. Place a new Gasket (4) on the Bearing Cap (30) sealing surface.
- 2.4.2. Install the Clutch Pack/Bearing Cap Assembly into the Chelsea PTO Housing (1).

CAUTION: Do not use sealing compounds. It could affect the correct operation of the transmission.

NOTE: See "BA" Flange Output for Shaft Brake Installation

- 2.4.3. Secure the Bearing Cap (30) with Socket Head Cap Screws (29).

Tighten and torque:

- 5/16" SH Cap Screws to 24-28 lbs-ft [33-39 Nm],
- 3/8" FH Cap Screws to 35-40 lbs-ft [47-54 Nm].

2.4.4. "XD" Output Option

- 1.4.4.1. Use a soft mallet to install a new Woodruff Key (63) into the Output Shaft.

2.4.5. "XV" Output Option

- 2.4.5.1. Place a new Gasket (4) on the Bearing Cap (30) sealing surface.

CAUTION: Do not use sealing compounds. It could affect the correct operation of the transmission. Install the Clutch Pack/Bearing Cap Assembly into the Chelsea PTO Housing (1).

- 2.4.5.2. Secure the Bearing Cap (30) with Socket Head Cap Screws (29).

Tighten and torque:

- 5/16" SH Cap Screws to 24-28 lbs-ft [33-39 Nm],
- 3/8" FH Cap Screws to 35-40 lbs-ft [47-54 Nm].

- 2.4.5.3. Install Output Shaft Companion Flange (32) onto Output Shaft.

- 2.4.5.4. Install Washer (35) and Flange Nut (33) into threaded bore on Output Shaft and torque to 75-85 lbs-ft [102-115 Nm].

2.4.6. "BA" Output Option

- 2.4.6.1. Place a new Gasket (4) on the PTO Housing (1) sealing surface. Install the Clutch Pack/Bearing Cap Assembly into the Chelsea PTO Housing (1).

CAUTION: Do not use sealing compounds. It could affect the correct operation of the transmission.

- 2.4.6.2. Install Shaft Brake Housing Spacer (60) with another Gasket (4).

- 2.4.6.3. Secure the Bearing Cap (30) with Socket Head Cap Screws (29). Tighten and torque:

- 5/16" SH Cap Screws to 24-28 lbs-ft [33-39 Nm],
- 3/8" FH Cap Screws to 35-40 lbs-ft [47-54 Nm].

- 2.4.6.4. Install Output Shaft Companion Flange (30) onto Output Shaft.

- 2.4.6.5. Install Washer (35) and Hex Head Cap Screw (33) into threaded bore on Output Shaft and torque to 75-85 lbs-ft [102-115 Nm].

CAUTION: When assembling or disassembling the PTO, always wear protective clothing and safety glasses.

2.5. Input Gear Assembly

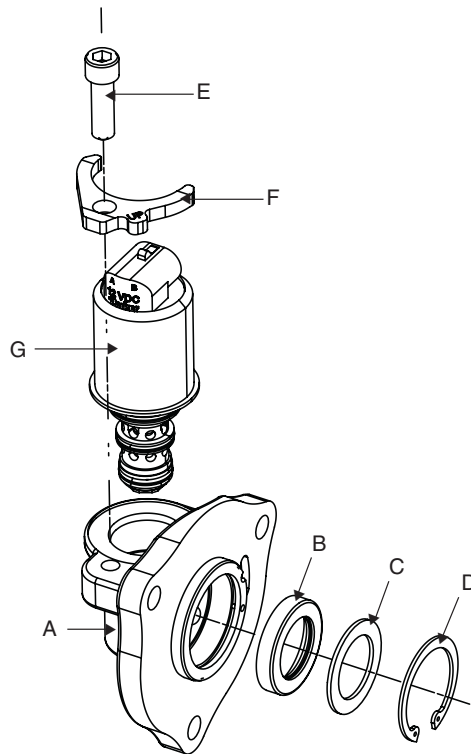
- 2.5.1. Install new, lubricated Tapered Bearings (9) into the Input Gear assembly (6), (7) and (8). The tapers should go toward the center of the Gear.
- 2.5.2. Next, place Tabbed Washer (Thrust Washer) (2A) next to the Input Gear (7).
- 2.5.3. Place the Shim (2B) on the ratio side of the Input Gear. Place the components into the Housing (1).
- 2.5.4. Align the Gear Assembly with the Idler Shaft (5) hole.
- 2.5.5. Place a new, lubricated O-Ring (10) on the Idler Shaft (5). Push it into the Housing (1) from the side opposite of the Roll Pin until it is just below the Housing (1) surface. Use the special alignment tool to ensure true alignment. The Shaft can only be installed from one direction because of the Roll Pin in the Housing (1).

NOTE: Once the Input Gear Assembly is installed, spin the Gear to seat the Tapered Bearings. There should be no side-to-side gear movement. If side-to-side movement exists, re-shim the gear with the appropriate thickness of shims.

Assembly

2.6. Valve Cap Assembly

- 2.6.1. If the Valve Assembly Oil Seal (B) was removed, replace it now. Lubricate a new seal. Install it carefully with the proper driver. **Important:** Avoid nicking the Housing (1). This could cause leakage or other PTO damage.
- 2.6.2. Next install the Washer (C) and Snap Ring (D).
- 2.6.3. Lubricate and insert the Solenoid Valve (G) into the Valve Cap (A).
- 2.6.4. Next install the Clamp (F) and Socket Head Cap Screw (E). Secure the Solenoid to the Valve Cap (A) with Socket Head Cap Screw (E). Torque to 9-10 lbs-ft [11-14 Nm].
- 2.6.5. Place a new Valve Cap Gasket (3) on the Valve Cap Assembly. Make sure the holes are aligned. **CAUTION:** Do not use sealing compounds. It could affect the correct operation of the transmission.
- 2.6.6. Attach the Valve Cap Assembly to the PTO Housing (1). Tighten the three Cap Screws (13) and torque to 24-28 lbs-ft [33-39 Nm].



Item	Part Number	Description	Qty.
11	329442-12X	Valve & Cap Assembly (12V) ("KV" Pitch Only).....	1 or
	329442-24X	Valve & Cap Assembly (24V) ("KV" Pitch Only).....	1
	329463-12X	Valve & Cap Assembly (12V) ("FJ" Pitch Only).....	1 or
	329463-24X	Valve & Cap Assembly (24V) ("FJ" Pitch Only).....	1
A	34-P-143	Valve Cap	1
B	28-P-119	Oil Seal (Hi Pressure).....	1
C	378811	Washer	1
D	378849	Snap Ring.....	1
E	378447-6	Sockethead Cap Screw .312"-18 x 1.00".....	1
F	379995	Clamp ("KV") Included with 379993 Valve	1 or
	380012	Clamp ("FJ") used with 380011 Valve.....	1
	380124	Clamp ("FJ") used with 380123 Valve.....	1
G	379993-12	Hydraulic Valve (12V) ("KV") (White Connector).....	1 or
	379993-24	Hydraulic Valve (24V) ("KV") (Black Connector)	1
	380123-12	Hydraulic Valve (12V) ("FJ") (White Connector Top) (New Style).....	1 or
	380123-24	Hydraulic Valve (24V) ("FJ") (Black Connector Top) (New Style).....	1

3. Final Check

- 3.1. While holding the Input Gear, turn the Output Shaft. If everything is assembled correctly, the Shaft will turn freely. Next, roll the Gears. They should roll freely. There should be no axial or radial movement if the unit is assembled correctly.
- 3.2. The unit is ready to be installed back on the transmission.

CAUTION: When assembling or disassembling the PTO, always wear protective clothing and safety glasses.

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Torque Chart**Service Manual
870 Series**

Location	Torque (English)	Torque (Metric)
Idler Pin Set Screw	20-30 In. Lbs.	2-3 Nm
Bearing Cap	5/16" – 24-28 lbs-ft 3/8" – 35-40 lbs-ft	33-38 Nm 47-54 Nm
Rotatable Flanges		
“RK”, “RF”, “RY” and “RS” (378447-8) (Qty. 4)	24-28 lbs-ft	33-39 Nm
Valve Cap Assembly	24-28 lbs-ft	33-39 Nm
Solenoid Valve Clamp	8-10 lbs-ft	11-13 Nm
Shaft Nut “XV” (380486)	75-85 lbs-ft	102-115 Nm
Shaft Hex Head Cap Screw “BA” (378435-7)	75-85 lbs-ft	102-115 Nm
Straight Thread Connector 90° (379486)	10-13 lbs-ft	14-18 Nm
Speed Sensor Port		
With EOC (379243)	25-30 lbs-ft	34-41 Nm
Without EOC		
O-Ring Boss Plug (379242)	25-30 lbs-ft	34-41 Nm
Pipe Plug (379231)	8-12 lbs-ft	11-16 Nm

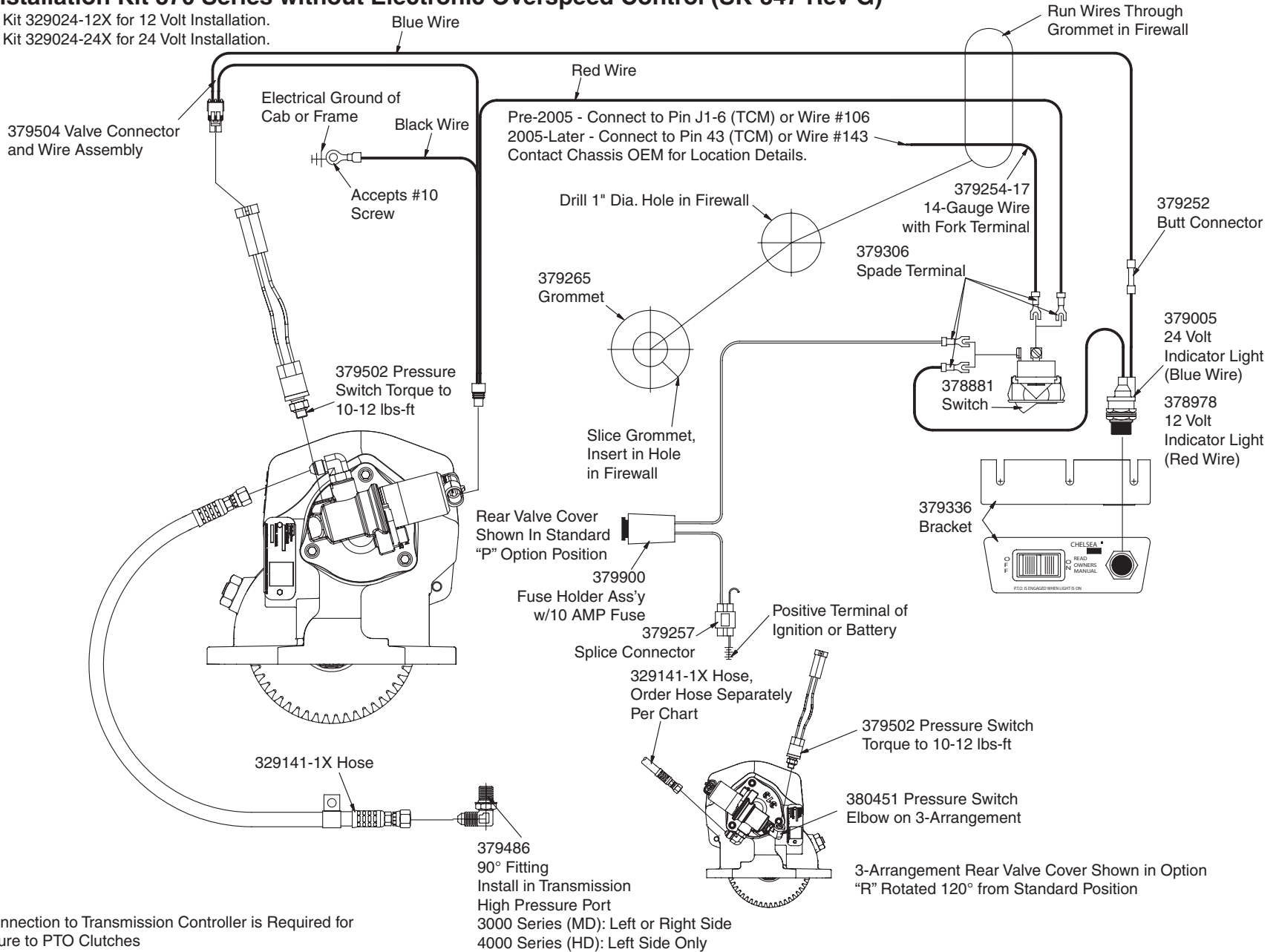
Gear Designator	Input Gear Assembly	NOT Sold Separately				Output Gear (19)	No. Teeth Output
		Input Gear (7)	No. Teeth Input	Ratio Gear (6)	No. Teeth Ratio		
870*AFJ	5-P-1428-1X	5-P-1428	50	5-P-1429	24	2-P-891	40
870*BFJ	5-P-1428-2X	5-P-1428	50	5-P-1438	25	2-P-892	39
870*CFJ	5-P-1428-3X	5-P-1428	50	5-P-1439	26	2-P-893	38
870*DFJ	5-P-1428-4X	5-P-1428	50	5-P-1440	27	2-P-894	37
870*EFJ	5-P-1428-5X	5-P-1428	50	5-P-1432	29	2-P-895	35
870*FFJ	5-P-1428-6X	5-P-1428	50	5-P-1433	31	2-P-896	33
870*GFJ	5-P-1428-7X	5-P-1428	50	5-P-1457	33	2-P-897	31
870*HFJ	5-P-1428-8X	5-P-1428	50	5-P-1455	34	2-P-898	30

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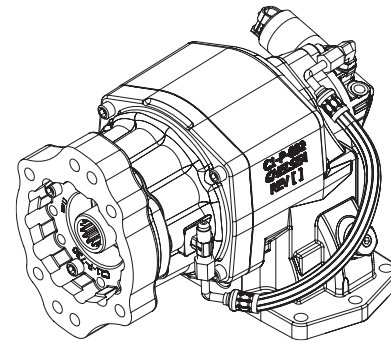
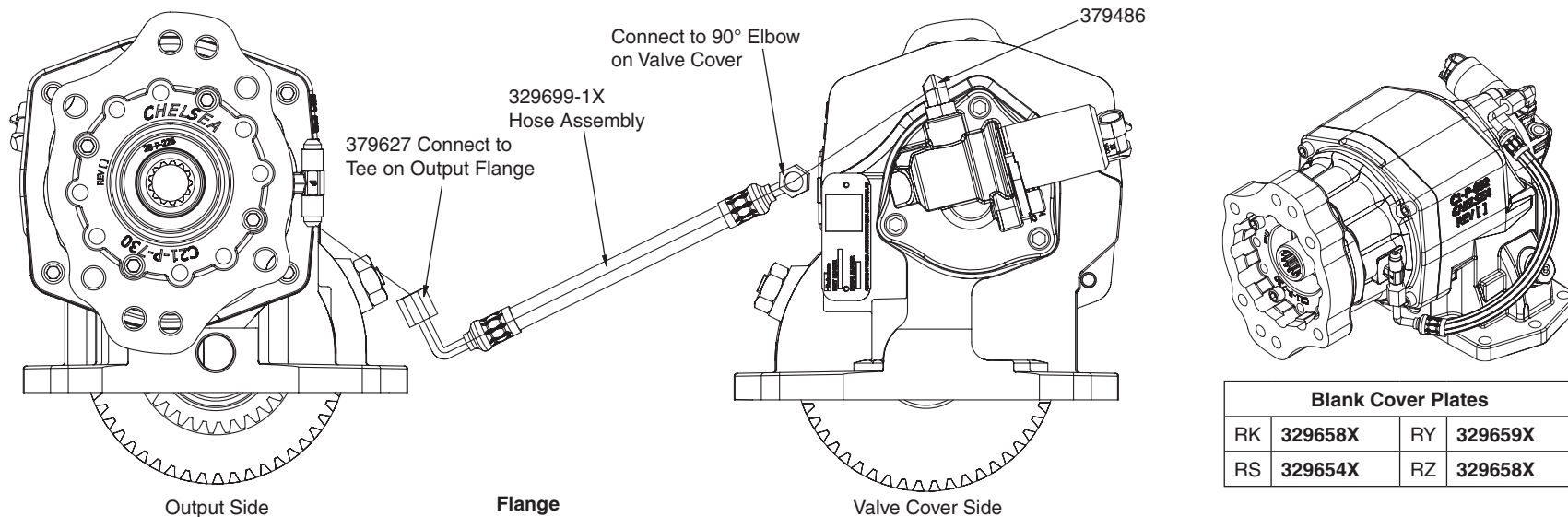
Shift Installation Kit 870 Series without Electronic Overspeed Control (SK-347 Rev G)

Reference Kit 329024-12X for 12 Volt Installation.
 Reference Kit 329024-24X for 24 Volt Installation.



NOTE: Connection to Transmission Controller is Required for Full Pressure to PTO Clutches

Installation “RK”, “RS”, “RY”, & “RZ” Wet Spline 870 Series (SK-508)



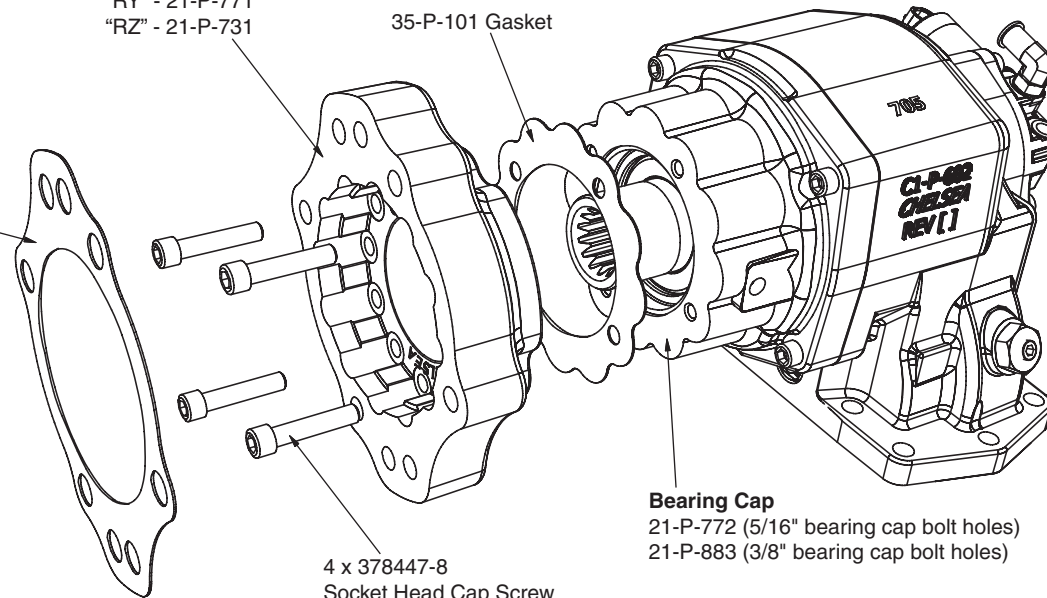
Blank Cover Plates			
RK	329658X	RY	329659X
RS	329654X	RZ	329658X

Output Side

Flange
 “RK” - 21-P-731
 “RS” - 21-P-769
 “RY” - 21-P-771
 “RZ” - 21-P-731

Valve Cover Side

Wet Spline Gasket or O-Ring
 “RK” - 35-P-102
 “RS” - 28-P-245
 “RY” - 35-P-111
 “RZ” - 35-P-102



4 x 378447-8
 Socket Head Cap Screw
 Torque 24-28 lbs-ft [33-39 Nm]

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When installing a PTO, always wear protective clothing and safety glasses.

1. Begin by draining the oil from the transmission. Use caution, since the oil may be hot (**Fig. 1**).

NOTE: Installation shown is for Right Side (Street Side) of Transmission.

2. Remove the PTO aperture plate with a 15mm socket (**Fig. 2**).
3. Remove the gasket and clean the aperture surface (**Fig. 3**).

NOTE: Do not reuse the gasket that comes with the transmission.

4. Using a screwdriver, install the guide pins until they bottom out (**Fig. 4**).

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

5. Install the special gasket over the guide pins. The ribbed surface should face outward, toward the installer (**Fig. 5**).

NOTE: To ensure proper backlash and sealing of PTO to transmission, only use gasket furnished with the PTO.

6. Position the PTO and secure it with the top Cap Screw (**Fig. 6**).
7. Install the remaining Cap Screws. Torque all to 40-50 lbs-ft [54-68 Nm] (**Fig. 7**).
8. Install PTO pressure switch, part # 379502, into port on Hydraulic Valve Cap. Torque to 10-12 lbs-ft [14-16 Nm] (**Fig. 8**).

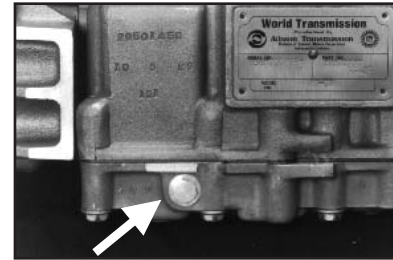


Fig. 1

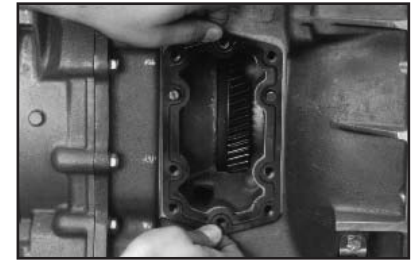


Fig. 5

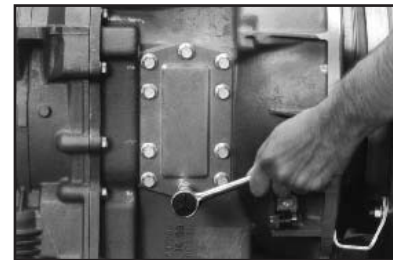


Fig. 2



Fig. 6

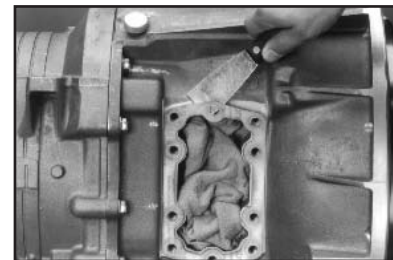


Fig. 3



Fig. 7

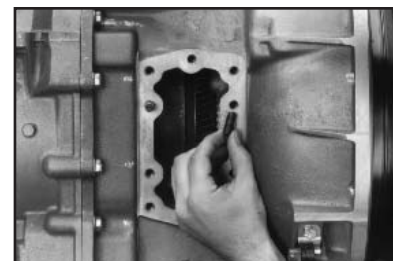


Fig. 4



Fig. 8

9. If using a rotatable flange, see [page 23](#) for bolt torque specification. (**Fig. 9**).
10. Securely attach the high pressure line to the PTO valve (**Fig. 10**).
11. Use the special fitting to securely attach the high pressure line to the transmission. This fitting is included with the PTO (**Fig. 11**). See installation drawing on [page 26](#) for the correct hose specifications. With the hose and PTO securely connected, refill the transmission to the manufacturer's suggested specifications.
12. Complete the assembly by installing the electrical connection to the valve assembly (**Fig. 12**) and the pressure switch (**Fig. 13**).

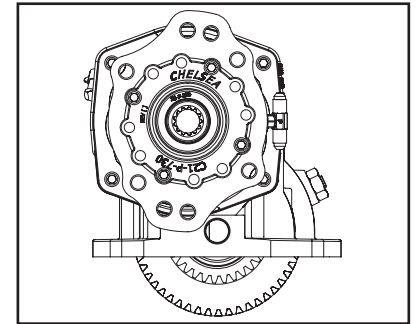


Fig. 9



Fig. 10

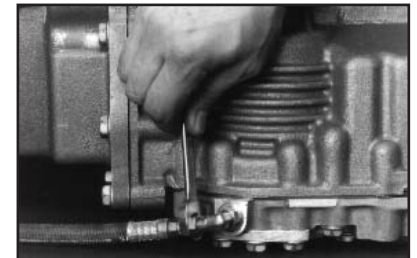


Fig. 11



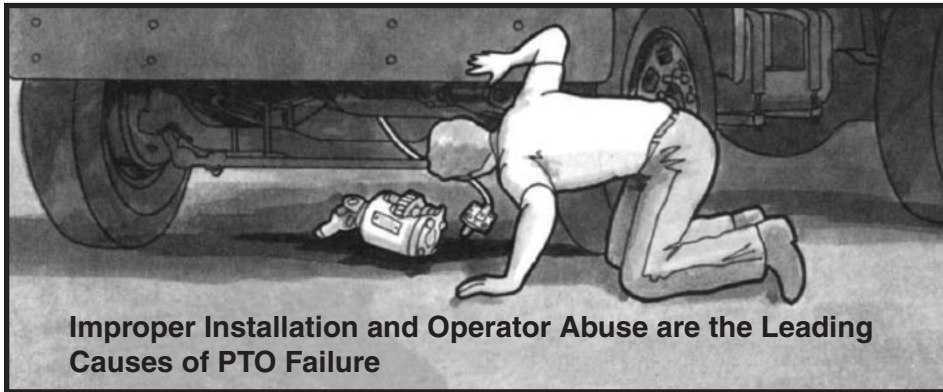
Fig. 12



Fig. 13

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

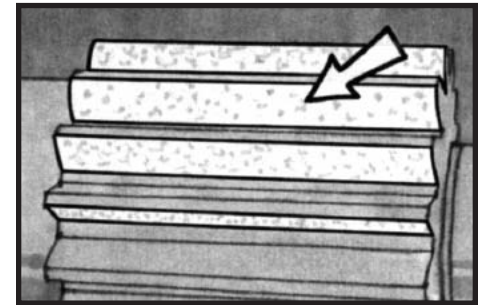
The first place to look when troubleshooting a PTO failure is in the application itself. Repeated or premature failure may be a sign of an incorrect application. This can be discovered by using the Chelsea HY25-3001/US General Information Catalog or HY25-3000/US Applications Catalog. Check to see if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

If the PTO was correctly specified and then failed prematurely, there are two likely causes: improper installation and/or operator

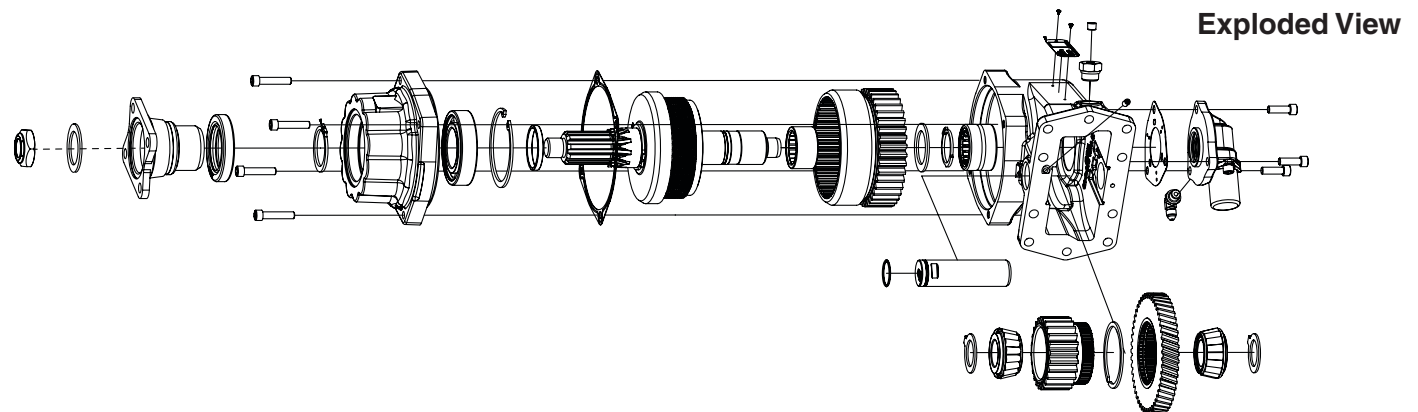
misuse. These are tough problems because they involve people as well as product. An improperly installed PTO can normally be identified immediately by the sound it makes. It will “whine” if installed too tightly, or “clatter” if it is installed too loosely. Sometimes, the vehicle itself may contribute enough noise to mask the sound of the PTO and one may not notice the problem.

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

Whatever the reason for a PTO failure, there will be confusion over who, or what, is at fault. More than likely the product will be blamed. Although the PTO cannot defend itself, its failed parts will tell a story. The first parts to inspect should be the gears. Check the surface of the gear teeth for signs of pitting . . . pitting is a normal wear pattern in most cases. However, contaminants in the oil or an installation that is too tight will cause severe pitting.

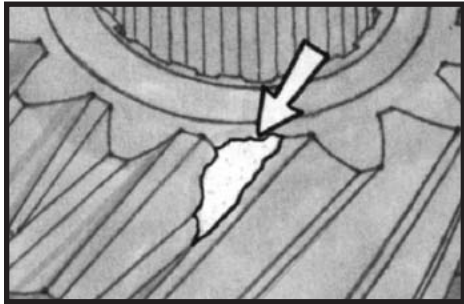


Once pitting of the gear surfaces has begun, there is nothing that can stop it. Severe pitting will eventually lead to gear tooth failure, therefore the damaged gear should be replaced when a PTO is repaired or rebuilt. Sometimes a gear will chip a tooth because of mishandling or improper shifting. Even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



Troubleshooting

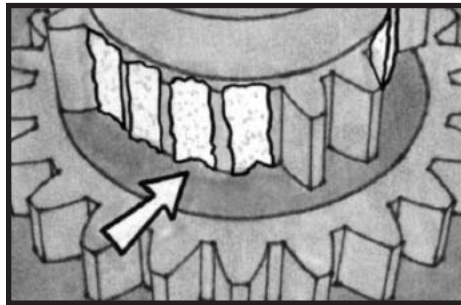
a PTO may continue to run with a chipped tooth, the damaged gear should be replaced immediately. It will damage the other teeth it comes in contact with during operation, not to mention the possible damage which could result from the loose chip. If the problem is



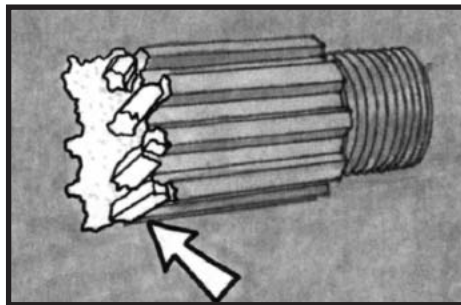
allowed to continue, then failure to other parts in the PTO or transmission could result.

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

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

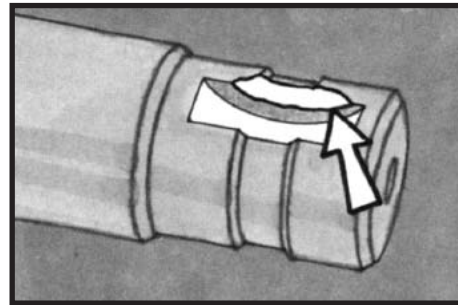


PTO shafts are also vulnerable to operating abuse. If the shaft break is irregular, this usually indicates a torsional overload. Bending fatigue failure usually shows up as a smooth, flat break. To correct a PTO shaft problem replace the failed shaft and check the speed and operating angle of the universal joint. Also, make sure the PTO driveshaft is properly phased, (yokes in-line with each other). If a driveline is improperly installed it will cause vibration, which may lead to PTO



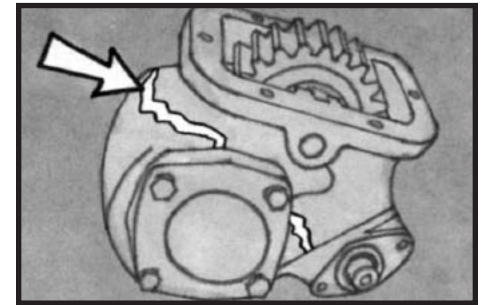
driveshaft or driven equipment problems. When inspecting a PTO output shaft, always inspect the keyway. Sometimes a PTO will fail because of a displaced keyway on the shaft caused by a loose fitting yoke or equipment freeze-up. Proper maintenance on auxiliary equipment and replacing a worn yoke and/or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

One of the most serious problems a PTO can suffer is a cracked case. This condition can lead to oil loss and eventual transmission failure. Improper installation, poorly torqued



bolts, or an unsupported direct mount pump can cause such a problem. A PTO case can also be damaged by foreign objects meshing between the gear teeth, severe shock load, or even hitting an obstacle in the road.

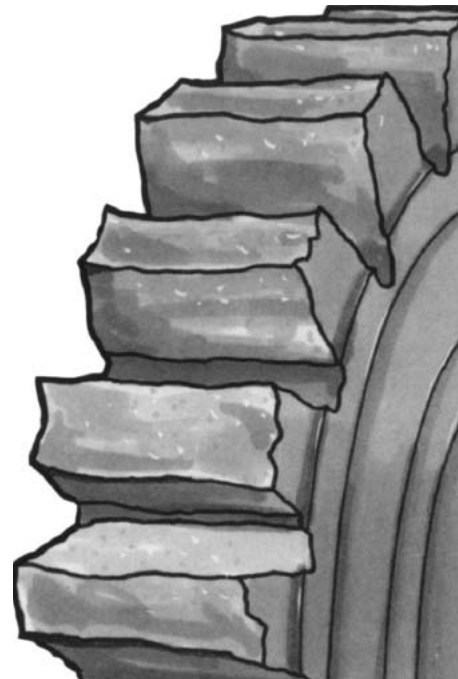
Prevention is the best cure for PTO case damage. Therefore, always torque the PTO flange bolts in sequence and the proper



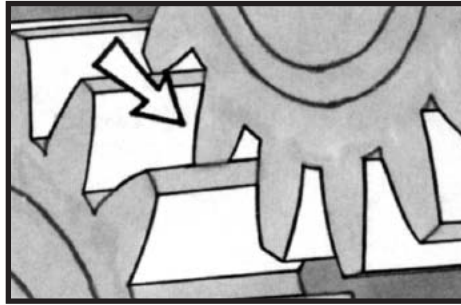
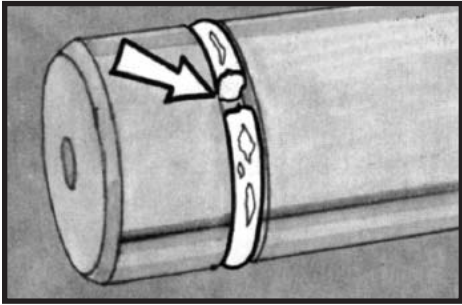
specifications. Also, be sure to check the weight of the direct mount pump and, if it is over forty pounds, make a support bracket for it.

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

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



Deep Mesh Pattern Caused by Improper Backlash Adjustment



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.

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Kits Bill of Materials

**Service Manual
870 Series**

329071-79X Gasket & Seal Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)

22-P-112	Gasket	1
22-P-151	Bearing - Cap Gasket	1
28-P-42	O-Ring 1.051" x .070"	1
28-P-119	Oil Seal 1.379" x .875" x .250"	1
28-P-211	Oil Seal 3.001" x 2.00" x .375"	1
28-P-267	Oil Seal 2.627" x 1.750" x .312"	1
28-P-285	O-Ring 1.597" x .103"	2
28-P-178	O-Ring 4.484" x .138"	1
35-P-101	Bearing Cap Gasket - Wet Spline.....	1

329071-60X Bearing Kit ("AB", "AC", "RS", "RY", "RZ", "SD", "SV", "XV" Outputs)

379746	Snap Ring	1
378263	Snap Ring - Internal	1
379555	Snap Ring.....	1
560972	Bearing - Needle Roller 1.500" x 1.875" x 1.000".....	1
550311	Bearing - Ball 1.77" x 3.346" x .748"	1
561026	Bearing - Tapered Cone 1.181" x .9843"	2
561047	Bearing - Needle Roller 1.500" x 2.062" x 1.250".....	1
14-P-82-1	Spacer 1.191" x 1.75" x .080".....	2
14-P-82-2	Spacer 1.191" x 1.75" x .085".....	1
14-P-82-3	Spacer 1.191" x 1.75" x .090".....	1
14-P-82-4	Spacer 1.191" x 1.75" x .094".....	1

329071-61X

378746	
378263	
379555	
378895	
560972	
561048	
561026	
561047	
14-P-82-1	
14-P-82-2	
14-P-82-3	
14-P-82-4	

329354-12X

22-P-112	
329230X	
329231X	
379258	
379449	
379686-1	
500357-7	
500457-6	
379564-2	
328075X	
379700	
380010	
379486	
329403X	
379711	
379131-1	
SK-432	
329057-4X	

Bearing Kit ("BA", "BB", "BC" Outputs)

Snap Ring.....	1
Snap Ring - Internal	1
Snap Ring.....	1
Snap Ring.....	1
Bearing - Needle Roller Ass'y 1.500" x 1.875" x 1.000".....	1
Bearing - Cylindrical Roller Ass'y 1.378" x 2.835" x .670"	1
Bearing - Tapered Cone 1.181" x .9843"	2
Bearing - Needle Roller 1.500" x 2.062" x 1.250".....	1
Spacer 1.191" x 1.75" x .080".....	2
Spacer 1.191" x 1.75" x .085".....	1
Spacer 1.191" x 1.75" x .090".....	1
Spacer 1.191" x 1.75" x .094".....	1

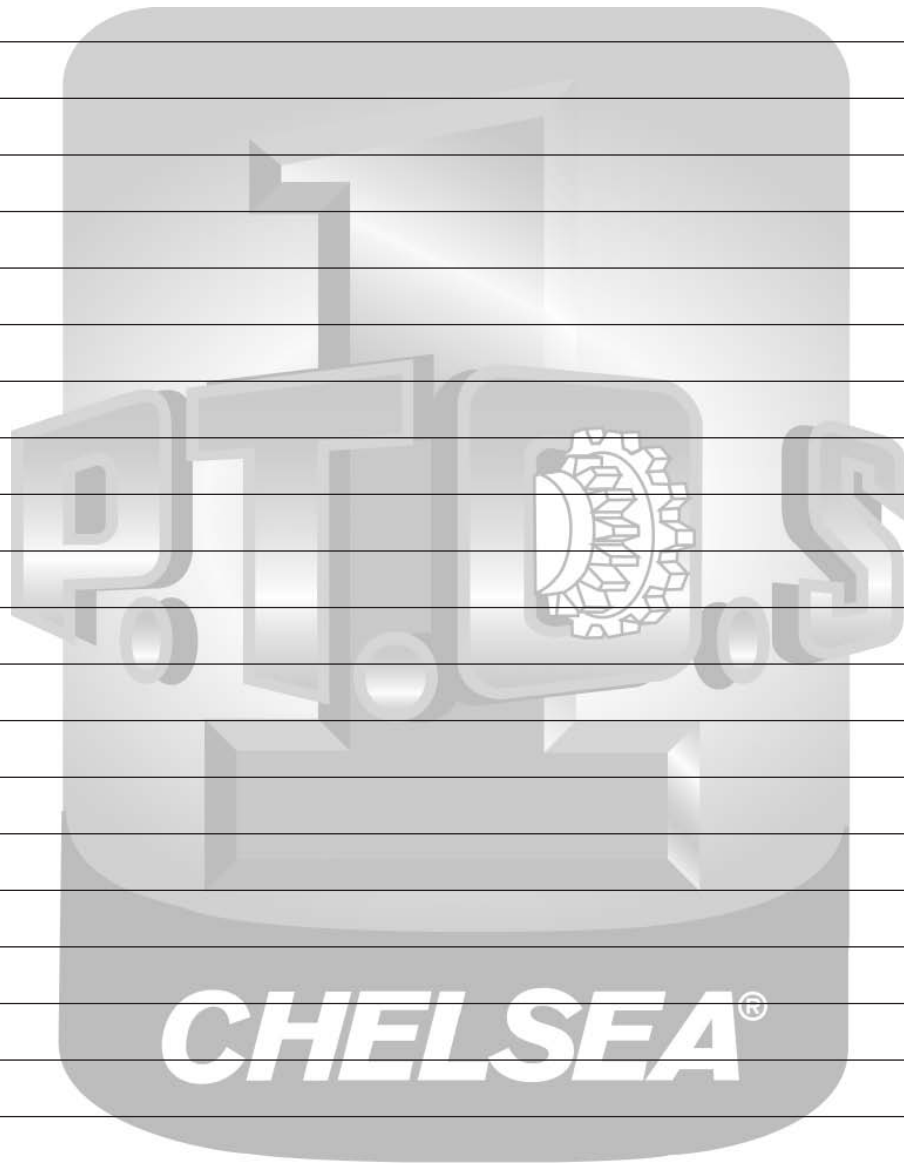
12V Remote Valve Conversion Kit

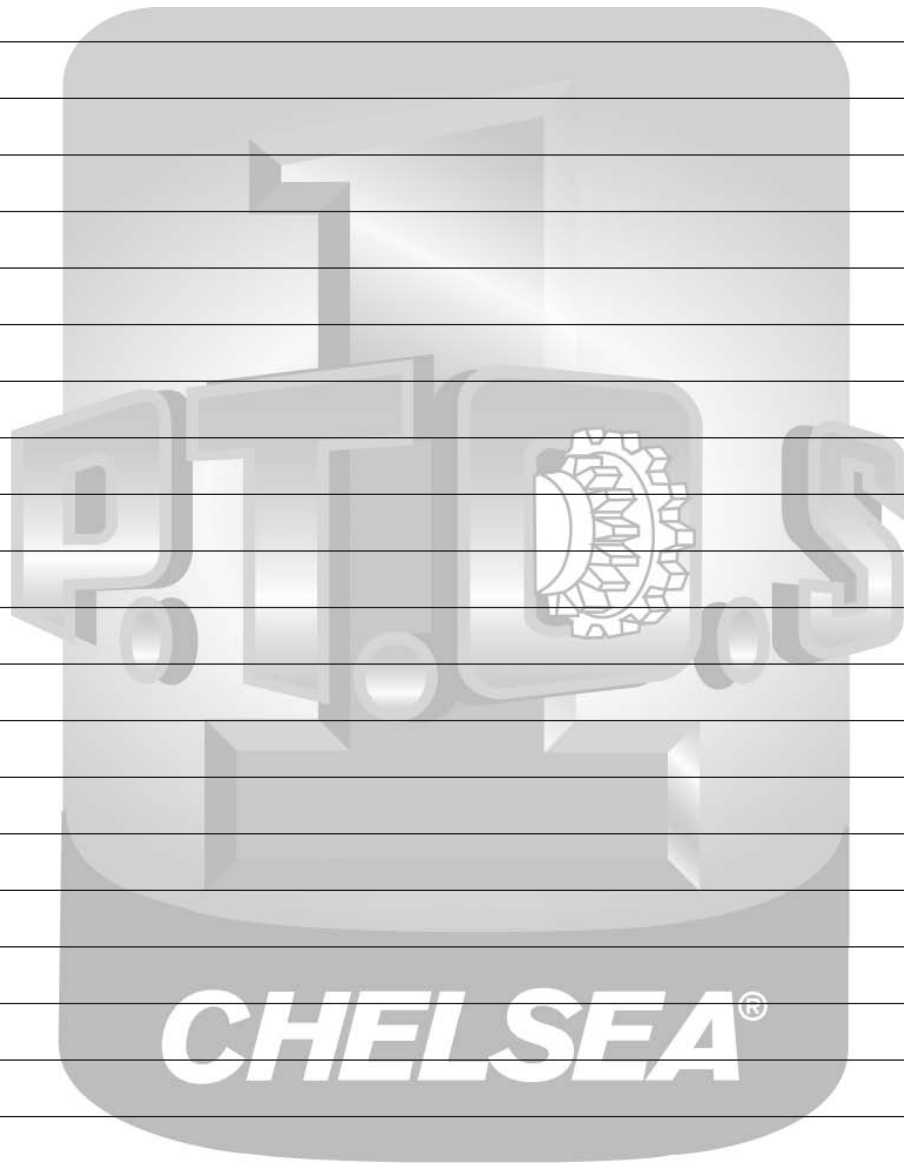
Valve Cap Gasket.....	1
Electrical Wire & Butt Connector	1
Valve Ass'y Connector Wire	1
Solenoid Valve Mounting Bracket	1
Male Connector .438"-20 x .250"-18	2
Solenoid Valve Hyd. Shift 12V	1
Lock Washer .337" x .19" x .047"	2
Screw - Round HD Slotted .190"-32 x .438"	
Shipping Cap.....	2
Hose Ass'y Length 36"	1
Tee - Swivel Nut .438"-20	1
Female Union SAE Swivel Nut .438"-20.....	1
Elbow 90° .438"-20	1
Seal Cap Ass'y	1
Tee .375"-24 x .438"-20 x .438"-20	1
Bushing - Pipe Reducer.....	1
Installation Schematic.....	1
Hose Ass'y Length 16.75"	2

Continued on Next Page

Kits Bill of Materials

329354-24X	24V Remote Valve Conversion Kit	
22-P-112	Valve Cap Gasket.....	1
329230X	Electrical Wire & Butt Connector	1
329231X	Valve Ass'y Connector Wire	1
379258	Solenoid Valve Mounting Bracket	1
379449	Male Connector .438"-20 x .250"-18	1
379686-2	Solenoid Valve Hyd. Shift 24V	1
500357-7	Lock Washer .337" x .19" x .047"	2
500457-6	Screw - Round HD Slotted .190"-32 x .438"	2
379564-2	Shipping Cap	2
328075X	Hose Ass'y Length 36"	1
379700	Tee - Swivel Nut .438"-20	1
380010	Female Union SAE Swivel Nut .438"-20.....	1
379486	Elbow 90° .438"-20.....	1
329403X	Seal Cap Ass'y	1
379711	Tee .375"-24 x .438"-20 x .438"-20.....	1
379131-1	Bushing - Pipe Reducer.....	1
SK-432	Installation Schematic.....	1
329057-4X	Hose Ass'y Length 16.75"	1
328948-9X	Gasket Installation Instructions ("XV", "RS", "RZ", "RY" Outputs)	
328946X	Caution Label Kit	1
35-P-74	Mounting Gasket	1
379085-2	Instructions Label	1
379624	Product Warranty Card	1
Owners Manual	HY25-1380-M1/US	1
Safety Guide	HY25-1002-M1/US	1
7170-86X	Stud Kit ("FJ" Pitch)	
379451	Guide Pin M10-1.5" x .984"	2
379453-10	Cap Screw FC M10-1.50" x 1.378".....	8
379486	Elbow 90 ° .438"-20.....	1
SK-355	Stud Kit Installation Card.....	1
7170-117X	Stud Kit ("KV" Pitch)	
379451	Guide Pin M10 x 1.5" x .984".....	2
379453-10	Cap Screw FC M10-1.50" x 1.378".....	8
379812	Male Connector .438"-20.....	1





Offer of Sale

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

07/14

Parker Worldwide

Europe, Middle East, Africa

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