

# GEARBOX PARTS MANUAL

# **P-12183**

## **GEARBOX PARTS MANUAL**

### **INDEX**

Gearbox Assemblies	
Gearbox Introduction	1-3
Circu-Lator 1 Gearbox ID	4
Circu-Lator 1 Gearbox:	
Top Assembly	5
Parts List	6
Center Assembly	7
Parts List	8
Bottom Assembly	9
Parts List	10
Circu-Lator 2G Gearbox:	
Top Assembly	11
Parts List	12
Center/Bottom Assembly	13
Parts List	14
Circu-Lator 2E Gearbox:	
Top Assembly	15
Parts List	16
Center/Bottom Assembly	17
Parts List	18
Circu-Lator Hi-Torque Gearbox	
Top Assembly	19
Parts List	20
Center/Bottom Assembly	21
Parts List	22
3 Sweep GB Top Assembly	23
Parts List	24
3-Sweep GB Top Assembly	25
Parts List	26
3 Sweep GB Center/Bottom Assy.	27
Parts List	28
Circu-Lator 2 Final Assembly	29
Circu-Lator 3 Final Assembly	30
Auxiliary Sweep Gearbox:	
Assembly	31
Parts List	32
Vertical Unload Gearbox:	
Assembly	33
Parts List	34
Circu-Lator Jr. Gearbox:	
Assembly	35
Parts List	36
Bottom Cap Assembly	37
Parts List	38
Gearbox Repair Kits	39-46
Connectors	
Sprockets	47
Base and Flange	48
Circu-Lator II Shaft Kits	49
Lubrication Guide	50
Repair Tools/Instructions	51-53

## CIRCU-LATOR I Gearboxes, Shivvers

Circulator-1	Description	Color Code	Cplr Type	Input O.D.	Key Type
203E-001A	C1GB-E: Std Input, 12T, Nit, 2pc Output, 8"-DRB		Spline	1.000	Woodruff
203-049A	C1GB-E,F: Top Hsg Assy, Nit, 2pc Output		Spline	1.000	Woodruff
NA	C1GB-E: Bot/Ctr Assy, Nit, Std Input				
203-011A	C1GB-B,C,D,E,F: Bot Hsg Assy		Spline	1.000	Woodruff
203Z-056A	C1GB-E: Ctr Hsg/Gear Assy		Spline	1.000	Woodruff
95A-001A	C1GB-D: Bskt Assy (Since 10/24/94)			1.000	
203F-001A	C1GB-F: Std Input, 12T, Nit, 2pc Output, 6"-DRB	Blue	Spline	1.000	Woodruff
203-049A	C1GB-E,F: Top Hsg Assy, Nit, 2pc Output	Blue	Spline	1.000	Woodruff
NA	C1GB-E: Bot/Ctr Assy, Nit, Std Input				
203-011A	C1GB-B,C,D,E,F: Bot Hsg Assy	Blue	Spline	1.000	Woodruff
203Z-055A	C1GB-F: Ctr Hsg/Gear Assy				

## CIRCU-LATOR II Gearboxes, Shivvers

428E-001A	C2GB-E: Lg Input, 12T, Viton, 1pc Output	Red	Spline	1.000	Woodruff
428-032A	C2GB-D,E,G: Top Hsg Assy, Viton, 1pc Output	Red	Spline		Woodruff
428-035A	C2GB-E: Bot/Ctr Assy, Viton, Lg Input	Red	Spline	1.000	Woodruff
428-068A	C2GB-E: Bot Hsg Assy, Viton, Lg Input	Red	Spline	1.000	Woodruff
NA	C2GB-E: Ctr Hsg/Gear Assy				
125I-001A	C2 GBE-Bskt Assy	Red			
428G-001A	C2GB-G: Lg Input, 12T, Nit, 1pc Output	Blue	Spline	1.000	Woodruff
428-063A	C2GB-G: Top Hsg Assy, Nit, 1pc Output	Blue	Spline		Woodruff
428-035A	C2GB-E: Bot/Ctr Assy, Viton, Lg Input	Blue	Spline	1.000	Woodruff
428-068A	C2GB-E: Bot Hsg Assy, Viton, Lg Input	Blue	Spline	1.000	Woodruff
125A-001A	C2 GBF-Bskt Assy (Since 04/28/04)	Blue			

## CIRCU-LATOR HI TORQUE Gearbox, Shivvers

428F-001A	CGB-F (HTGB): Lg Input, 16T, Viton, 1pc Output	Copper	Spline	1.250	5/16 -SQ
428-052A	CGB-F (HTGB): Top Hsg Assy, Viton, 1pc Output	Copper	Spline		5/16 -SQ
428-044A	CGB-F (HTGB): Bot/Ctr Assy, Viton, Lg Input	Copper	Spline	1.250	5/16 -SQ
428-045A	CGB-F (HTGB): Bot Hsg Assy, Viton, Lg Input	Copper	Spline	1.250	5/16 -SQ
125J-001A	CGBF-Bskt Assy (HTBA)	Copper			

## CIRCU-LATOR 3 HI TORQUE Gearbox, 3/8-16 Flange, Shivvers

428P-001A	C3GB-P (HTGB): Lg Input, 16T, Viton, 1pc Output	White	Spline	1.250	5/16 -SQ
428-112A	C3GB-P (HTGB): Top Hsg Assy, 3-Swp, Viton, 1pc Output	White	Spline		5/16 -SQ
428-044A	CGB-P (HTGB): Bot/Ctr Assy, Viton, Lg Input	White	Spline	1.250	5/16 -SQ
428-045A	CGB-P (HTGB): Bot Hsg Assy, Viton, Lg Input	White	Spline	1.250	5/16 -SQ
125L-001A	CGBP-Bskt Assy (HTBA)	White			

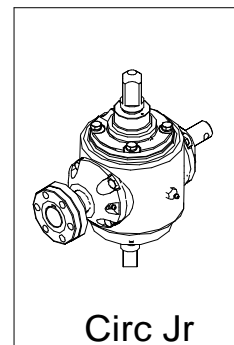
## CIRCU-LATOR 3 HI TORQUE Gearbox, 7/16-20 Flange, Shivvers

2015 versions-silver					
428Q-001A	C3GB-Q (HTGB): Lg Input, 16T, Viton, 1pc Output	Orange/Silver	Spline	1.250	5/16 -SQ
428-117A/143A	C3GB-Q (HTGB): Top Hsg Assy, 3-Swp, Viton, 1pc Output	Orange/Silver	Spline		5/16 -SQ
428-044A/142A	CGB-Q (HTGB): Bot/Ctr Assy, Viton, Lg Input	Orange/Silver	Spline	1.250	5/16 -SQ
428-045A	CGB-Q (HTGB): Bot Hsg Assy, Viton, Lg Input	Orange	Spline	1.250	5/16 -SQ
125N-001A	CGBQ-Bskt Assy (HTBA)	Orange			
428R-001A	C3GB-Q (HTGB): Lg Input, 16T, Viton, 1pc Output	Brown	Spline	1.250	5/16 -SQ
428-109A	C3GB-Q (HTGB): Top Hsg Assy, 3-Swp, Viton, 1pc Output	Brown	Spline	1.250	5/16 -SQ
428-132A	CGB-Q (HTGB): Bot/Ctr Assy, Viton, Lg Input. XL Housing	Brown	Spline	1.250	5/16 -SQ
125P-001A	CGBQ-Bskt Assy (HTBA)	Brown			

Shivvers offers the following systems using the Gearboxes shown in this Parts Manual, tailored to fit individual drying needs.

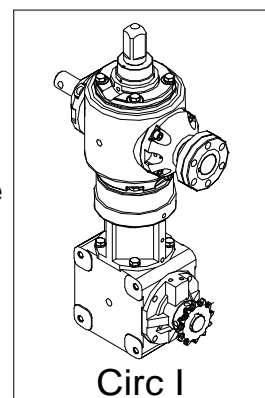
**Circu-lator JR:** This is an economy Continuous Flow Drying system that does not include a Horizontal Unload Auger. Instead, the Drive motor is installed on top of the Center Vertical Auger inside the bin. Its Gearbox is a single section, Circu-lator I style unit that does not extend below the Drying Floor. It has only one Tapered Sweep Auger, but can accommodate an Auxiliary Sweep Auger for end of season cleanout. Also, as the name implies, it can re-circulate the grain within the bin.

Circ JR Gearboxes are only available with regular temperature oil seals and grease.



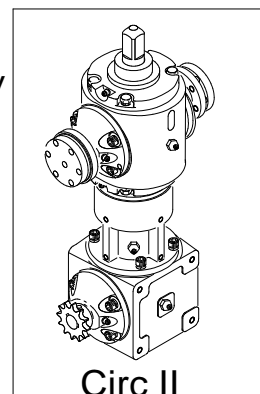
**Circu-lator I:** Used mainly in smaller dryer bins 18-27 ft. in diameter, this unit is driven from outside of the bin at ground level by a solid drive shaft inside the Horizontal Unload Auger. Its Gearbox is a dual section unit that has only one Tapered Sweep Auger attached, but like the Circ JR, it can accommodate an Auxiliary Sweep Auger for end of season cleanout. Additionally, with its Center Vertical Auger driven by the Gearbox's square top shaft, it can re-circulate the grain within the bin and its Horizontal Unload Auger can remove grain from the center of the bin.

Circ I Gearboxes are only available with regular temperature oil seals and grease.



**Circu-lator II:** By far our most popular drying system and offered in our Performance Systems, this unit is used primarily in 27-42 ft. bins. Its gearbox is a dual section unit that provides outputs for two Tapered Sweep Augers. As with the Circulator I, its Center Vertical Auger, driven by the Gearbox's square top shaft, can re-circulate the grain within the bin and its Horizontal Unload Auger can remove grain from the center of the bin.

Circ II Gearboxes are available with regular temperature or high temperature oil seals and grease.



**Dri Flo 500 & 1000:** Designed for continuous flow drying only, these systems do not have Center Vertical Augers and cannot re-circulate the grain within the drying bin. Current units have been fitted with Circulator II gearboxes. Since Dri Flo 500 and 1000 use Circulator II Gearboxes, they provide outputs for two Tapered Sweep Augers as well, and the Horizontal Unload Auger is used not just for unloading the bin but for transferring the dry grain during continuous flow drying.

Circulator II & Dri Flo 500 and 1000 drying systems currently use the same gearboxes: 428G-001A for regular temperature drying (up to 180°F) and 428E-001A for high temperature drying (up to 200° F). The 428E-001A is assembled with Silicon oil seals and a high temperature grease.

Dri-Flo is characterized as having NO CENTER VERTICAL auger, but rather a bonnet covering the gearbox. Replacement parts must be Identified and ordered by calling the factory.

**Dri-Flo 500 & 1000:**

Three current production models use two Tapered Sweeps:

Dri-Flo 500 w/ 6" Horizontal Unload

Dri-Flo 500 w/ 8" Horizontal Unload

Dri-Flo 1000 w/ 8" Horizontal Unload

**Dri Flo 1500:** (Designed to work with our HTDK). Designed for continuous flow drying only, these systems do not have Center Vertical Augers and cannot re-circulate the grain within the drying bin. Dri Flo 1500 uses Circulator III Gearboxes, which provide outputs for three Tapered Sweep Augers as well, and the 8" Horizontal Unload Auger is used not just for unloading the bin but for transferring the dry grain during continuous flow drying.

Dri Flo 1500 drying systems use 3-Sweep gearboxes, 428P-001A, prior to 2016, (for 42' and under bins, with 3/8-16 threads in the flange and 708 series sweeps) or 428R-001A (with 7/16-20 threads in the flange and 712 series sweeps). These gearboxes are for high temperature drying (up to 200° and are assembled with Silicon oil seals and a high temperature grease.

**HTDK (High Torque Drive Kit):** Similar to the Circulator II system, this unit is designed to handle higher capacities of grain and larger bins (36-48 ft). This system uses a dual electric motor powerhead, a stronger Horizontal Unload Auger, and our Wide Spread Center Vertical Auger.

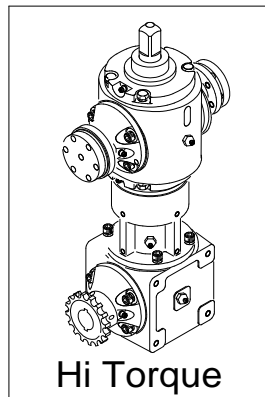
Requiring higher startup torques, its High Torque Gearbox, has been upgraded. It is a dual section unit that provides outputs for two or three larger capacity Tapered Sweep Augers.

As with the Circu-lator II, the High Torque Drives' Wide Spread Center Vertical Auger, Driven by the gearbox's square top shaft, can re-circulate the grain within the bin. Also, as the name indicates, The Wide Spread Center Vertical can distribute the grain more evenly in the larger bin sizes. The High Torque Drives' Horizontal Unload Auger, is used primarily to remove grain from the center of the bin.

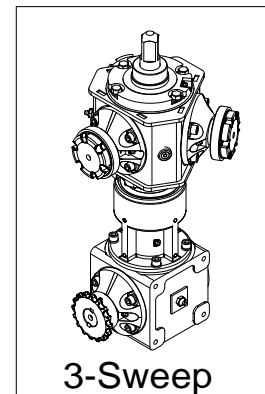
The 3-Sweep High Torque Gearbox is also used with the HCCV (High Capacity Center Vertical) Auger and is designed to handle the flow from 3 Sweep augers.

Note: High Torque Gearboxes used with a High Torque Drive Auger are driven with a 16-Tooth chain coupler, and cannot be installed in an existing Circulator system using a Non-High Torque Drive Unload Auger. High Torque Gearboxes are only available with high temperature oil Seals and Grease.

NOTE: The HCCV (High Capacity Center Vertical) Auger has a larger intake than the WSCV (15" instead of 13"), allowing it to handle more bushels per hour.

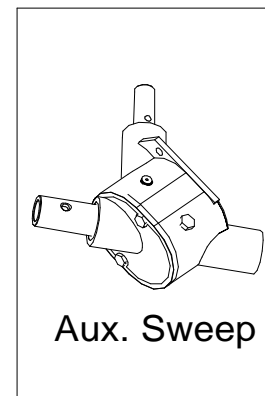


Hi Torque



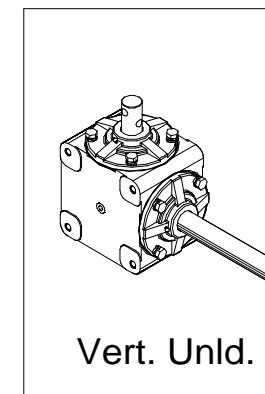
3-Sweep

**Auxiliary Sweep Gearbox:** Circu-lator JR and Circu-lator I systems are made so they will accept a carry-in Auxiliary Sweep Auger to clean out the bin at the end of season. These Sweep Augers include an aluminum housing, right angle gearbox that fits onto the Circu-lator Gearbox cross shaft opposite the tapered sweep.



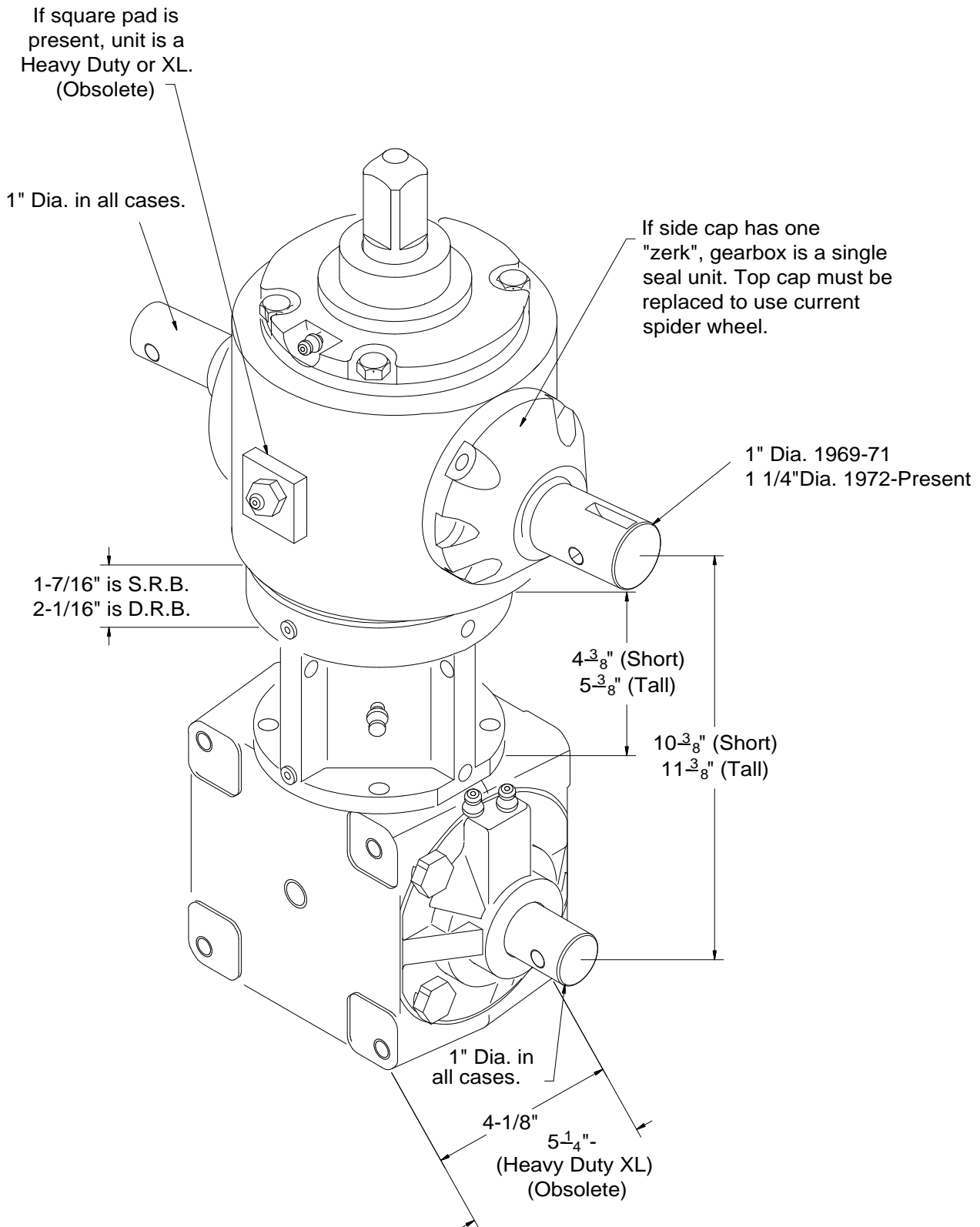
Aux. Sweep

**Vertical Unload Gearbox:** Circu-lator I & Circu-lator II can be fitted with a Vertical Unload Auger attached to their horizontal unload transitions. These units take their power through the gearboxes from the motors that drive the entire system. For systems that have a higher demand for power from their system motor, Shivers offers a top drive style Vertical Unload that has its own dedicated motor and no gearbox. Systems on larger bins or those using High Torque power heads are among these.



Vert. Unld.

# CIRCU-LATOR I GEARBOX IDENTIFICATION



**CIRCU-LATOR I (203E-001A (Black), 203F-001A (Blue))**

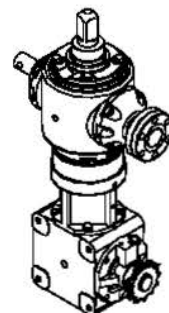
**CIRCU-LATOR I (203E-001A (Black), 203F-001A (Blue))**





# TOP HOUSING ASSEMBLY-203-049A

CIRCU-LATOR I (203E-001A (Black), 203F-001A (Blue))



CL-I  
203E  
203F

Item:	Description:	Qty	Part No.	
1	HOUSING, TOP	1	203-012P	
2	Cap, Side	2	203-017P	
3	Seal, 1-1/4" ID:CR-12364	4	D-7001-03	
4	Grease Fitting: ALE# 3038-B	5	H-1056	
5	Bearing Cup: LM67010	2	D-2014-01	
6	Bearing Cone: LM67048	2	D-2013-01	
7	Shaft, Cross: 11.375"	1	203-018P	
8	Collar	1	203-002P	
9	Washer	1	F-8001-01	
10	Snap Ring: Eaton# 336-2	1	F-1033-01	
11	Gear, Pinion: 14 Teeth	1	D-3025	
12	Key, Woodruff: 1/4 x 3/4"	3	D-1004-02	
13	Roll Pin: 5/16 x 2"	3	F-1036-39	
14	L'Washer: 5/16" Heavy Spring	16	F-1019-02	
15	Shim: 3.938" Dia. x .005"	AR	H-1351	
16	Shim: 3.938" Dia. x .015"	AR	H-1352	
17	Bottom Cap, Circ-1	1	203-020P	
18	Seal, 1" ID: (Nitrile) CR# 9878	4	D-7001-07	
19	Grease Fitting: ALE# 1607-B	1	H-1010-07	
20	Bearing Cup: L44610	2	D-2019-01	
21	Bearing Cone: L44643	2	D-2018-01	
22	Gear: 19 Teeth	2	D-3024	
23	Shaft, Bottom: Spline, 4.951"	1	203-050P	
24	Bearing Cone: LM11749	2	D-2016-01	
25	Bearing Cup: LM11710	2	D-2017-01	
26	Top Cap, Circ-1	1	203-014P	
27	Shaft, Top: Circ-1	1	203-015P	
28	Shim: 4.250" Dia. x .005"	AR	H-1066	
29	Shim: 4.250" Dia. x .015"	AR	H-1067	
46	SHCS: 5/16-18 x 1", GR8, Blk	8	F-1048-15	
47	HHCS: 5/16-18 x 1", GR5, Ny	8	F-1110	
48	Grease Fitting: ALE# 1627-B	1	H-1010-02	
49	Pipe, Plug: 1/4-18 NPT	1	H-1025-01	
	Lubricant: Grease, Moly-Lithium	AR	C-6185	Napa-Valv #633
	Extreme Pressure #2 only (14 oz. tube)			

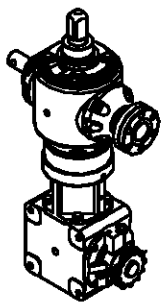
Assembly, 203-006A

AR= As Required

## Reference---Related Assemblies

				Assemblies
2	Cap, Side	1	203-017P	
3	Seal, 1-1/4" ID Nitrile	2	D-7001-03	
4	Grease Fitting: ALE# 3038-B Bearing Cup:	2	H-1056	
5	LM67010	1	D-2014-01	Assy: 203-016A
26	Cap, Top	1	203-014P	
18	Seal, 1" ID	2	D-7001-07	
4	Grease Fitting: ALE# 3038-B Bearing Cup:	1	H-1056	
20	LM67010	1	D-2019-01	Assy: 203-034A
17	Cap, Bottom	1	203-020P	
18	Seal, 1" ID	2	D-7001-07	
19	Grease Fitting: ALE# 3038-B Bearing Cup:	1	H-1010-07	
20	LM67010	1	D-2019-01	Assy: 203-035A
41	Base	1	203Z-032P	
42	Flange	1	203Z-033P	
43	Rollpin	1	F-1036-37	
44	Key, Woodruff: 1/4 x 1	1	D-1004-01	Kit: 423-022-001A
50	Coupler, Splined	1	203-054P	
51	Snap Ring, Internal:Eaton NAN112	1	H-2551	Kit: 203-059A

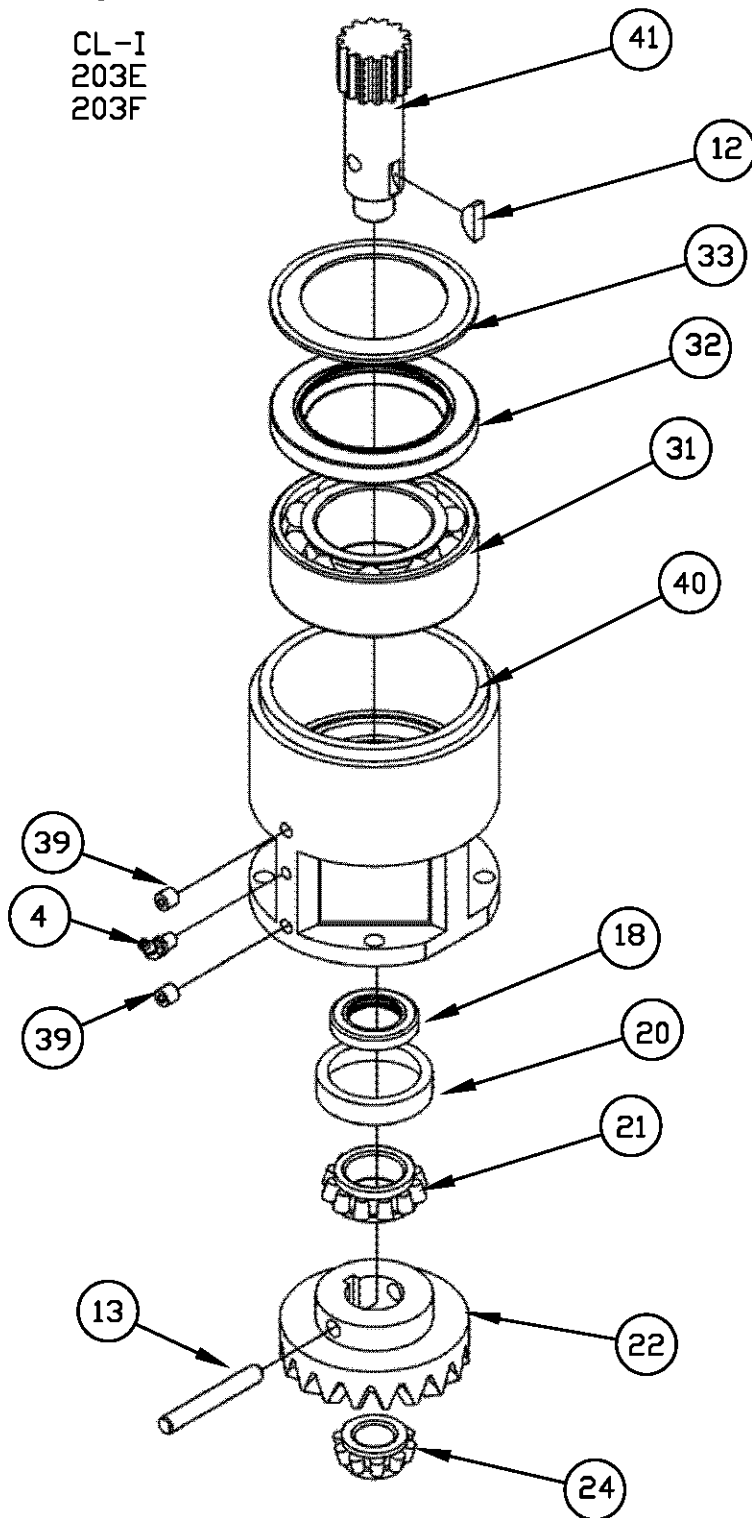
\*\*Must be used with Double-Row Bearing only. See "Center Housing" Note.



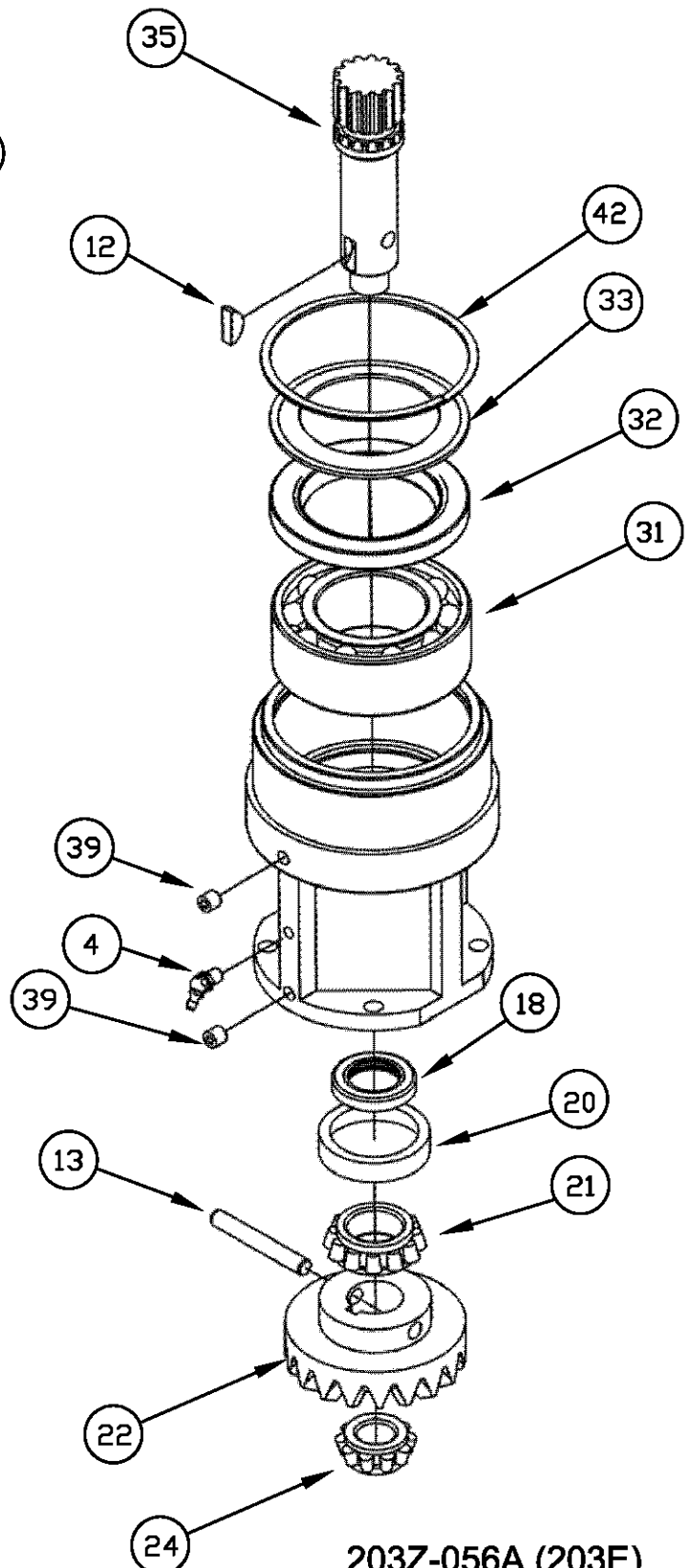
CL-I  
203E  
203F

# CENTER HOUSING ASSEMBLY

CIRCU-LATOR I (203E-001A (Black) 203F-001A (Blue))



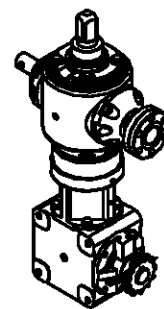
203Z-055A (203F)  
(SHORT Center housing)



203Z-056A (203E)  
(TALL Center Housing)

# CENTER HOUSING ASSEMBLY

CIRCU-LATOR I (203E-001A, 203F-001A)



CL-I  
203E  
203F

203Z-056A-(203E-001A) (TALL)

203Z-055A-(203F-001A) (SHORT)

Item:	Description:	Qty.	Part No.	Special Notes:
30	CENTER HOUSING	1	203Z-024P	*Tall Center Section 5.375" High.
40	CENTER HOUSING		203Z-023P	*Short Center Section 4.375" High.
31	Bearing, DRB 5210W	1	D-3033	**(Single Row=D-2015-01
32	Seal, Oil, 2.375 x .375W	1	D-7001-08	
33	Protector Washer	1	203-025P	
18	Seal, 1"ID CR9878	1	D-7001-07	
20	Bearing Cup, 1.980 L44610	1	D-2019-01	
21	Bearing Cone L44643	1	D-2018-01	
22	Gear, 19 Tooth	1	D-3024	
12	Key, Woodruff: 1/4 x 3/4"	1	D-1004-02	
13	Roll Pin, Dbl, 5/16 x 2"	1	F-1036-39	
4	Zerk, 45°, 1/4 NPT	1	H-1300	
35	Shaft, Splined (for TALL), 4.576"L	1	203-052P	203Z-056A (203E)
41	Shaft, Splined (for SHORT), 3.576"L	1	203-051P	203Z-055A (203F)
24	Bearing Cone, LM11749	1	D-2016-01	
39	Pipe Plug, 1/16"	2	H-1025-02	
42	Ring, Internal Retaining, 3.54"	1	F-1884	
	Capscrew, 5/16 x 1" (Shown but not part	4	F-1110	
	Lockwasher, 5/16" of the Assembly)	2	F-1019-02	
	Lubricant: Grease, Moly-Lithium			
	Extreme Pressure #2 only (14 oz. tube)	AR	C-6185	Napa-Valv #633

AR= As Required

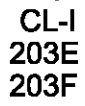
## NOTE:

See Splined Shaft Kits for 203Z-055A and 203Z-056A on page 38.

\*\*Before ordering a center section Bearing, measure the Center Housing (see page on 'Circu-Lator I Gearbox Identification') to determine whether you have a Double Row Bearing (DRB) or a Single Row Bearing (SRB).

Single Row Bearing center sections are no longer available. If a SRB center section needs replaced, the bottom cap of the top gearbox must also be replaced. By the same token, if a bottom cap of a top gearbox is replaced, the center section must be a Double Row Bearing unit.

These parts will not directly interchange without the likelihood of a failure at a later time.

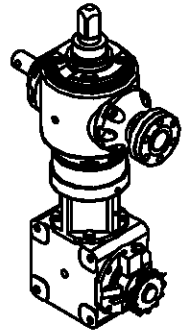


**CIRCU-LATOR I (203E-001A (Black), 203F-001A (Blue))**



# BOTTOM HOUSING ASSEMBLY 203-011A

CIRCU-LATOR (203E-001A (Black), 203F-001A (Blue))



CL-I  
203E  
203F

Item:	Description:	Qty.	Part No.
35	HOUSING, BOTTOM	1	203-028P
25	Bearing Cup: LM11710	1	D-2017-01
36	Grease Zerk 1/4 NPT, 67°	1	H-1010-04
49	Pipe, Plug: 1/4-18 NPT	1	H-1025-01
28	Shim: .005"	AR	H-1066
29	Shim: .015"	AR	H-1067
47	Capscrews, HHCS, 5/16-18 x 1"	8	F-1110
14	Lock Washer, 5/16	8	F-1019-02

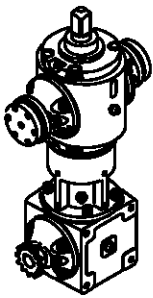
## Assemblies

37	Cap, End	1	203-030P	Assy: 203-042A,
18	Seal, 1" ID: CR9878	2	D-7001-07	
19	Grease Zerk, Straight, 1/4-28	1	H-1010-05	
38	Grease Zerk, 45° 1/4 NPT	1	H-1300	
20	Bearing Cup: L44610	1	D-2019-01	
21	Bearing Cone: L44643	1	D-2018-01	Assy: 203-029A,
23	Shaft, Input (4.125" lg)	1	203-031P	
45	Gear: 14 Teeth	1	D-3023	
13	Roll Pin: Double, 5/16 x 2"	1	F-1036-39	
12	Key, Woodruff: 1/4 x 3/4"	1	D-1004-02	
24	Bearing Cone: LM11749	1	D-2016-01	
Lubricant: Grease, Moly-Lithium		AR	C-6185	Napa-Valv #633
Extreme Pressure #2 only (14 oz. tube)				

AR= As Required

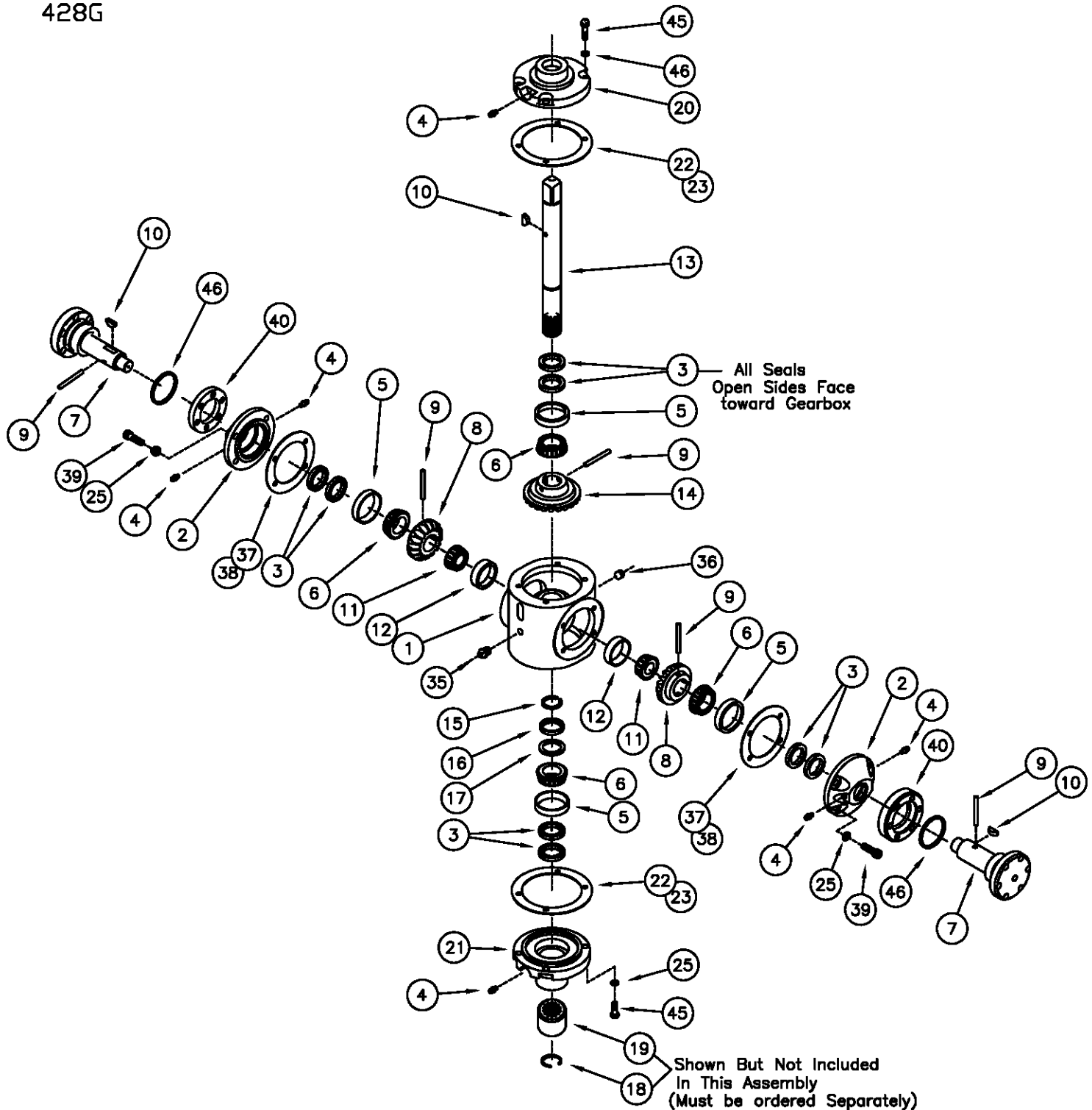
All parts are used in Both the Tall (5.375" center section, formerly called 8"), and the Short (4.375" center section, formerly called 6"), except where otherwise noted.

Complete Gearboxes are available to replace either size.



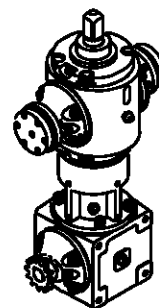
# TOP HOUSING ASSEMBLY 428-063A CIRCU-LATOR II OR DRI-FLO (428G-001A) (Blue)

CL-II or DF  
428G



# TOP HOUSING ASSEMBLY 428-063A

CIRCU-LATOR II OR DRI-FLO-428G-001A (Blue)



CL-II or DF  
428G

Item:	Description:	Qty.	Part No.
1	HOUSING, TOP	1	428-003P
2	Cap, Side	2	428-005P
3	Seal, 1-1/4" ID: (Nitrile) CR-12364	8	D-7001-03
4	Grease Fitting: ALE# 3038-B	6	H-1056
5	Bearing Cup: LM67010	4	D-2014-01
6	Bearing Cone: LM67048	4	D-2013-01
7	Shaft, output, 1 Pc. with Base	2	428-062P
8	Gear, Pinion: 17 Teeth	2	D-3028
9	Roll Pin: 1/4 x 2"	3	F-1036-29
10	Key, Woodruff: 1/4 x 3/4"	3	D-1004-02
11	Bearing Cone: M12649	2	D-2012-01
12	Bearing Cup: M12610	2	D-2011-01
13	Shaft, Main: 13" (Splined)	1	428-028P
14	Gear: 23 Teeth	1	D-3027
15	Snap Ring: Eaton# 336-2	1	F-1033-01
16	Collar	1	203-002P
17	Washer	1	F-8001-01
20	Cap, Top	1	428-009P
21	Cap, Bottom	1	428-012P
22	Shim 5.500" Dia. x .005"	AR	H-1069
23	Shim: 5.500" Dia. x .015"	AR	H-1071
25	L'Washer: 3/8" Heavy Spring	16	F-1019-03
35	Grease Fitting: ALE# 1627-B	1	H-1010-02
36	Pipe, Plug: 1/4-18 NPT	1	H-1025-01
37	Shim: 4.500" Dia. x .005"	AR	H-1073
38	Shim: 4.500" Dia. x .015"	AR	H-1075
39	SHCS: 3/8-16 x 1-1/4", GR8, Blk	8	F-1170
40	Flange	2	208-029P
45	HHCS: 3/8-16 x 1.25", GR5, Ny	8	F-1032-01
46	O-Ring	2	D-3771

## REFERENCE--RELATED ASSEMBLIES

				Assemblies
2	Cap, Side	1	428-005P	] Assy: 428-004A
3	Seal, 1-1/4" ID: (Nitrile) CR-12364	2	D-7001-03	
4	Grease Fitting: ALE# 3038-B	2	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
20	Cap, Top	1	428-009P	] Assy: 428-008A
3	Seal, 1-1/4" ID: (Nitrile) CR-12364	2	D-7001-03	
4	Grease Fitting: ALE# 3038-B	1	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
21	Cap, Bottom	1	428-012P	] Assy: 428-011A
3	Seal, 1-1/4" ID: CR-12364	2	D-7001-03	
4	Grease Fitting: ALE# 3038-B	1	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
13	Shaft, Main: 13" (Splined)	1	428-028P	] Kit: 423-312-001A
19	Coupler, Splined	1	203-054P	
18	Snap Ring, Internal: Eaton # NAN112	1	H-2551	
30A	Shaft, Splined	1	428-030P	

NOTE: See pg. 41 for Output Shaft Replacement Kit.

NA Lubricant: Grease, Moly-Lithium  
Extreme Pressure #2 only

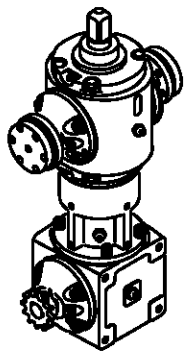
AR C-6185

NAPA-VALV #633

AR= As Required

# CENTER / BOTTOM ASSEMBLY 428-035A

CIRCU-LATOR II OR DRI -FLO (428G-001A) (Blue)



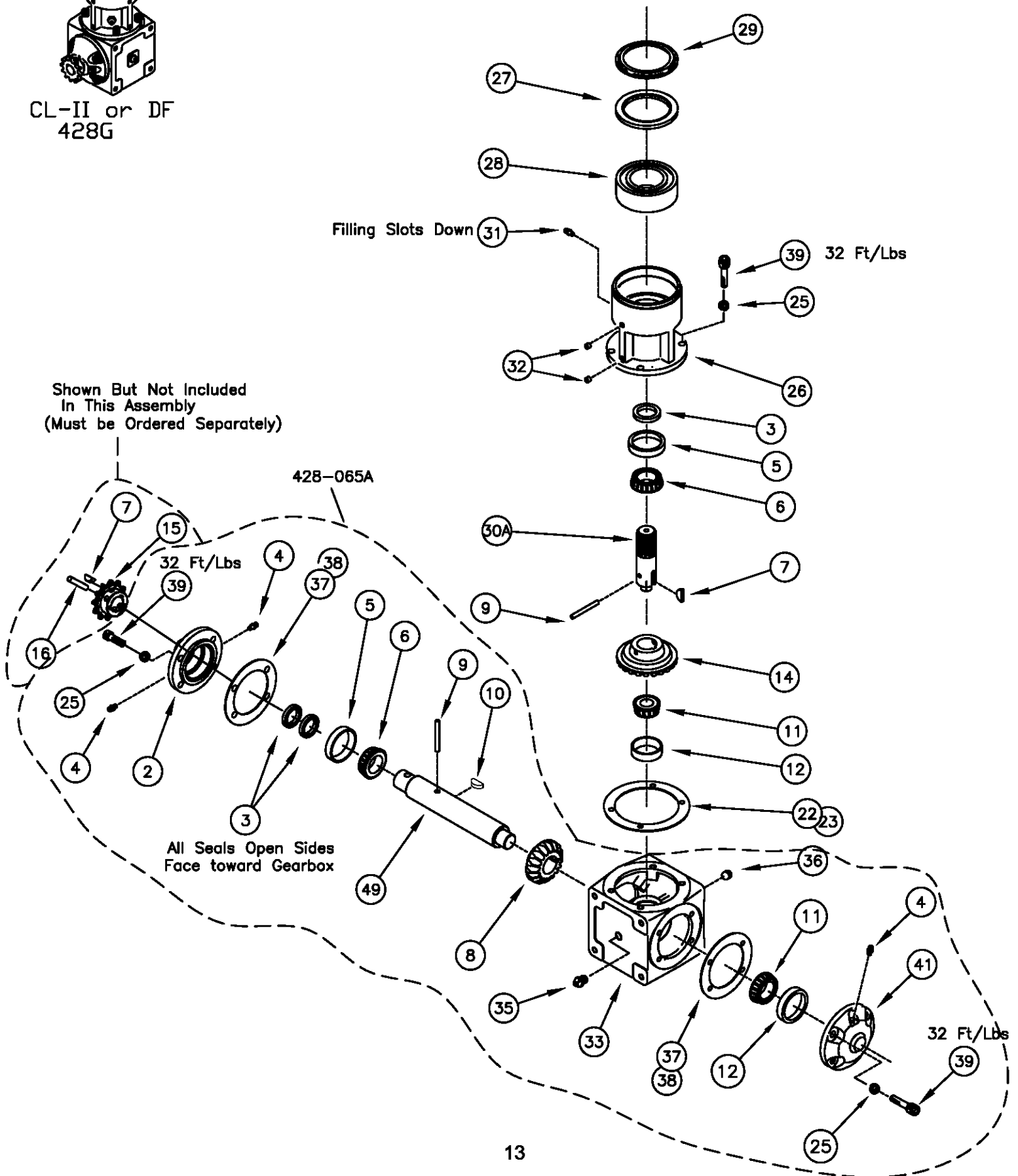
CL-II or DF  
428G

Filling Slots Down

Shown But Not Included  
In This Assembly  
(Must be Ordered Separately)

428-065A

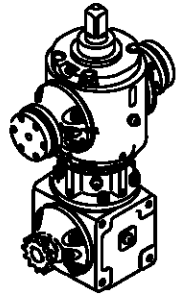
All Seals Open Sides  
Face toward Gearbox





# CENTER / BOTTOM ASSEMBLY 428-035A

CIRCU-LATOR II OR DRI-FLO (428G-001A) (Blue)



CL-II or DF  
428G

Item:	Description:	Qty.	Part No.
-	Bottom Assembly, Long Input	-	
2	Cap, Side	1	428-005P
3	Seal, 1-1/4" ID Viton: CR-12343	3	D-3640
4	Grease Fitting: ALE# 3038-B	3	H-1056
5	Bearing Cup: LM67010	2	D-2014-01
6	Bearing Cone: LM67048	2	D-2013-01
7	Key: Woodruff: 1/4 x 3/4"	1	D-1004-02
8	Gear: 17 Teeth	1	D-3028
9	Roll Pin: 1/4 x 2"	2	F-1036-29
10	Key: Woodruff: 1/4 x 1.000"	1	D-1004-01
11	Bearing Cone: M12649	2	D-2012-01
12	Bearing Cup: M12610	2	D-2011-01
14	Gear: 23 Teeth	1	D-3027
22	Shim: 5.500" Dia. x .005"	AR	H-1069
23	Shim: 5.500" Dia. x .015"	AR	H-1071
25	L'Washer: 3/8" Heavy	12	F-1019-03
49	Shaft, Input: Circ-2 Long	1	428-042P
41	End Cap	1	428-034P
26	SECTION, CENTER	1	428-015P
27	Seal, Viton, CR# 29912	1	D-3643
28	Bearing, DRB: Fafnir# 5211W	1	D-3166
29	Washer, Protective	1	428-016P
30	Shaft, Spline, 3.995"L	1	428-030P
31	Grease Fitting: ALE# 3053-B	1	H-1300
32	Pipe Plug: 1/16-27 NPT	4	H-1025-02
33	HOUSING, BOTTOM	1	428-033P
35	Grease Fitting: ALE# 1627-B	1	H-1010-02
36	Pipe, Plug: 1/4-18 NPT	1	H-1025-01
37	Shim: 4.500" Dia. x .005"	AR	H-1073
38	Shim: 4.500" Dia. x .015"	AR	H-1075
39	SHCS: 3/8-16 x 1, GR8, Blk	12	F-1388
15	Sprocket	-	D-3212
16	Roll Pin, 5/16 x 1.75	-	F-1036-37

428-065A

AR= As Required

See Page 40

## REFERENCE

Reference		Assemblies
2	Cap, Side	1
3	Seal, 1-1/4" ID: Viton: CR-12343	2
4	Grease Fitting: ALE# 3038-B	2
5	Bearing Cup: LM67010	1
13	Shaft, Main: 13" (Splined) Prev. Pg.	1
	Coupler, Splined	1
18	Snap Ring, Internal: Eaton # NAN212	1
30	Shaft, Splined	1
-	Lubricant: Grease, Moly-Lithium Extreme Pressure #2 only (14 oz. Tube)	AR

428-005P  
D-3640  
H-1056  
D-2014-01

Assy: 428-022A

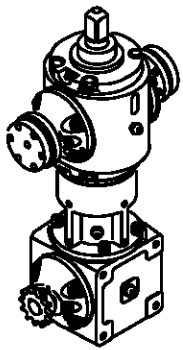
428-028P  
203-054P  
H-2551  
428-030P

203-059A

Kit: 423-312-001A

C-6185

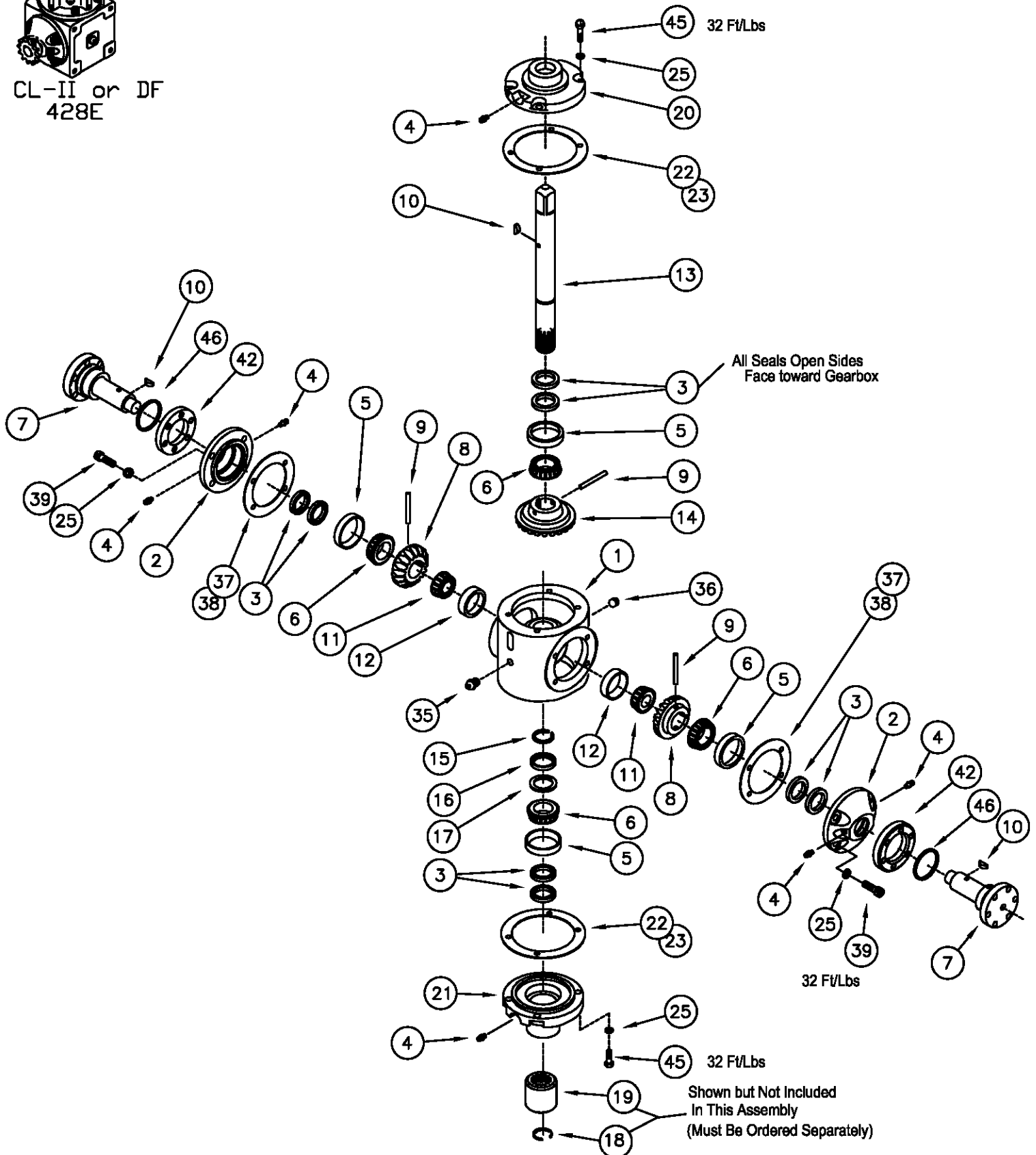
NAPA-VALV #633



CL-II or DF  
428E

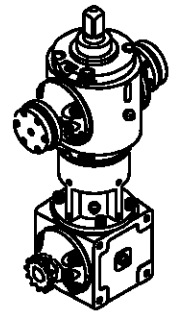
# TOP HOUSING ASSEMBLY 428-032A

CIRCU-LATOR II OR DRI-FLO (428E-001A) (Red)



# TOP HOUSING ASSEMBLY 428-032A

CIRCU-LATOR II OR DRI-FLO (428E-001A)(Red)



CL-II or DF  
428E

Item:	Description:	Qty.	Part No.	Special Notes:
1	HOUSING, TOP	1	428-003P	
2	Cap, Side	2	428-005P	
3	Seal, 1-1/4" ID: (Viton) CR-12343	8	D-3640	
4	Grease Fitting: ALE# 3038-B	6	H-1056	
5	Bearing Cup: LM67010	4	D-2014-01	
6	Bearing Cone: LM67048	4	D-2013-01	
7	Shaft, Output, 1 pc. with Base	2	428-062P	
8	Gear, Pinion: 17 Teeth	2	D-3028	
9	Roll Pin: 1/4 x 2"	3	F-1036-29	
10	Key, Woodruff: 1/4 x 3/4"	3	D-1004-02	
11	Bearing Cone: M12649	2	D-2012-01	
12	Bearing Cup: M12610	2	D-2011-01	
13	Shaft, Main: 13" Splined, Woodruff Key	1	428-028P	
14	Gear: 23 Teeth	1	D-3027	
15	Snap Ring: Eaton# 336-2	1	F-1033-01	
16	Collar	1	203-002P	
17	Washer	1	F-8001-01	
20	Top Cap, Circ-2	1	428-009P	
21	Bottom Cap, Circ-2	1	428-012P	
22	Shim: 5.500" Dia. x .005"	AR	H-1069	
23	Shim: 5.500" Dia. x .015"	AR	H-1071	
25	L'Washer: 3/8" Heavy Spring	16	F-1019-03	
35	Grease Fitting: ALE# 1627-B	1	H-1010-02	
36	Pipe, Plug: 1/4-18 NPT	1	H-1025-01	
37	Shim: 4.500" Dia. x .005"	AR	H-1073	
38	Shim: 4.500" Dia. x .015"	AR	H-1075	
39	SHCS: 3/8-16 x 1-1/4", GR8, Blk	8	F-1170	
42	Flange	2	208-029P	
45	HHCS: 3/8-16 x 1.25", GR5, Ny	8	F-1032-01	
46	O-Ring	2	D-3771	

## REFERENCE

## Assemblies

2	Cap, Side	1	428-005P	] Assy: 428-022A
3	Seal, 1-1/4" ID: (Viton) CR-12343	2	D-3640	
4	Grease Fitting: ALE# 3038-B	2	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
20	Cap, Top	1	428-009P	] Assy: 428-040A
3	Seal, 1-1/4" ID: (Viton) CR-12343	2	D-3640	
4	Grease Fitting: ALE# 3038-B	1	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
21	Cap, Bottom	1	428-012P	] Assy: 428-041A
3	Seal, 1-1/4" ID: (Viton) CR-12343	2	D-3640	
4	Grease Fitting: ALE# 3038-B	1	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
2	Cap, Side	1	428-005P	] Assy: 428-072A  This Side Cap Assembly (with Viton Seals) is meant for 428E-001A High Temp Gearbox, but it will serve as a replacement for both regular and high temp gearboxes when needed.  ] 203-059A
3	Seal, 1-1/4" ID: (Viton) CR-12343	2	D-3640	
4	Grease Fitting: ALE# 3038-B	2	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
6	Bearing Cone: LM67048	1	D-2013-01	
7	Shaft, Output	1	428-062P	
8	Gear, Pinion: 17 Teeth	1	D-3028	
9	Roll Pin: 1/4 x 2"	1	F-1036-29	
10	Key, Woodruff: 1/4 x 3/4"	1	D-1004-02	
42	Flange	1	208-029P	
18	Snap Ring, Internal: Eaton # NAN112	1	H-2551	
19	Coupler, Splined	1	203-054P	

NOTE: See pg. 41 for Output Shaft Replacement Kit.

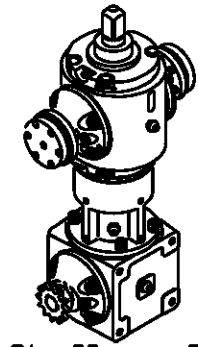
NA Lubricant: Grease, Hi Temp, Chevron  
Ulti-Plex Synthetic Grease EP  
(14 oz. Tube)

AR C-6188

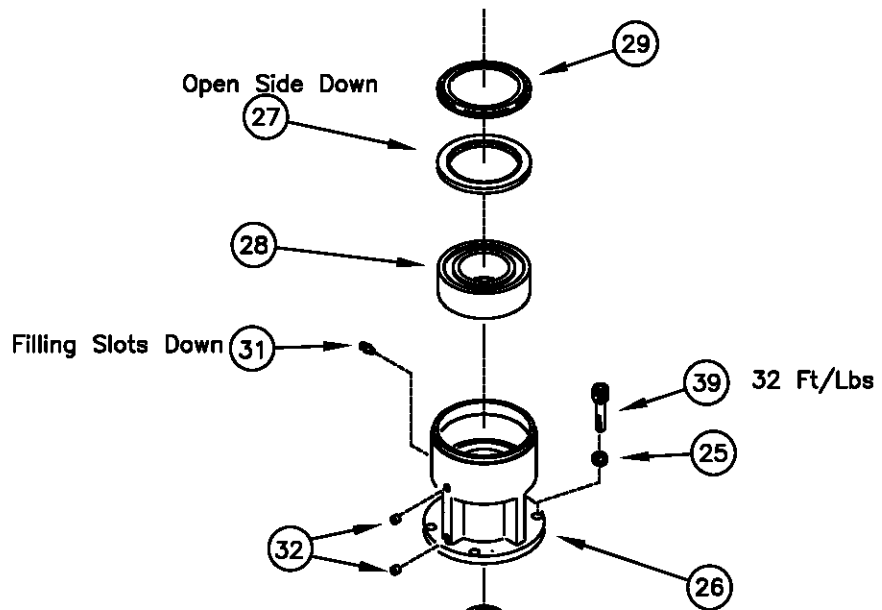
AR= As Required

# CENTER / BOTTOM ASSEMBLY 428-035A

## CIRCU-LATOR II OR DRI-FLO (428E-001A) (Red)



CL-II or DF  
428E



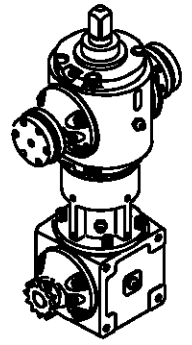
Shown But Not Included  
In This Assembly  
(Must be Ordered Separately)

428-065A

All Seals Open Sides  
Face Toward Gearbox

# CENTER / BOTTOM ASSEMBLY 428-035A

CIRCU-LATOR II OR DRI-FLO (428E-001A) (Red)



Item:	Description:	Qty.	Part No.	
-	Bottom Assembly, Long Input	-		
2	Cap, Side	1	428-005P	
3	Seal, 1-1/4" ID: CR-12343 (Viton)	3	D-3640	
4	Grease Fitting: ALE# 3038-B	3	H-1056	
5	Bearing Cup: LM67010	2	D-2014-01	
6	Bearing Cone: LM67048	2	D-2013-01	
7	Key: Woodruff: 1/4 x 3/4"	1	D-1004-02	
8	Gear: 17 Teeth	1	D-3028	
9	Roll Pin: 1/4 x 2"	2	F-1036-29	
10	Key: Woodruff: 1/4 x 1.000"	1	D-1004-01	
11	Bearing Cone: M12649	2	D-2012-01	
12	Bearing Cup: M12610	2	D-2011-01	
14	Gear: 23 Teeth	1	D-3027	
22	Shim: 5.500" Dia. x .005"	AR	H-1069	
23	Shim: 5.500" Dia. x .015"	AR	H-1071	
25	L'Washer: 3/8" Heavy	12	F-1019-03	
41	End Cap	1	428-034P	
49	Shaft, Input: Circ-2 Long, 8.039"L	1	428-042P	
26	SECTION, CENTER	1	428-015P	
27	Seal, Viton, CR# 29912	1	D-3643	
28	Bearing, DRB: Fafnir# 5211W	1	D-3166	
29	Washer, Protective	1	428-016P	
30	Shaft, Spline	1	428-030P	
31	Grease Fitting: ALE# 3053-B	1	H-1300	
32	Pipe Plug: 1/16-27 NPT	4	H-1025-02	
33	HOUSING, BOTTOM	1	428-033P	
35	Grease Fitting: ALE# 1627-B	1	H-1010-02	
36	Pipe, Plug: 1/4-18 NPT	1	H-1025-01	
37	Shim: 4.500" Dia. x .005"	AR	H-1073	
38	Shim: 4.500" Dia. x .015"	AR	H-1075	
39	SHCS: 3/8-16 x 1, GR8, Blk	12	F-1388	
15	Sprocket	-	D-3212	
16	Roll Pin, 5/16 x 1.75	-	F-1036-37	See Page 40

428-065A

## REFERENCE

Reference		Assemblies
2	Cap, End	1 428-005P
3	Seal, 1-1/4" ID: CR-12343 (Viton)	2 D-3640
4	Grease Fitting: ALE# 3038-B	2 H-1056
5	Bearing Cup: LM67010	1 D-2014-01
13	Shaft, Main: 13" (Splined) Prev. Pg.	1 428-028P
	Coupler, Splined	1 203-054P
18	Snap Ring, Internal: Eaton # NAN112	1 H-2551
30	Shaft, Splined	1 428-030P
		Kit: 423-312-001A
-	Lubricant: Grease, Hi Temp (14 oz. Tube)	AR C-6188

Chevron, Ulti-Plex  
Synthetic Grease, EP

AR= As Required

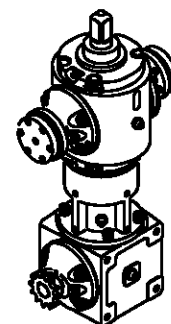


## HI TORQUE (428F-001A) (Copper)



# TOP HOUSING ASSEMBLY 428-052A

HI TORQUE (428F-001A) (Copper)



Hi Torque  
428F

Item:	Description:	Qty.	Part No.	Special Notes:
1	HOUSING, TOP	1	428-003P	
2	Cap, Side	2	428-005P	
3	Seal, 1-1/4" ID: (Viton) CR-12343	8	D-3640	
4	Grease Fitting: ALE# 3038-B	6	H-1056	
5	Bearing Cup: LM67010	4	D-2014-01	
6	Bearing Cone: LM67048	4	D-2013-01	
7	Shaft, Output Pinion, 1 pc, with Base	2	428-046P	
8	Gear, Pinion: 17 Teeth	2	D-3028	
9	Roll Pin: 1/4 x 2"	3	F-1036-29	
10	Key, Square; 5/16 x 1 1/8"	2	428-053P	
11	Bearing Cone: M12649	2	D-2012-01	
12	Bearing Cup: M12610	2	D-2011-01	
13	Shaft, Main, Circ 2F	1	428-047P	
14	Gear: 23 Teeth	1	D-3027	
15	Snap Ring: Eaton# 336-2	1	F-1033-01	
16	Collar	1	203-002P	
17	Washer	1	F-8001-01	
20	Top Cap, Circ-2	1	428-009P	
21	Bottom Cap, Circ-2	1	428-012P	
22	Shim: 5.500" Dia. x .005"	AR	H-1069	
23	Shim: 5.500" Dia. x .015"	AR	H-1071	
25	L'Washer: 3/8" Heavy Spring	16	F-1019-03	
35	Grease Fitting: ALE# 1627-B	1	H-1010-02	
36	Pipe, Plug: 1/4-18 NPT	1	H-1025-01	
37	Shim: 4.500" Dia. x .005"	AR	H-1073	
38	Shim: 4.500" Dia. x .015"	AR	H-1075	
39	SHCS: 3/8-16 x 1-1/4", GR8, Blk	8	F-1170	
42	Flange	2	208-029P	
45	HHCS: 3/8-16 x 1.25", GR5, Ny	8	F-1032-01	
46	Key, Square; 5/16 x .898	2	428-054P	
47	O-Ring	2	D-3771	

## REFERENCE

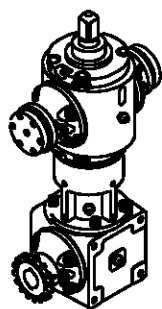
## Assemblies

2	Cap, Side	1	428-005P	] Assy: 428-022A
3	Seal, 1-1/4" ID: (Viton) CR-12343	2	D-3640	
4	Grease Fitting: ALE# 3038-B	2	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
20	Cap, Top	1	428-009P	] Assy: 428-040A
3	Seal, 1-1/4" ID: (Viton) CR-12343	2	D-3640	
4	Grease Fitting: ALE# 3038-B	1	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
21	Cap, Bottom	1	428-012P	] Assy: 428-041A
3	Seal, 1-1/4" ID: (Viton) CR-12343	2	D-3640	
4	Grease Fitting: ALE# 3038-B	1	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
2	Cap, Side	1	428-005P	] Assy: 428-043A
3	Seal, 1-1/4" ID: (Viton) CR-12343	2	D-3640	
4	Grease Fitting: ALE# 3038-B	2	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
6	Bearing Cone: M12649	1	D-2012-01	
7	Shaft, Output Pinion	1	428-046P	
8	Gear, Pinion: 17 Teeth	1	D-3028	
9	Roll Pin: 1/4 x 2"	1	F-1036-29	
10	Key, Square 5/16 x 1/8"	1	428-053P	
42	Flange	1	208-029P	
18	Snap Ring, Internal, Eaton # NAN112	1	H-2551	] 203-059A
19	Coupler, Splined	1	203-054P	

AR= As Required

NOTE: See pg. 41 for Output Shaft Replacement Kit

NA	Lubricant: Grease, Hi Temp Chevron Ulti-Plex Synthetic EP (14 oz. Tube)	AR	C-6188	—
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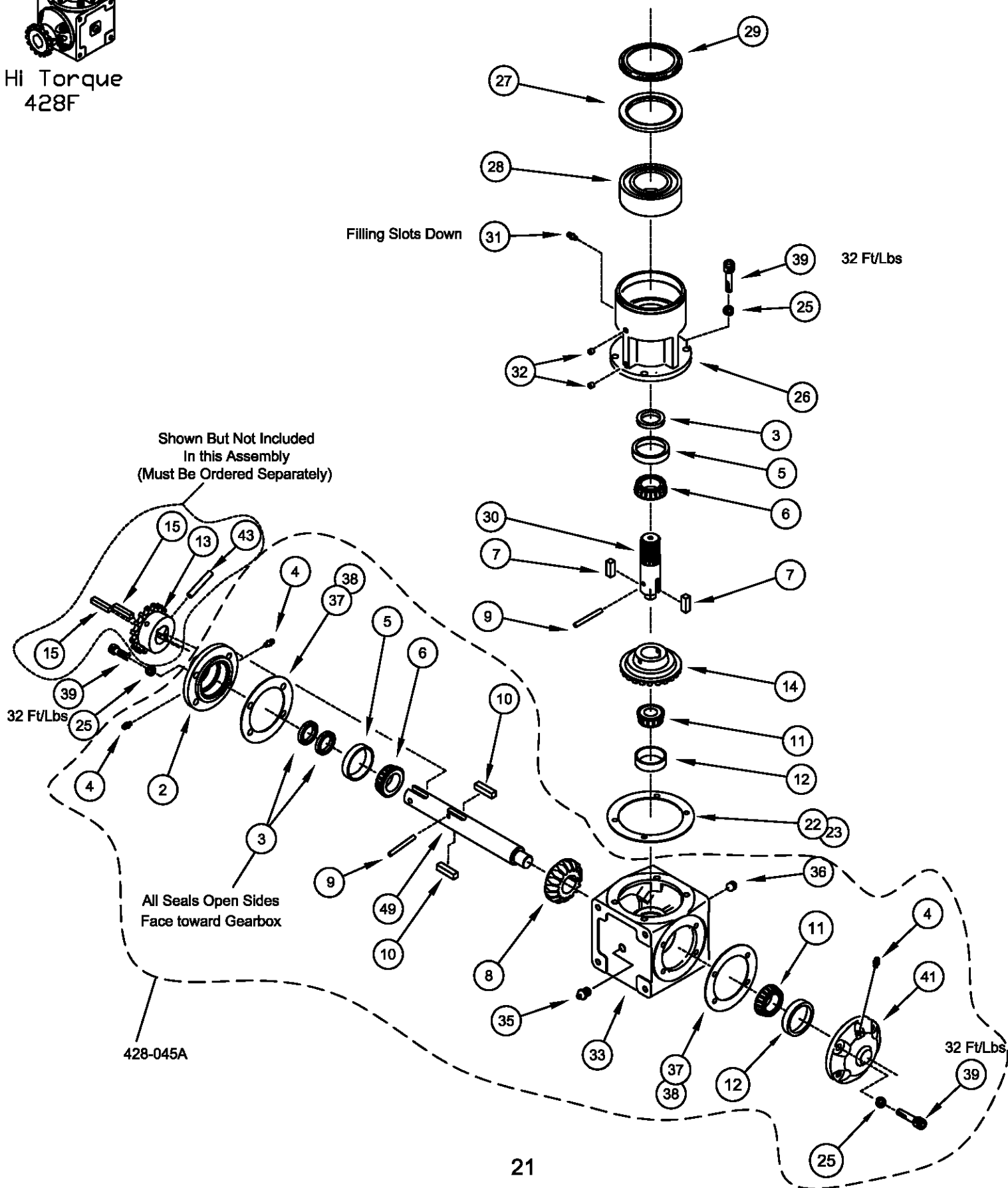


HI Torque  
428F

# CENTER / BOTTOM ASSEMBLY 428-044A (428-142A /2015)

HI TORQUE (428F-001A) (Copper)

Circu-Lator 3-Sweep (428Q-001A) (Orange) 2015 (Silver) -See pages 23-24

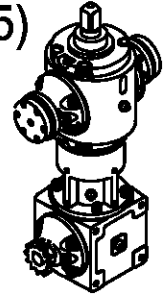




# CENTER / BOTTOM ASSEMBLY 428-044A (428-142A/2015)

CIRCU-LATOR HI TORQUE (428F-001A) (Copper)

CIRCU-LATOR 3-SWEEP (428Q-001A) (Orange) 2015 (Silver) -See pages 23-24



Hi Torque  
428F-001A

Item:	Description:	Qty.	Part No.	
-	Bottom Assembly, Long Input	-		
2	Cap, Side	1	428-005P	
3	Seal, 1-1/4" ID: CR-12343 (Viton)	3	D-3640	
4	Grease Fitting: ALE# 3038-B	3	H-1056	
5	Bearing Cup: LM67010	2	D-2014-01	
6	Bearing Cone: LM67048	2	D-2013-01	
7	Key: Square, 5/16 x .898"	2	428-054P	
8	Gear: 17 Teeth	1	D-3028	
9	Roll Pin: 1/4 x 2"	2	F-1036-29	
10	Sq. Key, 5/16"	2	428-053P	
11	Bearing Cone: M12649	2	D-2012-01	
12	Bearing Cup: M12610	2	D-2011-01	
14	Gear: 23 Teeth	1	D-3027	
22	Shim: 5.500" Dia. x .005"	AR	H-1069	
23	Shim: 5.500" Dia. x .015"	AR	H-1071	
25	L'Washer: 3/8" Heavy	12	F-1019-03	
26	SECTION, CENTER	1	428-015P	
27	Seal, Viton, CR# 29912	1	D-3643	
28	Bearing, DRB: Fafnir# 5211W	1	D-3166	
29	Washer, Protective	1	428-016P	
30	Shaft, Spline w/Dual Keyways	1	428-051P	
	Shaft, Spline w/Dual Keyways, Prehardened	1	428-051PX	
31	Grease Fitting: ALE# 3053-B	2	H-1300	
32	Pipe Plug: 1/16-27 NPT	4	H-1025-02	
33	HOUSING, BOTTOM	1	428-033P	
35	Grease Fitting: ALE# 1627-B	1	H-1010-02	
36	Pipe, Plug: 1/4-18 NPT	1	H-1025-01	
37	Shim: 4.500" Dia. x .005"	AR	H-1073	
38	Shim: 4.500" Dia. x .015"	AR	H-1075	
39	SHCS: 3/8-16 x 1, GR8, Blk	12	F-1388	
41	Blind Cap	1	428-034P	
49	Shaft, Input: Circ-2F w/Dual Keyways	1	428-050P	
15	Key, Square, 1/4 x 1 1/8"	-	656-027P	See Page 40
13	Chain Coupler, 16 tooth	-	656-009P	
43	Roll Pin, 5/16 x 1.750	-	F-1036-37	

## REFERENCE

2	Cap, End	1	428-005P	Assemblies Assy: 428-022A
3	Seal, 1-1/4" ID: CR-12343 (Viton)	2	D-3640	
4	Grease Fitting: ALE# 3038-B	2	H-1056	
5	Bearing Cup: LM67010	1	D-2014-01	
41	Cap, Blind. Circ2 Gearbox	1	428-034P	Assy: 428-057A
4	Grease Fitting: ALE# 3038-B	1	H-1056	
5	Bearing Cup: M12610	1	D-2011-01	

AR= As Required

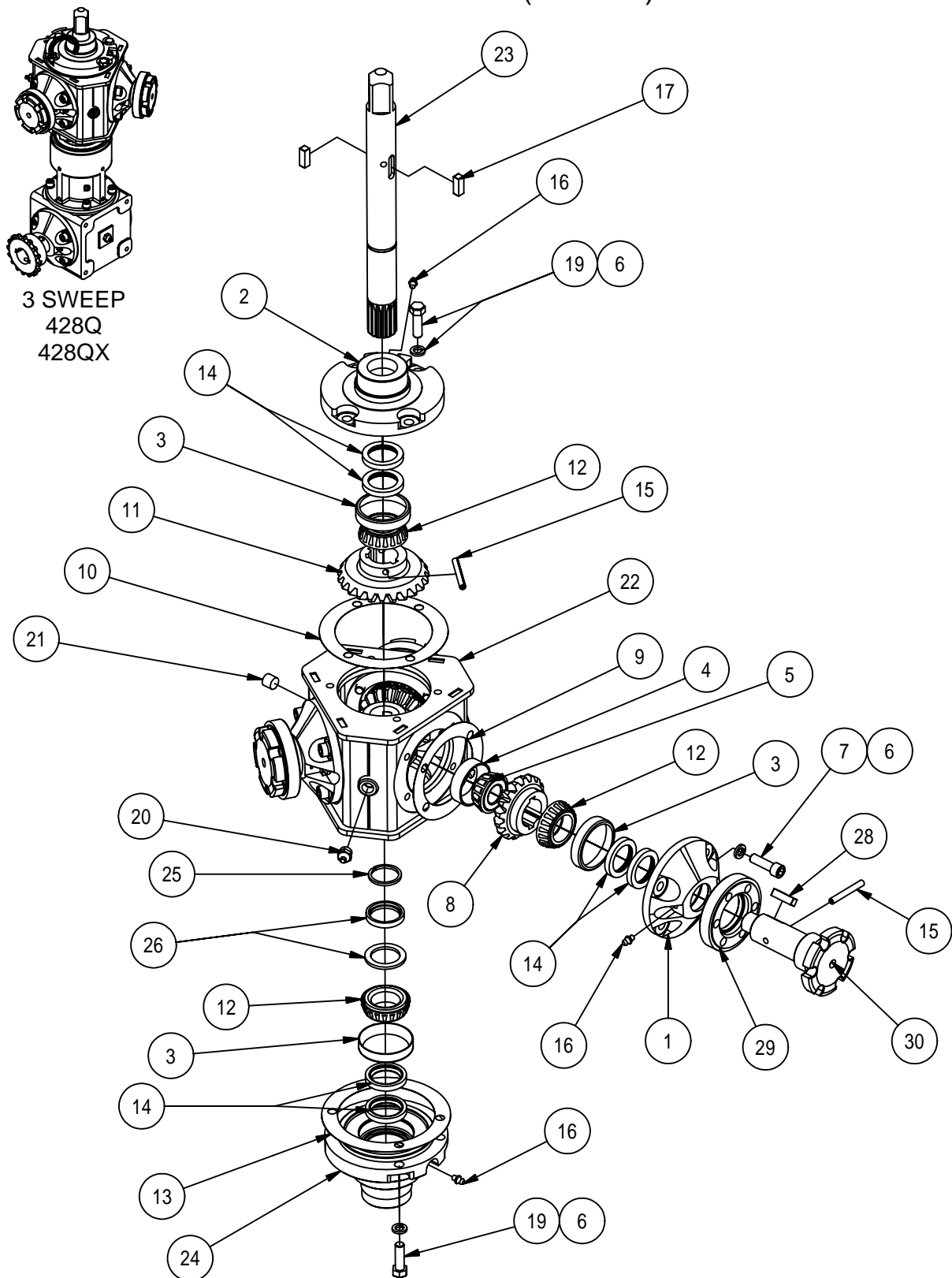
-	Lubricant: Grease, Hi Temp (14 oz. Tube)	AR	C-6188	Chevron Ulti-Plex Synthetic Grease EP
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# TOP HOUSING ASSEMBLY 428-117A

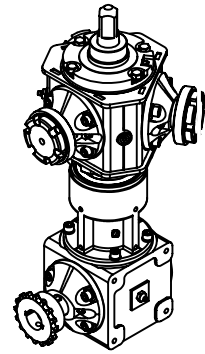
## 3-SWEEP (428Q-001A) (ORANGE)

# TOP HOUSING ASSEMBLY 428-143A

## 3-SWEEP 2015 (SILVER)



**TOP HOUSING ASSEMBLY, 428-117A**  
**3-SWEEP (428Q-001A) (ORANGE)**  
**TOP HOUSING ASSEMBLY, 428-143A**  
**3-SWEEP 2015 (SILVER)**



**3-SWEEP**  
**428Q**  
**428QX**

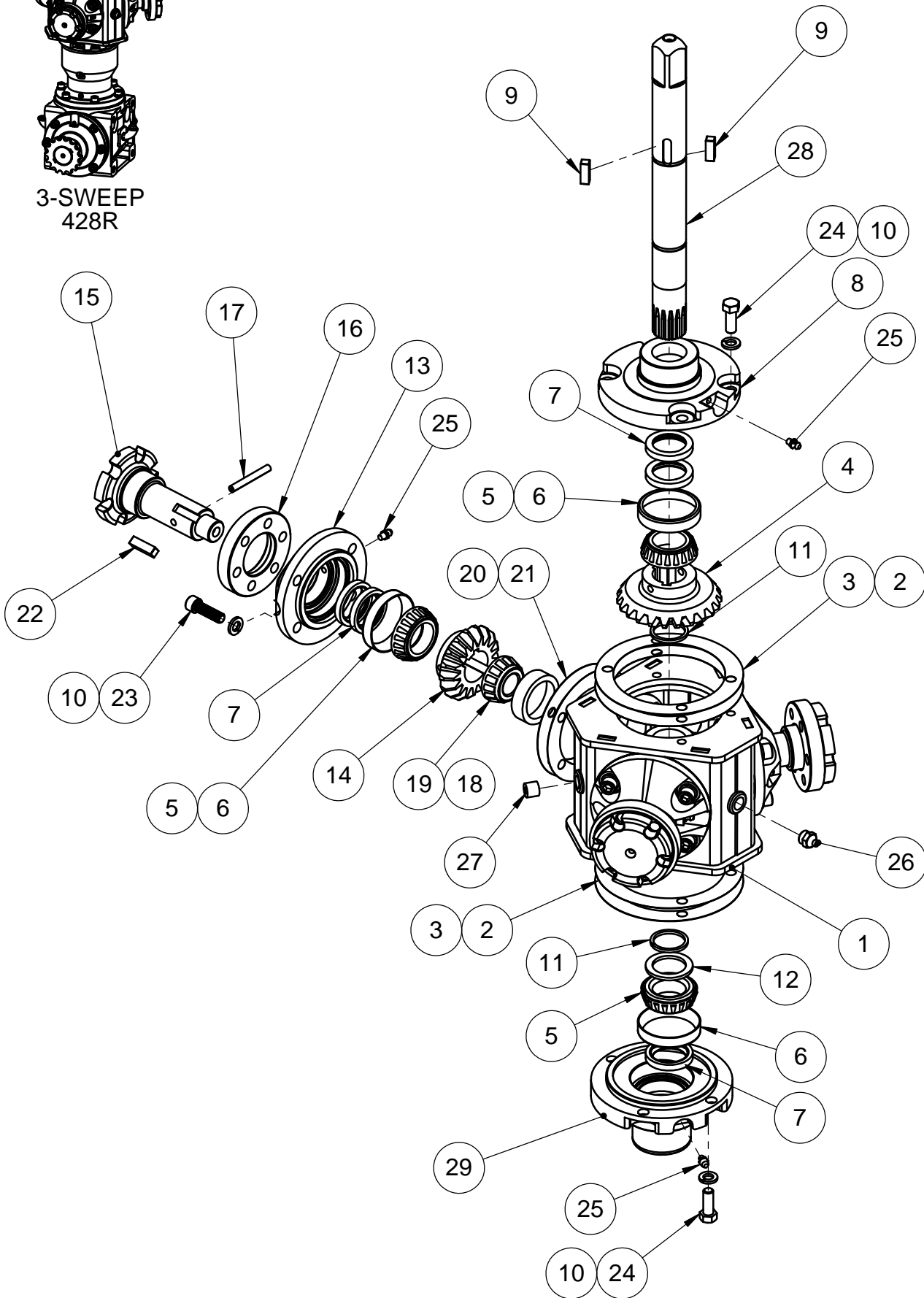
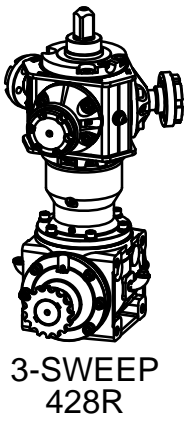
ITEM	QTY	PART NUMBER	DESCRIPTION
1	3	428-005P	Cap Side
2	1	428-009P	Cap, Top
3	5	D-2014-01	BEARING CUP 2.328 O.D.
4	3	D-2011-01	Bearing Cup, M12610, 1.9687 O.D.
5	3	D-2012-01	Bearing Cone, M12649, .8437 I.D.
6	20	F-1019-03	3/8" Lockwasher
7	12	F-1170	Sockethead Capscrew, 3/8-16x1.25
8	3	D-3028	Bevel Gears 17/23
9	3	H-1073	Shim, 4.5 O.D., 3.156 I.D. x .005 TH
10	1	H-1069	Shim, 5.5 O.D. 4.15625 I.D. x .005 TH
11	1	D-3027	Bevel Gears 17/23, 6
12	5	D-2013-01	Bearing Cone 1.25 Bore
13	1	H-1071	Shim, 5.500 OD x 4.15625 IDx .015 TH
14	10	D-3640	Oil Seal: 1.25" ID X 1.5" OD X 0.125" W
15	4	F-1036-29	1/4 x 2" Roll Pin
16	8	H-1056	1/4" Grease Fitting
17	2	428-054P	Square Key, 5/16 x .898
18	2	D-3771	O-Ring, Viton, 1 7/8 I.D. x 2 1/16 O.D.
19	8	F-1032-01	3/8-16 x 1-1/4" Capscrew
20	1	H-1010-02	Grease Fitting, Short Straight 1/4-18 NPT
21	2	H-1025-01	Pipe Plug, 1/4-18 NPT
22	1	428-088W	C3GB Top Housing Weldment
23	1	428-110P	C3GB Main Shaft, w/Splines (Std Ht +1/2") 428Q
23	1	428-110PX	C3GB Main Shaft (prehardened) w/Splines 428QX, 428R
24	1	428-111P	Bottom Cap, Circ 2 Gearbox
25	1	F-1033-01	Retaining Ring, 1.184
26	1	F-8001-01	Washer, 1.25ID x 1.75OD x .125 TH
27	1	203-002P	Collar, 1.625
28	3	428-053P	HTGB Square Key, 5/16 x 1 1/8"
29	3	708-005P	Stepped Flange, 3 Sweep
30	3	428-116P	Output Pinion Shaft, C3

REFERENCE:  
 SIDE CAP ASSEMBLY-  
 428-118A

QTY	PART NUMBER	DESCRIPTION
1	428-005P	Cap Side
2	D-3640	Oil Seal: 1.25" ID X 1.5" OD X 0.125" W
1	D-2014-01	BEARING CUP 2.328 O.D.
1	D-2013-01	BEARING CONE 1.25 BORE
1	D-3028	Bevel Gears 17/23, 6
1	428-116P	Output Pinion Shaft, C3
1	708-005P	Stepped Flange, 3 Sweep
1	F-1036-29	1/4 x 2" Roll Pin
1	428-053P	HTGB Square Key, 5/16 x 1 1/8"
2	H-1056	1/4" Grease Fitting
1	D-2012-01	Bearing Cone, M12649, .8437 I.D.
2	H-1073	Shim, 4.5 O.D., 3.156 I.D. x .005 TH

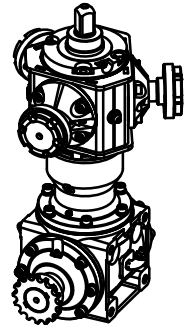
# TOP HOUSING ASSEMBLY 428-109A

CIRCULATOR 3-SWEEP (428R-001A) BROWN



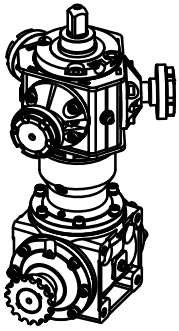
# TOP HOUSING ASSEMBLY 428-109A

CIRCULATOR 3-SWEEP (428R-001A) (BROWN)



**3-SWEEP  
428R**

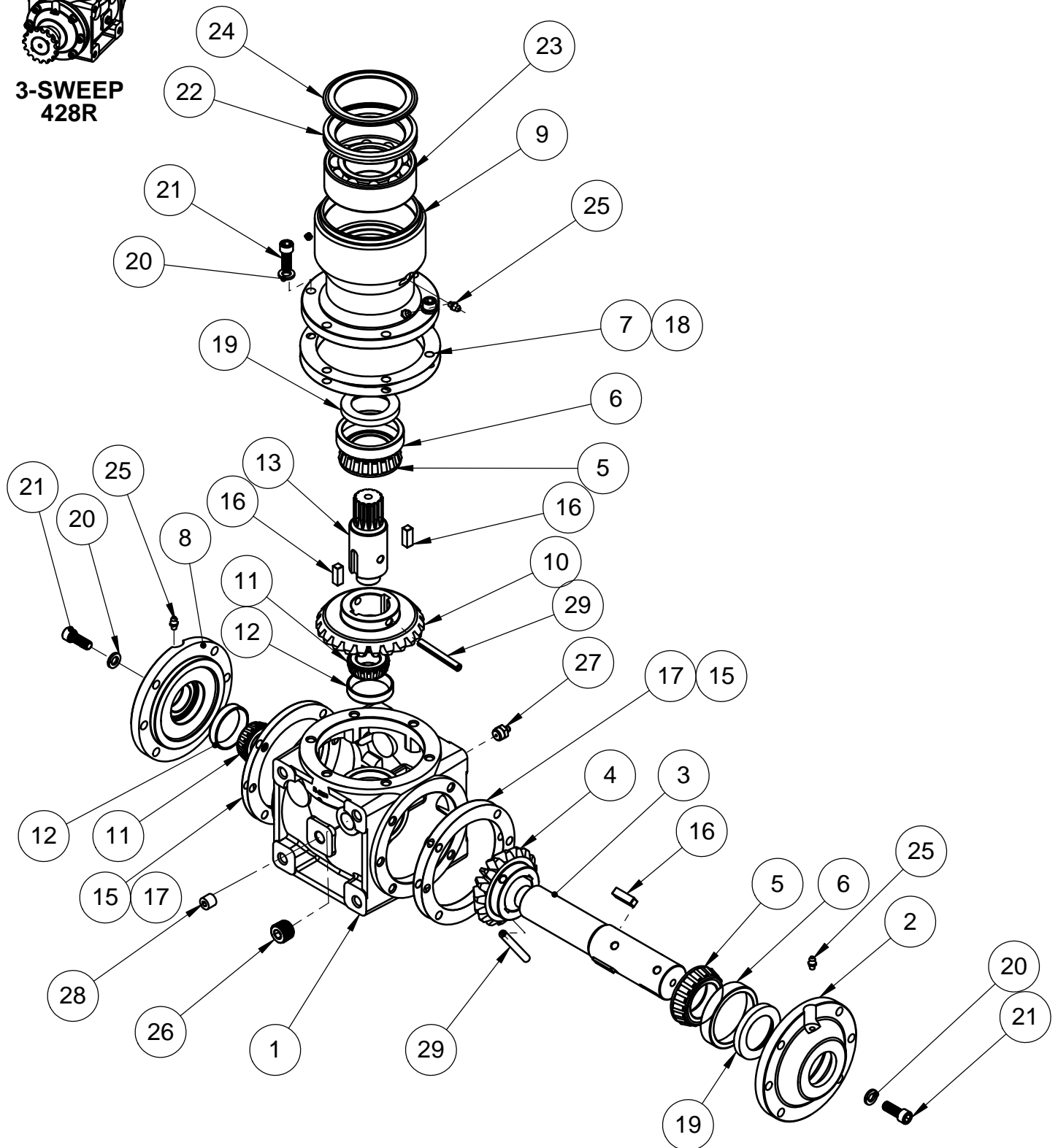
ITEM	PART NO.	DESCRIPTION	QTY.
1	428-088W	3-PORT GEARBOX TOP HOUSING	1
2	H-1069	GASKET	2
3	H-1071	GASKET	2
4	D-3027	HTGB BEVEL GEAR, 23-TOOTH	1
5	D-2013-01	CONE-BEARING	5
6	D-2014-01	CUP-BEARING	5
7	D3640	VITON SEAL CR#12343 1.25ID X 1.756 OD	9
8	428-009P	CIRC-2 GEARBOX TOP CAP	1
9	428-054P	HTGB KEY, SQ: 5/16" X .898" L,8630	2
10	F-1019-03	LOCKWASHER, HVY, 3/8, YZ	20
11	F-1033-01	RING-RETAINING	2
12	F-8001-01	WASHER	1
13	428-005P	CAP, SIDE	3
14	D-3028	GEAR, 17 TOOTH BEVEL	3
15	428-116P	OUTPUT PINION SHAFT, C3	3
16	708-005P	STEPPED FLANGE, TAPERED SWEEP	3
17	F-1036-29	SPIRAL SPRING HVY 1/4 X 2 HBK	3
18	D-2011-01	CUP-BEARING	3
19	D-2012-01	CONE-BEARING	3
20	H-1073	GASKET	3
21	H-1075	GASKET	3
22	428-053P	HI-TORQUE GEAR BOX (HTGB) KEY, SQ: 5/16" X 1-1/8" L,8630	3
23	F-1170	SHCS, 3/8-16 X 1-1/4", w/PATCH, GR8	12
24	F-1394	HHCS,3/8-16NC X 1",GR.5, YELLOW PLATED	8
25	H-1056	1/4" GREASE FITTING	8
26	H-1010-02	FITTING,GREASE,1/4-18NPT STRAIGHT	1
27	H-1025-01	PIPE PLUG, 1/4 HEX SOCKET HD	2
28	428-146P	C3GB MAIN SHAFT	1
29	428-012P	CAP, BOTTOM	1



**3-SWEEP  
428R**

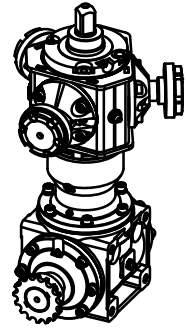
# CENTER/BOTTOM ASSEMBLY 428-132A

CIRCULATOR 3-SWEEP (428R-001A) (BROWN)



# CENTER/BOTTOM ASSEMBLY 428-132A

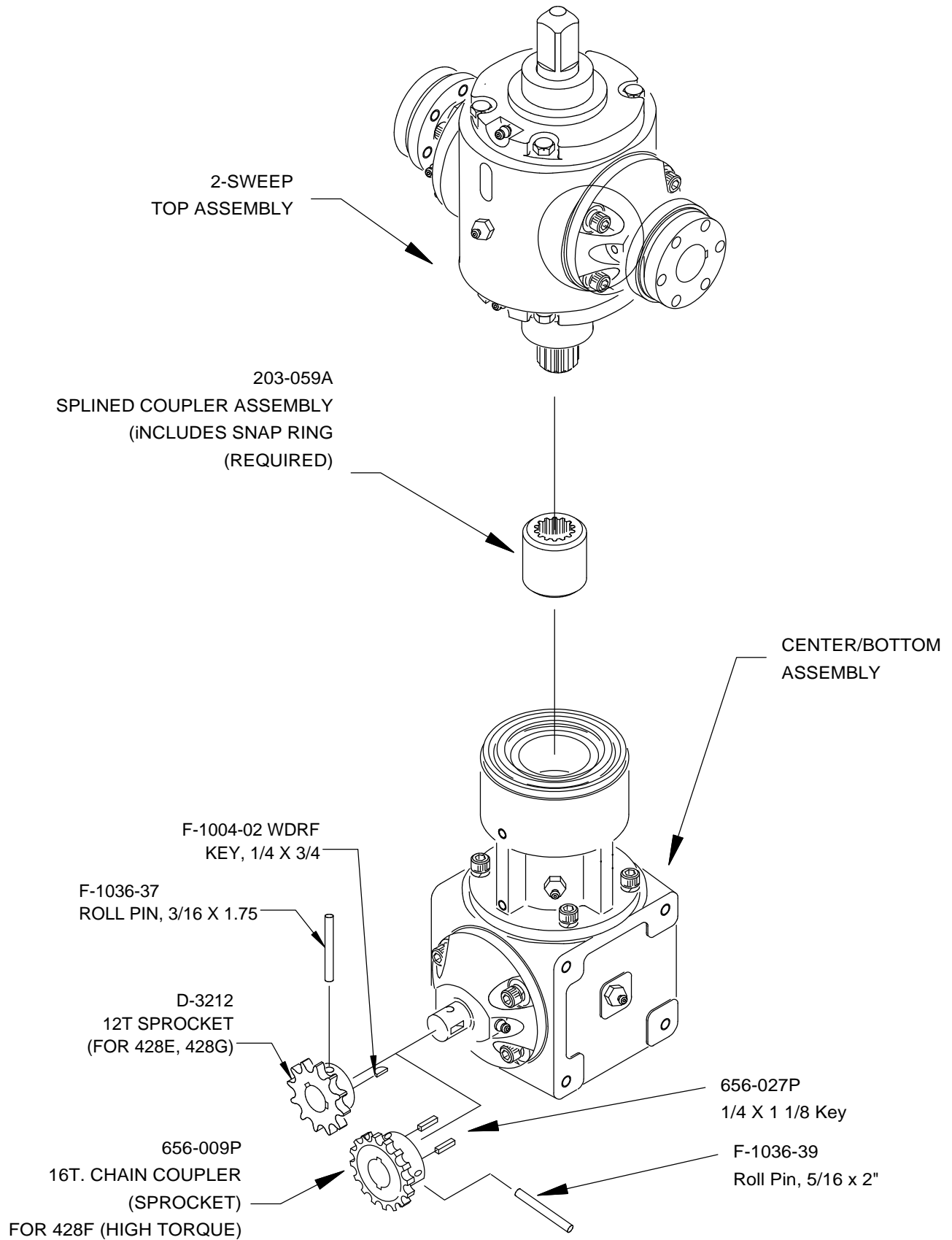
## CIRCULATOR 3-SWEEP (428R-001A) (BROWN)



**3-SWEEP  
428R**

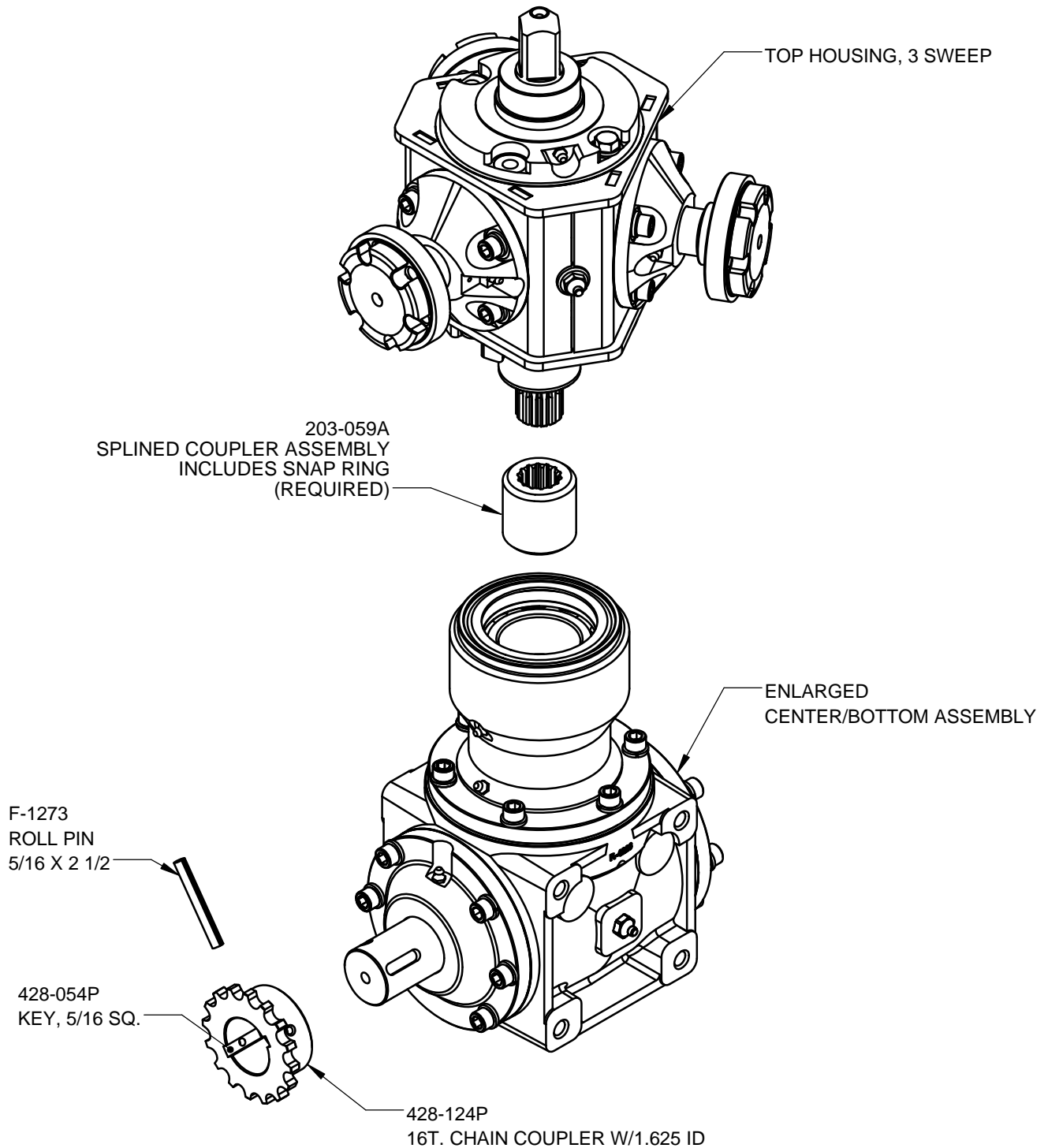
ITEM	PART NO.	DESCRIPTION	Default t/QTY.
1	428-129P	C3 BOTTOM HOUSING	1
2	428-127P	C3GB END CAP	1
3	428-125P	C3GB: INPUT SHAFT	1
4	D-3927	PINION GEAR: 17TX5DPX 1.625"ID	1
5	D-3821	Cone, TRBr: 1.625"IDx0.780W, LM501349	2
6	D-3822	Cup, TRBr: 2.891"ODx0.580"W, LM501310	2
7	H-2875	C3GB SHIM GASKET: 6.000"OD x 4.640"ID x 0.005"TH	-
8	428-128P	C3GB BLIND CAP	1
9	428-131P	C3GB: CENTER SECTION	1
10	D-3926	BEVEL GEAR: 23TX5DPX1.625INID	1
11	D-2018-01	TRB Cone 44643	2
12	D-2019-01	TRB Cup 44610	2
13	428-130P	C3GB: CENTER SHAFT	1
15	H-2873	C3GB SHIM GASKET, 5.625"OD x 4.265"ID x .005"TH	-
16	428-134P	Key: 3/8" x 5/16" x 1-1/8"L, 8630	4
17	H-2874	C3GB SHIM GASKET, 5.625"OD x 4.265"ID x .015"TH	-
18	H-2876	C3GB SHIM GASKET, 6.000"OD x 4.640"ID x .015"TH	-
19	D-3819	OIL SEAL, VITON: 1.625ID X 2.500 OD X .313 W	2
20	F-1019-03	LOCKWASHER, HVY, 3/8, YZ	18
21	F-1170	SHCS, 3/8-16 X 1-1/4", w/PATCH, GR5	18
22	D-3643	VITON SEAL CR#29912 3.00IDx4.008OD	1
23	D-3166	BEARING, DOUBLE ROW W 2.615" BORE; 3.937" OD; 1.3125" THK	1
24	428-016P	C2GB: PROTECTOR WASHER	1
25	H-1056	1/4" GREASE FITTING	4
26	H-1963	NPTF, HEX-SOCKET PLUG WITH MAGNET, 1/2-14	1
27	H-1010-02	FITTING, GREASE, 1/4-18NPT STRAIGHT	3
28	H-1025-01	PIPE PLUG, 1/4 HEX SOCKET HD	2
29	F-1273	ROLL PIN, 5/16 X 2 1/2"L	2
30	H-1173	ELBOW, 1/4" 90D STREET, SCH40	2
31	F-1252	SCREW, SET SKT CP PT 1/4-28 X 1/4	2

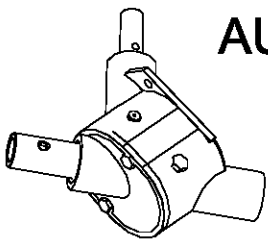
# 428 SERIES GEARBOX FINAL ASSEMBLY





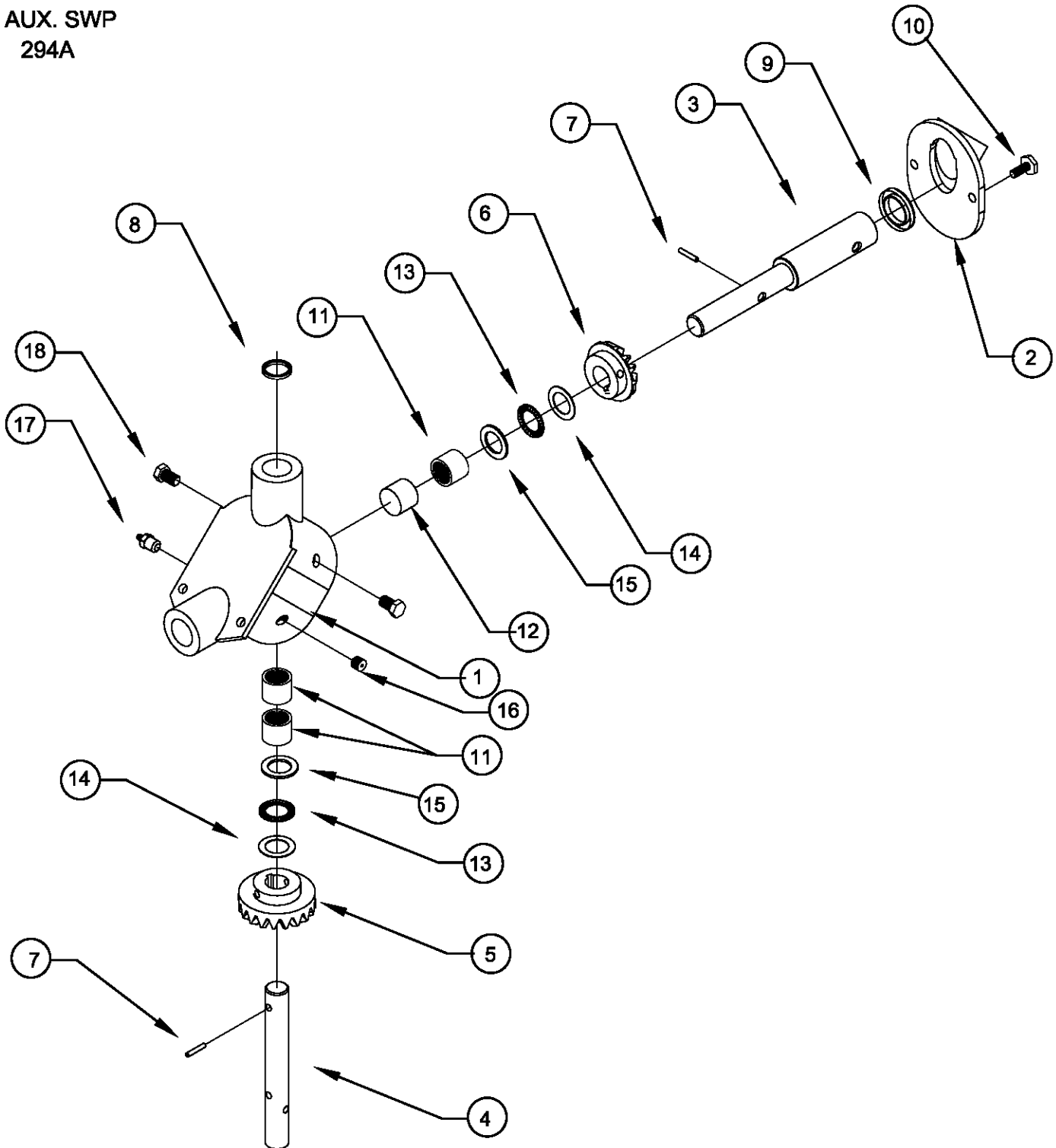
# 428 SERIES GEARBOX WITH ENLARGED CENTER/BOTTOM ASSEMBLY 3 SWEEP FINAL ASSEMBLY





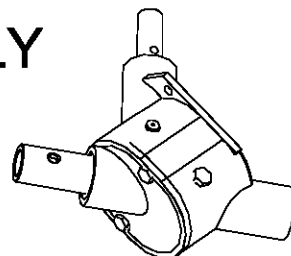
# AUXILIARY SWEEP GEARBOX ASSEMBLY 294A-001A

AUX. SWP  
294A



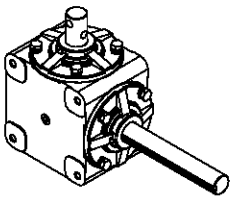
# AUXILIARY SWEEP GEARBOX ASSEMBLY

## 294A-001A



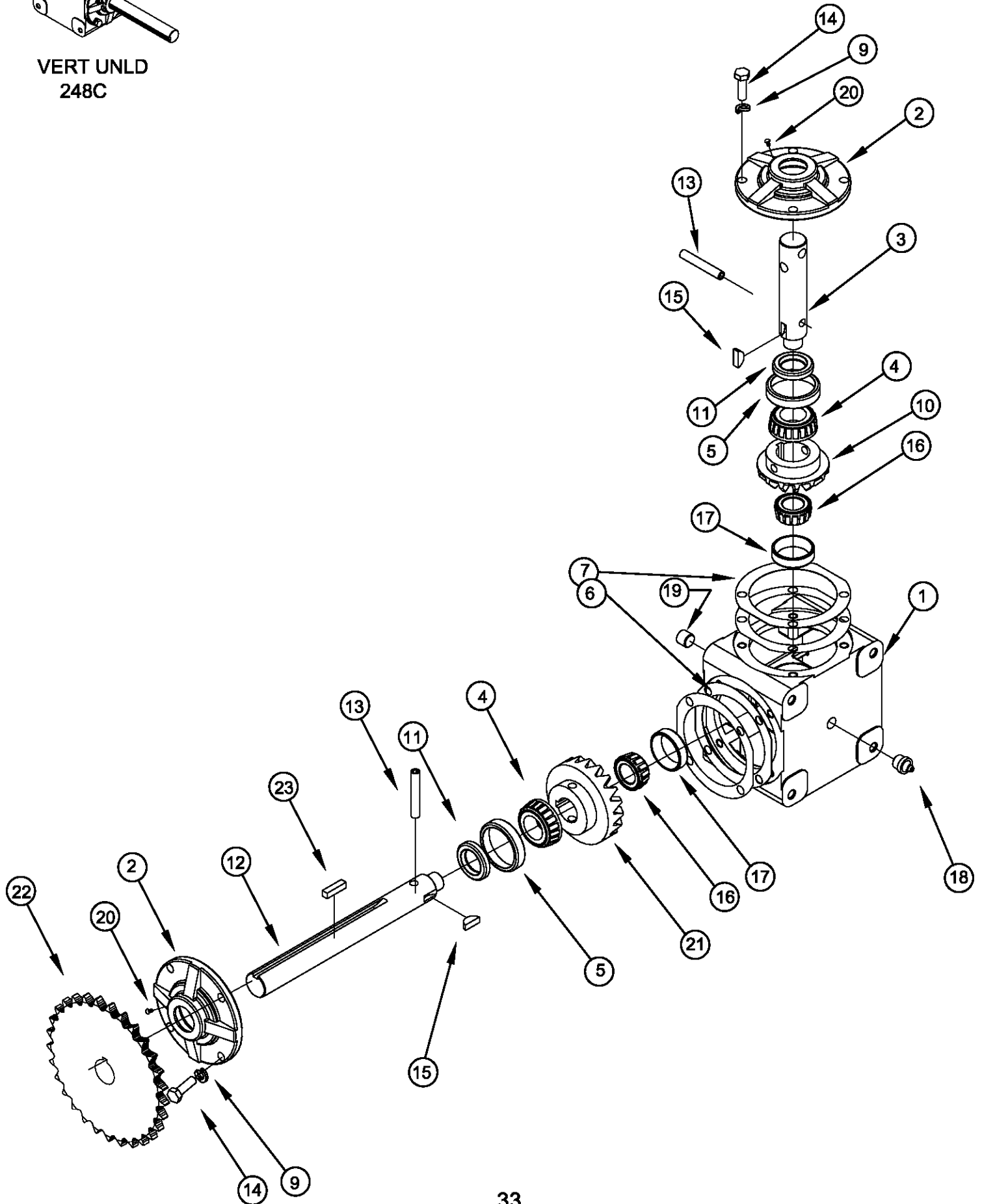
AUX. SWP  
294A

Item:	Description:	Qty.	Part No.
1	Body	1	294-008P
2	Cap	1	294-009P
3	Shaft, 10.125"	1	294-004P
4	Shaft, 8"	1	294-005P
5	Gear, 19 tooth	1	294-003P
6	Gear, 14 tooth	1	D-3023
7	Roll Pin, double, 5/16 x 2"	1	F-1036-39
8	Seal, in Body, CR9815	1	D-7001-01
9	Seal, in Cap, CR14810	1	D-7001-02
10	Capscrew, HHCS 3/8 x 1"	1	F-1006-259
11	Bearing, Needle, Torrington B1616	3	D-2005-01
12	Bearing, Needle, Torrington M16161	1	D-2005-02
13	Bearing, Thrust, Torrington NTA 1625	2	D-2006-01
14	Washer, Thrust, Torrington TRA 1625	2	D-2007-01
15	Washer, Thrust, Hvy Torrington TRE 1625	2	D-2007-02
16	Pipe Plug, 1/4-18 NPT	1	H-1025-01
17	Zerk, ALE 1627-B	1	H-1010-02
18	Capscrew, HHCS 1/2 x 3/4"	2	F-1006-43

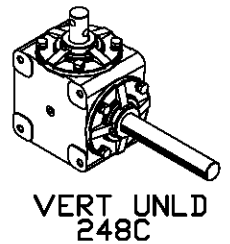


VERT UNLD  
248C

# VERTICAL UNLOADER GEARBOX 248C-001A



# VERTICAL UNLOADER GEARBOX \* 248C-001A



Item:	Description:	Qty.	Part No.	
1	HOUSING	1	203-028P	
2	Cap	2	248-007P	
3	Shaft, 4.75"	1	248-008P	(To flite weldment)
4	Bearing Cone, L44643	2	D-2018-01	
5	Bearing Cup, L44610	2	D-2019-01	
6	Shim: .005"	AR	H-1066	AR= As Required
7	Shim: .015"	AR	H-1067	
9	Lockwasher, 5/16"	8	F-1019-02	
10	Gear, 14 tooth	1	D-3023	
11	Seal, CR9878	2	D-7001-07	
12	Shaft, 9.5"	1	248B-005P	(Used in both 6" and 8")
13	Roll Pin, dbl., 5/16 x 2	2	F-1036-39	
14	Capscrew, 5/16 -18 x .875	8	F-1015-14	
15	Key, Woodruff, 1/4 x 3/4"	2	D-1004-02	
16	Bearing Cone, LM11749	2	D-2016-01	
17	Bearing Cup, LM11710	2	D-2017-01	
18	Zerk, ALE 1627-B	1	H-1010-02	
19	Pipe Plug, 1/4"	1	H-1025-01	
20	Screw, #4 x 3/16"	2	F-1034-01	
21	Gear, 19 tooth	1	D-3024	
22	Sprocket, 29 tooth	1	D-3363 **	
23	Key, Square 1/4 x 1"	1	234-002P	

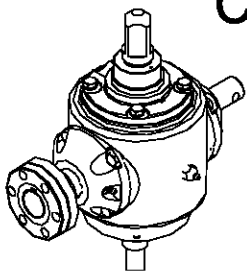
## Reference---Related Assemblies

2	Cap	1	248-007P	] Cap Assembly Assy: 248-010A
11	Seal, CR9878	2	D-7001-07	
5	Bearing Cup: LM67010	1	D-2019-01	
	Cap Assembly	1	248-010A	] Assy: 248-012A
15	Key, Woodruff, 1/4 x 3/4"	1	D-1004-02	
4	Bearing Cone, L44643	1	D-2018-01	
21	Gear, 19 tooth	1	D-3024	
12	Shaft, 9.5"	1	248B-005P	
	Cap Assembly	1	248-010A	] Assy: 248-013A
15	Key, Woodruff, 1/4 x 3/4"	1	D-1004-02	
4	Bearing Cone	1	D-2018-01	
10	Gear, 14 tooth	1	D-30234	
3	Shaft, 4.75"	1	248-008P	

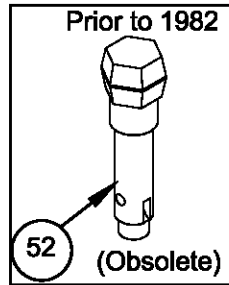
\*\*D-3007-01, 21 tooth sprocket used with gearboxes before 1985.  
Sprocket is shown but not included on 248C-001A. Order separately.

\*Replaces both 248A-001A (6") and 248B-001A (8") Vertical Unloader gearboxes.  
When replacing one of these gearboxes, the sprocket (not included in 248C-001A)  
should also be replaced in the order to keep the same vertical unloader speed.

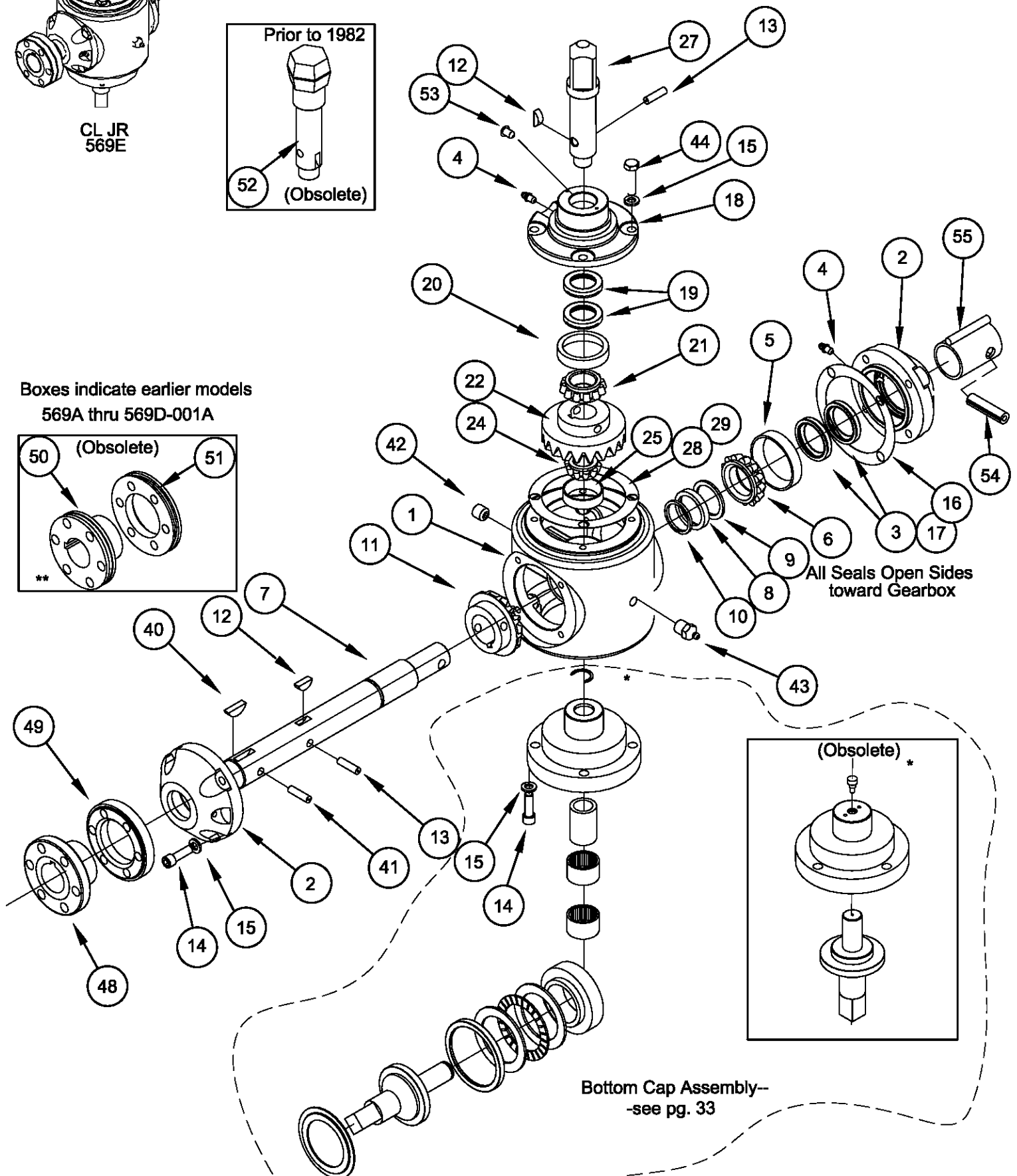
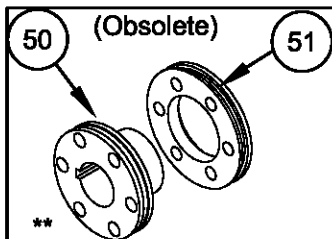
# CIRCU-LATOR JR. (STIRR-A-MATIC) GEARBOX 569A-001A-569D-001A, 569E-001A (shown)



CL JR  
569E

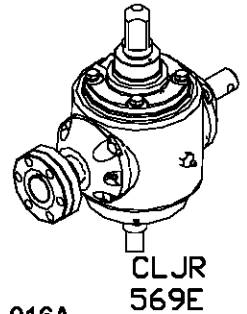


Boxes indicate earlier models  
569A thru 569D-001A



Bottom Cap Assembly--  
-see pg. 33

# CIRCU-LATOR JR. (STIRR-A-MATIC) GEARBOX 569A-001A-569D-001A AND 569E-001A (shown)



Item:	Description:	Qty.	Part No.	
1	HOUSING, TOP	1	203-012P	
2	Cap, Side	2	203-017P	
3	Seal, 1-1/4" ID: (Nitrile) CR-12364	4	D-7001-03	Assy: 203-016A (Includes Items 2-5)
4	Grease Fitting: ALE# 3038-B	4	H-1056	
5	Bearing Cup: LM67010	2	D-2014-01	
6	Bearing Cone: LM67048	2	D-2013-01	
7	Cross Shaft, 11.375	1	439-008P	
8	Collar	1	203-002P	Assy: 439-007A (Includes Items 7,11,12 & 13)
9	Washer	1	F-8001-01	
10	Ring, Retainer	1	F-1033-01	
11	Gear	1	D-3025	
12	Key, Woodruff, 1/4 x 3/4	1	D-1004-02	
13	Roll Pin, Dbl., 5/16 x 2"	1	F-1036-39	
14	Capscrews (SHCS), 5/16-18 x 1"	12	F-1048-15	
15	Lock Washer, 5/16	16	F-1019-02	
16	Shim, .005"	AR	H-1351	(Side Cap; 3.938" OD)
17	Shim, .015"	AR	H-1352	(Side Cap; 3.938" OD)
45	Bottom Cap	1	569-011P	Assy: 203-034A (Includes Items 4,18-20)
18	Cap, Top	1	203-014P	
19	Seal, 1" ID	2	D-7001-07	
20	Bearing Cup, L44610	1	D-2019-01	
21	Bearing Cone, L44643	1	D-2018-01	
22	Gear, 19 tooth	1	D-3024	
27	Shaft, Top 5.625"	1	203-015P	Assy: 203-013A (Includes Items 12, 13, 18-24 & 52)
24	Bearing Cone, LM11749	1	D-2016-01	
52	Shaft, Top, Hexagonal (Prior to 1982)		439-006P	
25	Bearing Cup, LM11710	1	D-2017-01	
28	Shim, .005"	AR	H-1066	(Top & Bottom Caps: 4.25" O.D.)
29	Shim, .015"	AR	H-1067	
42	Pipe Plug, 1/4"	1	H-1025-01	
43	Grease Fitting, 1/4" NPT	1	H-1010-02	
44	HHCS, 5/16 x 1"	4	F-1110	
	Cap, Bottom Assemblies*	1	(see next page)	
48	Base	1	203Z-032P	in 569E-001A (current model)
49	Flange	1	203Z-033P	
50	Base	1	569-006P	(Kit 423-079-001A includes items 40, 41, 50 & 51) (in earlier models-prior to 1991)
51	Flange	1	569-005P	
40	Key, 1/4 x 1"	1	D-1004-01	
41	Roll Pin, 5/16 x 1 3/4"	1	F-1036-37	
53	Plug, Round Screw, #4 x 3/16	2	F-1034-01	
54	Roll Pin, 3/8 x 1 1/4"	1	F-1036-45	
55	Flipper Weldment	1	569-009W	

AR= As Required

\*Note: The difference between models 569A-001A and 569D-001A are in the Bottom Cap Assemblies as indicated on the following pages.

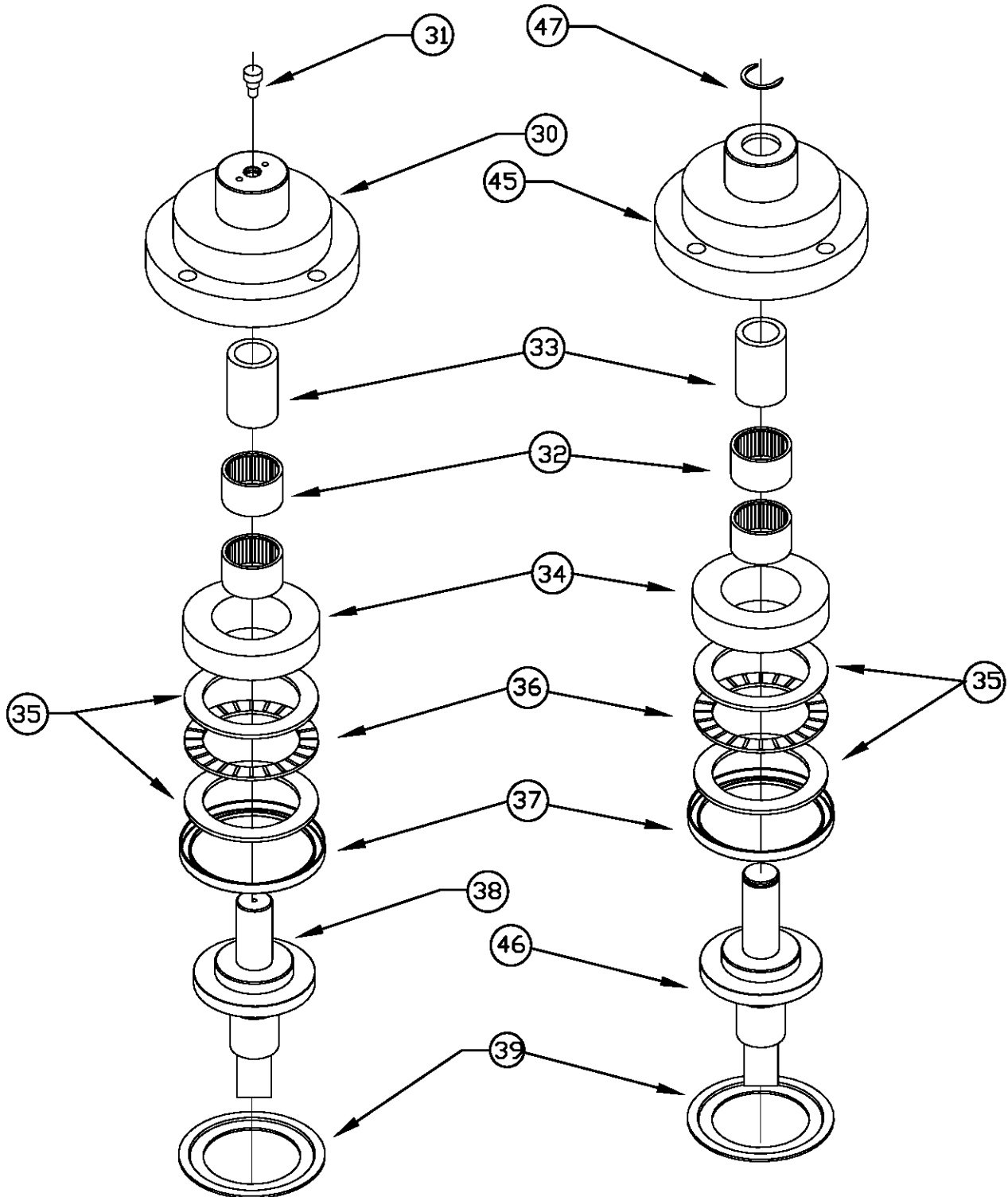
\*\* The current model of Circu-Lator Jr. (569E-001A) has the standard base and flange.

If it becomes necessary to order parts for a Circu-Lator Jr. that are not listed here, please call Shivvers for help.

# CIRCU-LATOR JR. (STIRR-A-MATIC) BOTTOM CAP ASSEMBLIES

439-016A  
USED IN 569A,B-001A  
(Obsolete)

569-012A  
USED IN 569C,D,E-001A





# CIRCU-LATOR JR. GEARBOX (Bottom Cap Assemblies)

For Model 569A-001A (Obsolete)

Item:	Description:	Qty.	Part No.	
30	Cap, Bottom	1	439-014P	<div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px; display: inline-block;"> <b>Assembly 439-016A</b> </div>
31	Shoulder Screw, #10-32 x 1/4"	1	F-1178	
32	Needle Bearing, Torrington B-1612	2	D-3186	
33	Inner Race, Torrington IR-1224	1	D-3187	
34	Bearing Spacer	1	439-024P	
35	Thrust Washer, TRC 3244	2	D-3171	
36	Thrust Bearing, NTA 3244	1	D-3170	
37	Seal, CR 24863	1	D-3189	
38	Centering Plug	1	439-012P	
39	Washer, Protective	1	439-015P	

For Model 569E-001A

Item:	Description:	Qty.	Part No.	
45	Cap, Bottom	1	569-011P	<div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px; display: inline-block;"> <b>Assembly 569-012A</b> </div>
47	Ring, Crescent, Waldes #5103-75	1	F-1581	
32	Needle Bearing, Torrington B-1612	2	D-3186	
33	Inner Race, Torrington IR-1224	1	D-3187	
34	Bearing Spacer	1	439-024P	
35	Thrust Washer, TRC 3244	2	D-3171	
36	Thrust Bearing, NTA 3244	1	D-3170	
37	Seal, CR 24863	1	D-3189	
46	Centering Plug	1	569-010P	
39	Washer, Protective	1	439-015P	

# CIRC-1 GEARBOX REPAIR KIT

## 423-249-001A

PART#	DESCRIPTION	QTY.
D-2013-01	Bearing Cone, 1- 1/4" ID	4
D-2018-01	Bearing Cone, 1" ID	4
D-2016-01	Bearing Cone, Small	4
D-2014-01	Bearing Cup, for 1-1/4" ID	2
D-2019-01	Bearing Cup, for 1" ID	4
D-2017-01	Bearing Cup, Small	4
D-7001-03	Seal, 1-1/4" ID	4
D-7001-07	Seal, 1" ID	7
D-7001-08	Seal, Large (Center Section)	2
H-1010-04	Zerk, 1/4 NPT 67°	1
H-1010-05	Zerk , 1/4-28	1
H-1010-07	Zerk, 1/8 NPT	1
H-1056	Zerk, Self-Tap, 1/4-28	6
H-1300	Zerk, 1/4-28 45°	1
H-1351	Shim, Side Cap, .005	6
H-1352	Shim, Side Cap, .015	6
H-1066	Shim, .005	6
H-1067	Shim, .015	6
203-002P	Collar	1
D-1004-02	Key, Woodruff, 1/4 x 3/4"	7
F-1036-39	Roll Pin, Double, 5/16 x 2"	5
F-1033-01	Snap Ring	1

Center Section Bearings must be ordered separately.

Shafts, Gears, Caps, etc. must be ordered separately.

# CIRC-II GEARBOX REPAIR KIT

## 423-250-001A

PART#	DESCRIPTION	QTY.
D-2013-01	Bearing Cone, 1- $\frac{1}{4}$ " ID	6
D-2016-01	Bearing Cone, Small	1
D-2012-01	Bearing Cone	3
D-2014-01	Bearing Cup, for 1- $\frac{1}{4}$ " ID	6
D-2017-01	Bearing Cup, Small	1
D-2011-01	Bearing Cup	3
D-7001-03	Seal, 1- $\frac{1}{4}$ " ID	11
D-3165	Seal, Large (Center Section)	1
H-1010-02	Zerk, Straight $\frac{1}{4}$ NPT	2
H-1056	Zerk, Self-Tap, ALE 3038-B	6
H-1300	Zerk, $\frac{1}{4}$ NPT 45°	2
H-1069	Shim, Side Cap, .005	6
H-1071	Shim, Side Cap, .015	6
H-1073	Shim, .005	6
H-1075	Shim, .015	6
203-002P	Collar	1
D-1004-02	Key, Woodruff, $\frac{1}{4}$ x $\frac{3}{4}$	7
F-1036-29	Roll Pin, Double, $\frac{1}{4}$ x 2"	7
F-1033-01	Snap Ring	1

Center Section Bearings must be ordered separately.

Shafts, Gears, Caps, etc. must be ordered separately.

# CIRCU-LATOR JR. (STIRR-A-MATIC) GEARBOX REPAIR KIT

## 423-251-001A

PART#	DESCRIPTION	QTY.
D-2013-01	Bearing Cone, 1- $\frac{1}{4}$ " ID	2
D-2018-01	Bearing Cone, 1" ID	1
D-2016-01	Bearing Cone, Small	1
D-3186	Needle Bearing	2
D-3170	Thrust Bearing, Needle	1
D-3171	Thrust Bearing, Race	2
D-2014-01	Bearing Cup, for 1- $\frac{1}{4}$ " ID	2
D-2019-01	Bearing Cup, for 1" ID	1
D-2017-01	Bearing Cup, Small	1
D-3187	Inner Race	1
D-7001-03	Seal, 1- $\frac{1}{4}$ " ID	4
D-7001-07	Seal, 1" ID	2
D-3189	Seal, Large (Bottom Cap)	1
H-1010-02	Zerk, Straight $\frac{1}{4}$ NPT	1
H-1056	Zerk, Self-Tap, ALE 3038-B	5
H-1351	Shim, Side Cap, .005	6
H-1352	Shim, Side Cap, .015	6
H-1066	Shim, .005	6
H-1067	Shim, .015	6
203-002P	Collar	1
439-024P	Bearing Spacer	1
D-1004-02	Key, Woodruff, $\frac{1}{4}$ x $\frac{3}{4}$	2
F-1036-39	Roll Pin, Double, $\frac{5}{16}$ x 2"	2
F-1033-01	Snap Ring	1

Shafts, Gears, Caps, etc. must be ordered separately.

## AUXILIARY SWEEP GEARBOX REPAIR KIT 423-252-001A

PART#	DESCRIPTION	QTY.
D-7001-01	Seal, in Body, CR9815	1
D-7001-02	Seal, in Cap, CR14810	1
D-2005-01	Needle Bearing, Torrington B-1616	3
D-2005-02	Needle Bearing, Torrington M-16161	1
D-2006-01	Thrust Bearing, NTA 1625	2
D-2007-01	Washer, Thrust, TRA 1625	2
D-2007-02	Washer, Thrust, 1.552 OD	2
F-1036-39	Roll Pin, Double, $\frac{5}{16}$ x 2"	2
F-1010-02	Zerk, Straight $\frac{1}{4}$ NPT	1

Shafts, Gears, Caps, etc. must be ordered separately.

## VERTICAL UNLOADER GEARBOX REPAIR KIT 423-253-001A

PART#	DESCRIPTION	QTY.
D-2018-01	Bearing Cone, 1" ID	2
D-2016-01	Bearing Cone, Small	2
D-2019-01	Bearing Cup, for 1" ID	2
D-2017-01	Bearing Cup, Small	2
D-7001-07	Seal, 1" ID CR9878	2
H-1010-02	Zerk, ALE 1627-B	1
H-1066	Shim, .005	6
H-1067	Shim, .015	6
H-1073	Shim, .005	6
H-1075	Shim, .015	6
D-1004-02	Key, Woodruff, $\frac{1}{4}$ x $\frac{3}{4}$	2
F-1036-39	Roll Pin, Double $\frac{5}{16}$ x 2"	2

Shafts, Gears, Caps, etc. must be ordered separately.

# CIRC-II HI-TEMP GEARBOX REPAIR KIT

## 423-355-001A

Part #	Description	428E Red	428F Copper	This kit contains the following items.
D-2013-01	Bearing Cone, 1 1/4" ID	6	6	6
D-2012-01	Bearing Cone	4	4	4
D-2014-01	Bearing Cup, 1/14" ID	6	6	6
D-2011-01	Bearing Cup	4	4	4
D-3640	Seal 1 1/4" ID Viton Hi-Temp	11	11	11
D-3643	Seal, Large ( Center Section)	1	1	1
H-1069	Shim, Side Cap, .005	10	10	10
H-1071	Shim, Side Cap, .015	8	8	8
H-1073	Shim, .005	10	10	10
H-1075	Shim, .015	8	8	8
F-8001-01	Steel Washer ( Special)	1	1	1
H-1010-02	Grease Zerk	2	2	2
H-1056	Grease Zerk, Self Tapping	9	9	9
H-1300	Grease Zerk	1	2	2
D-1004-02	Woodruff Key, 1/4" x 3/4"	4	0	6
D-1004-01	Woodruff Key, 1/4" x 1"	1	0	1
428-053P	Sq. Key 5/16" x 1 1/8"	0	2	2
428-054P	Sq. Key 5/16" x .898"	0	4	4
656-027P	Sq. Key 1/4" x 1 1/8"	0	2	2
F-1036-29	Double Roll Pin 1/4" x 2"	5	5	5
F-1033-01	Retaining Ring	1	1	1
203-002P	Collar	1	1	1

428E gearboxes are painted red, have a long input shaft, and a 12 tooth chain coupler

428F gearboxes are painted copper and have a long input shaft and 16 tooth chain coupler.

**Note:** This is a universal kit for all High Temp Gearboxes, some parts may not be used in the gearbox you are repairing.

Center Section Bearings must be ordered separately.  
Shafts, Gears, Caps, etc. must be ordered separately.

# CIRC-III HI-TEMP GEARBOX REPAIR KIT

## 423-416-001A

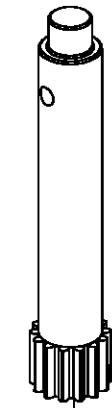
PART #	DESCRIPTION	QTY
D-2013-01	Bearing Cone, 1 1/4" ID	7
D-2012-01	Bearing Cone	5
D-2014-01	Bearing Cup, 1/14" ID	7
D-2011-01	Bearing Cup	5
D-3640	Seal 1 1/4" ID Viton Hi-Temp	13
D-3643	Seal, Large ( Center Section)	1
H-1069	Shim, Side Cap, .005	10
H-1071	Shim, Side Cap, .015	8
H-1073	Shim, .005	12
H-1075	Shim, .015	8
F-8001-01	Steel Washer ( Special)	1
H-1010-02	Grease Zerk	2
H-1056	Grease Zerk, Self Tapping	11
H-1300	Grease Zerk	2
D-1004-02	Woodruff Key, 1/4" x 3/4"	6
D-1004-01	Woodruff Key, 1/4" x 1"	1
428-053P	Sq. Key 5/16" x 1 1/8"	3
428-054P	Sq. Key 5/16" x .898"	4
656-027P	Sq. Key 1/4" x 1 1/8"	2
F-1036-29	Double Roll Pin 1/4" x 2"	6
F-1033-01	Retaining Ring	1
203-002P	Collar	1

Center Section Bearings must be ordered separately.

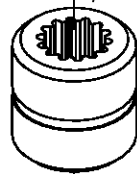
Shafts, Gears, Caps, etc. must be ordered separately.

# CLI SPLINED SHAFT KIT 423-310-001A, 423-311-001A

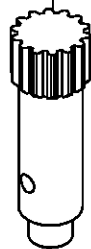
## 423-310-001A



203-050P  
SPLINED SHAFT  
(UPPER) 4.951"L

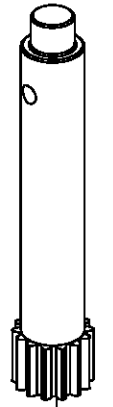


203-059A  
SPLINED COUPLER  
ASSEMBLY-INCLUDES  
SNAP RING  
(REQUIRED)

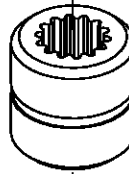


203-051P  
SPLINED SHAFT  
(LOWER, 6")  
3.576"L

## 423-311-001A



203-050P  
SPLINED SHAFT  
(UPPER) 4.951"L

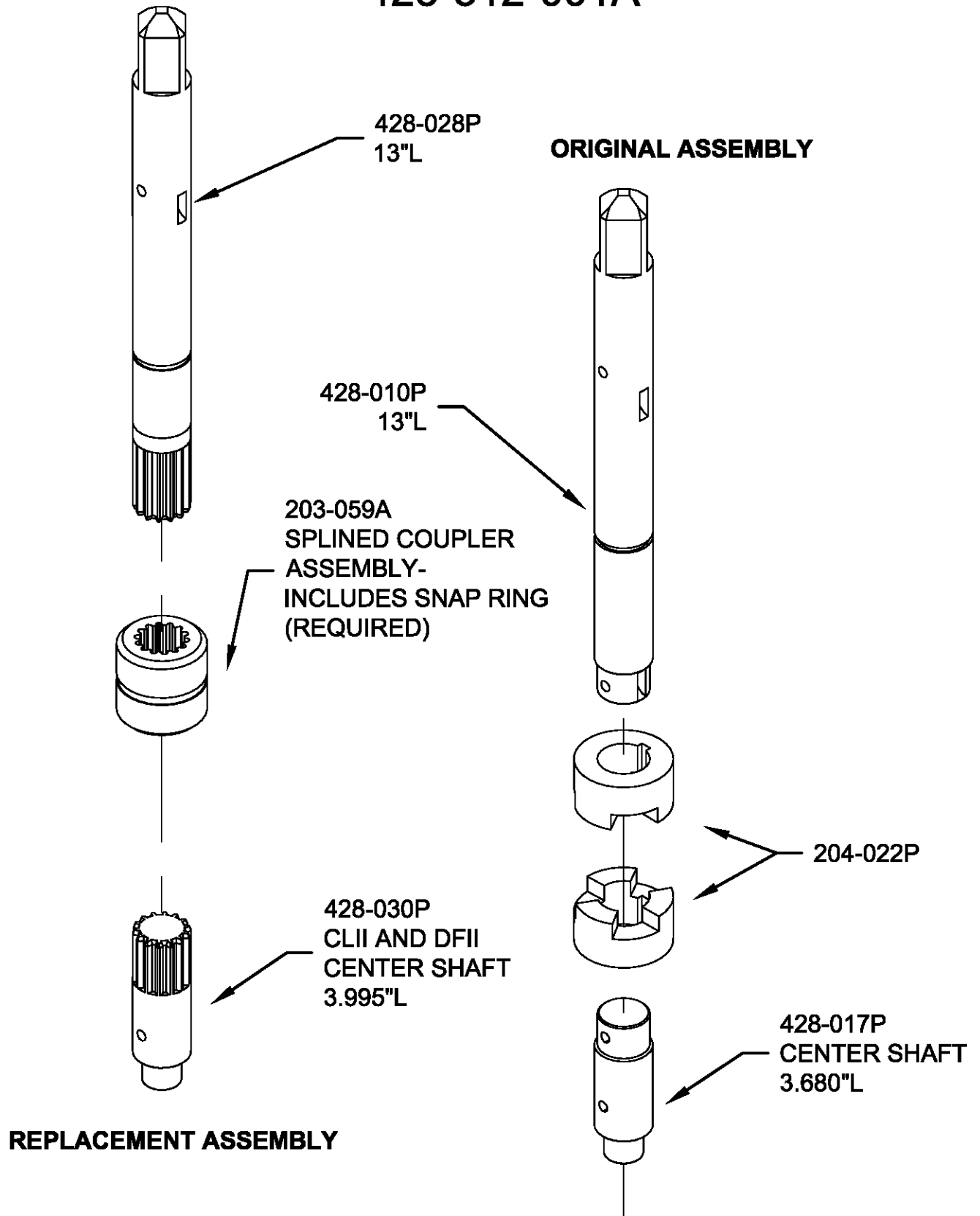


203-052P  
SPLINED SHAFT  
(LOWER, 8")  
4.576"L



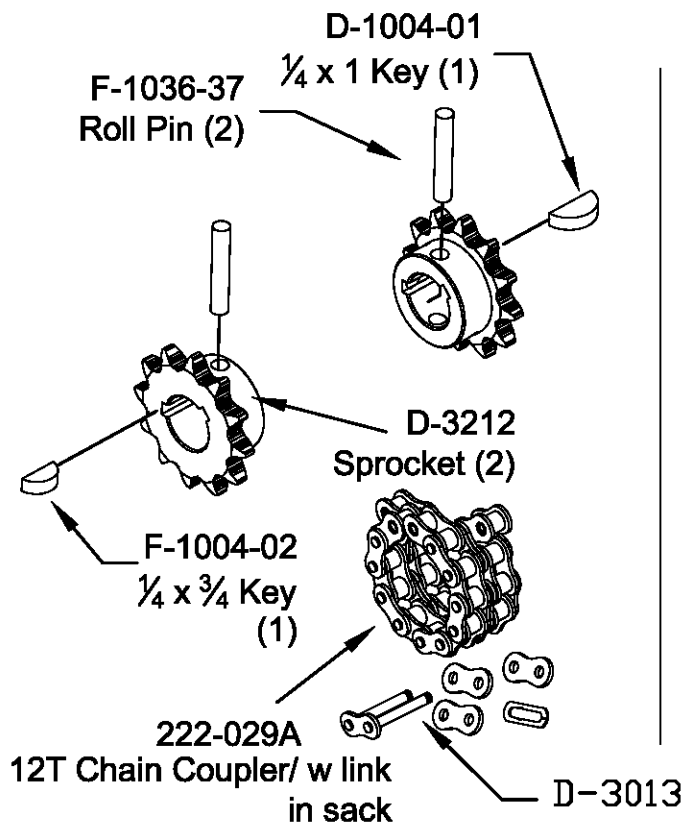


# CLII GB & DF SPLINED SHAFT KIT 423-312-001A

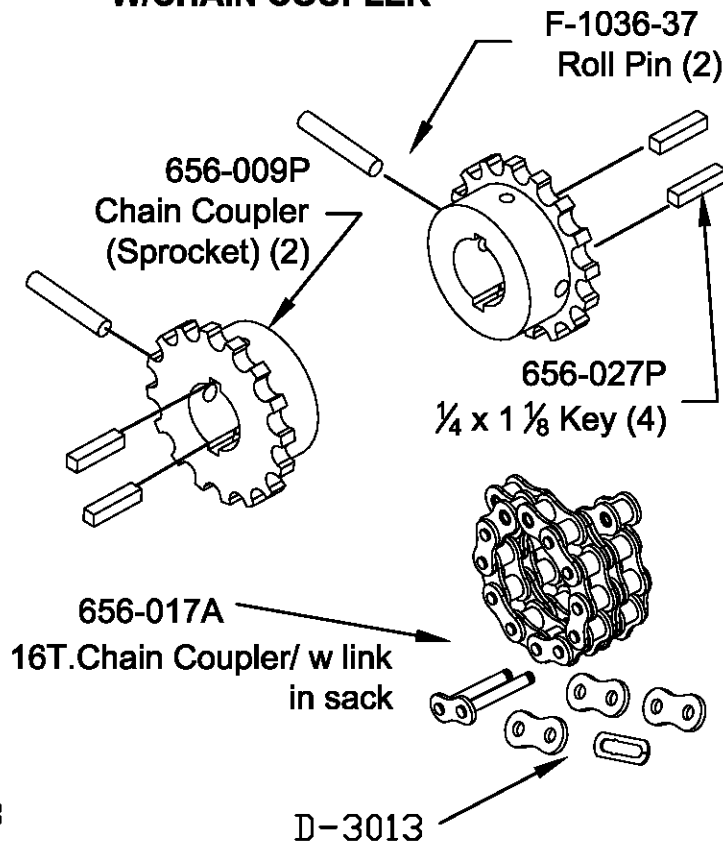


# CIRCU-LATOR GEARBOX CONNECTIONS

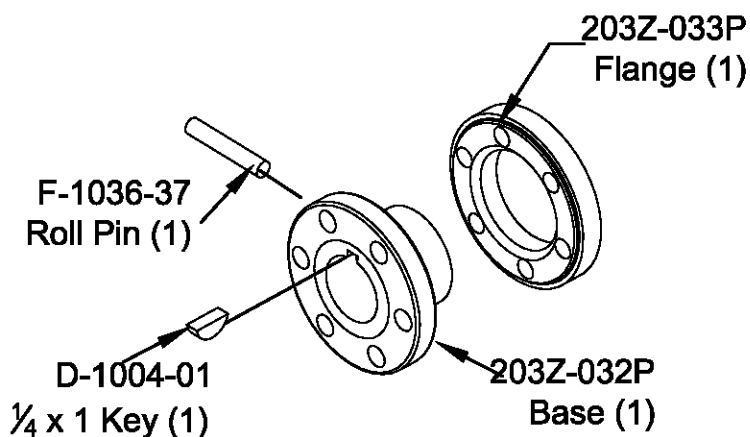
## 423-050-001A CIRCU-LATOR OR DRI FLO 12T. SPROCKET KIT W/CHAIN COUPLER



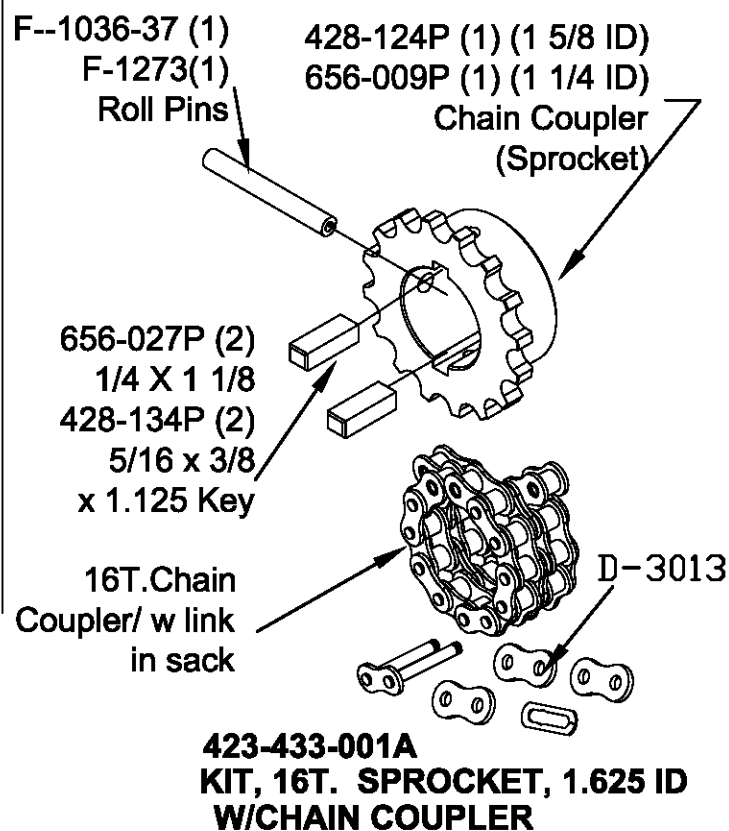
## 423-354-001A HI TORQUE GEARBOX 16T. SPROCKET KIT W/CHAIN COUPLER



## 423-022-001A CIRCU-LATOR I OR DRI FLO CIRC JR OR CIRC 2 (BEFORE 1999) BASE AND FLANGE KIT



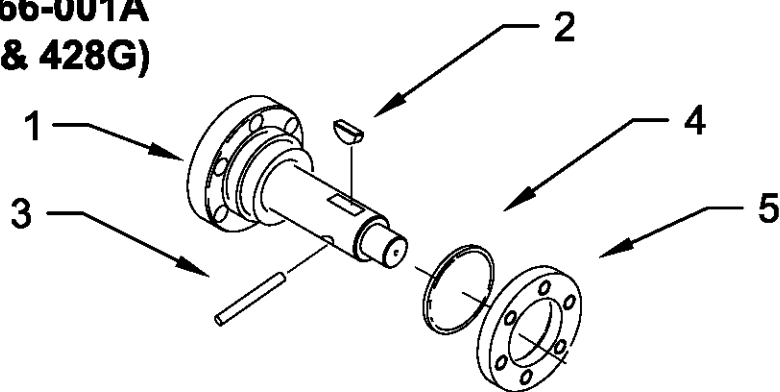
Order kit #423-021-001A for a 1" Shaft.  
(See Circu-Lator Gearbox Identification).



## 423-433-001A KIT, 16T. SPROCKET, 1.625 ID W/CHAIN COUPLER

## CIRCU-LATOR II DRI FLO GEARBOX SHAFT KIT

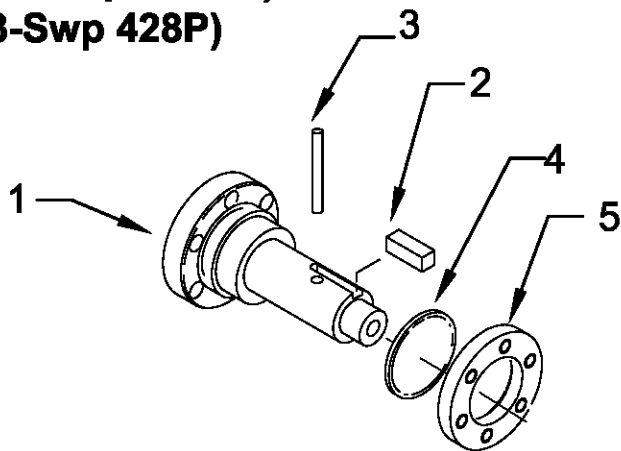
**423-366-001A**  
( 428E & 428G)



Item:	Description	Qty	Part No.
1	1 Pc. Base/Shaft	1	428-062P
2	Key, Wdf. $\frac{1}{4} \times \frac{3}{4}$ "	1	D-1004-02
3	Roll Pin, $\frac{1}{4} \times 2$ "	1	F-1036-29
4	O-Ring	1	D-3771
5	Flange	1	208-029P

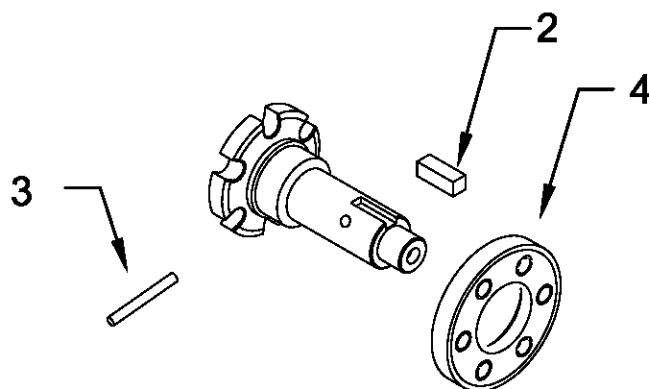
## CIRCU-LATOR HI TORQUE GEARBOX SHAFT KIT

**423-367-001A**  
(Hi-Torque 428F)  
(3-Swp 428P)



Item:	Description	Qty	Part No.
1	1 Pc. Base/Shaft	1	428-046P
2	Key, Sq. $\frac{5}{16} \times 1 \frac{1}{8}$ "	1	428-053P
3	Roll Pin, $\frac{1}{4} \times 2$ "	1	F-1036-29
4	O-Ring	1	D-3771
5	Flange	1	208-029P

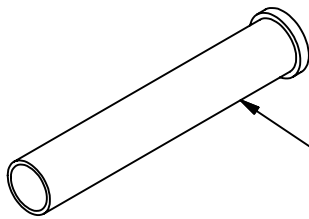
**423-414-001A**  
(3-Swp w/7/16-20 Bolts and Nuts)



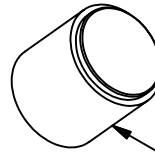
Item:	Description	Qty	Part No.
1	1 Pc. Base/Shaft	1	428-116P
2	Key, Sq. $\frac{5}{16} \times 1 \frac{1}{8}$ "	1	428-053P
3	Roll Pin, $\frac{1}{4} \times 2$ "	1	F-1036-29
4	Flange	1	708-005P

# GEARBOX TOOL REPAIR KIT

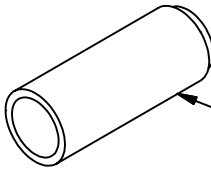
## 423-265-001A



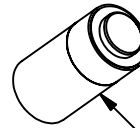
423-018W  
Small Cone Driver



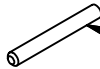
423-025P  
Large Cup Driver



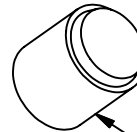
423-019W  
Large Cone Driver



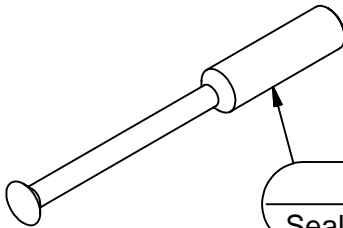
423-026P  
1" Seal Driver



423-020P  
Assembly Stud, 5/16



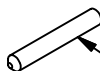
423-027P  
1" Cup Driver



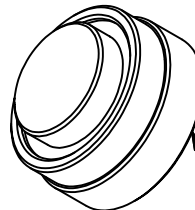
423-021P  
Seal Removal Punch



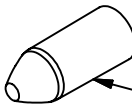
423-028P  
Small Cup Driver



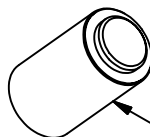
423-022P  
Assembly Stud, 3/8



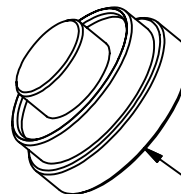
423-029P  
Large Center Driver



423-023P  
Seal Bullet

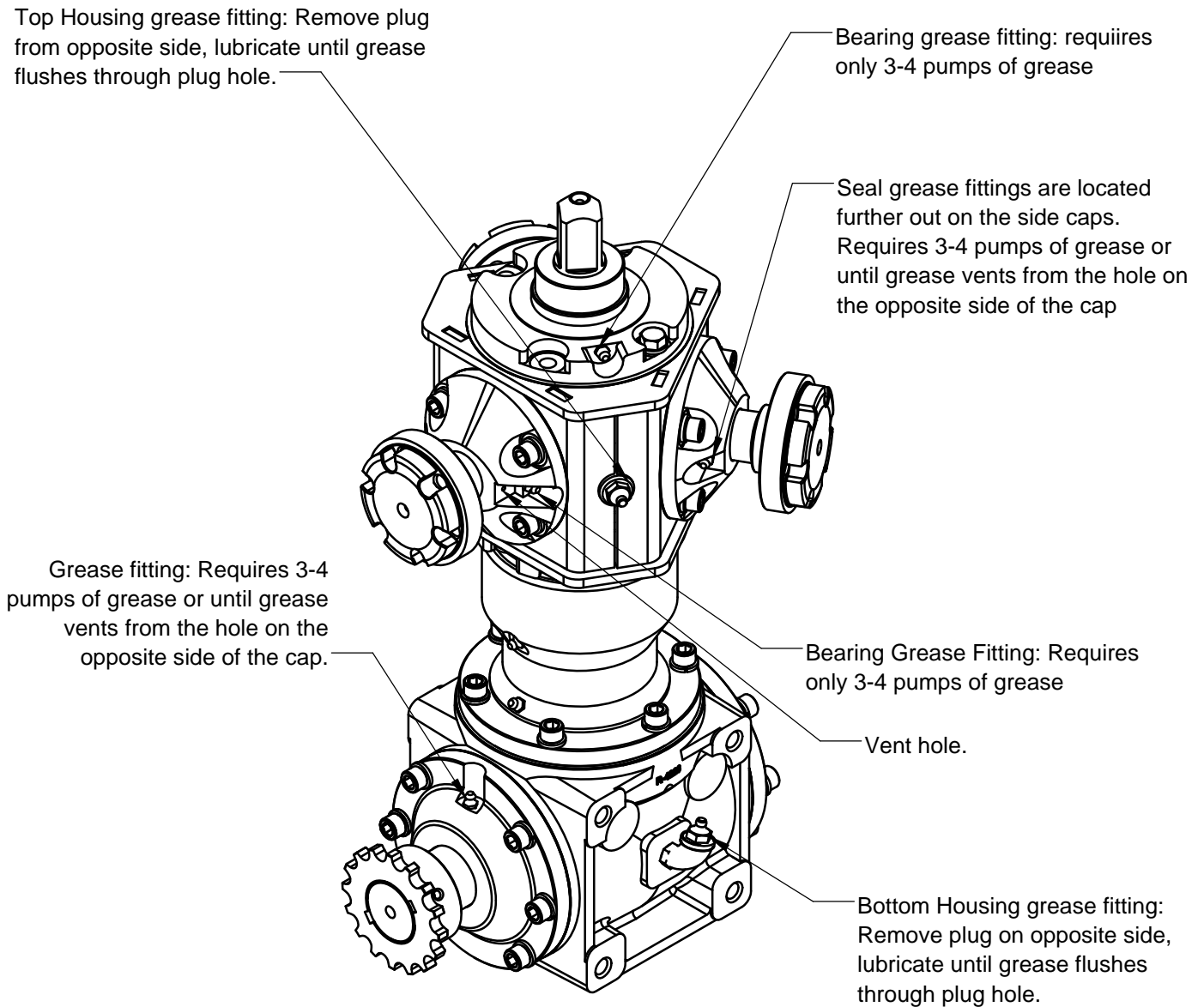


423-024P  
1.25" Seal Driver



423-030P  
Small Center Driver

# GEARBOX LUBRICATION GUIDE



Use only the Specified Lubricant  
Consult Parts List for your Gearbox Assembly

# REPAIR INSTRUCTIONS

The following pages are provided to assist you in repairing your Gearbox. If you follow these instructions closely, you should have little problem with either Disassembly (taking it apart) or Assembly (putting it together).

## Pointers and Hints to Shivers Gearbox Repair

Remember that once a Gearbox is opened, all Warranty still in effect at that time is VOID.

Always visually inspect each part before assembling it to the Gearbox. For example:

- a. Check Keyways for burrs and file off any that you find.
- b. Check all used parts for wear--Gears, Shafts, Bearing Cups, etc.
- c. Check Housings for cracks.

It is a good idea to "pre-pack" all Bearings with grease. Use only specified grease as listed in each section of this manual.

Be sure all Bearing Cups (races) are completely "seated"--pressed in as far as possible.

Be sure all Seals are pressed in facing in the right direction.

Oil all Seals before inserting Shafts into them.

Only use "double" roll pins of the proper length.

Only use the correct Shims. Never substitute "home made" Shims or use damaged ones. We suggest replacing the Shims with new ones.

Always check TORQUE on bolts securing caps to Gearbox.

Always check BEARING PRELOAD.

Always check BACKLASH.

## Bearing Preload Adjustment

Definition of Bearing Preload: The amount of Pressure between the Bearing Cone and the Bearing Cup (race) after assembly is known as "Preload". The Preload on each Bearing is set as the corresponding Cap is bolted to the Housing.

Purpose: Proper Bearing Preload Adjustment is necessary to insure the maximum life of the Bearing and the Gearbox as a whole.

Checking the Bearing Preload: The acceptable Preload on the bearings of a particular shaft is determined by 2 steps:

- a. Too Tight--more Shim is indicated. Under this condition the Shaft will not rotate easily when turned by hand.
- b. Too Loose--less Shim is indicated. Under this condition side to side movement can be detected by holding the thumb and forefinger of one hand against both the Shaft and the Cap at the same time, and moving the Shaft from side to side with the other hand.

Adjustment of Bearing Preload: Proper Bearing Preload is made by adding or removing Shims (sometimes called "gaskets"). This is done by changing the number or thickness of Shims affecting either the "Driving Gear" or the "Driven Gear," or both. These Shims are located between each Cap and Housing.

In making the adjustment, you must keep in mind:

1. A minimum of at least 1 Shim is needed between every Cap and Housing. (These also serve the purpose of Sealing Gaskets.)
2. Never "Overload" the Bearings. If the Shaft cannot be turned easily with the bare hand, the bearing is too tight, and more Shim is indicated at that Cap.

3. Never Allow "Shaft Side Play". If, when all Cap bolts are tight, you can move the Shaft from side to side, less Shim is indicated at that Cap. (This movement can be detected by holding the thumb and forefinger of one hand against both the Shaft and Cap at the same time at the point where the Shaft joins the Cap, and moving the Shaft from side to side with the other hand.)

4. Always RECHECK "Bearing Preload" after adjusting, and before continuing to another procedure.

Note: If the above adjustment procedure does not work in a particular case, see the page on "Special Situations".

### **Backlash Adjustment**

Definition of Backlash: The amount by which the width of a tooth space exceeds the thickness of engaging tooth on the pitch circles. In other words, when two gears are meshed together, the Backlash is the amount of "play" or movement before the "Driving Gear" engages the "Driven Gear".

Purpose: Proper backlash will insure longer life of the Gears as well as the associated parts (shafts, keys, pins, and bearings).

Too little backlash: (Too Tight Gear Mesh) This will result in the overloading of bearings, premature gear wear, increased power loss, overheating, and a noisy gearbox.

Too much backlash: (Too Loose Gear Mesh) This will result in uneven gear wear, and the increased possibility of gear slippage.

Measurement of Backlash: It is nearly impossible to measure accurately the amount of Backlash in an assembled Gearbox. However, a practical estimate of a proper Backlash in a Circu-Lator Gearbox can be made as follows:

A. While holding the Housing assembly with one hand, rotate each Shaft back and forth. You should feel a slight click. (The amount of rotation from one direction to the other is the backlash.)

B. Determine the approximate amount of movement of a point on the rotating Shaft. A maximum movement at this point should be about  $\frac{1}{64}$  of an inch unless this causes "tight spots" between the gears as an entire revolution of the shaft is made.

Adjustment of Backlash: The adjustment to obtain the proper amount of Backlash is made by adding or removing Shims. This is done by changing the number or thickness of Shims affecting either the "Driving Gear" or the "Driven Gear", or both. These Shims are located between each Cap and Housing.

In making the adjustment, you must keep in mind:

1. A minimum of at least 1 Shim is needed between every Cap and Housing. These also serve the purpose of Sealing Gaskets.

2. Never "Overload" the Bearings. If the Shaft cannot be turned easily with the bare hand, the bearing is too tight, and more Shim is indicated at that Cap.

3. Never allow "Shaft Side Play". If, when all Cap Bolts are tight, you can move the Shaft from side to side, less Shim is indicated at that Cap. (This movement can be detected by holding the thumb and forefinger of one hand against both the Shaft and Cap at the same time at the point where the Shaft joins the cap, and moving the Shaft from side to side with the other hand).

4. Always RECHECK "Measurement of Backlash" after adjusting and before continuing to another procedure.

Note: If the above adjustment procedure does not work in a particular case, see the page on "Special Situations".

## **Special Situations**

Due to the wearing of the parts and the compounding of manufacturing tolerances, sometimes it is necessary to use certain procedures that are not ordinarily prescribed. A few of these Special Situation PROBLEMS and SOLUTIONS are as follows:

Problem: BEARING PRELOAD cannot be properly set at the Top Cap, Bottom Cap, or End Cap. With a minimum Shim Pack (a .005" thick Shim) the Shaft is still too loose (there is still Side Shaft Play).

Solution: The Bearing Cup (race) in the center of the housing needs to be "Shimmed out". The Cup must be removed and a special Shim (203-048P-20) must be inserted under it. Then repeat the procedure for adjusting Bearing Preload.

Problem: BACKLASH or BEARING PRELOAD cannot be properly set at the Side Caps on the Cross Shaft. With a minimum Shim Pack (a .005" thick Shim) the Shaft is still too loose (there is still Side Shaft Play.)

Solution: The Bearing Cone on the Cross Shaft needs to be "Shimmed out". The Side Cap and the Bearing Cone need to be removed and a special Shim (203-048P-20) must be inserted between the Collar and the washer, before the Bearing.



