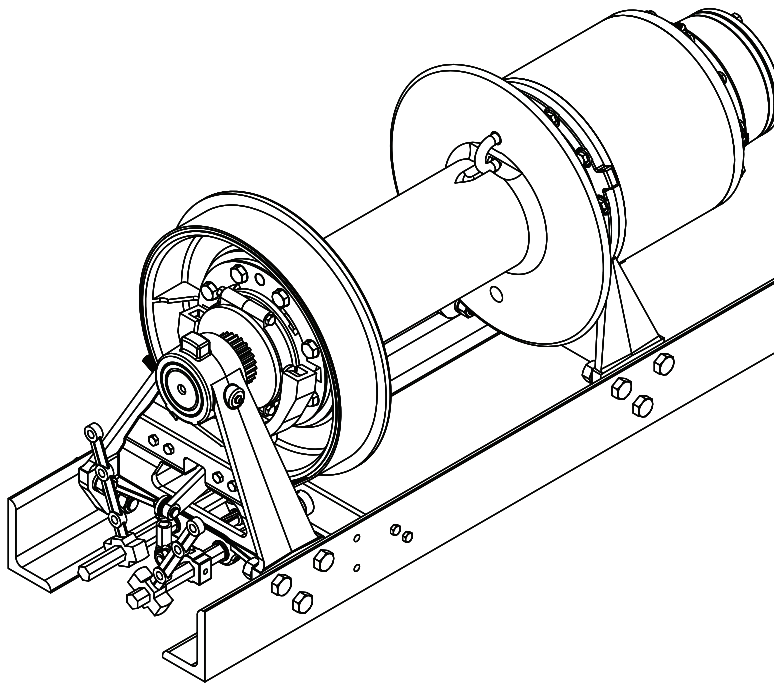


BRADEN®

HP50B

MATERIAL LIST



Authorized Distributor:
Pacific Marine & Industrial
www.pacificmarine.net
info@pacificmarine.net

PACCAR WINCH DIVISION
P.O. BOX 547 BROKEN ARROW, OK U.S.A. 74013
PHONE (918) 251-8511 FAX (918) 259-1575
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FOREWORD

Read this entire publication and retain it for future reference.

If you have any questions regarding your Braden HP50B Winch or this publication, call the Braden Service Department at 1-918-251-8511, 08:00-16:30 hours Central Time Zone, Monday through Friday.

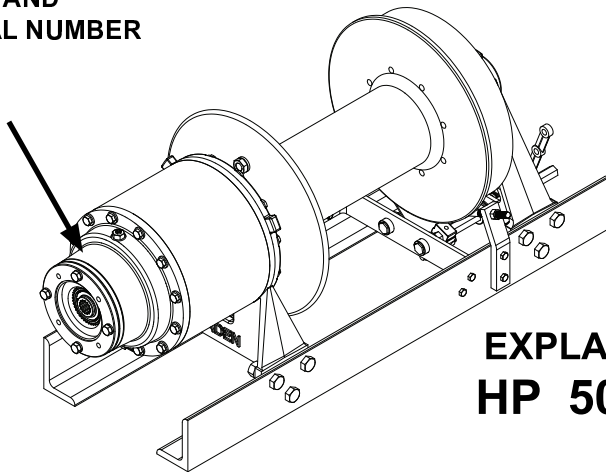
Some illustrations in this manual may show details or attachments that are different from your winch. Also, some components have been removed for illustrative purposes. Illustrations and pictures in this manual are of a “typical” unit sold through our distribution channels. Some winches, particularly those sold to original equipment manufacturers, may differ slightly in appearance.

Whenever a question arises regarding your Braden Winch, please contact the Braden Service Department for the latest available information.

PACCAR Winch Division
Service Department
P.O. Box 547
Broken Arrow, Oklahoma 74013-0547 United States of America
www.paccarwinch.com

**MODEL NUMBER
AND
SERIAL NUMBER**

UNIT IDENTIFICATION



When information is needed, always refer to the model number and serial number. Both are located on the top portion of brake cylinder assembly

**EXPLANATION OF MODEL NUMBER
HP 50 B - LP - 104 064 - 01**

- HP** DESIGNATES HYDRAULIC PLANETARY
- 50** DESIGNATES 50,000 POUND FIRST LAYER LINE PULL
- B** DESIGNATES THE MODEL SERIES RELATING TO DESIGN CHANGES
- LP** DESIGNATES LOW PROFILE
- 104** DESIGNATES TOTAL GEAR REDUCTION
- 064** DESIGNATES HYDRAULIC MOTOR DISPLACEMENT (064 - 6.4 CU IN/REV)
- 01** DESIGNATES THE DRUM OPTION

Oil Capacities - 2.5 Quarts (2.36 L)

Capacities are approximate. Fill winch to center of sight gauge or level plug in brake cylinder with drum in a horizontal position.

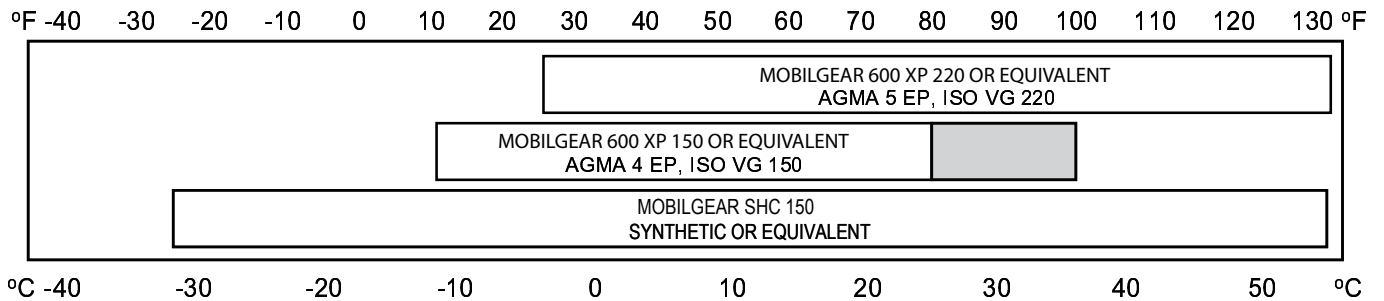
RECOMMENDED PLANETARY GEAR OIL

For simplicity, BRADEN has listed available products in each temperature range that have been tested and found to meet our specifications. This is not to say that other lubricant brands would not perform equally as well.

If the following lubricant brands are not available in your area, make certain your lubricant vendor supplies you with oil that is equivalent to those products listed below.

RECOMMENDED PLANETARY GEAR OIL

PREVAILING AMBIENT TEMPERATURE

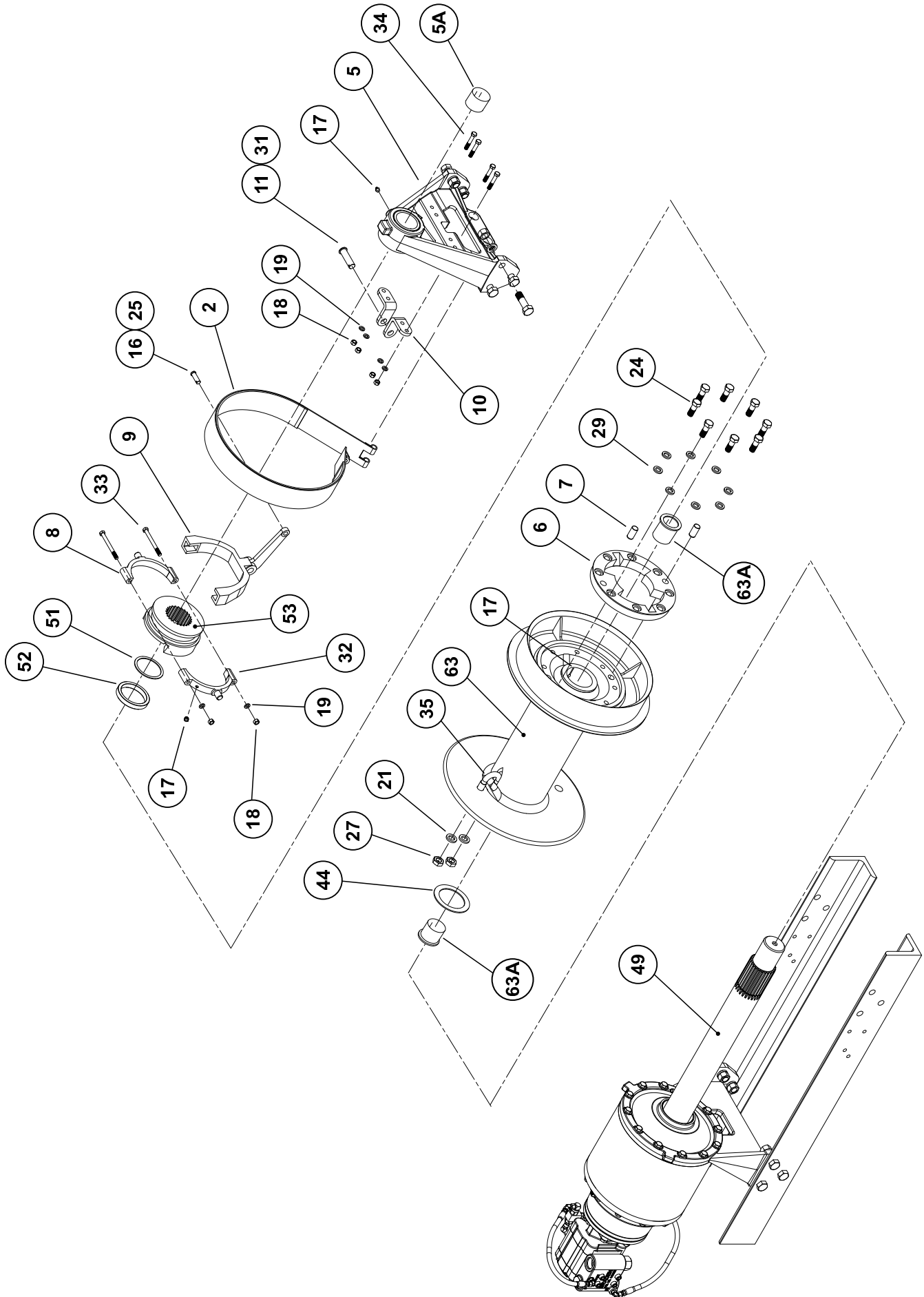


NOTE: SHADED TEMPERATURE RANGE IN THE CHART ABOVE NOT RECOMMENDED FOR SEVERE APPLICATIONS SUCH AS: OFFSHORE CRANES, SUSTAINED FAST DUTY CYCLES OR FREQUENT LIFTING.

Planetary hoists are factory filled with Mobilgear 600 XP 150, or equivalent. Consult your oil supplier for other equivalent oils if required.

Mobil	Shell	Chevron	Texaco
Mobilgear 600 XP 150	Omala 150	Gear Compounds EP 150	Meropa 150
Mobilgear 600 XP 220	Omala 220	Gear Compounds EP 220	Meropa 220

COMMON PARTS



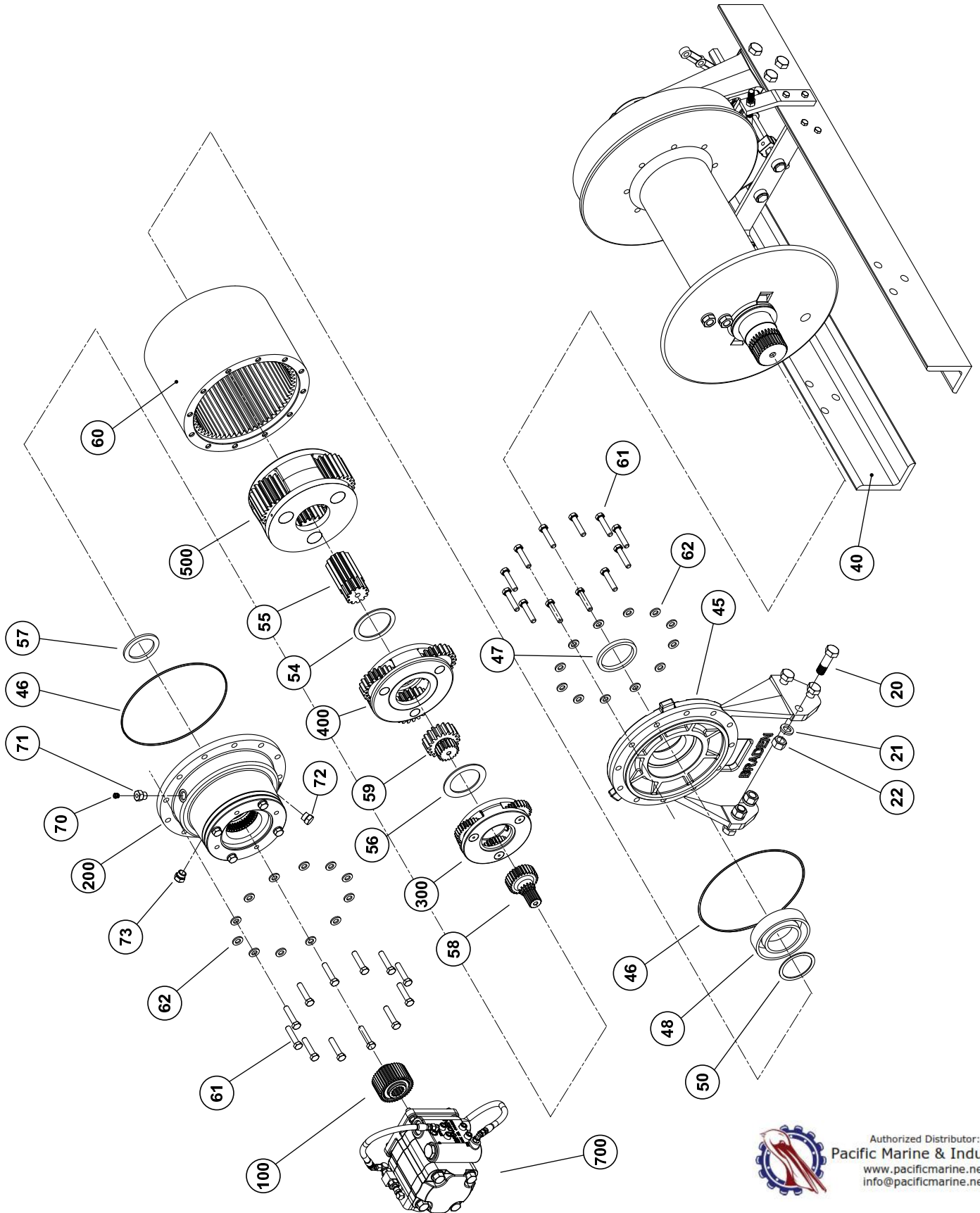
COMMON PARTS

ITEM	DESCRIPTION	PART	QTY
	PARTS GROUP HP50B-LP	63957	1
2	BRAKE BAND ASSY	83491	1
5	SUPPORT CLUTCH END ASSY	83495	1
5A	BEARING LEG BUSHING	12867	1
6	CLUTCH PLATE	11216	1
7	CLUTCH PLATE DOWEL PIN	12769	2
8	CLUTCH RIDER	11671	1
9	CLUTCH SHIFT FORK	11673	1
10	SHIFT FORK BRACKET	11656	2
11	CLUTCH SHIFT FORK PIVOT PIN	11657	1
15	SUPPORT BRACKET	11503	1
17	GREASE FITTING	18047	4
18	NUT 3/8-16	11780	12
19	LOCKWASHER 3/8 Z	27152	12
24	CAPSCREW 5/8-11 X 1-3/4 GD8 Z HX HD	103249	8
27	NUT - JAM 3/4-10 NC	11791	2
29	LOCKWASHER 5/8 Z	102423	8
31	COTTER PIN	13959	1
32	CLUTCH RIDER WITH GREASE PORT	11672	1
33	CAPSCREW 3/8-16 X 4-1/4 GD8 Z HX HD	107505	2
34	CAPSCREW 3/8-16 X 2-1/4 GD8 Z HX HD	104134	4
35	CABLE CLAMP	29036	1
36	COLLAR BEARING	11669	4
44	THRUST WASHER	106676	1
49	DRUM SHAFT	106656	1
51	RETAINING RING	32093	1
52	SPACER	102680	1
53	SLIDING CLUTCH	102681	1
63	CABLE DRUM ASSEMBLY	82847	1
63A	CABLE DRUM BUSHING	102686	2



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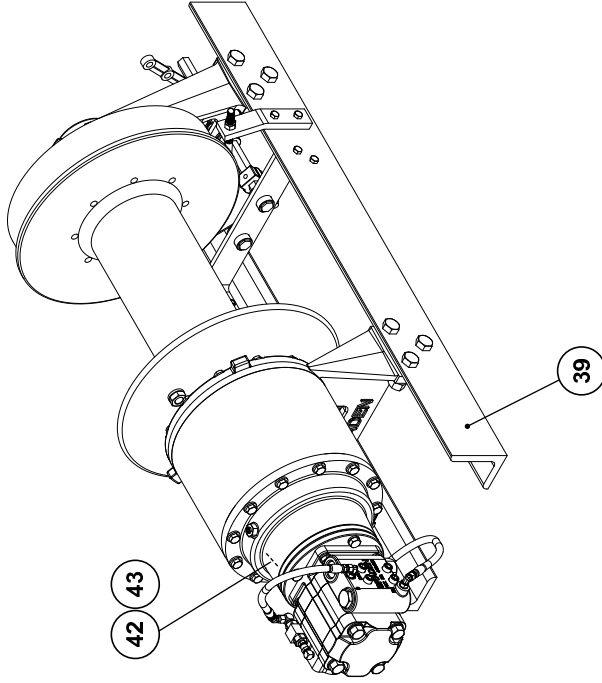
COMMON PARTS (CONTINUED)



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COMMON PARTS (CONTINUED)

ITEM	DESCRIPTION	PART	QTY
20	CAPSCREW 3/4-16 X 2-1/2 GD8 Z HX HD	23929	12
21	LOCKWASHER 3/4 Z	13435	14
22	NUT 3/4-16 GD8 Z	23930	12
39	BASE ANGLE R.H.	106658	1
40	BASE ANGLE L.H.	106659	1
41*	DECAL, CLUTCH CONTROL	100600	1
42	NAMEPLATE	76381	1
43	DRIVE SCREW	11842	4
45	SUPPORT MOTOR END	106661	1
46	O-RING	72111	2
47	LIP SEAL	103927	1
48	ROLLER BEARING	102677	1
50	RETAINING RING	102679	1
54	THRUST WASHER	24485	1
55	OUTPUT SUN GEAR	24571	1
56	THRUST WASHER	106960	1
57	THRUST WASHER	40128	1
58	PRIMARY SUN GEAR	106664	1
59	SECONDARY SUN GEAR	106957	1
60	RING GEAR	106657	1
61	CAPSCREW 1/2-13 X 2-1/4 GD8-Z HX HD	104137	24
62	WASHER, PLAIN 1/2 Z	100859	24
70	RELIEF VALVE 7.5-15 PSI	18062	1
71	REDUCER STR THD ADAPTER	26868	1
72	PLUG -8 ORB	70117	1
73	SIGHT GAUGE	26705	1
74**	COVER, MOTOR PLATE	13687	



ITEM	DESCRIPTION	PART	QTY
100	OVERRUNNING CLUTCH ASSY (SEE PG 10)	81716	1
200	BRAKE CYLINDER ASSEMBLY (SEE PG 11)	83488	1
300	PRIMARY PLANET CARRIER ASSY (SEE PG 12)	81805	1
400	SECONDARY PLANET CARRIER ASSY (SEE PG 13)	83542	1
500	OUTPUT PLANET CARRIER ASSEMBLY (SEE PG 14)	83494	1
700	HYD MTR SUB-ASSY (SEE PGS 16-21)	63241	1

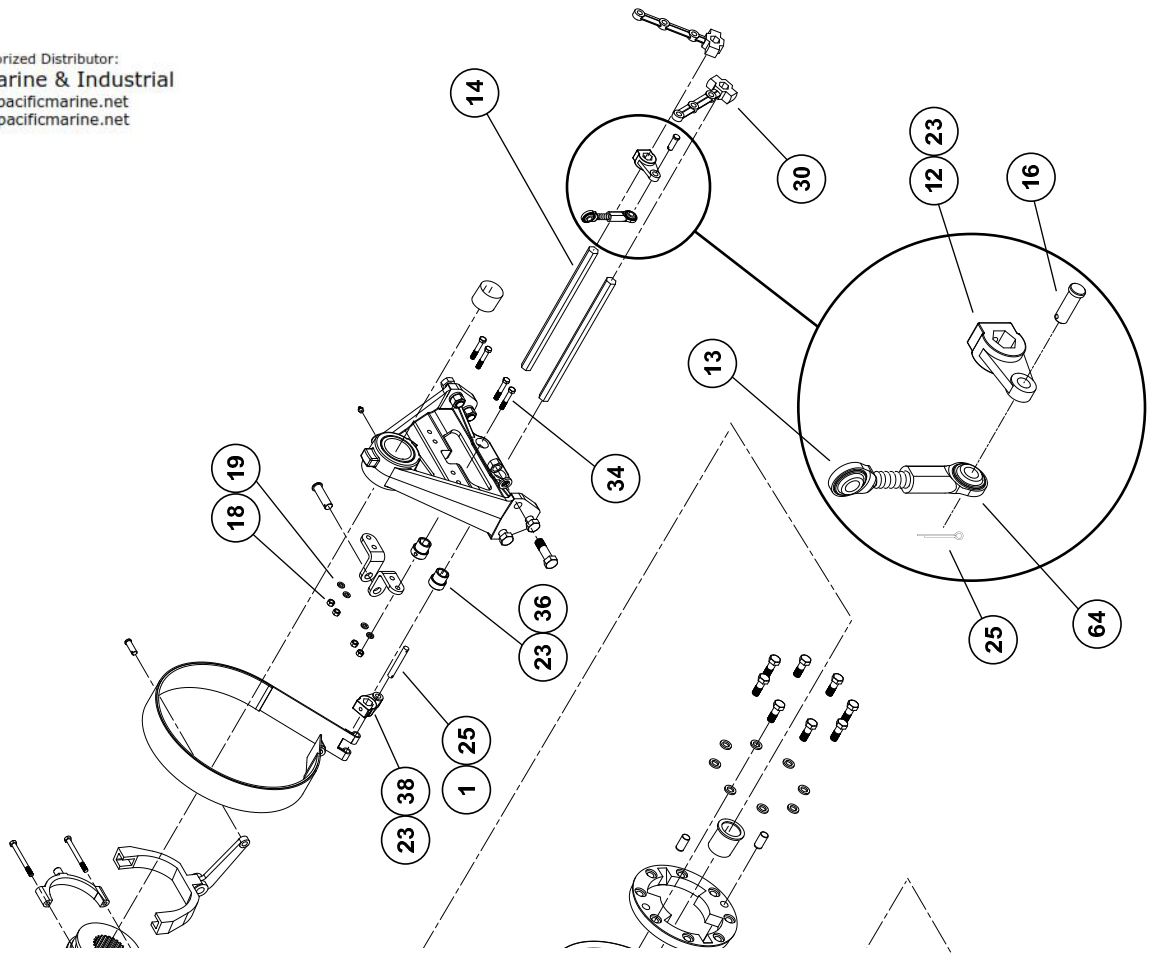
* NOT SHOWN - SUPPLIED SEPARATELY

** NOT SHOWN
(MODEL 50B-LP-104-000-01 ONLY)

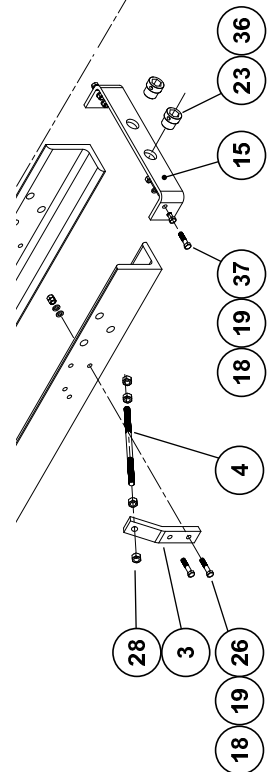
MECHANICAL SHIFT COMPONENTS



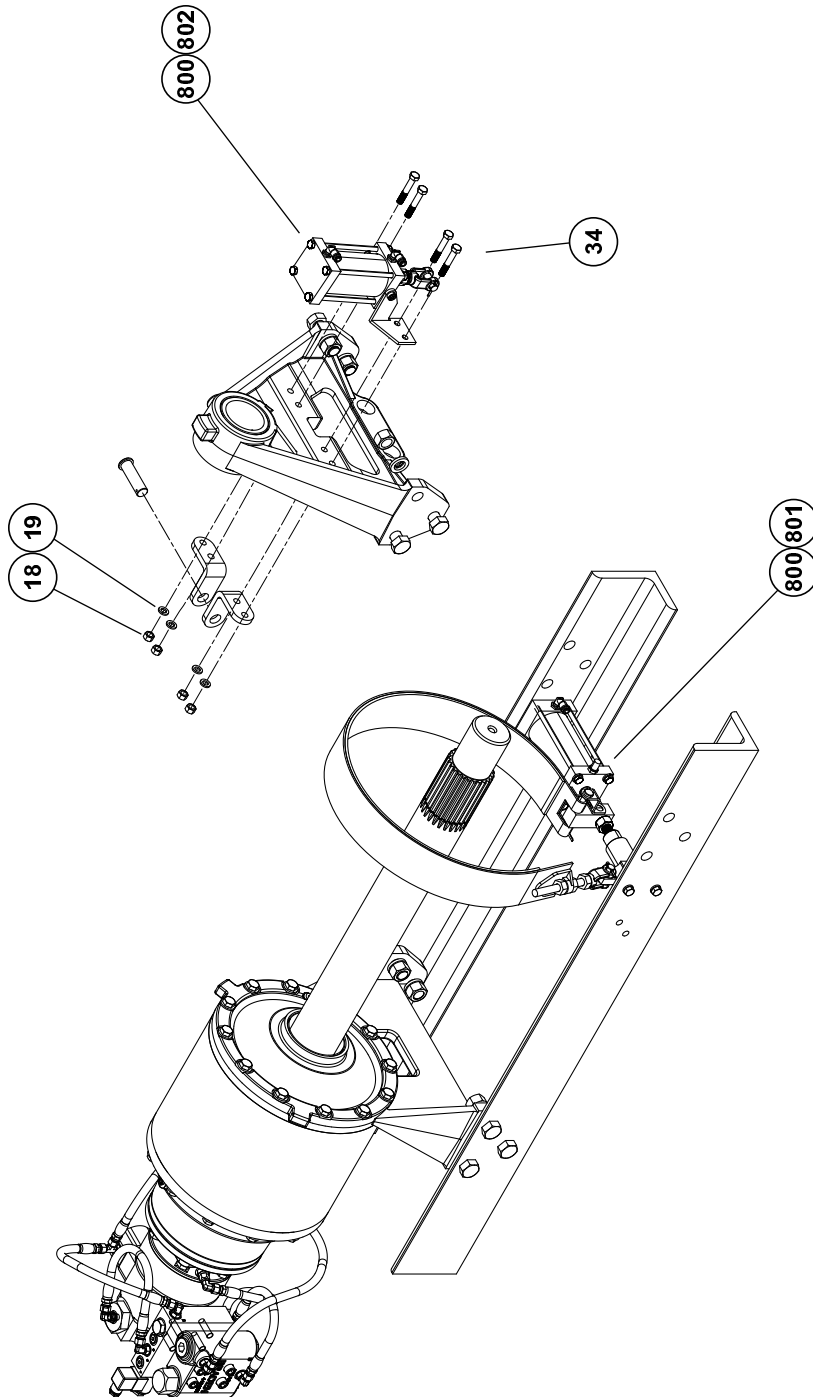
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ITEM	DESCRIPTION	PART	QTY
	PARTS GROUP HP50B-LP	63957	1
1	BRAKE BAND PIN	11569	1
3	BRAKE BAND ADJUSTER PLATE	106739	1
4	BRAKE LINK	11570	1
12	CLUTCH LEVER	11676	1
13	MALE PLAIN BALL ROD END	106913	1
14	CONTROL SHAFT	106666	2
15	SUPPORT BRACKET	11503	1
16	CLEVIS PIN	12751	2
18	NUT 3/8-16	11780	12
19	LOCKWASHER 3/8 Z	27152	12
23	SQ HD SETSCREW/CUP PT	13957	6
25	COTTER PIN	18008	4
26	CAPSCREW 3/8-16 X 1-3/4 GD8 Z HX HD	104311	2
27	NUT - JAM 3/4-10 NC	11791	2
28	NUT 1/2-20	22701	4
30	LEVER ASSY	81208	2
31	COTTER PIN	13959	1
32	CLUTCH RIDER WITH GREASE	11672	1
33	CAPSCREW 3/8-16 X 4-1/4 GD8 Z HX HD	107505	2
34	CAPSCREW 3/8-16 X 2-1/4 GD8 Z HX HD	104134	4
36	COLLAR BEARING	11669	4
37	CAPSCREW 3/8-16 X 1-1/2 GD8 Z HX HD	104313	4
38	BRAKE LEVER	11678	1
64	FEMALE PLAIN BALL ROD END	106914	1



AIR SHIFT COMPONENTS



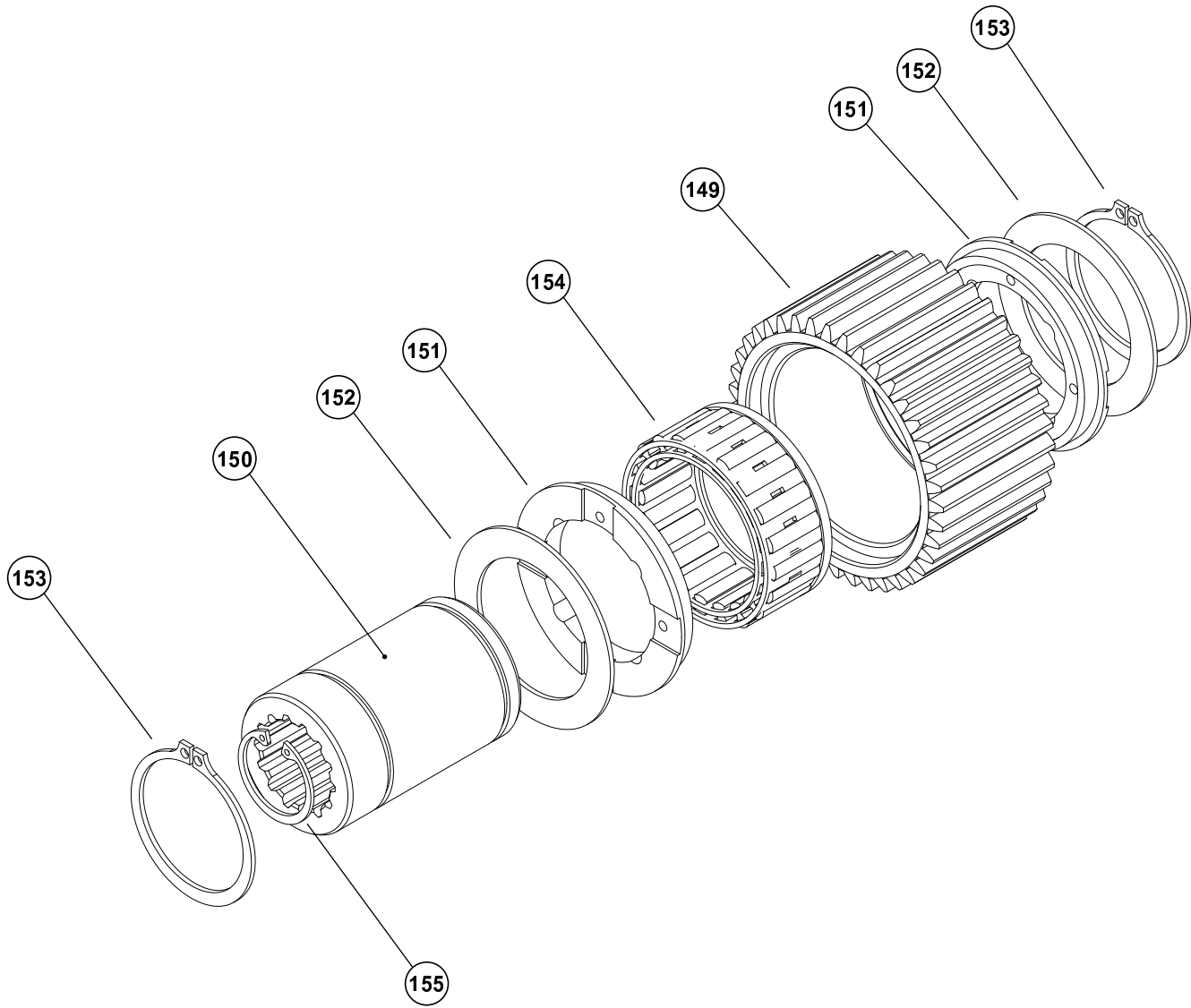
ITEM	DESCRIPTION	PART	QTY
800	APSCO AIR MISC PARTS GROUP (SEE PG 22)	64307	1
801	APSCO AIR CLUTCH CYLINDER	83761	1
802	APSCO AIR BRAKE CYLINDER	83760	1

* NOT SHOWN



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OVERRUNNING CLUTCH ASSY



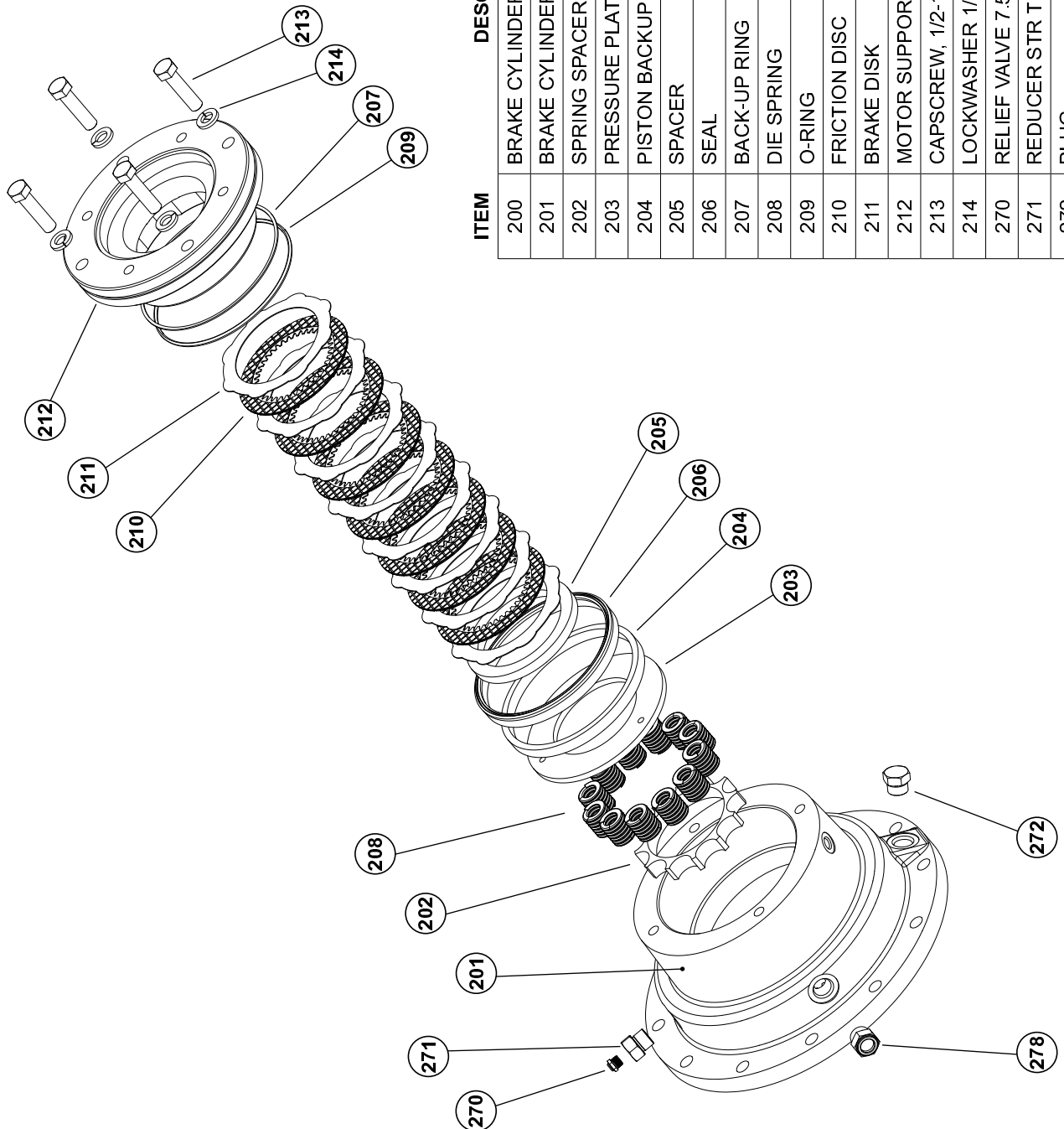
ITEM	DESCRIPTION	PART	QTY
100	SPRAG CLUTCH ASSY	81716	1
149	OUTER BRAKE RACE	NSS	1
150	INNER BRAKE RACE	NSS	1
151	SPRAG BEARING	27684	2
152	THRUST BEARING	24581	2
153	SNAP RING	12034	2
154	SPRAG CLUTCH	NSS	1
155	RETAINING RING	24506	1

NSS = NOT SERVICED SEPARATELY



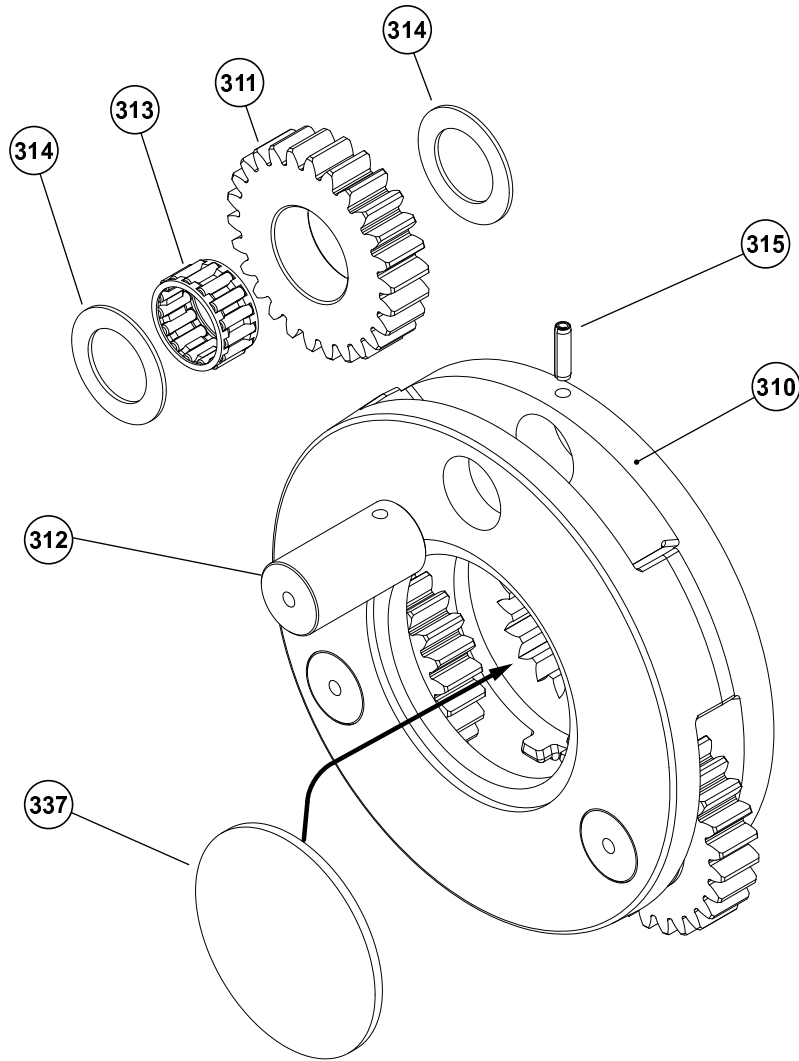
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BRAKE CYLINDER ASSY



ITEM	DESCRIPTION	PART	QTY
200	BRAKE CYLINDER ASSEMBLY	83488	1
201	BRAKE CYLINDER	106662	1
202	SPRING SPACER	100200	1
203	PRESSURE PLATE STAMPING	25635	1
204	PISTON BACKUP RING	25636	1
205	SPACER	25637	1
206	SEAL	25642	1
207	BACK-UP RING	25643	1
208	DIE SPRING	25644	12
209	O-RING	24981	1
210	FRICTION DISC	21036	7
211	BRAKE DISK	100027	8
212	MOTOR SUPPORT	100028	1
213	CAPSCREW, 1/2-13 X 2-INCH GD8	29855	4
214	LOCKWASHER 1/2 Z	11026	4
270	RELIEF VALVE 7.5-15 PSI	18062	1
271	REDUCER STR THD ADAPTER	26868	1
272	PLUG	70117	1
278	SIGHT GAUGE	26705	1

PRIMARY PLANET CARRIER

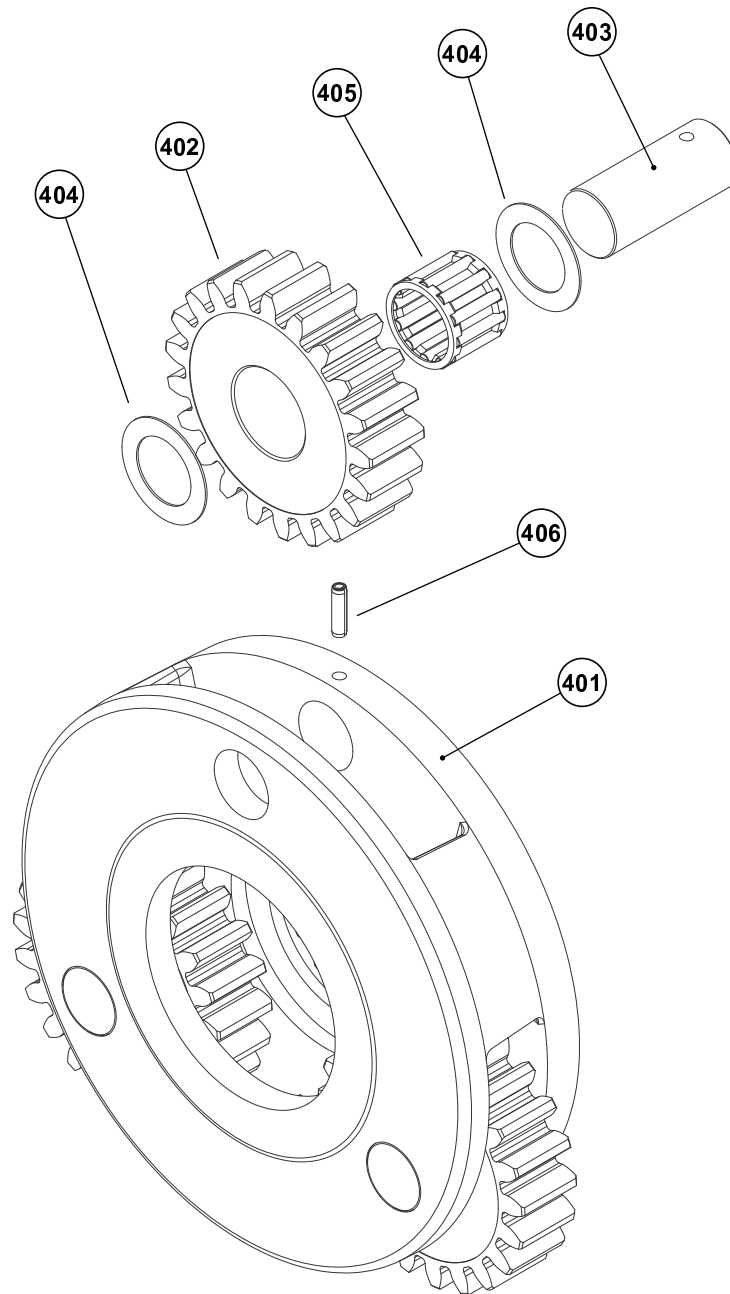


ITEM	DESCRIPTION	PART	QTY
300	PRIMARY PLANET CARRIER ASSY	81805	1
310	PRIMARY PLANET CARRIER	25715	1
311	PLANET GEAR	26280	3
312	PRIMARY PLANET GEAR SHAFT	25614	3
313	ROLLER BEARING	24175	3
314	THRUST BEARING	25361	6
315	SPIROL PIN	24113	3
337	PRIMARY SPACER	25729	1



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SECONDARY PLANET CARRIER

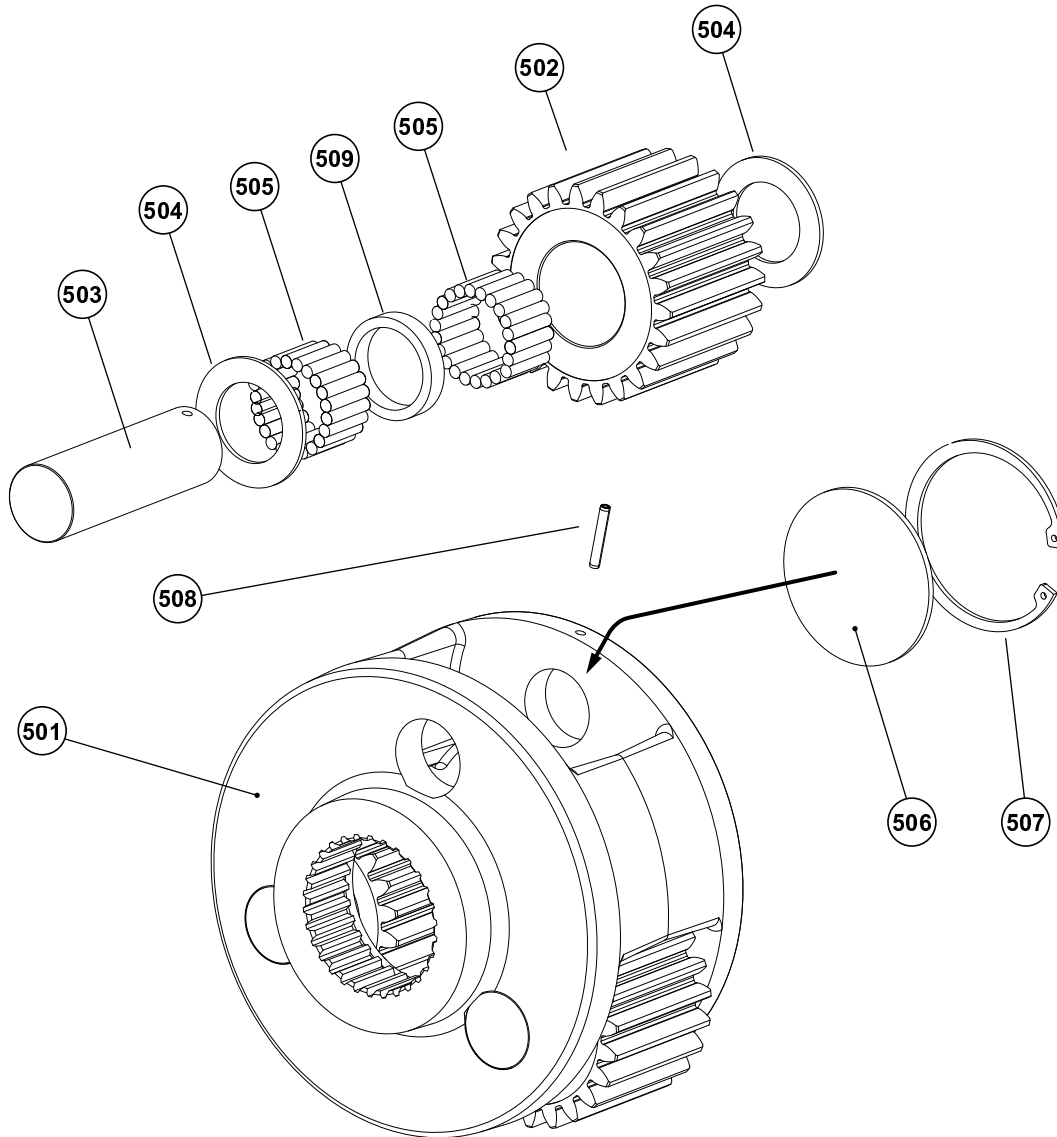


ITEM	DESCRIPTION	PART	QTY
400	SECONDARY PLANET CARRIER ASSY	83542	1
401	PLANET CARRIER	106959	1
402	PLANET GEAR	103398	3
403	PRIMARY PLANET GEAR SHAFT	26295	3
404	THRUST BEARING	24167	6
405	ROLLER BEARING	24579	3
406	SPIROL PIN	24113	3



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OUTPUT PLANET CARRIER

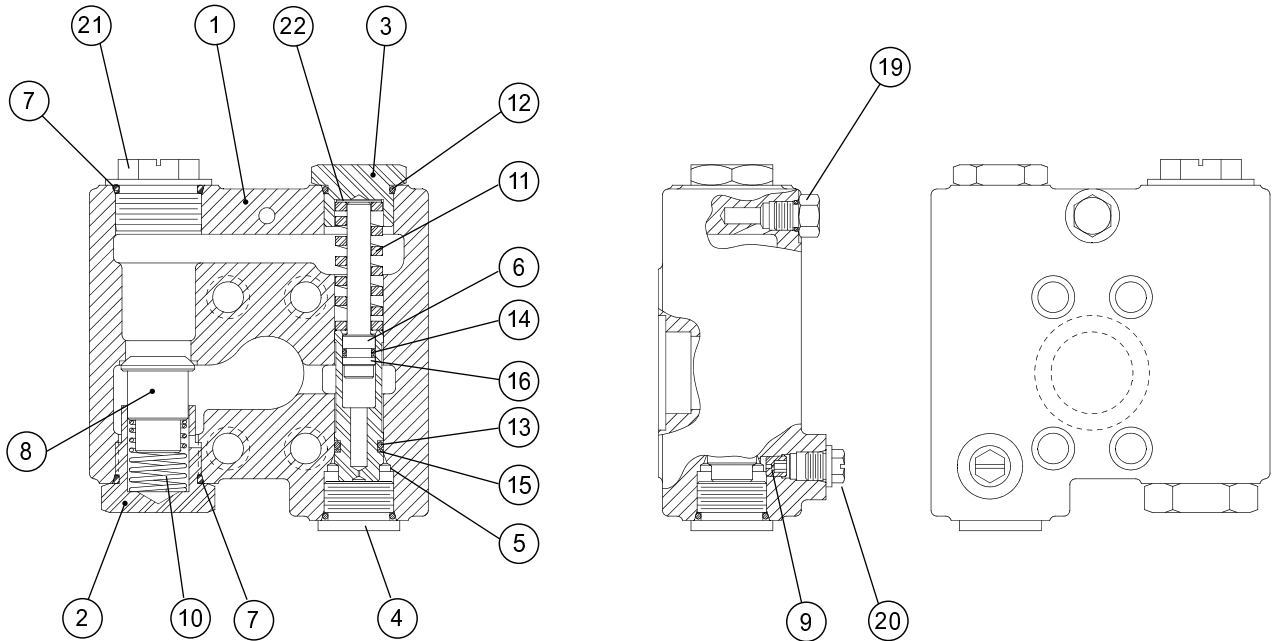


ITEM	DESCRIPTION	PART	QTY
500	PLANET CARRIER ASSEMBLY	83494	1
501	PLANET CARRIER	106679	1
502	PLANET GEAR	105633	3
503	OUTPUT PLANET SHAFT	105632	3
504	THRUST WASHER	103681	6
505	ROLLER	103683	132
506	OUTPUT THRUST PLATE	101971	1
507	INTERNAL RETAINING RING	101972	1
508	SPIROL PIN	24582	3
509	BEARING SPACER	105635	3



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BRAKE VALVE ASSY



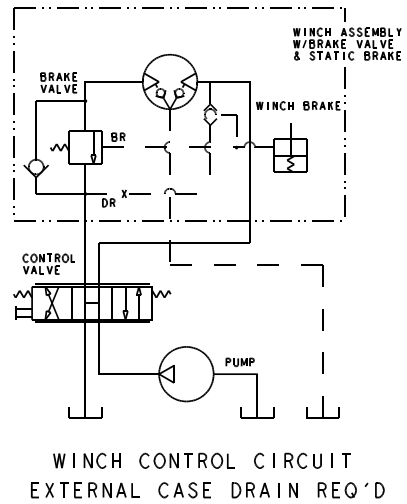
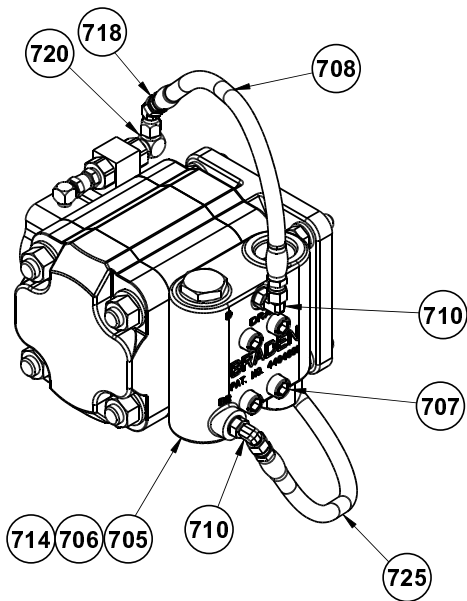
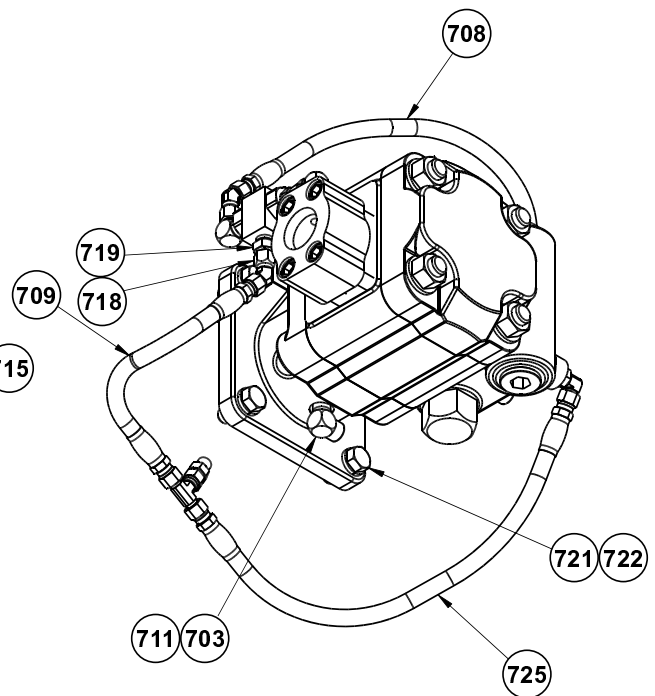
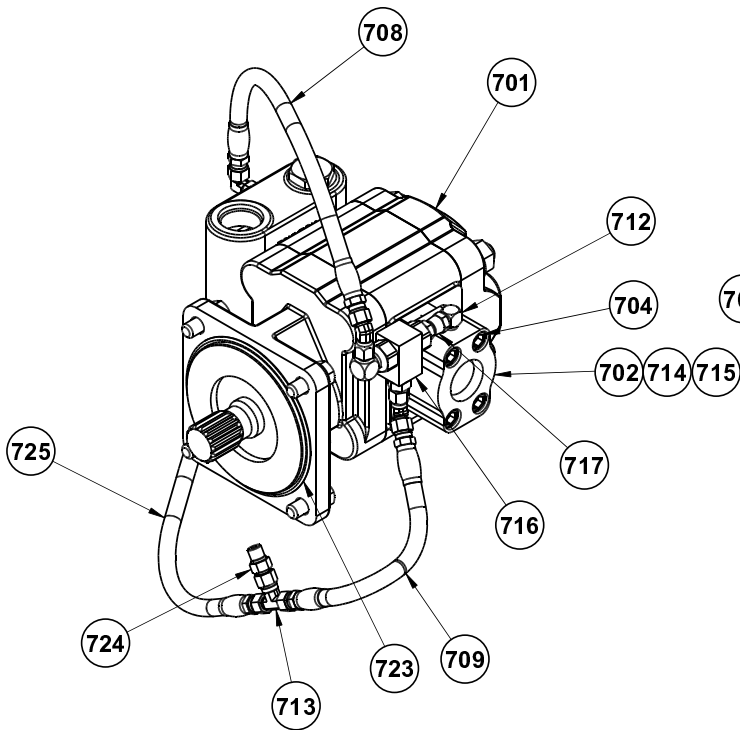
ITEM	DESCRIPTION	PART NO	QTY
	BRAKE VALVE ASSEMBLY	81984	1
1	BRAKE VALVE HOUSING	NSS	1
2	CHECK VALVE SPRING RETAINER	24424	1
3	SPRING RETAINER	24183	1
4	PLUG	22450	1
5	SPOOL	NSS	1
6	DAMPER PISTON	NSS	1
7	O-RING	24186	2
8	CHECK VALVE POPPET	24423	1
9	PILOT ORIFICE	24200	1
10	CHECK VALVE SPRING	24190	1
11	SPOOL SPRING	24192	1
12	O-RING*	23601	1
13	O-RING*	24193	1
14	O-RING*	24194	1
15	BACK-UP RING*	24195	1
16	BACK-UP RING*	24196	1
19	HEX HEAD PLUG -4 ORB	25663	1
20	SHIPPING PLUG HYD -4 ORB	25403	1
21	SHIPPING PLUG	25487	1
22	SHIM, VALVE SPRING	25661	0-2
	* SEAL KIT	61567	1

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SINGLE-SPEED GEAR MOTOR



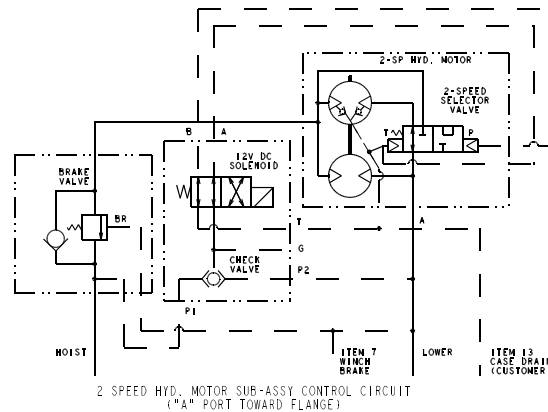
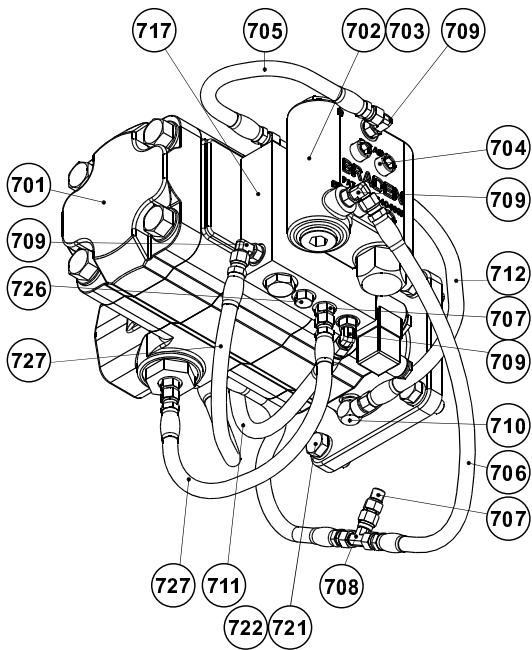
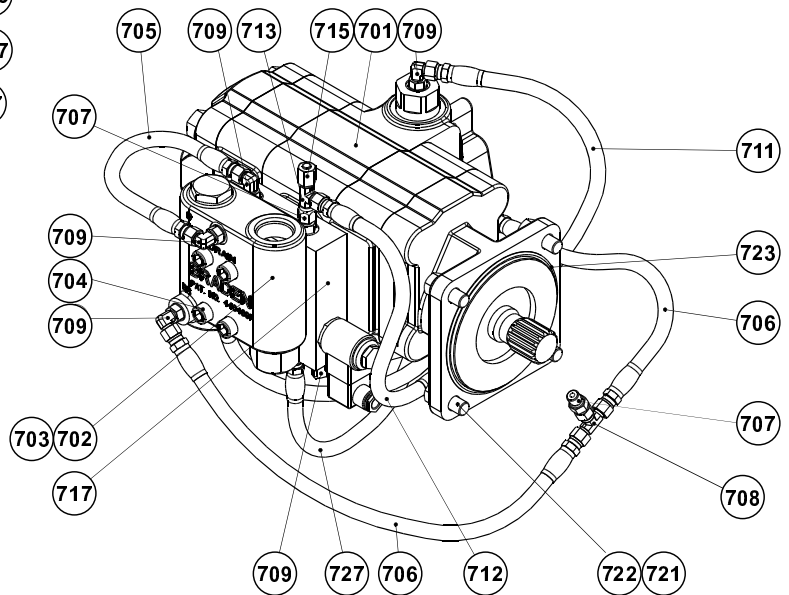
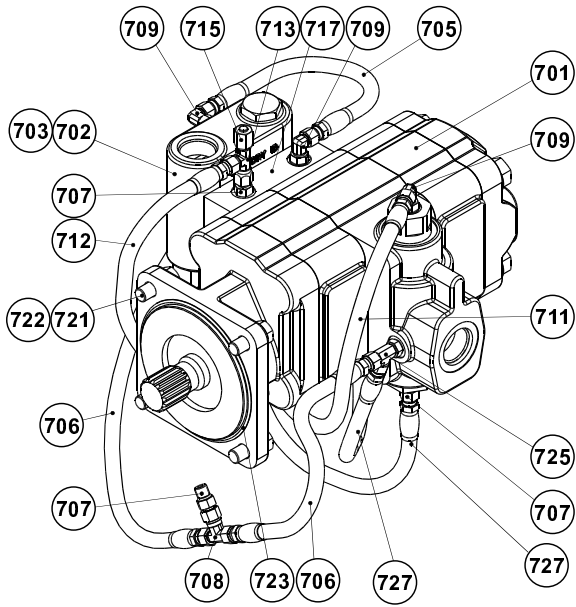
SINGLE-SPEED GEAR MOTOR

ITEM	DESCRIPTION	PART	QTY
700	HYD MTR SUB-ASSY	63241	1
701	HYD MOTOR, GEAR	25777	1
	MOTOR SEAL KIT	64070	1
702	MANIFOLD	24779	1
703	SHIPPING PLUG (NOT SHOWN)	100426	1
704	CAPSCREW 7/16-14 X 2 G8 Z	21144	4
705	BRAKE VALVE ASSY - 1.25-61	81984	1
706	O-RING	13838	1
707	CAPSCREW	21134	4
708	HOSE ASSY -4 X 14-IN. (355 MM)	25935	1
709	HOSE ASSY -4 X 17-IN. (431.8 MM)	25750	1
710	ELBOW FITTING	25302	2
711	REDUCER ELBOW	24236	1
712	ELBOW TBG FTG	21163	1
713	SWIVEL TEE	25748	1
714	SHIPPING PLUG (NOT SHOWN)	25487	2
715	O-RING	21150	1
716	SHUTTLE VALVE	72331	1
717	SWIVEL CONNECTOR	102752	1
718	MALE UNION 45	70122	2
719	MALE CONNECTOR	70104	1
720	ELBOW, 90 DEGREE MA	31341	1
721	LOCKWASHER 1/2 Z	11026	4
722	CAPSCREW 1/2-13 X 1-1/4 GD8-Z HX HD	104174	4
723	O-RING	10330	1
724	ADAPTER	25864	1
725	HOSE ASSY -4 X 16-IN. JIC (406 MM)	76499	1

TWO-SPEED GEAR MOTOR



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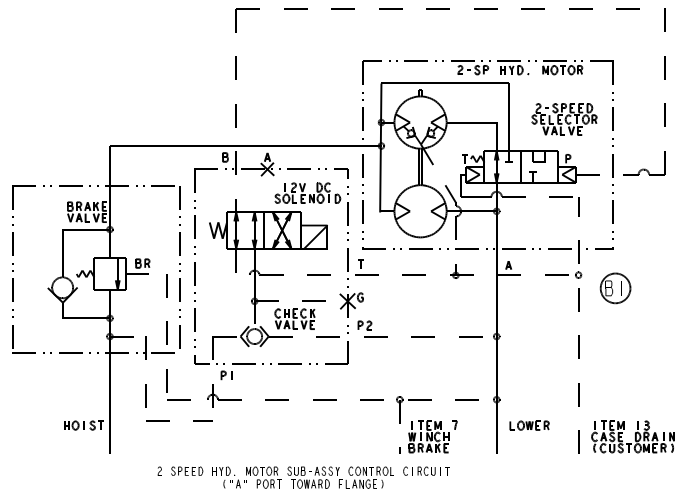
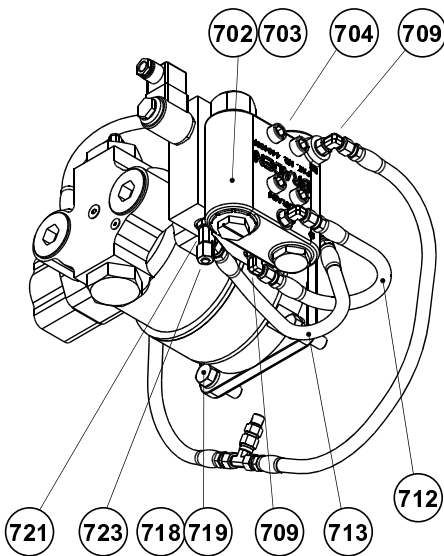
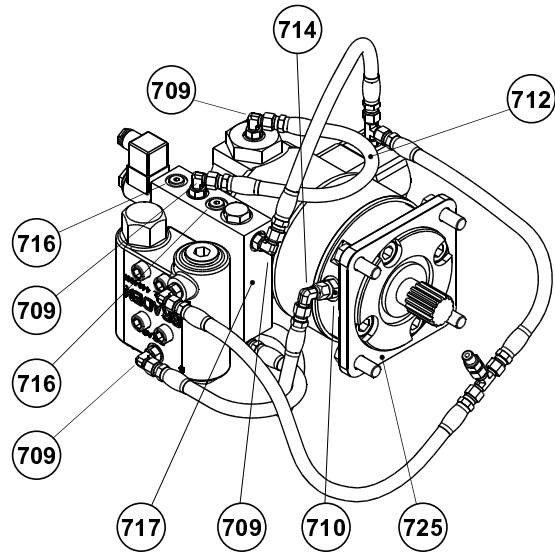
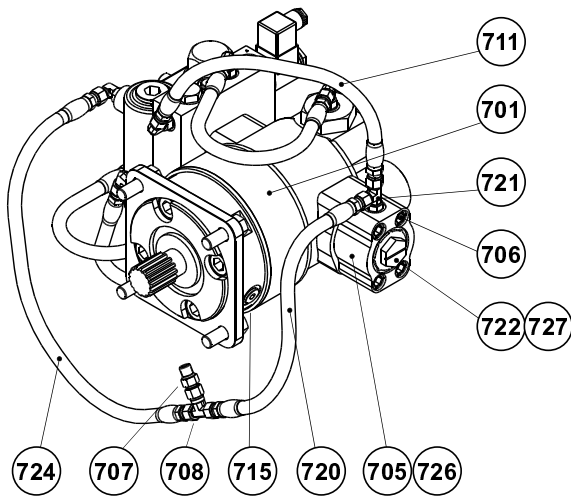
TWO-SPEED GEAR MOTOR

ITEM	DESCRIPTION	PART	QTY
700	HYD MOTOR SUB-ASSY	63267	1
701	HYD MOTOR 2 SPEED	103358	1
702	BRAKE VALVE ASSY - 1.25-61	81984	1
703	O-RING	13838	1
704	CAPSCREW 7/16-14 x 4-1/2 A574 SKT HD	102476	4
706	HOSE ASSY -4 X 17-IN. (431.8 MM)	25750	2
707	ADAPTER	25864	4
708	SWIVEL TEE	25748	1
709	ELBOW FITTING	25302	6
710	REDUCER ELBOW	24236	1
711	HOSE ASSY -4 X 20-IN. (508 MM)	25952	1
712	HOSE ASSY -2 NPT MALE TO -4 JIC FEMALE X 14-IN. (355 MM)	13705	1
713	SWIVEL TEE	26002	1
714	WARNING TAG	29080	1
715	CAP NUT	70182	1
705	HOSE ASSY -4 X 10-IN. (254 MM)	25936	1
717	MANIFOLD (SEE PG 23)	102922	1
721	LOCKWASHER 1/2 Z	11026	4
722	CAPSCREW 1/2-13 X 1-1/4 GD8-Z HX HD	104174	4
723	O-RING	10330	1
725	TEE, RUN -4JIC/-4JIC/-40RB	107314	1
726	HEX HEAD PLUG -4 SAE	25663	1
727	HOSE ASSY -4 X 14-IN. (355 MM)	25935	2



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TWO-SPEED VANE MOTOR



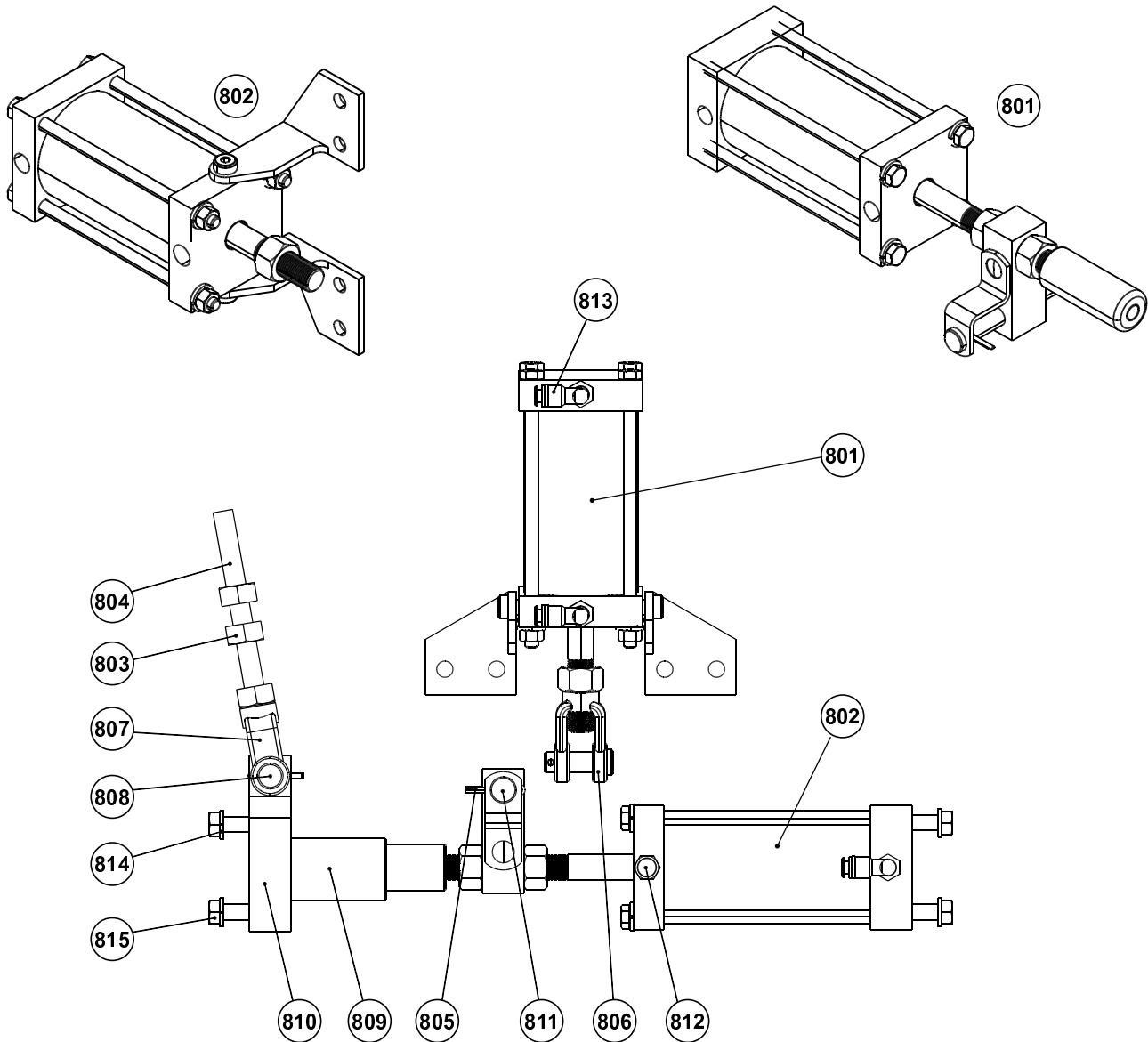
TWO-SPEED VANE MOTOR

ITEM	DESCRIPTION	PART	QTY
700	HYD MOTOR SUB-ASSY	64272	1
701	MOTOR, HYDRAULIC	107962	1
	MOTOR SEAL KIT	64333	1
702	BRAKE VALVE ASSY - 1.25-61	81984	1
703	O-RING	13838	1
704	CAPSCREW 7/16-14 X 4-1/4 A574 Z SKT HD	108559	4
705	MANIFOLD	27434	1
706	CAPSCREW 7/16-14 X 2 G8 Z	21144	4
707	ADAPTER	25864	1
708	SWIVEL TEE	25748	1
709	ELBOW FITTING	25302	6
710	ADAPTER	31284	1
711	HOSE ASSY -4 X 16-IN. JIC (406 MM)	76499	1
712	HOSE ASSY -4 X 14-IN. (355 MM)	25935	2
713	HOSE ASSY -4 X 10-IN. (254 MM)	25936	1
714	SWIVEL NUT 90 DEG. ELBOW	26140	1
715	PLUG	25665	1
716	PLUG	69325	2
717	MANIFOLD (SEE PG 23)	102922	1
718	LOCKWASHER 1/2 Z	11026	4
719	CAPSCREW 1/2-13 X 1-1/4 GD8-Z HX HD	104174	4
720	HOSE ASSY -4 X 16-IN. JIC (406 MM)	76499	1
721	TEE, RUN -4JIC/-4JIC/-40RB	107314	2
722	SHIPPING PLUG	25487	1
723	CAP NUT -4	70182	1
724	HOSE ASSY -4 X 17-IN. (431.8 MM)	25750	1
725	GASKET-MTR PLATE COVER	13684	1
726	O-RING	21150	1
727	O-RING	24186	1



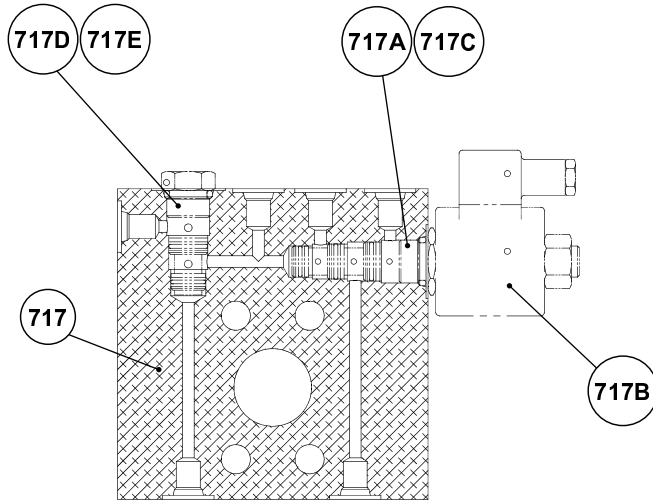
Authorized Distributor:
Pacific Marine & Industrial
www.pacificmarine.net
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AIR SHIFT KIT



ITEM	DESCRIPTION	PART	QTY
801	APSCO AIR CLUTCH CYLINDER	83761	1
802	APSCO AIR BRAKE CYLINDER	83760	1
803	NUT, 1/2-20 HEX FULL		3
804	ALLTHREAD, 1/2-20 X 5-1/4 LG		1
805	COTTER PIN, 1/8 DIA X 1 LG		3
806	CLEVIS, 5/8-18 W/ 1/2 DIA PIN		1
807	CLEVIS, 1/-20 W/ 1/2 DIA PIN		1
808	CLEVIS PIN, 1/2 X 1-1/2 LG		2
809	TUBE, GUIDE		1
810	BLOCK, GUIDE MTG		1
811	PIN, RETAINING 1/2 X 3-1/2 LG		1
812	MUFFLER, SINTERED BRONZE 1/4 NPT		1
813	FITTING, ELBOW QC 1/4 TUBE X 1/4 NPT		3
814	LOCKWASHER, SPLIT 3/8		4
815	CAPSCREW 3/8-16 X 1-1/4 LG HEX HD PL		4

MANIFOLD, 2-SPEED SHIFT

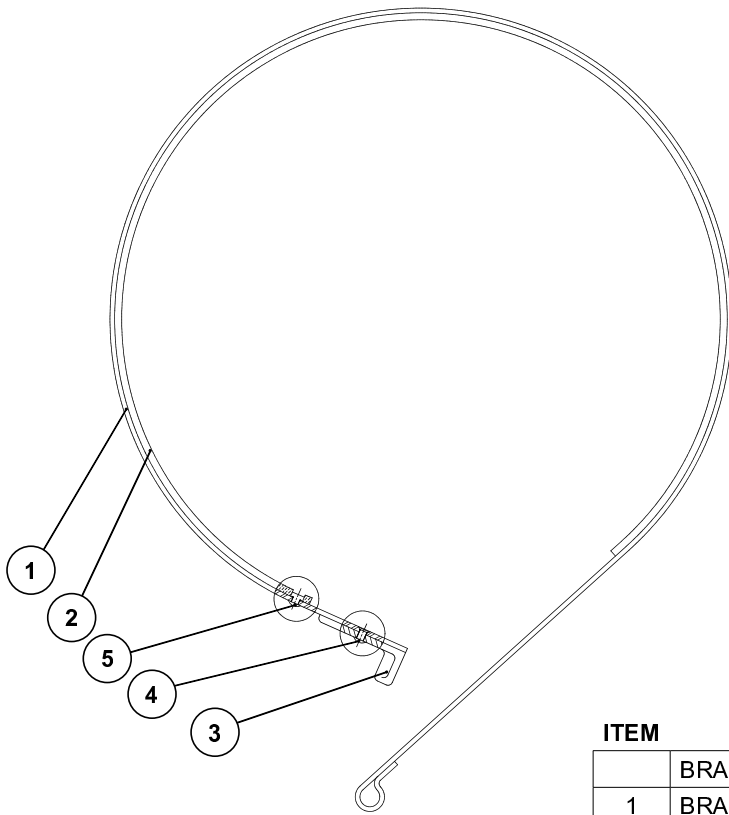


ITEM	DESCRIPTION	PART NO	QTY
717	MANIFOLD, 2-SPD, SHIFT (INCLUDES 717A-717F)	102922	1
717A	SOLENOID VALVE	102853	1
717B	SEAL KIT, SOLENOID VALVE	104004	1
717C	COIL, SOLENOID VALVE	104007	1
717D	SHUTTLE VALVE	104006	1
717E	SEAL KIT, SHUTTLE VA	104005	1
717F	CONNECTOR DIN	103171	1

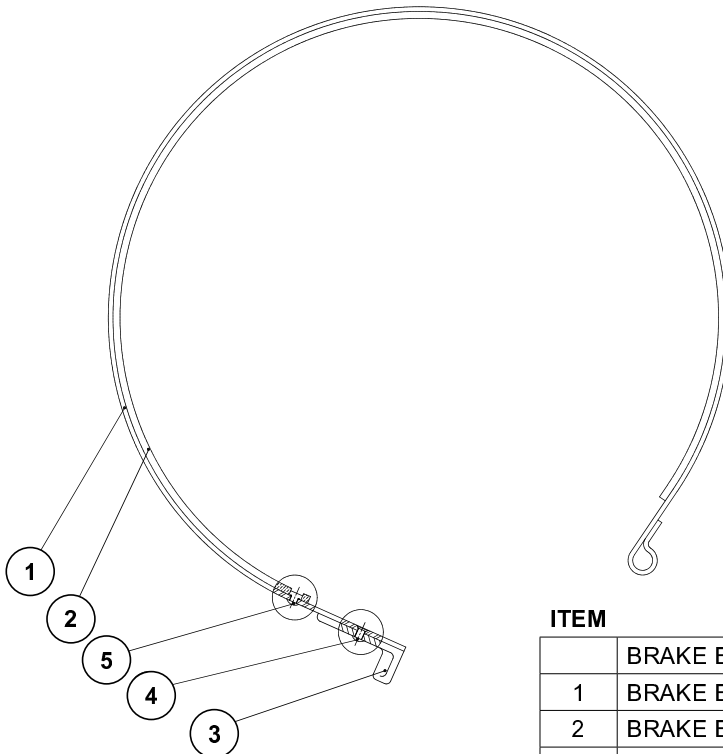


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BRAKE BAND ASSY



ITEM	DESCRIPTION	PART	QTY
	BRAKE BAND ASSY (MECH SHIFT)	83491	1
1	BRAKE BAND	106677	1
2	BRAKE LINING	24207	1
3	BRAKE BAND LUG	12976	1
4	RIVET	12977	5
5	RIVET	13026	12



ITEM	DESCRIPTION	PART	QTY
	BRAKE BAND ASSY (AIR SHIFT)	83747	1
1	BRAKE BAND	107978	1
2	BRAKE BAND LINING	107981	1
3	BRAKE BAND LUG	12976	1
4	RIVET	12977	1
5	RIVET	13026	12

METRIC CONVERSION TABLE

English to Metric			Metric to English		
LINEAR					
inches (in.)	X 25.4	= millimeters (mm)	millimeters (mm)	X 0.3937	= inches (in.)
feet (ft.)	X 0.3048	= meters (m)	meters (m)	X 3.281	= feet (ft.)
miles (mi.)	X 1.6093	= kilometers (km)	kilometers (km)	X 0.6214	= miles (mi.)
AREA					
inches ² (sq.in.)	X 645.15	= millimeters ² (mm ²)	millimeters ² (mm ²)	X 0.000155	= inches ² (sq.in.)
feet ² (sq.ft.)	X 0.0929	= meters ² (m ²)	meters ² (m ²)	X 10.764	= feet ² (sq.ft.)
VOLUME					
inches ³ (cu.in.)	X 0.01639	= liters (l)	liters (l)	X 61.024	= inches ³ (cu.in.)
quarts (qts.)	X 0.94635	= liters (l)	liters (l)	X 1.0567	= quarts (qts.)
gallons (gal.)	X 3.7854	= liters (l)	liters (l)	X 0.2642	= gallon (gal.)
inches ³ (cu.in.)	X 16.39	= centimeters ³ (cc)	centimeters ³ (cc)	X 0.06102	= inches ³ (cu.in.)
feet ³ (cu.ft.)	X 28.317	= liters (l)	liters (l)	X 0.03531	= feet ³ (cu.ft.)
feet ³ (cu.ft.)	X 0.02832	= meters ³ (m ³)	meters ³ (m ³)	X 35.315	= feet ³ (cu.ft.)
fluid ounce (fl.oz.)	X 29.57	= milliliters (ml)	milliliters (ml)	X 0.03381	= fluid ounce (fl.oz.)
MASS					
ounces (oz.)	X 28.35	= grams (g)	grams (g)	X 0.03527	= ounces (oz.)
pounds (lbs.)	X 0.4536	= kilograms (kg)	kilograms (kg)	X 2.2046	= pounds (lbs.)
tons (2000 lbs.)	X 907.18	= kilograms (kg)	kilograms (kg)	X 0.001102	= tons (2000 lbs.)
tons (2000 lbs.)	X 0.90718	= metric tons (t)	metric tons (t)	X 1.1023	= tons (2000 lbs.)
tons (long) (2240 lbs.)	X 1013.05	= kilograms (kg)	kilograms (kg)	X 0.000984	= tons (long) (2240 lbs.)
PRESSURE					
inches Hg (60 °F)	X 3600	= kilopascals (kPa)	kilopascals (kPa)	X 0.2961	= inches Hg (60 °F)
pounds/sq.in. (PSI)	X 6.895	= kilopascals (kPa)	kilopascals (kPa)	X 0.145	= pounds/sq.in. (PSI)
pounds/sq.in. (PSI)	X 0.0703	= kilograms/sq.cm. (kg/cm ²)	kilograms/sq.cm. (kg/cm ²)	X 14.22	= pounds/sq.in. (PSI)
pounds/sq.in. (PSI)	X 0.069	= bars	bars	X 14.5	= pounds/sq.in. (PSI)
inches H ₂ O (60 °F)	X 0.2488	= kilopascals (kPa)	kilopascals (kPa)	X 4.0193	= inches H ₂ O (60 °F)
bars	X 100	= kilopascals (kPa)	kilopascals (kPa)	X 0.01	= bars
POWER					
horsepower (hp)	X 0.746	= kilowatts (kW)	kilowatts (kW)	X 1.34	= horsepower (hp)
ft.-lbs./min.	X 0.0226	= watts (W)	watts (W)	X 44.25	= ft.-lbs./min.
TORQUE					
pound-inches (in.-lbs.)	X 0.11298	= newton-meters (N-m)	newton-meters (N-m)	X 8.851	= pound-inches (in.-lbs.)
pound-feet (ft.-lbs.)	X 1.3558	= newton-meters (N-m)	newton-meters (N-m)	X 0.7376	= pound-feet (ft.-lbs.)
pound-feet (ft.-lbs.)	X .1383	= kilograms/meter (kg-m)	kilogram/meter (kg-m)	X 7.233	= pound-feet (ft.-lbs.)
VELOCITY					
miles/hour (m/h)	X 0.11298	= kilometers/hour (km/hr)	kilometers/hour (km/hr)	X 0.6214	= miles/hour (m/h)
feet/second (ft./sec.)	X 0.3048	= meter/second (m/s)	meters/second (m/s)	X 3.281	= feet/second (ft./sec.)
feet/minute (ft./min.)	X 0.3048	= meter/minute (m/min)	meters/minute (m/min)	X 3.281	= feet/minute (ft./min.)
TEMPERATURE					
°Celsius = 0.556 (°F - 32)			°Fahrenheit = (1.8 X °C) + 32		
COMMON METRIC PREFIXES					
mega	(M)	= 1,000,000 or 10 ⁶	deci	(d)	= 0.1 or 10 ⁻¹
kilo	(k)	= 1,000 or 10 ³	centi	(c)	= 0.01 or 10 ⁻²
hecto	(h)	= 100 or 10 ²	milli	(m)	= 0.001 or 10 ⁻³
deka	(da)	= 10 or 10 ¹	micro	(µ)	= 0.000.001 or 10 ⁻⁶