

INSTALLATION AND PARTS MANUAL

FOR WINCH MODEL 527

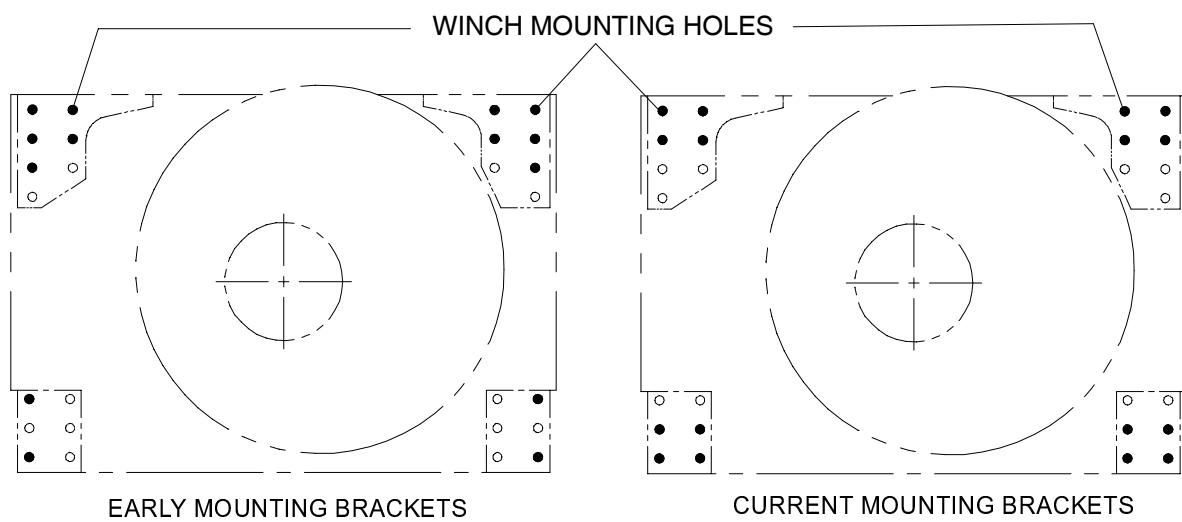
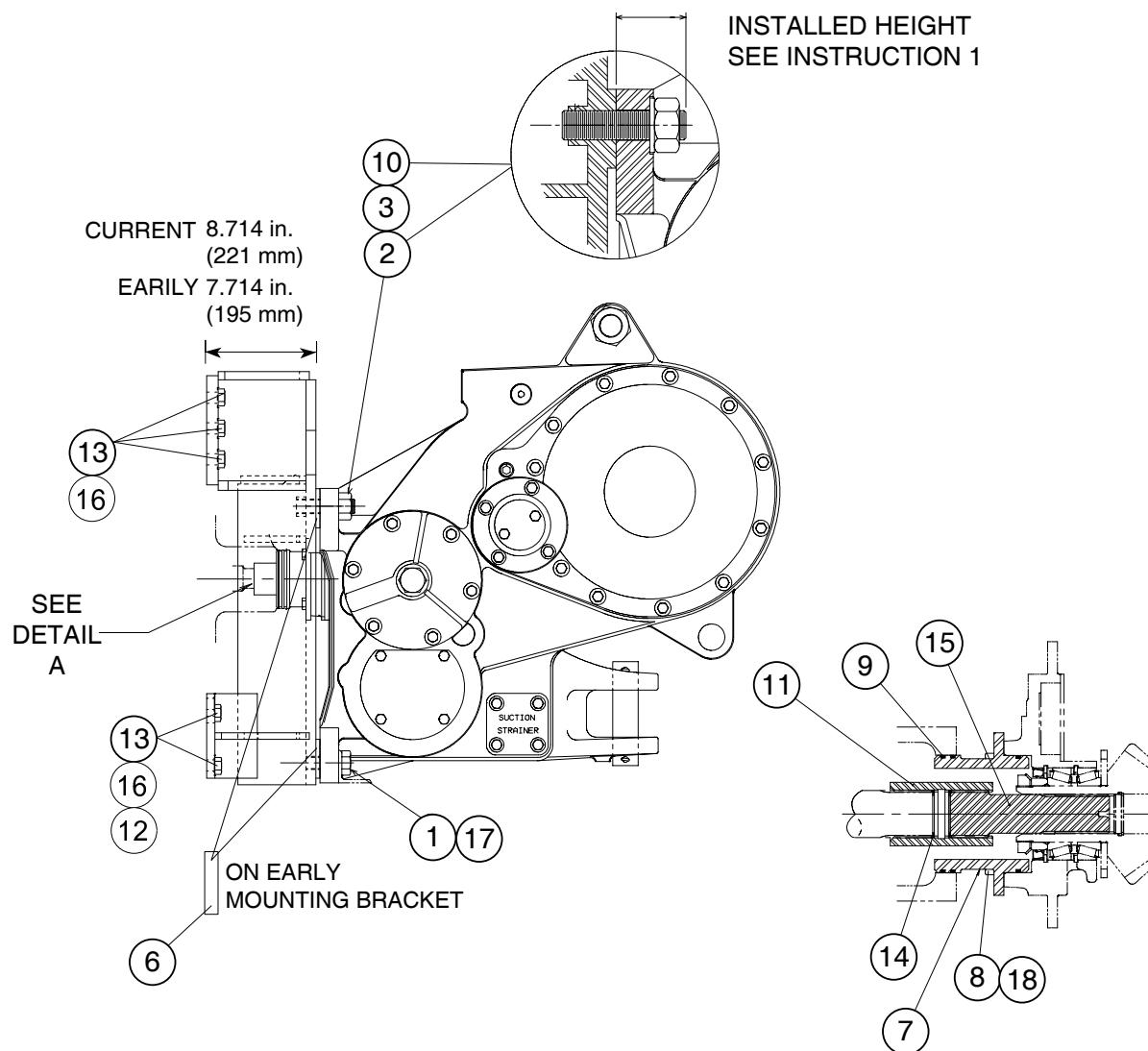
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MODEL NUMBER DESCRIPTION

	C	0	0	0	1	0
527	Bevel Gear Ratio B-1.27:1 C-1.64:1 D-2.11:1 E-2.79:1	0-Overwind 1-Underwind	0-Standard Brake	0-Without Freespool 1-With Freespool	1-Three Shaft Winch	0-No Fairlead 3 - Three Roller 4 - Four Roller

MODEL 527
MOUNTING GROUP



VIEW OF TRACTOR REAR FACE

INSTRUCTIONS

1. Apply Loctite 271 to threads of studs, item 3 and install into winch adapter brackets, items 4 and 5, to the height of 3.68 in. (94 mm).
2. PTO rotation is counterclockwise (CCW) as viewed from rear of tractor.
Remove and discard tractor PTO cover.
3. Remove paint, rust, dirt and grease from mounting surfaces of tractor, winch and winch adapters.
4. Coat splines of PTO shaft, item 15, with multi-purpose grease and install into bevel pinion gear of winch.
5. Install retaining rings, item 14, in coupling, item 11. Place coupling over PTO shaft with beveled end away from winch.
6. Install o-rings, item 9, onto PTO pilot, item 7.
NOTE: As the same PTO pilot may be used on several adaptions, usually only one o-ring groove will engage and seal in the tractor PTO opening.
7. Remove winch top cover to gain access to the bevel gears.

! WARNING !

Winch and adapters weigh approximately 2,500 lb (1,135 kg). Make certain that lifting equipment has adequate capacity. Failure to use adequate lifting equipment may result in property damage, personal injury or death.

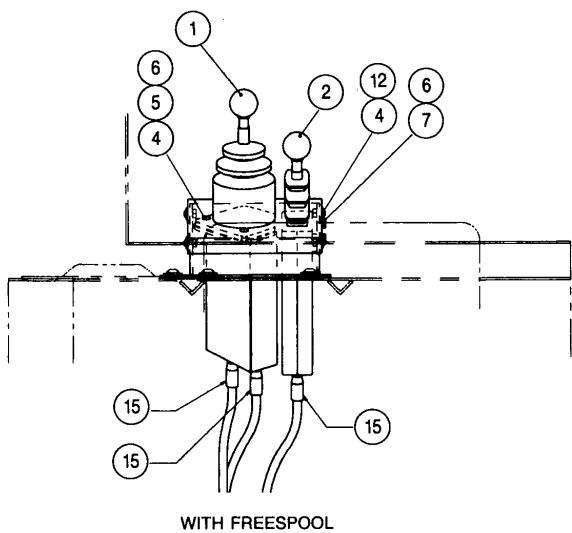
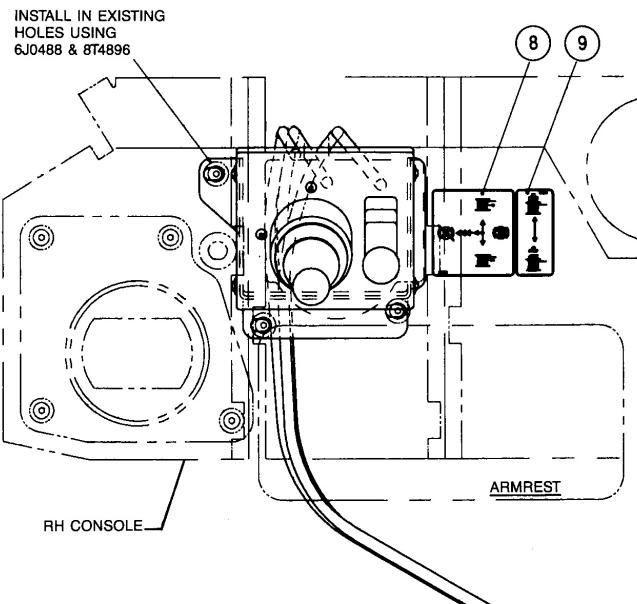
△ CAUTION △

Fill winch to proper level with recommended oil BEFORE starting tractor. Winch bearing and gear damage may result if tractor is run without oil in winch.

NOTE: New adapters are 1 in. (25 mm) thicker and spacers, item 6, no longer required when new spacers are used.

ITEM	PART NO.	DESCRIPTION	CURRENT	EARLY
			ADAPTERS	ADAPTERS
1	7X-0408	CAPSCREW, HEX HD, 1 - 8 X 3½ Gd 8	-	4
	7X-0406	CAPSCREW, HEX HD, 1 - 8 X 3 Gd 8 Z	4	-
2	4J-5977	NUT, HEX 1-1/8 - 7	4	4
3	133-9225	STUD, 1-1/8 - 7 X 5¾ Gd 8	-	4
	133-9224	STUD, 1-1/8 - 7 X 4¾ Gd 8	4	-
4	123-4428	ADAPTER - RH EARLY	-	1
	280-7204	ADAPTER - RH CURRENT	1	-
5	123-4429	ADAPTER - LH EARLY	-	1
	280-7205	ADAPTER - LH CURRENT	1	-
6	118-6553	SPACER	-	4
7	118-6537	PTO PILOT	1	1
8	5P-2228	CAPSCREW, HEX HD ½ - 13 X 1 Gd 8 Z	4	4
9	8S-5654	O-RING	3	3
10	119-1551	WASHER, 1-1/8 HARDENED	4	4
11	118-6539	COUPLING	1	1
12	8T-9398	CAPSCREW, HEX HD, ¾ - 10 X 1¾ Gd 8 Z	-	4
13	7X-0366	CAPSCREW, HEX HD ¾ - 10 X 2 Gd 8 Z	16	10
14	120-7671	RETAINING RING	2	2
15	118-6559	PTO SHAFT	1	1
16	8T-4994	WASHER, ¾ HARDENED	16	14
17	8T-5361	WASHER, 1" HARDENED	4	-
18	8T-4223	WASHER, ½ HARDENED	4	-

MODEL 527
CONTROL GROUP



ITEM	PART NO.	DESCRIPTION	QTY.
1	123-4432	CONTROL, DUAL AXIS	1
2	225-8020	CONTROL, FREESPOOL, SINGLE AXIS	1
3	126-2830	CONTROL BRACKET BASE	1
4	123-4435	CAPSCREW, BUTTON SOCKET HEAD	7
5	6V-8185	NUT (1/4 - 20)	5
6	3B-4504	LOCKWASHER (1/4)	5
7	8T-9368	CAPSCREW (1/4 - 20 X 2 1/4)	2
8	123-4439	DECAL, POWERSHIFT CONTROL	1
9	123-4440	DECAL, FREESPOOL CONTROL	1
10	126-2831	GASKET	1
11	126-2827	CONTROL BRACKET COVER	1
12	8T-4205	WASHER (1/4)	4
15	123-4424	CONTROL CABLE - 90 in. (2286 mm)	3

CONTROL INSTALLATION INSTRUCTIONS

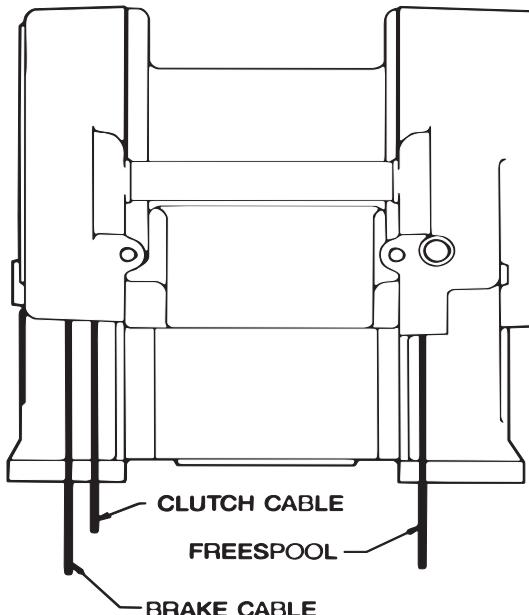
i **NOTE:** These instructions are provided as a general guide. Tractor options, application requirements or local regulations may require deviation from these recommendations.

1. Modify the right hand console cover by removing the shaded area as shown.
2. Install the gasket, item 10, to the bottom of the control bracket, item 3.
3. Install the control bracket onto the right hand console using existing button head capscrews.
4. Carefully route control cables from winch to underside of right hand console.

△ CAUTION △

Avoid routing cables near moving shafts or linkage, which may cause damage to the cables or restrict free movement of tractor components.

5. Route the control cables up through the opening of the control bracket and install cables into controllers as follows:



Top View of Winch

Power-Shift Control – Dual Axis

1. Remove the six through-bolts, item 34, from the control stand and separate the two cable support housings, items 37 & 38. From each plunger, remove the sliding lock screw and threaded bushing, items 35 & 36.

2. Install the sliding lock screw, item 35, onto the control cables. Apply two drops of Loctite 242, or equivalent, to the cable threads and install the threaded bushing, item 36, onto the cable core until the end of the cable core is level with the end of the bushing.
3. Hold the controller in your left hand with the knob end up and the mounting bolts located at the 6, 9 and 12 o'clock positions. Mark the plunger closest to the 6 o'clock position as the "clutch" control. Mark the plunger closest to the 12 o'clock position as the "brake" control. The "clipped" corner of the control will be installed toward the rear of the tractor.
4. Install the brake cable to the "brake" control plunger and the clutch cable to the "clutch" control plunger. Move the control lever to extend the plungers far enough to expose the wrench flats. With a wrench, hold the plunger and tighten the sliding lock screw to 50 lb·ft (68 N·m) torque.

△ CAUTION △

Tightening the sliding lock screw without holding the plunger with a wrench will result in damage to the control assembly.



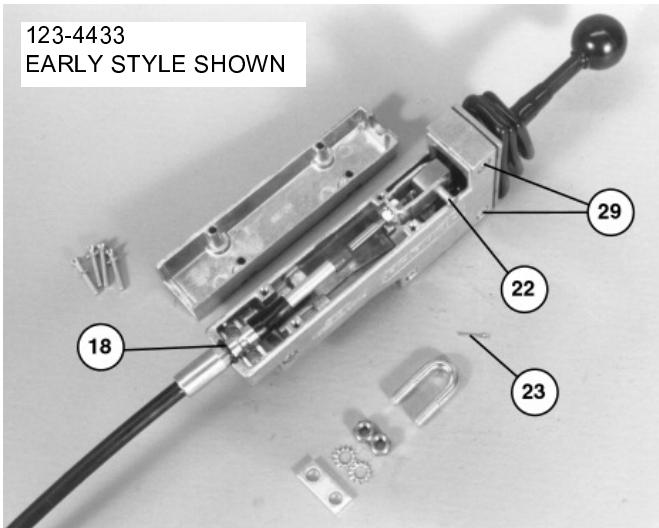
5. Install the cable support housings, items 37 & 38, onto the controller. Place the groove of the control cable housings into the saddle of the cable anchors, items 39 & 40. Install the six through-bolts, washers, lock washers and nuts, items 31, 33, 34 & 41. Evenly tighten the bolts to 85 lb·in (10 N·m) torque.
6. Insert the controller and cables sub-assembly from the bottom into the opening of the control bracket cover, item 11, and secure with three button, socket-head capscrews, lock washers and nuts, items 4, 5 & 6. If the winch is equipped with freespool, install the freespool controller / cable sub-assembly at

MODEL 527 CONTROL GROUP

this time. If not equipped with freespool, install the control bracket cover/controllers sub-assembly onto the control bracket using four button, socket-head capscrews and washers, items 4 and 12.

Freespool Control – Single Axis

1. Remove the knob, item 32, and the four oval head machine screws and lockwashers, items 16 & 17, from the long lever housing cover and remove the cover.
2. Prepare the control cable for installation by installing the o-ring, item 18, over the control lever end of the cable. The control lever end is identified by the u-bolt groove in the cable housing.
3. Install one nut, item 19, onto the cable core followed by the lockwasher, item 31.
4. Install the clevis, item 21, and one more nut, item 19, onto the cable. The cable core end must extend beyond the nut by 7/32 in. (5.5 mm). Tighten the first nut to secure the clevis in this position.
5. Slip the clevis over the bellcrank of the lever and install the clevis pin, item 22, and secure in place with cotter pin, item 23.



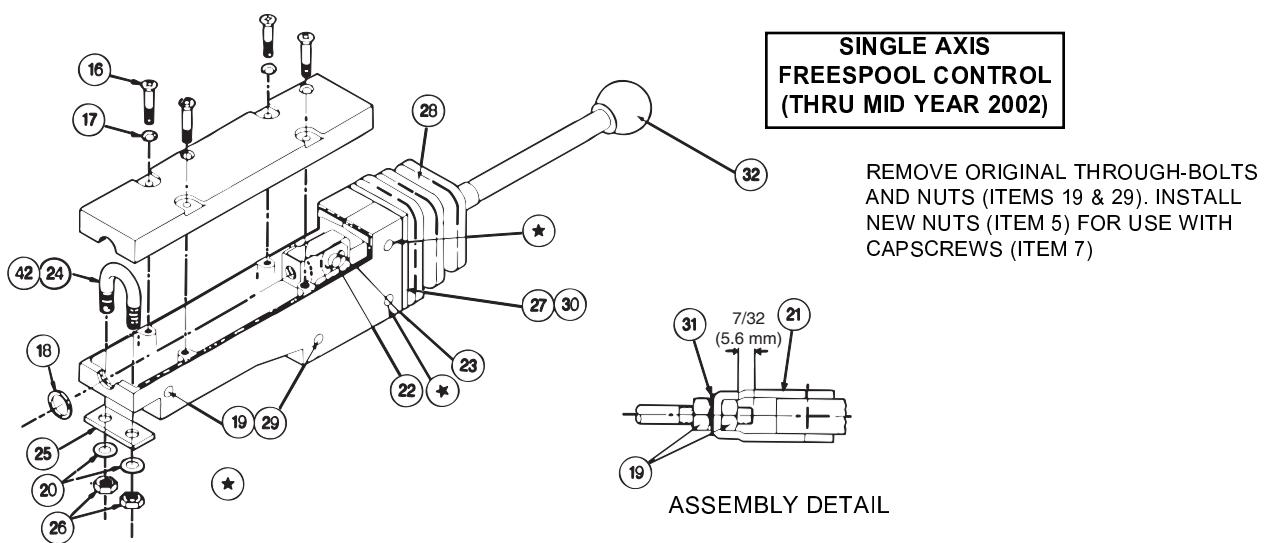
6. Remove the u-bolt, item 24, from the housing.
7. Position the o-ring, item 18, on the control cable housing so that when the cable is lowered into place, the o-ring fits in the groove in the housing.
8. Install the u-bolt, item 24, over the cable and through the housing. Install the spacer, item 25, over the u-bolt, followed by the lock washers and nuts, items 20 & 26. Tighten the u-bolt nuts to 90 lb·in (10 N·m) torque.
9. Install the cover onto the housing with the four oval head machine screws and lockwashers, items 16 and 17.

10. Remove the two through-bolts and nuts, items 29 and 19, from the top two mounting holes of the lever housing.
11. Secure the lever to the control bracket with capscrews, lockwashers and nuts, items 5, 6 and 7. The long cover of the lever housing must face toward the operator.
12. Install the control bracket cover/controller sub-assembly onto the control bracket base using four button, socket-head capscrews and washers, items 4 and 12. Install the knob, item 32, onto the lever.

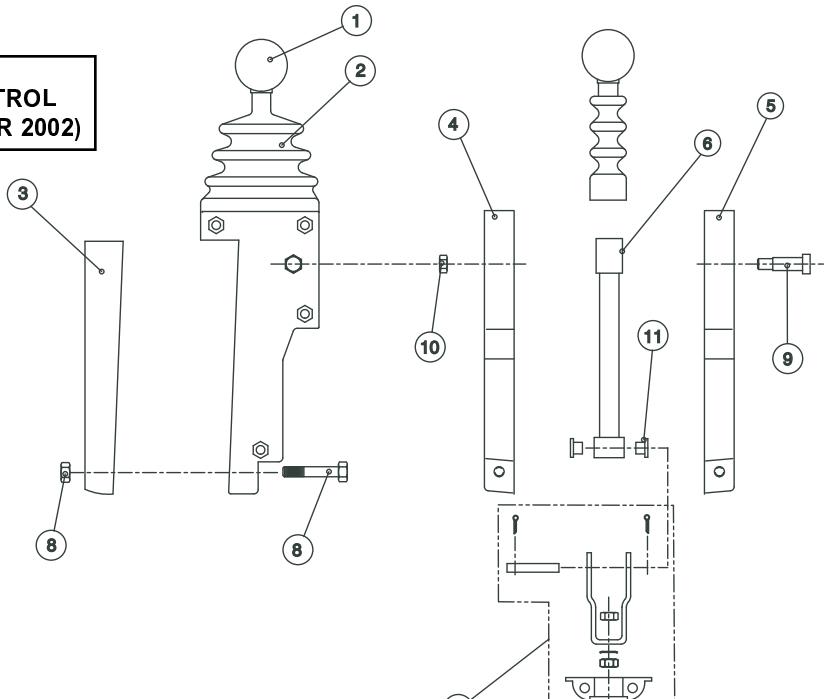
GENERAL INSTRUCTIONS

1. Install the control instruction self-adhesive decal(s), items 8 and 9, onto the console cover to the rear of the control bracket.
2. Fill winch to proper level with recommended oil. Refer to oil specifications found in the Operation and Preventive Maintenance Manual, publication SEBU 7026.
3. Verify proper control cable and operating pressure adjustment by following the procedures found in the Operation and Preventive Maintenance Manual, publication SEBU 7026 or the service manual, publication SENR 8444.

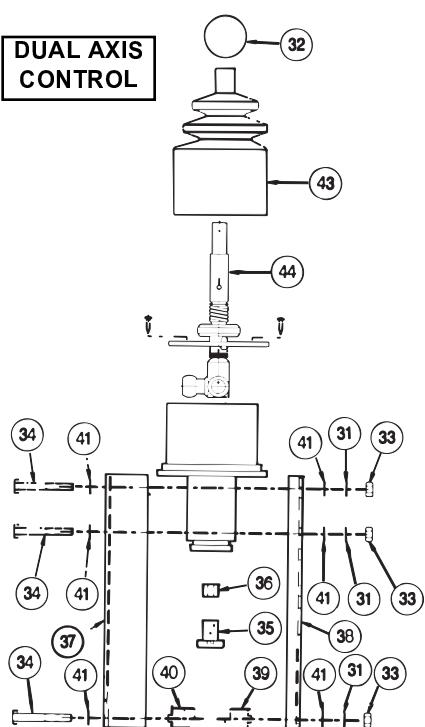
**MODEL 527
CONTROL GROUP**



SINGLE AXIS FREESPOOL CONTROL (STARTING MID YEAR 2002)



DUAL AXIS CONTROL

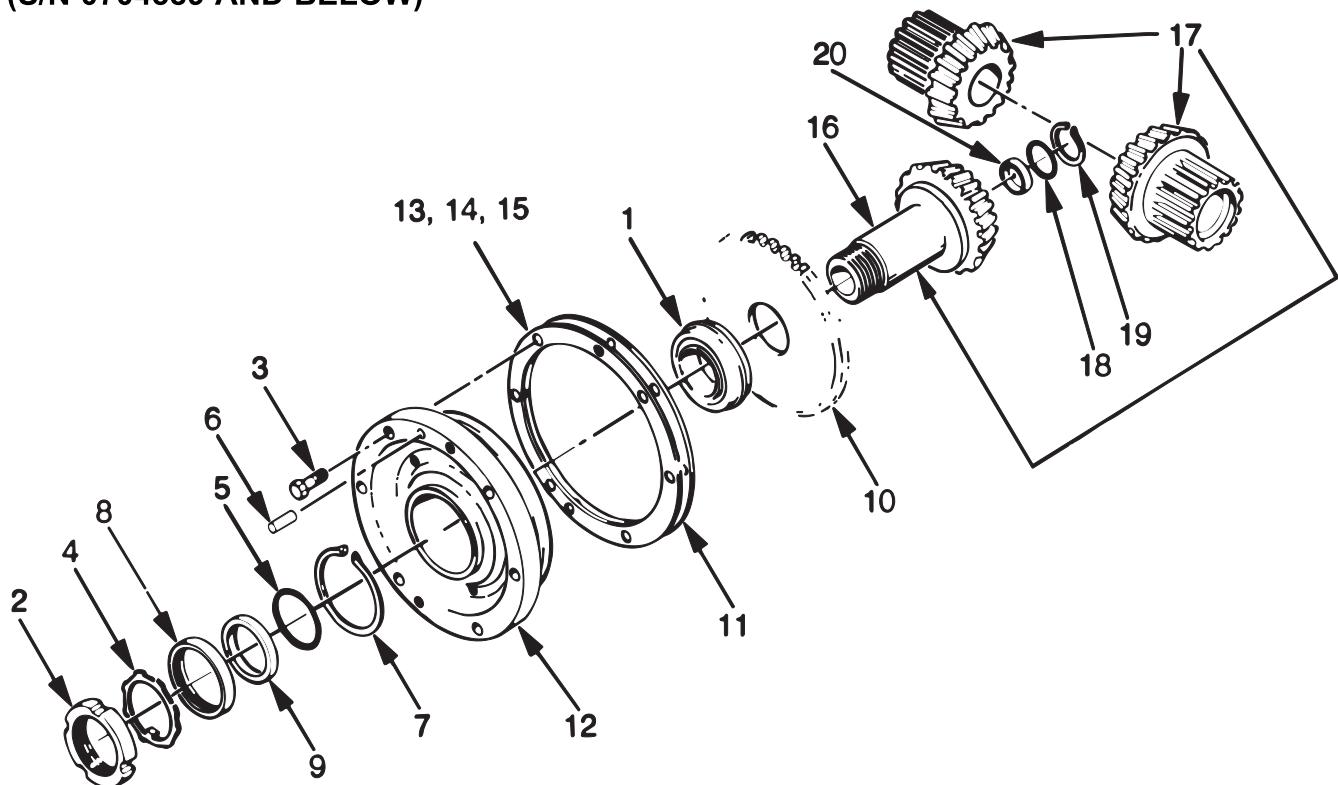


MODEL 527
CONTROL GROUP

ITEM	PART NO.	DESCRIPTION	QTY.
	123-4432	CONTROL, DUAL AXIS (COMPLETE)	1
	123-4433	CONTROL, SINGLE AXIS (THRU MID-YEAR 2002)	1
	225-8020	CONTROL, SINGLE AXIS (AFTER MID-YEAR 2002)	1
1	7R-5874	KNOB	1
2		BOOT (PACCAR 104015)	1
3		COVER (PACCAR 104016)	1
4		HOUSING, LEFT (PACCAR 104017)	1
5		HOUSING, RIGHT (PACCAR 104018)	1
6		LEVER ASSEMBLY (PACCAR 104019)	1
7		CABLE HARDWARE KIT (PACCAR 104020)	1
8		COVER HARDWARE KIT (PACCAR 104021)	1
9		SHOULDER SCREW (PACCAR104022)	1
10	3E-9860	NUT, SELF-LOCKING	1
11		BUSHING (PACCAR 104023)	1
16	126-5992	MACHINE SCREW (8 - 32 UNC X 1 1/4, CSK, OVAL HD)	4
17	9F-5602	LOCKWASHER (#8)	4
18	8F-9206	O-RING	1
19	9S-8748	HEX NUT (1/4 - 28 UNF)	2
20	7H-3937	LOCKWASHER, EXT. TOOTH (5/16)	2
21	126-2799	CLEVIS	1
22	126-2800	CLEVIS PIN	1
23	3B-4604	COTTER PIN (1/16 X 1/2)	1
24	126-2798	U-BOLT	1
25	126-2801	U-BOLT SPACER	1
26	6V-8186	HEX NUT (5/16 - 24 UNF)	2
27	126-5990	MACHINE SCREW (8 - 32 UNC X 1/2, CSK, OVAL HD)	4
28	126-2825	BOOT, FREESPOOL LEVER	1
29	126-5991	MACHINE SCREW (1/4 - 28 UNF X 1 7/16, FLSTR HD)	4
30	126-2802	BOOT RETAINER PLATE	1
31	1H-3338	LOCKWASHER, EXT. TOOTH (1/4)	7
32	7R-5874	KNOB	2
33	6V-8185	NUT (1/4 - 20)	6
34	8T-9367	CAPSCREW (1/4 - 20 UNC X 2 in, HX HD, G5)	6
35	126-2821	SLIDING LOCKSCREW	2
36	126-2822	CABLE BUSHING	2
37	126-2823	CABLE SUPPORT HOUSING, OUTER	1
38	126-2824	CABLE SUPPORT HOUSING, INNER	1
39	126-2818	CABLE ANCHOR, OUTER	1
40	126-2820	CABLE ANCHOR, INNER	1
41	8T-4205	WASHER, FLAT - THIN (1/4)	20
42	126-2803	CABLE CLAMP	1
43	163-3201	BOOT, WINCH CONTROL LEVER	1
44	163-3198	BRAKE-OFF DETENT REPAIR KIT	1

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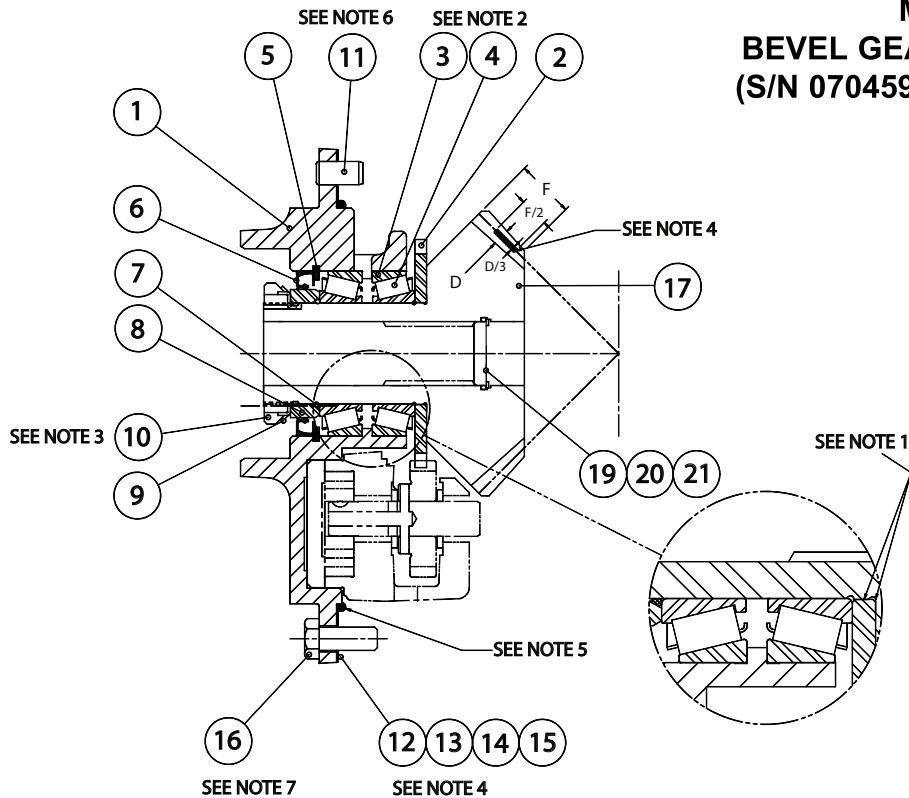
MODEL 527
BEVEL GEAR GROUP
(S/N 0704589 AND BELOW)



ITEM	PART NO.	DESCRIPTION	QTY.
1	119-2141	BEARING ASSEMBLY	1
2	119-1617	BEARING LOCKNUT	1
3	5P-2228	CAPSCREW, HEX HEAD (1/2 - 13 x 1)	6
4	119-1618	BEARING LOCKWASHER	1
5	118-5804	O-RING	1
6	123-4403	DOWEL PIN	1
7	119-2157	RETAINING RING	1
8	120-7638	OIL SEAL	1
9	118-8381	SEAL SPACER	1
10	118-6589	PUMP DRIVE PINION	1
11	118-5854	SHIM GASKET	1
12	118-7222	BEVEL PINION CARRIER	1
13	118-5855	SHIM .005 in. (.13 mm)	2-AR
14	118-5856	SHIM .007 in. (.18 mm)	2-AR
15	118-5857	SHIM .020 in. (.51 mm)	2-AR
16	118-6971	BEVEL PINION - 18T STANDARD SPEED - 3 SHAFT	1
17	119-2218	BEVEL GEAR SET - 18/38T STD. SPD. - 2 BVL. GRS. 1 BVL. PN.	1
18	9X-7545	O-RING	1
19	1L-3768	RETAINING RING	1
20	119-2190	PLUG, BEVEL PINION	1

AR - AS REQUIRED

MODEL 527
BEVEL GEAR GROUP
(S/N 0704590 AND UP)



NOTES:

1. Clean bevel and pump pinions with Loctite solvent. Verify press fit before assembly. Apply Loctite 609 or equal to surfaces indicated in Detail A. Press pump drive pinion, item 2, onto bevel pinion and seat securely against shoulder. Allow proper cure time for Loctite before usage.
2. Apply a thin coat of multi-purpose grease to rollers. Do not pack solid.
3. Tighten nut to ensure parts are fully seated. Loosen nut to set the rolling torque of 10 lb-in (1.1 N-m). Pinion must turn smoothly by hand.
4. Shim as required for tooth contact pattern as shown. The pattern height

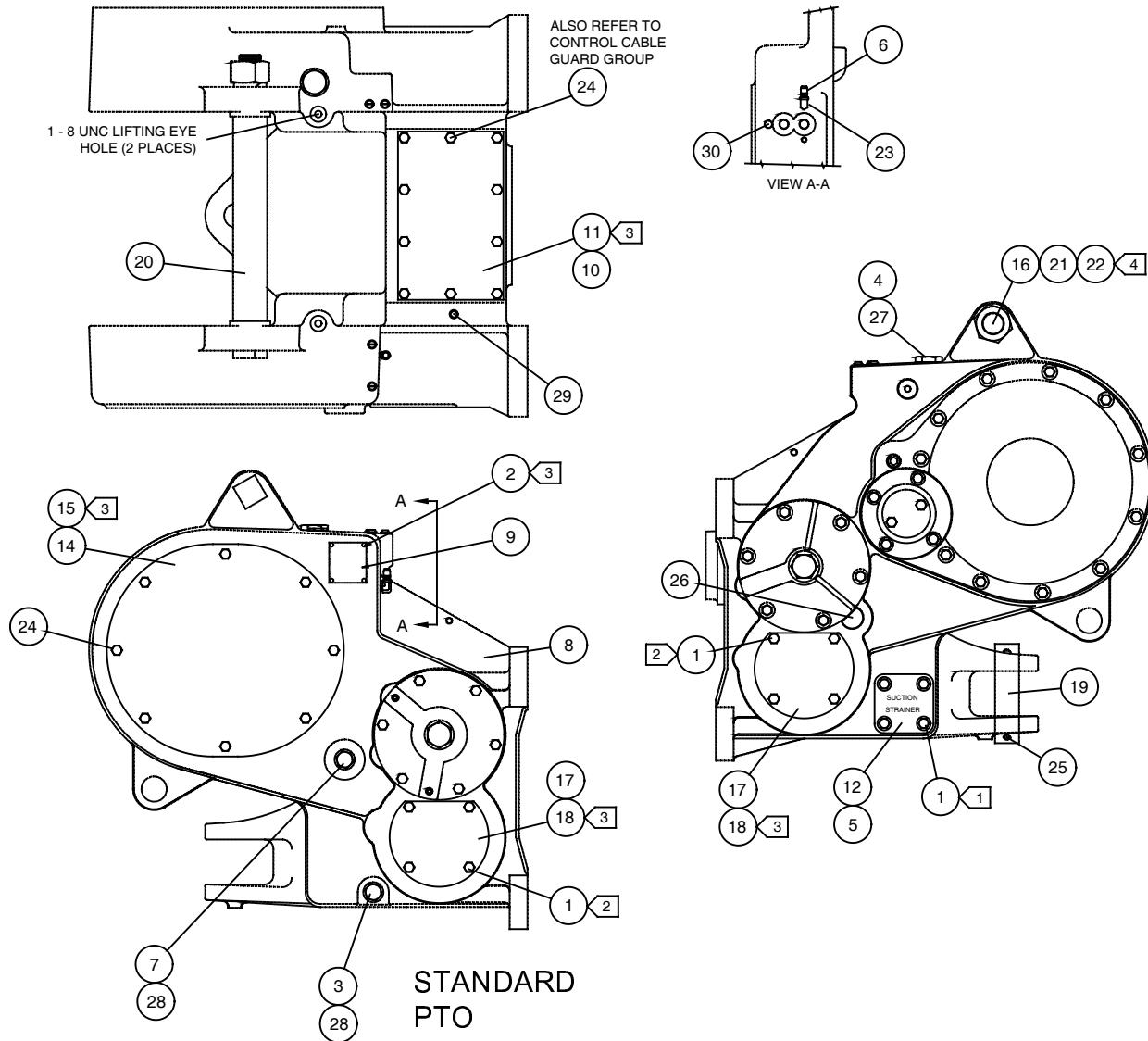
should be about 1/3 the whole depth, located midway between tip and root. It should be about 1/2 the face width shifted toward the toe. Set the backlash to .004 to .012 in. (.10 - .30 mm).

5. Apply approximately 3/16" (5 mm) bead of silastic sealant (RTV 732) to pilot diameter as indicated.
6. Clean with Loctite solvent and apply Loctite 242 to dowel pin and insert into winch case.
7. Clean with Loctite solvent and apply Loctite 242 to threads. Torque to 75 to 83 ft-lb (102 - 113 N-m).

ITEM	PART NO.	DESCRIPTION	QTY.
1	317-7551	BEVEL PINION CARRIER	1
2	118-6589	PUMP PINION	1
3	7K-5448	BEARING CUP	2
4	7K-5449	BEARING CONE	2
5	119-2157	RETAINING RING	1
6	120-7638	OIL SEAL	1
7	118-5804	O-RING	1
8	118-8381	SEAL SPACER	1
9	119-1618	BEARING LOCKWASHER	1
10	119-1617	BEARING LOCKNUT	1
11	123-4403	DOWEL PIN	1
12	118-5854	SHIM GASKET	1
13	118-5855	SHIM, .005 in. (.13 mm)	2-AR
14	118-5856	SHIM, .007 in. (.18 mm)	2-AR
15	118-5857	SHIM, .020 in. (.51 mm)	2-AR
16	8T-8917	CAPSCREW, HEX HD (1/2 - 13 X 1 1/4 in. G8, Z)	6
17	118-6971	BEVEL PINION - 18T STANDARD SPEED - 3 SHAFT	1
18	119-2218	BEVEL GEAR SET - 18/38T STD. SPD. (CODE D) * (NOT SHOWN)	1
19	9X-7545	O-RING	1
20	1L-3768	RETAINING RING	1
21	119-2190	PLUG, BEVEL PINION	1

* Bevel Gear Set includes one Bevel Pinion and two Bevel Gears

WINCH CASE AND COVERS



NOTES:

- 1 APPLY "FEL-PRO C648F" TO BOLTS TO PREVENT THREAD CORROSION.
- 2 TIGHTEN FASTENERS TO 75 LB•FT (10.4 Kg•M) TORQUE.
- 3 APPLY "RTV 732" SILASTIC SEALANT TO BOTH SIDES OF GASKETS (11, 15 & 18) AND DRIVE SCREWS (2).
- 4 TIGHTEN HEX NUT (22) UNTIL LOCKWASHER (21) IS FLATTENED AND THEN TURN ONE FLAT.

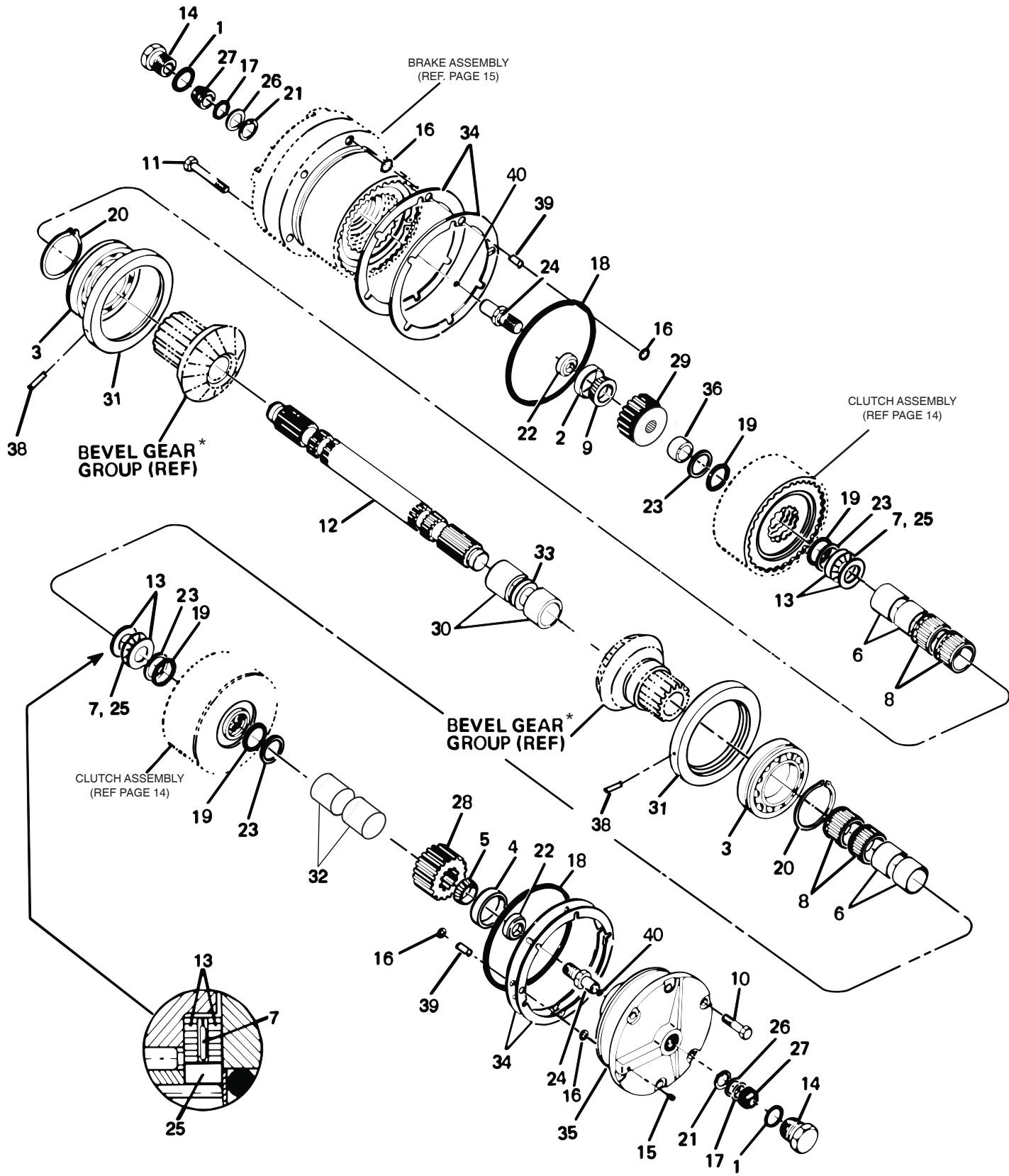
WINCH CASE AND COVERS

ITEM	PART NO.	DESCRIPTION	QTY.
1	5P-2228	CAPSCREW, HEX HEAD (1/2-13 X 1)	12
2	7H-4543	DRIVE SCREW	4
3	5P-9436	PLUG, DRAIN (MAY BE SUBSTITUTED FOR ITEM 7)	1
4	5P-1403	PLUG, OIL FILL (INCLUDES ITEM 27)	1
5	6L-9965	O-RING **	2
6	5F-5434	VENT PLUG	1
7	118-5783	SIGHT GAUGE (INCLUDES ITEM 28)	1
8	118-6973	WINCH CASE - STANDARD PTO	1
9	138-2456	SERIAL NUMBER DATA PLATE	1
10	118-6598	COVER, TOP ACCESS	1
11	118-6316	GASKET	1
12	120-7541	STRAINER COVER	1
14	118-6588	COVER, SIDE ACCESS	1
15	120-7543	GASKET	1
16	118-6298	TIE BOLT	1
17	118-6597	COVER, LOWER ACCESS	2
18	118-6317	GASKET	2
19	118-8382	DRAW BAR PIN	1
20	118-6314	SPACER TUBE	1
21	119-1623	LOCKWASHER (1 3/4)	1
22	2B-2673	NUT, HEX HEAD (1 3/4 NC)	1
23	3B-8822	ELBOW	2
24	6K-7917	CAPSCREW, HEX HEAD (1/2-13 X 1) SS*	15
25	3B-5320	COTTER PIN (3/8 X 3 IN.)	2
26	119-2165	EXPANSION PLUG - 3 SHAFT ONLY	1
27	6V-5065	O-RING - FOR OIL FILL PLUG	1
28	9X-4609	O-RING - FOR OIL DRAIN & LEVEL PLUG	2
29	2B-7457	PLUG (3/8 NPT SQ HD)	1
30	5M-6214	PLUG (1/4 NPT SQ HD)	1

*SS = SELF-SEALING MATERIAL PREAPPLIED TO THREADS

** = EARLY COVERS USE ONE O-RING, 6L-9965

CLUTCH SHAFT GROUP

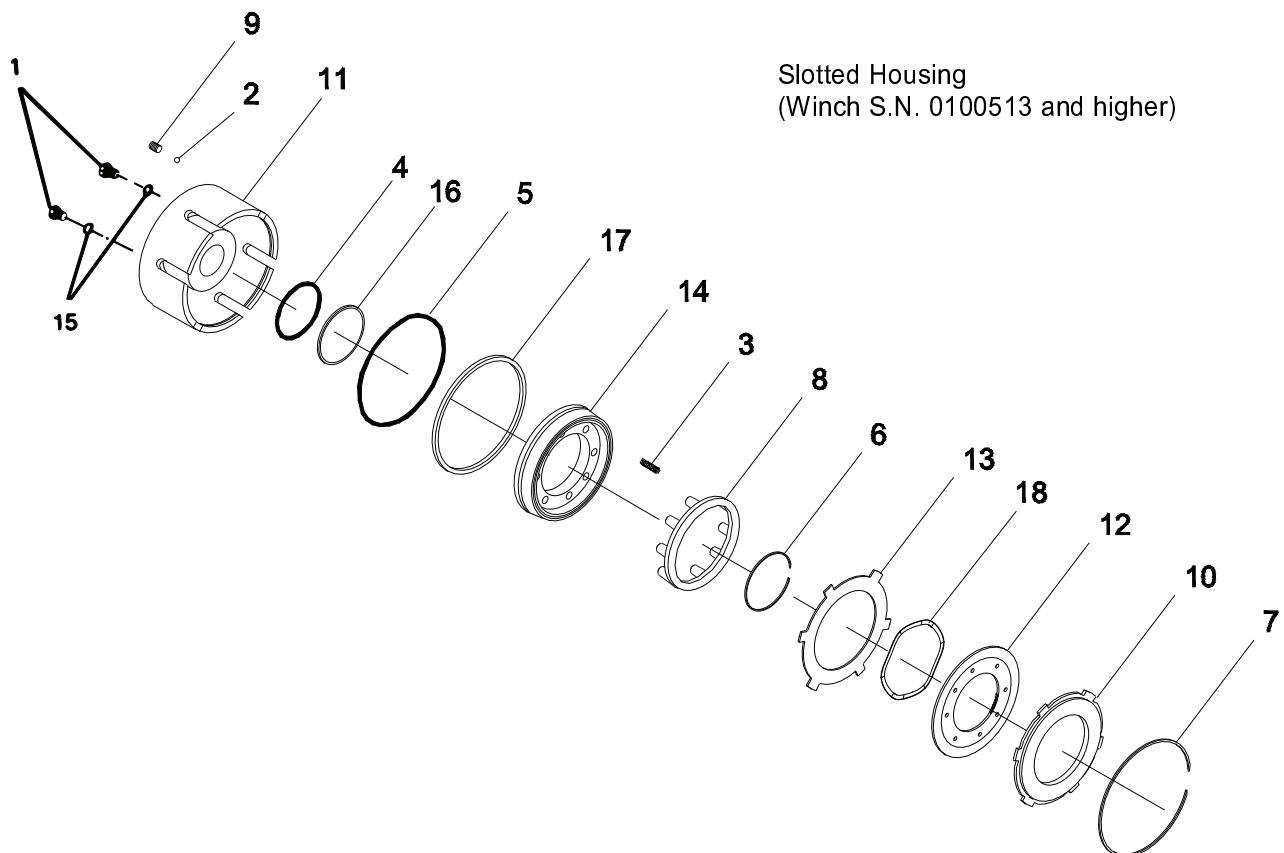


CLUTCH SHAFT GROUP

ITEM	PART NO.	DESCRIPTION	QTY.
1	6V-5065	O-RING (PART OF ITEM 14)	2
2	009-3691	BEARING CUP	1
3	119-2138	BALL BEARING - STD PTO	2
4	119-2140	BEARING CUP	1
5	120-7635	BEARING CONE	1
6	119-2206	NEEDLE BEARING - INNER RACE	4
7	124-0493	THRUST BEARING	2
8	119-2208	NEEDLE BEARING	4
9	009-3690	BEARING CONE	1
10	5P-2228	CAPSCREW, HEX HEAD (1/2 - 13 X 1)	6
11	7X-0326	CAPSCREW, HEX HEAD (1/2 - 13 X 3)	6
12	118-7217	CLUTCH SHAFT - 3 SHAFT	1
13	120-7633	THRUST BEARING RACE	4
14	5P-1403	PLUG (CONTAINS ITEM 1)	2
15	102-0883	PLUG (1/4 NPT EARLY)	1
	148-8407	PLUG, -6 ORB HEX (CURRENT)	1
16	8M-4437	O-RING	8
17	120-7629	O-RING	2
18	119-1590	O-RING	2
19	119-1549	O-RING	4
20	119-1616	RETAINING RING	2
21	2D-6398	RETAINING RING	2
22	119-2171	BEARING RETAINER	2
23	119-1550	BACK-UP RING	4
24	147-2728	ROTARY SEAL SHAFT	2
25	217-8445	THRUST BEARING SPACER	2
26	119-1628	BACK-UP WASHER	2
27	119-2193	ROTARY SEAL	2
28	118-6560	PINION GEAR - 15 TEETH - 3 SHAFT	1
29	318-8441	BRAKE HUB	1
30	118-5858	BEVEL GEAR SPACER	2
31	118-5844	BEARING CARRIER	2
32	217-8444	PINION SPACER - 3 SHAFT	1
33	118-5848	SHIM SET	1
34	118-6647	SHIM, .005 in. (.13 mm)	2-AR
	118-6599	SHIM, .007 in. (.18 mm)	2-AR
	118-6600	SHIM, .020 in. (.51 mm)	2-AR
35	118-6969	CLUTCH SHAFT BEARING CARRIER - 3 SHAFT	1
36	217-8444	BRAKE HUB SPACER	1
38	4H-1440	ROLLPIN	2
39	120-7663	SLEEVE	4
40	140-1197	ORIFICE PLUG	2

AR = AS REQUIRED

CLUTCH ASSEMBLY (SLOTTED HOUSING)

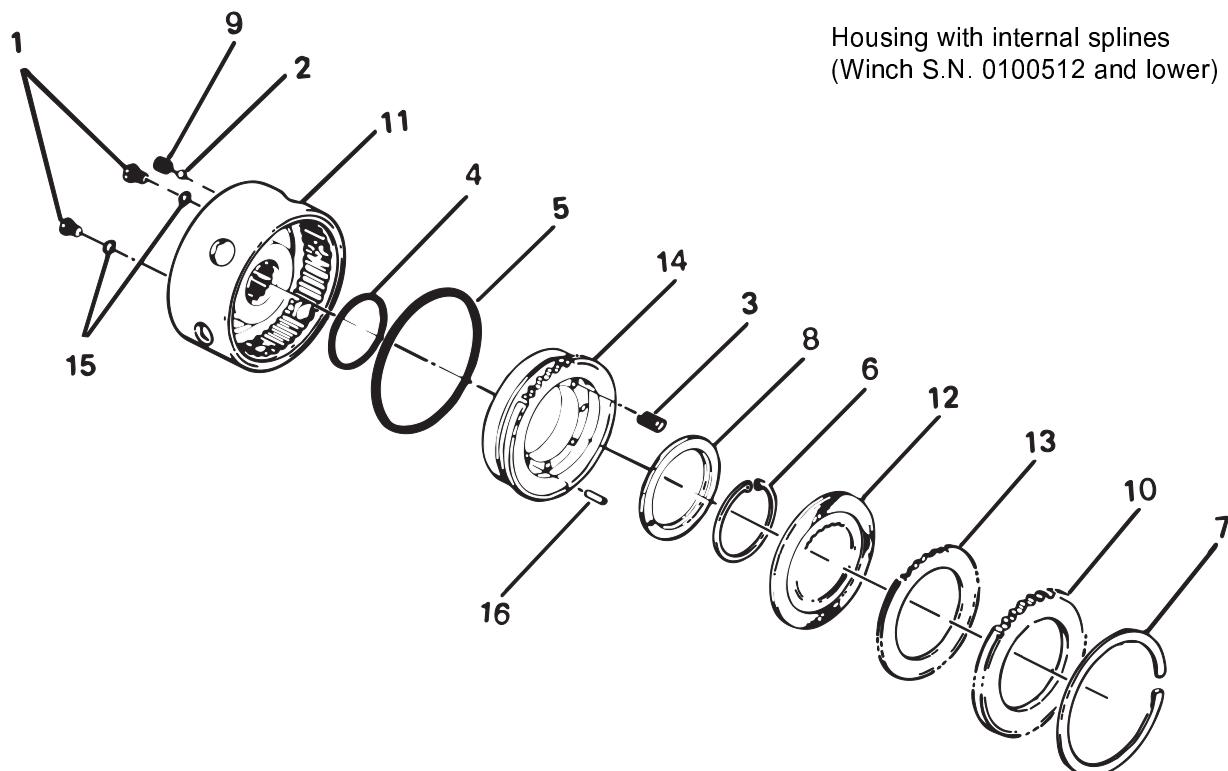


ITEM	PART NO.	DESCRIPTION	QTY.
-	211-1631	CLUTCH ASSEMBLY - INCLUDES 1 - 18	
1	183-7263	PLUG (-4 ORB)	2
2	3Y-9267	STEEL CHECK BALL (.25 in.)	1
3	211-1640	SPRING	8
4	1H-6227	O-RING	1
5	9F-1399	O-RING	1
6	119-2195	RETAINING RING	1
7	211-1634	RETAINING RING	1
8	295-1797	SPRING RETAINER	1
9	118-5849	CHECK VALVE SEAT	1
10	211-1641	PRESSURE PLATE	1
11	211-1639	CLUTCH HOUSING *	1
12	107634 **	DISC - FRICTION	5
13	161-6434	DISC - STEEL .104 in. (2.64 mm)	5
14	161-6439	CLUTCH PISTON	1
15	3J-7354	O-RING	2
16	162-2753	BACKUP RING	1
17	162-2754	BACKUP RING	1
18	231-2245	WAVE SPRING	4

* Item 11 includes a basic housing with two (2) steel balls 3Y-9267 driven into cross-drilled passages.

** PACCAR Winch Division part number. Caterpillar part number not available at this printing.

CLUTCH ASSEMBLY (SPLINED HOUSING)

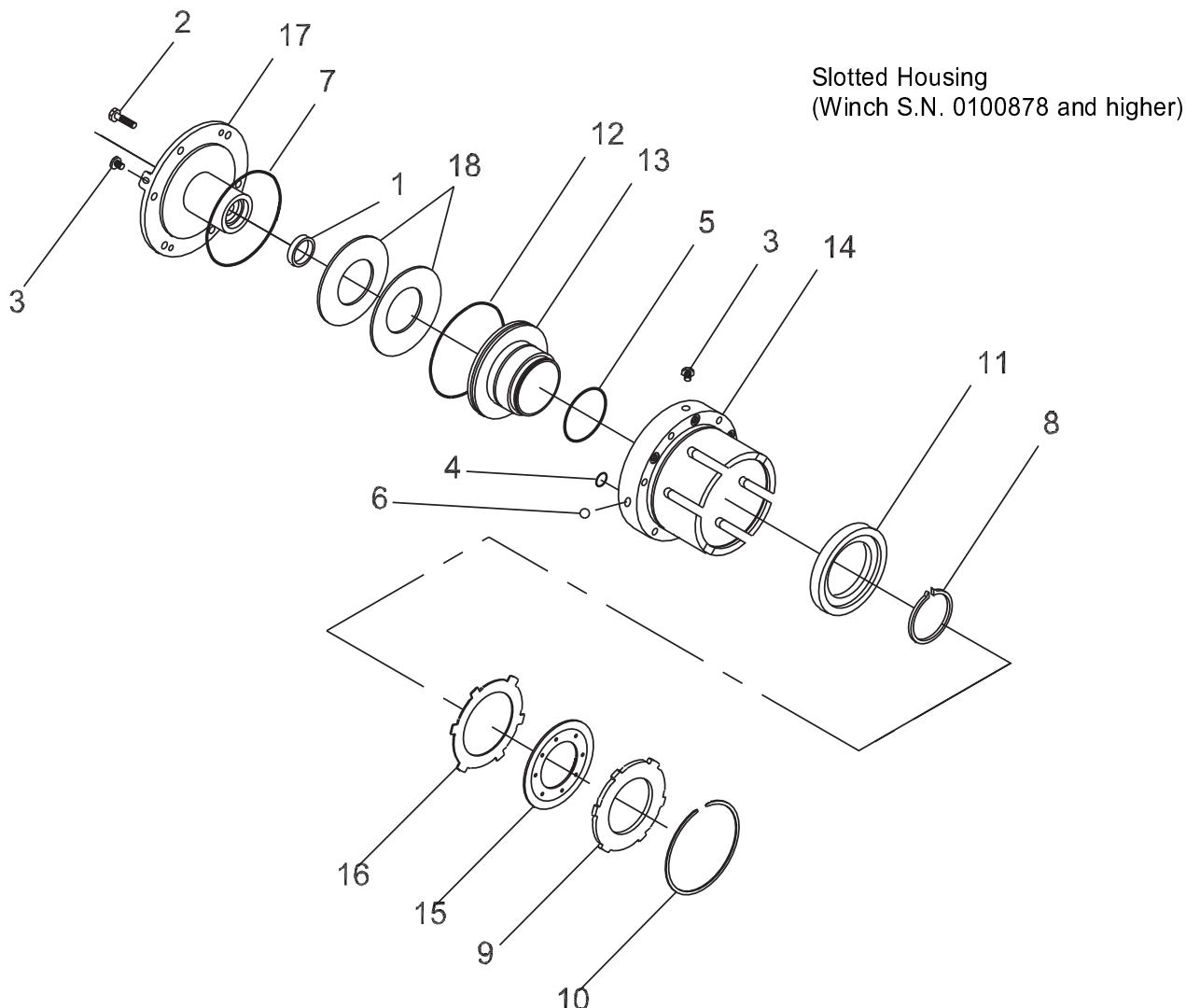


ITEM	PART NO.	DESCRIPTION	QTY.
-	118-7210	CLUTCH ASSEMBLY - INCLUDES 1 - 16	
1	9S-8007	PLUG (-3 ORB)	2
2	3Y-9267	STEEL CHECK BALL (.25 in.)	1
3	118-5851	SPRING	8
4	1H-8128	O-RING	1
5	120-7669	O-RING	1
6	119-2195	RETAINING RING	1
7	119-1534	RETAINING RING	1
8	118-6566	SPRING RETAINER	1
9	118-5849	CHECK VALVE SEAT	1
10	118-6323	PRESSURE PLATE	1
11	118-8385	CLUTCH HOUSING *	1
12	107634**	DISC - FRICTION	5
13	118-6302	DISC - STEEL .093 in. (2.36 mm)	4
14	118-6594	CLUTCH PISTON	1
15	119-2189	O-RING	2
16	5H-3182	PIN	1

* 118-8385 includes a basic housing 120-7697 with two (2) steel balls 3Y-9267 driven into cross-drilled passages.

** PACCAR Winch Division part number. Caterpillar part number not available at time of printing.

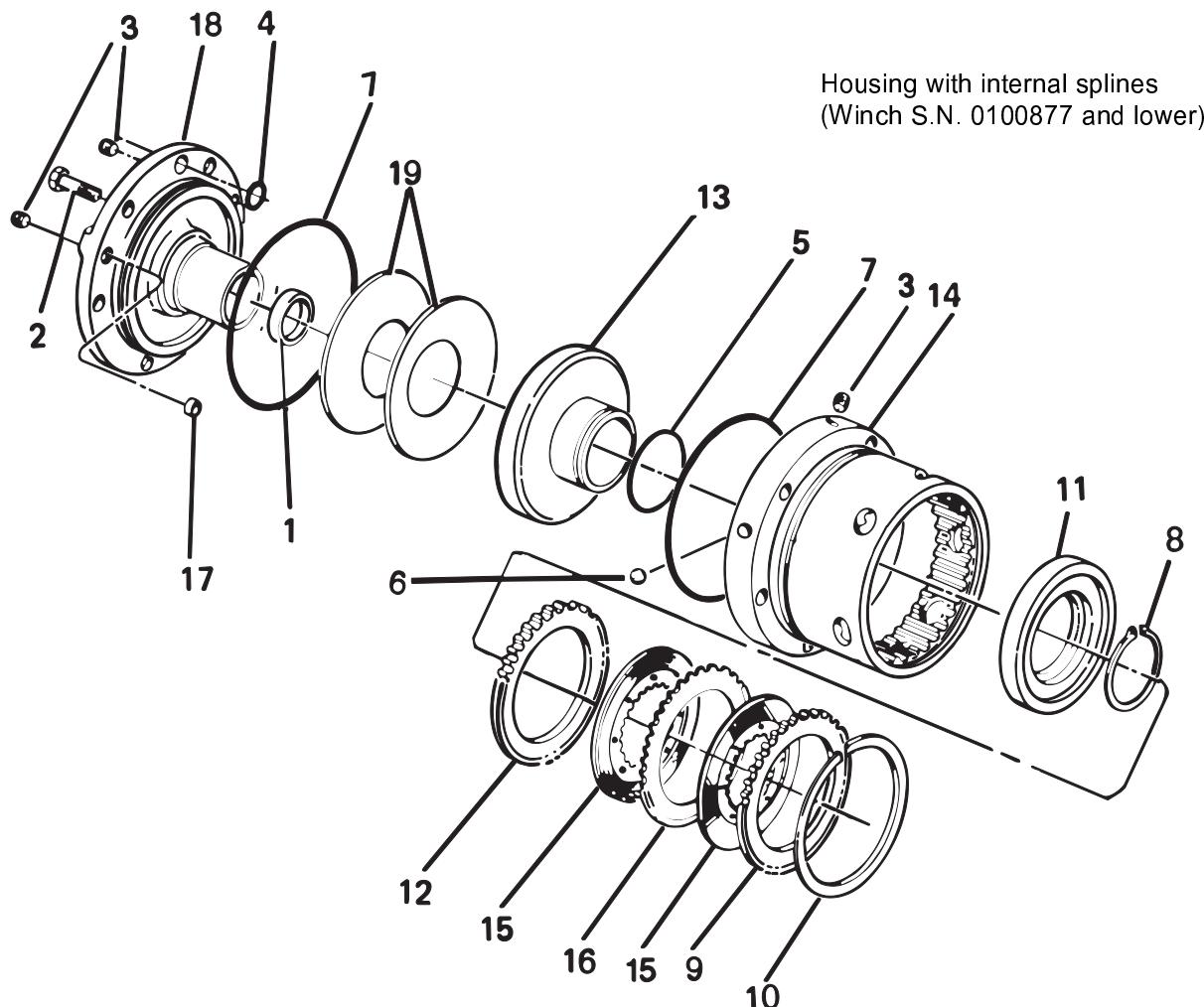
BRAKE ASSEMBLY (SLOTTED HOUSING)



ITEM	PART NO.	DESCRIPTION	QTY.
-	211-1630	BRAKE ASSEMBLY, STD - INCLUDES 1 - 18	
1	009-3691	BEARING CUP	1
2	4L-6454	CAPSCREW, HEX HEAD (3/8 - 16 X 1 GD 8 Z)	2
3	148-8407	PLUG, HEX SOCKET (-6 ORB)	3
4	119-1577	O-RING	3
5	5F-3144	O-RING	1
6	3Y-9267	STEEL BALL (PRESSED INTO HOUSING)	1
7	119-1586	O-RING	1
8	123-4415	RETAINING RING	1
9	211-1638	PRESSURE PLATE	1
10	211-1634	RETAINING RING	1
11	211-1632	PRESSURE PLATE	1
12	1S-6119	O-RING	1
13	211-1633	BRAKE PISTON	1
14	211-1637	BRAKE HOUSING - CURRENT (REQUIRES 1 OF ITEM 6)	1
15	107634 *	DISC - FRICTION - BRONZE	8
16	161-6434	DISC - STEEL - .104 in. (2.64 mm)	8
17	211-1636	BRAKE CARRIER	1
18	119-2167	BRAKE SPRING	2

* PACCAR Winch Division part number. Caterpillar part number not available at time of printing.

BRAKE ASSEMBLY (SPLINED HOUSING)

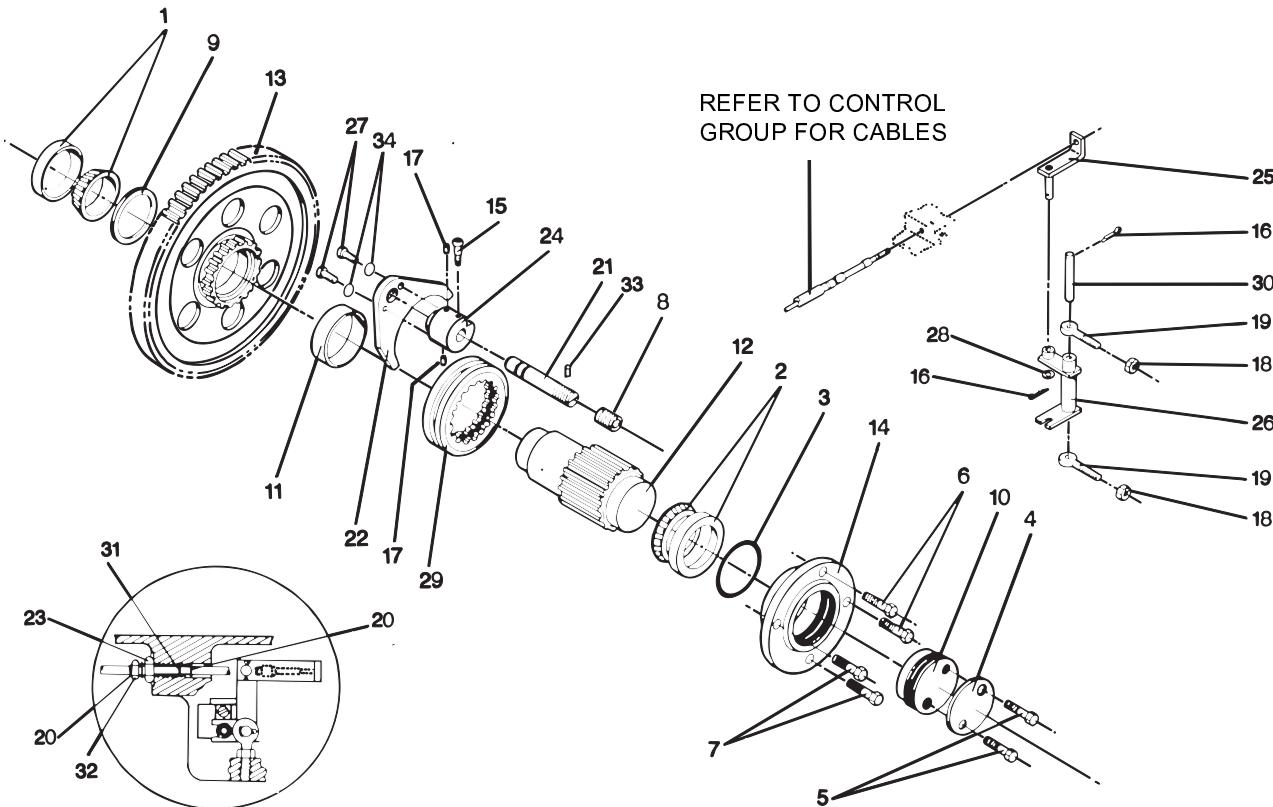


ITEM	PART NO.	DESCRIPTION	QTY.
-	120-7698	BRAKE ASSEMBLY, STD - INCLUDES 1 - 19	
1	009-3691	BEARING CUP	1
2	4L-6454	CAPSCREW, HEX HEAD (3/8 - 16 X 1)	2
3	102-0883	PLUG, HEX SOCKET (1/4 NPT - EARLY)*	4
	148-8407	PLUG, HEX HEAD (-6 ORB - CURRENT)*	3
4	119-1577	O-RING	3
5	4S-5898	O-RING	1
6	3Y-9267	STEEL BALL	2
7	119-1586	O-RING	2
8	123-4415	RETAINING RING	1
9	118-6323	PRESSURE PLATE	1
10	119-1534	RETAINING RING	1
11	118-6587	PISTON RETAINER	1
12	118-5846	PRESSURE PLATE - INNER	1
13	118-6593	BRAKE PISTON	1
14	118-6949	BRAKE HOUSING - CURRENT (REQUIRES 1 OF ITEM 6)	1
15	107634 **	DISC - FRICTION - BRONZE	8
16	118-6302	DISC - STEEL - .093 in. (2.36 mm)	7
17	118-0550	INSERT - NOT USED IN CURRENT HOUSING	1
18	118-7223	BRAKE CARRIER	1
19	119-2167	BRAKE SPRING	2

*Current brake housing may be visually distinguished from the early design by locating the -6 ORB plug at the "B" brake pressure port. The early design used a hex-socket head, 1/4 NPT plug.

** PACCAR Winch Division part number. Caterpillar part number not available at time of printing.

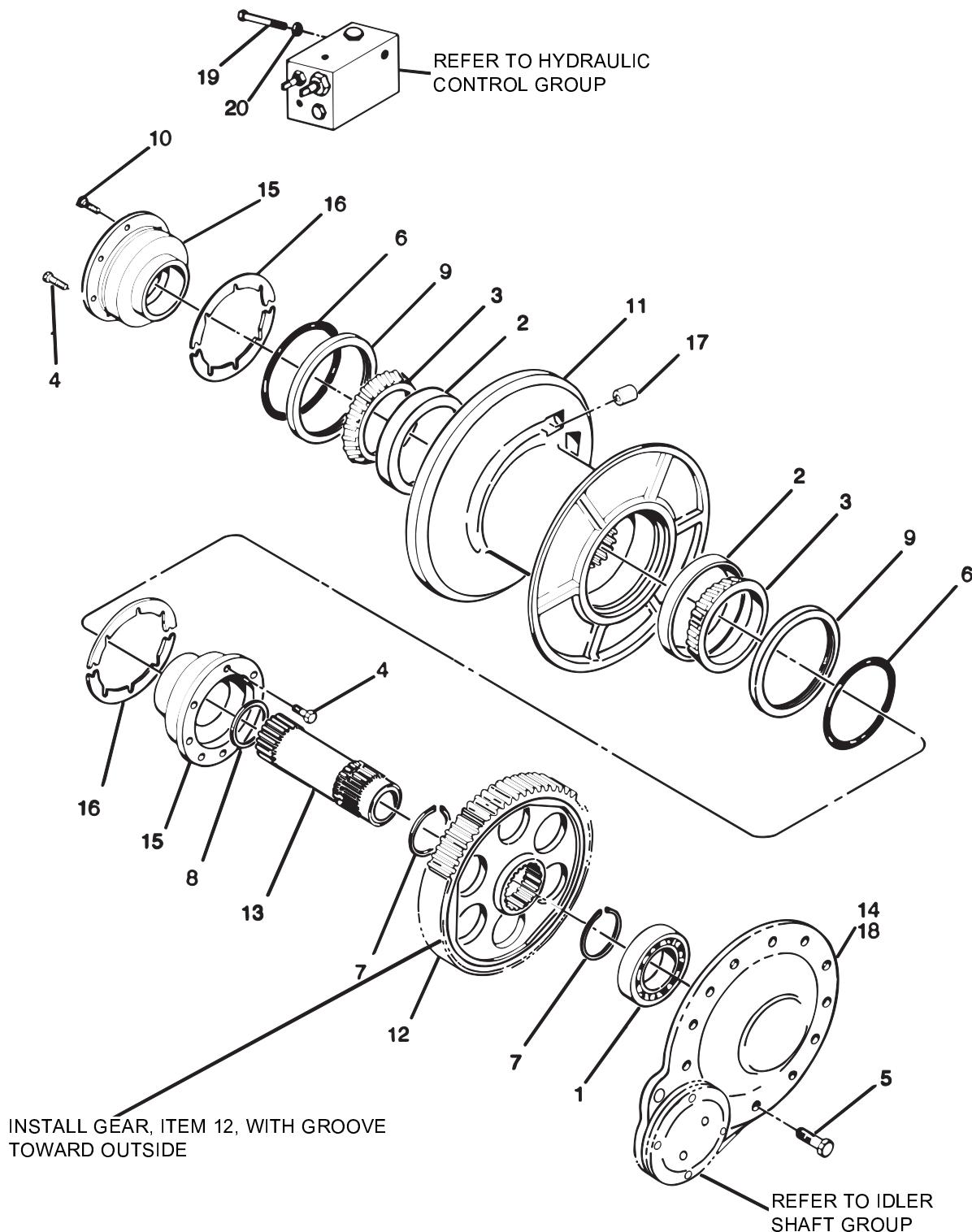
IDLER SHAFT GROUP WITH FREESPOOL



ITEM	PART NO.	DESCRIPTION	QTY.
1	119-0160	BEARING ASSEMBLY - INNER	1
2	114-5870	BEARING ASSEMBLY - OUTER	1
3	119-1547	O-RING	1
4	118-5859	LOCK PLATE	1
5	8T-9383	CAPSCREW, HEX HEAD (1/2 - 13 X 3/4 G5)	2
6	8T-8917	CAPSCREW, HEX HEAD (1/2 - 13 X 1-1/4 G5)	2
7	124-0764	CAPSCREW, HEX HEAD (1/2 - 13 X 2 G5)	2
8	038-7338	PLUG, SOCKET HEAD	1
9	120-7633	THRUST WASHER	1
10	118-6535	ADJUSTER	1
11	119-2170	BUSHING	1
12	118-6584	PINION, SECOND REDUCTION	1
13	118-7224	GEAR, FIRST REDUCTION	1
14	118-6917	CARRIER, IDLER SHAFT	1
15	039-2676	SHOULDER SCREW	1
16	9L-7469	COTTER PIN	2
17	119-1626	BALL PLUNGER	2
18	1B-4430	JAM NUT	2
19	2J-5038	ROD END	2
20	3K-9042	RETAINING RING	2
21	119-2184	SHIFT RAIL, INCLUDES ITEM 33	1
22	118-6567	YOKE	1
23	1D-5120	JAM NUT	1
24	118-5862	SHIFT COLLAR	1
25	118-6658	CABLE CONNECTOR	1
26	118-5785	BELLCRANK WELDMENT	1
27	4L-6454	CAPSCREW, HEX HEAD (3/8 - 16 X 1 G8)	2
28	8T-4223	WASHER (1/2)	1
29	118-6585	COLLAR	1
30	119-2210	PIN	1
31	5H-8853	O-RING	1
32	119-2209	CONTROL CABLE ADJUSTER	1
33	119-0570	NYLON PELLET	1
34	3B-4506	LOCKWASHER (3/8)	2

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CABLE DRUM GROUP



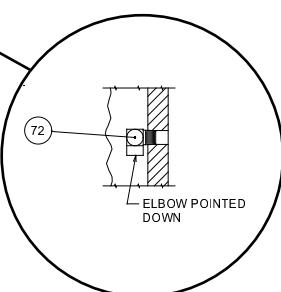
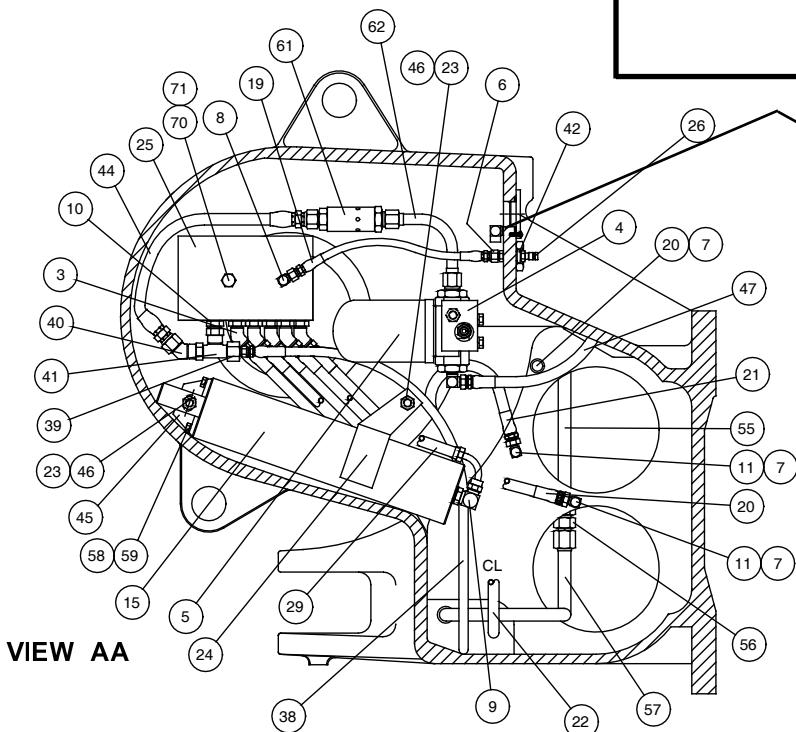
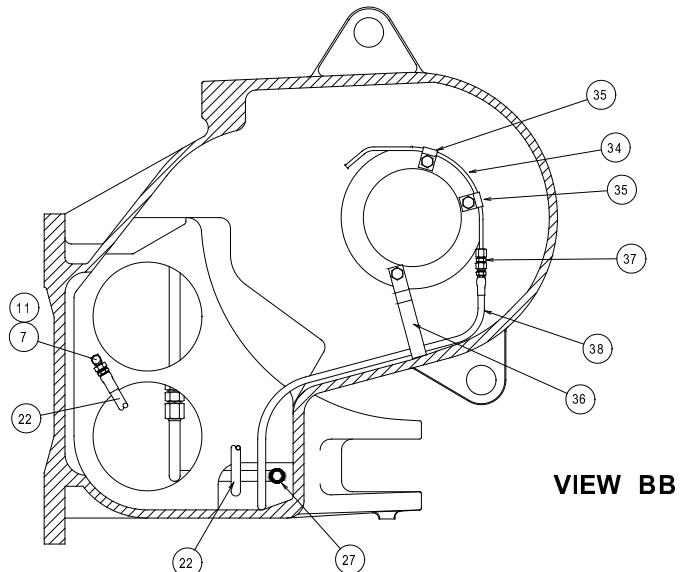
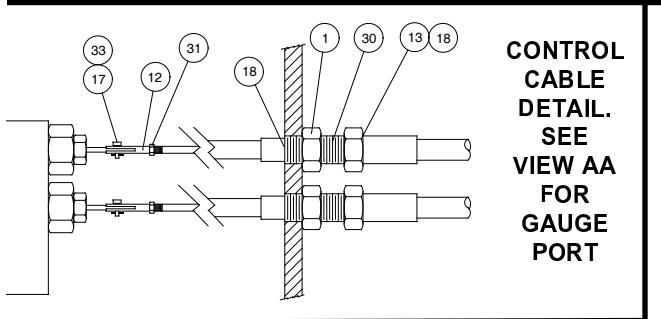
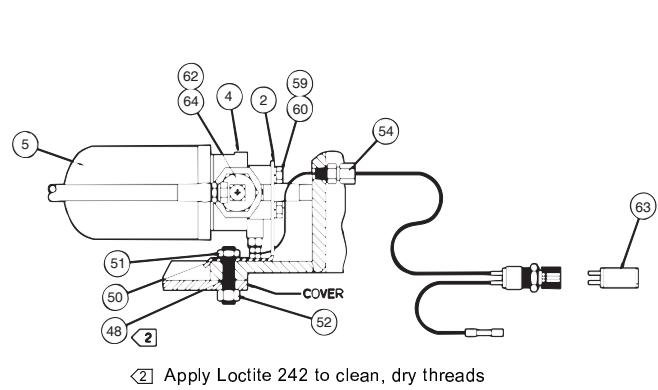
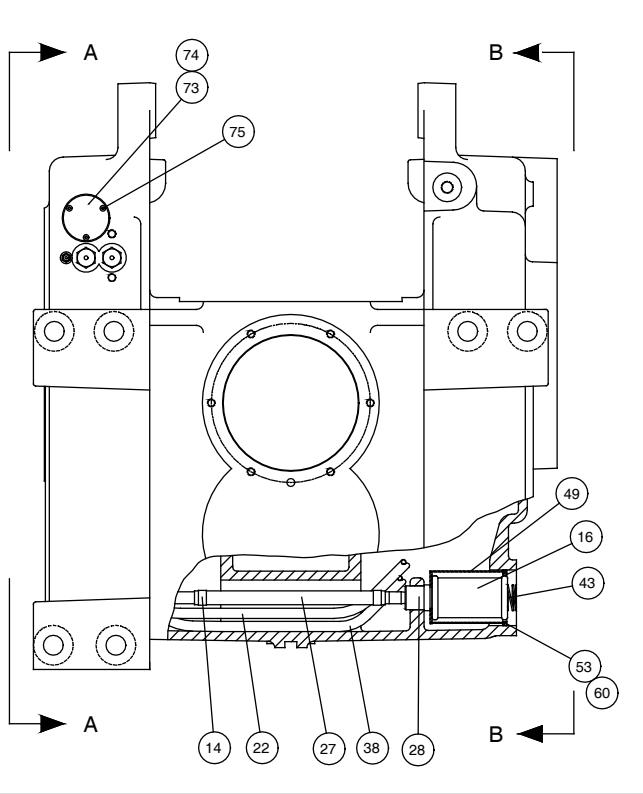
CABLE DRUM GROUP

ITEM	PART NO.	DESCRIPTION	QTY.
1	8M-2031	BALL BEARING	1
2	4F-2041	BEARING CUP	2
3	5P-3236	BEARING CONE	2
4	6K-7917	CAPSCREW, HEX HEAD (1/2 - 13 X 1 G5 S)	10
5	5P-2566	CAPSCREW, HEX HEAD (1/2 - 13 X 1-1/2 G8 Z)	11
6	1S-6119	O-RING	2
7	123-4416	RETAINING RING, EXTERNAL	2
8	7M-2275	RETAINING RING, INTERNAL	1
9	313-8894	OIL SEAL	2
10	119-0561	CAPSCREW, SOCKET HEAD (1/2 - 13 X 1 G8 S)	1
11	118-7229	CABLE DRUM	1
12	118-7215	SECOND REDUCTION GEAR	1
13	118-6583	SECOND REDUCTION GEAR SHAFT	1
14	118-6968	BEARING CARRIER, COVER	1
15	118-6975	BEARING CARRIER, DRUM	2
16	118-5847	SHIM SET (1 pair each, .005, .007, .020 in. (.13, .18, .51 mm)	1-2 AR
17	118-6273	FERRULE - 3/4 IN. (19 mm) WIRE ROPE	1
	118-6275	FERRULE - 7/8 IN. (22 mm) WIRE ROPE	1
	118-6276	FERRULE - 1 IN. (25 mm) WIRE ROPE	1
18	-----	NO GASKET, USE DOWs RTV 732 OR EQUIVALENT	--
19	119-0562	CAPSCREW, HEX HEAD (1/2 - 13 X 5 G5 S)	1
20	8T-4223	WASHER (1/2 HARD Z)	11

AR - AS REQUIRED

SS - SELF SEALING

HYDRAULIC CONTROL GROUP - STANDARD PTO (EARLY)



HYDRAULIC CONTROL GROUP - STANDARD PTO (EARLY)

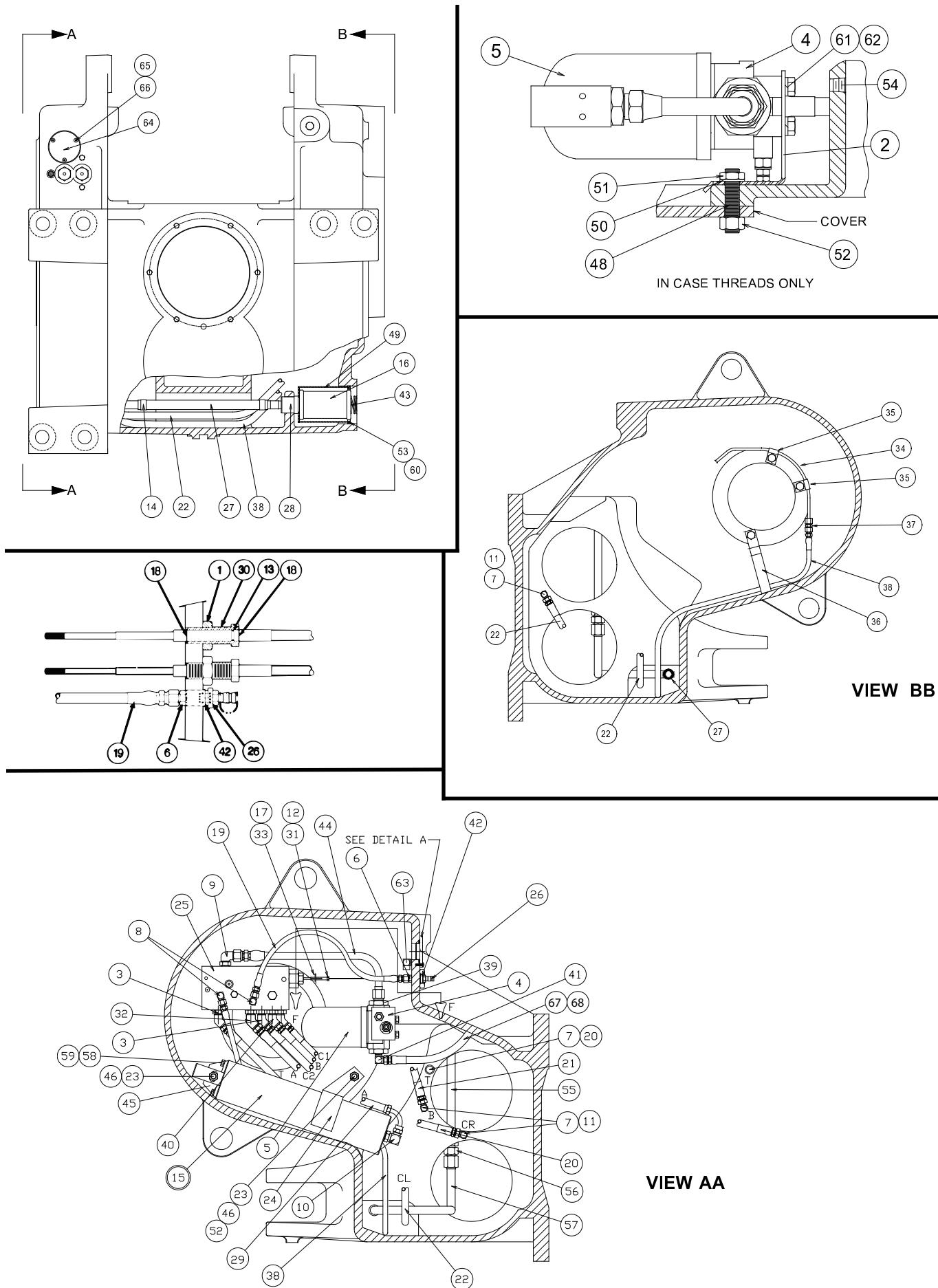
ITEM	PART NO.	DESCRIPTION	QTY.
1	1D-5120	JAM NUT	2
2	118-6318	FILTER BRACKET	1
3	030-7943	ELBOW - 45° - 8 VALVE PORTS A,B	1
	3K-0360	O-RING FOR ITEM 3	2
4	118-6321	FILTER HEAD	1
5	118-6322	FILTER ELEMENT	1
6	8L-6557	ADAPTER 1/8 - NPT - 4	1
7	061-9463	ADAPTER - 8	4
8	7J-4026	ELBOW - 90° - 4 VALVE PORT G	1
	3J-1907	O-RING FOR ITEM 8	1
9	030-7948	ELBOW - 90° - 8	1
	3K-0360	O-RING FOR ITEM 9	1
10	8M-0505	ADAPTER VALVE PORTS, P,T, C1, C2	4
	3K-0360	O-RING FOR ITEM 10	4
11	8M-0547	ADAPTER - 90° - 8	3
12	119-0131	CLEVIS YOKE	2
13	5H-8853	O-RING	2
14	9M-7958	CLAMP, SUCTION HOSE	1
15	118-7012	ACCUMULATOR ASSEMBLY-SPRING TYPE (SEE ACCUMULATOR ASSY.)	1
16	119-2164	SUCTION STRAINER	1
17	119-0156	CLEVIS PIN	2
18	3K-9042	RETAINING RING	4
19	118-6332	HOSE - VALVE TO GAUGE PORT	1
20	119-0115	HOSE - 24 in. (610 mm) VALVE TO T, CR	2
21	119-0114	HOSE - 18 in. (457 mm) VALVE TO B	1
22	119-0120	HOSE - 50 in. (1,270 mm) VALVE TO CL	1
23	8T-4223	LOCKWASHER - 1/2	2
24	118-6313	ACCUMULATOR CLAMP BRACKET	1
25	118-6978	CONTROL VALVE ASSEMBLY (SEE CONTROL VALVE ASSY.)	1
26	158-6530	QUICK DISCONNECT	1
27	118-6301	SUCTION HOSE	1
28	118-6265	CONNECTOR	1
29	118-5853	HOSE - 16 in. (406 mm) VALVE TO ACCUMULATOR	1
30	119-2209	ADJUSTER, CONTROL CABLE	2
31	6F-0612	JAM NUT - 1/4 - 28	2
32	030-7963	ADAPTER - 45° - 8, VALVE PORTS, P, T, C1, C2	4

ITEM	PART NO.	DESCRIPTION	QTY.
33	119-0157	HITCH PIN	2
34	118-6558	LUBE TUBE	1
35	119-0161	CLAMP, LUBE TUBE	2
36	118-6270	CLAMP, LUBE TUBE	1
37	3J-7355	UNION - 4	1
38	119-0122	HOSE - 60 in. (1520 mm) LUBRICATION	1
39	5P-5007	REDUCER - 8 - 4 VALVE PORT P	1
40	030-7963	UNION - 45° MALE	1
41	5P-3166	TEE SWIVEL - 8 VALVE PORT P	1
42	127-7025	SLEEVE	1
43	119-1535	SPRING	1
44	119-0118	HOSE - 17 in. (432 mm) FLOW CONTROL TO VALVE	1
45	118-6308	ACCUMULATOR MOUNTING ANGLE	1
46	119-0549	STUD - (1/2 - 13 - 2 3/4)	2
47	119-0118	HOSE - 17 in. (432 mm) PUMP TO FILTER	1
48	119-1520	STUD (1/2 - 13 NC X 2 1/4)	1
49	118-6283	SUCTION STRAINER SHIELD	1
50	3J-4818	LOCKWASHER, SHAKEPROOF - 1/2	1
51	3H-3680	JAM NUT (1/2 - 13)	1
52	1F-7958	HEX NUT (1/2 - 13)	5
53	118-6284	SEAL RING .25 in. (6.4 mm) THICK	1
54	118-6550	WIRING ASSEMBLY	1
55	118-6654	TUBE, UPPER SUCTION	1
56	9S-7739	UNION	1
57	118-6653	TUBE, LOWER SUCITON	1
58	8T-9043	CAPSCREW (5/16 - 16 X 3/4 G5)	2
59	3B-4505	LOCKWASHER (5/16)	2
60	118-6286	SEAL RING .06 in. (1.5 mm) THICK	4
61	118-6277	FLOW CONTROL VALVE	1
62	118-6278	TUBE ASSEMBLY	1
63	119-1511	INDICATOR LAMP	1
64	118-5843	ADAPTER, -8	1
70	119-0562	CAPSCREW, HEX HEAD (1/2 - 13 X 5 G5 SS*)	1
71	8T-4223	WASHER (1/2)	1
72	3B-8822	ELBOW, STREET - 90°	1
73	100843	COVER +	1
74	8M-4986	O-RING	1
75	138-2407	CAPSCREW (5/16 - 16 X 3/4 G5)	3

* SS - SELF SEALING

+ No Caterpillar part number at this time.

HYDRAULIC CONTROL GROUP - STANDARD PTO (CURRENT)



**HYDRAULIC CONTROL GROUP - STANDARD PTO
(CURRENT)
(S/N 0401030 and LATER)**

ITEM	PART NO.	DESCRIPTION	QTY.
1	1D-5120	NUT, JAM (3/4 - 10)	2
2	118-6318	FILTER BRACKET	1
3	030-7943	ELBOW - 45° - 8 ORB/-8JIC PORT C1,C2,T	3
4	118-6321	FILTER HEAD	1
5	118-6322	FILTER ELEMENT	1
6	8L-6557	ADAPTER - 1/8 NPT / - 8	1
7	061-9463	ADAPTER - 1/4 NPT / - 8	4
8	7J-4026	ELBOW - 90° - 4 ORB/-4JIC PORT L,G	2
9	030-7948	ELBOW - 90° - 8 ORB/-8JIC, PORT P	1
10	1P-7625	ELBOW - 90° - 8 ORB/-10JIC, ACCUMULATOR	1
11	8M-0547	ELBOW - 90° - 8 JIC UNION	3
12	119-0131	YOKES	2
13	5H-8853	O-RING	2
14	9M-7958	CLAMP	1
15	118-7012	ACCUMULATOR	1
16	119-2164	STRAINER	1
17	119-0156	CLEVIS PIN	2
18	3K-9042	RETAINING RING	4
19	118-6332	HOSE, 17 in. (432 mm) VALVE TO GAUGE PORT	1
20	119-0115	HOSE, 24 in. (610 mm) VALVE TO T, CR	2
21	119-0118	HOSE, 17 in. (432 mm) VALVE TO B	1
22	119-0120	HOSE, 50 in. (1,270 mm) VALVE TO CL	1
23	8T-4223	LOCKWASHER (1/2)	2
24	118-6313	ACCUMULATOR CLAMP BRACKET	1
25	367-2032	CONTROL VALVE ASSEMBLY	1
26	158-6530	QUICK DISCONNECT, GAUGE PORT	1
27	118-6301	SUCTION HOSE	1
28	118-6265	CONNECTOR	1
29	105055 *	HOSE - VALVE TO ACCUMULATOR	1
30	119-2209	ADJUSTER	2
31	6F-0612	NUT, HEX (1/4 - 28)	2
32	6M-7476	ELBOW 45° - 10 ORB/-10 JIC PORT A	
33	119-0157	HITCH PIN	2
34	138-2409	LUBE TUBE	1
35	119-0161	CLAMP	2

ITEM	PART NO.	DESCRIPTION	QTY.
36	118-6270	CLAMP	1
37	3J-7355	UNION - 4	1
38	119-0122	HOSE, LUBE	1
39	100796 *	ADAPTER, -16 ORB /-8 JIC	1
40	030-7963	UNION - 45°, -8/-8	1
41	138-2438	ELBOW 90°, -16 ORB/-8 JIC	1
42	127-7025	SLEEVE, GAUGE PORT	1
43	119-1535	SPRING, SUCTION STRAINER	1
44	119-0118	HOSE - 17 in. (432 mm), FILTER TO VALVE	1
45	118-6308	ACCUMULATOR MOUNTING ANGLE	1
46	119-0549	STUD (1/2 - 13 X 2 3/4)	2
48	119-1520	STUD (1/2 - 13 X 2 1/4)	1
49	118-6283	STRAINER SHIELD	1
50	3J-4818	LOCKWASHER (1/2)	1
51	3H-3680	NUT, JAM (1/2 - 13)	1
52	6V-8188	NUT (1/2 - 13)	5
53	118-6284	SEAL RING .25 in. (6.4 mm) THICK	1
54	5M-6214	PLUG, 1/8 NPT	1
55	118-6654	UPPER SUCTION TUBE	1
56	9S-7739	UNION	1
57	118-6653	LOWER SUCTION TUBE	1
58	8T-9043	CAPSCREW, HEX HD (5/16 - 18 X 7/8 GD 8 Z)	2
59	3B-4505	LOCKWASHER (5/16)	2
60	118-6286	SEAL RING .06 in. (1.5 mm) THICK	1-2
61	5M-3062	CAPSCREW, HEX HD (3/8 - 16 X 3/4 GD 8 Z)	2
62	3B-4506	LOCKWASHER (3/8)	2
63	3B-8822	ELBOW, 90° 1/8 NPT	1
64	100843 *	COVER	1
65	138-2407	CAPSCREW, BUTTON HEAD (#10-24 X 5/8, SS) +	3
66	8M-4986	O-RING	1
67	8K-0973	HOSE, 14 in. (356 mm) PUMP TO FILTER	1
68	030-7963	ELBOW, 45° - 8 JIC	1

+ SS - Self Sealing

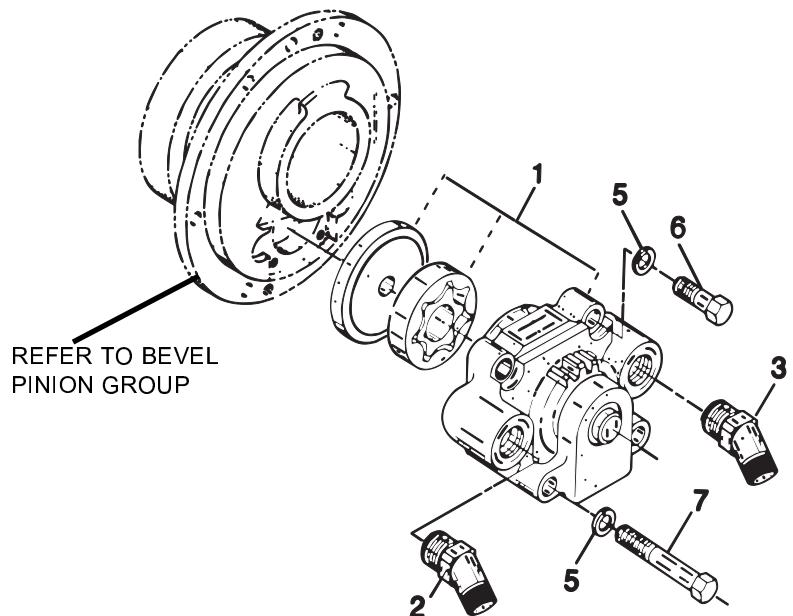
* PACCAR Winch Division part number, Caterpillar part number was not available at time of printing.

! NOTE !

Effective mid-year 2005, the original pump-to-filter hose, one of item 44, part number 119-0118 was replaced with a shorter hose 8K-0973 and a long tube elbow 138-2429. These two parts were identified as items 67 and 68 in some manuals. It was found that the elbow may fail on some winches due to fatigue or vibration.

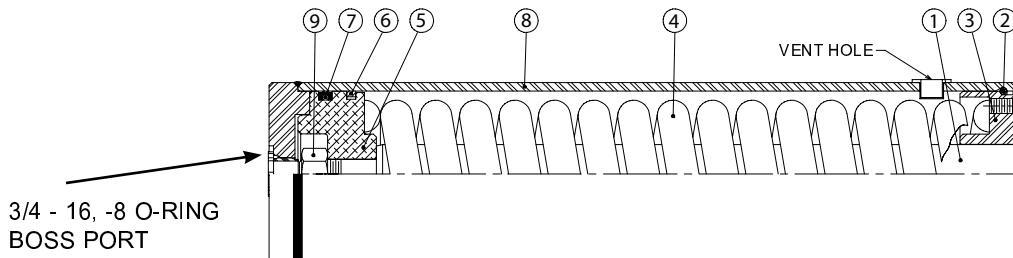
Beginning in April 2006, the long tube elbow mentioned above, has been replace by 45 degree elbow, P/N 030-7963. One of hose item 44, P/N 119-0118 will continue to be used between the filter outlet and the control valve inlet (P).

PUMP GROUP



ITEM	PART NO.	DESCRIPTION	QTY.
1	118-6979	PUMP ASSEMBLY	1
2	123-4411	ELBOW, 45° -8, PRESSURE SIDE	1
3	031-6303	ELBOW, 45° SUCTION	1
5	3B-4504	LOCKWASHER (1/4)	4
6	7X-0264	CAPSCREW, HEX HEAD (1/4 - 20 X 1 1/2 G8)	2
7	7X-0266	CAPSCREW, HEX HEAD (1/4 - 20 X 3 G8)	2

ACCUMULATOR ASSEMBLY - 81959

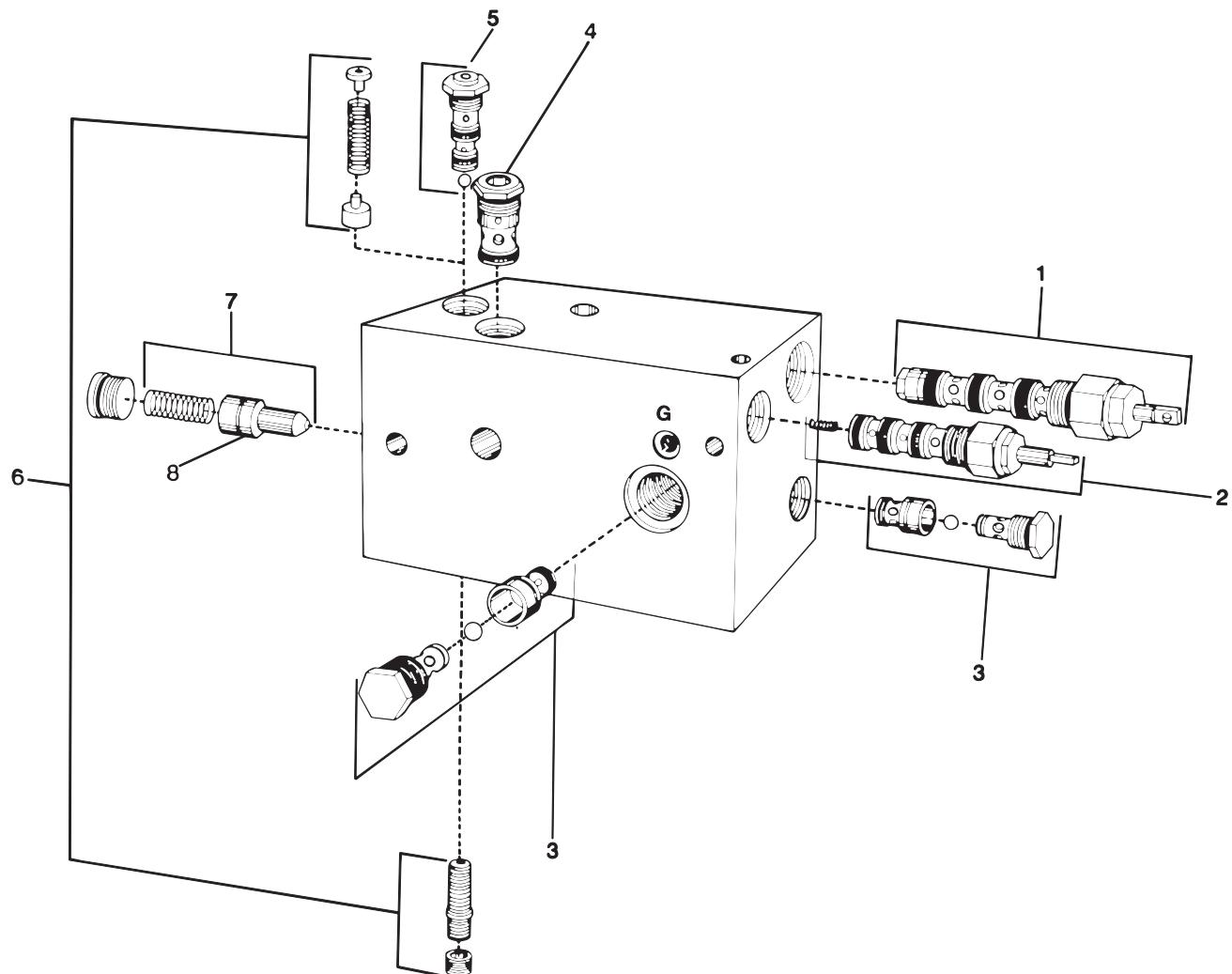


⚠ WARNING ⚠

! DANGER - 2,000 LB (900 KG) SPRING PRELOAD !
 USE PRESS FOR DISASSEMBLY PER SERVICE INSTRUCTIONS.
 SEVERE PERSONAL INJURY OR DEATH MAY RESULT IF ROD
 GUIDE REMOVAL IS ATTEMPTED WITHOUT A PRESS.

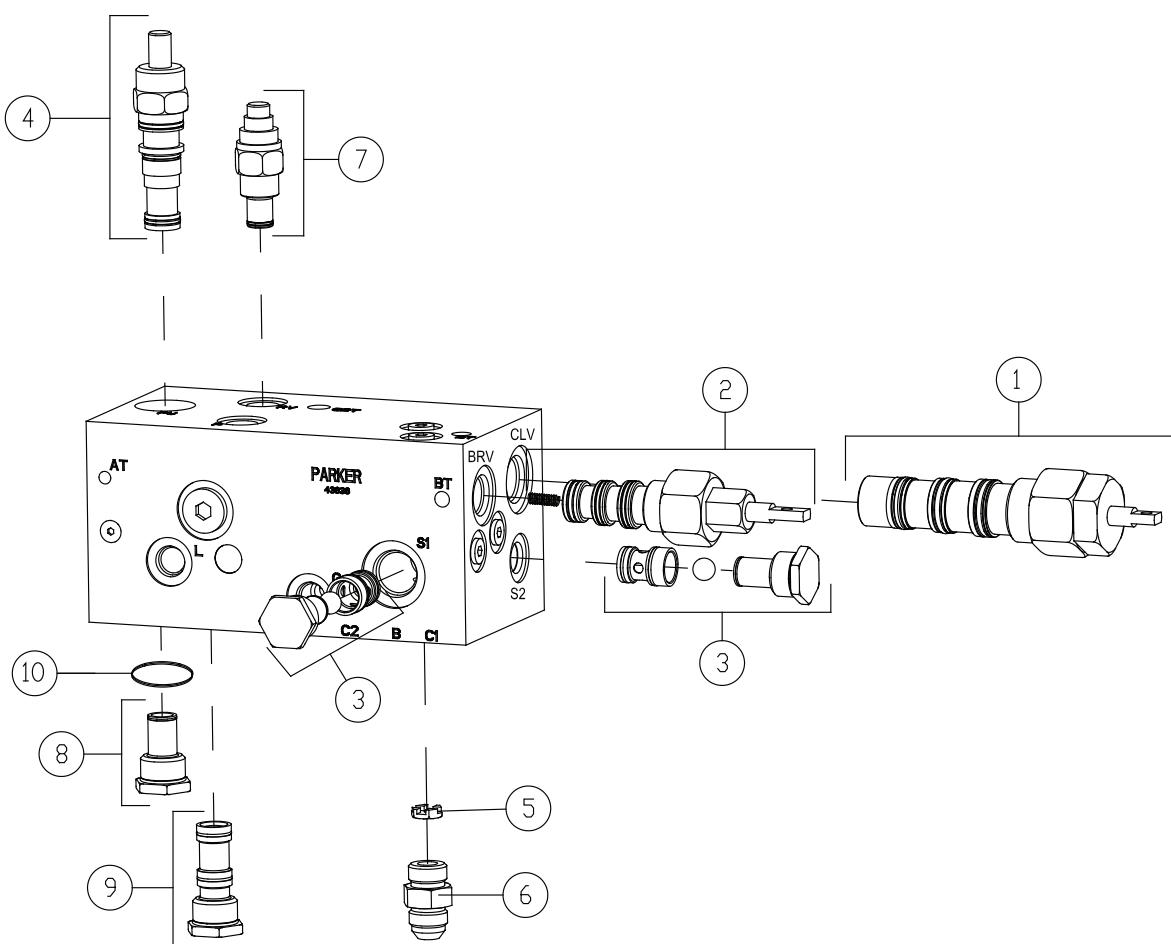
ITEM	PART NO.	DESCRIPTION	QTY.
1	NSS	ROD	1
2	096-8139	RETAINING RING	1
3	NSS	ROD GUIDE	1
4	NSS	SPRING	1
5	NSS	PISTON	1
6	119-0554	CAST IRON PISTON RING	1
7		SEAL KIT (PACCAR P/N 107956)	1
8	NSS	BARREL ASSEMBLY	1
9		NUT (PACCAR P/N 22702)	1
-	123-4413	SEAL KIT (CONTAINS 2, 6 & 7)	
NSS = Not Serviced Separately.			

**CONTROL VALVE ASSEMBLY
(118-6978 - EARLY)**



ITEM	PART NO.	DESCRIPTION	QTY
1	119-1522	DIRECTIONAL CONTROL CARTRIDGE	1
-----	119-2129	SEAL KIT FOR ITEM 1	1
2	119-1523	BRAKE CONTROL CARTRIDGE	1
-----	119-2127	SEAL KIT FOR ITEM 2	1
3	119-1525	SHUTTLE VALVE ASSEMBLY	2
-----	119-1631	SEAL KIT FOR ITEM 3	2
4	119-0564	CHECK VALVE CARTRIDGE	1
-----	119-2126	SEAL KIT FOR ITEM 4	1
5	119-1527	DIFFERENTIAL UNLOADING PILOT VALVE CARTRIDGE	1
-----	119-1630	SEAL KIT FOR ITEM 5	1
6	119-0170	DIF. UNLOADING VALVE REPAIR KIT, INCLUDES ITEM 5	1
7	119-0169	UNLOADING POPPET ASSEMBLY	1
8	119-1577	O-RING	1

CONTROL VALVE ASSEMBLY (CURRENT)

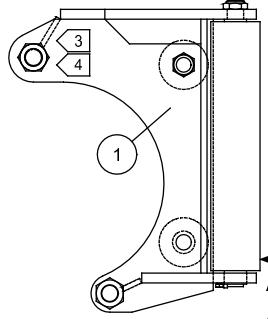


ITEM	PART NO.	DESCRIPTION	QTY
1	119-1522	CLUTCH CONTROL VALVE CARTRIDGE (CLV)	1
	119-2129	SEAL KIT FOR ITEM 1	1
2	119-1523	BRAKE CONTROL VALVE CARTRIDGE (BRV)	1
	119-2127	SEAL KIT FOR ITEM 2	1
3	119-1525	SHUTTLE VALVE (S1, S2)	2
	119-1631	SEAL KIT FOR ITEM 3	2
4	40166 *	DIFFERENTIAL PRESSURE UNLOADING CARTRIDGE (PU)	1
	125-3325	SEAL KIT FOR ITEM 4	1
5	105094 *	ORIFICE DISC .095	1
6	8M-0505	ADAPTER -8 ORB -8 JIC - BRAKE PORT	1
7	105629 *	RELIEF VALVE CARTRIDGE (RV)	1
	63616 *	SEAL KIT FOR ITEM 7	1
8	105631 *	CHECK VALVE (CV)	1
	63617 *	SEAL KIT FOR ITEM 8	1
9	105630 *	LOGIC CONTROL CARTRIDGE (LC)	1
	63618 *	SEAL KIT FOR ITEM 9	1
10	106929*	ORIFICE DISC	1

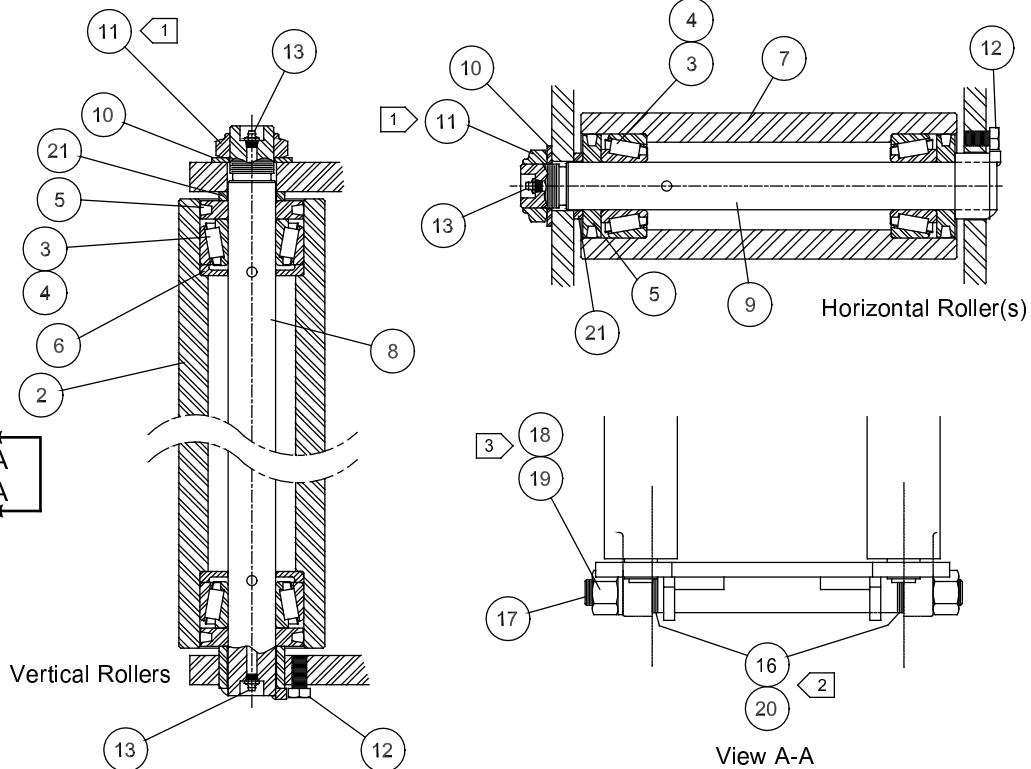
* PACCAR part numbers shown; no Caterpillar part numbers available at this time.

FAIRLEAD ASSEMBLY

Standard 3-roller fairlead consists of two vertical rollers, and one horizontal roller in the top position.



Four roller fairlead adds a second horizontal roller in the bottom position.



NOTES:

- ① WHILE TURNING ROLLER, TIGHTEN NUT. WHEN ROLLER WILL NO LONGER TURN, BACK OFF NUT 1/8 TURN.
- ② SHIM BOTH SIDES AS REQUIRED TO REDUCE END PLAY TO LESS THAN 0.030 in. (0.8 mm).
- ③ TIGHTEN NUT TO 200 - 300 LB·FT (271 - 407 N·m) TORQUE.
- ④ WHEN INSTALLING FAIRLEAD ON WINCH IN FIELD, REMOVE ORIGINAL CABLE GUARD SPACER TUBE AND RE-USE UPPER TIE BOLT (118-6298), LOCKWASHER (119-1623) AND NUT (2B-2673).

THOROUGHLY PACK ALL FAIRLEAD BEARINGS WITH MULTI-PURPOSE GREASE ON ASSEMBLY.

ITEM	PART NO.	DESCRIPTION	QUANTITY	
			3 ROLLER	4 ROLLER
	118-7211	3 ROLLER FAIRLEAD ASSEMBLY		
	118-7213	4 ROLLER FAIRLEAD ASSEMBLY		
1	118-6935	FAIRLEAD FRAME	1	1
2	118-6649	ROLLER - VERTICAL	2	2
3	119-2174	BEARING CONE	6	8
4	3K-3963	BEARING CUP	6	8
5	118-5803	DUST GUARD ASSEMBLY	6	8
6	119-2186	GREASE RETAINER	4	4
7	124-0763	ROLLER - HORIZONTAL	1	2
8	118-6648	SHAFT - VERTICAL	2	2
9	118-6604	SHAFT - HORIZONTAL	1	2
10	119-2211	WASHER	3	4
11	205-8260	LOCK NUT	3	4
12	8T-9383	CAPSCREW, HEX HEAD (1/2 - 13 X 3/4)	3	4
13	3B-8489	GREASE FITTING	5	6
16	120-7634	WASHER - .030 in. (.8 mm)	5	6
17	118-6298	TIE BOLT	1	1
18	119-1623	LOCK WASHER (1 3/4)	1	1
19	2B-2673	NUT, HEX (1 3/4 - 5)	1	1
20	123-4410	SHIM - .125 in. (3.18 mm)	6-AR	6-AR
21	120-7536	SPACER	3	4
	174-4770	4th ROLLER KIT (CONTAINS ONE EACH 7, 9, 10, 11, 12, 13, 21 AND TWO EACH 3, 4 & 5)	1	-
AR - AS REQUIRED				

CONTROL CABLE GUARD GROUP

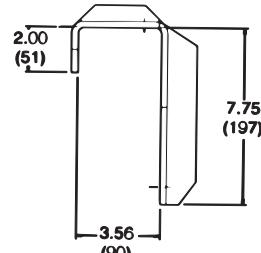
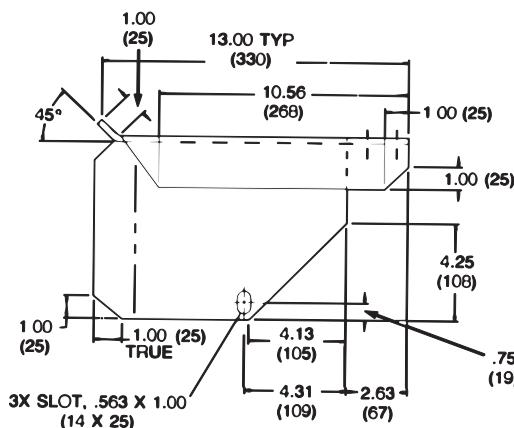
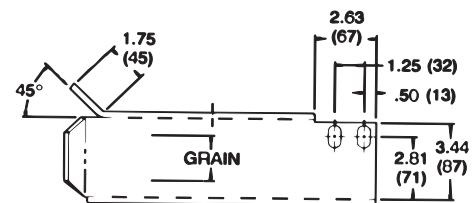
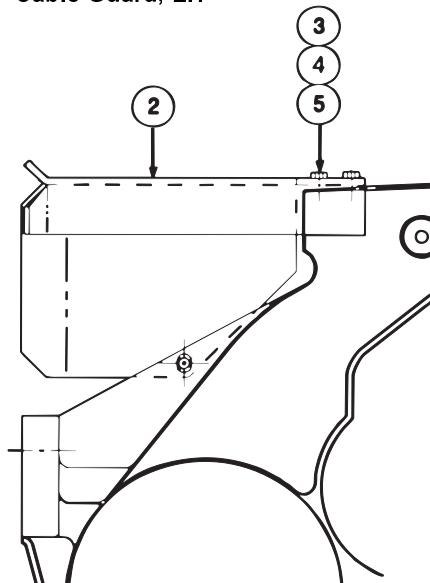
Material:

0.25 in. (6 mm) thick, hot rolled, descaled plate. ASTM A36 or AISI 1015.

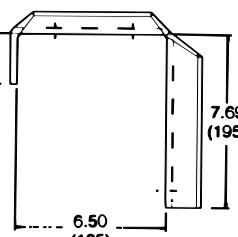
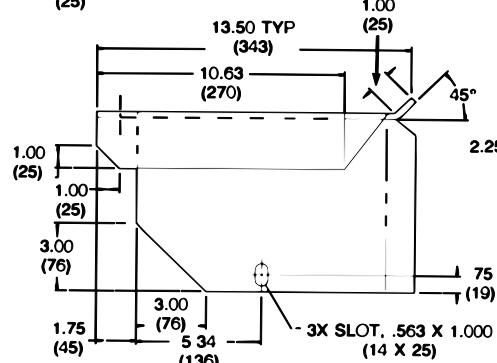
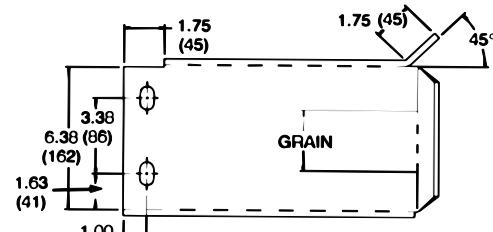
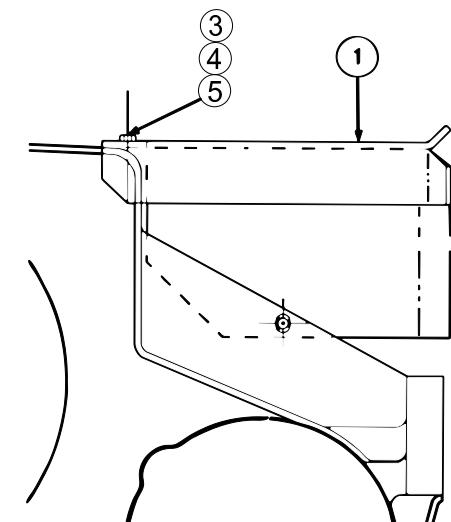
Bend Radii:

0.25 in. (6 mm) minimum, corner notches at bend lines to be 60° to 90° .

Cable Guard, LH



Cable Guard, RH



ITEM	PART NO.	DESCRIPTION	QTY.
1	128-1999	CABLE GUARD, RH	1
2	128-1998	CABLE GUARD, LH	1
3	5P-2228	CAPSCREW, HEX HEAD (1/2 -13 X 1 G8)	6
4		LOCKWASHER (1/2)	6
5	8T-4223	WASHER (1/2)	6

Cable Guard Kit 128-2000 contains items 1 - 5 above.

RECOMMENDED FASTENER TORQUE

Bolt Dia. Inches	Thds Per Inch	Torque (LB-FT)			
		Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed
1/4	20 28	8	6	12	9
5/16	18 24	17	13	24	18
3/8	16 24	31	23	45	35
7/16	14 20	50	35	70	50
1/2	13 20	75	55	110	80
9/16	12 18	110	80	150	110
5/8	11 18	150	115	210	160

Bolt Dia. Inches	Thds Per Inch	Torque (LB-FT)			
		Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed
3/4	10 16	265	200	380	280
7/8	9 14	420	325	600	450
1	8 14	640	485	910	680
1 1/8	7 12	790	590	1290	970
1 1/4	7 12	1120	835	1820	1360
1 3/8	6 12	1460	1095	2385	1790
1 1/2	6 12	1940	1460	3160	2370

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