

INSTALLATION AND PARTS MANUAL

MODEL PA56 for D6T Tier 4

with CATERPILLAR ELECTRONIC CONTROL GROUP

TABLE OF CONTENTS

Mounting Group.....	2-4
Control Group.....	5-14
Bevel Gear Group	15
Case and Covers.....	16-17
Clutch Shaft Group.....	18-19
Clutch Assembly.....	20
Brake Assembly	21
Fourth Shaft Group.....	22
Idler Shaft Group w/Freespool	23
Hydraulic Control Group.....	24-26
Control Valve Assembly	27
Cable Drum Group	28-29
Freespool Cylinder Assembly.....	30
Pump Group	31
Accumulator Assembly.....	31
Cover Group.....	32
Fairlead Assembly.....	33

NOTE: Control Group supplied by Caterpillar

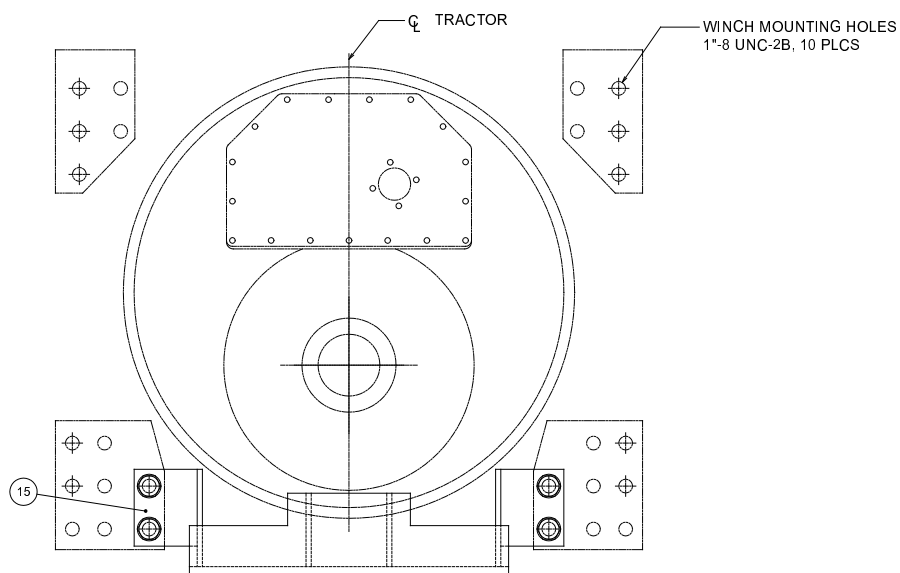
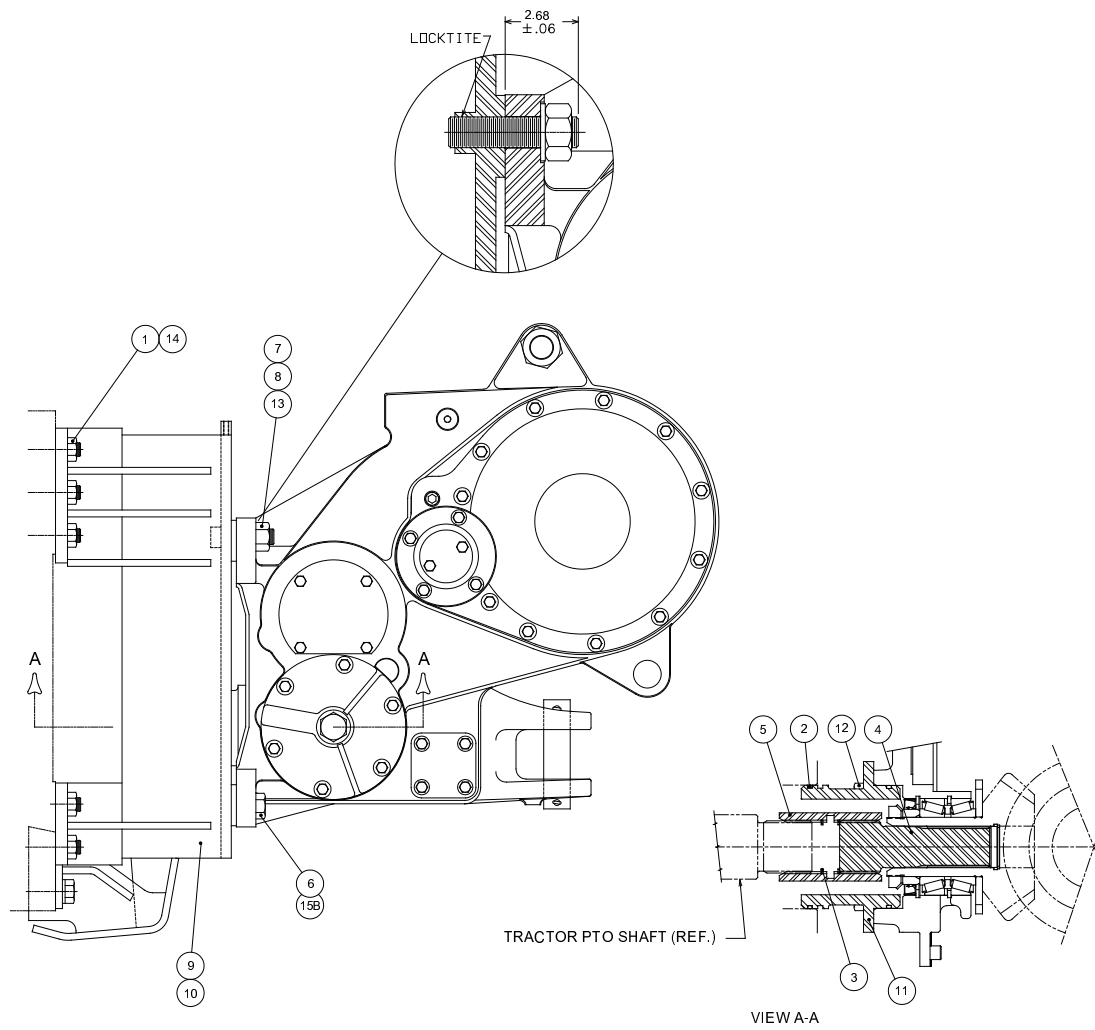
MODEL NUMBER DESCRIPTION

PA56	B	0	0	1	0	0	E
Basic Winch Model	Bevel Gear Ratio B-1.27:1 E-2.78:1	0-Overwind	0-Standard Brake	1-With Freespool	0-Four Shaft Winch	0-No Fairlead 3-3 Roller Fairlead 4-4 Roller Fairlead	E-Electronic Control

PACCAR Winch

PO Box 547 Broken Arrow, OK 74012
Tel (918) 251-8511 / Fax (918) 259-1575
www.paccarwinch.com

**PA56
MOUNTING GROUP
D6T Tier 4**



VIEW LOOKING AT TRACTOR REAR FACE

ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	119-0171	STUD (1 - 8 X 3-1/4 G8)	10
2	8S-5654	O-RING	3
3	002-3455	RETAINING RING	2
4	118-6595	PTO SHAFT	1
5	118-5863	COUPLING	1
6	7X-0406	CAPSCREW, HEX HEAD (1 - 8 X 3 G8 Z)	4
7	4J-5977	NUT, HEX (1-1/8 - 7)	4
8	133-9224	STUD (1-1/8 - 7 X 4-3/4)	4
9	118-6929	ADAPTER, RH	1
10	118-6930	ADAPTER, LH	1
11	118-6537	PILOT, PTO	1
12	5P-2228	CAPSCREW, HEX HEAD (1/2 - 13 X 1 G8 Z)	4
13	7X-0531	WASHER, HARDENED (1-1/8)	4
14	6V-8190	NUT, HEX (1 - 8)	10
15	3W-1356	ECOLOGY DRAIN GROUP (INCLUDES ITEMS 15A, B & C)	1
15A	3W-1357	GUARD	1
15B	8T-5361	WASHER, HARDENED (1)	8
15C	7X-0400	CAPSCREW, HEX HEAD (1 - 8 X 1-1/2 G8 Z)	4

MOUNTING GROUP INSTRUCTIONS

- PTO rotation is counterclockwise (CCW) as viewed from the rear of the tractor. Remove the tractor PTO cover.
- Remove paint, dirt, rust, oil and grease from mounting surfaces of tractor, winch and winch adapters. If this material is left between the mounting surfaces, movement of the clamped members will result in loosening mounting fasteners and possible fastener or mounting component failure.
- Coat splines of PTO shaft (4), with multi-purpose grease and install into bevel pinion gear of winch.
- Install retaining rings (3), in coupling (5). Trial fit the coupling onto the tractor PTO shaft and the winch PTO shaft to make certain the splines fit well and there are no rough areas on either shaft that need to be smoothed. Install coupling onto winch PTO shaft with deepest bevel end away from winch.
- Install O-rings (2), onto PTO pilot (11). NOTE: As the same PTO pilot may be used on several adaptations, typically only one O-ring groove will engage and seal in the tractor PTO opening.
- Apply Loctite 271, 277 or equivalent to threads and install studs (8) into winch adapters (9, 10) to a height of 2-5/8 in. (67 mm).
- Apply Loctite 242, 243 or equivalent to the threads of capscrews (6), and studs (8). Install the winch adapters (9, 10) onto the winch then install capscrews (6), washers (13) and nuts (7) onto studs (8). At this time, only lightly hand-tighten the capscrews (6), and nuts (21).
- Fill winch to proper level with recommended oil.

WARNING

Winch weighs approximately 2500 lb. (1134 kg) without oil, cable or tractor adapters. Make certain lifting equipment has adequate capacity to eliminate the possibility of damage or injury. Attempting to lift the winch with inadequate equipment may result in personal injury or property damage.

WARNING

DO NOT start the tractor engine until the winch has been filled to the proper level with the recommended oil. Bearing and gear damage may result if the tractor is run without oil in the winch.

PA56
MOUNTING GROUP
D6T Tier 4

There are two methods that may be used to install the winch with adapters onto the rear face of the tractor:

Method A: Involves removing winch guards and covers to gain access to the bevel gears.

A1. Apply Loctite 271, 277 or equivalent to clean, dry threads and install studs (1) into rear face of tractor until they bottom in the stud bores but no lower than a height of 1.80 in. (46 mm) measured from the machined surface of the tractor rear face mounting pads to the end of the stud.

A2. Apply general purpose grease to the PTO pilot o-rings. Lift winch into position and install onto rear of tractor taking care to guide the PTO shaft/coupling onto the tractor PTO shaft. It may be necessary to rotate the winch bevel pinion gears to align the winch shaft with the tractor shaft. It will be necessary to remove the guard group and top cover from the winch to gain access to the bevel gears.

A3. Apply Loctite 242 or 243 to clean dry threads of studs (1) and install nuts (14).

NOTE: Keep the winch in a level position to avoid binding of the PTO pilot and shafts.

With the weight of the winch supported by the hoist, use a cross pattern to evenly tighten all mounting fasteners to approximately 25% of the recommended torque. Start the tractor engine and listen for any unusual gear train noise that would indicate binding in the PTO shafts or gear train. If no unusual noises are detected, remove the hoist from the winch and continue to evenly tighten all mounting fasteners to recommended torque. Tighten nuts (7) & (14) to 600 lb·ft. (815 N·m) torque. Tighten capscrews (6) to 680 lb·ft (920 N·m) torque. If torque wrench adapters are not available for tightening the nuts (7, 14) they may be tightened as follows: Tighten nuts with a hand wrench to approximately 100 lb·ft. (136 N·m) torque to remove all looseness from the assembly. Mark the position of a wrench flat on each nut, then tighten each nut one (1) additional wrench flat.

Method B: Does not require removal of guards and covers from the winch.

B1. Apply general purpose grease to the PTO pilot o-rings. Lift winch into position and install onto rear of tractor taking care to guide the PTO shaft/coupling onto the tractor PTO shaft. While the winch is supported on the hoist, slightly rotate the winch case to align the PTO coupling on the winch with the PTO shaft of the tractor.

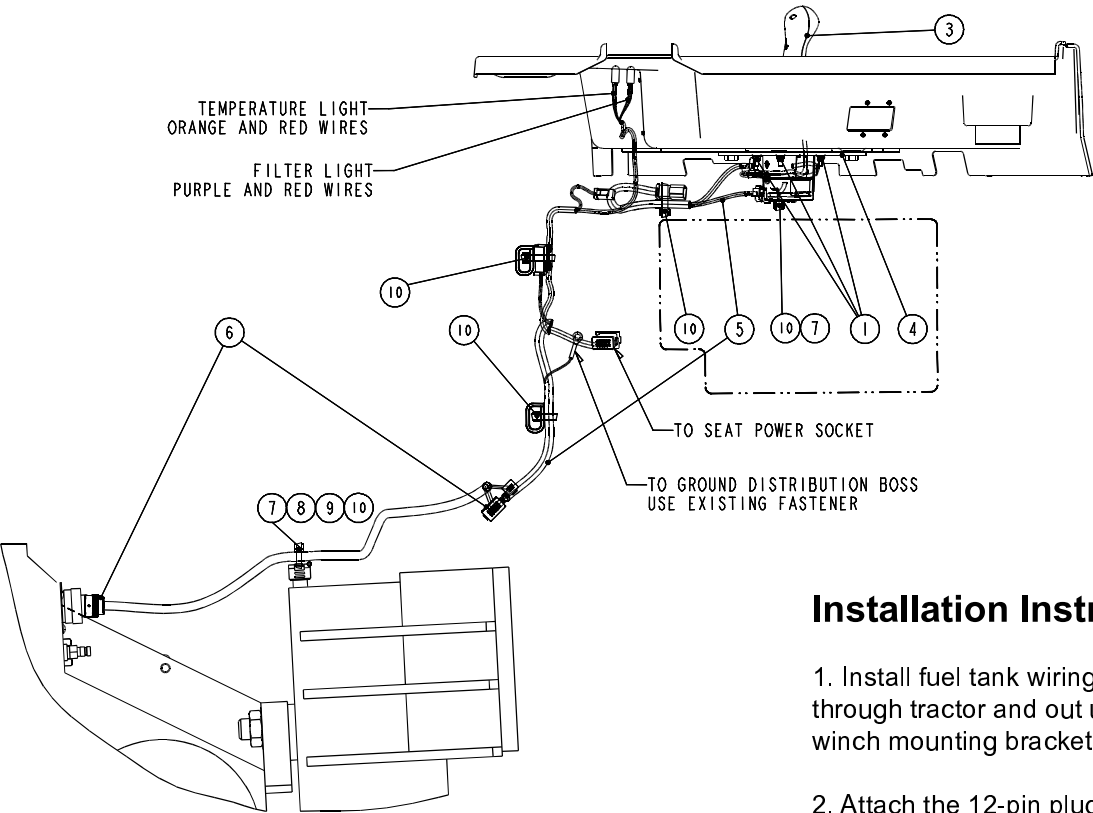
NOTE: Keep the winch in a level position to avoid binding of the PTO pilot and shafts.

B2. Apply Loctite 271, 277 or equivalent to clean dry threads and install studs (1) through winch adapter holes into the tractor rear face. Install the studs till they bottom in the stud bores but no lower than 1.80 in. (46 mm) measured from the machined surface of the tractor rear face mounting pads to the end of the stud. Apply Loctite 242 or 243 to clean dry threads of studs (1) and install nuts (14). With the weight of the winch supported by the hoist, use a cross pattern to evenly tighten all mounting fasteners to approximately 25% of the recommended torque. Start the tractor engine and listen for any unusual gear train noise that would indicate binding in the PTO shafts or gear train. If no unusual noises are detected, remove the hoist from the winch and continue to evenly tightening all mounting fasteners to recommended torque. Tighten nuts (7) & (14) to 600 lb·ft. (815 N·m) torque. Tighten capscrews (6) to 680 lb·ft (920 N·m) torque. If torque wrench adapters are not available for tightening the nuts (7, 14) they may be tightened as follows: Tighten nuts with a hand wrench to approximately 100 lb·ft. (136 N·m) torque to remove all looseness from the assembly. Mark the position of a wrench flat on each nut, then tighten each nut one (1) additional wrench flat.

After winch is installed on tractor and all fasteners tightened to recommended torque, the bevel pinion must be pried toward the tractor. During installation, the pinion may get driven hard into the bevel gears, taking all end-play out of the pinion bearings and back-lash out of the gear set. Insert a pry bar between the clutch shaft and pinion then pry the pinion toward the tractor. A small amount of gear back-lash should be detected when the pinion moves forward.

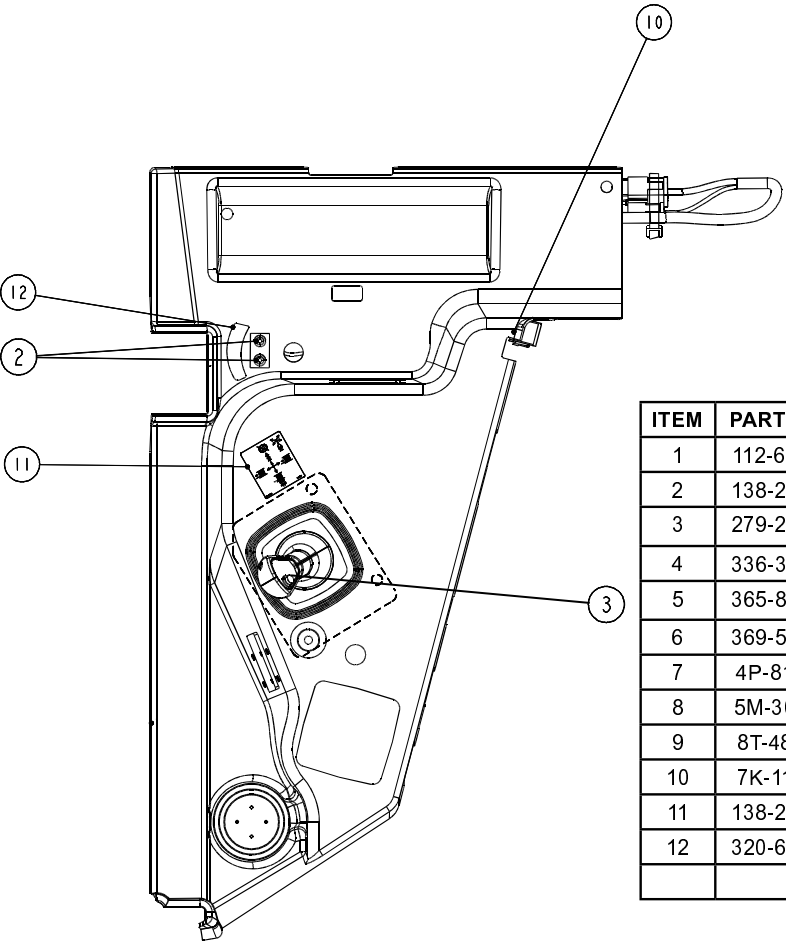
Winch wiring and parts for **WINCH READY** tractors manufactured **BEFORE** October 2012

PA56
CONTROL GROUP
D6T Tier 4



Installation Instructions:

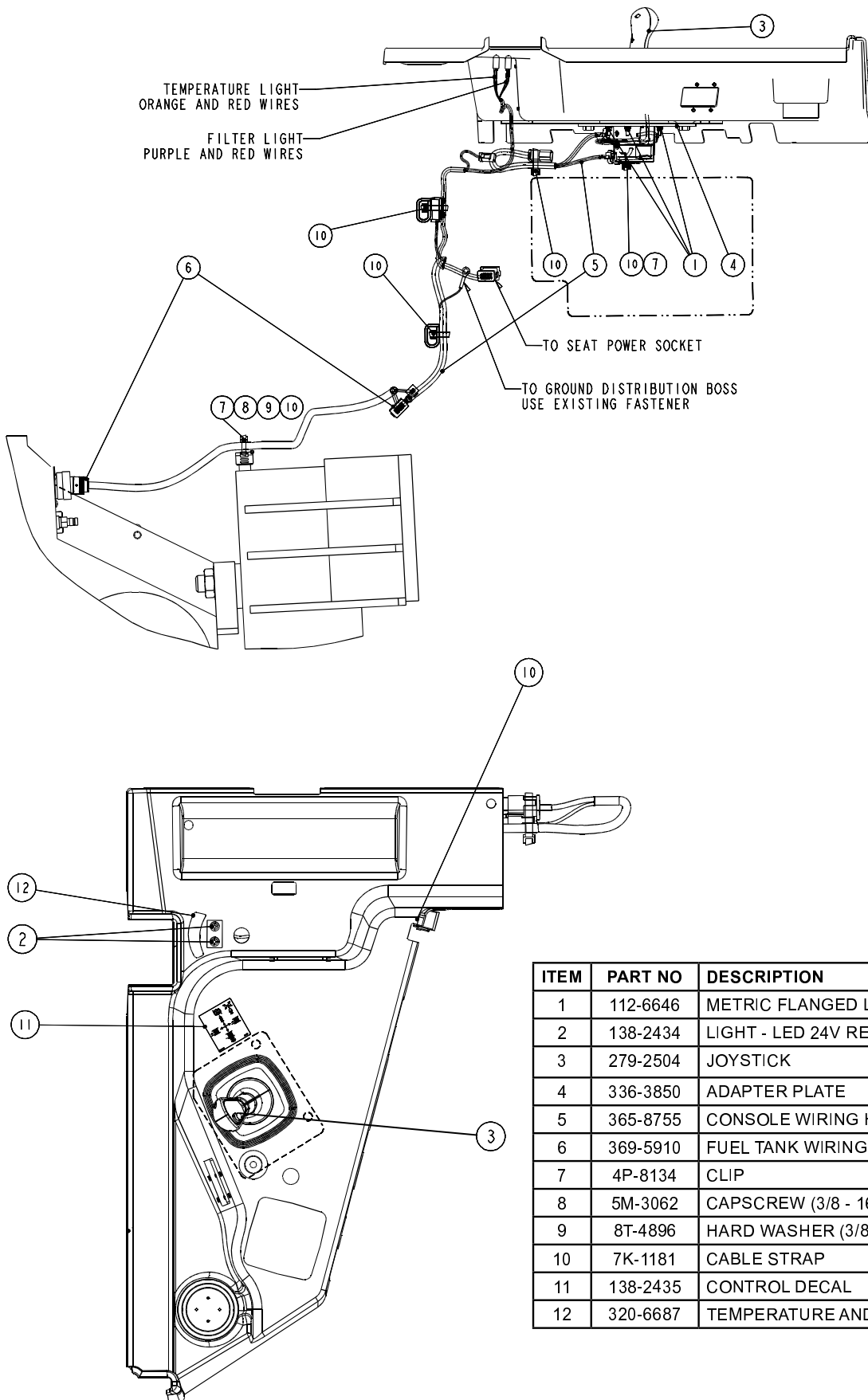
1. Install fuel tank wiring harness (item 6). Route through tractor and out under fuel tank near right winch mounting bracket.
2. Attach the 12-pin plug connector and 4-pin plug connectors on the console wiring harness (item 5) to corresponding receptacle connectors on winch wiring harness (item 6).
3. Secure wiring harness to boss on top of right winch mounting bracket using capscrew (item 8), washer (9), clip (7), and zip tie (item 10) as appropriate.



ITEM	PART NO	DESCRIPTION	QTY
1	112-6646	METRIC FLANGED LOCKNUT (M6 X 1) *	4
2	138-2434	LIGHT - LED 24V RED BIPOLAR *	2
3	279-2504	JOYSTICK *	1
4	336-3850	ADAPTER PLATE *	1
5	365-8755	CONSOLE WIRING HARNESS *	1
6	369-5910	FUEL TANK WIRING HARNESS - INSTALL	1
7	4P-8134	CLIP *	2
8	5M-3062	CAPSCREW (3/8 - 16 X 3/4 G8 Z) *	1
9	8T-4896	HARD WASHER (3/8 Z) *	1
10	7K-1181	CABLE STRAP *	8
11	138-2435	CONTROL DECAL *	1
12	320-6687	TEMPERATURE AND FILTER DECAL *	1
		* INSTALLED AT FACTORY	

Winch wiring and parts for **NON-WINCH READY** tractors manufactured **BEFORE** October 2012

PA56
CONTROL GROUP
D6T Tier 4



ITEM	PART NO	DESCRIPTION	QTY
1	112-6646	METRIC FLANGED LOCKNUT (M6 X 1)	4
2	138-2434	LIGHT - LED 24V RED BIPOLAR	2
3	279-2504	JOYSTICK	1
4	336-3850	ADAPTER PLATE	1
5	365-8755	CONSOLE WIRING HARNESS	1
6	369-5910	FUEL TANK WIRING HARNESS	1
7	4P-8134	CLIP	2
8	5M-3062	CAPSCREW (3/8 - 16 X 3/4 G8 Z)	1
9	8T-4896	HARD WASHER (3/8 Z)	1
10	7K-1181	CABLE STRAP	8
11	138-2435	CONTROL DECAL	1
12	320-6687	TEMPERATURE AND FILTER DECAL	1

Installation Notes - Non-Winch Ready before October 2012

Installation of this control group requires modification of ripper control console cover to allow fitment of the winch control joystick.

To avoid modification of the ripper control cover, it may be replaced with Caterpillar winch control specific console cover part no. 351-6442.

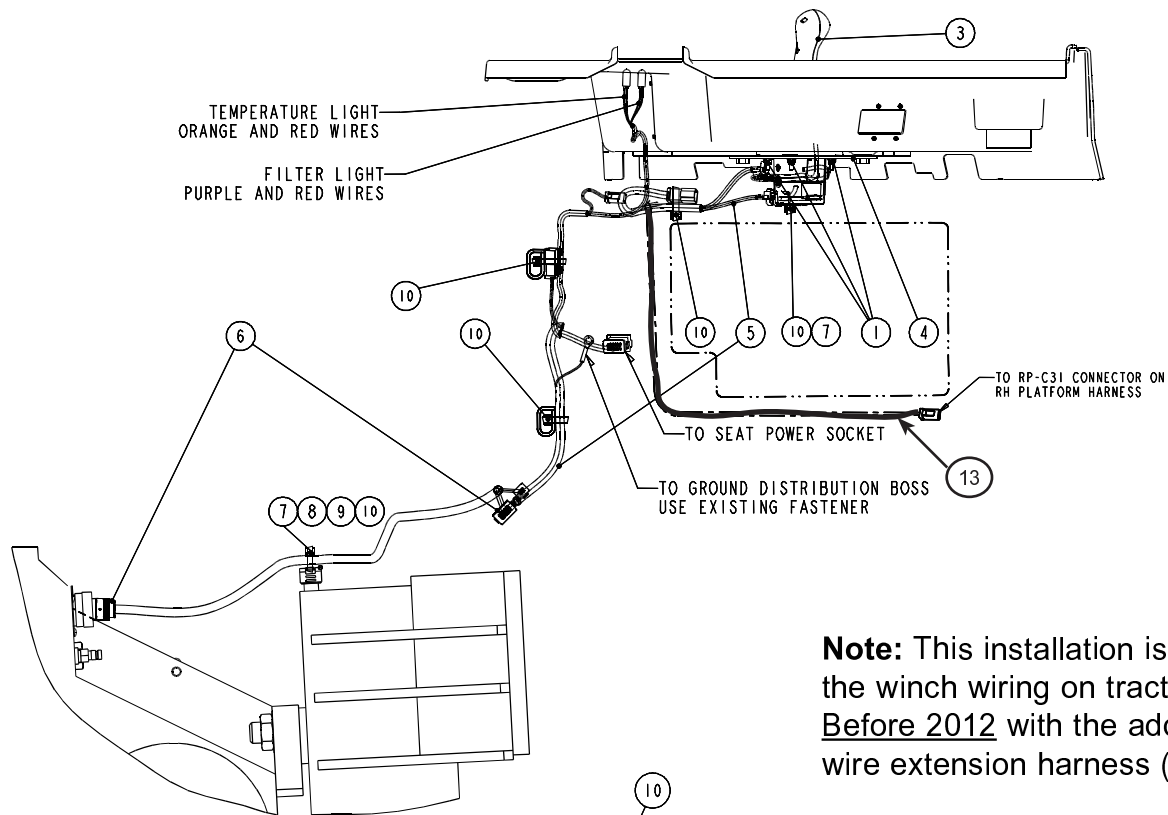
A template of the blade control opening can be used to help trace over existing ripper control opening as the winch control opening will be of identical shape and dimension.

Installation Instructions - Non-Winch Ready before October 2012

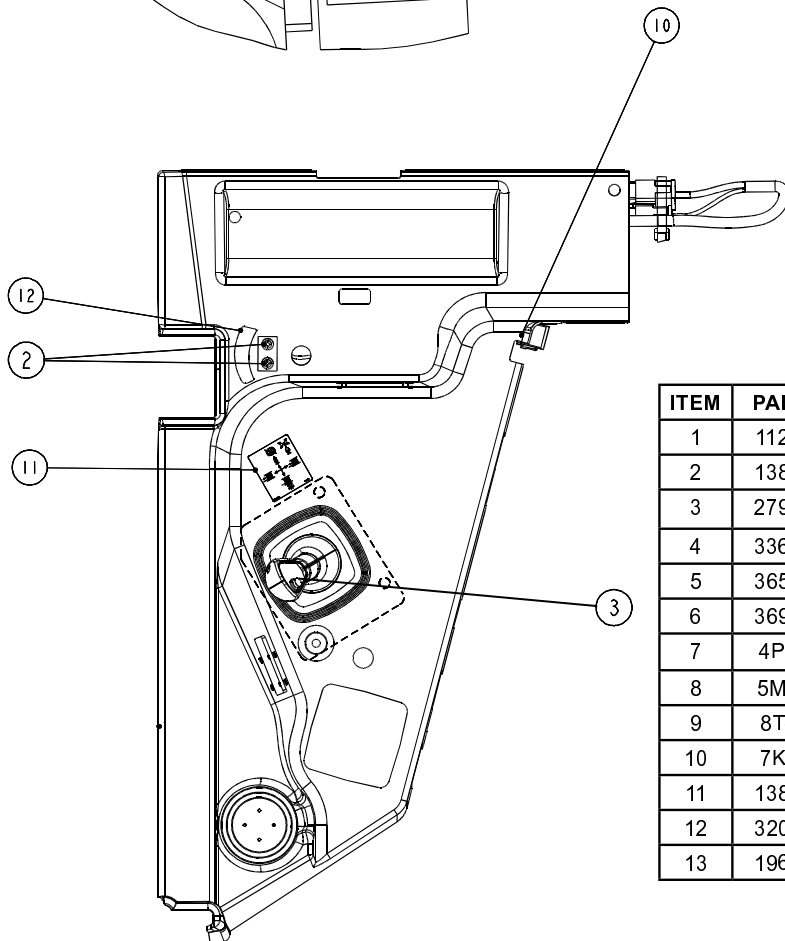
1. Remove plastic console cover
2. Remove ripper control lever or filler plate. Retain fasteners for re-use.
3. Drill $\frac{1}{2}$ " holes in console in locations as shown.
4. Trace outline of area to be trimmed from console cover using dimension shown.
5. Install adapter plate (item 4) in place of ripper control plate removed in step 2 using original Caterpillar screws.
6. Orient control lever assembly so that wiring lead fits through notch in plate. Attached winch control lever assembly (item 3) to adapter plate using locknuts (item 1).
7. Attach 12-pin receptacle connector and 6-pin receptacle connector on console wiring harness (item 5) to the corresponding plug connectors on control lever wiring leads on the joystick.
8. Locate the 12-pin seat power socket receptacle below the console and attach the corresponding plug connector from wiring harness (item 5).
9. Using existing bolt attach ground lead of wiring harness to ground distribution boss near 12-pin seat power socket.
10. Route the fuel tank wiring harness (item 6) through tractor and out under fuel tank near right winch mounting bracket.
11. Attach the 12-pin plug connector and 4-pin plug connectors on the console wiring harness (item 5) to corresponding receptacle connectors on winch wiring harness (item 6).
12. Secure wiring harness to boss on top of right winch mounting bracket using capscrew (item 8), washer (9), clip (7), and zip tie (item 10) as appropriate.
13. Secure wiring harness between operator console and winch with zip ties (item 10) as appropriate.
14. Snap warning lights (item 2) into $\frac{1}{2}$ " holes previously drilled. Attach spade sockets on wiring harness to warning light terminals as shown. Light terminals have no polarity.
15. Re-install plastic console cover.
16. Affix winch operation decal (item 11) near control lever as appropriate.
17. Affix filter and temperature warning light decal (item 12) near lights as appropriate. Ensure decal identifies warning lights correctly per wire colors as shown.

Winch wiring and parts for NON-WINCH READY tractors manufactured AFTER October 2012

PA56
CONTROL GROUP
D6T Tier 4



Note: This installation is similar to the winch wiring on tractors built Before 2012 with the addition of wire extension harness (item 13).



ITEM	PART NO	DESCRIPTION	QTY
1	112-6646	METRIC FLANGED LOCKNUT (M6 X 1)	4
2	138-2434	LIGHT - LED 24V RED BIPOLAR	2
3	279-2504	JOYSTICK	1
4	336-3850	ADAPTER PLATE	1
5	365-8755	CONSOLE WIRING HARNESS	1
6	369-5910	FUEL TANK WIRING HARNESS	1
7	4P-8134	CLIP	2
8	5M-3062	CAPSCREW (3/8 - 16 X 3/4 G8 Z)	1
9	8T-4896	HARD WASHER (3/8 Z)	1
10	7K-1181	CABLE STRAP	8
11	138-2435	CONTROL DECAL	1
12	320-6687	TEMPERATURE AND FILTER DECAL	1
13	196-2695	2 WIRE EXTENSION HARNESS	1

Installation Notes - Non-Winch Ready after October 2012

PA56
CONTROL GROUP
D6T Tier 4

Installation of this control group requires modification of ripper control console cover to allow fitment of the winch control joystick. To avoid modification of the ripper control cover, it may be replaced with Caterpillar winch control specific console cover part no. 351-6442.

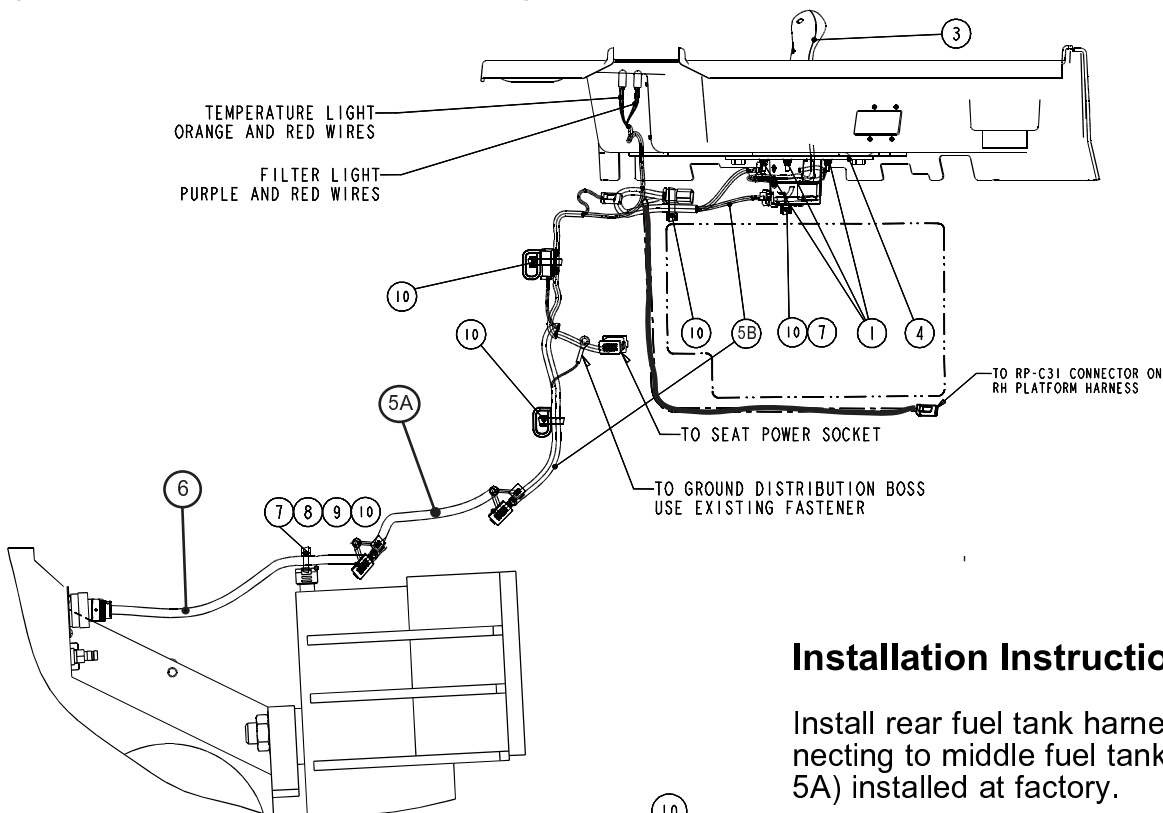
A template of the blade control opening can be used to help trace over existing ripper control opening as the winch control opening will be of identical shape and dimension.

Installation Instructions - Non-Winch Ready after October 2012

1. Remove plastic console cover
2. Remove ripper control lever or filler plate. Retain fasteners for re-use.
3. Drill ½" holes in console in locations as shown.
4. Trace outline of area to be trimmed from console cover using dimension shown.
5. Install adapter plate (item 4) in place of ripper control plate removed in step 2 using original Caterpillar screws.
6. Orient control lever assembly so that wiring lead fits through notch in plate. Attached winch control lever assembly (item 3) to adapter plate using locknuts (item 1).
7. Attach 12-pin receptacle connector and 6-pin receptacle connector on console wiring harness (item 5) to the corresponding plug connectors on control lever wiring leads on the joystick.
8. Locate the 12-pin seat power socket receptacle below the console and attach the corresponding plug connector from wiring harness (item 5).
9. Using existing bolt attach ground lead of wiring harness to ground distribution boss near 12-pin seat power socket.
10. Route the fuel tank wiring harness (item 6) through tractor and out under fuel tank near right winch mounting bracket.
11. Attach the 12-pin plug connector and 4-pin plug connectors on the console wiring harness (item 5) to corresponding receptacle connectors on winch wiring harness (item 6).
12. Remove tractor seat and floorboards. Connect 2-pin receptacle connector of 2 wire extension harness (Item 13) to 2 pin plug connector on console wiring harness (Item 5) and route underneath control station floor area. Attach 2-pin plug connector of wire extension harness to 2-pin receptacle connector of rear attachment connector RP-C31. Removal tractor seat and floorboard.
13. Secure wiring harness to boss on top of right winch mounting bracket using capscrew (item 8), washer (9), clip (7), and zip tie (item 10) as appropriate.
14. Secure wiring harness between operator console and winch with zip ties (item 10) as appropriate.
15. Snap warning lights (item 2) into ½" holes previously drilled. Attach spade sockets on wiring harness to warning light terminals as shown. Light terminals have no polarity.
16. Re-install plastic console cover.
17. Affix winch operation decal (item 11) near control lever as appropriate.
17. Affix filter and temperature warning light decal (item 12) near lights as appropriate. Ensure decal identifies warning lights correctly per wire colors as shown.

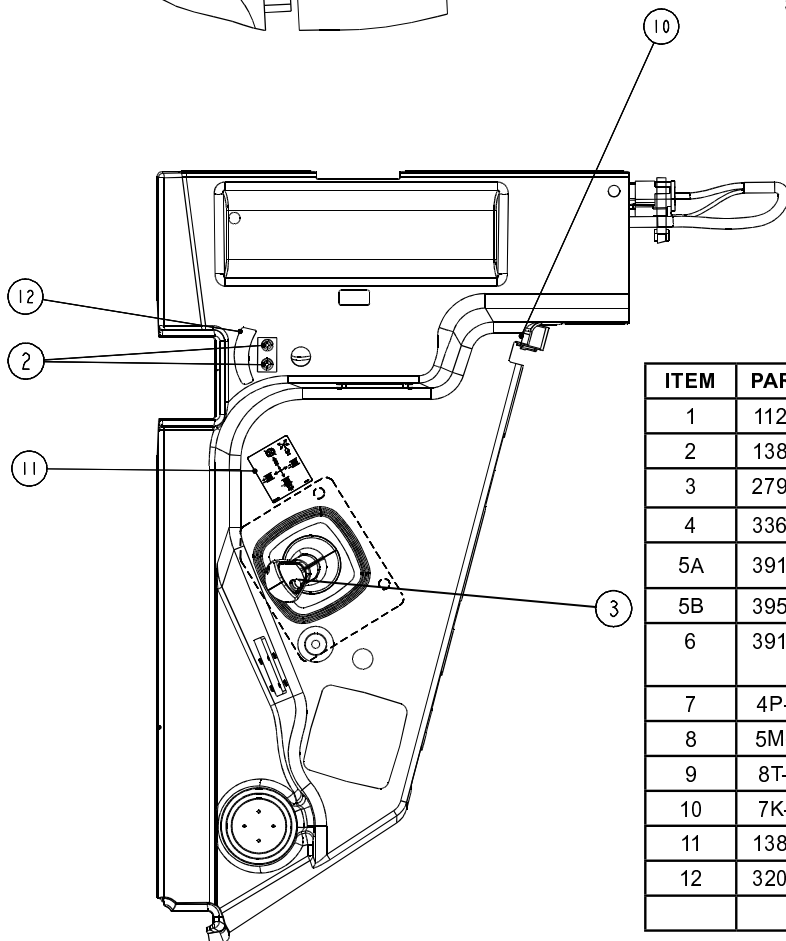
**Winch wiring and parts for WINCH READY tractors
manufactured AFTER October 2012 - **OPTION 1**
(this option is recommended)**

**PA56
CONTROL GROUP
D6T Tier 4**



Installation Instructions:

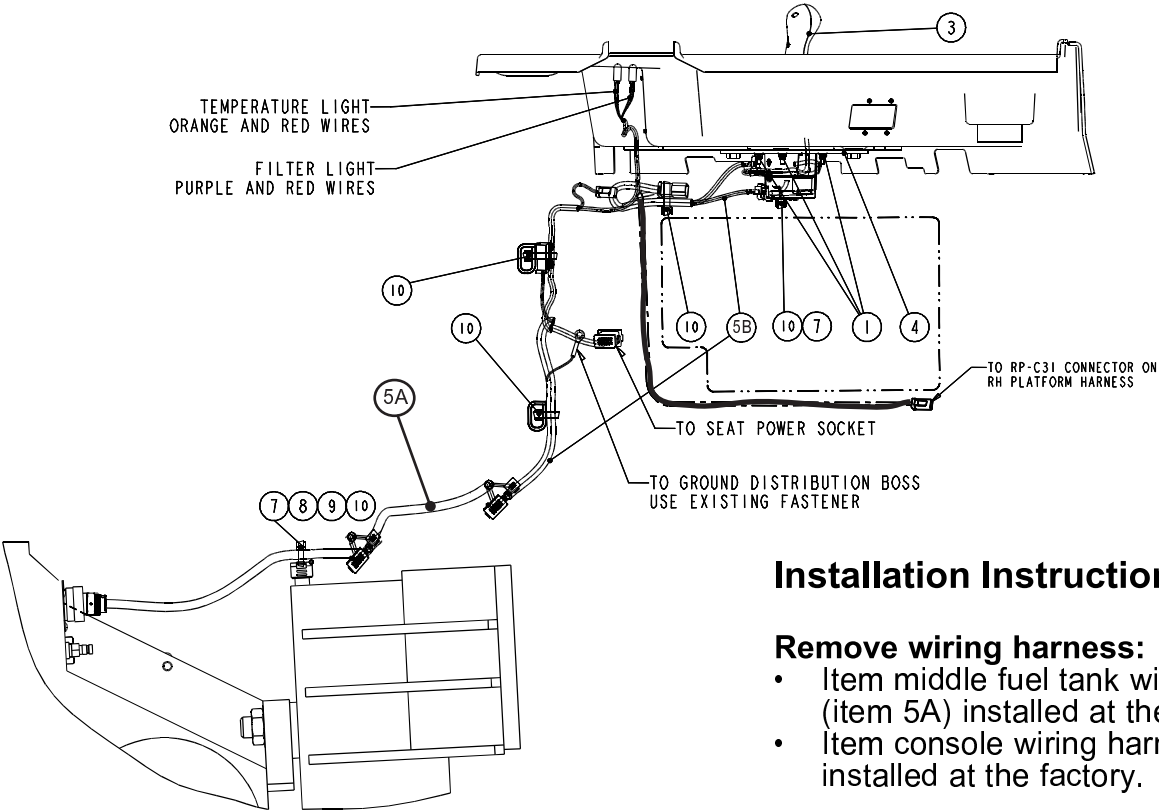
Install rear fuel tank harness (item 6) connecting to middle fuel tank harness (item 5A) installed at factory.



ITEM	PART NO	DESCRIPTION	QTY
1	112-6646	METRIC FLANGED LOCKNUT (M6 X 1) *	4
2	138-2434	LIGHT - LED 24V RED BIPOLAR *	2
3	279-2504	JOYSTICK *	1
4	336-3850	ADAPTER PLATE *	1
5A	391-4577	FUEL TANK MIDDLE WIRING HARNESS *	1
5B	395-3834	CONSOLE WIRING HARNESS *	
6	391-4576	FUEL TANK REAR WIRING HARNESS - INSTALL	1
7	4P-8134	CLIP *	2
8	5M-3062	CAPSCREW (3/8 - 16 X 3/4 G8 Z) *	1
9	8T-4896	HARD WASHER (3/8 Z) *	1
10	7K-1181	CABLE STRAP *	8
11	138-2435	CONTROL DECAL *	1
12	320-6687	TEMPERATURE AND FILTER DECAL *	1
		* INSTALLED AT FACTORY	

Winch wiring and parts for **WINCH READY** tractors manufactured **AFTER** October 2012 - **OPTION 2 - STEP 1** of 2

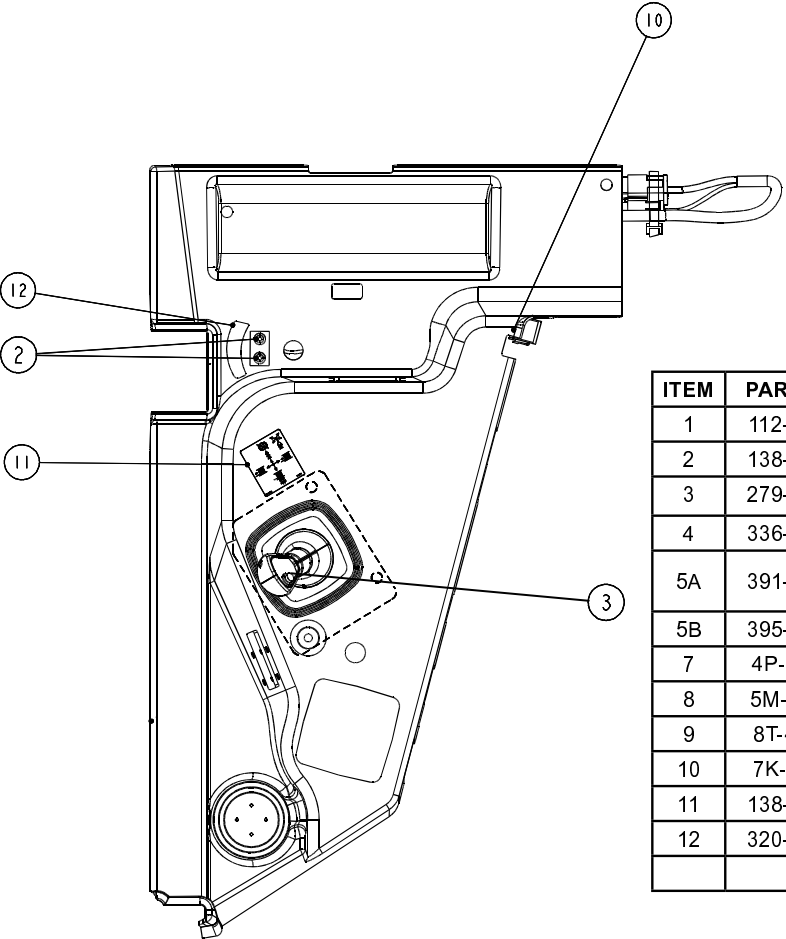
PA56
CONTROL GROUP
D6T Tier 4



Installation Instructions:

Remove wiring harness:

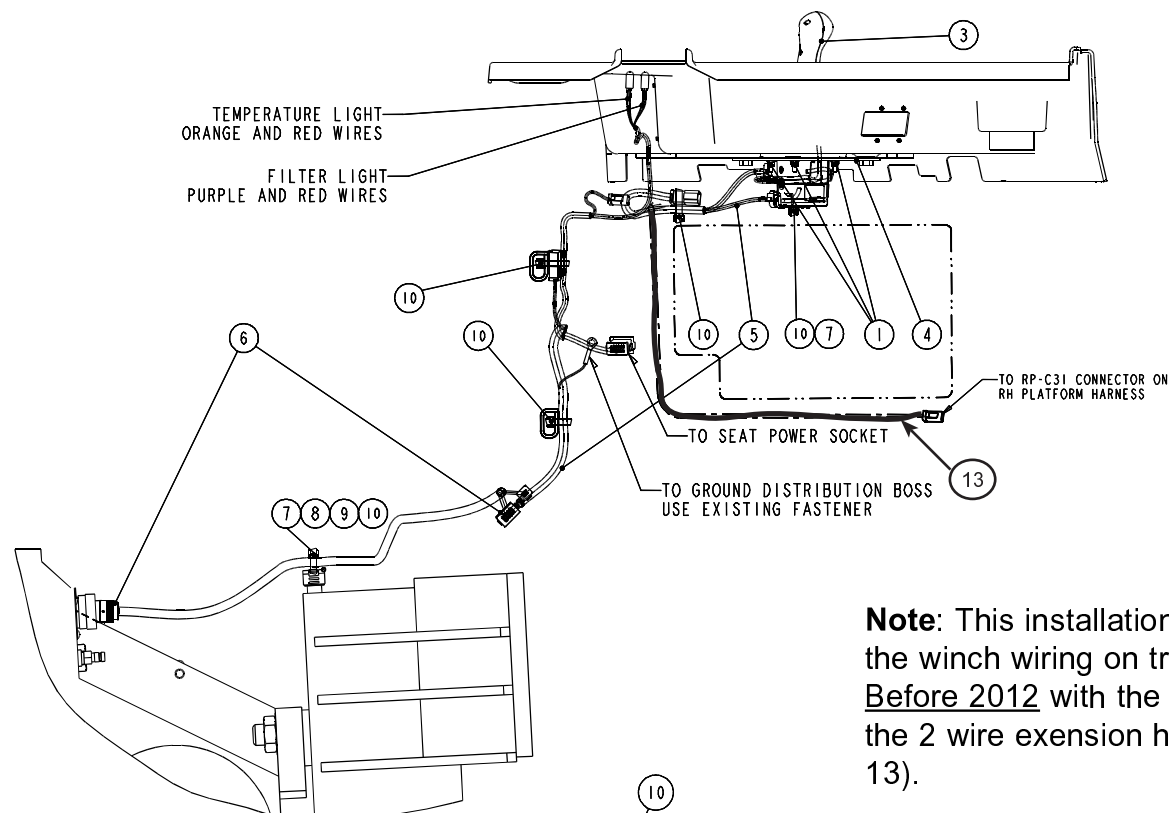
- Item middle fuel tank wiring harness (item 5A) installed at the factory.
- Item console wiring harness (item 5B) installed at the factory.



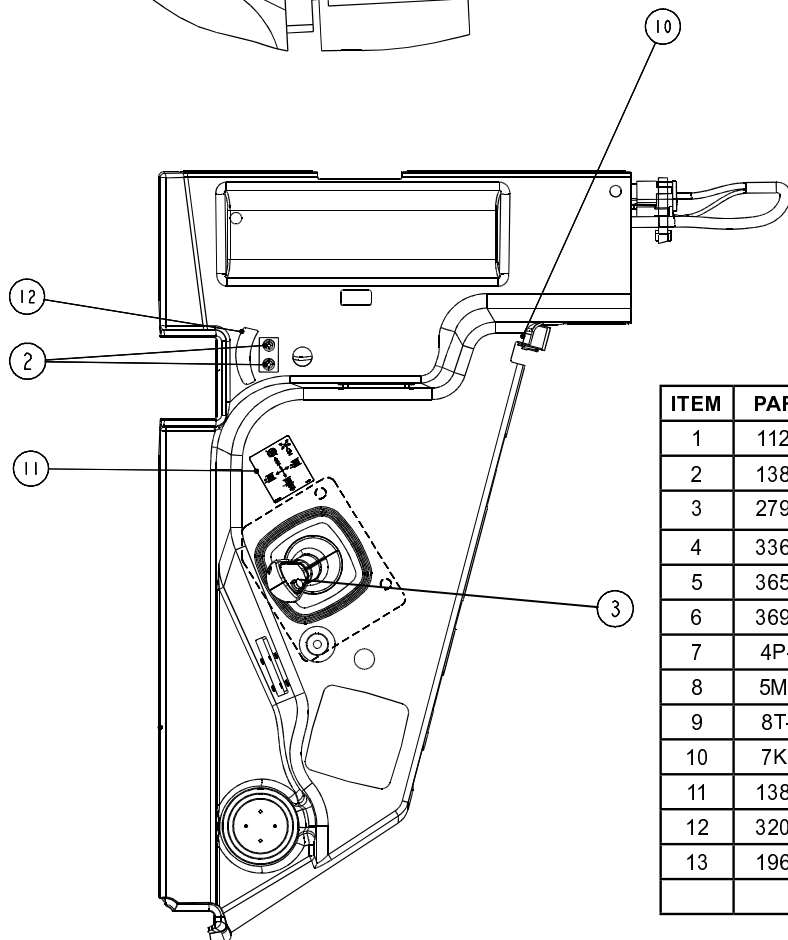
ITEM	PART NO	DESCRIPTION	QTY
1	112-6646	METRIC FLANGED LOCKNUT (M6 X 1) *	4
2	138-2434	LIGHT - LED 24V RED BIPOLAR *	2
3	279-2504	JOYSTICK *	1
4	336-3850	ADAPTER PLATE *	1
5A	391-4577	UPPER FUEL TANK WIRING HARNESS - REMOVE - *	1
5B	395-3834	CONSOLE WIRING HARNESS - REMOVE - *	
7	4P-8134	CLIP *	2
8	5M-3062	CAPSCREW (3/8 - 16 X 3/4 G8 Z) *	1
9	8T-4896	HARD WASHER (3/8 Z) *	1
10	7K-1181	CABLE STRAP *	8
11	138-2435	CONTROL DECAL *	1
12	320-6687	TEMPERATURE AND FILTER DECAL *	1
		* INSTALLED AT FACTORY	

Winch wiring and parts for WINCH READY tractors manufactured AFTER October 2012 - **OPTION 2 - STEP 2 of 2**
Also applies to NON-WINCH READY tractors manufactured AFTER October 2012

PA56
CONTROL GROUP
D6T Tier 4



Note: This installation is similar to the winch wiring on tractors built Before 2012 with the addition of the 2 wire extension harness (item 13).



ITEM	PART NO	DESCRIPTION	QTY
1	112-6646	METRIC FLANGED LOCKNUT (M6 X 1) *	4
2	138-2434	LIGHT - LED 24V RED BIPOLAR *	2
3	279-2504	JOYSTICK *	1
4	336-3850	ADAPTER PLATE *	1
5	365-8755	CONSOLE WIRING HARNESS - INSTALL	1
6	369-5910	FUEL TANK WIRING HARNESS - INSTALL	1
7	4P-8134	CLIP *	2
8	5M-3062	CAPSCREW (3/8 - 16 X 3/4 G8 Z) *	1
9	8T-4896	HARD WASHER (3/8 Z) *	1
10	7K-1181	CABLE STRAP *	8
11	138-2435	CONTROL DECAL *	1
12	320-6687	TEMPERATURE AND FILTER DECAL *	1
13	196-2695	2 WIRE EXTENSION HARNESS - INSTALL	1
* INSTALLED AT FACTORY			

Installation Notes - Non-Winch Ready after October 2012

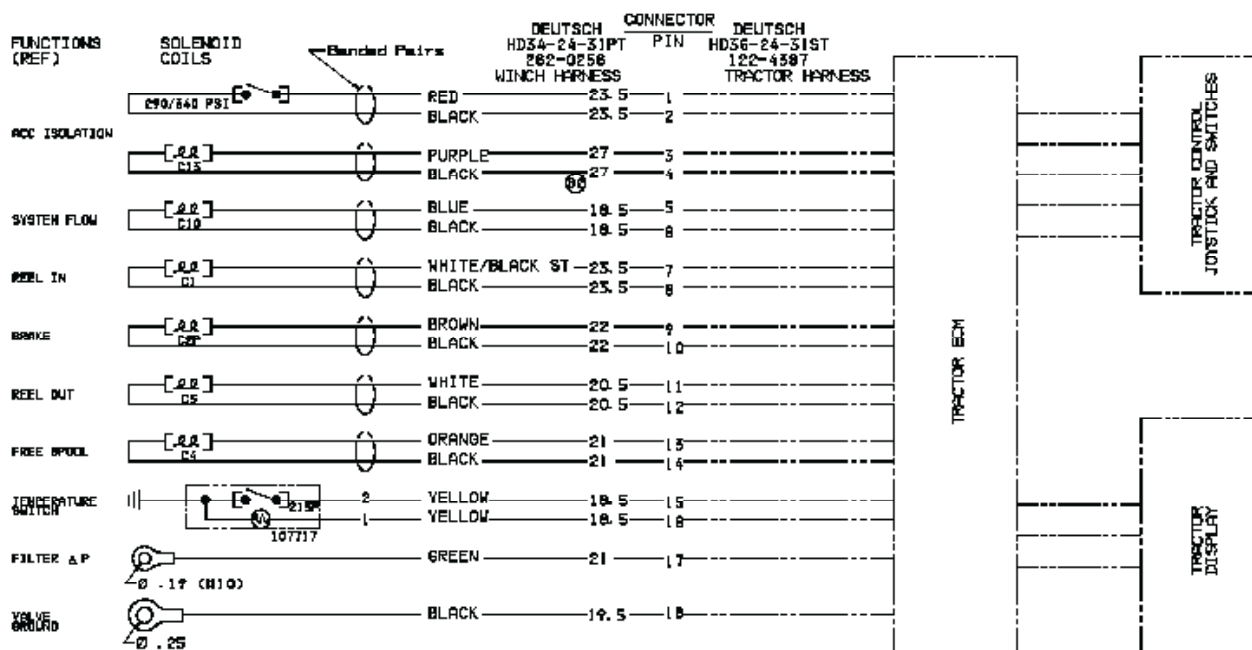
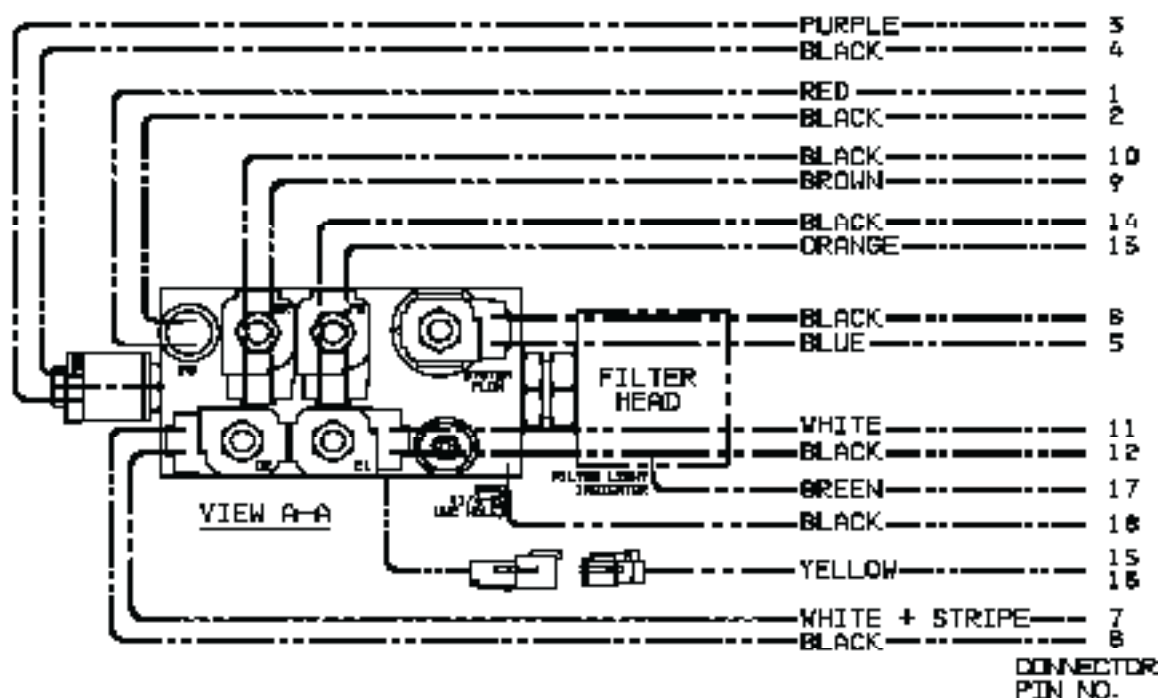
Installation of this control group requires modification of ripper control console cover to allow fitment of the winch control joystick. To avoid modification of the ripper control cover, it may be replaced with Caterpillar winch control specific console cover part no. 351-6442.

A template of the blade control opening can be used to help trace over existing ripper control opening as the winch control opening will be of identical shape and dimension.

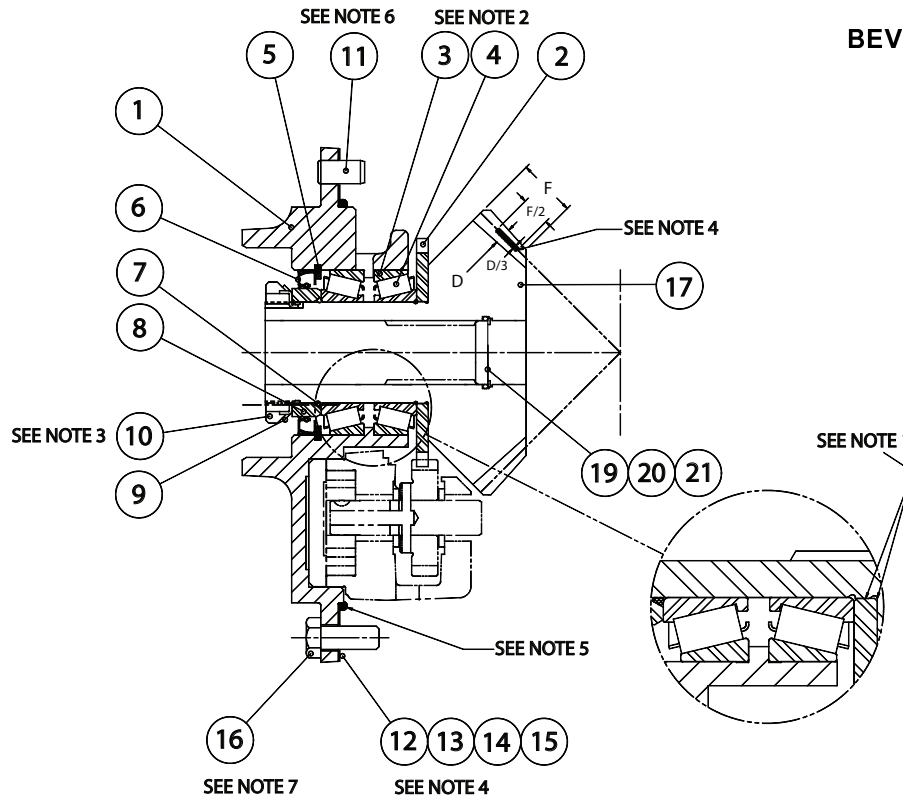
Installation Instructions - Non-Winch Ready after October 2012

1. Remove plastic console cover
2. Remove ripper control lever or filler plate. Retain fasteners for re-use.
3. Drill $\frac{1}{2}$ " holes in console in locations as shown.
4. Trace outline of area to be trimmed from console cover using dimension shown.
5. Install adapter plate (item 4) in place of ripper control plate removed in step 2 using original Caterpillar screws.
6. Orient control lever assembly so that wiring lead fits through notch in plate. Attached winch control lever assembly (item 3) to adapter plate using locknuts (item 1).
7. Attach 12-pin receptacle connector and 6-pin receptacle connector on console wiring harness (item 5) to the corresponding plug connectors on control lever wiring leads on the joystick.
8. Locate the 12-pin seat power socket receptacle below the console and attach the corresponding plug connector from wiring harness (item 5).
9. Using existing bolt attach ground lead of wiring harness to ground distribution boss near 12-pin seat power socket.
10. Route the fuel tank wiring harness (item 6) through tractor and out under fuel tank near right winch mounting bracket.
11. Attach the 12-pin plug connector and 4-pin plug connectors on the console wiring harness (item 5) to corresponding receptacle connectors on winch wiring harness (item 6).
12. Remove tractor seat and floorboards. Connect 2-pin receptacle connector of 2 wire extension harness (Item 13) to 2 pin plug connector on console wiring harness (Item 5) and route underneath control station floor area. Attach 2-pin plug connector of wire extension harness to 2-pin receptacle connector of rear attachment connector RP-C31. Removal tractor seat and floorboard.
13. Secure wiring harness to boss on top of right winch mounting bracket using capscrew (item 8), washer (9), clip (7), and zip tie (item 10) as appropriate.
14. Secure wiring harness between operator console and winch with zip ties (item 10) as appropriate.
15. Snap warning lights (item 2) into $\frac{1}{2}$ " holes previously drilled. Attach spade sockets on wiring harness to warning light terminals as shown. Light terminals have no polarity.
16. Re-install plastic console cover.
17. Affix winch operation decal (item 11) near control lever as appropriate.
17. Affix filter and temperature warning light decal (item 12) near lights as appropriate. Ensure decal identifies warning lights correctly per wire colors as shown.

Electrical Diagrams Inside winch case



**PA56
BEVEL GEAR GROUP
D6T Tier 4**



NOTES:

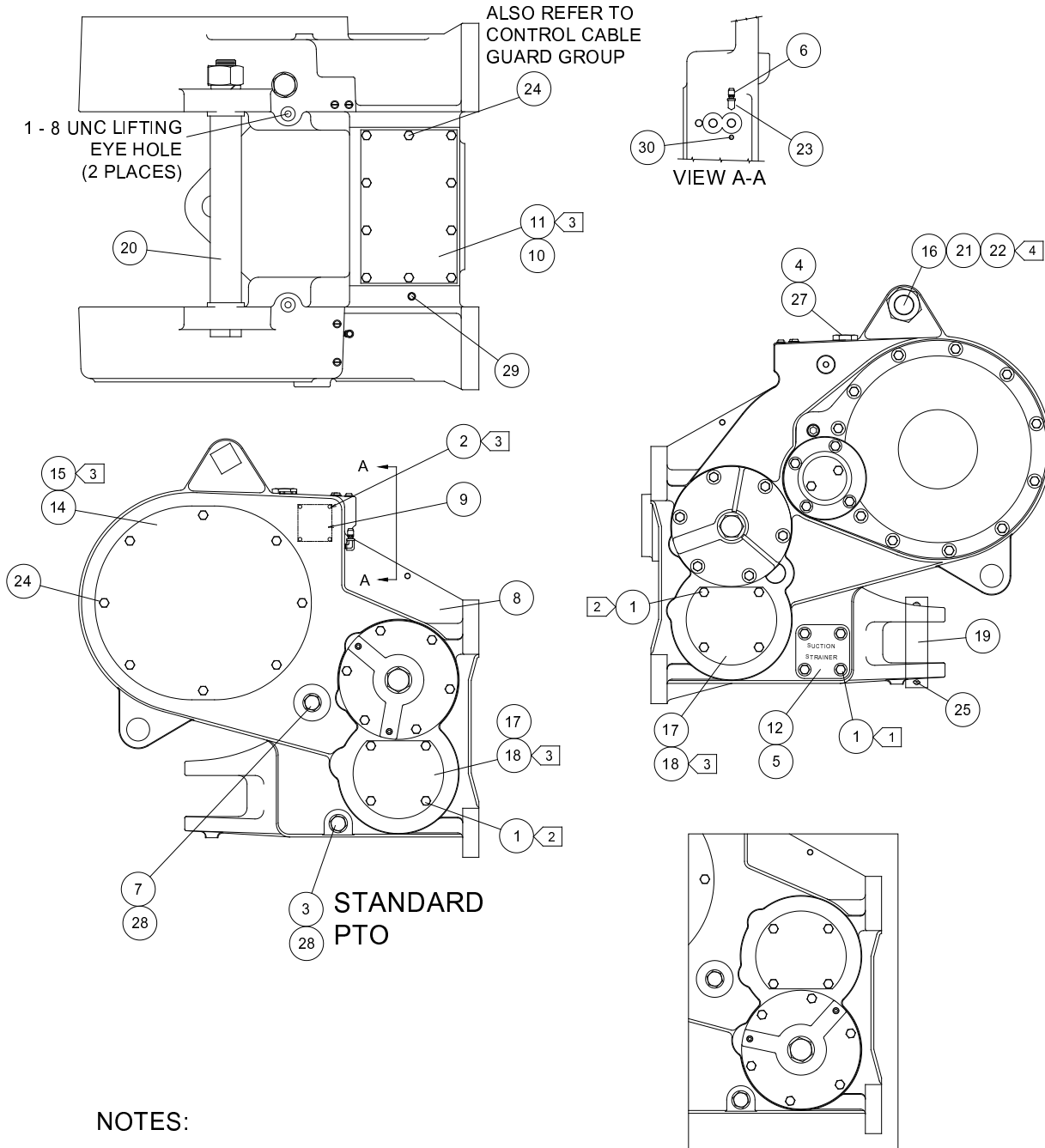
1. Clean bevel and pump pinions with Loctite solvent. Verify press fit before assembly. Apply Loctite 609 or equal to surfaces indicated in Detail A. Press pump drive pinion, item 2, onto bevel pinion and seat securely against shoulder. Allow proper cure time for Loctite before usage.
2. Apply a thin 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 NO.	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) BLUE	2-AR
14	118-5856	SHIM, .007 in. (.18 mm) SILVER	2-AR
15	118-5857	SHIM, .020 in. (.51 mm) YELLOW	2-AR
16	8T-8917	CAPSCREW, HEX HD (1/2 - 13 X 1 1/4 in. G8, Z)	6
17	118-7219	BEVEL PINION - 26T (B RATIO)	1
	118-7218	BEVEL PINION - 14T (E RATIO)	1
18	119-2217	BEVEL GEAR SET - 33/26T (B RATIO)* (NOT SHOWN)	1
	119-2213	BEVEL GEAR SET - 39/14T (E RATIO)* (NOT SHOWN)	1
19	6F-0249	O-RING (USED ON B RATIO ONLY)	1
20	1J-6473	RETAINING RING (USED ON B RATIO ONLY)	1
21	119-2191	BEVEL PINION PLUG (USED ON B RATIO ONLY)	1

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

WINCH CASE AND COVERS



NOTES:

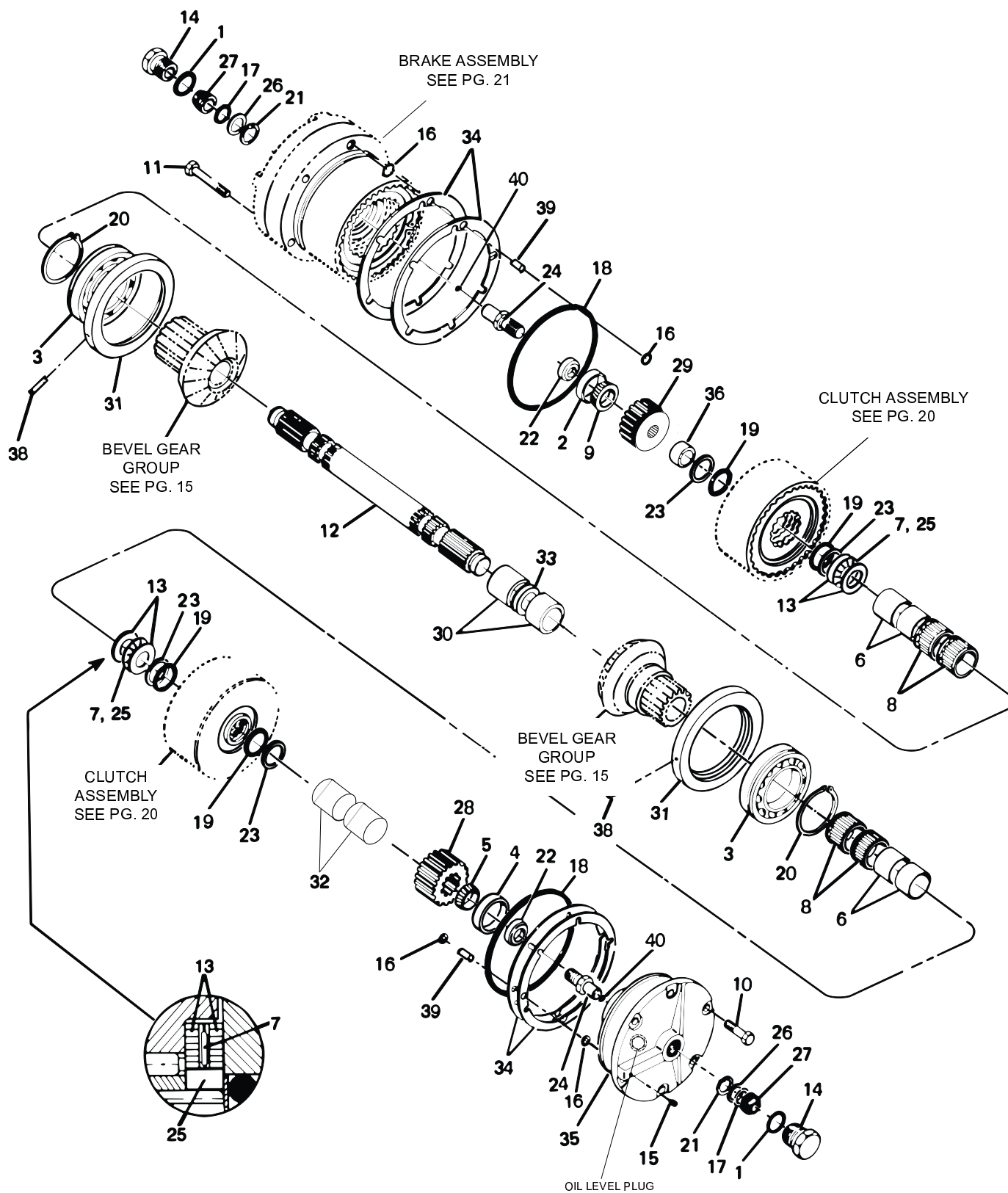
- 1 APPLY "FEL-PRO C648F SEALANT" TO BOLTS TO PREVENT THREAD CORROSION.
- 2 TIGHTEN FASTENERS TO 75 LB•FT (10.4 Kg•M) TORQUE.
- 3 APPLY "RTV 732" SILASTIC SEALANT TO BOTH SIDES OF GASKETS (11, 15 & 18) AND DRIVE SCREWS (2).
- 4 TIGHTEN HEX NUT (22) UNTIL LOCKWASHER (21) IS FLATTENED AND THEN TURN ONE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

WINCH CASE AND COVERS

ITEM	PART NO.	DESCRIPTION	QTY.
1	5P-2228	CAPSCREW, HEX HEAD (1/2-13 X 1 G8 Z)	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 - EARLY - RH SIDE	1
	270-5244	SIGHT GLASS - CURRENT - LH SIDE	
8	118-6972	WINCH CASE - LOW PTO	1
9	123-4417	SERIAL NUMBE 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
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 (1/8 NPT SQ HD)	1

*SS = SELF-SEALING MATERIAL PREAPPLIED TO THREADS

CLUTCH SHAFT GROUP

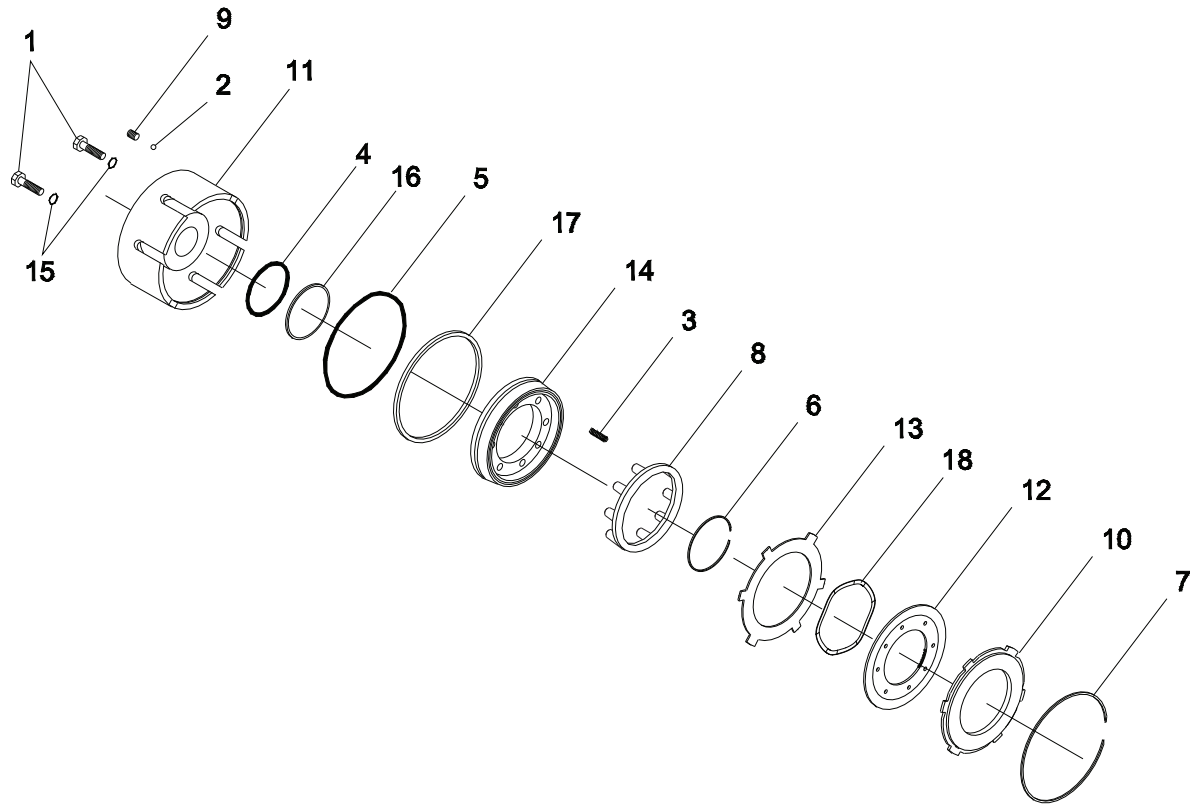


CLUTCH SHAFT GROUP

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 w/SHIELD	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 G8 Z)	6
11	7X-0326	CAPSCREW, HEX HEAD (1/2 - 13 X 3 G8 Z)	6
12	118-7225	CLUTCH SHAFT - 4 SHAFT	1
13	120-7633	THRUST BEARING RACE	4
14	5P-1403	PLUG (CONTAINS ITEM 1)	2
15	148-8407	PLUG, -6 ORB HEX (CURRENT)	1
16	8M-4437	O-RING	8
17	120-7629	O-RING	2
18	1S-6119	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	118-6582	PINION GEAR - 18 TEETH - 4 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	2
33	118-5848	SHIM SET	1
34	118-6647	SHIM, .005 in. (.13 mm) BLUE	2-AR
	118-6599	SHIM, .007 in. (.18 mm) SILVER	2-AR
	118-6600	SHIM, .020 in. (.51 mm) YELLOW	2-AR
35	118-6951	CLUTCH SHAFT BEARING CARRIER - 4 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

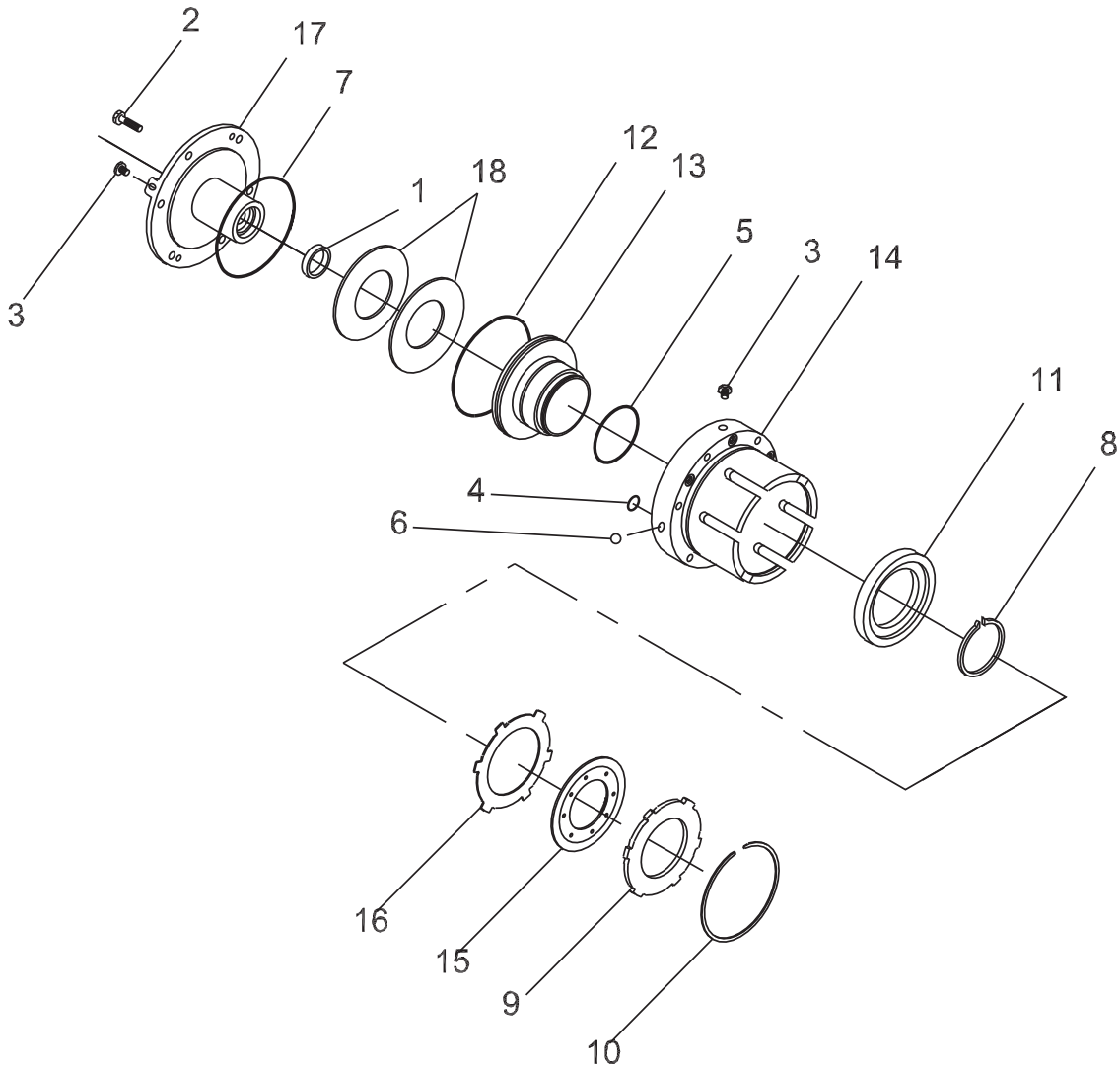


ITEM	PART NO.	DESCRIPTION	QTY.
-	211-1631	CLUTCH ASSEMBLY - INCLUDES 1 - 18	
1	183-7263	PLUG (-4 ORB)	2
2	3Y-9267	STEEL CHECK BALL (.25 in.)	1
3	211-1640	SPRING	8
4	8M-8997	O-RING	1
5	9F-1399	O-RING	1
6	8M-8997	RETAINING RING	1
7	149-5461	RETAINING RING	1
8	295-1797	SPRING RETAINER	1
9	118-5849	CHECK VALVE SEAT	1
10	211-1641	PRESSURE PLATE	1
11	211-1639	CLUTCH HOUSING *	1
12	161-6435	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.

** Item 12 Friction Disc, 161-6435 interchangeable with 118-6547. Use all of one part number.

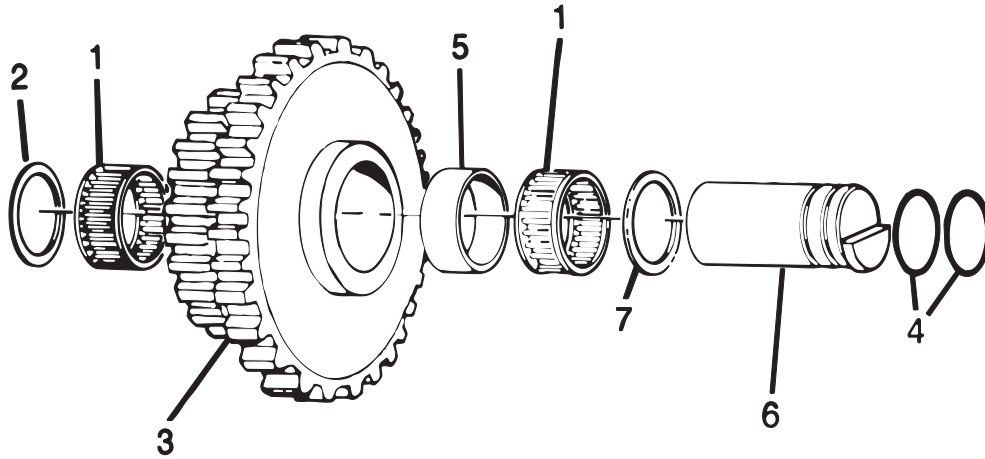
BRAKE ASSEMBLY



ITEM	PART NO.	DESCRIPTION	QTY.
-	211-1630	BRAKE ASSEMBLY, STD - INCLUDES 1 - 20	
1	009-3691	BEARING CUP	1
2	4L-6454	CAPSCREW, HEX HEAD (3/8 - 16 X 1 G8 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	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	161-6435	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

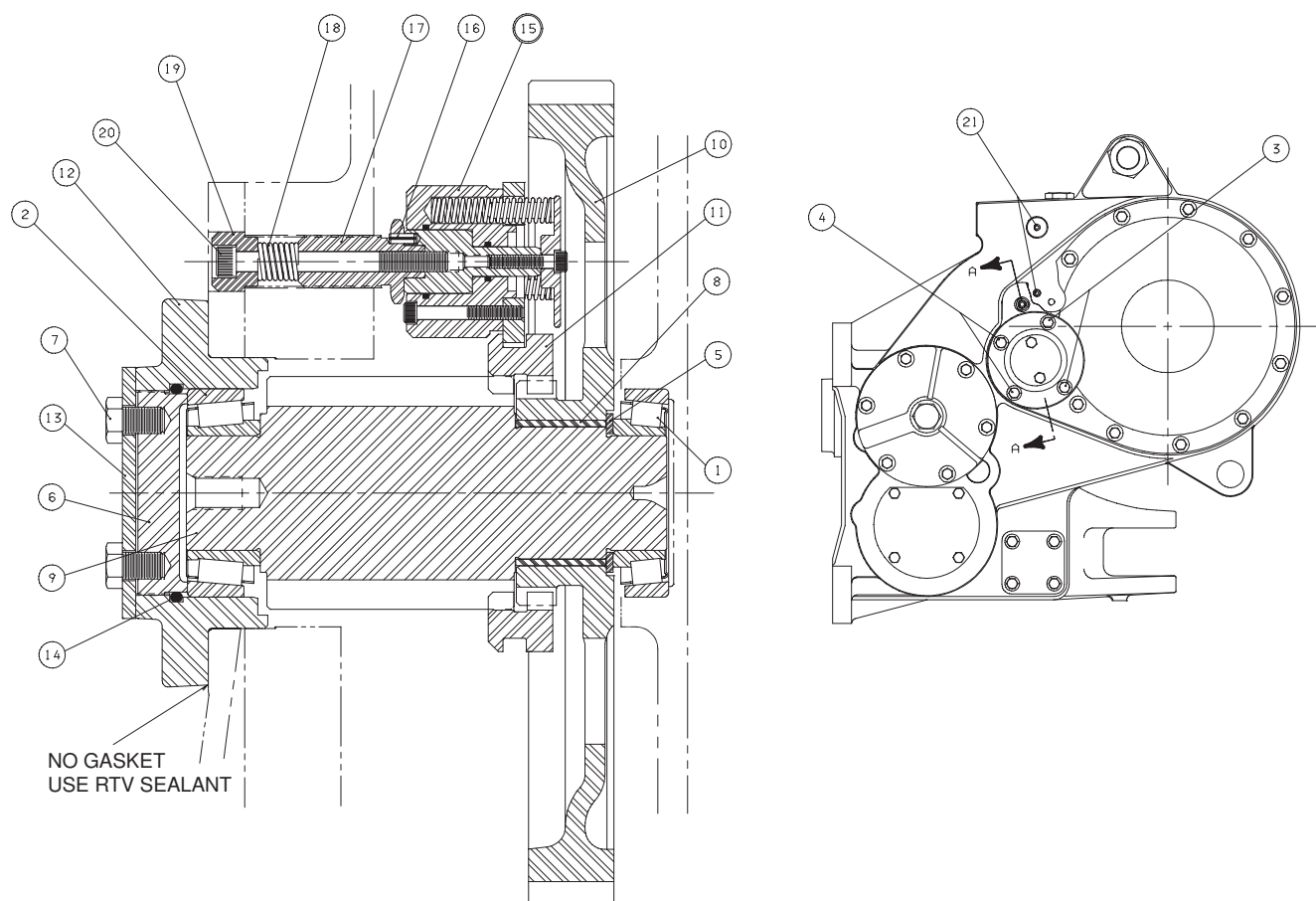
* 161-6435 Friction Disc interchangeable with 118-6547. Use all of one part number.

FOURTH SHAFT GROUP



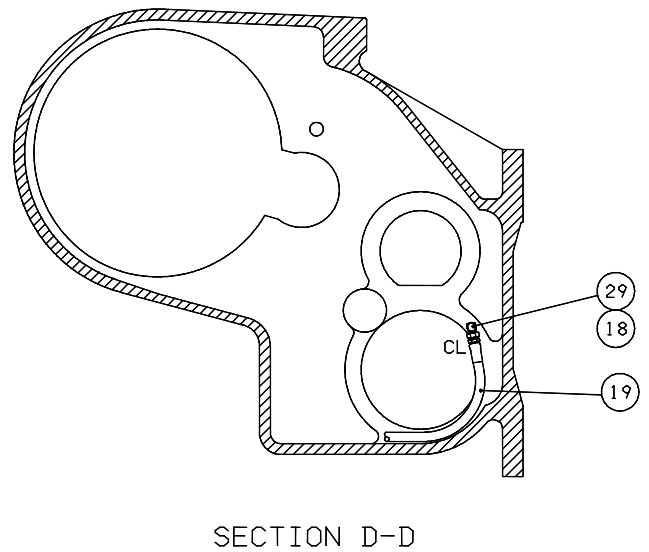
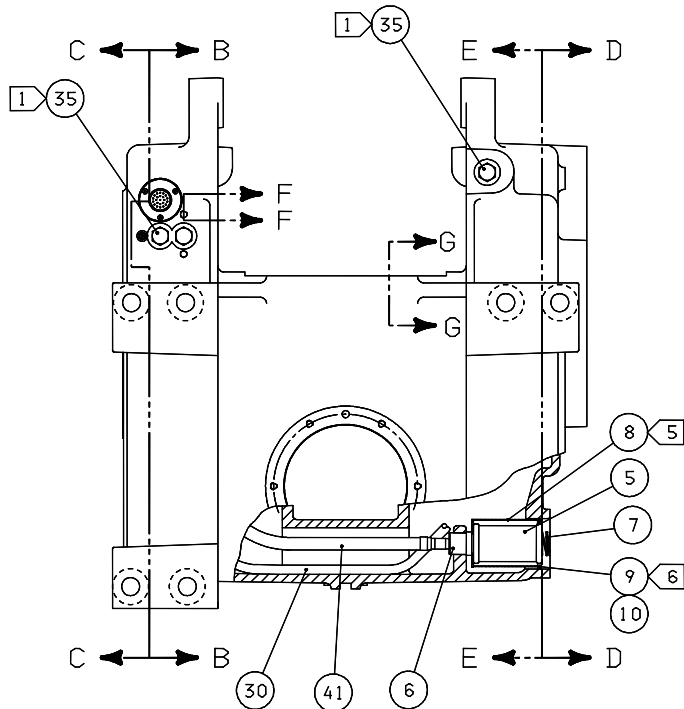
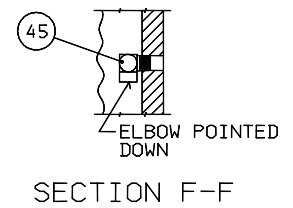
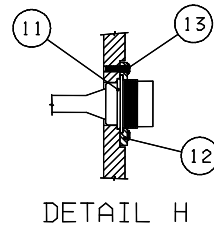
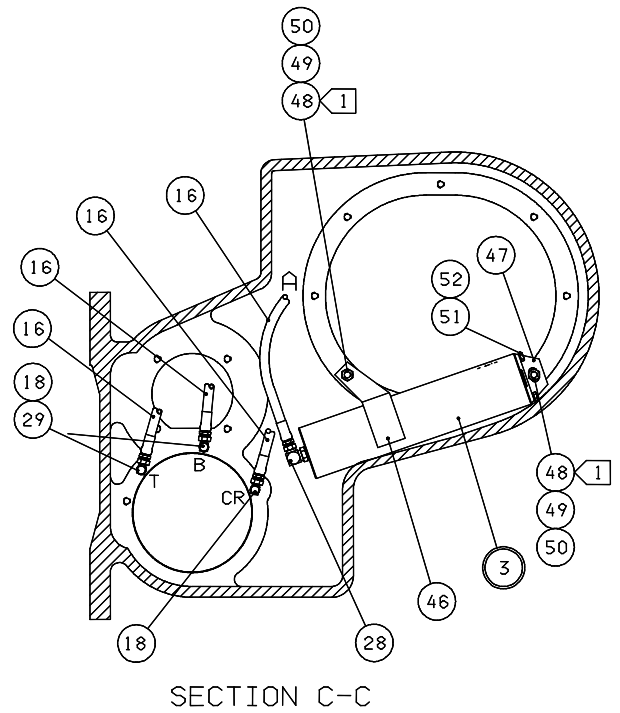
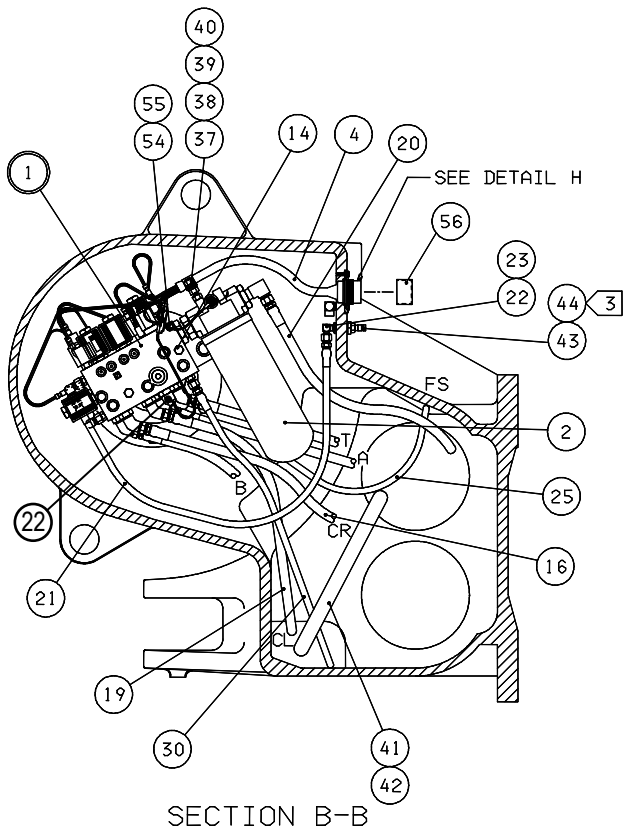
ITEM	PART NO.	DESCRIPTION	QTY.
1	119-2173	ROLLER BEARING	2
2	119-1572	THRUST WASHER - .062 in. (1.58 mm)	1
3	118-6651	CLUSTER GEAR 37/17 TEETH	1
4	8M-4986	O-RING	2
5	118-6297	SPACER	1
6	118-6533	COUNTERSHAFT PIN	1
7	118-6287	THRUST WASHER - .217 in. (5.5 mm)	1

IDLER SHAFT GROUP WITH FREESPOOL

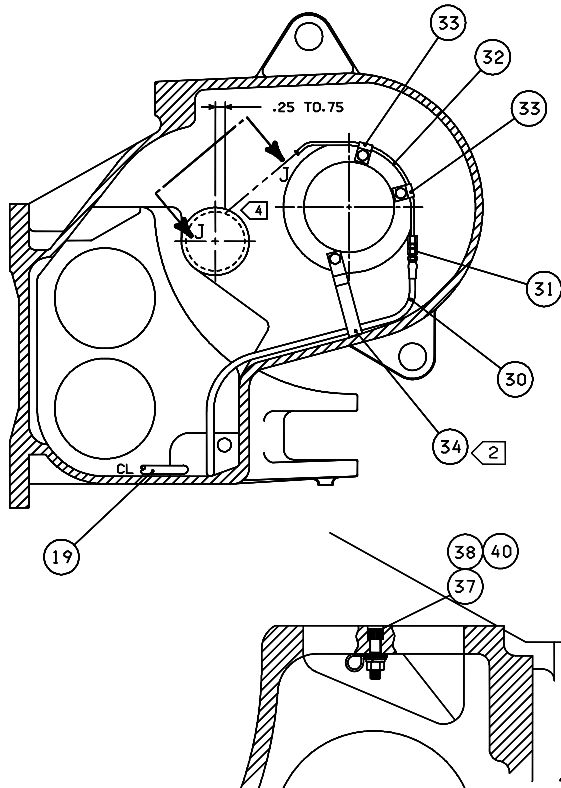


ITEM	PART NO.	DESCRIPTION	QTY
1	119-0160	BEARING ASSEMBLY	1
2	114-5870	BEARING ASSEMBLY	1
3	8T-8917	CAPSCREW, HEX HEAD (1/2 - 13 - 1 1/4 GD 8 Z)	2
4	1A-1460	CAPSCREW, HEX HEAD (1/2 - 13 X 2 GD 8 Z)	2
5	120-7633	THRUST WASHER	1
6	118-6535	ADJUSTER	1
7	8T-9383	CAPSCREW (1/2 - 13 - 3/4 GD 8 Z)	2
8	119-2170	BUSHING	1
9	118-6584	SECOND REDUCTION PINION	1
10	118-7224	FIRST REDUCTION GEAR	1
11	118-6585	CLUTCH COLLAR	1
12	118-6917	CARRIER	1
13	118-5859	LOCK PLATE	1
14	119-1547	O-RING	1
15	138-2411	FREESPOOL CYLINDER ASSEMBLY (SEE PAGE 22)	1
16	5H-8985	ROLL PIN	1
17	138-2419	CYLINDER STUD	1
18	138-2420	SPRING	1
19	138-2421	BOLT RETAINER	1
20	116-7209	CAPSCREW, SOCKET HEAD (3/8 - 16 X 4 - 1/4 GD 8 Z)	1
21	064-1609	SET SCREW, SOCKET HEAD (1/2 - 20 X 1)	2

HYDRAULIC CONTROL GROUP - LOW PTO



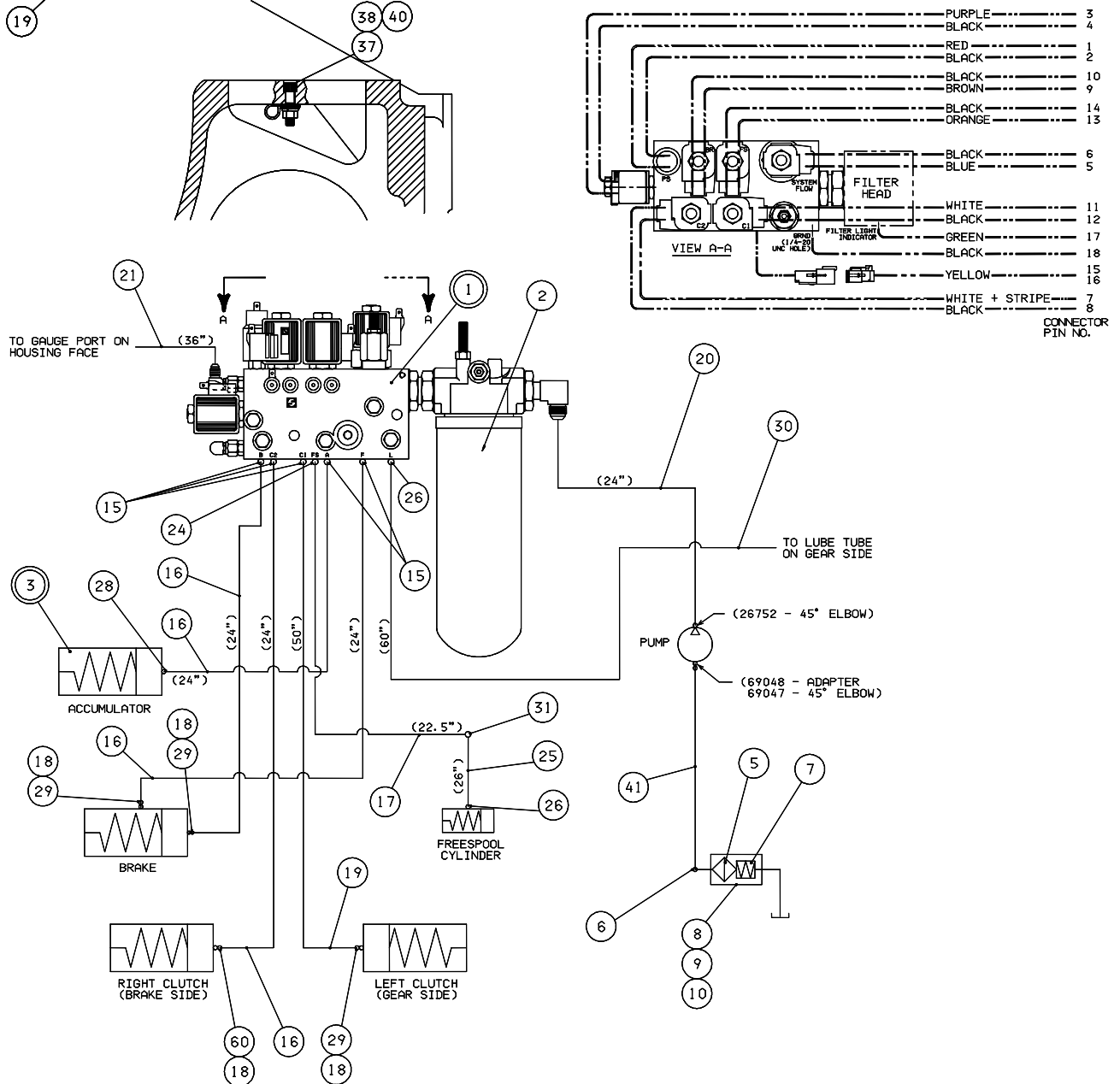
HYDRAULIC CONTROL GROUP - LOW PTO



NOTES:

1. Apply Loctite 271 to clean, dry threads.
2. Trim clamp end a minimum amount to clear bottom case wall so clamp cannot rotate out of position.
3. Apply Loctite 609 to external threads.
4. Install strainer shield (item 8) with open side facing downward.
5. Measure distance from shield to strainer cover mounting surface. If measured distance is .720" - .783" (18.3 - 19.9 mm), add one seal (item 57) outboard of seal (item 49). If distance is greater than .783" (19.9 mm), add two seals (item 57).
6. Torque filter element (item 2), to 15 - 20 ft-lbs.

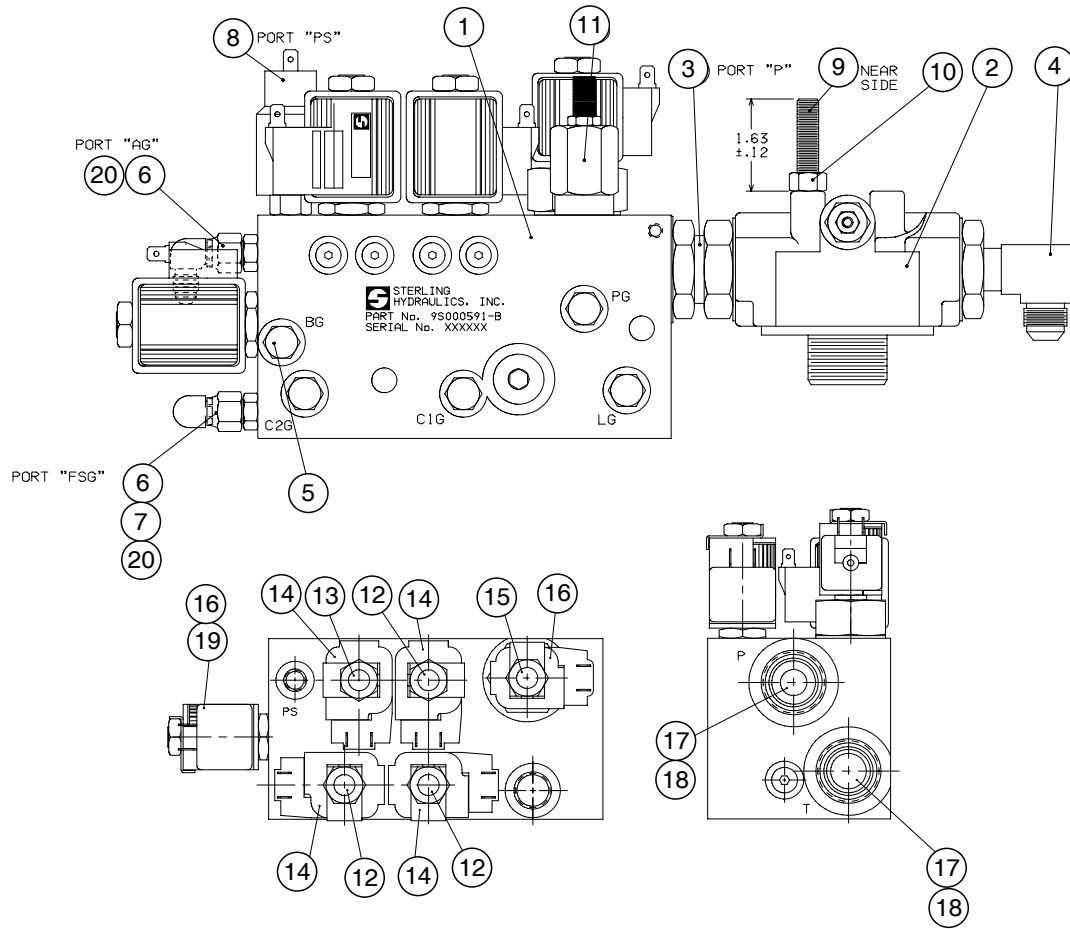
Note: See page 14 for larger version of diagram below:



HYDRAULIC CONTROL GROUP - LOW PTO

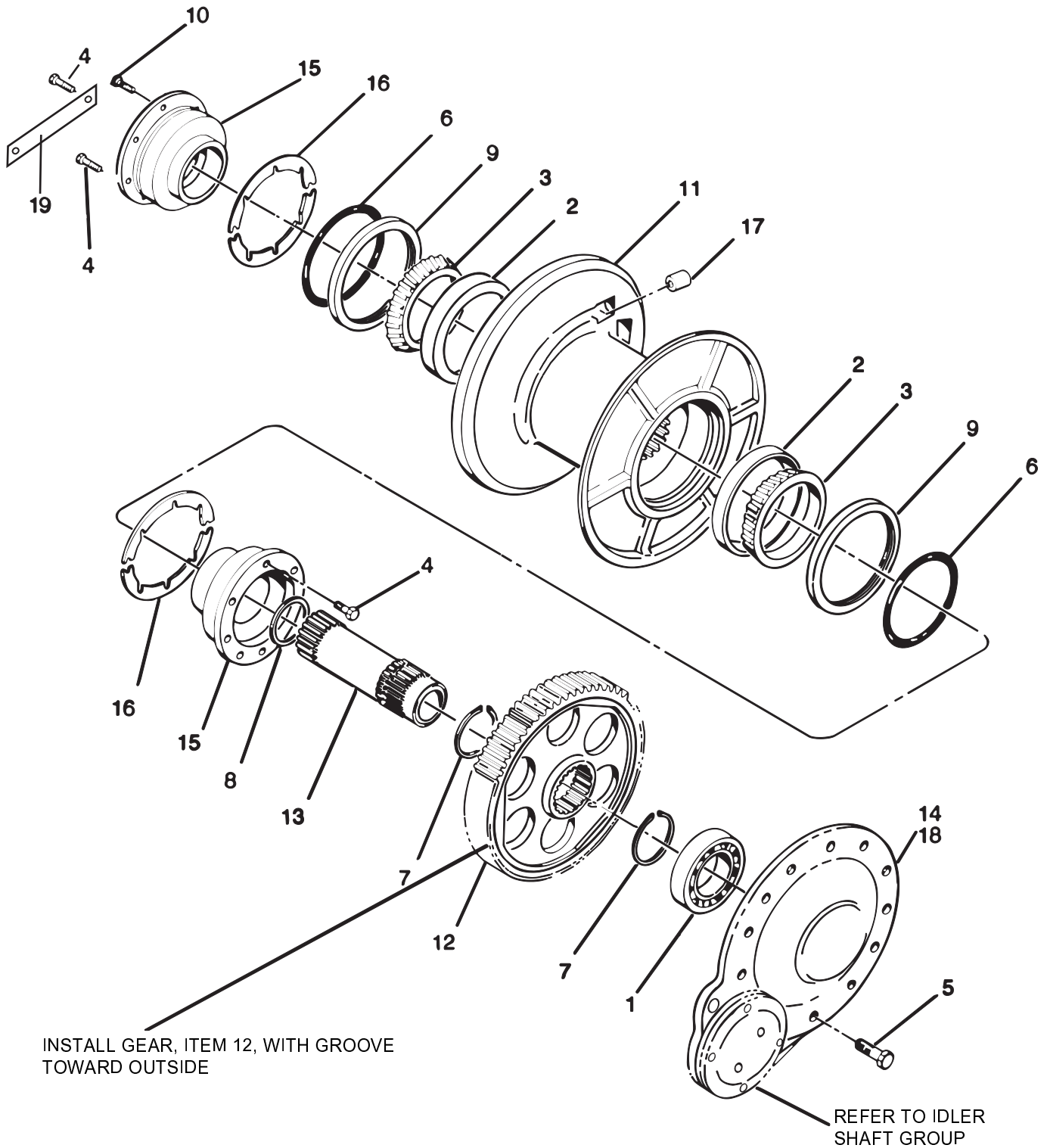
ITEM	PART NO.	DESCRIPTION	QTY.
1	174-0334	CONTROL VALVE (SEE CONTROL VALVE ASSEMBLY, PG. 27)	1
2	1G-8878	FILTER ELEMENT	1
3	118-7012	ACCUMULATOR (REFER TO ACCUMULATOR ASSEMBLY)	1
4	381-7641	WIRING HARNESS	1
5	119-2164	STRAINER	1
6	118-6265	CONNECTOR	1
7	119-1535	COMPRESSION SPRING	1
8	118-6283	STRAINER SHIELD	1
9	118-6284	SEAL RING, .25 in. (6.4 mm)	1
10	118-6286	SEAL RING, .06 in. (1.5 mm)	1-2 AR
11	8M-4986	O-RING	1
12	138-2406	RETAINER FLANGE	1
13	138-2407	MACHINE SCREW, BUTTON SOC. HEAD (#10 - 3/4)	3
14	7X-0292	CAPSCREW, HEX HEAD (3/8 - 16 X 4 1/2 G8 Z)	2
15	030-7943	ELBOW, 45° ORB -8	5
16	119-0115	HOSE, -8, 24 in. (610 mm) B, F, CR, A	4
17	129-8701	HOSE, -4, 22.5 in. (572 mm) F/S	1
18	061-9463	ADAPTER 1/4 NPT -8	4
19	119-0120	HOSE, -8, 50 in. (1270 mm) CL	1
20	119-0115	HOSE, -8, 24 in. (610 mm) PUMP TO FILTER	1
21	138-2430	HOSE, -4, 36 in. (914 mm) GAUGE	1
22	7K-9197	ELBOW, 90° -4, GAUGE PORT	1
23	8L-6557	ADAPTER, -4	1
24	030-7941	ELBOW, 45° -4	1
26	3J-7352	ADAPTER, ORB -4	2
28	030-7948	ELBOW, 90° ORB -8	1
29	8M-0547	ELBOW, 90° -8	4
30	119-0122	HOSE, -4, 60 in. (1524 mm) LUBRICATION	1
31	3J-7355	UNION, -4	2
32	138-2409	LUBRICATION TUBE	1
33	119-0161	CLAMP	2
34	118-6270	CLAMP	1
35	2H-3740	CAPSCREW, HEXHEAD (3/4 - 10 X 1 1/4 G8 Z)	3
37	9S-8752	NUT, HEX (3/8 - 16)	3
38	4B-4278	WASHER (3/8)	3
39	4K-8864	HOSE CLAMP	1
40	3B-4506	LOCKWASHER (3/8)	2
41	118-6264	SUCTION HOSE	1
42	9M-7958	CLAMP	1
43	158-6530	QUICK DISCONNECT, GAUGE PORT	1
44	127-7025	SLEEVE, GAUGE PORT	1
45	3B-8822	ELBOW, 90° (1/8 NPT) VENT PORT, INSIDE	1
46	118-6313	ACCUMULATOR BRACKET	1
47	118-6308	MOUNTING ANGLE	1
48	119-0549	STUD (1/2 - 13 X 2 3/4)	2
49	6V-8188	NUT, HEX (1/2 - 13)	2
50	8T-4223	LOCKWASHER (1/2)	2
51	8T-9043	CAPSCREW, HEX HEAD (5/16 - 18 X 7/8 G8 Z)	2
52	3B-4505	LOCKWASHER (5/16)	2
54	0S-1614	CAPSCREW, HEX HEAD (1/4 - 20 X 1/2 G8 Z)	1
55	3B-4504	LOCKWASHER (1/4)	1
56	104-3008	TEMPERATURE SWITCH	1

CONTROL VALVE ASSEMBLY - 174-0334



ITEM	PART NO	DESCRIPTION	QTY
1	174-0333	CONTROL VALVE - INCLUDES 12-19 & HOUSING	1
2	118-6321	FILTER HEAD	1
3	138-2437	UNION	1
4	138-2438	ELBOW, 90° -8	1
5	155-3624	HEX HEAD PLUG (-4 ORB)	5
6	3J-7352	ADAPTER, -4 ORB	2
7	9L-8493	CAP, -4	1
8	317-7553	PRESSURE SWITCH	1
9	1J-8668	STUD (3/8 - 16 X 2)	1
10	9S-8752	NUT-HEX (3/8)	2
11	140-1183	RELIEF VALVE	1
	294-7612	SEAL KIT	1
12	140-1176	SOLENOID VALVE, CLUTCH & F/S - W/O COIL	3
	294-7611	SEAL KIT	1
13	140-1178	PROPORTIONAL BRAKE SOLENOID VALVE - W/O COIL	1
	140-1177	SEAL KIT	1
14	140-1179	COIL FOR 12 & 13	4
15	140-1180	MAIN PRES. SOLENOID VALVE - W/O COIL	1
	140-1181	SEAL KIT	1
16	140-1182	COIL FOR 15 & 19	2
17	140-1195	CHECK VALVE	2
	140-1194	SEAL KIT	2
18	2U-7353	CHECK VALVE RETAINER	2
19	174-0701	SOLENOID VALVE, ACCUMULATOR, ISOLATOR - W/O COIL	1
	300-3575	SEAL KIT FOR 19	1
20	7K-9197	ELBOW, 90° -4	2
21	174-0334	CONTROL VALVE ASSEMBLY - ALL ITEMS ABOVE	1

CABLE DRUM GROUP



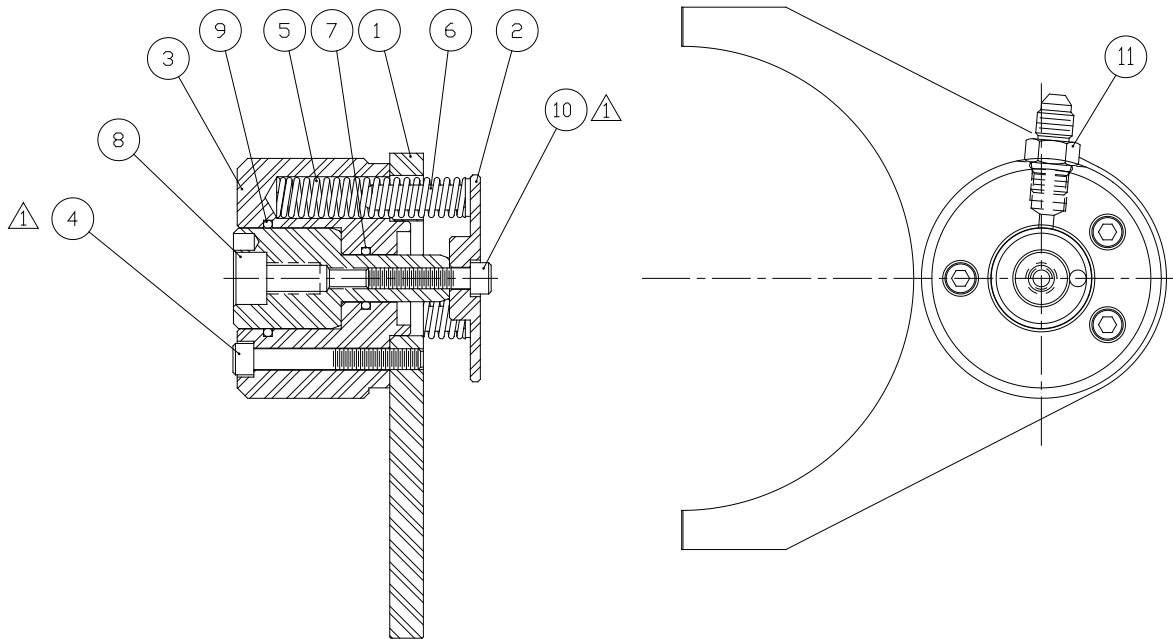
CABLE DRUM GROUP

			QTY.
			ELECTRONIC CONTROLS
ITEM	PART NO.	DESCRIPTION	
1	8M-2031	BALL BEARING	1
2	4F-2041	BEARING CUP	2
3	5P-3236	BEARING CONE	2
4	6K-7917	CAP SCREW, HEX HEAD (1/2 - 13 X 1 G5 SS)	12
5	5P-2566	CAP SCREW, HEX HEAD (1/2 - 13 X 1 1/2 G5)	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
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 DOW® RTV 732 OR EQUIVALENT	--
19	138-2400	VALVE MOUNTING PLATE	1

AR - AS REQUIRED

SS - SELF SEALING

FREESPOOL CYLINDER ASSEMBLY - 138-2412

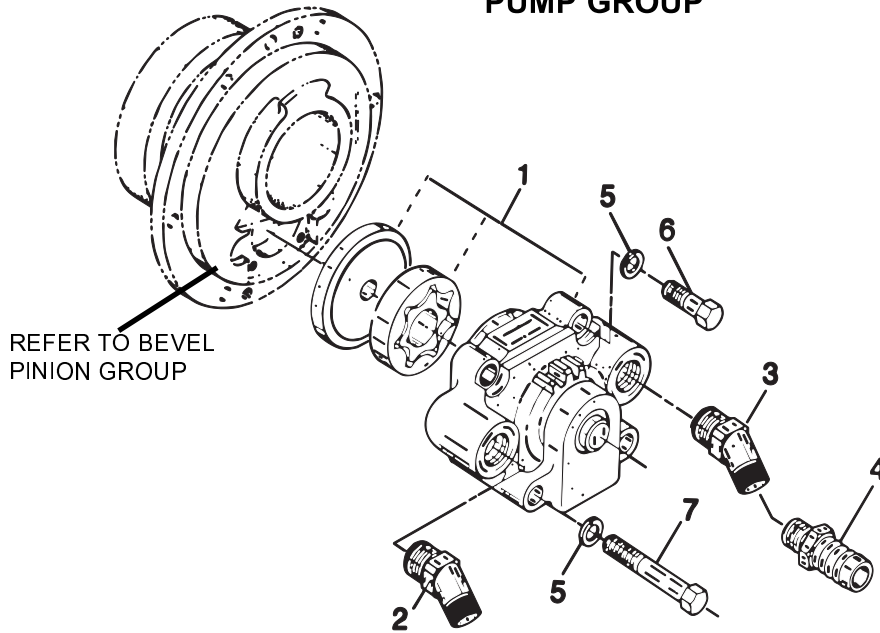


NOTE:

- ⚠️ APPLY LOCTITE 242 OR 243 TO CLEAN DRY THREADS OF ITEMS 4 & 10 AND TIGHTEN TO 13 LB•FT (18 N•m)

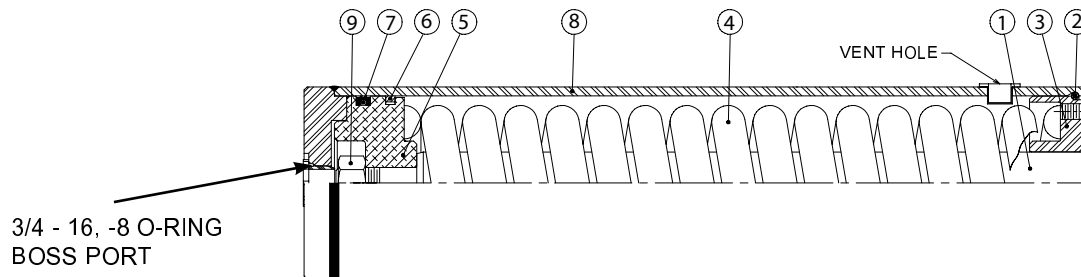
ITEM	PART NO.	DESCRIPTION	QTY.
-	138-2412	FREESPOOL CYLINDER ASSEMBLY	1
1	138-2413	YOKE	1
2	138-2414	CYLINDER RETAINER	1
3	138-2415	FREESPOOL CYLINDER	1
4	6L-1596	CAPSCREW, SOC. HEAD (1/4 - 20 x 2 GD 8 Z)	3
5	138-2416	SPRING	3
6	138-2417	SPRING GUIDE	3
7	8M-4437	O-RING	1
8	138-2418	CYLINDER ROD	1
9	3S-9233	O-RING	1
10	4L-7124	CAPSCREW, SOC. HEAD (1/4 - 20 x 1 1/4 GD 8 Z)	1
11	3J-7352	ADAPTER	1

PUMP GROUP



ITEM	PART NO.	DESCRIPTION	QTY
1	118-6979	PUMP ASSEMBLY	1
2	123-4411	ELBOW, 45° -8 PRESSURE SIDE	1
3	3B-7731	ELBOW, 45° SUCTION	1
4	1H-9779	BARBED HOSE ADAPTER	1
5	3B-4504	LOCKWASHER (1/4)	4
6	4M-5282	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 - 118-7012



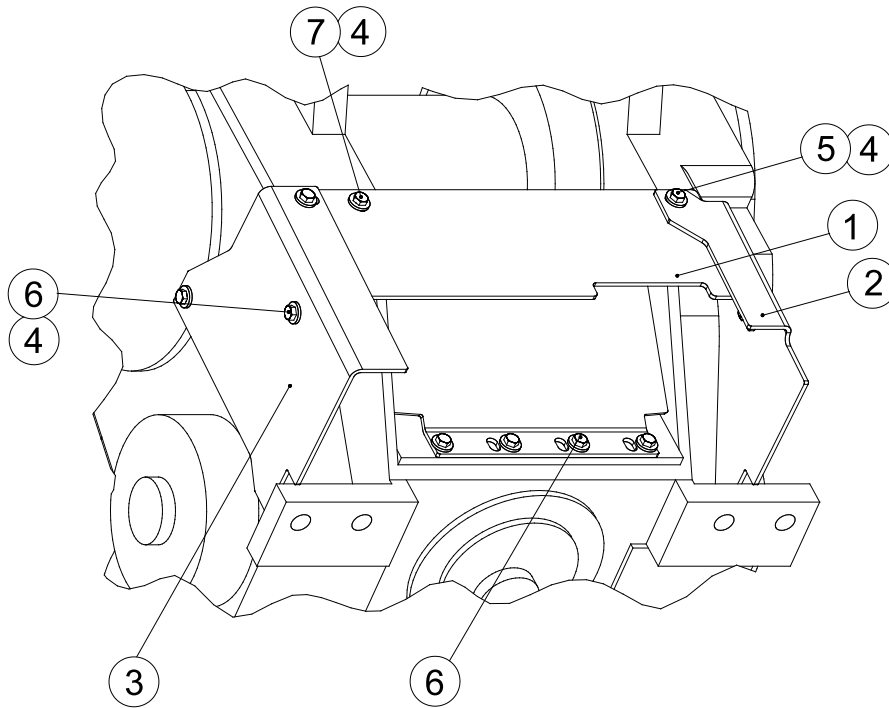
⚠ WARNING ⚠

! 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 (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)	

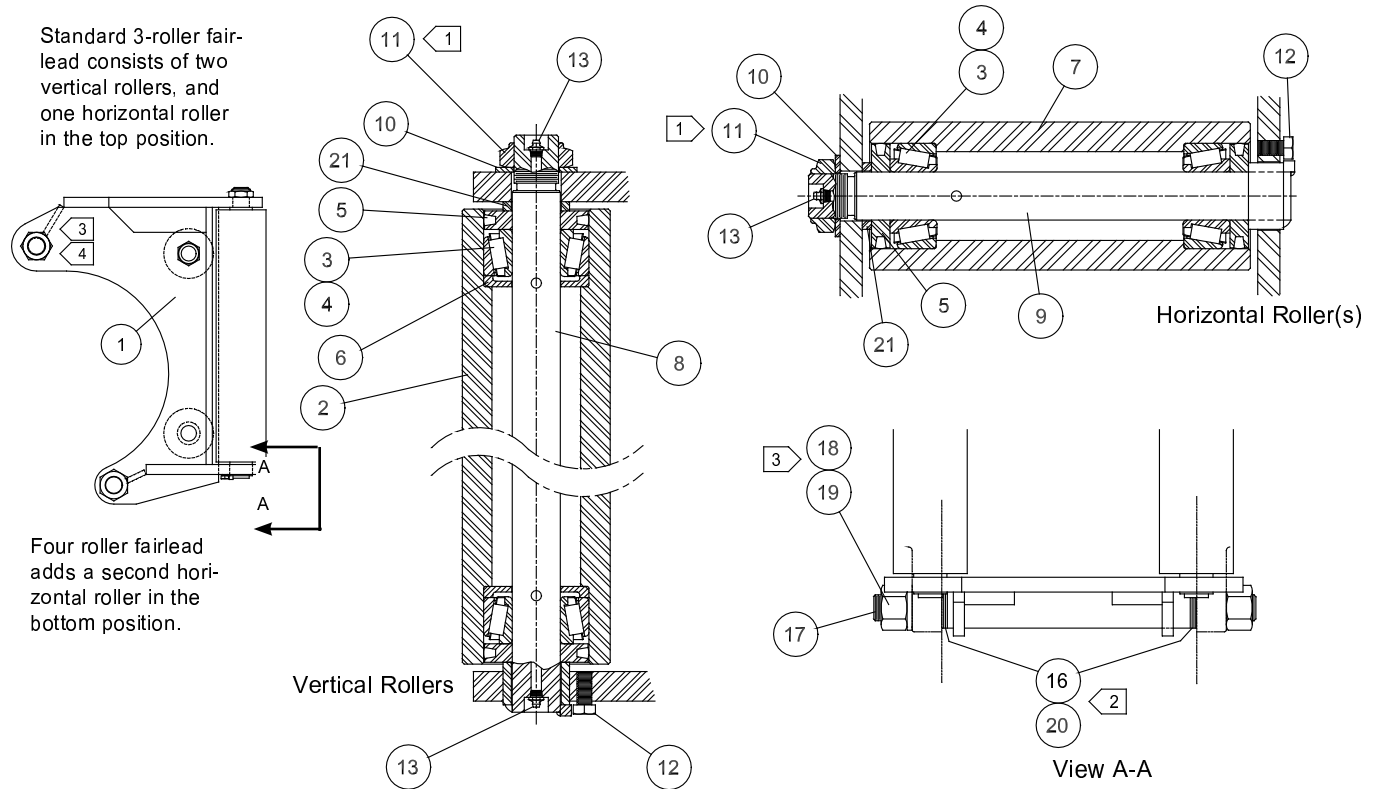
NSS = Not Serviced Separately

COVER GROUP



ITEM	PART NO	DESCRIPTION	QTY
1	240-6267	UPPER GUARD	1
2	240-6268	LH GUARD	1
3	240-6269	RH GUARD	1
4	5P-1076	HARDENED WASHER	10
5	5P-2228	CAPSCREW, HEX HEAD 1/2 - 13 X 1 GD8 Z	1
6	8T-8917	CAPSCREW, HEX HEAD 1/2 - 13 X 1-1/4 GD8 Z	8
7	5P-2566	CAPSCREW, HEX HEAD 1/2 - 13 X 1-1/2 GD8 Z	1

FAIRLEAD ASSEMBLY



NOTES:

- Ⓛ WHILE TURNING ROLLER, TIGHTEN NUT. WHEN ROLLER WILL NO LONGER TURN, BACK OFF NUT 1/8 TURN.
- Ⓜ SHIM BOTH SIDES AS REQUIRED TO REDUCE END PLAY TO LESS THAN 0.030 in. (0.8 mm).
- Ⓝ TIGHTEN NUT TO 200 - 300 LB•FT (271 - 407 N•m) TORQUE.
- Ⓞ 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

METRIC CONVERSION TABLE

English to Metric

Metric to English

LINEAR

inches (in.)	X 25.4	= millimeters (mm)	millimeters (mm)	X 0.03937	= 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

$$^{\circ}\text{Celsius} = 0.556 (^{\circ}\text{F} - 32)$$

$$^{\circ}\text{Fahrenheit} = (1.8^{\circ}\text{C}) + 32$$

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

