dp WINCH

12K RPW

LIGHT RECOVERY WINCH MANUAL

SERIAL NUMBER:

DATE:

Table of Contents

Warning & Caution Notices

Review entire manual before installation or operation of winch

DANGER

Do not disengage gear box while winch is under load. Immediate loss of load control will result.

DANGER

The last five wraps of wire rope must be left on the drum to assist the wire rope clamp in holding the load.

DANGER

Winches are not to be used for the lifting or moving of persons.

WARNING

Wire rope can break without warning. Always keep a safe distance from the winch and wire rope while under a load. Consult the wire rope manufacturer for wire rope ratings and maintenance procedures.

WARNING

Failure to adequately align, support, or attach winch to a suitable mounting base could result in a loss of efficiency or premature failure of winch, wire rope, or mounting base.

WARNING

Shifting into high speed with a suspended load could result in loss of speed control of the load. Drifting of the load during precise load positioning could also occur. Loss of speed control or drifiting of the load could result in damage, injury or death.

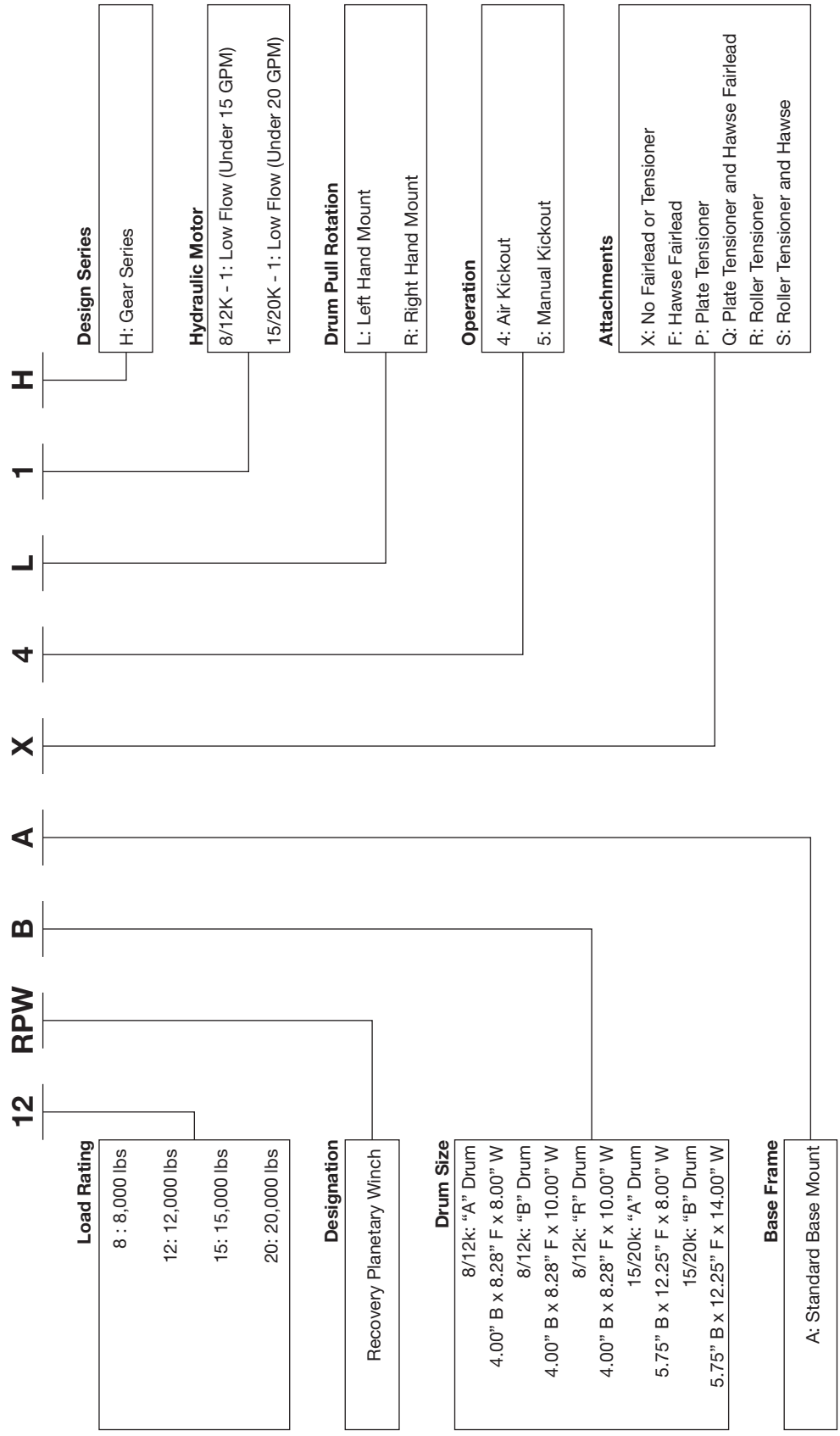
Safe Operating Practices

TWG sells its product to original equipment manufacturers, distributors, and individuals who may sell to the ultimate consumer, OEM, or another distributor, agent, or dealer. As a result, **TWG** does not necessarily know the application on which the product is to be placed. For that reason, you should carefully read and understand the operating instructions of the equipment on which the product is placed before you operate it.

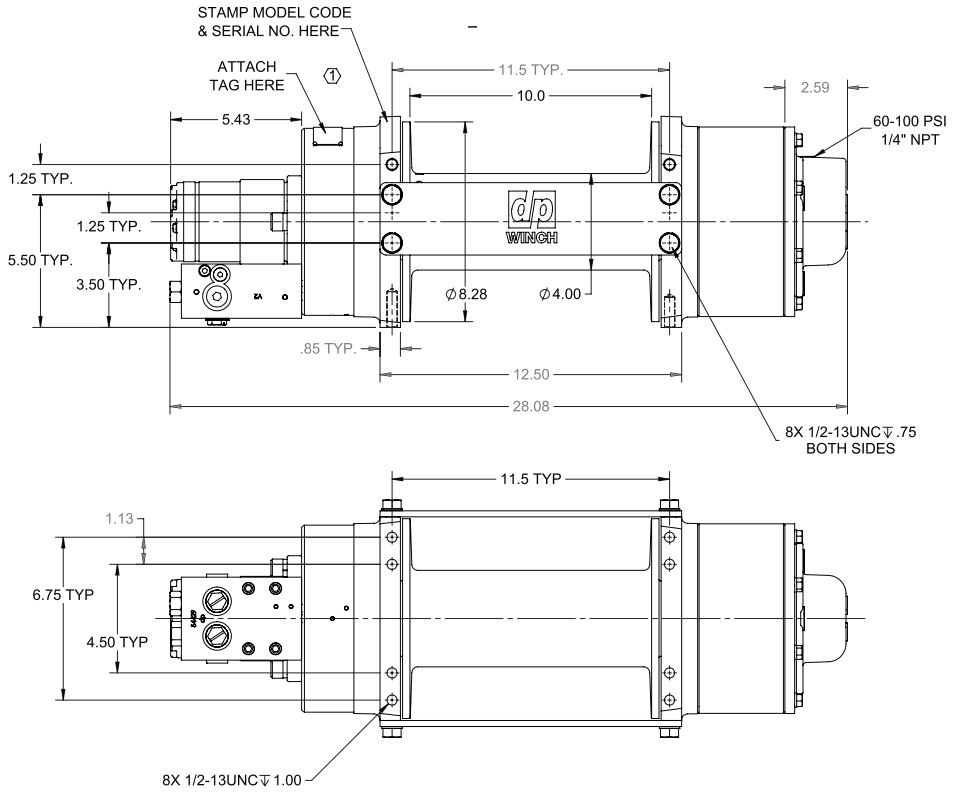
- Read this Installation, Operation Maintenance and Parts manual in its entirety before attempting to install your **dp** product.
- Read, understand, and follow all instructions on this machine and in the manual before operation. Become completely familiar with the controls and proper use of this machine before operating it.
- Keep this manual in a safe place for future and regular reference and for ordering replacement parts.
- Keep the area of operation clear of all persons. Inadvertent shifting of a load or wire rope breakage can cause serious personal injury or death.
- Always wear safety glasses or goggles and gloves during operation or while performing any adjustments or repairs.
- Do not put hands or feet near rotating parts or moving wire rope. Wire rope under tension can cause serious personal injury. Before operators power a winch, they are required to check that the area around the winch and the load being hauled is clear.
- Do not operate equipment while under the influence of alcohol or drugs.
- Do not operate the winch if the vehicle is on unstable ground or near a pit.
- Only use accessories approved for this machine by the manufacturer. Read, understand, and follow all instructions provided with the approved accessory.
- If the equipment should respond, sound, or vibrate abnormally, stop the equipment and check immediately for the cause. Unusual sounds or vibrations are generally a warning of trouble.
- If a situation occurs that may cause damage to your winch or gear box (such as impact loading, disengaging while under load, engaging the gears while they are still turning or overloading the winch) the winch or gear box should be disassembled, inspected for damage and repaired before returning to service.
- When replacement parts are required, only use parts provided by **TWG** or authorized by **TWG**
- Upon completion of any service or repairs to this equipment, ask the service technician to perform safety checks to determine that the equipment is in proper operation condition.
- If situations occur which are not covered in this manual, use care and good judgment.
- Do not use **TWG** winches for abnormal use. They should only be used in the specified manner.
- The designer/installer should refer to International Standards EN 292-2 (Safety of Machinery – Basic Concepts, General Principles for Design) and EN 237.98, Annex 1 (Essential Health and Safety Requirements Relative to the Design and Construction of Machinery and Safety Components) when installing the winch and associated equipment. This is an essential health and safety requirement of the European Community.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

Model Code Description



Dimensional & Performance Information

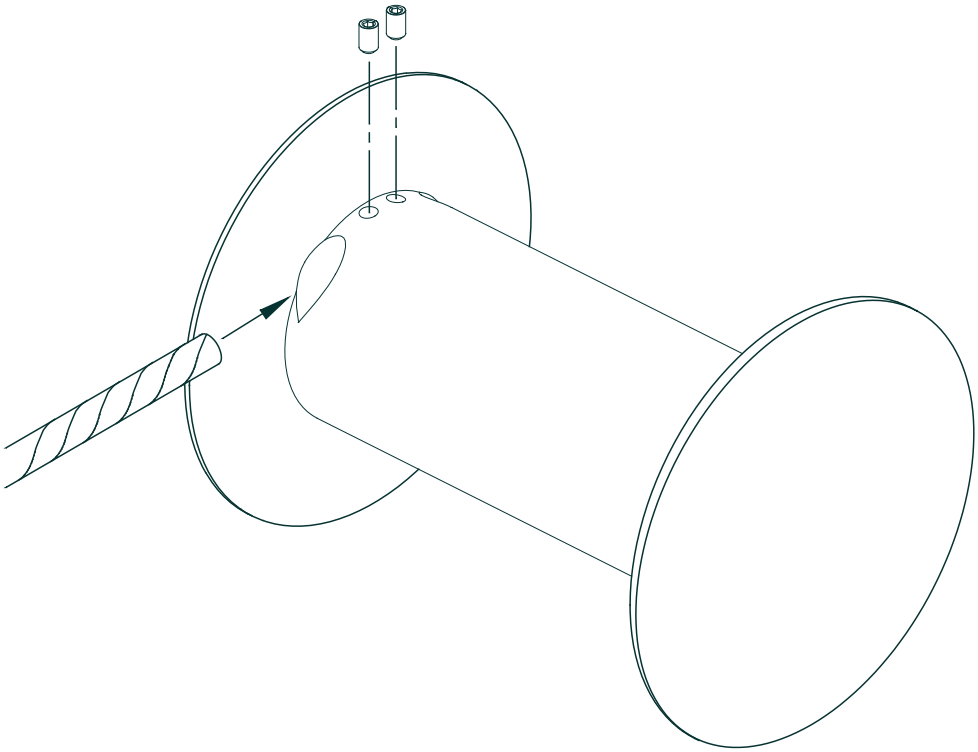


LAYER	LINE PULL (lbs)	LINE SPEED (fpm)	DRUM CAPACITY (ft)
1	12000	29	21
2	9820	36	47
3	8310	42	78
4*	7200	49	113

Performance is based on 15 gpm @ 2500 psi with Ø1/2 wire rope.
Rated line pulls shown are for the winch only.
Consult the wire rope manufacturer for wire rope ratings.
Top layer does not comply with J706 winch capacity.
Actual capacities are usually up to 10% greater than those shown.

Wire Rope Installation

Insert wire rope into pocket as shown and tighten setscrews down until tight.



Operating Procedure for Shifting Gears

The following steps are necessary for proper gear shifting operations.

Gear Disengagement:
1. Winch must be “at rest” and have no load on cable.
2. Shift winch to out of gear “free spool” mode.

Gear Engagement:
1. Winch must be “at rest” and have no load on cable.
2. Shift winch to in-gear mode and slowly rotate drum 90° in pay out direction, and then stop rotation. Net, slowly rotate drum in pay in direction to insure gears are fully engaged and begin paying in of load.

WARNING!

If your winch has ever been “shifted under load” or has ever encountered “rotational face contact of non-engaged gear components,” the gear teeth could be damaged. Damaged gear teeth can prevent your winch from fully engaging into gear and could allow it to jump out of gear. If this has happened to your winch, this procedure may not insure that it is fully engaged, and it may need to be inspected for possible gear damage.

Service Instructions for Dp Brake

GENERAL:
The unit is fully hydraulic with a multi disc wet brake. The brake is spring applied and hydraulically released and will automatically set any time the winch control valve is in neutral or in case of power failure. When the hydraulic pressure is less than 270 psi, the brake will set. Hydraulic power must be restored before brake will release. Maximum brake torque is achieved at 0 psi.
(This winch is not to be used for moving or lifting people.)

DISASSEMBLY OF BRAKE
(REFER TO MOTOR END INSTALLATION DRAWING 1.10540)

1. Remove Winch from frame or mount of vehicle or structure.
2. Disconnect motor (item 4) from brake housing (item 1) by removing two capscrews (item 6), lock washers (item 7), capscrew (item 28). Remove brake driver (item 16). Allow oil to drain.
3. Remove end support (item 20) from tie rods (installation 1.50540/1.50541) and slide end support off drum.
4. Remove end support (item 20) from brake housing (item 1) by removing 4 capscrews (item 23).
   CAUTION: Since housing is under spring loading of approximately 3,500 lbs., the capscrews should be loosened evenly until spring force has been relieved.
5. Note the orientation of brake springs (item 18) and remove them. Using compressed air, blow in the center brake port of the brake housing (item 1) to remove brake piston (item 12). It may be necessary to pry out brake piston, use care not to damage the piston or any o-rings.
6. Finally, remove the two brake discs (item 10) and stationary plate (item 11).

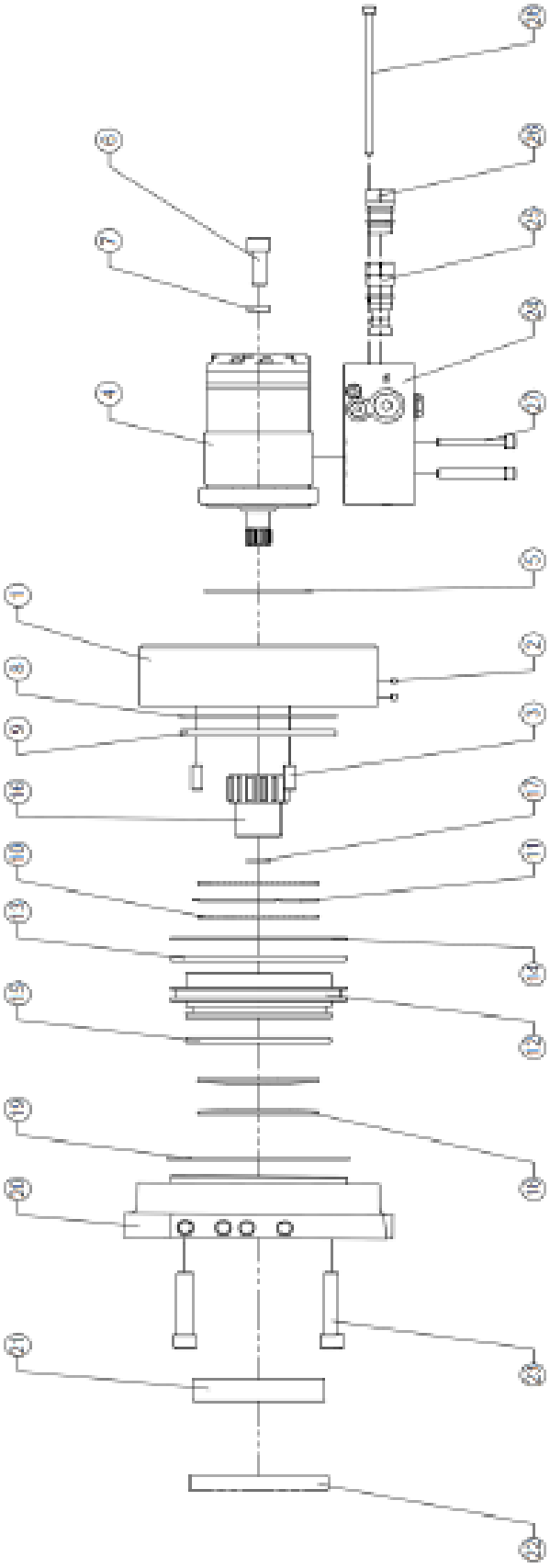
ASSEMBLY OF BRAKE

1. Lubricate all o-rings and back-up rings with clean hydraulic oil used in the system.
2. Clean all parts thoroughly and visually examine for cuts, dents or other damage before assembly. Repair or replace parts with such defects.
3. Place back up ring (item 8) & o-ring (item 9) into brake housing (item 1). Place back up ring (item 14), o-ring (item 13), o-ring (item 15) onto brake piston (item 12). Insert the two brake discs (item 10), separated by the stationary plate (item 11) into the brake piston. Set brake piston onto brake housing (item 1), ensuring that the slots in the brake piston align with the dowel pins in the brake housing. Using the brake driver (item 16), ensure the splines of the two brake discs are aligned, and gently tap piston into position until seated.
4. Insert springs (item 18) in brake piston (item 1) in the same orientation in which they were removed.
5. Place o-ring (item 19) onto end support (item 20) and align end support onto brake housing and tighten the four capscrews (item 23) evenly and torque to 57 ft-lbs.
6. Slide the end support back onto the drum and reconnect to the tie rods (installation 1.50540/1.50541).
7. Insert the brake driver (item 16) onto input shaft. Place o-ring (item 5) on pilot dia. of motor (item 4). Then insert into brake housing (item 1) and secure with capscrews (item 6), lock washers (item 7), capscrew (28).
8. Refill winch with oil through fill port of gear end cover (installation 1.60540/1.60541).

Brake Trouble Shooting

1. Brake will not release:
   (a) Insufficient system pressure to brake.
   (b) Damaged seals within housing (item 1), or brake piston (item 12).
   (c) Brake discs or stationary plates (items 10 and 11) warped or heat damaged.
2. Brake will not apply or applies but torque low:
   (a) Damaged springs (item 18), either broken or heat damaged and having taken a permanent set.
   (b) Brake discs (item 10) worn out.

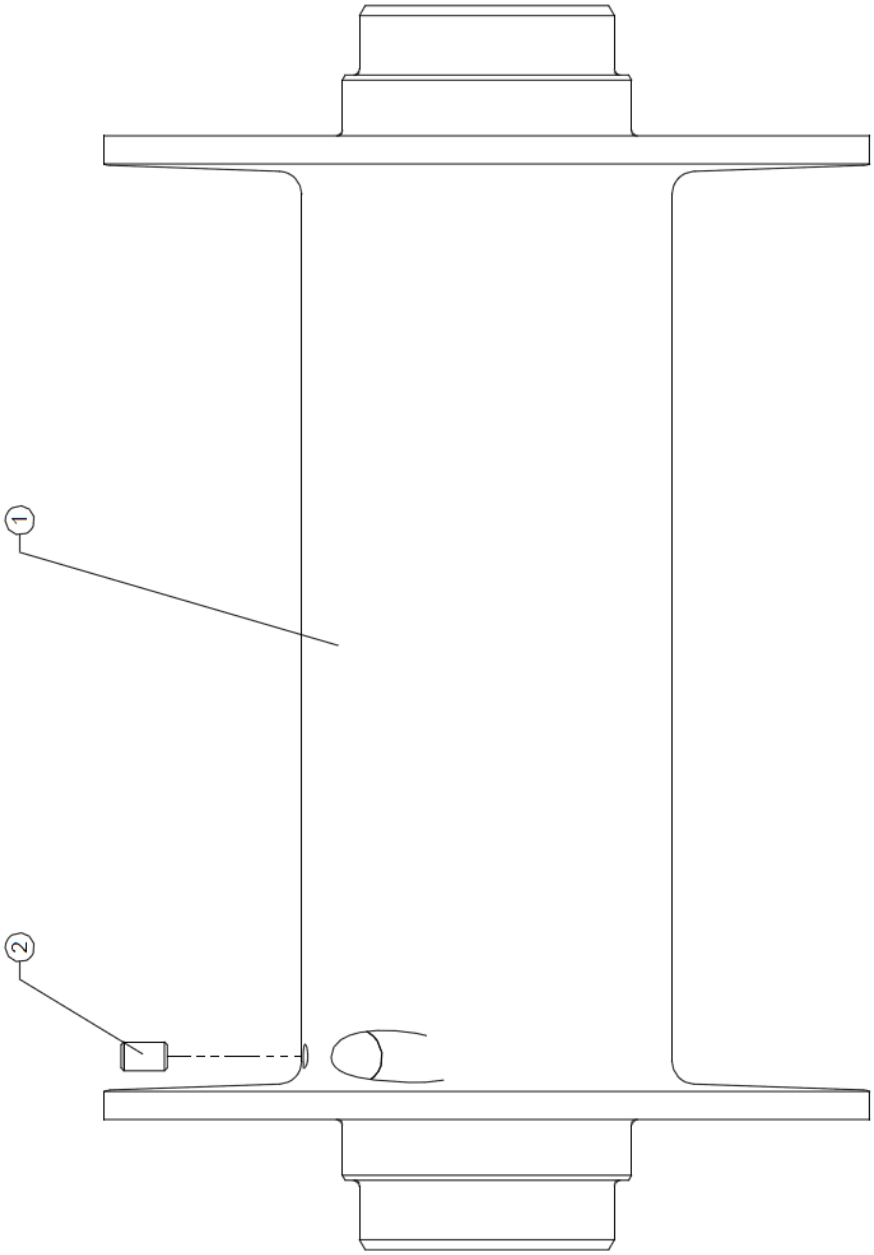
Motor End Installation



MOTOR END INSTALLATION - 1.10540

Motor End Installation – 1.10540 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	54406	HOUSING-BRAKE-MACHINED-8/12K RECOV	1
2	3440	PLUG-HOLE-EXPANDER #MB-040	2
3	54422	PIN-DOWEL 3/8 X 7/8 ANSI B18.8.2, Hardened Ground Machine	3
4	73212	HMTR - GE - 04.00 - S - A2	1
5	9637	ORING-3 1/4 ID X 3/32 W-#2-152	1
6	1454	CAPSCREW-SH-1/2-13UNC X 1 1/4	2
7	1144	WASHER-LOCK-1/2-HI COLLAR	2
8	9711	RING-BACKUP-4 3/4ID X .183W-#351	1
9	9600	ORING-4 3/4 ID X 5 1/8 OD X 3/16W-2-351	1
10	13035	PLATE-FRICTION-BRAKE-DRV-WHEEL	2
11	13034	PLATE-STATIONARY-BRK-DRV-WHEEL	1
12	54408	PISTON-BRAKE-MACHINED-8/12K RECOV	1
13	9851	ORING-5 3/8 ID x 3/16 W 2-356 BUNA 70	1
14	9852	RING-BACKUP-5.278 ID X .076-#8-355	1
15	9709	ORING-4 3/8 ID X 3/16W-#348 BUNA 70 DURO	1
16	54428	DRIVER-BRAKE-MOTOR END-H SERIES	1
17	3460	RING-RETAINING-3/4 X .035T	1
18	3607	SPRING-BELLEVILLE-4 X 2 X .12 X .14H	2
19	43689	O-RING, -162	1
20	54404	END SUPPORT-MOTOR END-MACHINED-8/12K RECOV	1
21	45419	BEARING - RA - BAL - 02.756	1
22	41277	SEAL, OIL, G1542	1
23	42517	CAPSCREW-SH-1/2-13UNC X 2 1/4	4
24	54431	VALVE ASSY-C'BAL-CL-T & R SERIES-TOP PORTS	1
25	71033	CARTRIDGE-VALVE-SUN #CKCB-XEN	1
26	70042	PLUG-SUN T11A-(XEOA-XXN)	1
27	1248	CAPSCREW-SH-5/16-18UNC X 2 1/4	4
28	54430	CAPSCREW-SH-1/4-20UNC X 5	1

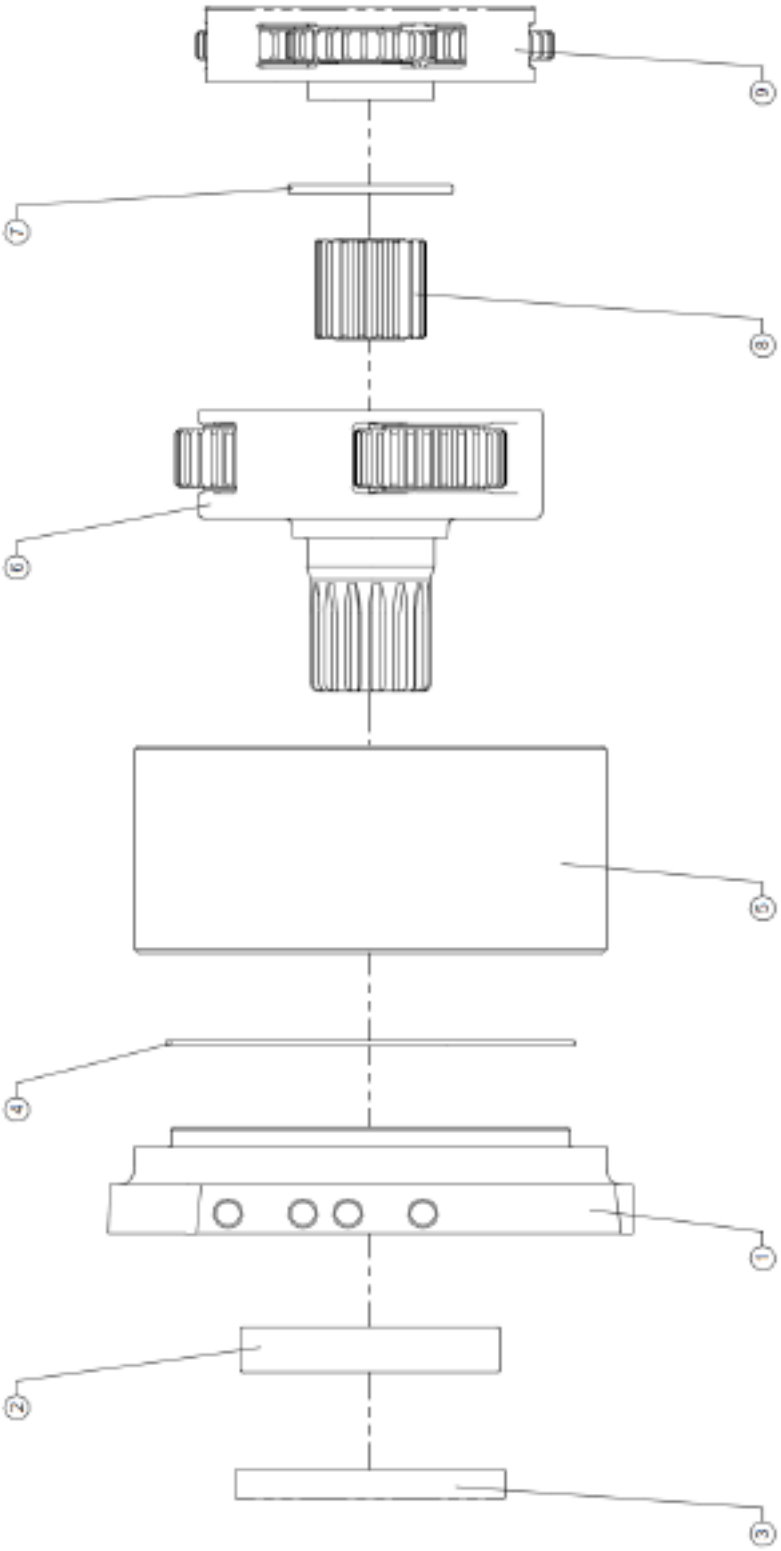
Drum Installation



DRUM INSTALLATION - 1.20540 / 1.20541

Drum Installation – 1.20540 / 1.20541 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	54399	DRUM-MACHINED-8”-8/12K RECOV	1
	54401	DRUM-MACHINED-10”-8/12K RECOV	1
2	1289	SET SCREW-SOCKET – 0.31-18 X .50	2

Gear End Installation



GEAR END INSTALLATION - 1.30540

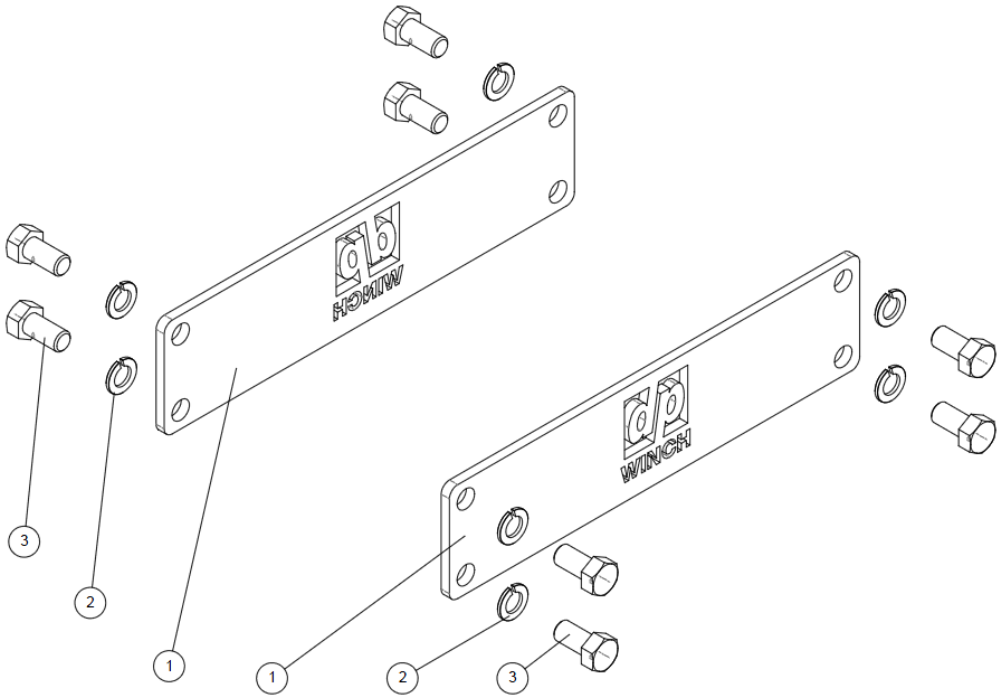
Gear End Installation – 1.30540 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	54403	END SUPPORT-GEAR END-MACHINED-8/12K RECOV	1
2	45419	BEARING - RA - BAL - 02.756	1
3	41277	SEAL, OIL, G1542	1
4	9897	ORING-6 1/2 ID X 3/32 W-#165 BUNA 70 DUR	1
5	54419	GEAR-RING-H SERIES	1
6	54420	ASSEMBLY-CARRIER-SEC-H-5:1	1
7	12083	WASHER-THRUST-NYLON-J	1
8	54427	GEAR-SUN-SEC-H SERIES	1
9	54421	ASSEMBLY-CARRIER-PRI-H-5:1	1

Input Shaft Installation

INPUT SHAFT INSTALLATION - 1.40540 / 1.40541

Input Shaft Installation – 1.40540 / 1.40541 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	54409	INPUT SHAFT-20.238L (10” DRUM)	1
	54424	INPUT SHAFT-18.738L (8” DRUM)	1

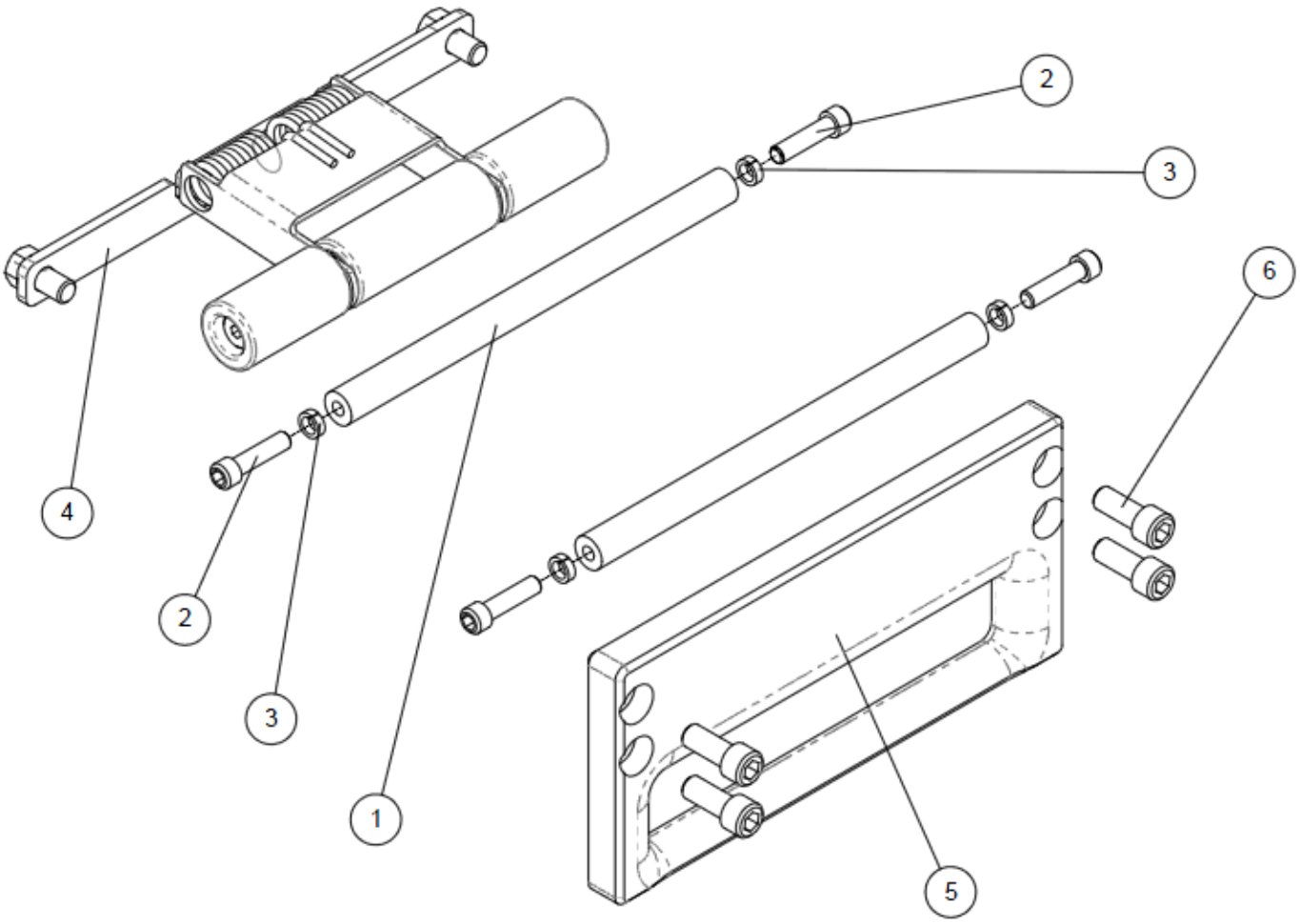
Base Mount Installation



BASE MOUNT INSTALLATION - 1.50540 / 1.50541

Base Mount Installation – 1.50540 / 1.50541 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	54549	PLATE-TIE-10” DRUM	2
	54548	PLATE-TIE-8” DRUM	2
2	1495	WASHER-LOCK-1/2	8
3	1403	CAPSCREW-HH-1/2-13UNC X 1 ½	8

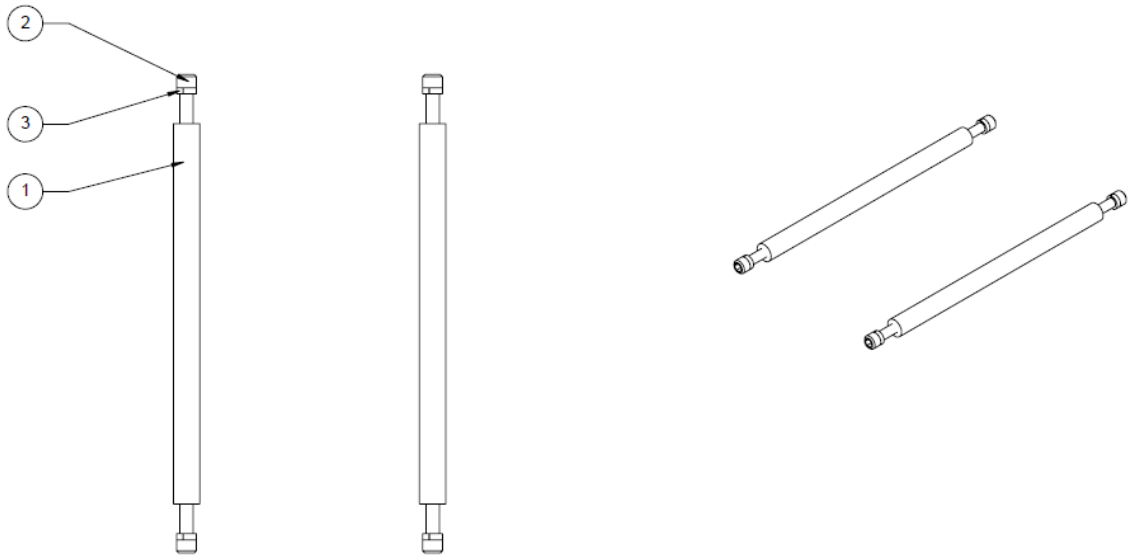
Base Mount Installation



BASE MOUNT INSTALLATION - 1.50545

Base Mount Installation – 1.50545 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	54423	BAR, TIE, 10.810L	2
2	1342	CAPSCREW-SH-3/8-16UNC X 1 1/2	4
3	1379	WASHER-LOCK-3/8-HI COLLAR	4
4	54511	KIT-TENSIONER-8/12RPW	1
5	54436	HAWSE PLATE – 10” DRUM	1
	54437	HAWSE PLATE – 8” DRUM	1
6	1454	CAPSCREW-SH-1/2-13UNC X 1 ¼	4

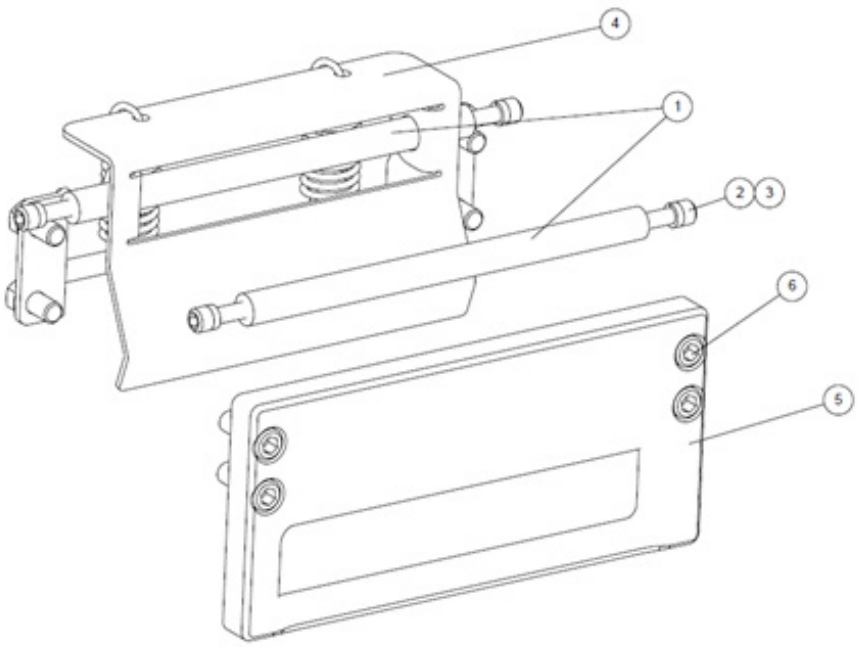
Base Mount Installation



BASE MOUNT INSTALLATION - 1.50542

Base Mount Installation – 1.50542 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	54423	BAR, TIE, 10.810L	2
2	1342	CAPSCREW-SH-3/8-16UNC X 1 1/2	4
3	1379	WASHER-LOCK-3/8-HI COLLAR	4

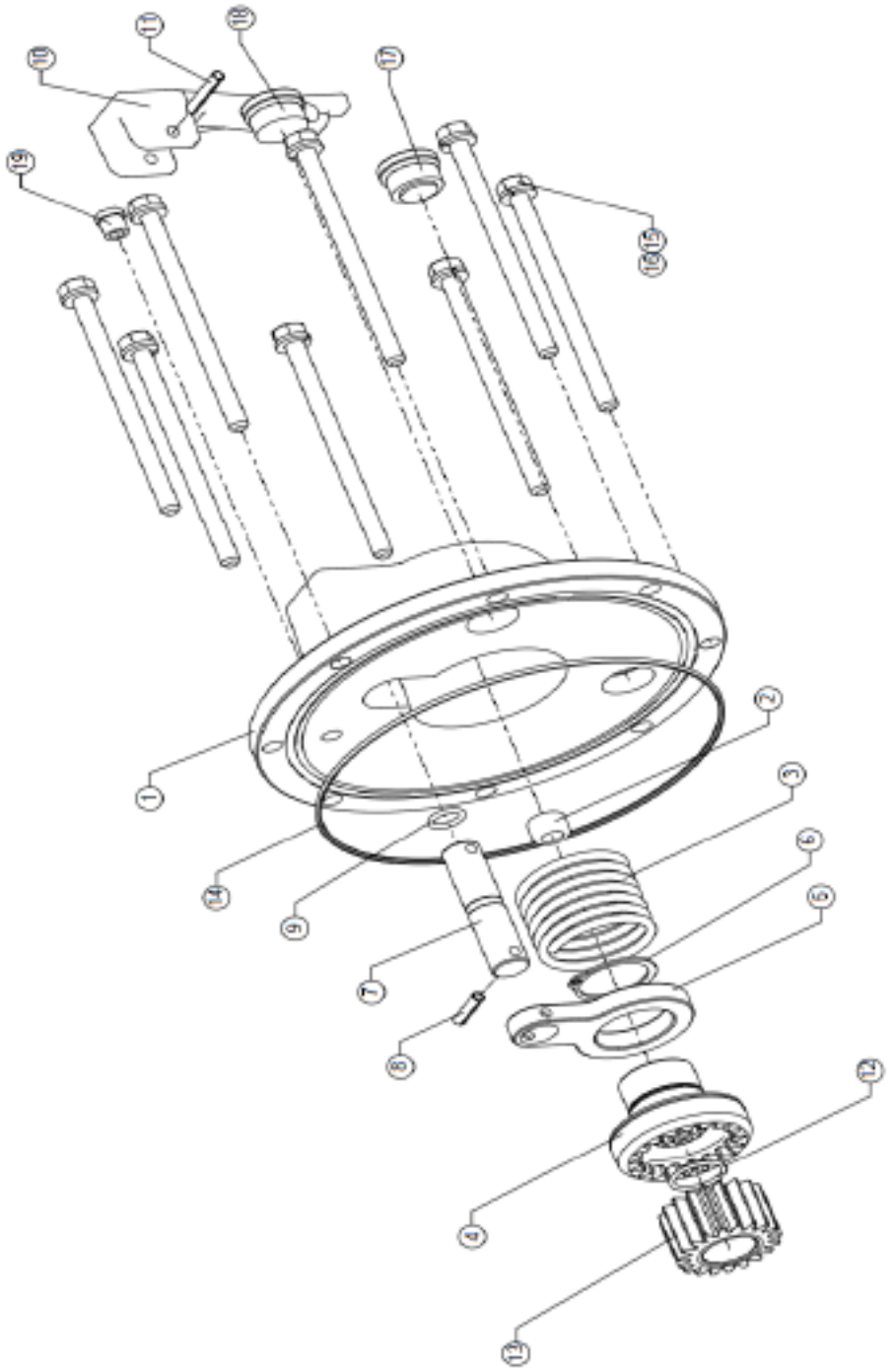
Alternate Base Mount Installation



BASE MOUNT INSTALLATION - 1.50546/1.50547

Base Mount Installation – 1.50546/1.50547 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	54423	BAR, TIE, 10.810L	2
	54425	BAR, TIE, 9.310L	2
2	1342	CAPSCREW-SH-3/8-16UNC X 1 1/2	4
3	1379	WASHER-LOCK-3/8-HI COLLAR	4
4	54446	KIT-TENSIONER-8/12RPW – 10” DRUM	1
	54445	KIT-TENSIONER-8/12RPW – 8” DRUM	1
5	54436	HAWSE PLATE – 10” DRUM	1
	54437	HAWSE PLATE – 8” DRUM	1
6	1454	CAPSCREW-SH-1/2-13UNC X 1 ¼	4

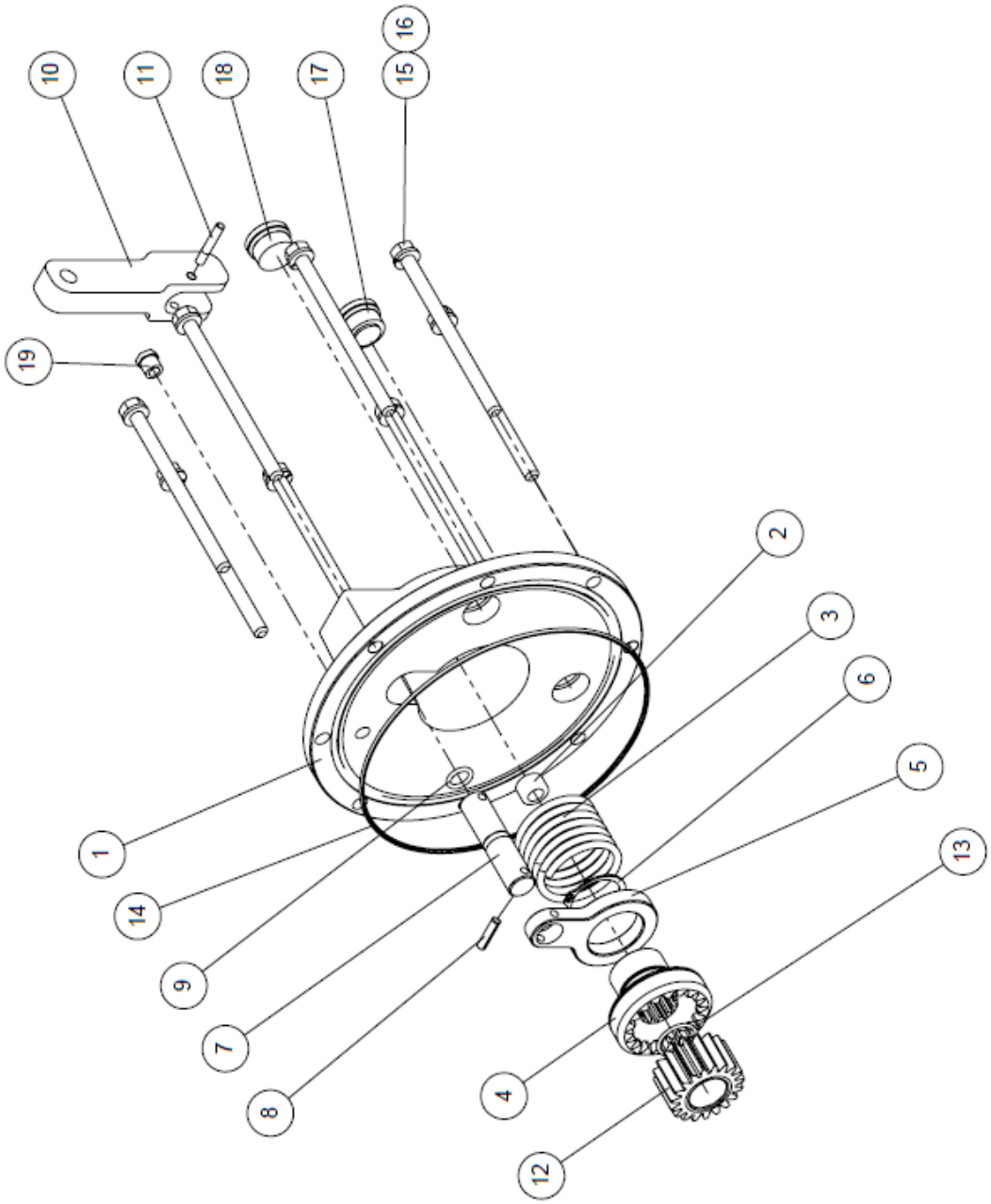
Manual Kickout Gear End Cover Installation



GEAR END COVER INSTALLATION - 1.60540

Manual Kickout Gear End Cover Installation – 1.60540 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	14182	COVER-G.E.-LKO-A SERIES>	1
2	81612	BUSHING-BRNZ-5/8 OD X 3/8” ID X 3/8 LG	1
3	2309	SPRING-COMP-ASSO.#C1937-162-3000M	1
4	54411	COUPLING-DRIVE-LKO-H SERIES	1
5	14183	YOKE-OVAL-SHIFT-LKO>	1
6	3303	RING-RETAINING-1 1/4 X .05T	1
7	14181	SHAFT-SHIFTER-LKO>	1
8	3456	PIN-SPRING-SLOTTED-3/16 X 13/16	1
9	9739	ORING-7/16 X 5/8OD X 3/32W-#2-111-70D	1
10	14099	LEVER-KICKOUT-LKO>	1
11	3705	PIN-SPRING-SLOTTED-3/16 X 1 1/8-ZINC PLTD	1
12	3321	RING-RETAINING-7/8 X .08 RD SEC.-805ID	1
13	54426	GEAR-SUN-MKO/AKO-PRI-H SERIES	1
14	9897	ORING-6 1/2 ID X 3/32 W-#165 BUNA 70 DUR	8
15	3004	CAPSCREW-HH-5/16-18UNC X 4 3/4-GR 8	8
16	1168	WASHER-LOCK-5/16	1
17	76343	PLUG-SH-O’RING BOSS-MAG #10	1
18	76344	PLUG-ORING-BOSS-#10-SH-7/8-14	1
19	3059	VENT-RELIEF-ALEMITE PART #47200	1

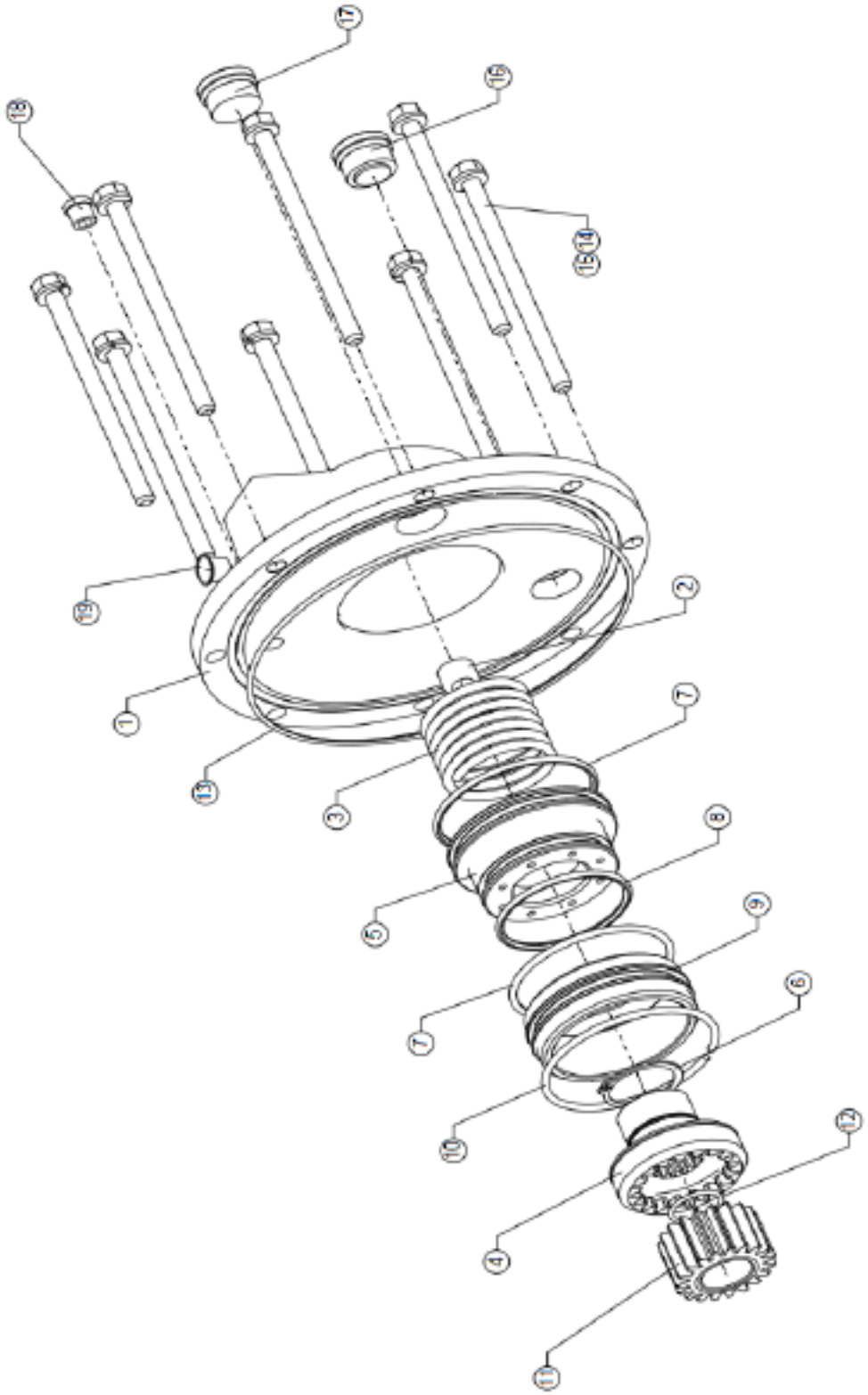
Alternate Manual Kickout Gear End Cover Installation



GEAR END COVER INSTALLATION - 1.60542

Manual Kickout Gear End Cover Installation – 1.60542 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	14182	COVER-G.E.-LKO-A SERIES>	1
2	81612	BUSHING-BRNZ-5/8 OD X 3/8” ID X 3/8 LG	1
3	2309	SPRING-COMP-ASSO.#C1937-162-3000M	1
4	54411	COUPLING-DRIVE-LKO-H SERIES	1
5	14183	YOKE-OVAL-SHIFT-LKO>	1
6	3303	RING-RETAINING-1 1/4 X .05T	1
7	14181	SHAFT-SHIFTER-LKO>	1
8	3456	PIN-SPRING-SLOTTED-3/16 X 13/16	1
9	9739	ORING-7/16 X 5/8OD X 3/32W-#2-111-70D	1
10	54566	FULCRUM-KICKOUT-MILLER	1
11	3705	PIN-SPRING-0.19 X 1.13	1
12	54426	GEAR-SUN-MKO/AKO-PRI-H SERIES	1
13	3321	RING-RETAINING-7/8 X .08 RD SEC – .805 ID	1
14	9897	ORING-6 1/2 ID X 3/32 W-#165 BUNA 70 DUR	1
15	3004	CAPSCREW-HH-5/16-18UNC X 4.75-GR 5	8
16	1168	WASHER-LOCK-5/16	8
17	76343	PLUG-SH-O’RING BOSS-MAG #10	1
18	76344	PLUG-ORING-BOSS-#10-SH-7/8-14	1
19	3059	VENT-RELIEF-ALEMITE PART #47200	1

Air Kickout Gear End Cover Installation



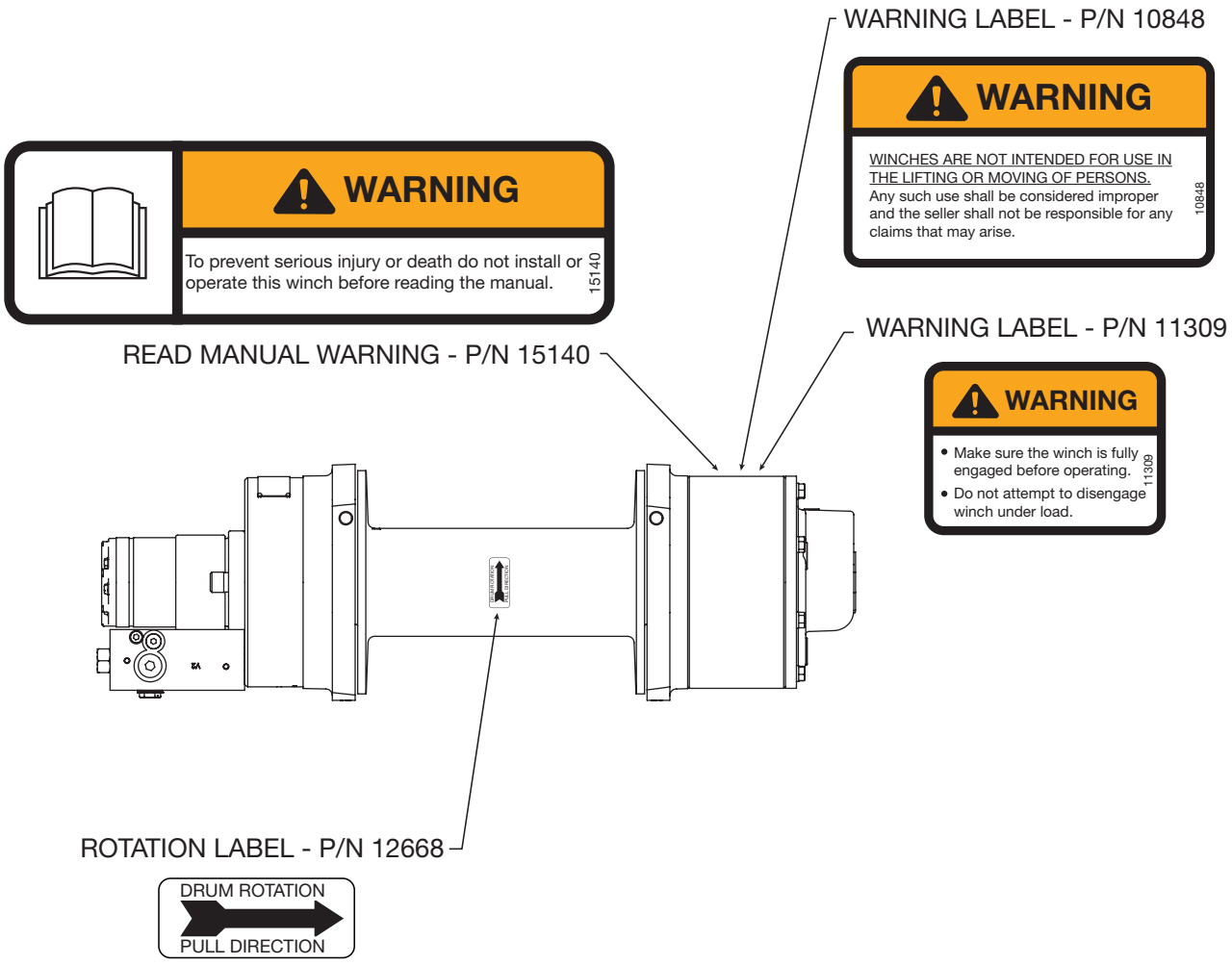
GEAR END COVER INSTALLATION - 1.60541

Air Kickout Gear End Cover Installation – 1.60541 Parts List			
Find No.	**Part No.**	**Description**	**Qty**
1	13370	COVER-G.E.-AKO-A SER-DS “G”>	1
2	81612	BUSHING-BRNZ-5/8 OD X 3/8” ID X 3/8 LG	1
3	2309	SPRING-COMP-ASSO.#C1937-162-3000M	1
4	54411	COUPLING-DRIVE-LKO-H SERIES	1
5	13373	PISTON-AKO-A SER-DS “G”>	1
6	3303	RING-RETAINING-1 1/4 X .05T	1
7	9672	ORING-2 5/8 ID X 1/8 W-#231	2
8	9704	ORING-2 1/8 ID X 2 3/8 OD-139-227	1
9	13296	CYLINDER-PISTON-AKO-B/C/D SER>	1
10	3632	RING-RETAINING-RD-SEC-3 OD X 34 GA	1
11	54426	GEAR-SUN-MKO/AKO-PRI-H SERIES	1
12	3321	RING-RETAINING-7/8 X .08 RD SEC.-805ID	1
13	9897	ORING-6 1/2 ID X 3/32 W-#165 BUNA 70 DUR	1
14	3004	CAPSCREW-HH-5/16-18UNC X 4 3/4-GR 8	8
15	1168	WASHER-LOCK-5/16	8
16	76343	PLUG-SH-O’RING BOSS-MAG #10	1
17	76344	PLUG-ORING-BOSS-#10-SH-7/8-14	1
18	3059	VENT-RELIEF-ALEMITE PART #47200	1
19	1157	CAPLUG-1/4 “ NPT THREADED PLUG-#P28”	1

Bolt Installation Torque Chart

Nominal Diameter / Thread Pitch	Grade 5 Torque		Grade 8 Torque	
	lb-ft	(lb-in)	lb-ft	(lb-in)
1/4-20	6.3	(76)	8.9	(107)
5/16-18	13	(156)	18.5	(221)
3/8-16	23		33	
7/16-14	37		53	
1/2-13	57		80	
5/8-11	113		159	
3/4-10	200		282	
7/8-9	322		454	
1-8	483		682	
1 1/8-7	596		966	

WARNING LABEL LOCATIONS



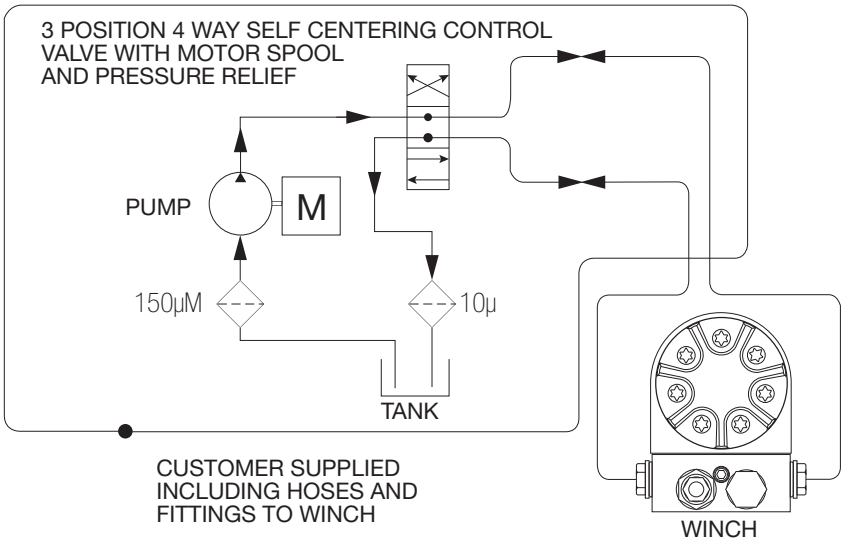
WARNING LABEL LOCATIONS MAY VARY ACCORDING TO WINCH MODEL.

Note: The removal or defacement of warning labels affixed to winches becomes the sole responsibility of the purchaser and will constitute a waver of claims to TWG.

HYDRAULIC SYSTEM

WARNING

The hydraulic system shown below must contain an open center, or motor spool, valve in order for the winch to perate correctly. Failure to use the correct control will result in loss of load control, possibly resulting in damage to property, personal injury or death.



WARNING

The relief must be set so the pressure supplied to the winch does not exceed the pressure rating of the winch. If the pressure or flow exceeds those rated for the winch, it could cause the winch, winch mounting or wire rope to fail. This could result in damage to property, personal injury or death.

CAUTION

Hydraulic pressures or flows lower than those rated for the winch will result in a lower line pull or lower line speed.

CAUTION

Control devices should be positioned for safe operation of the winch without hesitation or loss of time. They should also be designed so the operator or other persons are not exposed to any danger zones.

WINCH MOUNTING

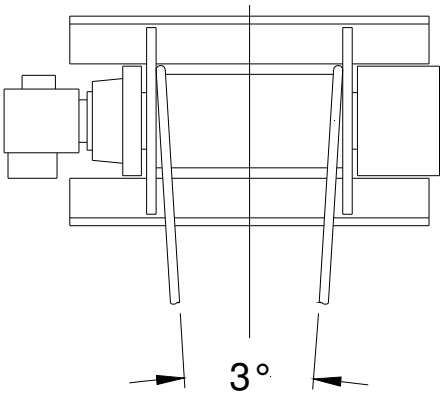
Knowledgeable parties should install all dp winches. Consult TWG if questions should arise. When users or third parties modify the winch or the vehicle that a winch is mounted to, they become responsible for the modifications and any results caused by the modifications. The finished installation should be able to withstand the maximum load applied to the vehicle by the full rated load of the winch.

Vehicles that dp winches are mounted on must have sufficient structural capacity to support the combined load that can be produced by all of the winches on the vehicle.

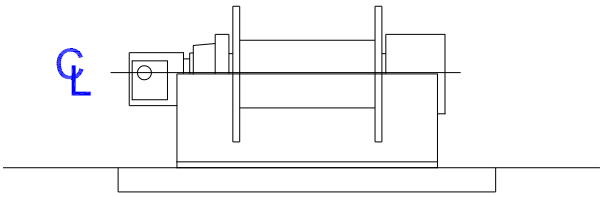
1. The winch should be mounted as close to center and as perpendicular as possible to the direction of the line pull. This will keep the wire rope fleet angle centered on the drum as small as possible. The maximum recommended fleet angle for smooth wire rope reeving is 3° total.

WARNING

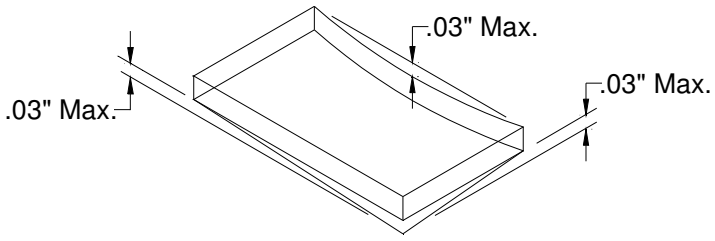
If the proper fleet angle is not maintained, the wire rope could wind onto one side of the drum. This could cause failure of the winch or wire rope, resulting in damage, injury or death.



2. The winch drum centerline should be mounted on a horizontal plane to insure proper lubrication to both ends of the winch.

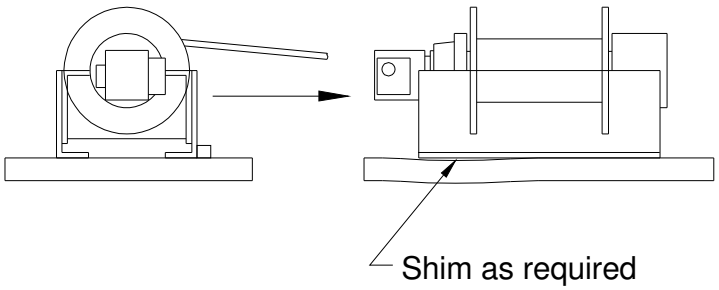


3. The winch mounting surface must be flat within .03" from any location and rigid enough to withstand full rated line pull without distortion of more than .03" in any direction.



WINCH MOUNTING (Continued)

4. Attach the winch to the mounting base. Shim stock may be used between the mounting surface and winch to insure the winch base is flat and fully supported. The winch shall be adequately attached to mounting base to support the full rated load without any movement between the winch and base.



WARNING

Failure to adequately align, support, or attach winch to a suitable mounting base could result in a loss of efficiency or premature failure of winch, wire rope, or mounting base.

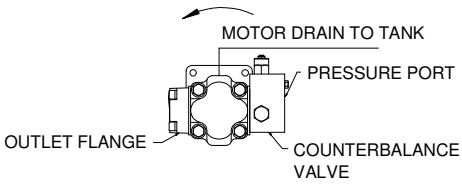
WINCH INSTALLATION

To Reverse Direction of Drum Rotation

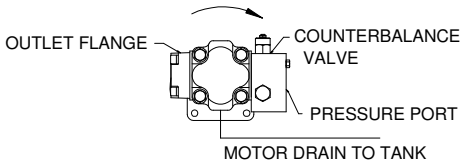
COMMERCIAL INTERTECH - METHOD 1

REMOVE THE COUNTERBALANCE VALVE AND OUTLET FLANGE.
REMOVE THE MOTOR MOUNTING BOLTS AND ROTATE THE MOTOR 180°.
REASSEMBLE MOTOR, COUNTERBALANCE VALVE, AND OUTLET FLANGE.

(STD) L



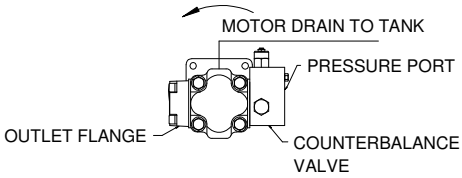
R



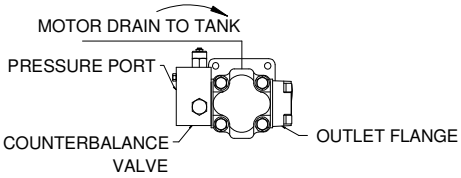
COMMERCIAL INTERTECH - METHOD 2

SWITCH POSITIONS OF COUNTERBALANCE VALVE AND OUTLET FLANGE.
NOTE: HOSES GOING TO BRAKE HOUSING MAY NEED TO BE LENGTHENED.

(STD) L



R

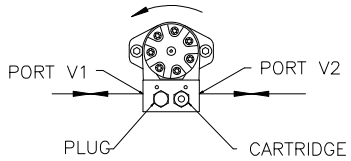


(STD) L

L PRESSURE TO V1 ROTATES WINCH DRUM COUNTER CLOCKWISE WHEN VIEWED FROM MOTOR END.

R PRESSURE TO V2 ROTATES WINCH DRUM CLOCKWISE WHEN VIEWED FROM MOTOR END.

TO REVERSE WIRE ROPE PULL DIRECTION,
SWITCH POSITIONS OF CARTRIDGE AND PLUG.



(STD) L

L PRESSURE TO V1 ROTATES WINCH DRUM COUNTER CLOCKWISE WHEN VIEWED FROM MOTOR END.

R PRESSURE TO V2 ROTATES WINCH DRUM CLOCKWISE WHEN VIEWED FROM MOTOR END.

TO REVERSE WIRE ROPE PULL DIRECTION,
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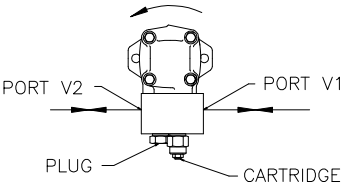


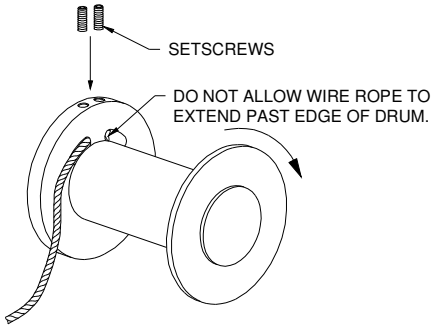
ALL UTILITY UNITS ARE BI-DIRECTIONAL WITHOUT MANIPULATION OF CARTRIDGE, AND OR PLUG LOCATIONS.

NOTE: IF TENSIONER AND, OR FAIRLEAD OPTIONS EXIST, THEN REVERSAL OF THEIR POSITION
IN RELATION TO WINCH MUST TAKE PLACE BEFORE REVERSAL OF WIRE ROPE PULL DIRECTION CAN OCCUR.

WARNING

Do not adjust any cartridge on the winch unless directed to do so by dp Manufacturing. They are preset at the desired pressure and may effect the performance of the winch if adjusted incorrectly.

WINCH INSTALLATION (Continued)

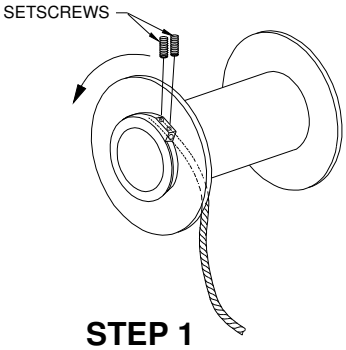


STEP 1

INSERT WIRE ROPE INTO PROPER SLOT ACCORDING TO DRUM ROTATION AND THREAD SET-SCREWS INTO THREADED HOLES IN DRUM FLANGE, MAKING SURE THAT BOTH SCREWS CLAMP ONTO WIRE ROPE.

STEP 2

ONCE SET-SCREWS ARE TIGHTENED SECURE, THE WIRE ROPE IS PROPERLY INSTALLED.



STEP 1

INSERT WIRE ROPE INTO SLOT ACCORDING TO DRUM ROTATION.

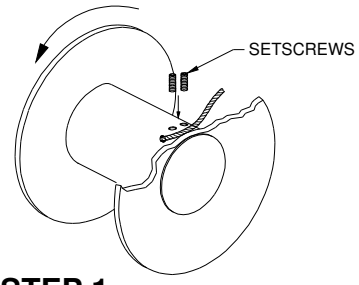
STEP 2

WRAP WIRE ROPE AROUND OUTSIDE OF FLANGE AND INSERT THROUGH CABLE ANCHOR.

THREAD SET-SCREWS INTO THREADED HOLES IN ANCHOR, MAKING SURE THAT BOTH SCREWS CLAMP ONTO WIRE ROPE.

STEP 3

ONCE SET-SCREWS ARE TIGHTENED SECURE, THE WIRE ROPE IS PROPERLY INSTALLED.

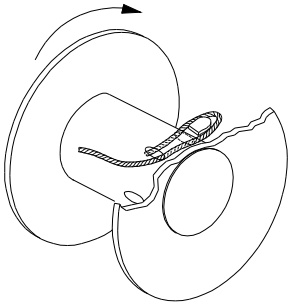


STEP 1

INSERT WIRE ROPE INTO PROPER SLOT ACCORDING TO DRUM ROTATION AND THREAD SET-SCREWS INTO THREADED HOLES IN DRUM FLANGE, MAKING SURE THAT BOTH SCREWS CLAMP ONTO WIRE ROPE.

STEP 2

ONCE SET-SCREWS ARE TIGHTENED SECURE, THE WIRE ROPE IS PROPERLY INSTALLED.



STEP 1

INSERT WIRE ROPE INTO POCKET OPENING AND THROUGH WEDGE POCKET.

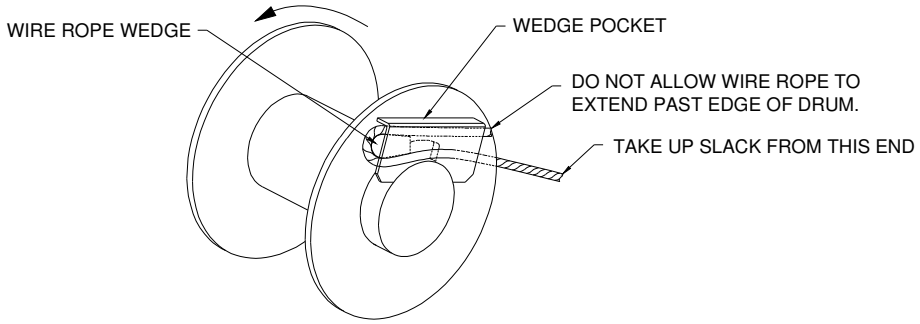
STEP 2

LOOP WIRE ROPE END AROUND WEDGE AND FEED WIRE ROPE BACK THROUGH WEDGE POCKET.

STEP 3

ONCE SLACK IS TAKEN UP, THE WIRE ROPE IS PROPERLY INSTALLED.

WINCH INSTALLATION (Continued)



STEP 1

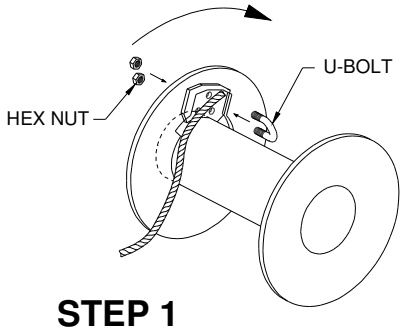
INSERT WIRE ROPE INTO POCKET OPENING AND THROUGH WEDGE POCKET.

STEP 2

LOOP WIRE ROPE END AROUND WEDGE AND FEED WIRE ROPE BACK THROUGH WEDGE POCKET.

STEP 3

ONCE SLACK IS TAKEN UP, THE WIRE ROPE IS PROPERLY INSTALLED.



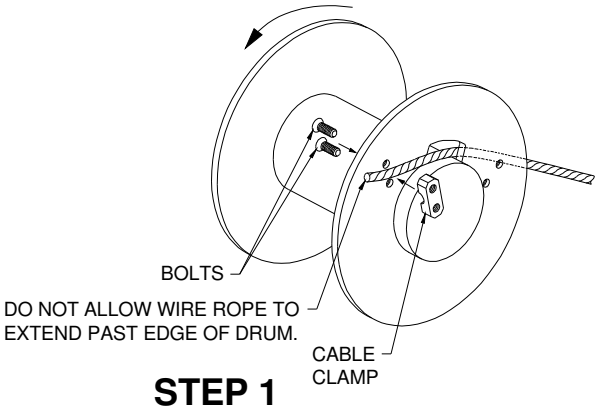
STEP 1

ALIGN WIRE ROPE BETWEEN PROPER HOLES ACCORDING TO DRUM ROTATION. INSERT U-BOLT INTO HOLES AND THEAD ON NUTS FROM BACK OF FLANGE.

STEP 2

ONCE NUTS ARE TIGHTENED SECURE, THE WIRE ROPE IS PROPERLY INSTALLED.

WINCH INSTALLATION (Continued)



STEP 1

INSERT WIRE ROPE INTO FLANGE OPENING.

STEP 2

PULL WIRE ROPE THROUGH AND ALIGN BETWEEN FLANGE HOLES. POSITION CLAMP OVER WIRE ROPE, AND THREAD BOLTS AS SHOWN.

STEP 3

ONCE BOLTS ARE TIGHTENED SECURE, THE WIRE ROPE IS PROPERLY INSTALLED.

DANGER

If the wire rope is not installed for the correct drum rotation, the winch brake valve will not hold the load. Do not apply full load to the winch with less than 5 full wire rope wraps on the drum. The last five wraps of wire rope must be left on the drum to assist the wire rope clamp in holding the load.

WINCHING PRINCIPLES

A basic knowledge of hydraulics and equipment application is needed in winching, both as a matter of safety, and for the best operational results. dp winches should only be run by experienced operators. This relates specifically to three factors for which a vehicles resistance to motion is contingent:

A) Total Weight - A vehicles total weight.
B) Surface Drag - The characteristics of the terrain, or surface to be traversed.
C) Gradient Resistance - The incline of grade, or slope on which the vehicle is being moved.

A) Total Weight (Wt) should include all attributing factors, including fuel, passengers, cargo, and equipment.

B) Surface Drag (S) is the single most significant factor in winching. Assuming the vehicle is in proper working condition, a flat surface will use approximately 4% of its total weight to initiate motion. In opposition, a restrictive surface can require as much as 50% of the vehicles total weight.

Refer to the following table for proportionate effects:

Surface Type	**Surface Drag (S)**
Hard flat road	.04
Grass	.14
Sand (hard wet)	.17
Gravel	.20
Sand (soft wet)	.20
Sand (soft/dry/loose)	.25
Shallow mud	.33
Bog	.50
Marsh	.50
Clay (clinging)	.50

The values and calculations in this section are approximate and are for reference only.

Basic mathematics will indicate the approximate rolling resistance of a vehicle that is functioning properly.

Example: If the surface is gravel, .20 is multiplied by the vehicles total weight. If the total weight is 5,000 pounds, then the approximate rolling resistance is 1,000 pounds.

(5,000 pounds x .2 = 1,000 pounds)

Note: This equation is only applicable for flat surfaces. For all other surfaces, the calculation must include the gradient resistance co-efficient.

C) **Gradient Resistance (G)** For practical purposes, gradient resistance can be taken as 1/60th of the weight of the vehicle for each degree of the slope. Slope is defined as height versus the horizontal distance. See Figure 1.

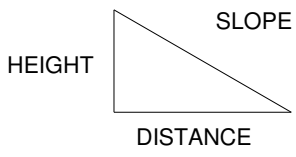
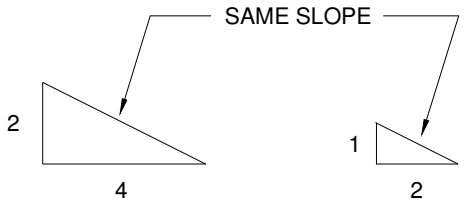


Figure 1

WINCHING PRINCIPLES (Continued)

The height and distance can be defined in terms of a ratio.



For example, if the height is 1 and the distance is 2, the slope will be the same as if the height was 2 and the distance was 4, and so on (see above). The following table can be used to find the gradient values for the given ratio of height and distance.

GRADIENT VALUES

Ratio		Angle (ref.)	Gradient (G)
Height	Distance		
1	1	45°	.75
1	2	27°	.44
1	3	18°	.31
1	4	14°	.23
1	5	11°	.19
1	6	9°	.16
1	7	8°	.14
1	8	7°	.12
1	10	6°	.10
1	12	5°	.08
1	15	4°	.06
1	20	3°	.04
1	30	2°	.03
1	50	1°	.02

Combining the weight of the vehicle (Wt), the type of the surface to be traversed (S), and the gradient to overcome (G), use the following formula.

(Weight of vehicle x Surface drag) + (Gradient value x Weight of vehicle) = Effort required.

Or, (Wt x S) + (G x Wt) = Effort required.

For example, if a vehicle weighing 4,500 pounds were winched up an inclined dune that is 20 long and 10 tall of dry, loose, sand, then the above formula would be used as follows:

Where, Wt = 4,500 pounds (vehicle weight)
S = .25 (co-efficient for soft sand)
G = .44 (gradient value)

We have, (4,500 lbs. x .25) + (.44 x 4,500 lbs.) =

1,125 lbs. + 1,980 lbs. = 3,105 pound of effort required to recover the vehicle.

WINCHING PRINCIPLES (Continued)

An important aid to successful winching is the snatch block, which can be used to increase the pulling power of a winch or change the direction of a pull. The following figures show typical examples of how a snatch block can be used to gain an advantage.

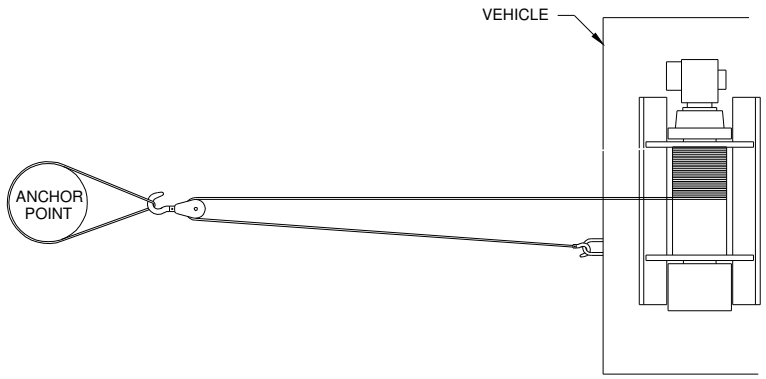


Figure 1

Figure 1 shows self recovery using a snatch block attached to an anchor point. In this instance the vehicle becomes the load. The pull applied to the vehicle is twice as much as the line pull of the winch.

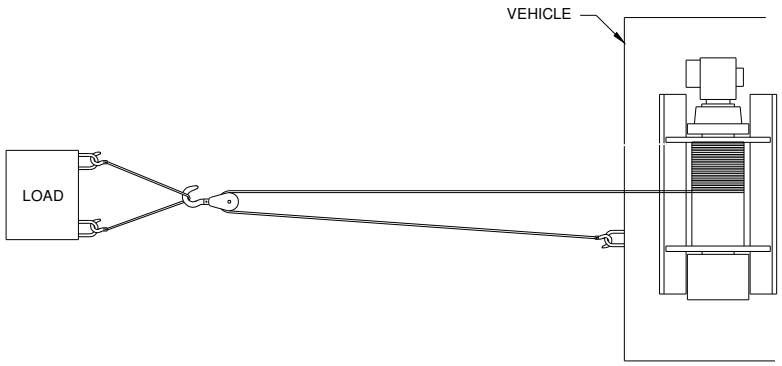


Figure 2

Figure 2 shows a direct pull on a load using the vehicle as the anchor with the snatch block attached to the load. The pull on the load will be twice as much as the line pull of the winch. The end of the wire rope may be anchored indirectly instead of using the vehicle but it is not recommended. If the end of the wire rope is anchored indirectly, the recovery should be in stages by moving the anchor point or vehicle to avoid paying the winch in at sharp angles.

WARNING

Always make sure that the wire rope is securely fastened to the load. Consult the Wire Rope Users Manual published by the Wire Rope Technical Board or the wire rope manufacturer for the proper wire rope attachment method for your application.

WINCHING PRINCIPLES (Continued)

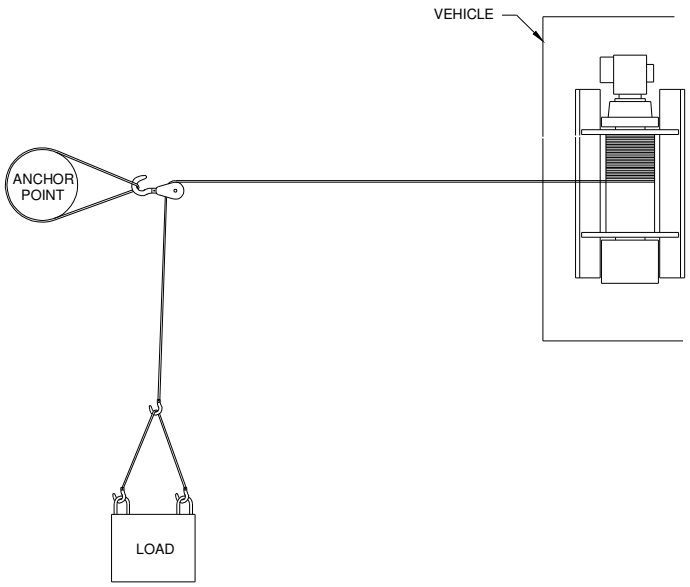


Figure 3

Figure 3 shows an indirect pull where the vehicle is limited due to unsuitable ground or obstruction, using a snatch block attached to a suitable anchor point. The pull on the load is the actual line pull of the winch.

Notes:
1) If more than one snatch block is used, they must be located at least 36" apart. If they are any closer than that, the wire rope can not properly realign itself and the chance of failure increases.
2) The effort required may be outside the capacity of the winch - (the rating system of a winch usually refers to the first layer of wire rope on the drum) In this case, one solution may be to run out the greatest majority of wire rope in order to increase the efficiency of the rated capacity, or install a snatch block pulley in the winch line to create a mechanical leverage, thus practically cutting the effort required in half.

WARNING

If the winch is used in an application other than self recovery:
- Do not attempt to pull a load if the vehicle that the winch is mounted on is parked on unstable ground.
- The vehicle that the winch is mounted on must stay stationary when the winch is being operated.

WARNING

If a sheave is used to guide the wire rope, consult the wire rope manufacturer or the Wire Rope Users Guide published by the Wire Rope Technical Board for the proper sheave specifications needed for the application. Do not use the boom or vehicle to move a load while the winch's wire rope is attached to load.

ACCESSORIES

CABLE HOLD DOWN

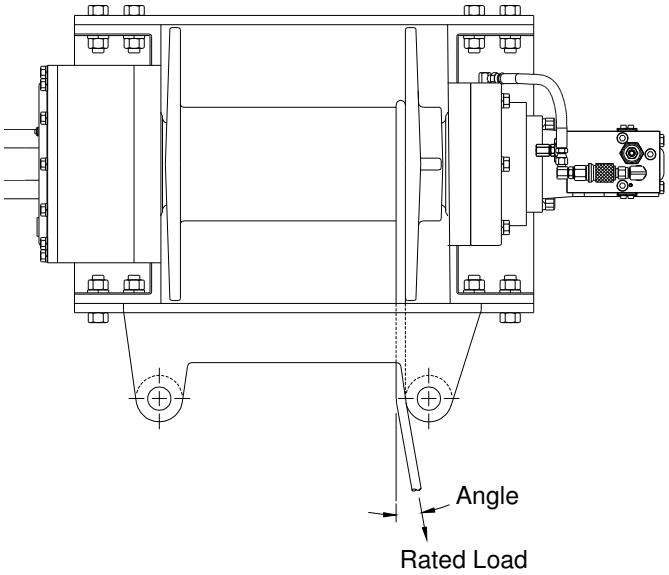
The purpose of TWG cable hold down devices is to keep the wire rope tight on the drum while the winch is in freespool mode or while there is no load on the wire rope. TWG cable hold down devices should NOT be relied upon to insure that the wire rope winds onto the winch evenly.

WARNING

If the wire rope is allowed to wind onto the drum in an uneven or disorderly manner, damage to the the tensioner may occur. This could cause damage or failure of the winch or wire rope resulting in damage, injury or death.

Fairleads

The use of a fairlead does not insure that the wire rope will wind onto the drum in an orderly manner. The proper fleet angle must be maintained for the wire rope to wind onto the drum in an orderly manner (see “Winch Mounting” for the proper fleet angle).



Note: This figure is for illustration purposes only. The configuration of the fairlead may vary according to the model of the winch.

WARNING

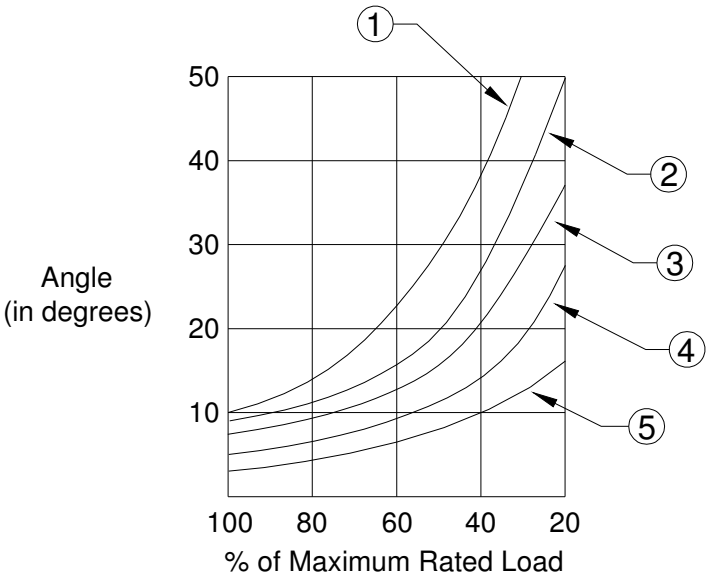
If the proper fleet angle is not maintained, the wire rope could wind onto one side of the drum. This could cause failure of the winch or wire rope, resulting in damage, injury or death.

WARNING

Due to the diameter of the fairlead rollers, contact with the wire rope must be limited. Excessive contact of the wire rope with the fairlead rollers could lead to failure of the wire rope resulting in damage, injury or death.

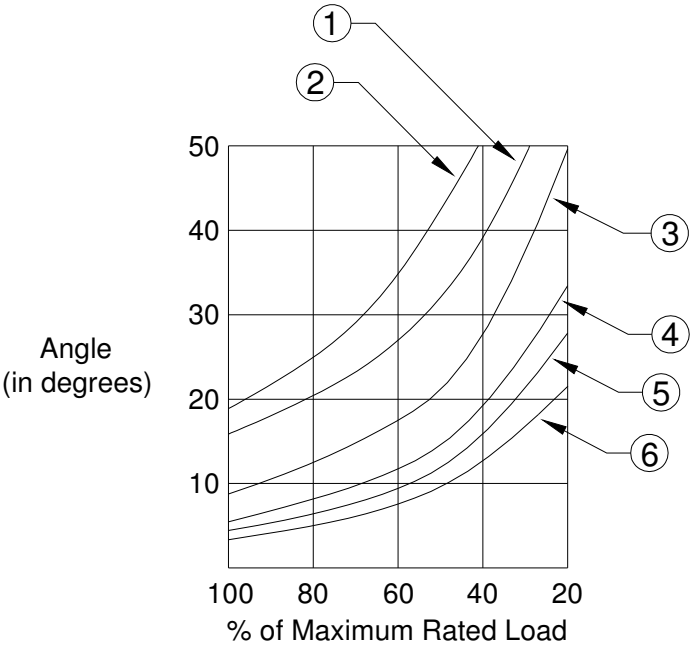
ACCESSORIES (Continued)

The following graphs can be used to determine the angle at which the percentage of the rated load on the first layer may be pulled against the fairlead rollers (see illustration on previous page).



Curve #	Winch Model
1	12, 15, 45, 50
2	8GR, 10GR, 10J, 12J, 12AJ
3	15AJ, 25, 30
4	20AJ, 20
5	16J, 35

Horizontal Roller



Curve #	Winch Model
1	8GR, 10GR, 10J, 15
2	12J, 12, 45, 50
3	16J, 12AJ, 20, 25
4	15AJ, 30
5	20AJ
6	35

Vertical Roller

⚠ CAUTION

If the proper angle between the load and the fairlead is not maintained, it could result in damage to the winch.

TROUBLE SHOOTING

Condition	Possible Cause	Correction
WINCH WILL NOT PAY OUT.	The brake is not releasing because it is not getting the pilot signal.	Check the pressure at the S1 port of the brake valve. With the hydraulic system running, the pressure at the S1 port will be approximately equal to the system pressure. The brake is fully opened at 270 psi. If the pressure at S1 is not correct, replace the brake valve.
	The brake is mechanically binding up.	If the pressure at S1 reads 270 psi and the brake does not release, the brake may be mechanically bound. This requires disassembly of the motor end to correct the problem. Contact dp Parts and Service Department before disassembly.
	The hydraulic system will not build up enough pressure to release the brake.	The relief valve, located in the system control valve, is set too low or stuck open. OR, the hydraulic pump has failed.
	The gear train is mechanically binding up.	This will require disassembly of the winch for repair. Contact dp Parts and Service department before disassembly.
WINCH WILL NOT PULL LOAD.	The brake is not releasing.	Check the pressure at the S1 port of the brake valve. With the hydraulic system running, the pressure at the S1 port will be approximately equal to the system pressure. The brake is fully opened at 270 psi. If the pressure at S1 is not correct, replace the brake valve. If the pressure at S1 reads 270 psi and the brake does not release, the brake may be mechanically bound. This requires disassembly of the motor end to correct the problem. Contact dp Parts and Service Department before disassembly.
	The hydraulic system pressure is not adequate to power the load, or the back pressure is too high.	Check the pressure by installing pressure gauges on each side of the winch motor. Compare the difference shown on the gauges with the winch performance information.
	Winch is mechanically binding up.	Check to insure that the winch is mounted on a flat, rigid surface. Loosen, but do not remove, the capscrews that are attaching the support straps (or base angles if you have a low mount winch) to the end supports. Rotate the drum, making sure that it turns freely without sticking. Tighten the capscrews. Remove and disassemble the winch for repair and mounting adjustment. Contact dp Parts and Service before disassembling.
HYDRAULIC OIL IS LEAKING FROM THE BRAKE HOUSING, MOTOR OR END SUPPORT.	Front seal in the hydraulic motor shaft has failed.	Remove and replace the motor. Replace or repair the brake. Contact dp Parts and Service. Drain oil and refill. Check end support to insure that there is not additional leakage.

General Information

MISCELLANEOUS LUBRICATION POINTS
Manual kick out levers should be cleaned and lubricated with a coat of light oil on the shaft and the detent mechanism (avoid excessive oil build up, which will attract dust).

PNEUMATIC SYSTEM
This product is available in a configuration that uses air pressure to power the drum disengagement. This component requires clean dry air for trouble free service. A typical pneumatic system should have an FDL (filter, dryer, lubricator) and a pressure regulator. More than (1) pressure regulator may be required depending on the pressure requirements of the different components. It is important to keep moisture from entering the winch. Moisture could cause corrosion. If temperatures fall below 32°F, moisture could freeze and render the component inoperable. See the dimensional drawing for the pressure requirements.

EXTENDED STORAGE PROCEDURES
If you plan to store your dp product for more than 90 days, some extra precautions are required to insure your product will be ready to perform when you put it back into service.

- Wash and dry the exterior of the winch.
- Service the wire rope as recommended by the rope manufacturer
- The winch should be filled with the appropriate corrosion-inhibiting lubricant and operated for 5 minutes in both directions to distribute the lubricant. The winch should then be filled to the highest level possible (i.e.: vent high). This will insure the maximum coverage of all internal components. Note: Drain oil to normal operation level before returning to service.
- The internal components of the pneumatic system should be coated with a corrosion-inhibiting lubricant. If a pneumatic lubrication system is not installed, this can be accomplished by spraying an aerosol lubricant into the ports of the components and shifting it several times to distribute the lubricant evenly.
- All ports should be plugged (i.e. motor inlet/outlet ports, drum disengagement)
- Lubricate all external components
    - Fairlead rollers
    - Pivot points of cable hold down
    - Manual drum disengagement handle

Hydraulic System

FLUID SPECIFICATIONS
When choosing a fluid, it is important to consider the start-up and operating temperatures of the hydraulic system. Generally, the fluid is then when started and with movement it warms and thins out. Premium grade petroleum based hydraulic fluids will provide the best performance. They contain anti-wear agents, rust/oxidation inhibitors, and anti-foaming agents. dp recommends an oil viscosity of 20-43 cSt and a temperature range of 100-140°F. The oil viscosity should never fall below 13 cSt or a temperature rise above 180°F. Oil viscosity great than 43 cSt is not normally detrimental to the motors used on dp products, except 2 speed and variable displacement motors. Consult your local hydraulic fluid distributor for assistance in selecting a fluid that would best suit your climate and application.

FLUID / SYTEM MAINTENANCE
Maintaining correct fluid viscosity and cleanliness level is essential for all hydraulic systems. dp products are used in a wide variety of applications and it is impossible to publish a fluid maintenance schedule that would cover every situation. dp recommends that the minimum hydraulic fluid cleanliness be maintained at an ISO Cleanliness Code 18/13 rating. Your hydraulic system designer can recommend an adequate filtration system and maintenance schedule to achieve this rating.

Winch Lubrication

LUBRICANT SPECIFICATIONS

Gear lubrication is an important component in insuring the long life of your winch. The type of lubricant will have a great influence. Generally, a gear lubricant should have a viscosity of 100 to 250 cSt at the expected ambient operating temperature. For operation in lower temperature ranges, it is imperative that the pour point of the lubricant be at least 10° below the lowest ambient temperature. The oil you select should meet GL5 performance standards for high pressure, possess rust/oxidation inhibitors, and low foaming properties. Many lubricants available under a variety of trade names meet these requirements. Unless otherwise requested, the gear oil your winch was shipped with is GL5 80W90. Consult your local lubricant distributor on the selection that best fits your climate and application.

LUBRICANT TYPE:

HYDRAULIC SYSTEM

120°F to 45°F	MIL SPEC-L-2104E	GRADE 30W
40°F to -15°F	MIL SPEC-L-2104E	GRADE 10W
40°F to -50°F	MIL SPEC-L-46167B	ARCTIC

WINCH LUBRICANT (MAINTAIN AT WINCH FILL PLUG LEVEL)

120°F to 10°F	MIL SPEC-L-2105D	85W/140
55°F to -10°F	MIL SPEC-L-2105D	80W/90
50°F to -50°F	MIL SPEC-L-2105D	75W

CHANGE INTERVAL

The initial lubricant should be changed after the first 10 hours of operation. During this “breaking in” period it is normal for the lubricant to contain minuscule black & bronze particles. Subsequent changes should be scheduled every 250 hours of operation or annually.

LUBRICATION LEVEL

The oil level should be checked with the winch centerline horizontal. The winch should be filled to the bottom of the fill/level plug. If your winch has more than (1) fill/level plug, select the plug that is slightly above the centerline. If unit is mounted in a non-standard orientation, consult dp Service Department for lubrication level information.

1. Oil Check and Filla.
   a. Remove oil fill plug.
   b. Oil level should be visible. If overfull and thin it may indicate hydraulic oil leakage through the brake. correct by draining and refilling before operating winch. If this condition continues winch should be checked for seal fail¬ure.
   c. Add specified gear lubrication oil as required to bring to proper lever.
   d. If winch lubrication oil consistently checks low, inspect unit for leaking seals or gaskets.
2. Oil Drain and Replacement
   a. Remove oil drain & fill plug.
   b. Drain oil.
   c. Clean drain plug and replace. Fill with oil to proper level.
   d. Oil should be changed after the first 6 weeks of operation. Change should then be on an annual basis.
3. **CAUTION:** Winch lubrication oil is not hydraulic oil.

Parts Ordering Information

To insure satisfactory product performance after repairs, always use genuine dp Manufacturing replacement parts.

MODEL IDENTIFICATION

Always furnish the dp Model Number and Serial Number when ordering parts. The information is found on the product nameplate and/or stamped on the top of the motor end support.

PART NUMBER AND DESCRIPTION

In addition to the serial number, always give the part number and description of each part ordered. If there is any doubt as to the correct part number and description, furnish a dimensional sketch or return the part to be replaced.

Your cooperation is furnishing as much information as possible will assist us in filing your orders correctly in the shortest possible time.

TWG
11135 s James Ave.
Jenks, OK 74037-1731

Phone: (918) 298-8300
Fax: (918) 298-8301
Email: service@dovertwg.com

DETAILED TERMS AND CONDITIONS OF SALE
for dp Light Recovery Winches

Effective 6/19/2019
SUPERSEDES ALL PRIOR TERMS AND CONDITIONS

The provisions of the quotation or acknowledgment form, or invoice, to which these Detailed Terms and Conditions of Sale are attached, including all of the terms and conditions in these Detailed Terms and Conditions of Sale, shall, unless otherwise specifically agreed to by Seller in writing, be the **SOLE TERMS AND CONDITIONS GOVERNING ANY PURCHASE AND SALE** contract evidenced by any such quotation, acknowledgment or invoice, or any order, and shall supersede any and all prior terms and conditions. There are no other representations or warranties, oral or written, expressed or implied, statutory or otherwise, which apply to the purchase and sale evidenced or contemplated hereby. No modification of or adding to or waiver of any such provisions, terms, or conditions will be effective unless agreed to in writing by Seller, and any written terms or conditions supplied by Buyer in respect to such purchase and sale which are not conforming with, or are contrary to, these Detailed Terms and Conditions of Sale are hereby rejected and considered void and of no force or effect.

1. PRICES: Prices are not guaranteed to Seller by the manufacturer and are subject to escalation. Therefore, Seller's prices are subject to adjustment to reflect costs in effect at the time of shipment. Payment shall not prejudice claims on account of omissions or shortages in shipment, but no such claim will be allowed unless made within 30 days after receipt of shipment by Buyer. Prices include ordinary pre-delivery packing only, and prices and specifications are subject to change without notice. A minimum order charge of $100.00 will apply to all orders.

2. Delivery and Acceptance: Unless Seller otherwise specifies in a pre-shipment writing, delivery inside the U.S. and Canada shall be made EXW (Incoterms 2010) Factory, Seller's facility, Jenks, OK, USA. Title, possession, and risk of loss shall pass to Buyer at that point. Seller shall have the right to choose means of transportation and to route shipments when specific instructions are not included with Buyer's order. Seller shall have no liability whatsoever, nor shall this order be subject to cancellation for delay in delivery due to act of God or civil or military authority, fire, labor disturbance, war, terrorism, insurrection or riot, failure of or delay in transportation, unusually severe weather, default of a supplier or subcontractor, or due to any other cause beyond Seller's reasonable control. In the event of delay for any such cause, the scheduled delivery date shall be extended for a reasonable length of time, but not less than the period of delay. Buyer shall be deemed to have accepted all of Seller's articles purchased by and delivered to Buyer and subject hereto if not specifically rejected, or any prior acceptance revoked, and notice of such rejection, or such revocation of acceptance, is delivered in writing by Buyer to Seller at Seller's plant no later than five calendar days following delivery or tender of delivery of the article to Buyer, whichever occurs first. Such five-day period following delivery or tender of delivery is specifically agreed to by Buyer and Seller as reasonable for rejection, or revocation of acceptance, of any of the articles and for seasonable notification to Seller of such rejection or revocation. Failure of Buyer to reject, or revoke a prior acceptance, and provide notice within the time period stated will waive any right of Buyer to reject the articles or revoke any acceptance thereof, such time period also being acknowledged and agreed by Buyer and Seller as sufficient time to enable Buyer to discover any basis for rejection, or revocation of acceptance, of such articles.

3. Terms of Payment: All orders are taken subject to prior credit approval. Terms of payment shall be Net 30 days, unless otherwise stated in quotation or on Seller's invoice. All accounts older than thirty days will be charged an interest rate of 1½% per month on the unpaid account balance.

4. Limited Warranty: Seller warrants that each article sold to Buyer under this order, quote, acknowledgment and/or invoice shall at the time of shipment (i) conform to applicable specifications, and (ii) be free from defects in material and workmanship during normal and ordinary use and service (the "Warranty"). Buyer's exclusive remedy and Seller's sole obligation under this Warranty shall be, at Seller's option, to repair or replace any article or part thereof which has proven to be defective, or to refund the purchase price of such article or part thereof. Buyer acknowledges that Buyer is knowledgeable concerning the articles covered by this Warranty and sold in connection therewith which are being purchased, that Buyer has reviewed this Warranty and that the remedies provided hereunder are adequate and acceptable to Buyer. This Warranty shall expire thirty-six (36) months from the date the dp Light Recovery Winch is first shipped by Seller unless otherwise authorized in writing by TWG. Notice of claimed breach of this Warranty must be given by Buyer to Seller within the applicable period. Such notice shall include an explanation of the claimed warranty defect and proof of date of purchase of the article or part thereof for which warranty coverage is sought. No allowances shall be made by Seller for any transportation, labor charges, parts, "in and out" costs, adjustments or repairs, or any other work, unless such items are authorized in writing and in advance by Seller. Nor shall Seller have any obligation to repair or replace items which by their nature are expendable. If an article is claimed to be defective in material or workmanship, or not to conform to the applicable specifications, Seller will either examine the article at Buyer's site or issue shipping instructions for return to Seller. This Warranty shall not extend to any articles or parts thereof which have been installed, used, or serviced otherwise than in conformity with Seller's applicable specifications, manuals, bulletins, or instructions, or which shall have been subjected to improper installation, operation, or usage, misapplication, neglect, incorrect installation, overloading, or employment for other than normal and ordinary use and service. This Warranty shall not apply to any article which has been repaired, altered or disassembled, or assembled by personnel other than those of Seller. This Warranty shall not apply to any article upon which repairs or alterations have been made (unless authorized in writing and in advance by Seller). This Warranty shall not apply to any articles or parts thereof furnished by Seller to Buyer's specifications and/or furnished by Buyer or acquired from others at Buyer's request. SELLER MAKES NO EXPRESS WARRANTIES AND NO IMPLIED WARRANTIES OF ANY KIND, OTHER THAN THE WARRANTY EXPRESSLY SET FORTH ABOVE. SUCH WARRANTY IS EXCLUSIVE AND IS MADE AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. The remedies for this Warranty shall be only those expressly set forth above, to the exclusion of any and all other remedies of whatsoever kind. The limited remedies set forth above shall be deemed exclusive, even though they may fail their essential purpose. No agreement varying or extending the foregoing Warranty, remedies, exclusions, or limitations shall be effective unless in a writing signed by an executive officer of Seller and Buyer. This Warranty is non-transferable. If a party who had purchased articles from Buyer, or from persons in privity with Buyer, brings any action or proceeding against Seller for remedies other than those set forth in this Warranty, Buyer agrees to defend Seller against the claims asserted in such action or proceeding at Buyer's expense, including the payment of attorneys' fees and costs, and indemnify Seller and hold Seller harmless of, from and against all such claims, actions, proceedings or judgments therein. Buyer also agrees to defend and indemnify Seller of, from and against any loss, cost, damage, claim, debt or expenses, including attorneys' fees, resulting from any claims by Buyer or third parties to property or injury to persons resulting from faulty installation, repair or modification of the article and misuse or negligent operation or use of the article, whether or not such damage to property or injury to persons may be caused by defective material, workmanship, or construction. **ADVISORY:** *Winches and hoists are not approved for lifting or handling personnel or persons unless specifically approved in writing by Seller for the specific application intended. LMIs and RCIs are operational aids that only provide information to the operator.* Under no circumstances shall Seller be liable (i) for any damage or loss to any property other than the warranted article or part thereof, or (ii) for any special, indirect, incidental, or consequential damage or loss, even though such expenses, damages, or losses may be foreseeable. The foregoing limitations on Seller's liability in the event of breach of warranty shall also be the absolute limit of Seller's liability in the event of Seller's negligence in manufacture, installation, or otherwise, with regard to the articles covered by this Warranty, and at the expiration of the Warranty period as above stated, all such liabilities shall terminate. Buyer's purchase of any article(s) covered by this Warranty shall constitute acceptance of the terms and conditions hereof and shall be binding upon Buyer and Buyer's representatives, heirs and assigns. The laws of the State of Oklahoma,

USA, shall govern Buyer's rights and responsibilities in regard to this Warranty and the transaction(s) subject thereto, and the state or federal court of competent jurisdiction located in Oklahoma, USA, shall be the exclusive forum and jurisdiction for any action or proceedings brought by Buyer in connection herewith or any dispute hereunder. If any of the terms and conditions contained within this Warranty are void, the remaining provisions thereof are and shall remain valid and enforceable. **Note:** *Prices and specifications contained in this price book are subject to change without notice.*

5. Patents; Intellectual Property Rights: Seller will defend any suit or proceeding against Buyer, insofar as it is based on a claim that any article or part thereof furnished under this order constitutes an infringement of any patent of the United States, if Seller is notified promptly in writing and given authority, information, and assistance (at Seller's expense) for the defense or settlement of the same, and Seller will pay all damages and costs which by final judgment (or by settlement agreed to by Seller) are awarded therein against Buyer, *provided, however,* that no obligation or liability shall result from the foregoing provision if (a) any such article or part is manufactured in accordance with any design, drawing, or specification that is furnished to Seller by or for Buyer and that it is not based upon Seller's design, drawing, or specification, or (b) such infringement or alleged infringement arises out of or is based upon the use of the article or part with another article or material or in a particular manner. If, in a suit or proceeding in respect of which Seller is liable, as above provided, the article or part is held to constitute infringement and the use thereof is enjoined (or Seller consents to the non-use thereof), Seller will, at Seller's expense and at Seller's option, procure for Buyer that right to continue using such article or part, or replace it with a non-infringing article or part, or modify it so that it becomes non-infringing, or refund the purchase price and the transportation costs upon return to Seller of the infringing article or part. The foregoing provisions sets forth Seller's entire liability for, or resulting from, patent infringement or claim thereof. No right or license is granted to the Buyer under any patent, copyright, registered design, trademark or other industrial property right except the right to use or resell the goods (unless otherwise specifically granted).

6. Taxes: Prices do not include any present or future federal, state, or local sales, use, excise, manufacturing, processing, or importation tax, or any other tax or charges, that is/are or may be imposed on the articles or services covered by this order or on subsidiary articles or material incorporated therein, unless otherwise stated on quotation or current published price lists. Any such taxes or charges will be added to the invoices as separate items, unless appropriate exemption certificates are furnished to Seller.

7. Compliance with Laws: Seller, to the best of Seller's knowledge and belief, is complying with all state and federal laws, orders, and regulations applicable to the manufacture of the articles ordered.

a. Seller shall comply with the U.S. Foreign Corrupt Practices Act which prohibits providing a payment of money or anything of value to a foreign government official, public international organization official, foreign political party, foreign political party official or candidates for such offices, either directly or indirectly, for the purpose of influencing official acts and decisions (including failures to act and decide) in order to assist in obtaining or retaining business or directing business to any entity. Information regarding the Foreign Corrupt Practices Act is available at www.usdoj.gov/criminal/fraud/fcpa.

b. Seller agrees to comply with all foreign, federal, state and local laws regarding Imports and Exports, including any laws of the United States regarding unsanctioned foreign boycotts, anti-boycott laws, and embargoed countries. Information is available at: www.ustreas.gov/ofac, www.bis.doc.gov/dpl/thedeniallist.asp, www.ftc.gov/oia/competition.shtm and www.bis.doc.gov/antiboycottcompliance/.

8. Partial Shipments: Seller reserves the right to make and to invoice for partial shipments of completed articles.

9. Cancellation: Orders are not subject to cancellation, complete or partial, without Seller's prior written consent. Any reduction in quantities ordered shall constitute a partial cancellation subject to this clause. Where Seller consents to cancellation, settlement will be made on the following basis. Buyer will pay to Seller, upon delivery, the full purchase price of all articles completed at the time Seller agrees to cancellation, and if Seller elects to complete any part or all of the articles scheduled for delivery within 30 days from such time, the full purchase price of all such articles so completed. Buyer will further pay to Seller a percentage of the purchase price of all other articles equivalent to the percentage of completion thereof as determined by Seller's normal cost accounting methods. Buyer will also pay the full unamortized costs of materials, dies, tools, patterns, and fixtures made or contracted specifically for Buyer's order. Invoices for all cancellation charges are payable promptly upon presentation. If within 90 days from the presentation of such invoice Buyer does not instruct Seller as to the disposition of the material, etc., arising from the cancellation, Seller may sell the same, crediting Buyer for the proceeds. Buyer will also pay the reasonable costs and expenses incurred by Seller in making a settlement and in protecting property in which Buyer has an interest. Where United States Government contracts are involved, cancellation shall be in accordance with the appropriate armed services procurement regulations. Seller will defer manufacture or delivery of any articles only if and to the extent agreed to in writing.

10. Return of Material for Credit Consideration: All returns shall be made at the sole discretion of Seller. All items returned must have an authorized RGA (Returned Goods Authorization) number. When applying for the RGA number, Buyer should be prepared to provide the winch or article/product serial number, date of original shipment, and any other details requested. Material returned, whether for the purpose of a customer's inventory balancing, resulting from the customer's error in ordering or for any reason beyond the control of Seller, will be subject to a handling and restocking fee of $100.00, or 25%, whichever is greater. A time limit of six months from the date of shipment will be enforced in these situations. All items returned to Seller must be shipped DDp-Seller's Plant (Incoterms 2010). The return of any non-standard items may be subject to higher restocking fees. All items returned must be in new and unused condition and will be inspected prior to credit being issued. No obsolete parts may be returned. Unless specified writing by the Seller, collect shipments, any other shipment deviating from the DDp-Seller's Plant (Incoterms 2010), and shipments without clearly marked RGA numbers will be refused.

11. Default: If Buyer shall fail to pay promptly when due any sum owing to Seller or to perform any agreement under this order or under any other order heretofore or hereafter placed with Seller, or if Buyer shall become insolvent or shall make an assignment for the benefit of creditors or if there shall be instituted by or against Buyer any proceeding under any bankruptcy, reorganization, arrangement, readjustment of debt, or insolvency law of any jurisdiction, or for the appointment of a receiver or trustee in respect of any of Buyer's property, and if any such proceeding shall be instituted against Buyer, it shall not be dismissed within 20 days, or if Seller shall reasonably believe that Buyer is unable to meet Buyer's debts as they mature, then, and in any such event, Seller may, in addition to exercising any or all other rights and remedies that Seller may have, require payment of cash upon delivery, and Seller may at any time and without notice to Buyer, cancel any or all of Seller's unperformed obligations under any one or more of such orders. Upon any cancellation under this clause, Buyer shall thereupon become obligated to pay to Seller the same sum in respect to each such order as if such order had been cancelled by Buyer with Seller's consent and settlement had been made on the basis set forth in Paragraph 9 of these Detailed Terms and Conditions of Sale. In the event legal action or other proceedings are instituted to collect any sums due to Seller hereunder, Buyer agrees to pay Seller all of Seller's reasonable attorneys' fees and expenses incurred in connection with such action or proceeding.

12. Indemnification; Defense: Buyer agrees to defend and indemnify Seller of, from and against any and all loss, damage, cost, claim or expense including reasonable attorneys' fees resulting from any claims made by Buyer or by third parties for damage to property or injury to persons resulting from faulty or improper installation, use, repair, alteration or negligent operation of the article(s) sold hereunder, whether or not such damage to property or injury to persons may have been caused or be caused by defective material, workmanship or construction.

13. Governing Law; Jurisdiction: All transactions covered by this order shall be construed and enforced in accordance with, and shall be governed by, the laws of the State of Oklahoma (excluding rules on conflicts of laws and excluding the Convention on Contracts for the International Sale of Goods), and the state or federal court of competent jurisdiction located within Oklahoma, USA, shall be the exclusive forum and jurisdiction for bringing any action with respect to disputes regarding this order or items sold hereunder.

14. Export Control: Buyer agrees that unless prior authorization is obtained from the U.S. Department of Commerce, neither Buyer nor its subsidiaries shall export, re-export, or release, directly or indirectly, any technology, (as defined in Part 772 of the Export Administration Regulations of the U.S. Department of Commerce ("EAR")), received from Tulsa Winch, Inc., or export, re-export, or release, directly or indirectly, any direct product of such technology, (as defined in Part 734 of the EAR), to any destination or country to which the export, re-export or release of the technology, or direct product is prohibited by the EAR.

TWG

a DOVER company

www.dovertwg.com

Technical and Customer Support

918.298.8300

salesinfo@dovertwg.com

Winches in this brochure are optimized for viewing and not shown to scale. All measurements are in inches. All dp Winches are designed in accordance with SAE J706. Because of product improvement, we reserve the right to make changes without notice.