Tulsa Winch Group
A DOVER COMPANY

DESIGN SERIES 001

30P

SERVICE MANUAL

INTRODUCTION AND THEORY OF OPERATION

The planetary winch is designed to use a high-speed Geroler motor, driving through a multiple disc brake, through two planet sets to the cable drum.

The multiple disc brake is spring applied and hydraulically released through a port in the brake housing. During inhaul, the brake is not released since the load is driven through the one-way cam clutch, bypassing the brake. When the load comes to a stop, the cam clutch locks up and the load is prevented from moving by the brake.

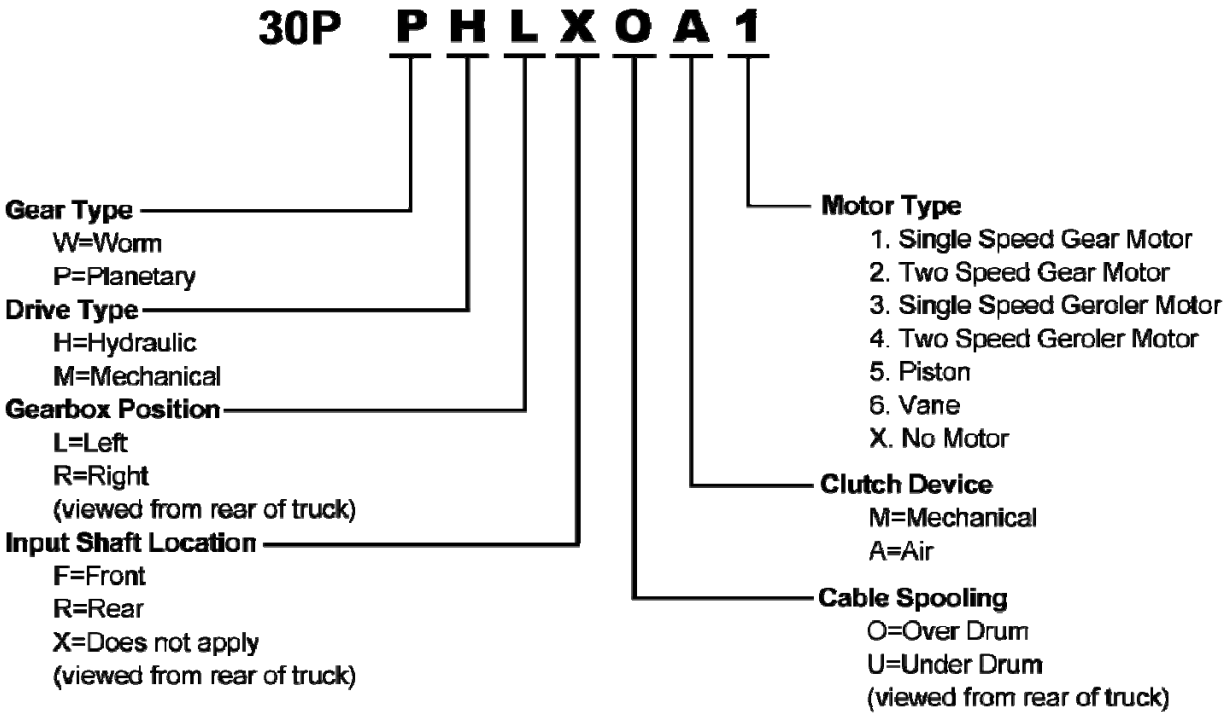
The brake and brake valve receives its signal any time the winch is in pay out. With the brake fully open the brake valve will open and dynamically control the lowering of the load.

ASSEMBLY NUMBER EXPLANATION

This manual is for design series 001. In the case of a major design change implementation, a new design series designation number will be issued for the winch. A new manual will also be created for that specific design series.

ASSEMBLY #	DESIGN SERIES
82210	001

WINCH MODEL CODES



WARNING

FAILURE TO HEED THE FOLLOWING WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH.

The safety of the winch operator and ground personnel should always be of great concern, and all necessary precautions to insure their safety must be taken. The primary mover and the winch must be operated with care and concern for the equipment and the environment and with a thorough knowledge of the equipment and its performance capabilities must be understood. These general safety guidelines are offered, however local rules and regulations or national standards may also apply. Recommended references are, but not limited to, ANSI B30, OSHA 1910, AWS D 14.3, and SAE J706.

Additional information can be found at http://www.Team-Twg.com

DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.
NOTICE	Indicates information or a company policy that relates directly or indirectly to the safety of personnel or protection of property.

Mounting:

Winch mounting must be secure and able to withstand the applied loads.

- The stability of the mounting system must be approved by a qualified person.
- All welding should also be done by a qualified person.
- Winch mount must be flat so as not to induce binding.
- The flatness must not exceed 1/16 inch across the mounting surface of the winch itself.

Guards must be placed on all open drives in the case of mechanical winches. Insure that all hydraulic hoses, valves and fittings are rated to winch manufacturer's operating pressures.

Relief valves should be set to winch manufacturer's specifications. Insure that all PTO's and drivelines are sized appropriately for the winch manufactures speed and torque specifications.

⚠ WARNING

FAILURE TO HEED THE FOLLOWING WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH.

Operator:

Must read and understand the operating and service manual.

Both the **SERVICE MANUAL** and **OPERATING AND MAINTENANCE MANUAL** are available online at http://www.team-twg.com

Must never lift or move people with this winch.

This winch is not designed or intended for any use that involves moving people.

Must stay clear of the load at all times.

Ground personnel should remain a safe distance from the load and winch cable at least 1 ½ times the length of cable measured from the winch to the load.

Must stay clear of the cable at all times.

A broken cable can cause serious injury or death.

Must avoid shock loads.

Shock loads can impose a strain on the winch that can be many times the design rating.

Must be aware of the fleet angle of the winch.

All loads should only be pulled with the load line perpendicular to the drum shaft, this is to avoid excessive stresses on the winch and will help prevent the cable from building on one side of the drum flange.

Must wear personnel protective equipment (PPE) if required.

Check the local, state and federal regulations for compliance.

Must insure that the drum clutch is fully engaged before hoisting.

A visual inspection of the drum clutch engagement is required before each winching operation.

Must rig all loads secure before winching.

Pull the load line taut and inspect the condition of load for stability.

Must inspect the drum brake if equipped.

The drum brake is not a load holding device it is design to prevent over spooling of the drum and causing bird nesting of the cable on the drum. Inspect the brake for wear of the lining and the actuation method.

Must inspect the load control brake.

These winches are equipped with two (2) forms of dynamic braking. The spring-applied/hydraulically-released multi-disc oil brake is one method. Before a load is handled the load should be pulled tight and stopped to check this brake. The second method is a hydraulic lowering control. The same method should be used to check this brake.

Operation:

- All winch controls must be well marked for function to avoid confusion.
- All winch controls must be located to provide the operator with a clear view of the load.
- The clutch must be inspected daily for proper operation.
- The winch cable should be inspected daily for serviceability.
- A minimum of five wraps of tightly wound cable must remain on the drum.

MAINTENANCE

Tulsa planetary winches, like any other piece of machinery, need to be periodically serviced and well maintained to insure proper operation.

Good maintenance consists of four steps.

1. A daily inspection to insure that there are no oil leaks present, all mounting bolts and other fasteners are tight, and that the wire rope is in good condition.

2. Changing the oil in the gearbox. (*Severity of use will determine the need for oil changes but the oil should be checked at a minimum of every 500 hours. Factors such as extremely dirty conditions or widely varying temperature changes may dictate even more frequent servicing).*

3. Lubing drum bushings, end bracket and sliding clutch with grease. The drum bushings are lubed thru two grease zerks. One on each end of the drum.

4. Complete teardowns and component inspections. (*Again, severity and frequency of use will determine how often this should be done).* If the equipment that this winch is mounted to is subject to standards for this type of inspection, then those standards must be followed. If oil changes reveal significant metallic particles then a teardown and inspection must be made to determine the source of wear.

Planetary winches are designed with a common oil reservoir for the gearbox and brake. The winches are shipped from the factory filled with BELVAC SYNTHETIC GEAR OIL SAE 75W-90 which is satisfactory for operation in ambient temperatures from -40°F to +110°F. If winch will be operated in temperatures outside this range, contact Tulsa Winch for recommendations.

The gear and brake oil are drained by removing the drain plug *(Item# 48)* located at bottom of brake adapter *(Item# 65)*. Then remove the fill plug *(Item# 47)* located at the top of the gear housing. Inspect the oil for signs of metallic particles and/or burning and dispose of in a proper manner. Then re-install the drain plugs.

Fill the gearbox\brake with (3 QUARTS) BELVAC SYNTHETIC GEAR OIL SAE 75W-90, and replace the fill plug.

OIL CAPACITY = 3 QUARTS

NOTICE

GENERAL DISASSEMBLY

A. MOTOR DISASSEMBLY

1. Disconnect case drain if installed*.

2. Drain the oil from the gear housing by removing the plug *(Item# 48)* from bottom of brake adapter (*Item# 65*).

3. Remove hose *(Item# 82).*

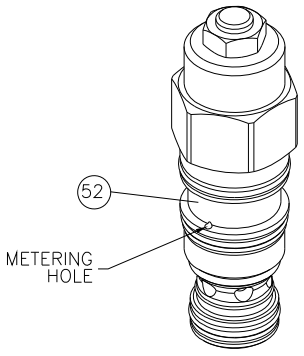
4. Remove the counterbalance block *(Item# 77)* from the motor by removing the capscrews *(Item# 84*).

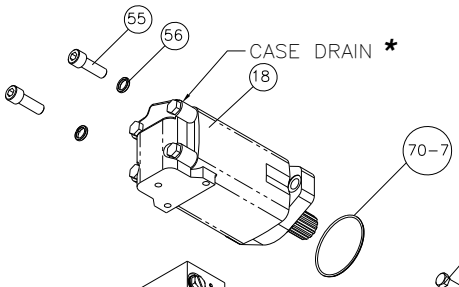
5. Remove the motor *(Item# 18)* from the winch by removing two capscrews *(Item# 55*) and washers *(Item# 56).*

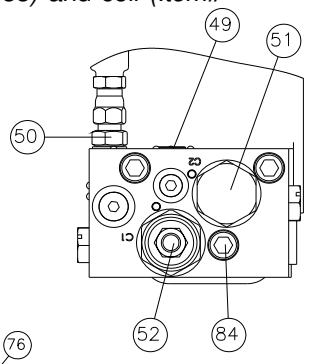
6. Remove the counterbalance valve *(Item# 52)* from the counterbalance block *(Item# 77).*

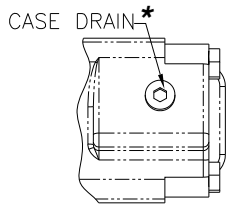
7. Inspect parts as follows, replacing them if necessary.

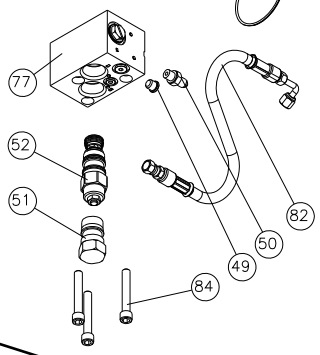
   A. Inspect the o-ring (Item# 70-7) for damage.
   B. Inspect the metering hole in the counterbalance valve to make sure it is not obstructed
   C. Inspect the o-rings on the valve to ensure that they are not flat or cut.
   D. Motors and counterbalance valves are not serviceable in the field. Return them to an authorized dealer for service.
   E. For a 2-speed version remove and inspect cartridge valve *(Item# 85)* and coil *(Item# 86).*

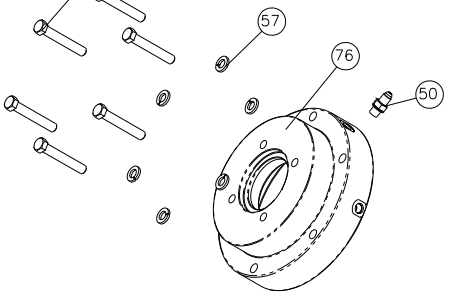


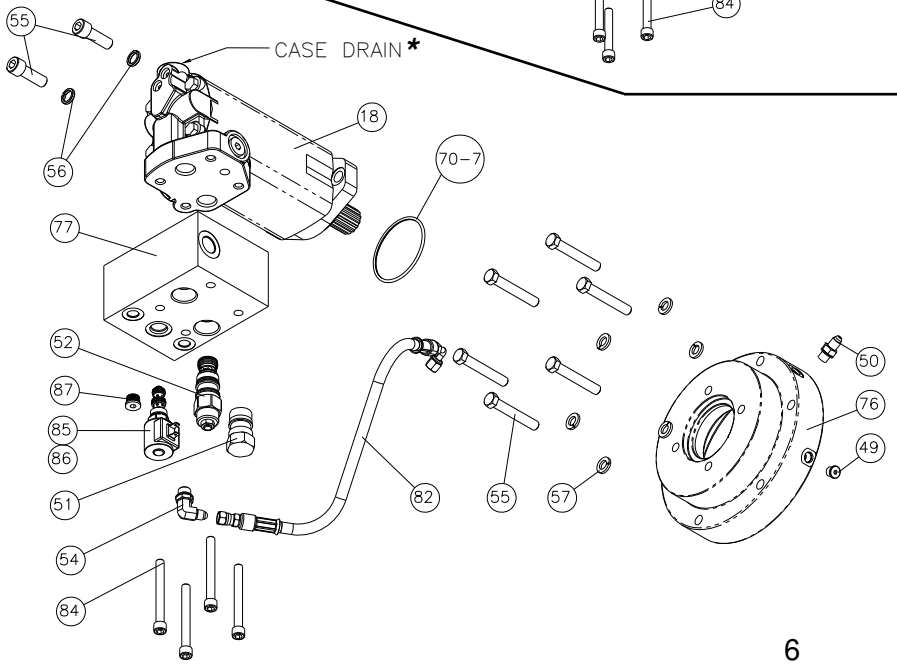






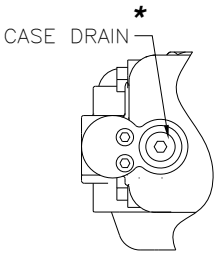


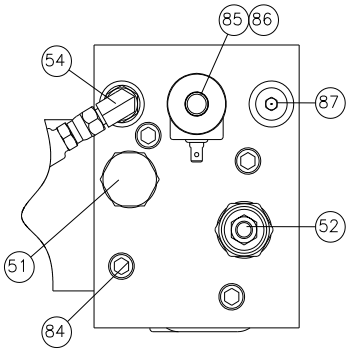




TWO SPEED

SINGLE SPEED





B. BRAKE SECTION DISASSEMBLY

1. Please refer to page 6 of this manual for motor disassembly.

2. Drain the oil from the gear housing by removing the plug *(Item# 48)* from bottom of brake housing *(Item# 65).*

3. Evenly remove the six capscrews and lock washers *(Items# 57 & 34)* that hold the brake housing *(Item# 76)* in place. (take note of the brake port location for reassembly) Spring pressure will raise the cover up as the capscrews are loosened. Carefully remove the housing from the brake adapter *(Item# 65).* The piston, clutch assembly, stator & friction disks, and spacer will come out with the adapter.

4. Remove the piston *(Item# 13)* and dowel pins *(Item# 73)* from the brake housing.

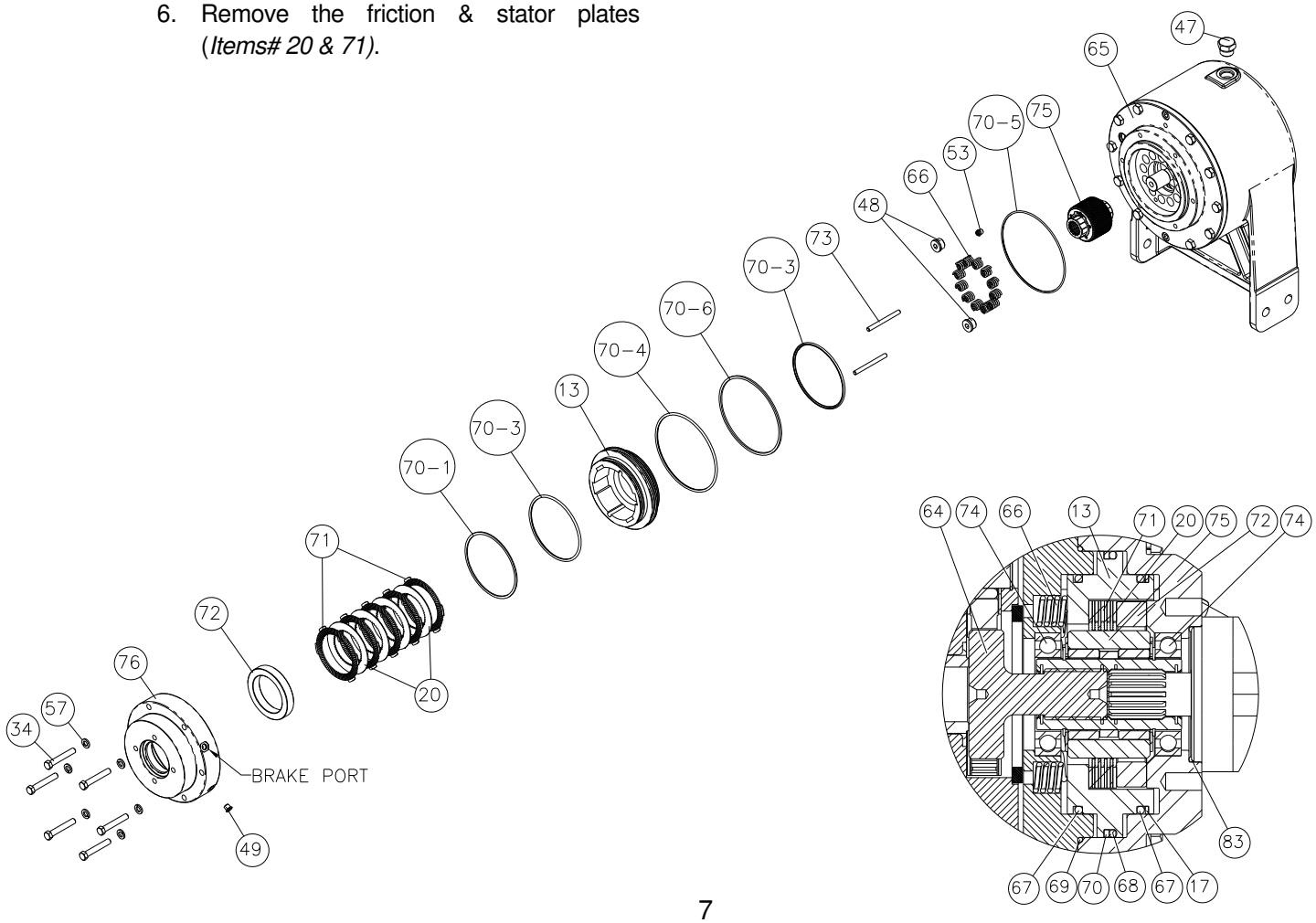
5. Remove the brake driver/clutch assembly *(Item# 75)*

6. Remove the friction & stator plates (*Items# 20 & 71)*.

7. Inspect parts as follows, replacing them if necessary:
   A. Inspect all o-rings and back up rings to insure they are not flat or cut
   B. Inspect the stator and friction disks for wear. Friction disks should measure no less than .077 in. thick and stator plates no less than .054 in. thick
   C. The free height of each brake spring should measure no less than 1.000 in. with no force on them.
   D. Inspect the brake driver/clutch assembly to ensure it is locking up in one direction and free in the other.
   E. Check bearings for signs of pitting or spalling.

⚠ WARNING

Notice the direction of lock-up on the clutch for re-assembly.



C. DRUM SECTION DISASSEMBLY

1. To remove the drum, first disconnect the cable from the drum by removing the U-bolt from the drum flange and lay aside.

NOTICE

You may need to remove the airlines, so it's a good idea to mark them for re-assembly

2. Support the weight of the drum *(Item# 78)* with a hoist. Remove the capscrews *(Item# 16)*, nuts, and washers *(Items# 15 &19)* connecting the end bracket *(Item# 4)* to the Frames *(Items# 3 & 4)*. Remove the cotter pin *(Item# 41)* and clevis pin *(Item# 40)* that connects the air cylinder *(Item# 38)* to the yoke assembly *(Item# 44).*

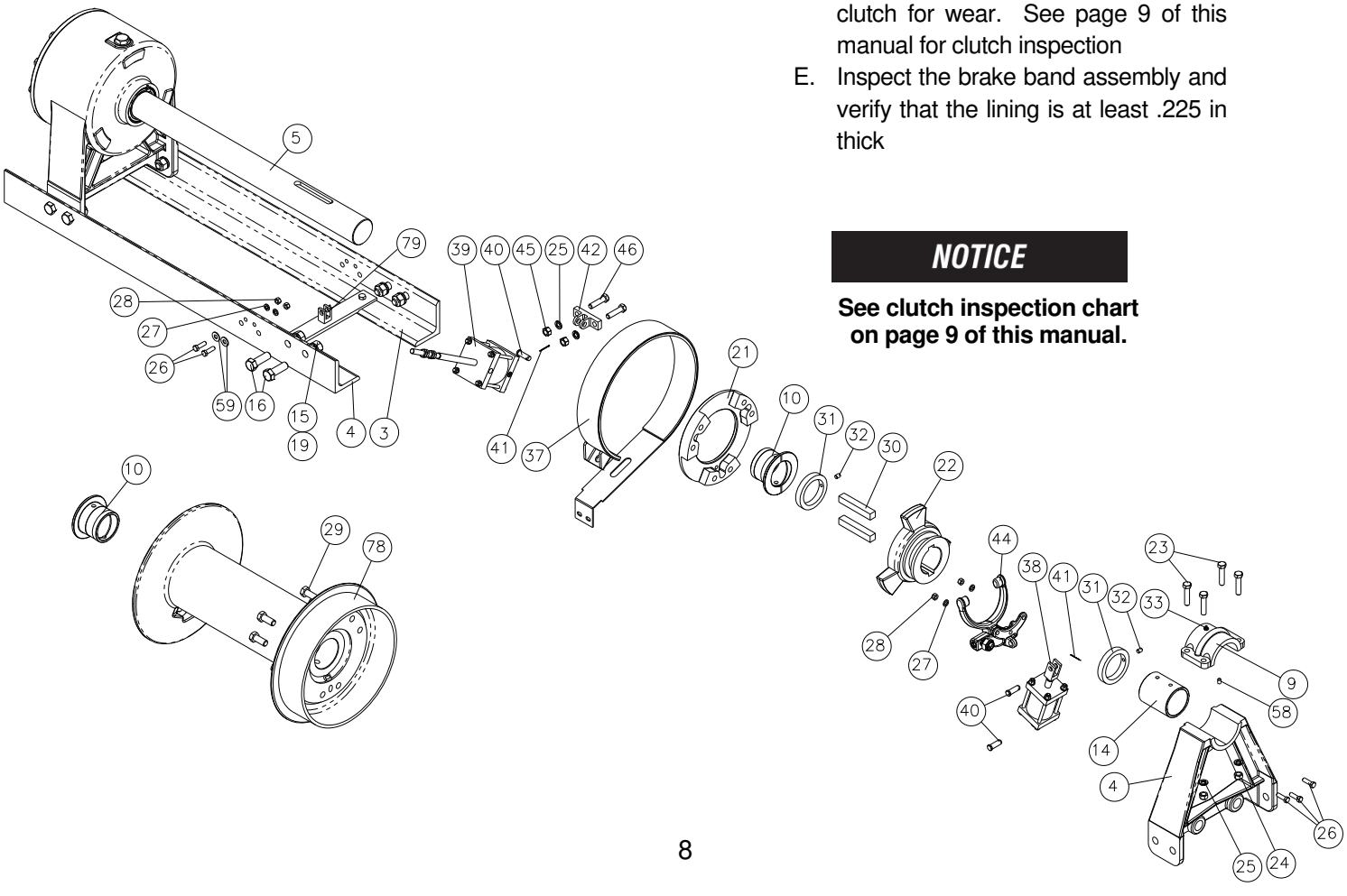
3. Remove the end bracket *(Item# 4)*, yoke assembly *(Item# 44)*, and air cylinder *(Item# 38)*. Loosen the set screw and remove the first collar *(Item# 31)*.

4. Remove the sliding clutch *(Item# 22)*, keys *(Item# 30)*, and other collar *(Item# 31)*.

5. Remove the brake band assembly *(Item# 37)* by removing the capscrews *(Item# 26)*, nuts, washers and lock washers *(Items# 27, 28 & 59)* attaching the brake band to the frame. Then remove the air cylinder *(Item# 39)* by removing the clevis pins *(Item# 40).*

6. Slide the drum *(Item# 78)* off of the output shaft *(Item# 5)* using an overhead hoist.

7. Inspect parts as follows, replacing them if necessary:
   A. Inspect the collars for excessive wear or damage
   B. Inspect the bushings for wear or damage
   C. Inspect the keys for excessive wear or damage
   D. Inspect the drum clutch and sliding clutch for wear. See page 9 of this manual for clutch inspection
   E. Inspect the brake band assembly and verify that the lining is at least .225 in thick



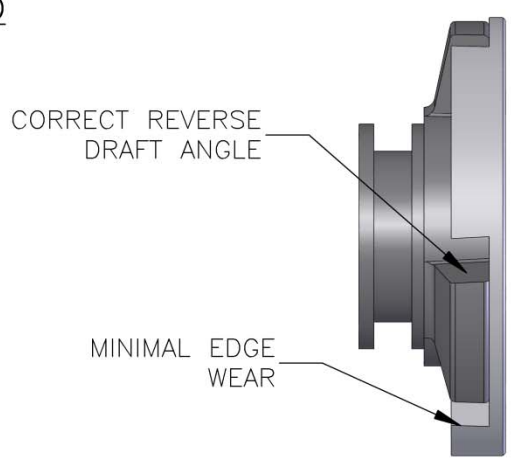
NOTICE

See clutch inspection chart on page 9 of this manual.

CLUTCH INSPECTION

GOOD

THIS PICTURE ILLUSTRATES A SLIDING & DRUM CLUTCH WITH THE PROPER REVERSE DRAFT AND MINIMUM EDGE WEAR

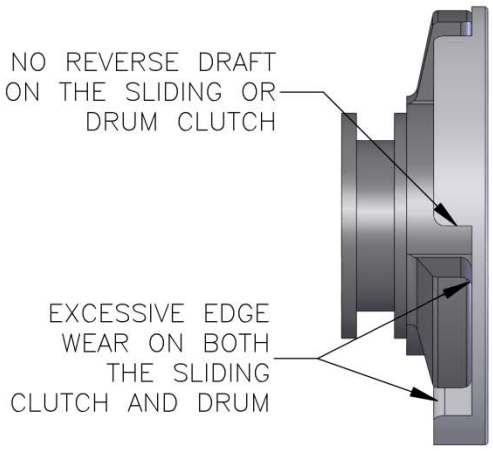


BAD

NOTICE

THE REVERSE DRAFT ENSURES THE CLUTCH STAYS ENGAGED DURING PAY–IN.

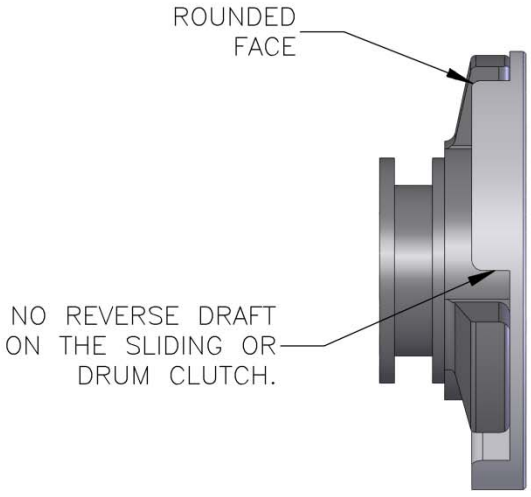
WITHOUT THE CORRECT DRAFT, THE CLUTCH COULD DIS–ENGAGE UNPREDICTIBLY.



CLUTCH REPLACEMENT CRITERIA

WARNING

IF 1/4 OF THE SURFACE OF THE FACE ON THE SLIDING CLUTCH OR DRUM CLUTCH IS ROUNDED OR HAS NO REVERSE DRAFT THE SLIDING CLUTCH AND OR DRUM CLUTCH MUST BE REPLACED.



C. GEARSET SECTION DISASSEMBLY

NOTICE

To remove the output gearset the Drum must first be removed, see DRUM DISASSEMBLY Section on page 8 of this manual

1. Remove the brake adapter *(Item# 65)* from the gear housing *(Item# 1)* by removing ten capscrews *(Item# 34)*. If the brake housing/motor assembly is attached support its weight with a hoist.

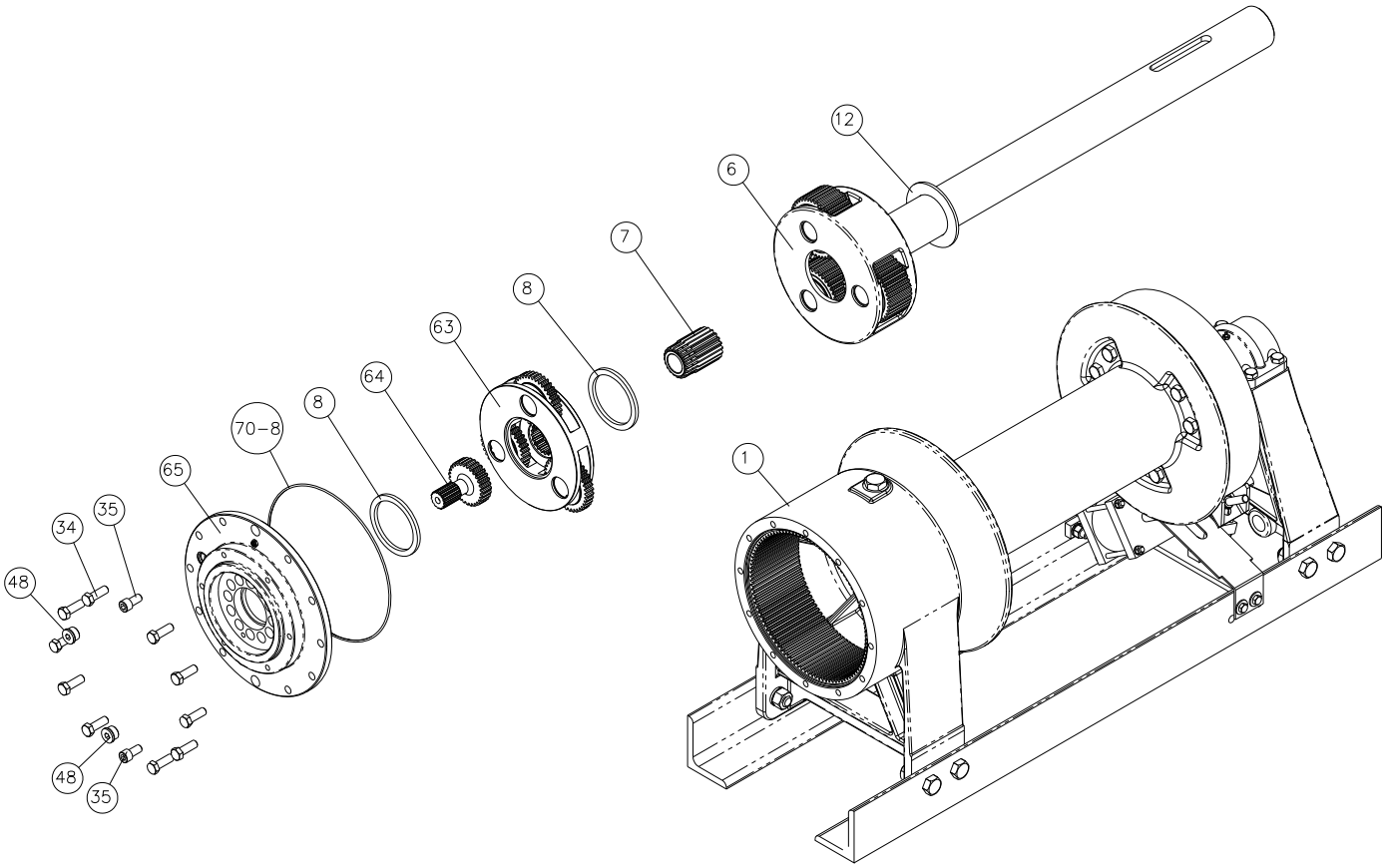
2. Remove the input sun gear *(Item# 64)*.

3. Remove the input gear set *(Item# 63)* along with the inner and outer thrust washers *(Item# 8)*.

4. Remove the output sun gear *(Item# 7)*.

5. Carefully remove the output gear set/output shaft assembly *(Item# 6)* from the gear housing along with thrust washer *(Item# 12)*.

6. Inspect parts as follows, replacing them if necessary:
   A. Inspect all gear teeth to insure none are excessively worn, cracked, or broken.
   B. Inspect gear housing for structural integrity.
   C. Inspect the o-ring to insure it is not flat or cut.
   D. Inspect the bushing and seal in the end of the gear housing.
   E. Check the planetary gears to ensure that they turn smooth and don't have excessive wear. If gears need serviced see section E & F of this manual.



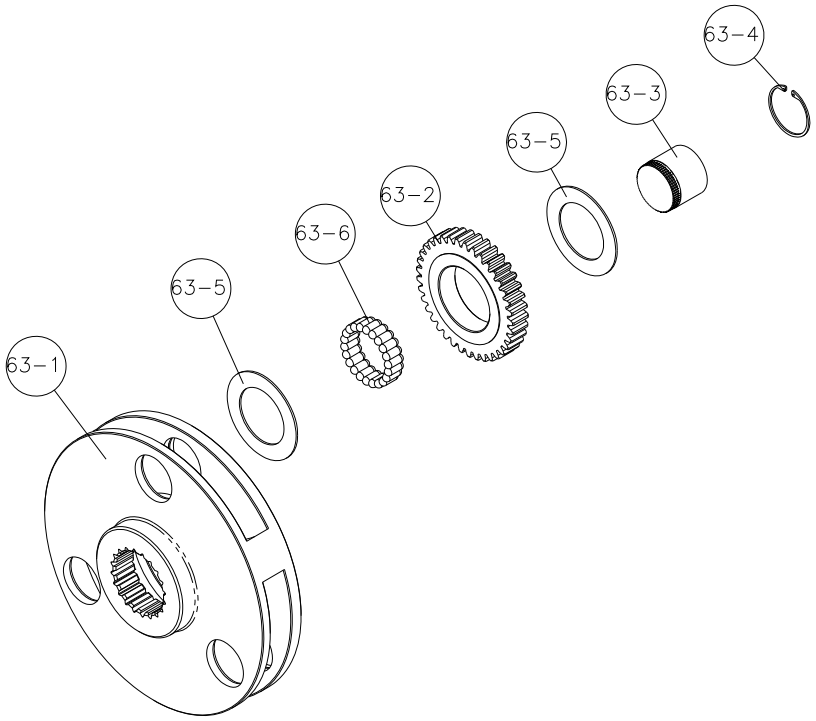
E. INPUT PLANET SET DISASSEMBLY

1. Remove the retaining rings *(Item# 63-4)* from the planet carrier *(Item# 63-1).*

2. Remove the pins *(Item# 63-3)* from the carrier *(Item# 63-1)* by carefully pressing them out.

3. Remove the planet gear *(Item# 63-2)*, thrust washers *(Item# 63-5)* and rollers *(Item# 63-6)* from the carrier *(Item# 63-1).*

4. Inspect the parts for wear or damage and replace if necessary.



INPUT GEAR SET (ITEM# 63)		
ITEM NO.	DESCRIPTION	QTY
63-1	CARRIER	1
63-2	PLANET GEAR	3
63-3	PLANET PIN	3
63-4	RETAINING RING	3
63-5	WASHER	6
63-6	ROLLERS	66

F. OUTPUT PLANET SET DISASSEMBLY

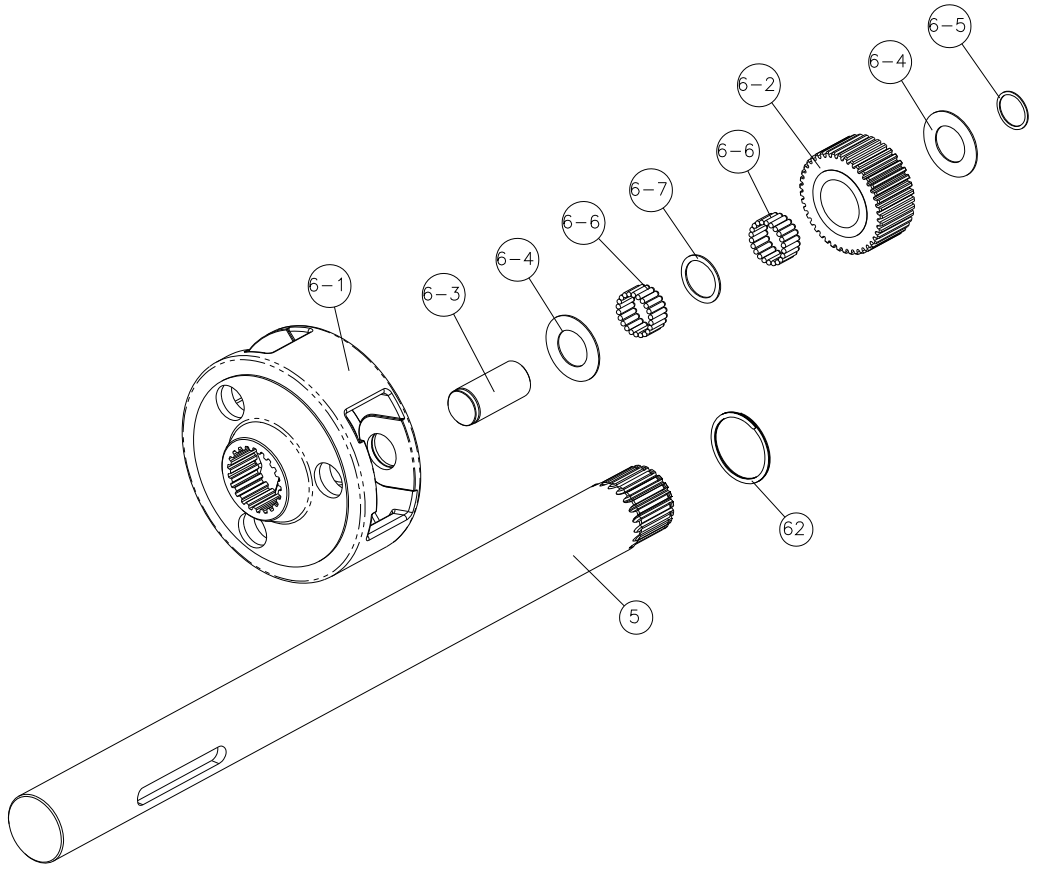
1. Remove the retaining rings *(Item# 6-5)* from the carrier *(Item# 6-1)*

2. Remove the pins *(Item# 6-3*) from the carrier *(Item# 6-1*) by carefully pressing them out.

3. Remove the planet gears *(Item# 6-2),* thrust washers *(Item# 6-4)*, rollers *(Item# 6-6)* and spacers *(Item# 6-7)* from the carrier.

4. With planet gears out, remove the retaining ring *(Item# 62)* to remove the shaft (*Item# 5*) from the carrier *(Item# 6-1).*

5. Inspect all parts for wear or damage and replace if necessary



OUTPUT GEAR SET (ITEM# 6)		
ITEM NO.	DESCRIPTION	QTY
6-1	CARRIER	1
6-2	PLANET GEAR	3
6-3	PLANET PIN	3
6-4	WASHER	6
6-5	RETAINING RING	3
6-6	ROLLERS	132
6-7	SPACER	3

GENERAL ASSEMBLY

G. OUTPUT PLANET SET ASSEMBLY

1. Insert the output shaft *(Item# 5)* into the carrier *(Item# 6-1),*) and install the retaining ring *(Item# 62).*

2. Install the rollers *(Item# 6-6,)* and spacers *(Item# 6-7)* into the planet gears *(Item# 6-2).* Coat rollers in chassis lube to help hold in position.

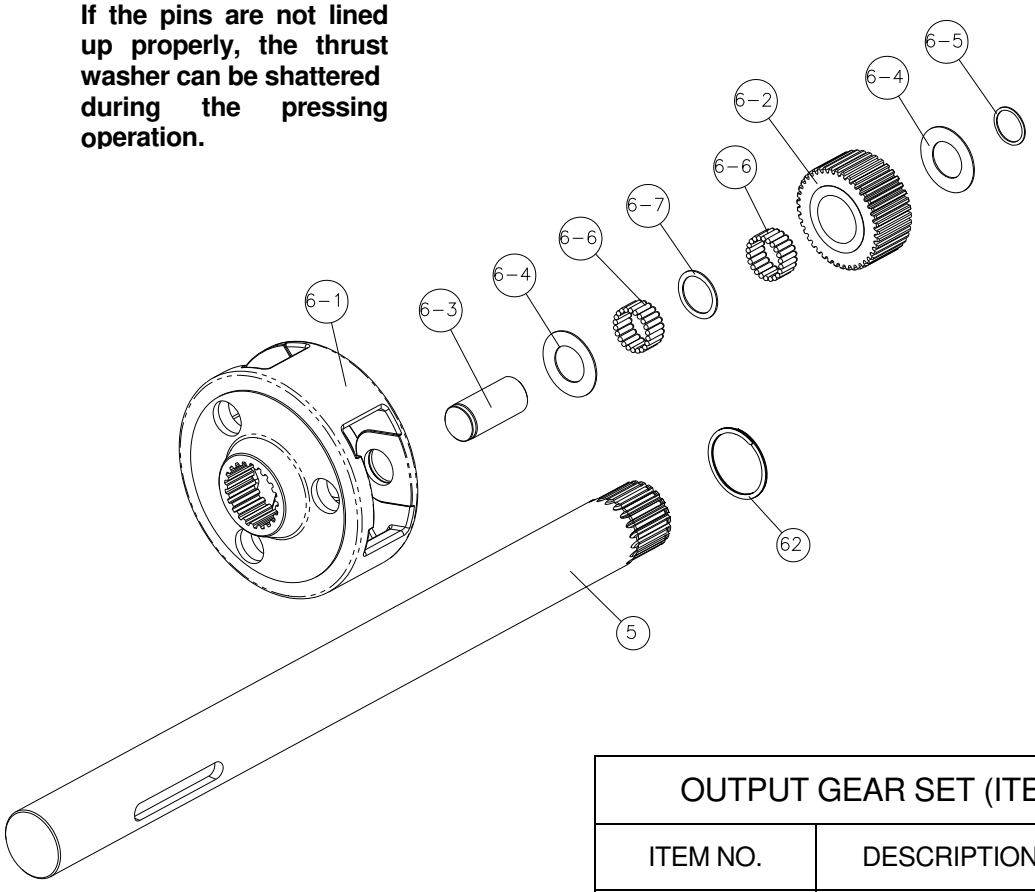
3. Next insert the thrust washers *(Item# 6-4),* into the carrier *(Item# 6-1)* along with the gears *(Item# 6-2),* rollers *(Item# 6-6)* and spacers *(Item# 6-7).*

4. Being careful to line up the thrust washers (*Item# 6-4)* and rollers *(Item# 6-6),* with the planet pins *(Item# 6-3),* press the pins into the carrier *(Item# 6-1).*

5. Replace retaining rings *(Item# 6-5).*

⚠ CAUTION

If the pins are not lined up properly, the thrust washer can be shattered during the pressing operation.



OUTPUT GEAR SET (ITEM# 6)		
ITEM NO.	DESCRIPTION	QTY
6-1	CARRIER	1
6-2	PLANET GEAR	3
6-3	PLANET PIN	3
6-4	WASHER	6
6-5	RETAINING RING	3
6-6	ROLLERS	132
6-7	SPACER	3

H. INPUT PLANET SET ASSEMBLY

1. Install the rollers *(Item# 63-6,)* into the planet gears *(Item# 63-2)*.Coat rollers in chassis lube to help hold in position.

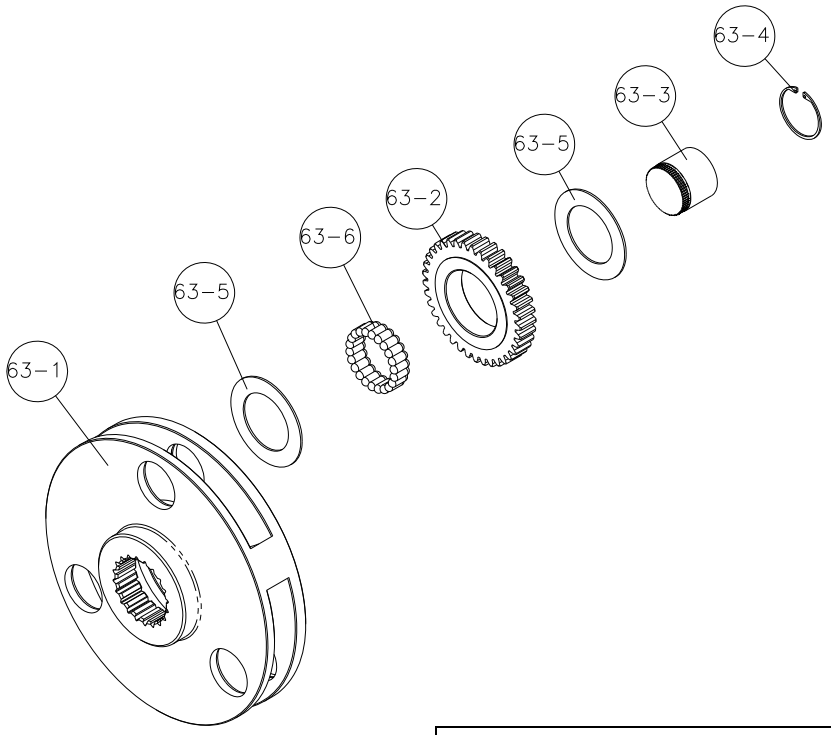
2. Next insert the thrust washers *(Item# 63-5),* into the carrier *(Item# 63-1)* along with the gears *(Item# 63-2),* bearings *(Item# 63-6)* and spacers *(Item# 63-5).*

3. Being careful to line up the thrust washers (*Item# 63-5)* and rollers *(Item# 63-6) with* the planet pins *(Item# 63-3)*, press the pins into the carrier *(Item# 63-1).*

4. Replace the retaining rings *(Item# 63-4)*).

⚠ CAUTION

If the pins are not lined up properly, the thrust washer can be shattered during the pressing operation.



INPUT GEAR SET (ITEM# 63)		
ITEM NO.	DESCRIPTION	QTY
63-1	CARRIER	1
63-2	PLANET GEAR	3
63-3	PLANET PIN	3
63-4	RETAINING RING	3
63-5	WASHER	6
63-6	ROLLERS	66

I. GEAR END ASSEMBLY

1. When reassembling, apply grease to parts such as thrust washers, o-rings, and seals.

NOTICE

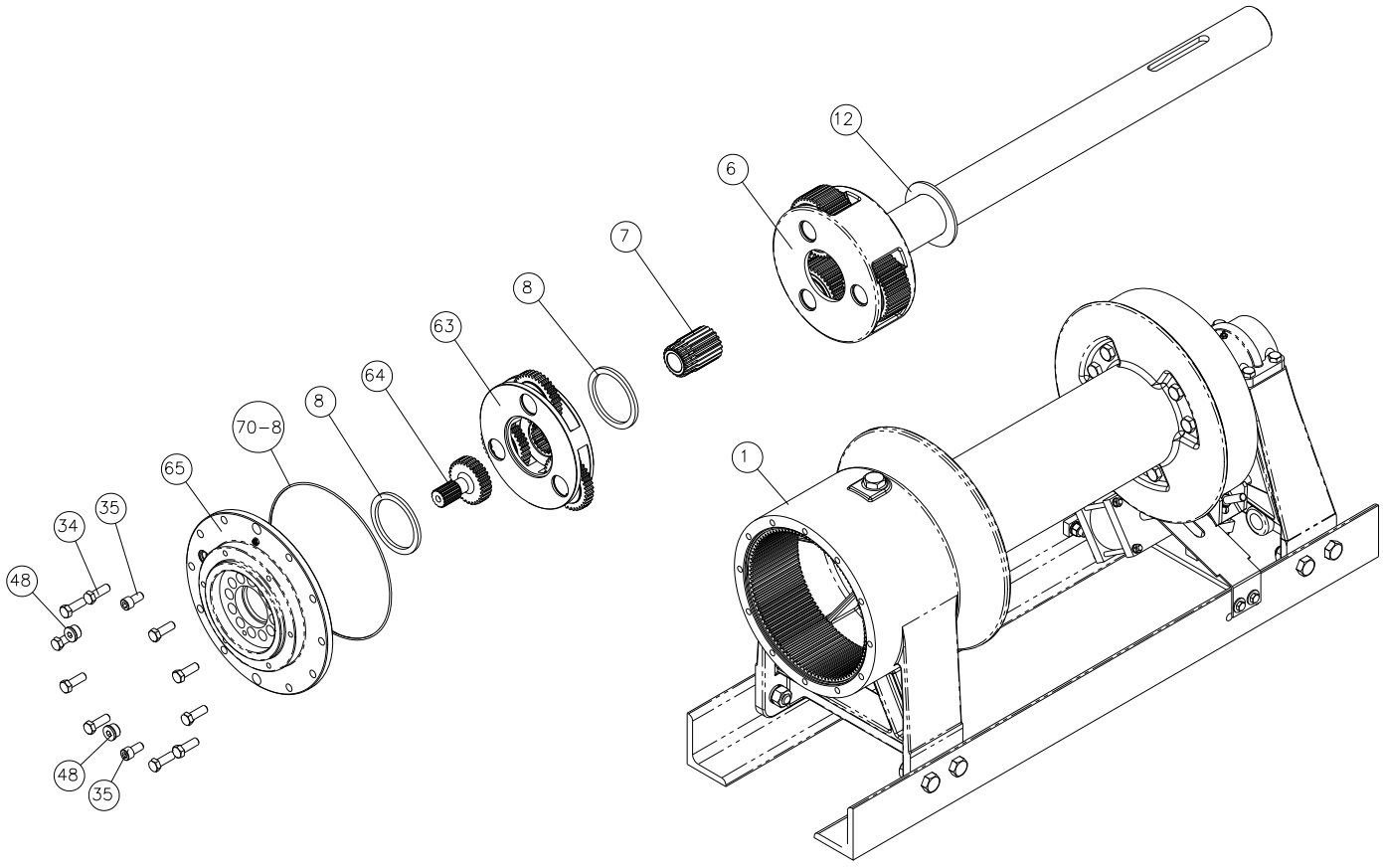
Make sure to line up the gear teeth in all three planet gears in the output gear set with the gear teeth in the housing.

2. Slide thrust washer *(Item# 12)* onto the output shaft, next install the output gearset/output shaft assembly *(Items# 6)* into the gear housing *(Item# 1)* and drum. Push the gear set into the gear housing until it stops against the thrust washer.

3. Install the output sun gear *(Item# 7)* into the output gear set *(Item# 6)*.

4. Install the inner thrust washer *(Item# 8)* onto the input gear set *(Item# 63)*. Insert the input gear set into the gear housing making sure it is against the output gear set and engaged with the output sun gear *(Item# 7)*. Grease and install the outer thrust washer *(Item# 8)* in place and slide the input sun gear *(Item# 64)* into the input gear set *(Item# 63)*.

5. Put the brake adapter *(Item# 65)* on with ten capscrews *(Item# 34),* using the two sockethead capscrews (*Item# 35)* for alignment. Being careful not to damage the o-ring *(Item# 70-8)*.



J. DRUM SECTION ASSEMBLY

1. After inspecting and replacing the necessary parts, such as the drum bushings *(Item# 10)* and drum clutch *(Item# 21)*. Install the drum *(Item# 78)* onto the output shaft *(Item# 5)*. This part is very heavy and you will need the assistance of a hoist. With the weight of the drum supported install the brake band assembly *(Item# 37)* with capscrews *(Item# 26)*, lock washers *(Item# 59)* nuts and washers *(Items# 27 & 28)*. Attach the bracket *(Item# 42)*, with capscrews *(Item# 46)*, nuts, and washers *(Items# 25 & 45)*.

NOTICE

You may need to lower the drum to align the holes in the brake band with the holes in the frame

2. Install the brake band air cylinder *(Item# 39)* making sure the rod of the air cylinder is going through the slot in the brake band *(Item# 37)*. Secure it to the bracket *(Item# 42)* with the clevis pin *(Item# 40)* and cotter key *(Item# 41)*. Tighten the adjusting nut on the air cylinder shaft until there is not space between the drum and the brake band. Then tighten the jam nut to secure the adjusting nut.

NOTICE

The brake band may need Properly adjusted after Winch is fully Assembled.

3. Install the inner thrust collar *(Item# 31)*. Then Tap the two keys *(Item# 30)* into the keyways in the output shaft. Tightly hold the inner thrust collar against the keys and lock down the set screw *(Item# 32).*

4. Align the Sliding clutch *(Item# 22)* with the keys and slide onto the output shaft *(Item# 5)*. Install the outer thrust collar *(Item# 31).*

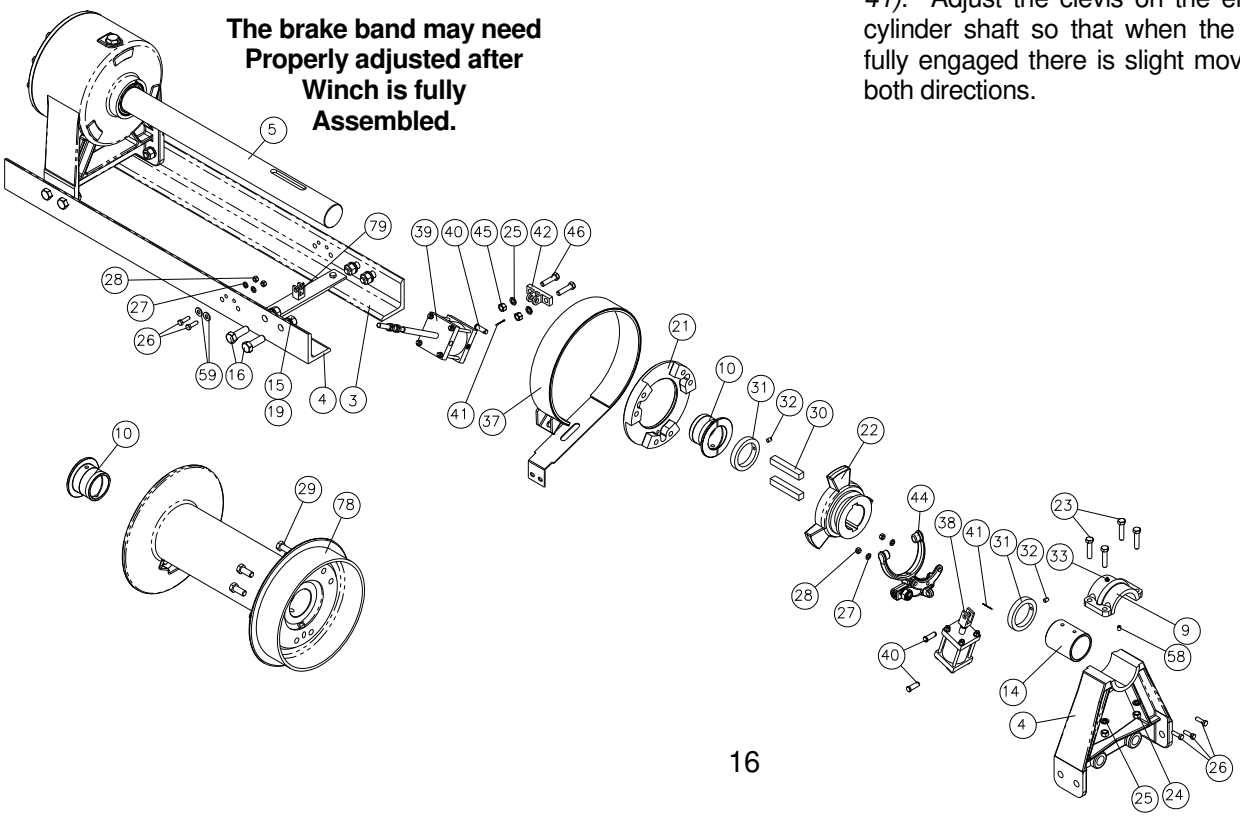
5. Install the end bracket/yoke assembly *(Item# 44)* onto the shaft, aligning the lugs of the yoke with the groove of the sliding clutch. Tightly hold the outer thrust collar *(Item# 31)* against the keys *(Item# 30)* and lock down the set screw *(Item# 32)*.

6. Bolt the end bracket *(Item# 4)* loosely into both frames *(Items# 3 & 4)*. Lower the drum so its weight is supported by both the gear housing and end bracket

7. Disengage the sliding clutch so you can turn the drum freely and tighten all bolts through the frames to the proper torque specification (see page 23 of this manual)

8. Turn the drum to make sure it is not binding.

9. Install the air cylinder into the clevis (item 79) with the pin and cotter key *(Item# 40 & 41)*. Adjust the clevis on the end of the cylinder shaft so that when the clutch is fully engaged there is slight movement in both directions.



K. BRAKE SECTION ASSEMBLY

1. If necessary install bearings *(Item# 74)* into the brake housing *(Item# 76)* and brake adapter *(Item# 65).*

2. Install new o-rings and back-up rings onto the piston.

3. Install the stator plates *(Item# 20)* and friction discs *(Item# 71)* into the piston *(Item# 13).* Starting with a friction disc and alternating between friction discs and stator plates until four stator plates and five friction disks are used.

NOTICE

Dip friction discs in lightweight Non-EP oil before installation.

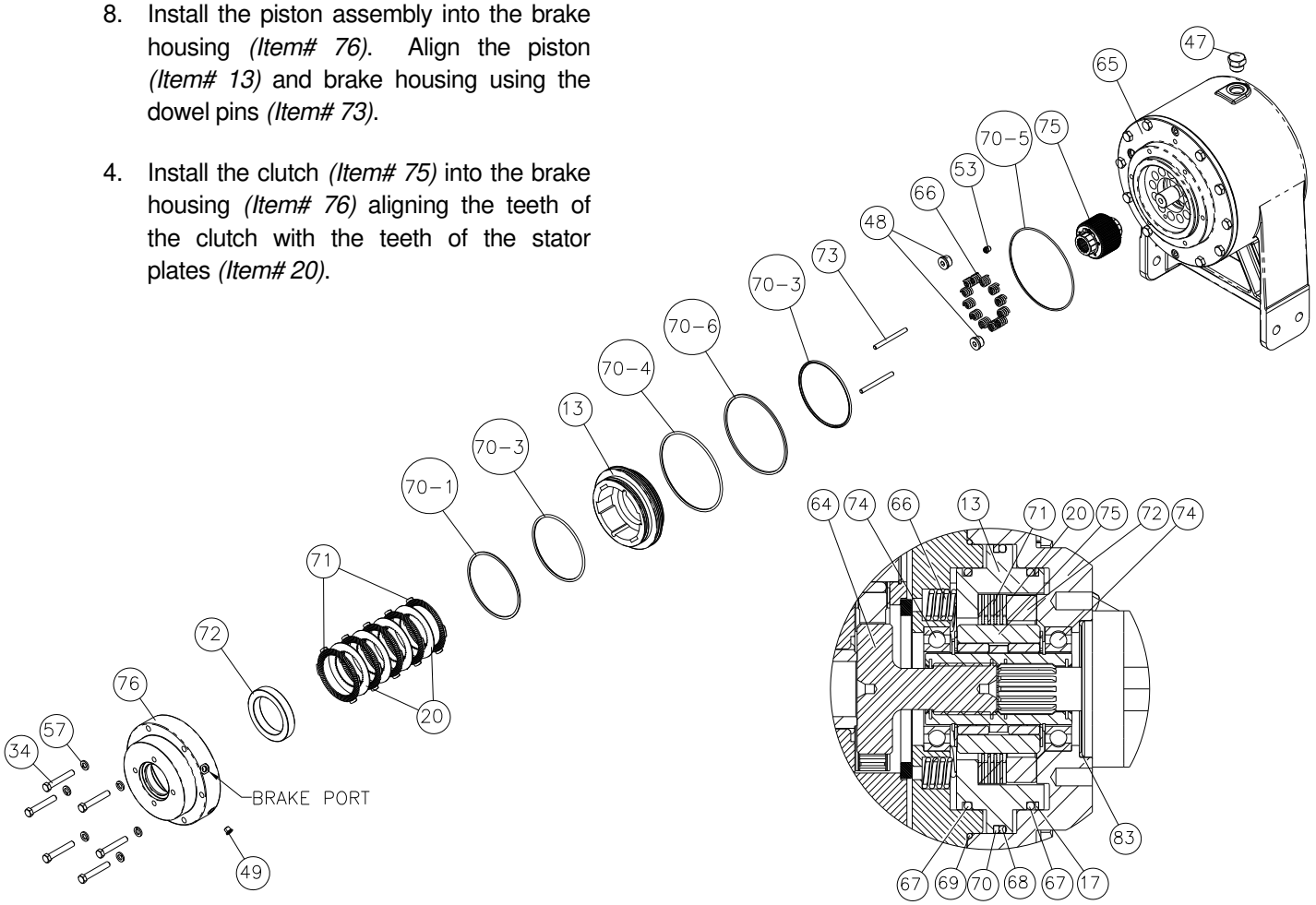
3. Install the spacer *(Item# 72)* into the piston *(Item# 13).*

8. Install the piston assembly into the brake housing *(Item# 76).* Align the piston *(Item# 13)* and brake housing using the dowel pins *(Item# 73).*

4. Install the clutch *(Item# 75)* into the brake housing *(Item# 76)* aligning the teeth of the clutch with the teeth of the stator plates *(Item# 20).*

5. Install twelve springs *(Item# 66)* into the spring pockets on the brake adapter *(Item# 65).* If working in a horizontal position coat the bottom of each spring with grease to keep it in position.

6. Install an o-ring *(Item# 70-5)* on the outside of the brake adapter *(Item# 65)* and attach the brake housing *(Item# 76)* with six capscrews and lock washers *(Items# 37 & 54).* Draw the cover down evenly; alternating between opposite hex bolts, making sure that the cover is aligned properly with the brake housing to orient the motor as it should be.



L. MOTOR ASSEMBLY

1. Install the o-ring *(Item# 70-7)* onto the motor (18). Attach the motor *(Item# 18*) to the brake housing *(Item# 76*) using two capscrews *(Item# 55*) and washers *(Item# 56*). Tighten the capscrews to the proper torque specification (see page 24 this manual).

2. If removed, install the cartridge valve *(Item# 85 & 86)* onto the counter-balance block *(Item# 77*). *Two speed version only.*

3. Install the counterbalance valve *(Item# 52*) into the counter-balance block.

4. Install the o-rings into the counterbalance block *(Item# 77*). Install the counterbalance block using capscrews *(Item# 84*).

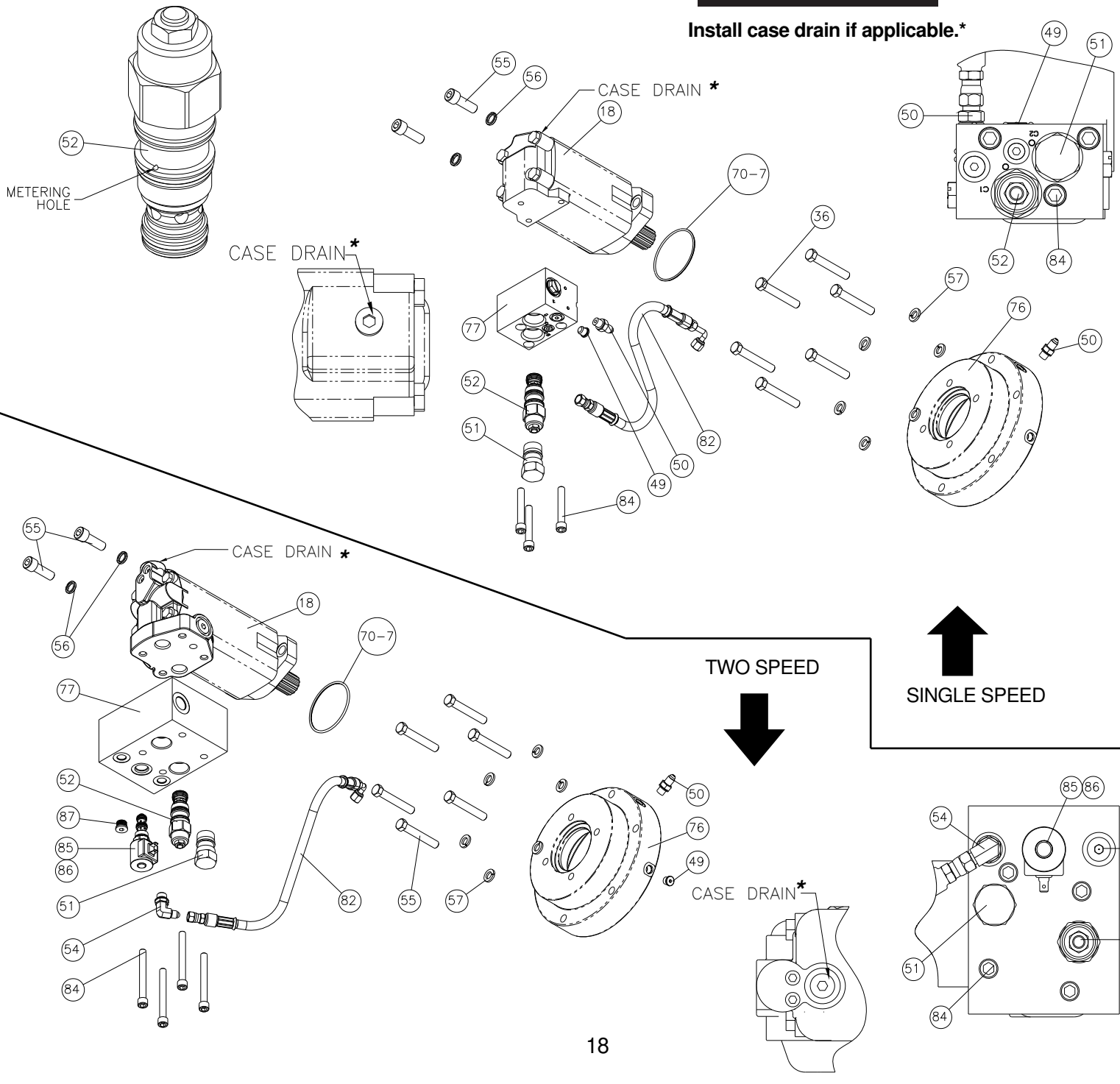
5. If removed Install plugs *(Items# 49, 51 & 87.*)

6. Install hose *(Item# 82*) with two adapter fittings.

7. Fill the brake and gearbox with the proper oil.

NOTICE

Install case drain if applicable.*



TROUBLESHOOTING

FAILURE	PROBABLE CAUSE
Winch won't hold load.	a) Excessive back pressure in the system. Check the system for restrictions and reduce the backpressure. b) Brake discs are worn out. Replace brake discs. c) Winch clutch is slipping. Inspect the clutch and driver for wear and replace worn parts.
Winch will not raise the load it should.	a) Relief valve setting may be too low to allow proper lifting. Increase relief valve pressure setting. *(Note: do not exceed recommended system pressures.)* b) Load being lifted may be more than the winch's rating. Reduce the load or re-rig to increase mechanical advantage.
Oil leaks from the vent located on the top of the gearbox.	a) The motor shaft seal may have failed. Replace this seal and reduce backpressure if that caused the shaft seal to fail. b) Brake piston seals may have failed. Service the brake section and replace worn parts.
Winch runs too slow	a) Low flow rate. Check the flow rate and increase if necessary. b) Hydraulic motor worn out. Replace the motor.
Cable drum won't free spool	a) Winch not mounted squarely. Check mounting and confirm that the winch is mounted on a level surface. b) Clutch not disengaged. Disengage the clutch.

30P BILL OF MATERIAL

Item	Qty	P/N	Description
1	1	44951	HOUSING, GEAR
2	1	44884	FRAME, R.H.
3	1	44885	FRAME, L.H.
4	1	20256	END BRACKET
5	1	44971	SHAFT, OUTPUT
6	1	4399	GEAR SET, SECONDARY
7	1	45031	GEAR, SUN, OUTPUT
8	2	44428	WASHER, THRUST, NYLON
9	1	20053	CAP, END BRACKET
10	2	32839	BUSHING, GEARBOX
11	1	32840	BUSHING, DRUM
12	1	44973	WASHER, THRUST
13	1	45025	PISTON, BRAKE
14	1	32842	BUSHING ,END BRACKET
15	8	20520	LOCK WASHER
16	8	939262	CAPSCREW
18A	1	41921	MOTOR, HYDRAULIC
18B	1	42189	MOTOR, HYDRAULIC
19	8	20274	NUT
20	4	45028	PLATE, STATOR
21	1	23598	CLUTCH, DRUM
22	1	20262	SLIDING CLUTCH
23	4	20266	CAPSCREW
24	4	20267	NUT
25	6	20518	LOCK WASHER
26	5	20270	CAPSCREW
27	3	20526	LOCK WASHER
28	5	20271	NUT
29	6	20407	CAPSCREW
30	2	20098	KEY
31	2	20096	THRUST COLLAR
32	2	20515	SET SCREW
33	3	21128	FITTING, GREASE ZERKS
34	10	28060	CAPSCREW
35	2	30426	CAPSCREW, SOCKET, HD
36	6	45007	CAPSCREW
37	1	1741	BAND, BRAKE,
38	1	44679	CYLINDER, CLUTCH
39	1	44681	CYLINDER, BRAKE
40	3	939243	CLEVIS PIN
41	3	20514	COTTER PIN,
42	1	42955	MOUNTING, BRACKET

"A" PARTS = TWO SPEED MOTOR
"B" PARTS = SINGLE SPEED MOTOR

30P BILL OF MATERIAL CONTINUED

43	1	45034	PLATE, MOUNTING
44	1	4362	POS. IND. CLUTCH
45	4	20521	NUT
46	2	20525	CAPSCREW
47	1	31582	PLUG, O-RING
48	1	41719	PLUG, O-RING
49A	1	41307	PLUG, O-RING
49B	2	41307	PLUG, O-RING
50A	1	41838	ADAPTER, STRAIGHT
50B	2	41838	ADAPTER, STRAIGHT
51	1	42287	PLUG, CAVITY
52	1	42286	CARTRIDGE
53	1	13050	BREATHER
54A	1	32868	ADAPTER
55	2	13529	CAPCREW, SOCKET HEAD
56	2	41000	LOCK WASHER, HI-COLLAR
57	6	20519	LOCK WASHER
58	1	20517	PIN
59	2	20617	WASHER,
60	1	21154	U-BOLT
62	1	45039	RING, RETAINING
63	1	4534	GEARSET, INPUT
64	1	44880	GEAR, SUN, INPUT
65	1	45021	ADAPTER, BRAKE
66	12	45022	SPRING, BRAKE
70	1	SA-4582	SEAL KIT, 30P ASSEMBLY
70-1	1	45045	RING, BACK-UP
70-2	1	40845	SEAL, OIL
70-3	2	45041	O-RING
70-4	1	45042	O-RING
70-5	1	45043	O-RING
70-6	1	42337	RING, BACK-UP
70-7	1	41641	O-RING
70-8	1	28933	O-RING
71	5	45027	DISC, FRICTION
72	1	45029	SPACER, BRAKE
73	2	45023	PIN, DOWEL
74	2	45024	BEARING, BALL
75	1	4535	CLUTCH, BRAKE
76	1	45026	HOUSING, BRAKE
77A	1	42967	BLOCK, COUNTERBALANCE
77B	1	45032	BLOCK, COUNTERBALANCE
78	1	45016	DRUM
79	1	45035	CLEVIS
80	2	45036	CAPSCREW

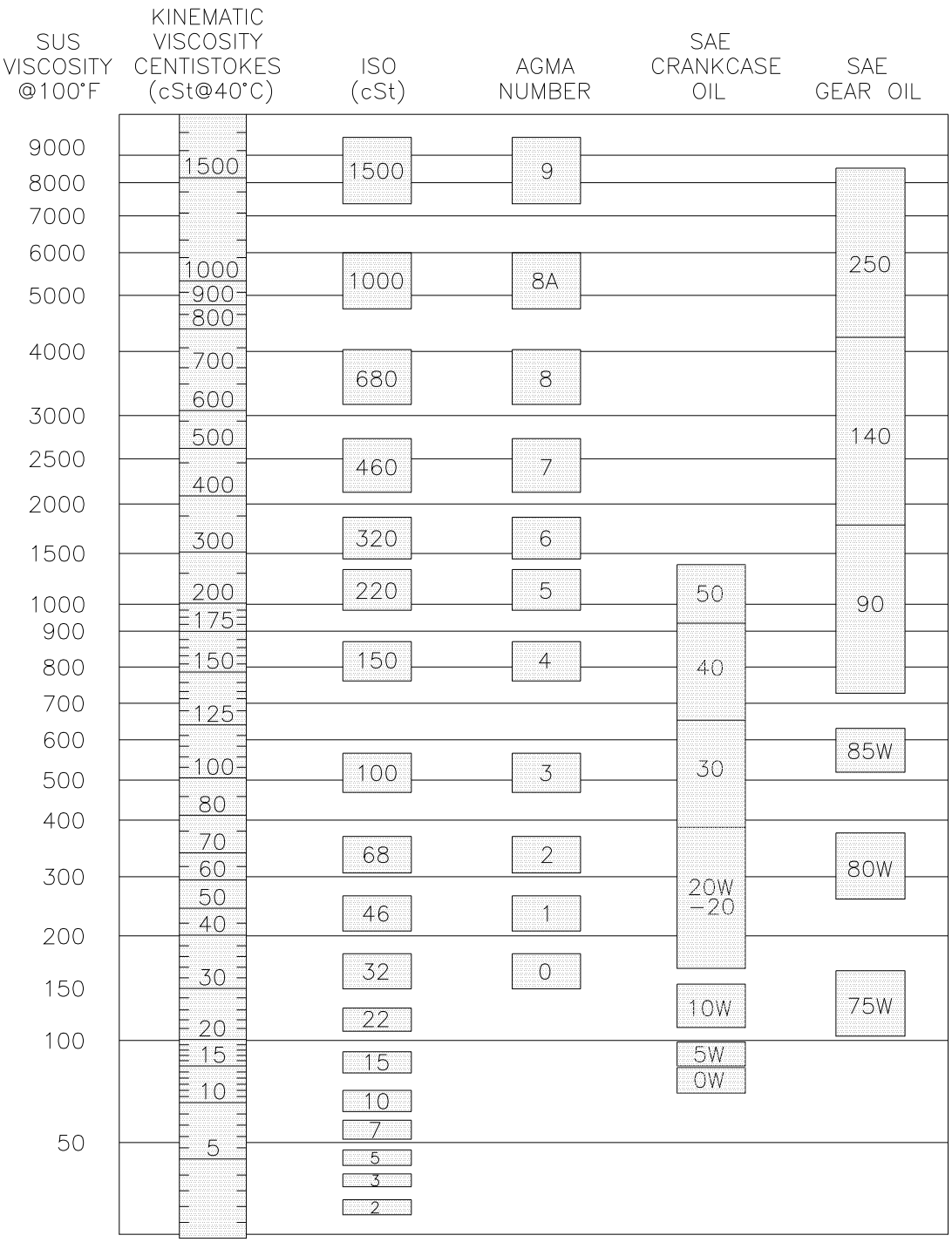
"A" PARTS = TWO SPEED MOTOR
"B" PARTS = SINGLE SPEED MOTOR

30P BILL OF MATERIAL CONTINUED						
82A		1		42031		HOSE ASSEMBLY
82B		1		42449		HOSE ASSEMBLY
84A		4		43111		CAPSCREW, SOCKET HEAD
84B		3		40557		CAPSCREW, SOCKET HEAD
85A		1		43446		COIL, 12V
85B		1		45124		CAPSCREW
86		1		43445		VALVE, SPOOL
87		1		42392		PLUG, O-RING
88		1		45124		CAPSCREW

"A" PARTS = TWO SPEED MOTOR
"B" PARTS = SINGLE SPEED MOTOR

VISCOSITY CHART

Tulsa Winch



Tulsa Winch

TORQUE SPECIFICATIONS CHART

		Dry	Plated	Lubricated	Dry	Plated	Lubricated
		SAE Grade 5	SAE Grade 5	SAE Grade 5	SAE Grade 8	SAE Grade 8	SAE Grade 8
Nominal	Size	Torque *(Ft-Lbs)	Torque *(Ft-Lbs)	Torque *(Ft-Lbs)	Torque *(Ft-Lbs)	Torque *(Ft-Lbs)	Torque *(Ft-Lbs)
1/4	20	8	6	5	12	9	7
1/4	28	10	7	6	14	10	8
5/16	18	17	13	10	25	18	15
5/16	24	19	14	11	27	20	16
3/8	16	31	23	19	44	33	26
3/8	24	35	26	21	49	37	30
7/16	14	49	37	30	70	53	42
7/16	20	55	41	33	78	58	47
1/2	13	76	57	45	106	80	64
1/2	20	85	64	51	120	90	72
9/16	12	109	82	65	153	115	92
9/16	18	122	91	73	172	129	103
5/8	11	150	113	90	212	159	127
5/8	18	170	128	102	240	180	144
3/4	10	266	200	160	376	282	226
3/4	16	297	223	178	420	315	252
7/8	9	430	322	258	606	454	364
7/8	14	474	355	284	668	501	401
1	8	644	483	386	909	682	545
1	14	721	541	433	1019	764	611
1-1/8	7	794	596	475	1288	966	772
1-1/8	12	890	668	534	1444	1083	866
1-1/4	7	1120	840	672	1817	1363	1090
1-1/4	12	1241	930	745	2012	1509	1207

T = BOLT TORQUE (LB. FT.) **T = (KWD) / 12**

K = TORQUE COEFFICIENT (K **= 0.20 DRY** **K = 0.15 PLATED** **K = 0.12 LUBRICATED)**

W = PRELOAD TENSION

D = NOMINAL BOLT SIZE (IN.)

*** ALL TORQUE VALUE TOLERANCES ARE ± 5%**

30P ISOMETRIC DRAWING