TULSA WINCH®

DESIGN SERIES 003

RUFNEK 130W

SERVICE MANUAL

⚠ 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. Additionally, 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/TulsaWinch/

⚠ 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 PTO's and drivelines are sized appropriately for the winch manufactures speed and torque specifications.

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/TulsaWinch/

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.
The drum brake is not a load holding device. It is designed to prevent over spooling of the drum, causing the cable to bird nest on the drum. Inspect the brake band for worn lining and the actuation method.

Must inspect the load control brake.
This winch is equipped with a form of dynamic braking. The worm brake is adjustable for pay-out load control. Before a load is handled the load should be pulled tight and stopped to check this brake.

Operation:

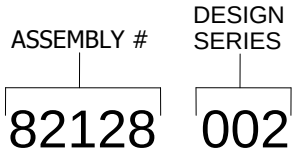
- All winch controls must be well marked for function to avoid confusion.
- Insure that the PTO is disengaged when the winch is not in use.
- All winch controls must be located to provide the operator with a clear view of the load.
- The clutch must be inspected daily for proper operation.
- The winch cable should be inspected daily for serviceability.
- A minimum of five wraps of tightly wound cable must remain on the drum.

GENERAL INFORMATION
INTRODUCTION AND THEORY OF OPERATION

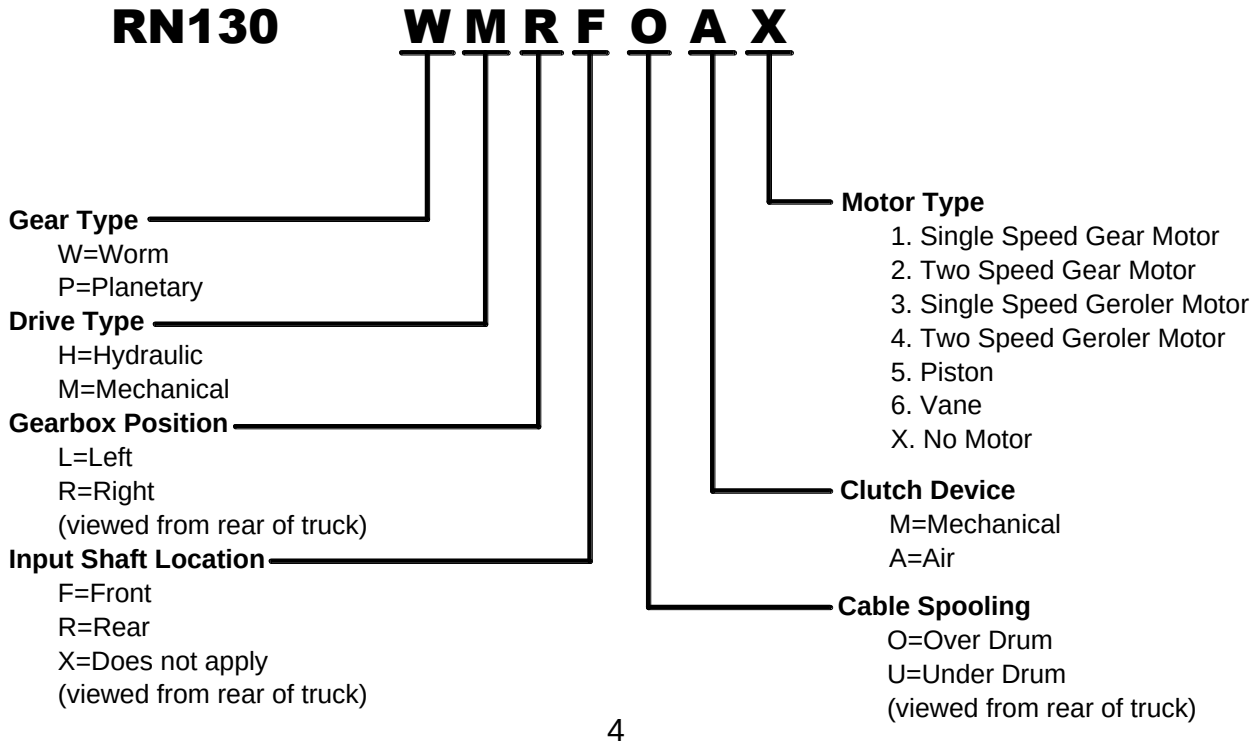
The Tulsa worm gear winch is operated by turning the input of the worm using a PTO-driven sprocket and chain. This winch utilizes the adjustable, spring applied, multiple disc oil brake that activates only during pay-out to provide maximum efficiency during pay-in. An optional non-adjustable, air released brake is also available. The torque is transferred from the gearbox through the drum shaft which is keyed to a mechanically actuated sliding clutch that, when engaged, transfers the torque to the drum.

ASSEMBLY NUMBER EXPLANATION

This manual is for design series 002. 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.



MODEL CODE



MAINTENANCE

Tulsa Winch worm gear driven winches require regular maintenance to ensure safe and reliable operation. Regular oil changes with the correct oil for the ambient temperature conditions and an annual inspection of the wear components is strongly recommended.

Maintenance Scheduling

The owner is to ensure proper inspection intervals, in compliance with the API RP 2D Section 4, ANSI B30.5, 5-2.3, or ANSI B30.7, 7-2.1, and will review winch usage categories on a periodic basis. A qualified inspector should perform all maintenance and inspections.

USE (HRS PER MONTH)	API RP 2D RECOMMENDED INSPECTION SCHEDULE
0-10	PRE-USE, ANNUAL
11-50	PRE-USE, QUARTERLY
51+	PRE-USE, MONTHLY

Oil Maintenance

The oil in the gear section and the brake section should be changed every **1000 hrs** or **6 months** of normal usage.

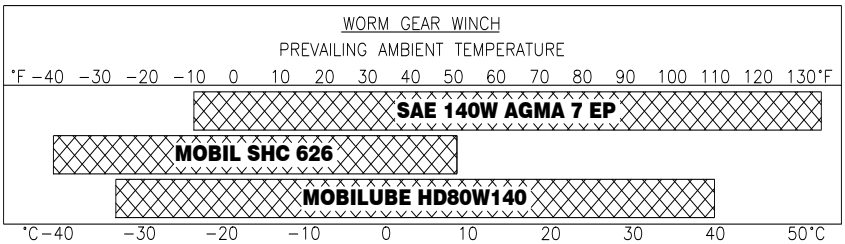
- Tulsa Winch recommends that the oil level in the gearbox and brake be checked and adjusted as part of the pre-use inspection. If the oil level drops frequently or oil leakage is detected during an inspection, maintenance should be performed to correct any problems.

Oil Capacity

	AMOUNT	OIL TYPE
GEARBOX SECTION	8.50 QTS	SEE CHART BELOW
BRAKE SECTION	.50 QTS	LIGHTWEIGHT NON-EP*

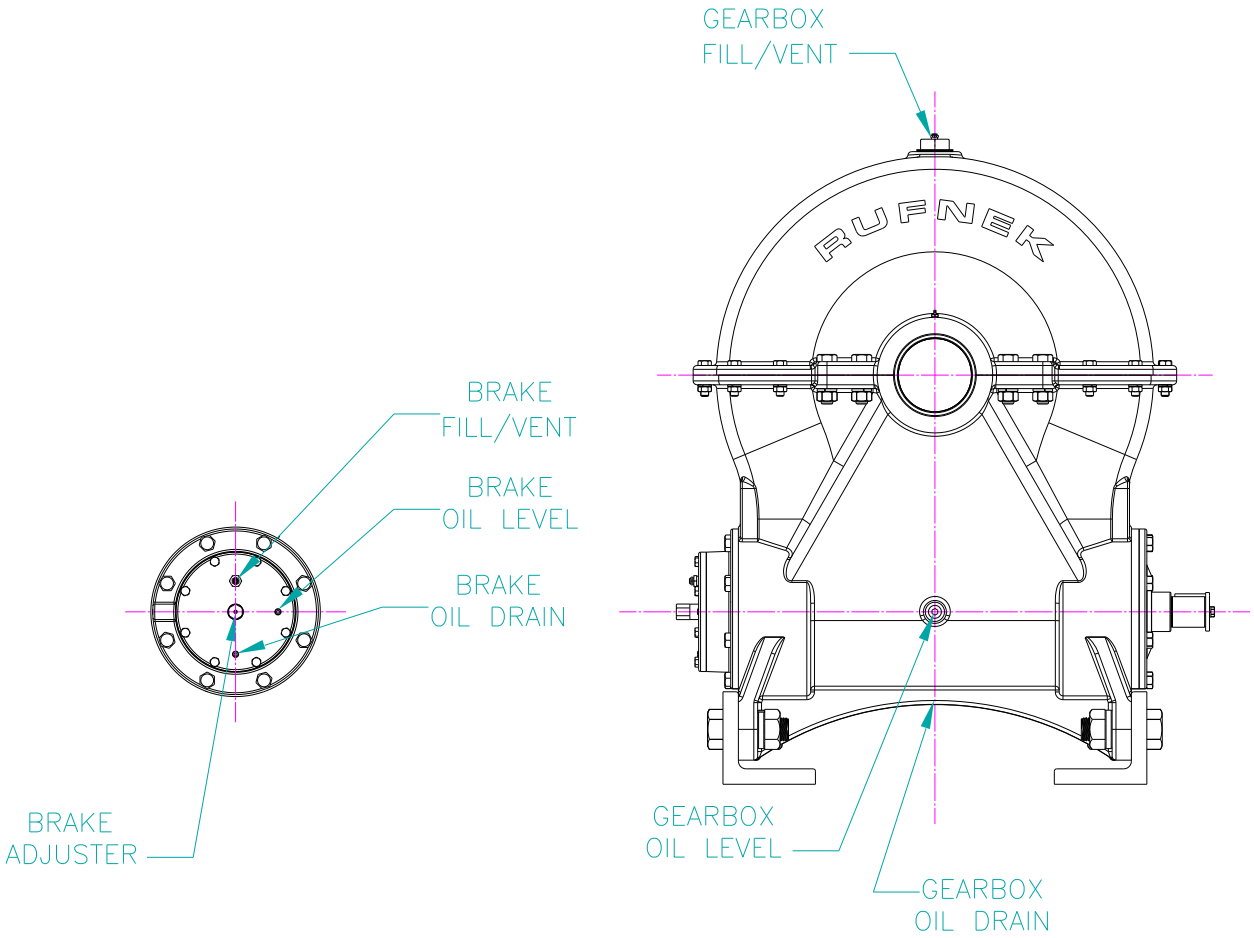
**SAE 20W, AUTOMATIC TRANSMISSION FLUID, OR MOST HYDRAULIC OILS.*

- Gearbox oil level inspection is achieved by removing the oil level inspection plug and visually inspecting the oil level. Minimum oil level is to the bottom of the threads of the inspection hole. Refer to the chart below for the recommended oil type and grade for your application.

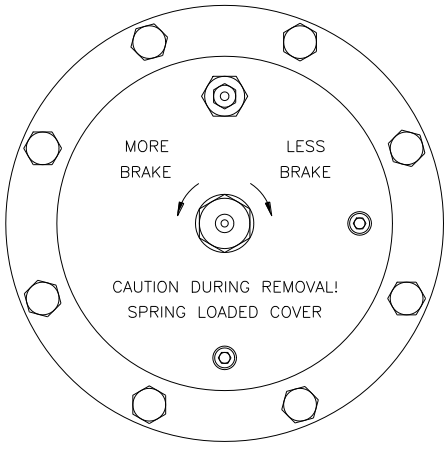


All oils must meet MIL-PRF2105E standards. Substitution from a reputable manufacturer is allowed as long as type and grade are maintained.

OIL LEVELS



BRAKE ADJUSTMENT



The brake is adjusted by turning the hex adjuster counter-clockwise to increase brake and clockwise to decrease brake. The direction of braking for all multiple disc brakes can be changed by removing the cam clutch, turning it over, and re-installing it. For detailed service instructions, contact your Tulsa Winch distributor or the factory.

If the input to the winch is accessible and a torque wrench can be adapted to fit it, the brake can be set with a torque wrench. The RN130W brake is shipped from the factory pre-set at 100 Ft.-Lbs.

DISASSEMBLY
RUFNEK OIL BRAKE SECTION

1. Remove the bottom drain plug (41) to drain the oil from the brake.

2. Loosen the spring tension inside the brake by rotating the adjusting nut (39) clockwise until it stops.

⚠ CAUTION

Extreme care should be taken when removing the brake cover. The cover is spring loaded against the cover bolts.

3. Evenly remove the capscrews (35) from the brake cover (34).

4. Remove the spring (43) and retaining ring (47), then remove the clutch assembly components (46, 48, 49, and 50), along with friction discs (45) and stator plates (44). Be sure to examine and note the direction of lockup on the cam clutch (50) for reinstallation.

5. If necessary, remove the coupler (51) by removing the retaining rings (47 & 90) and threading the coupler out of the worm.

NOTICE

The coupler threads are left-handed.

6. Inspect parts as follows, replace if necessary:

   A. Inspect the friction discs (44) for uneven or excessive wear. Friction discs should measure no less than .055-in thick.

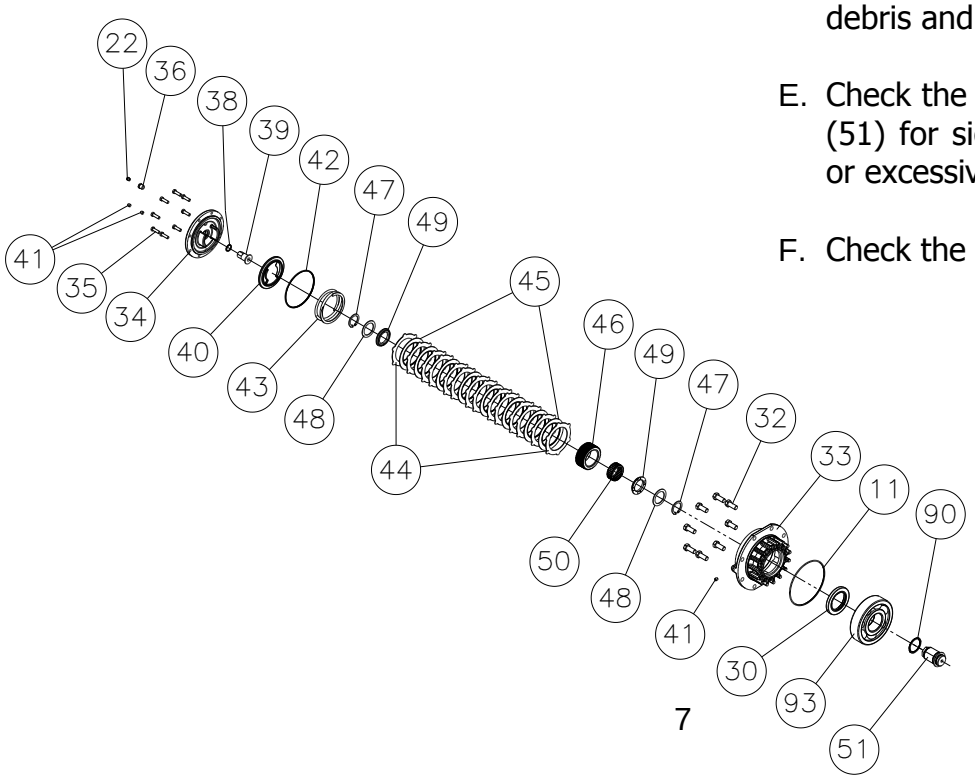
   B. Inspect the stator plates (45) for warpage or excessive wear.

   C. Inspect the spring (43) for damage or discoloration.

   D. Cam clutch (50) should be free of debris and have all cams intact.

   E. Check the driver (46) and coupler (51) for signs of pitting, spalling, or excessive wear.

   F. Check the seal (30) for damage.



DISASSEMBLY
CLUTCH AND DRUM SECTION

1. Remove the brake band (62) by removing the jam nuts securing the brake band to the air cylinder (69).

2. Remove the air cylinders (69 & 70) by removing the cotter keys (77) from the clevis pins (76).

3. Remove the capscrews (4), nuts (6), and washers (5) connecting the end bracket (75) to the frames (2 & 3).

4. Remove the end bracket (75) and clutch yoke assembly (68). Remove the thrust collar (63).

5. Remove the sliding clutch (65), keys (84), and the other thrust collar (63).

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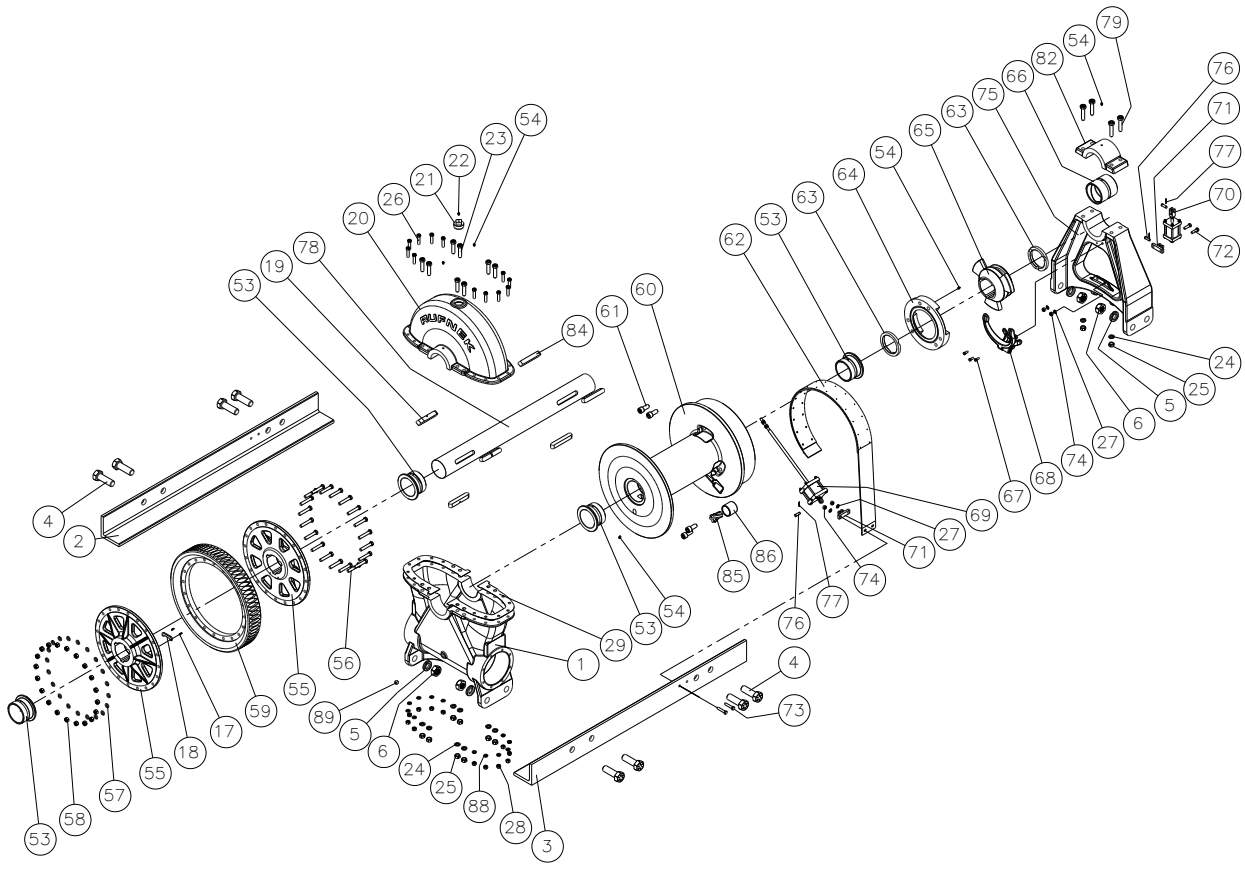


DISASSEMBLY
CLUTCH AND DRUM SECTION CONTINUED

6. Remove the brake band assembly (62) and bracket (71) by removing the capscrews (73), nuts (74), and washers (27) securing them to the frame.

7. Slide the drum (60) off of the output shaft (78), using an overhead hoist.

8. Inspect parts as follows, replacing them if necessary:

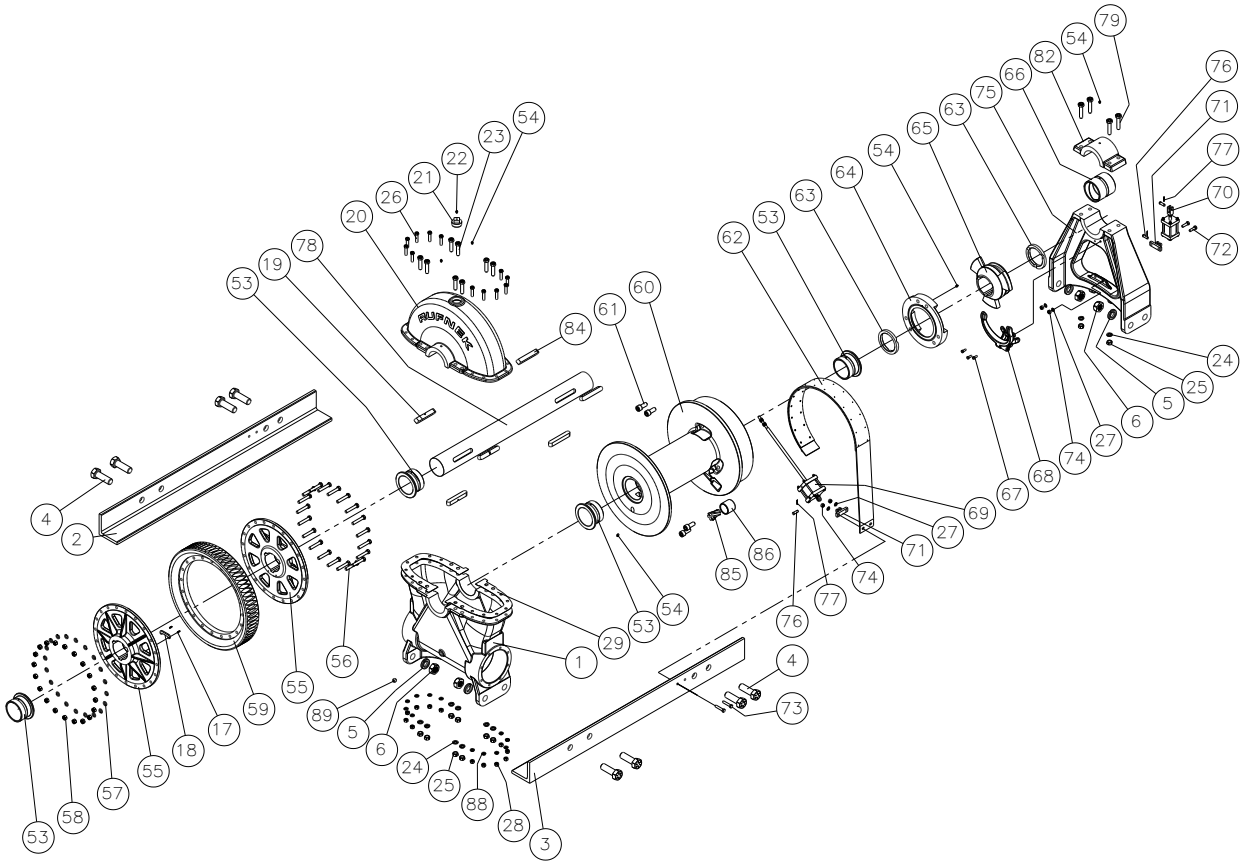
   A. Inspect the thrust collars (63) for excessive wear or damage.

   B. Inspect the bushings (53 & 66) for excessive wear or damage.

   C. Inspect the keys (84) for excessive wear or damage.

   D. Inspect the drum clutch (64) and sliding clutch (65) for wear. See page 21 this manual for Clutch Inspection.

   E. Inspect the brake band assembly (62) and verify the lining is at least .225-in thick.



DISASSEMBLY
GEARBOX SECTION

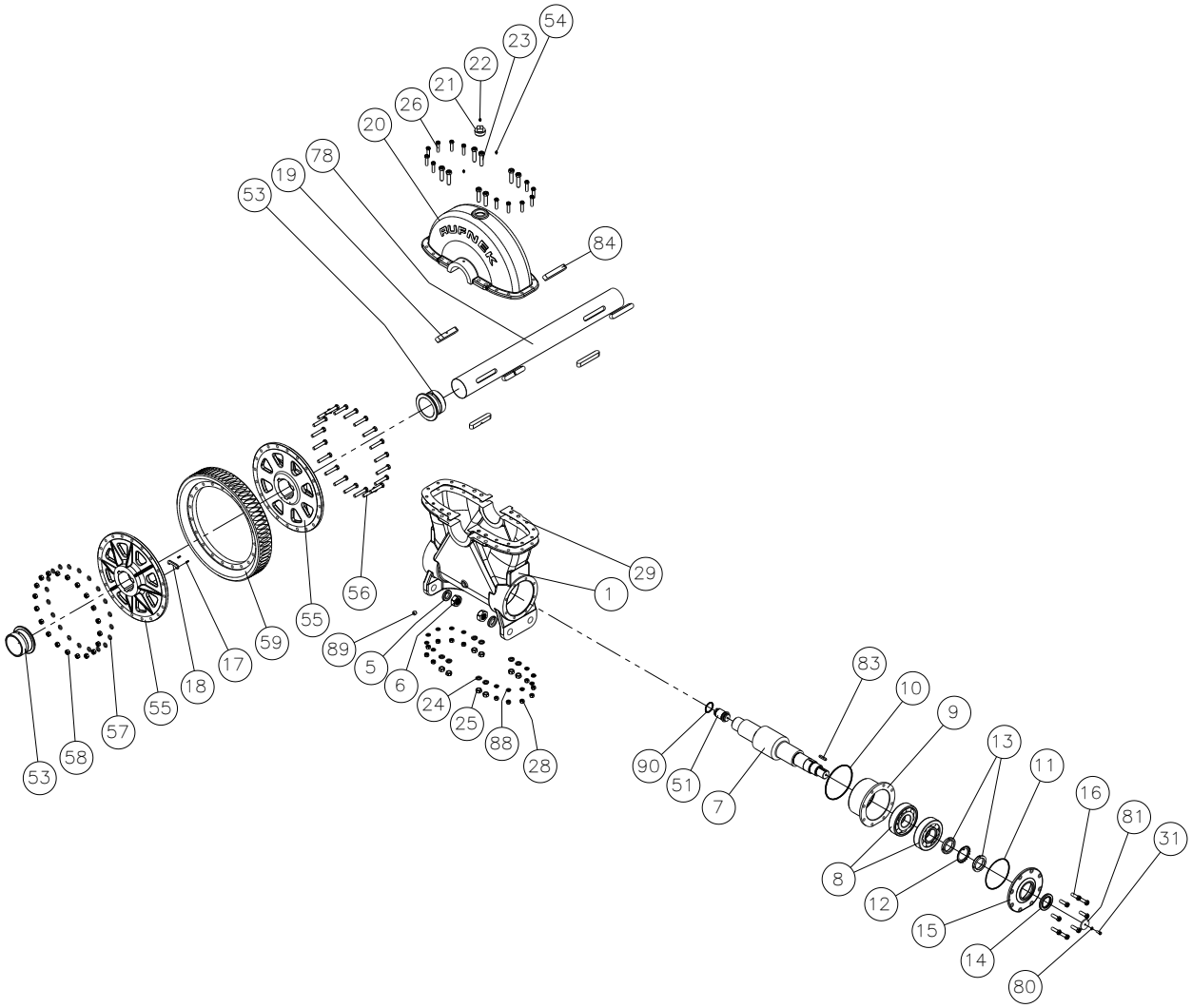
1. Supporting the end of the output shaft (78) with a hoist, remove the housing cover (20) by removing capscrews (23 & 26), nuts (25 & 28), and washers (24 & 88).

2. Use the hoist to lift the output shaft (78), bushings (53), and gear (assembled items 17, 18, 19, 53, 55, 56, 57, 58, and 59) out of the housing (1).

3. Remove the bushing (53) from the output shaft (78).

4. Remove the gear (59) from the carriers (55) by removing the twenty capscrews (56), nuts (58), and washers (57), then pull the carrier (55) off of the shaft (78). Finally, remove the spacer (18), carrier (55), and keys (19).

(Continued on page 11)



DISASSEMBLY
GEARBOX SECTION CONTINUED

NOTICE

If the brake has not been removed, see brake disassembly on pages 10-13 of this manual.

5. Remove the worm assembly (assembled items 7, 8, 9, 10, 12, 13, 51, 83 and 90) from the housing by removing the end cap (15). From the brake end, push the worm assembly out of the housing (90), being careful not to damage the oil seal (30) in the brake housing.

6. Disassemble the worm by removing the bearing locknut (13), washer (12), and then other locknut. Press the worm out of the bearings (8 & 93). Next, press the two angular contact bearings out of the bearing carrier (9).

7. If the coupler (51) shows signs of wear or damage, remove the coupler and retaining ring (90) then replace it with a new one. Use Loctite 277 on coupler threads when replacing.

NOTICE

The coupler threads are left-handed.

8. Inspect parts as follows, replacing them if necessary:

   A. Inspect the carriers (55) for damage.

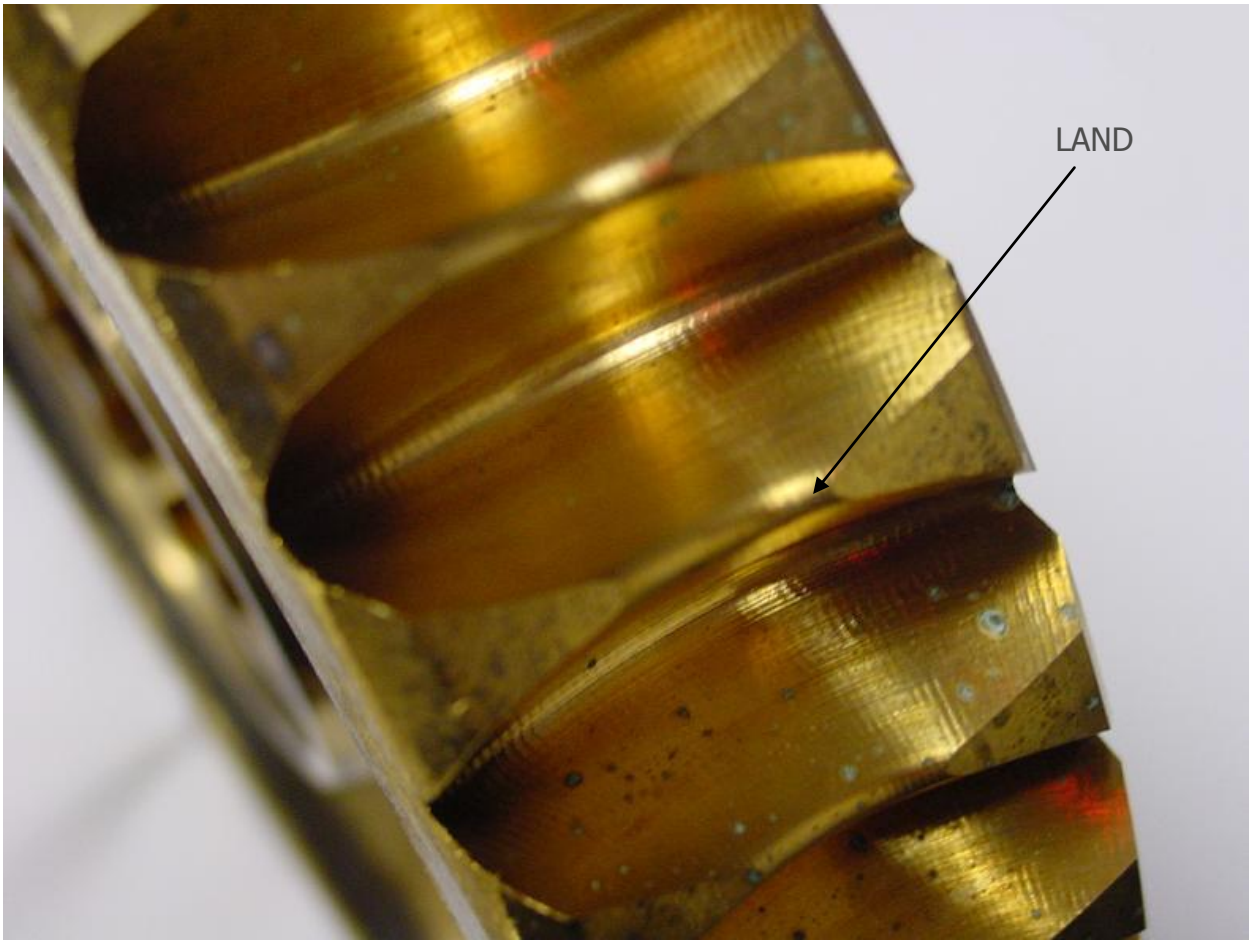
   B. Inspect the gear (59) for excessive wear or damage. See page 12 for instructions.

   C. Inspect the keys (19 & 83) and bushings (53) for wear or damage.

   D. Inspect the worm (7) for excessive wear or signs of heat checking or cracks.

   E. Inspect the bearings (8 & 93), o-rings (10 & 11), and seals (14 & 30) for excessive wear or damage.

DISASSEMBLY
BULL GEAR INSPECTION INSTRUCTIONS



Check gear wear by removing the cover and visually inspecting the bronze gear. If the gear is worn such that there is no visible land on the throat of the gear between the gear flanks as shown in picture above the gear should be replaced.

ASSEMBLY
GEARBOX SECTION

1. Press the angular bearings (8) into the bearing carrier (9) (as illustrated below), then press the bearing carrier and bearings onto the worm (7) and secure with a locknut (13), a washer (12), and another locknut (13). Torque locknut to 150 FT-LBS.

2. Press the brake-side bearing (93) onto the other end of the worm.

3. Press a new oil seal (14) into the end cap (15). Install the worm assembly into the gearbox (1), using o-ring (10). Secure the end cap (15) with eight capscrews (16), using o-ring (11). Torque the capscrews to specification using the chart on page 20.

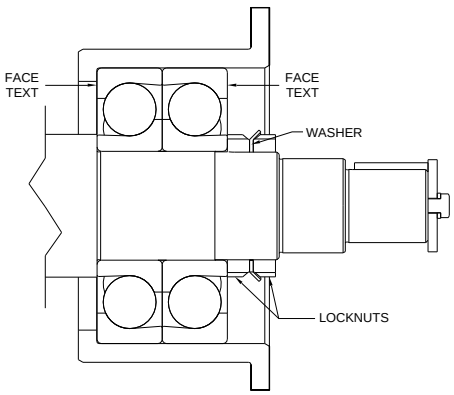
4. Install the key (83) into the worm (7).

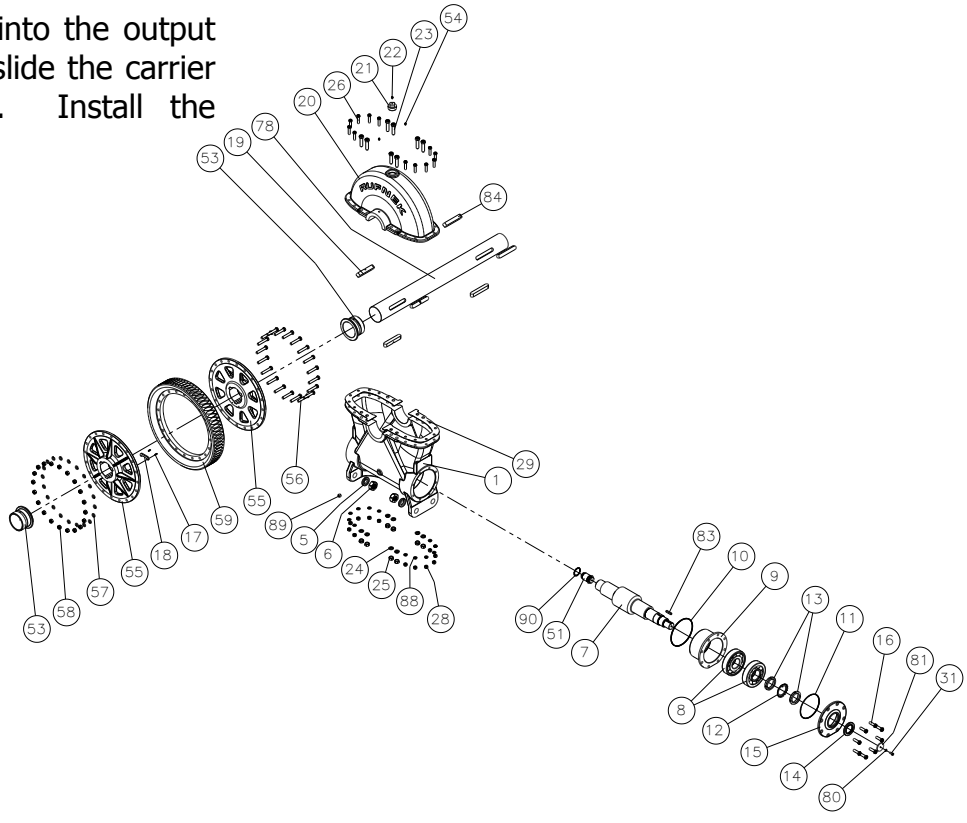
5. Install the keys (19) into the output shaft (78), and then slide the carrier (55) over the keys. Install the spacer (18) using two pins (17). Slide the gear (59) and the other carrier (55) onto the shaft and secure with twenty capscrews (56), nuts (58), and washers (57). Torque the capscrews to specification using the chart on page 20.

6. Slide two bushings (53) onto both ends of the shaft.

7. Carefully lower the output shaft assembly into the housing (1).

8. Install both gaskets (29) onto the housing (1). Attach the cover (20) to the housing, using capscrews (23 & 26), nuts (25 & 28), and washers (24 & 88). Torque the capscrews to specification using the chart on page 20.





ASSEMBLY
RUFNEK OIL BRAKE SECTION

1. Press the oil seal (30) into the brake housing (33). Attach the brake housing to the gearbox with eight capscrews (32), using o-ring (11). Be sure to torque the capscrews to specification using the chart on page 20.

2. Install the key (52) into the worm.

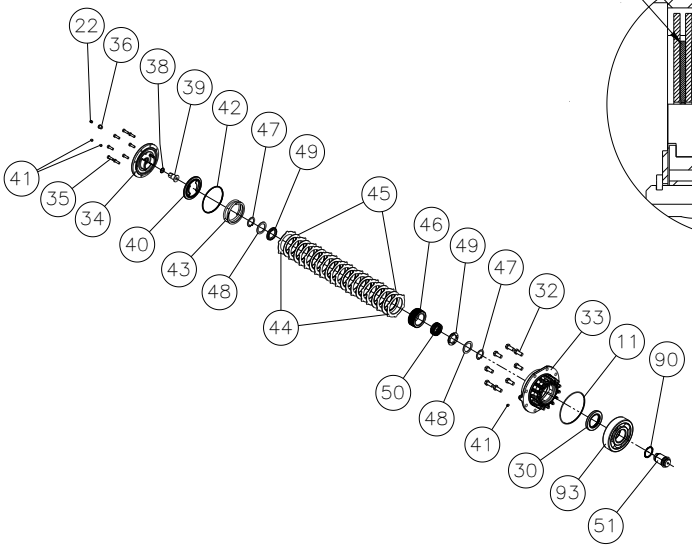
3. Reassemble the clutch assembly components:

   A. Install the thrust race (48) and bushing (49) onto the coupler (51).

   B. Install the cam clutch (50) and driver (46) onto the coupler, being sure the clutch is oriented correctly as defined in Brake Disassembly.

   C. Install the other bushing (49) and thrust race (48), along with the retaining ring (47) onto the coupler.

4. Install the clutch assembly onto the worm.



5. Install the retaining ring (37) on the worm (7). Install the stator plates (44) and friction discs (45), in the correct layout as shown below.

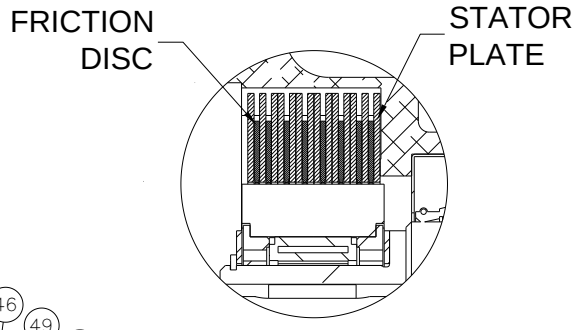
6. Install the spring (43).

7. Install the adjusting components (items 38, 39, and 40) into the brake cover (34) and attach it to the brake housing (33) with eight evenly installed capscrews (35), using o-ring (42). Torque the capscrews to specification using the chart on page 20.

8. Install the drain plug (41) into the bottom of the brake cover (34).

9. Fill gearbox and brake with proper oil. Refer to winch maintenance section on page 5 of this manual for oil type and amounts.

10. Adjust the brake using the procedure on page 6 of this manual.



ASSEMBLY
CLUTCH AND DRUM SECTION

1. Install bushings (53) into the drum (60). Slide the drum onto the output shaft (78).

2. Slide the thrust collar (63) onto the output shaft (78). Install the keys (84) into the output shaft.

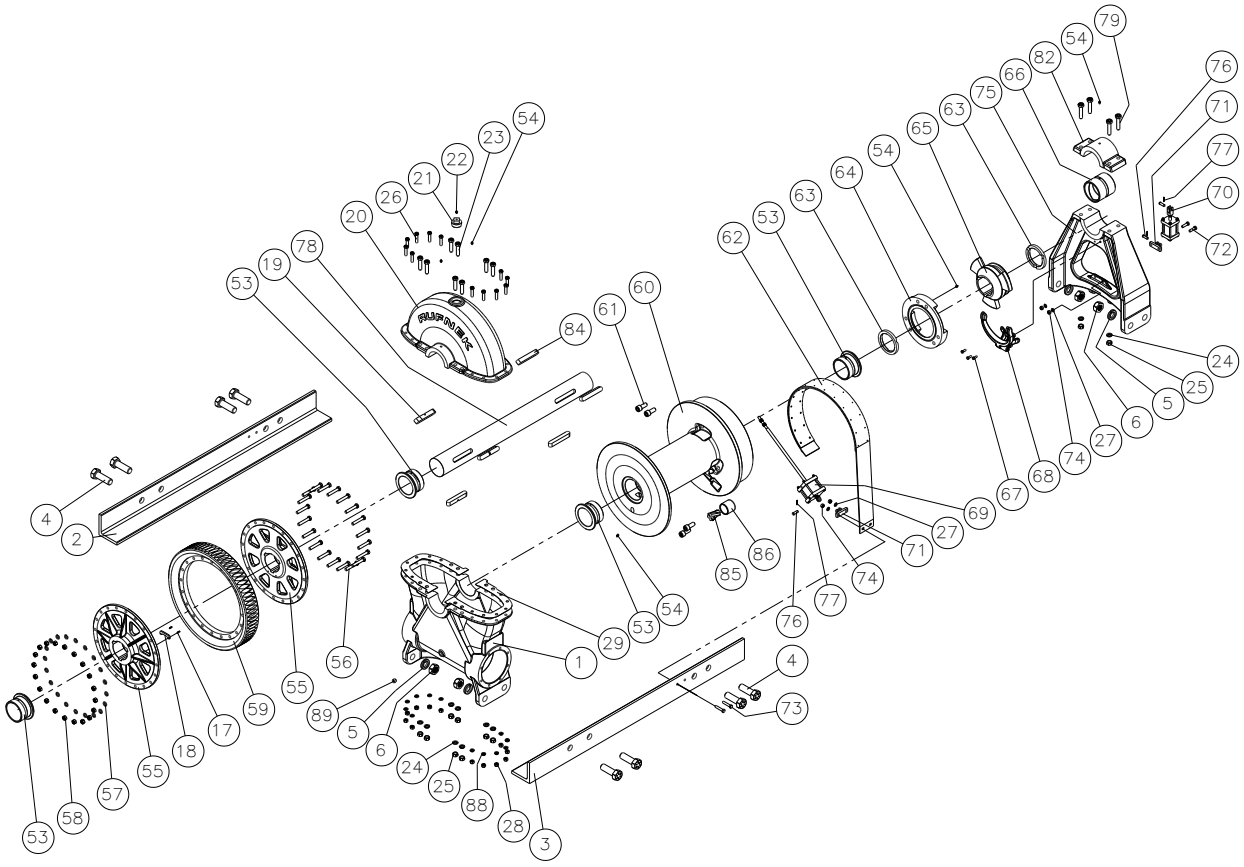
3. Install the sliding clutch (65) onto the output shaft (78) then slide the clutch over the keys (84).

4. Install the other thrust collar (63).

5. Install the bushing (53) and end cap (82), and then secure it with four capscrews (79), nuts (25), and washers (24). Torque the capscrews to specification using the chart on page 20.

6. Install the yoke assembly (68) onto the end bracket (75), then install the end bracket (75) onto the output shaft (78), being sure to engage the sliding clutch with the yoke. Mount the end bracket to the frame using four capscrews (4), nuts (6), and washers (5). Torque the capscrews to specification using the chart on page 20.

7. Install the brake band (62) onto the drum (60), making sure it is oriented properly for winch arrangement in regard to cable spooling.



ASSEMBLY
CLUTCH POSITION INDICATOR ADJUSTMENT

Make sure that the sliding clutch (65) is fully engaged and that the yoke assembly (68) is not binding on the drum clutch. The lugs of the yoke MUST be centered in the groove with the clutch fully engaged in order for the clutch position indicator to be properly adjusted (See FIG-1).

- The switch is a normally-open electrical switch that is actuated by disengaging the clutch which closes the circuit.
- With the clutch fully engaged, adjust the switch in until the warning device is activated, then back-out 1/4 turn to deactivate the warning device.
- Tighten the jam nut against the clutch bracket to secure the adjustment.
- Test the switch by fully engaging, then disengaging, the clutch. The warning device should activate while disengaging the clutch pivoting no more than 3°.

FIG.-1

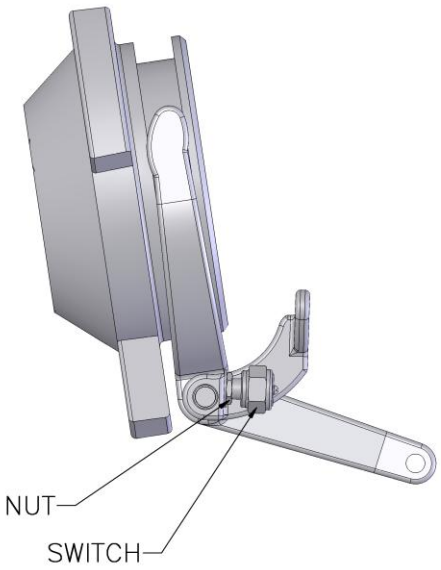
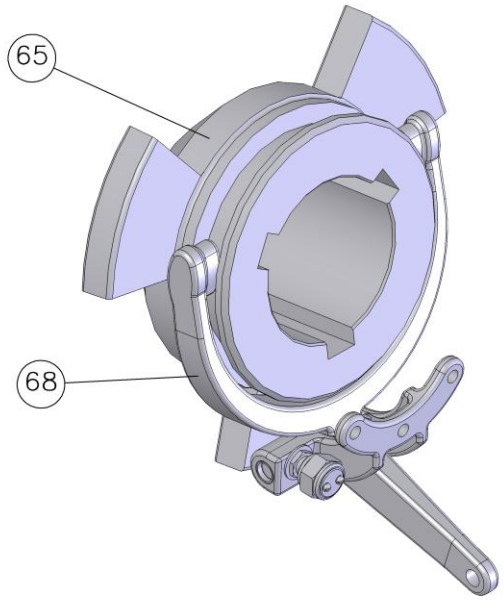


FIG.-2



TROUBLESHOOTING

FAILURE	PROBABLE CAUSE
Clutch won't engage	a) Clutch jaws aren't aligned. Align the jaws by rotating drum. b) Damaged yoke, linkage, airline, or cylinder. Replace the damaged components. c) Lack of draft angle or excessive wear on clutch jaws. Replace the clutch.
Oil leaks from housing	a) O-ring is damaged. Replace the o-ring.
Load drifts	a) The brake is out of adjustment or worn. Adjust brake until load doesn't drift. If adjustment doesn't correct problem, service brake and worm to replace worn components. b) Load exceeds winch rating. Reduce work load.
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. c) Drum bushings are running dry. Grease winch at all grease points (zerk fittings).
Winch won't pick up heavy loads.	a) Too much cable on the drum. Use the snatch block or remove some cable from the drum. b) Winch not broke-in. See Break-in section of this manual. c) Load exceeds winch rating. Reduce work load.

BILL OF MATERIAL

BOM DATED FEBRUARY 2007

SEQ	QTY	P/N	DESCRIPTION
1	1	44624	GEAR HOUSING
2	1	44628	RIGHT FRAME
3	1	44627	LEFT FRAME
4	8	44638	CAPSCREW
5	8	44640	WASHER
6	8	44639	NUT
7	1	44835	WORM
8	2	44641	BEARING
9	1	44655	BEARING CARRIER
10	1	939452	O-RING
11	2	32184	O-RING
12	1	44653	WASHER
13	2	44648	NUT
14	1	41285	OIL SEAL
15	1	44635	END CAP
16	8	44676	CAPSCREW
17	2	164056	ROLL PIN
18	1	20569	SPACER
19	3	44665	KEY
20	1	44630	COVER
21	1	29311	BUSHING
22	2	13050	BREATHER
23	8	44674	CAPSCREW
24	12	20520	WASHER
25	12	44675	NUT
26	12	44671	CAPSCREW
27	4	20518	WASHER
28	12	44672	NUT
29	2	44668	GASKET
30	1	42013	OIL SEAL
31	1	20278	CAPSCREW
32	8	30640	CAPSCREW
33	1	44645	BRAKE HOUSING
34	1	44662	BRAKE COVER
35	8	939261	CAPSCREW
36	1	12208	BUSHING
37	1	23390	RETAINING RING
38	1	41411	O-RING
39	1	41406	ADJUSTING NUT
40	1	41404	SPRING PLATE
41	3	21684	PIPE PLUG
42	1	44151	O-RING
43	1	44661	SPRING
44	14	42148	STATOR PLATE
45	8	32765	FRICTION DISC
46	1	41740	BRAKE DRIVER
47	1	26980	RETAINING RING

BILL OF MATERIAL CONTINUED

SEQ	QTY	P/N	DESCRIPTION
48	2	41723	THRUST RACE
49	2	41743	BUSHING
50	1	41759	CLUTCH
51	1	44836	COUPLER
53	4	43751	DRUM BUSHING
54	5	21128	GREASE ZERK
55	2	44626	GEAR CARRIER
56	20	44666	CAPSCREW
57	20	20558	WASHER
58	20	44673	NUT
59	1	44621	GEAR
60	1	44889	DRUM
61	6	44888	CAPSCREW
62	1	44643	BRAKE BAND
63	2	43775	THRUST COLLAR
64	1	44890	DRUM CLUTCH
65	1	44903	SLIDING CLUTCH
66	1	44642	BUSHING
67	3	20522	CAPSCREW
68	1	4466	YOKE ASSEMBLY
69	1	44646	BRAKE AIR CYLINDER
70	1	44679	CLUTCH AIR CYLINDER
71	2	42955	MOUNTING BRACKET
72	2	10381	CAPSCREW
73	2	939254	CAPSCREW
74	4	20521	NUT
75	1	44632	END BRACKET
76	3	939243	CLEVIS PIN
77	3	20514	COTTER KEY
78	1	44916	OUTPUT SHAFT
79	4	44647	CAPSCREW
80	1	20526	WASHER
81	1	20320	WASHER
82	1	44637	CAP
83	1	20321	KEY
84	3	43826	KEY
85	1	44669	CABLE FERRULE
86	1	45520	FERRULE SOCKET
87	--	--	OMIT
88	12	21862	WASHER
89	3	20286	PIPE PLUG
90	1	31598	O-RING
91	1	28673	O-RING
92	1	44657	BRAKE PISTON
93	1	44758	BEARING
94	1	44659	NON-ADJUSTABLE BRAKE COVER

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**
1-1/2	**6**	**1949**	**1462**	**1170**	**3161**	**2371**	**1897**
1-1/2	**12**	**2194**	**1645**	**1316**	**3557**	**2668**	**2134**

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

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

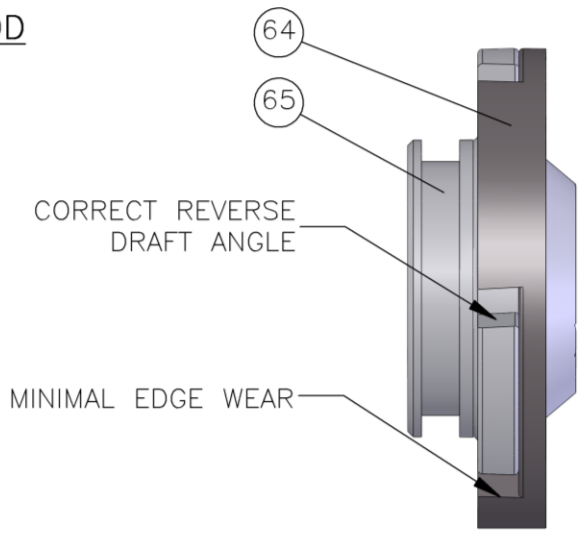
W = PRELOAD TENSION

D = NOMINAL BOLT SIZE (IN.) *** ALL TORQUE VALUE TOLERANCES ARE ± 5%**

CLUTCH INSPECTION

GOOD

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

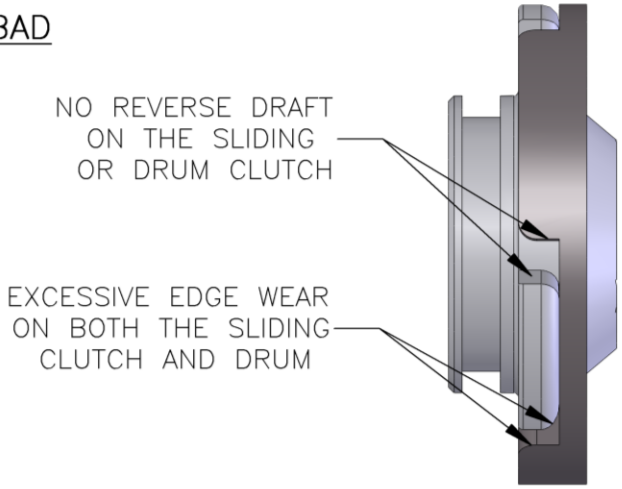


NOTICE

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

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

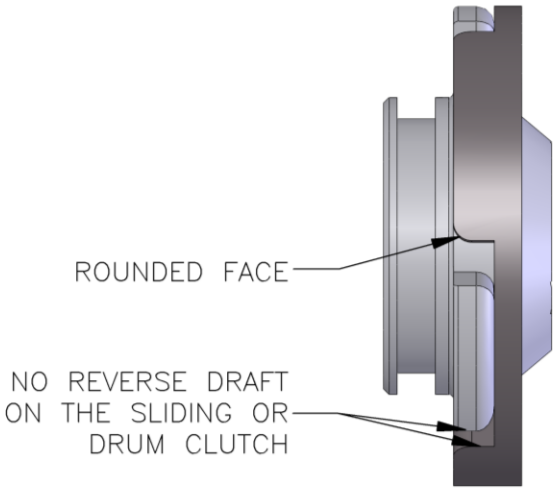
BAD



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.



ISOMETRIC VIEW