



RUFNEK 100 AND MODEL 80 SERVICE MANUAL




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**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 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.

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-twq.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 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 can be equipped with two (2) forms of dynamic braking. The worm brake is one method and is adjustable for pay-out load control. 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 that is not field adjustable. The same method should be used 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.

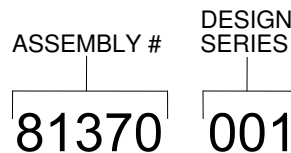
GENERAL INFORMATION

INTRODUCTION AND THEORY OF OPERATION

The Tulsa worm gear winch is operated by turning the input of the worm using a hydraulic motor or PTO driven sprocket and chain. The winch utilizes the adjustable, spring applied, multiple disc oil brake that activates only during pay-out to provide maximum efficiency during pay-in. 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 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.



WINCH BREAK-IN

Winches, like any other kind of machinery, require a “break-in” period to perform well and to maximize their life. The following guidelines should be used in the break-in of Tulsa Winches.

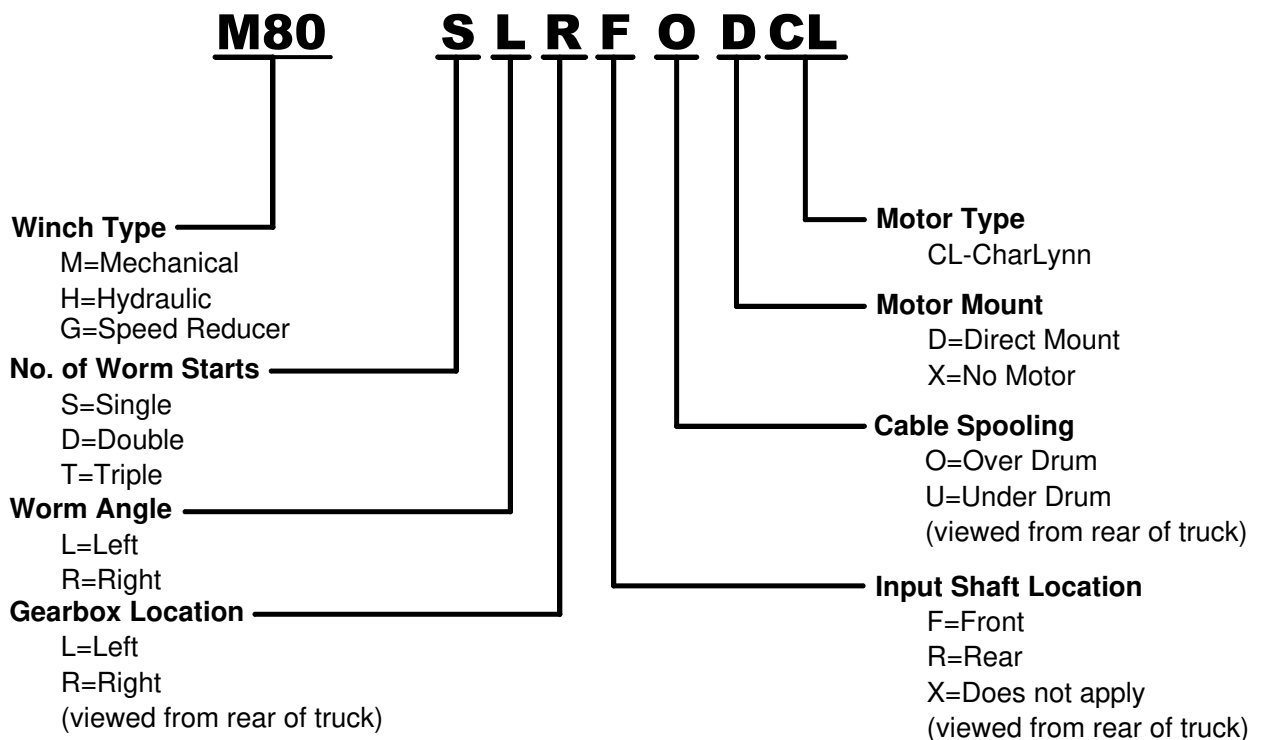
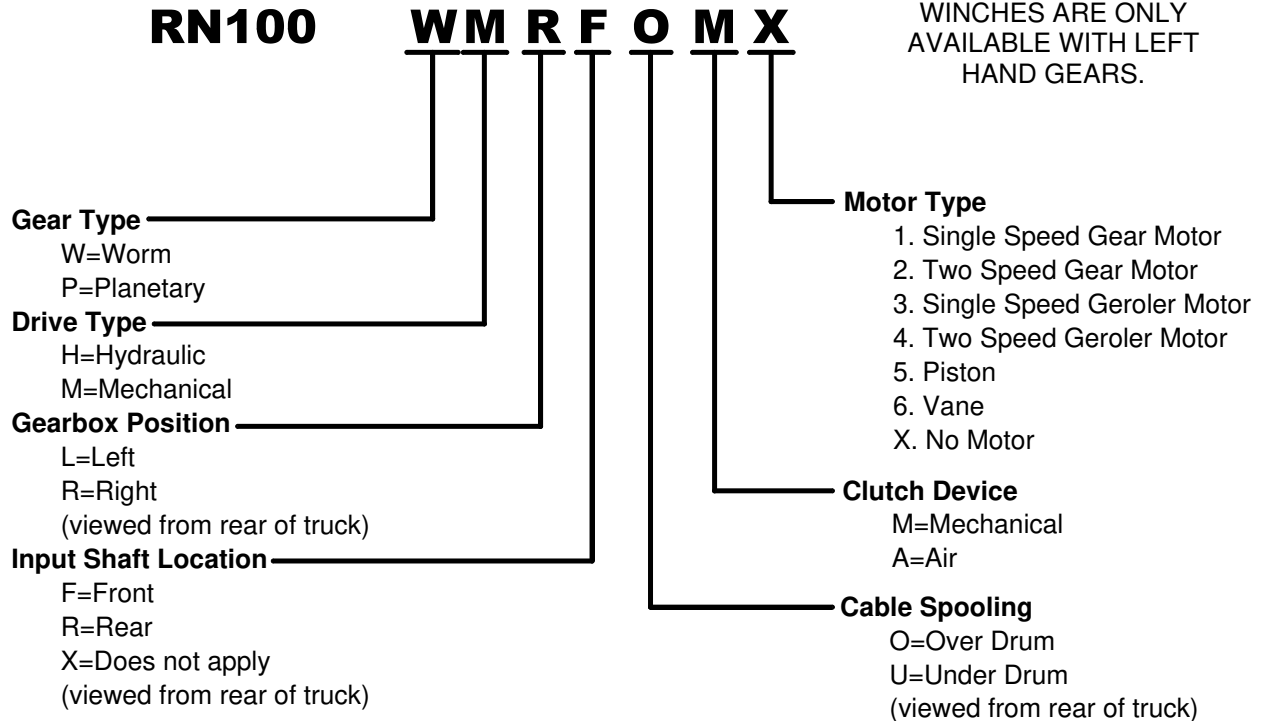
Use extreme care when first spooling cable onto the winch. DO NOT run the winch at high speeds when performing this operation. Make sure that the cable is unrolled in a line (to prevent kinks) and SLOWLY inhaul the winch to install the cable.

DO NOT exceed one half rated load or one half rated line speed for the first thirty minutes of operation. This will insure that the worm and gear have an opportunity to wear in properly. Periodically, check the gearbox for temperature rises and allow the winch to cool down between pulls. Worm gear winches are designed and intended for intermittent duty application only; using them in extremely long pulls may generate excessive heat and shorten the life of the winch.

MODEL CODES

NOTICE

THE RUFNEK SERIES WINCHES ARE ONLY AVAILABLE WITH LEFT HAND GEARS.



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 are 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. If your winch is mounted with a drum brake, do not fill the brake with oil.

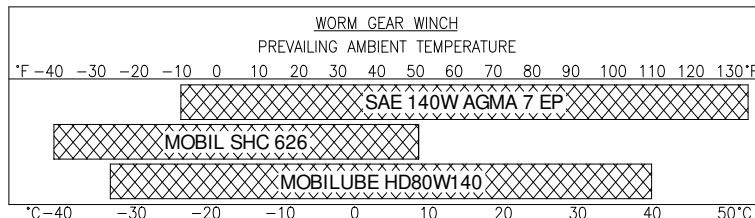
- Tulsa Winch recommends that the oil level in the gearbox be checked and adjusted as part of the pre-use inspection. If the oil level drops frequently or oil leakage is detected during an inspection, maintenance should be performed to correct any problems.

Oil Capacity

	AMOUNT	OIL TYPE
GEARBOX SECTION	8.00 QTS	SEE CHART BELOW
BRAKE SECTION	TO LEVEL	LIGHTWEIGHT NON-EP*

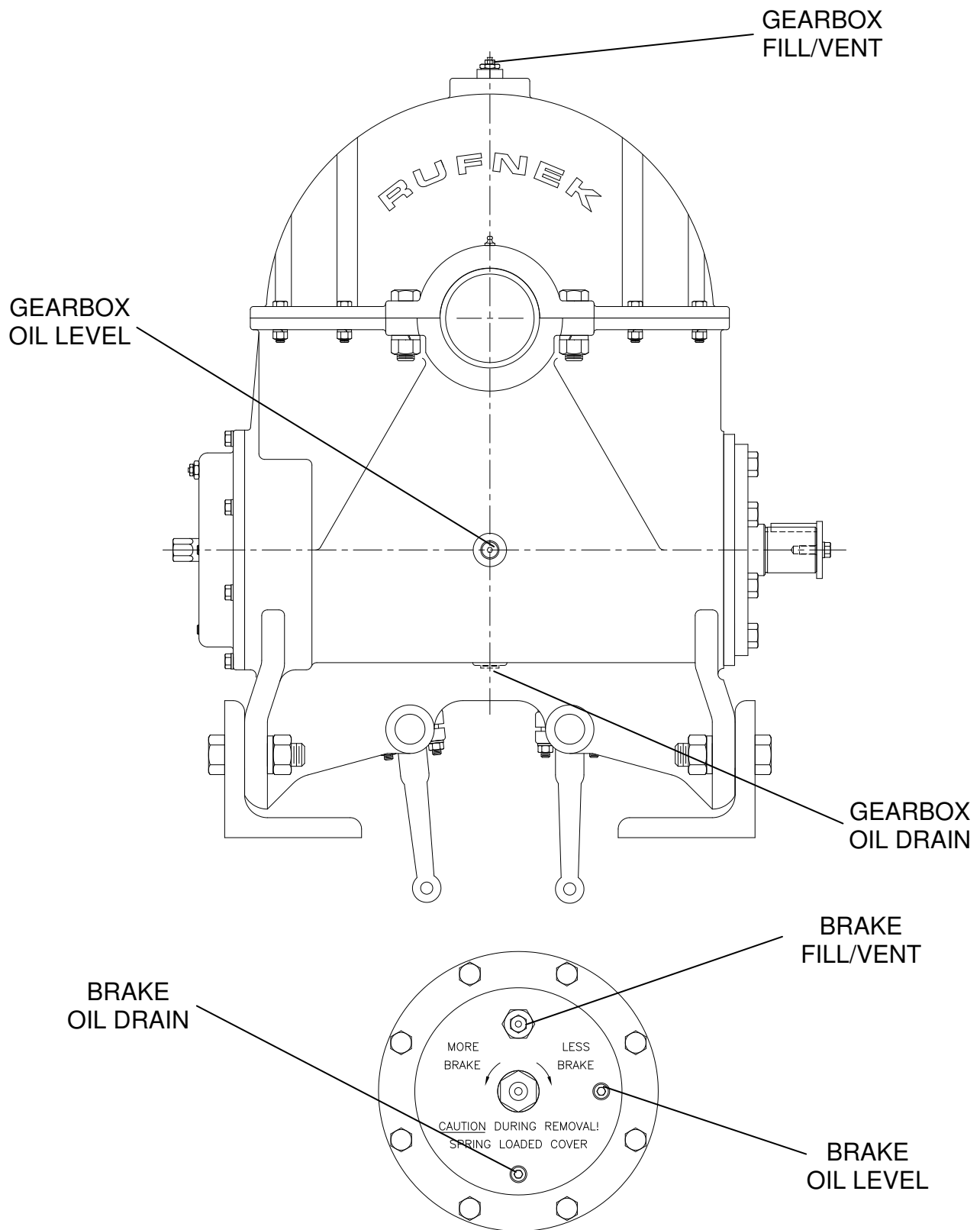
*SAE 20W, AUTOMATIC TRANSMISSION FLUID, OR MOST HYDRAULIC OILS.

- 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

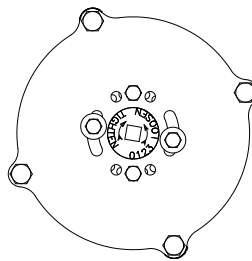


BRAKE IDENTIFICATION AND ADJUSTMENT

In general, worm brakes on Tulsa winches should be set to hold the load you are currently working with. Excessive brake torque will result in excessive heat generation and brake wear. The best way to insure proper brake adjustment is to pull the cable tight against the load and stop to ensure the brake holds. If it doesn't, tighten the brake slightly and try it again. If the brake doesn't respond to adjustment the brake must be serviced.

If the input to the winch is accessible and a torque wrench can be adapted to it, the brake can be set with a torque wrench. The Model 80 brake is shipped from the factory pre-set at 185 Ft.-Lbs.

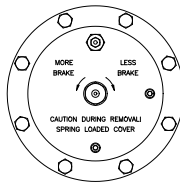
ADJUSTABLE SHOE BRAKE



To tighten the brake, remove the two capscrews located in the set of holes in the top and bottom of the brake cover. Loosen the two capscrews in the slotted holes and rotate the brake clockwise.

The direction of braking can be changed by replacing the cam with the opposite version. For detailed service instructions, contact your Tulsa Winch distributor or the factory.

ADJUSTABLE MULTIPLE DISC OIL BRAKE



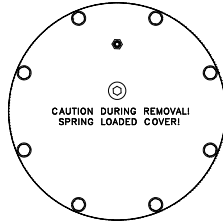
This is the standard version of the multiple disc oil brake. This style of brake can be adjusted by turning the hex adjuster counter-clockwise to increase brake and clockwise to decrease brake. The direction of braking for all multiple disc brakes can be changed by removing the cam clutch, turning it 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 it, the brake can be set with a torque wrench. The RN100W brake is shipped from the factory pre-set at 185 Ft.-Lbs.

BRAKE IDENTIFICATION AND ADJUSTMENT CONTINUED

Some versions of the Model 80 winch are equipped with a non-adjustable multiple disc oil brake. These winches can be identified by the warning on the cover.

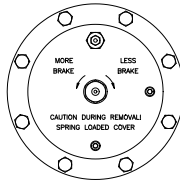
NON-ADJUSTABLE MULTIPLE DISC OIL BRAKE



**CAUTION DURING REMOVAL!
SPRING LOADED COVER!**

These brakes require no regular adjustment. 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.

RUFNEK ADJUSTABLE MULTIPLE DISC OIL BRAKE



This brake is the Rufnek version of the adjustable oil brake. This is the latest design of the worm-driven winch brakes. This style of brake can be 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 it, the brake can be set with a torque wrench. The RN100W brake is shipped from the factory pre-set at 185 Ft.-Lbs.

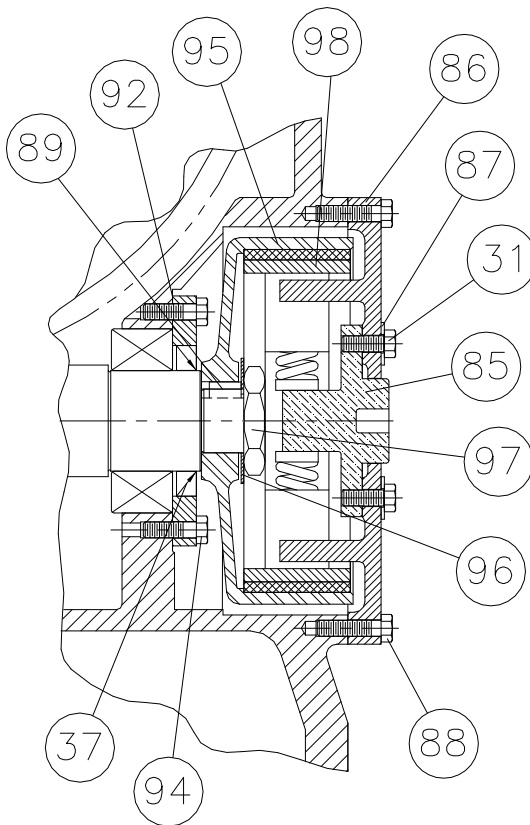
DISASSEMBLY

DRUM BRAKE DISASSEMBLY

1. Loosen the capscrews (31).
2. Remove the capscrews (88) from the cover (86).
3. Remove the cover (86) from the gearbox.
4. Remove the brake shoes (98).
5. Remove the nut (97) and washer (96).
6. Use the two threaded holes in the brake drum (95) and a gear puller to remove the brake drum.
7. Inspect parts as follows, replace if necessary:
 - A. Inspect the brake shoes (98) for wear. If the shoe linings are worn flush with the rivet heads, the shoes must be replaced.
 - B. Inspect the brake drum (95) for severe wear or scoring.
 - C. Check the inside lower part of the gearbox housing for the presence of oil. Replace the seal (37) if oil is present

NOTICE

If replacing the seal (37), first drain the oil from the gearbox then remove the capscrews (94) and brake cover (93).



ADJUSTABLE OIL BRAKE DISASSEMBLY

1. Drain the oil from the brake by removing the drain plug (21).
2. Loosen the spring tension inside the brake by turning the adjusting mechanism (22) clockwise until it stops.



CAUTION

Extreme care should be taken when removing the cover of the brake housing. The cover compresses the spring which is used to set the brake, thus the cover is spring loaded against the cover screws.

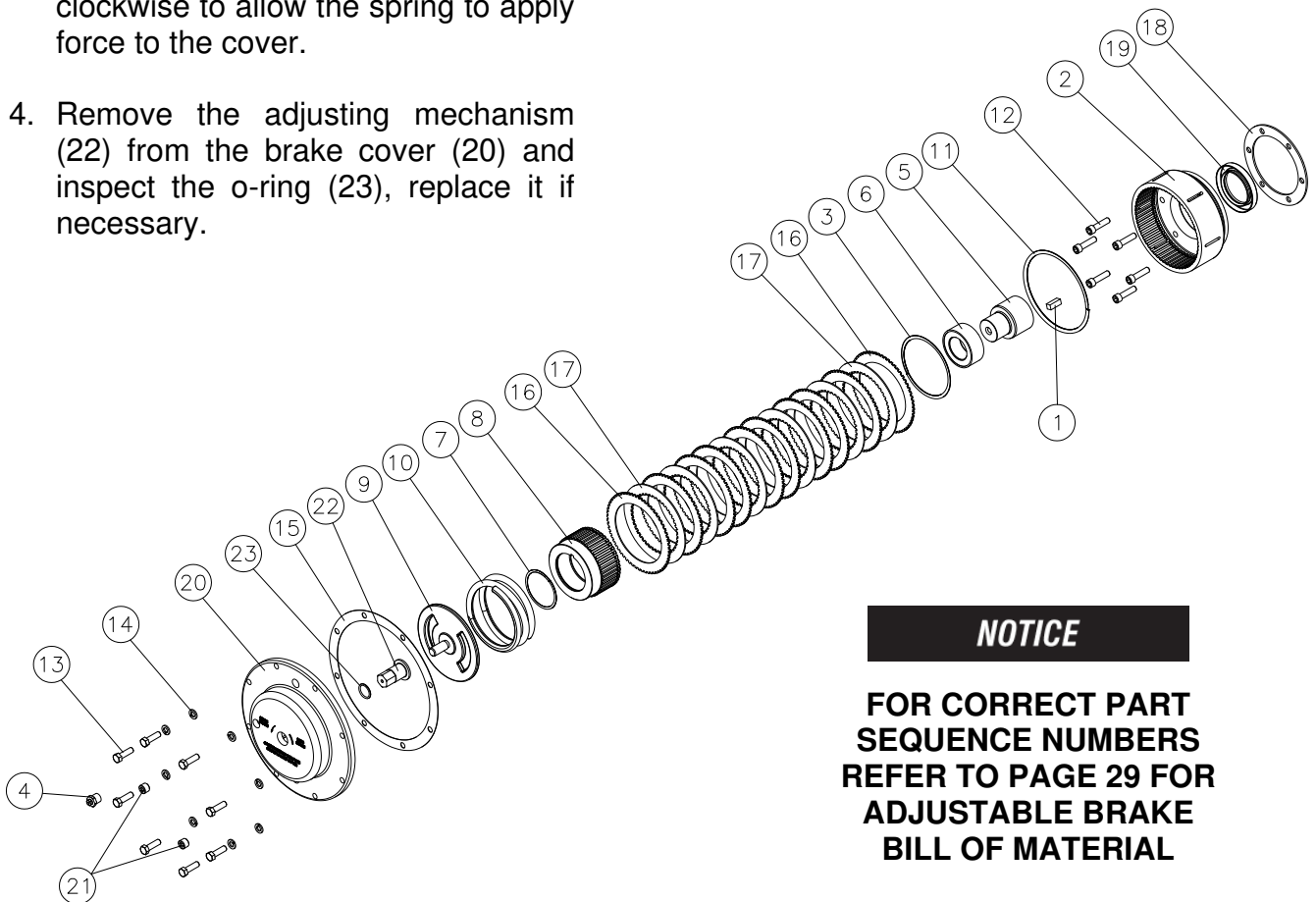
3. Loosen and remove the capscrews (13) and washers (14) from the brake cover (20). If needed, rotate the adjusting mechanism counter-clockwise to allow the spring to apply force to the cover.
4. Remove the adjusting mechanism (22) from the brake cover (20) and inspect the o-ring (23), replace it if necessary.

5. Remove the spring (10). Grasp the brake driver (8) and remove the brake components.
6. Inspect stator plates (16), friction discs (17), and retaining ring (7) for wear and replace them if necessary.
7. Noting the direction that the cam clutch (6) is installed, inspect it for wear. Replace if necessary.

NOTICE

Failure to re-install the clutch in the correct orientation will result in the brake engaging in the opposite direction.

8. If necessary, remove the reaction housing (2) and replace the oil seal (19).



NOTICE

FOR CORRECT PART SEQUENCE NUMBERS REFER TO PAGE 29 FOR ADJUSTABLE BRAKE BILL OF MATERIAL

NON-ADJUSTABLE BRAKE DISASSEMBLY

1. Place a container underneath the brake to catch the oil when the cover is removed.



CAUTION

Extreme care should be taken when removing the cover of the brake housing. The cover compresses the spring which is used to set the brake, thus the cover is spring loaded against the cover screws.

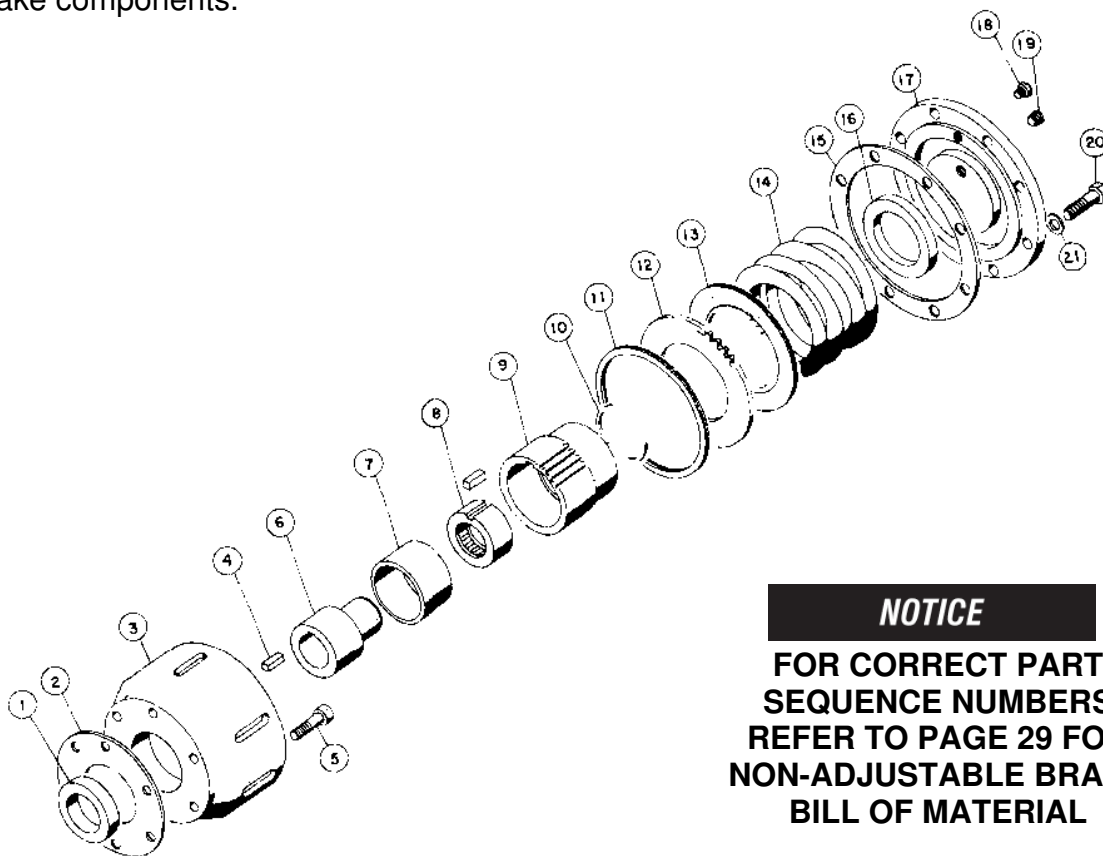
2. Evenly loosen and remove the capscrews (20) and washers (21) from the brake cover (17) to dislodge the cover.
3. Remove the spring (14), then grasp the brake driver (9) and remove the brake components.

4. Inspect the stator plates (12), friction discs (13), and retaining ring (11) for wear and replace them if necessary.
5. Noting the direction that the cam clutch (8) is installed, inspect it for wear. Replace if necessary.

NOTICE

Failure to re-install the clutch in the correct orientation will result in the brake engaging in the opposite direction.

If necessary, remove the reaction housing (3) and replace the oil seal (16).



NOTICE

FOR CORRECT PART
SEQUENCE NUMBERS
REFER TO PAGE 29 FOR
NON-ADJUSTABLE BRAKE
BILL OF MATERIAL

RUFNEK ADJUSTABLE OIL BRAKE DISASSEMBLY

1. Remove the bottom drain plug (9) to drain oil from brake.
2. Loosen the spring tension inside the brake by rotating the adjusting mechanism (6) clockwise until it stops.



CAUTION

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

3. Evenly remove the capscrews (11) and washers (12) from the brake cover (7).
4. Remove the spring (13) and retaining ring (21), then remove the brake driver (23) along with the brake components (19, 20, 21, 22, 23, 25, 26, 27, and 28).

NOTICE

FOR CORRECT PART SEQUENCE NUMBERS REFER TO PAGE 30 FOR RUFNEK ADJUSTABLE BRAKE BILL OF MATERIAL

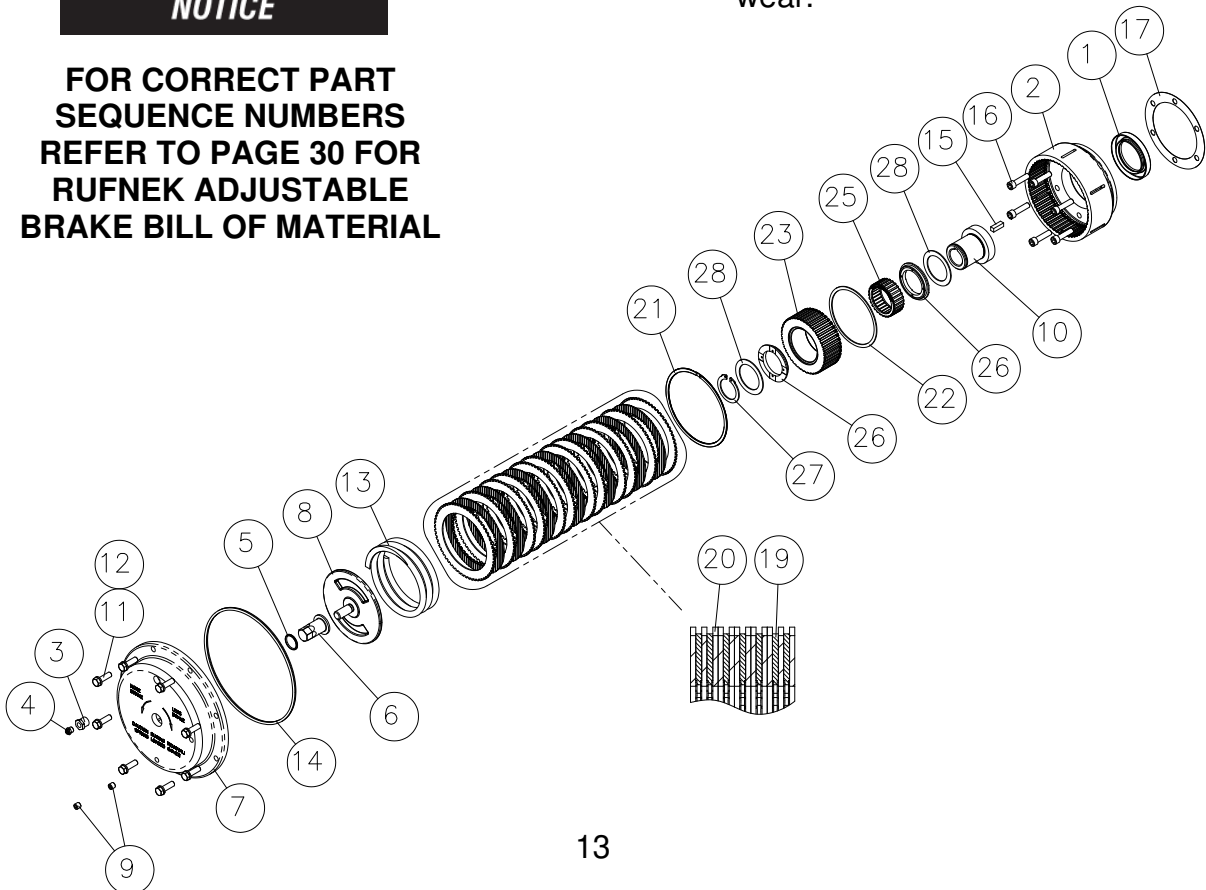
5. Inspect parts as follows, replace if necessary:

- A. Inspect the friction discs (19) for uneven or excessive wear. Friction discs should measure no less than .055-in thick.
- B. Inspect the stator plates (20) for warpage or excessive wear.
- C. Inspect the spring (13) for damage or discoloration.
- D. Cam clutch (25) should be free of debris and have all cams intact.

NOTICE

If replacing the cam clutch (25), take note of the direction it locks up for reassembly.

- E. Check the coupler (10) for signs of pitting, spalling, or excessive wear.



CLUTCH AND DRUM DISASSEMBLY

1. Remove the cotter keys (20) and clevis pins (19) holding the rod assembly (24, 28, 38) in place. Remove the rod assembly.
2. Remove the arms (18) by removing the capscrews (43), nuts (17), and washers (16) holding the arms in place.
3. Loosen the tension on the brake band (5) by loosening the nuts on the rod (29), then remove the line shafts (15) by loosening the set screws in the collars (40) and the set screws (22) in the control arms (21 & 39).
4. Remove the capscrews (61), nuts (63), and washers (62) connecting the end bracket (32) to the frames (64 & 67).
5. Remove the end bracket (32) and yoke assembly (items 4, 31, 36, 41, 42) or the clutch position indicator assembly (100). Remove the thrust washer (6).
6. Remove the sliding clutch (7), keys (79), and the other thrust washer (6).
7. Remove the brake band assembly (5) by removing the capscrews (27), nuts (24), and washers (25) attaching the brake band to the frame.
8. Slide the drum (14) off of the output shaft (78), using an overhead hoist.
9. Inspect parts as follows, replacing them if necessary:
 - A. Inspect the thrust washers (6) for excessive wear or damage.
 - B. Inspect the bushing (12 & 23) for excessive wear or damage.
 - C. Inspect the keys (79) for excessive wear or damage.
 - D. Inspect the drum clutch (8) and sliding clutch (7) for wear. See page 30 this manual for Clutch Inspection.
 - E. Inspect the brake band assembly (5) and verify that the band and lining is at least .225-in thick.

GEARBOX DISASSEMBLY

1. Supporting the end of the output shaft (78) with a hoist, remove the housing cover (80) by removing capscrews (1 & 43), nuts (17 & 34), and washers (16 & 35).
2. Use the hoist to lift the output shaft (78), bushings (77), keys (76), and gear (assembled items 24, 25, 71, 72, 73, 74, and 75) out of the housing (61).
3. Remove the bushing (77) from the output shaft (78).
4. Remove the gear (71) from the carriers (74) by removing the sixteen capscrews (75), nuts (24), and washers (25), then pull the carrier (74) off of the shaft (78). Finally, remove the spacer (73), carrier (74), and keys (76).
5. Remove the worm assembly (assembled items 58, 59, 60, and 91) from the housing by removing either the motor (99) and motor adapter (93) or the end cap (59), depending on type of drive. From the brake end, push the worm assembly out of the housing (90).
6. Disassemble the worm by removing the nut (54) and washer (55) then

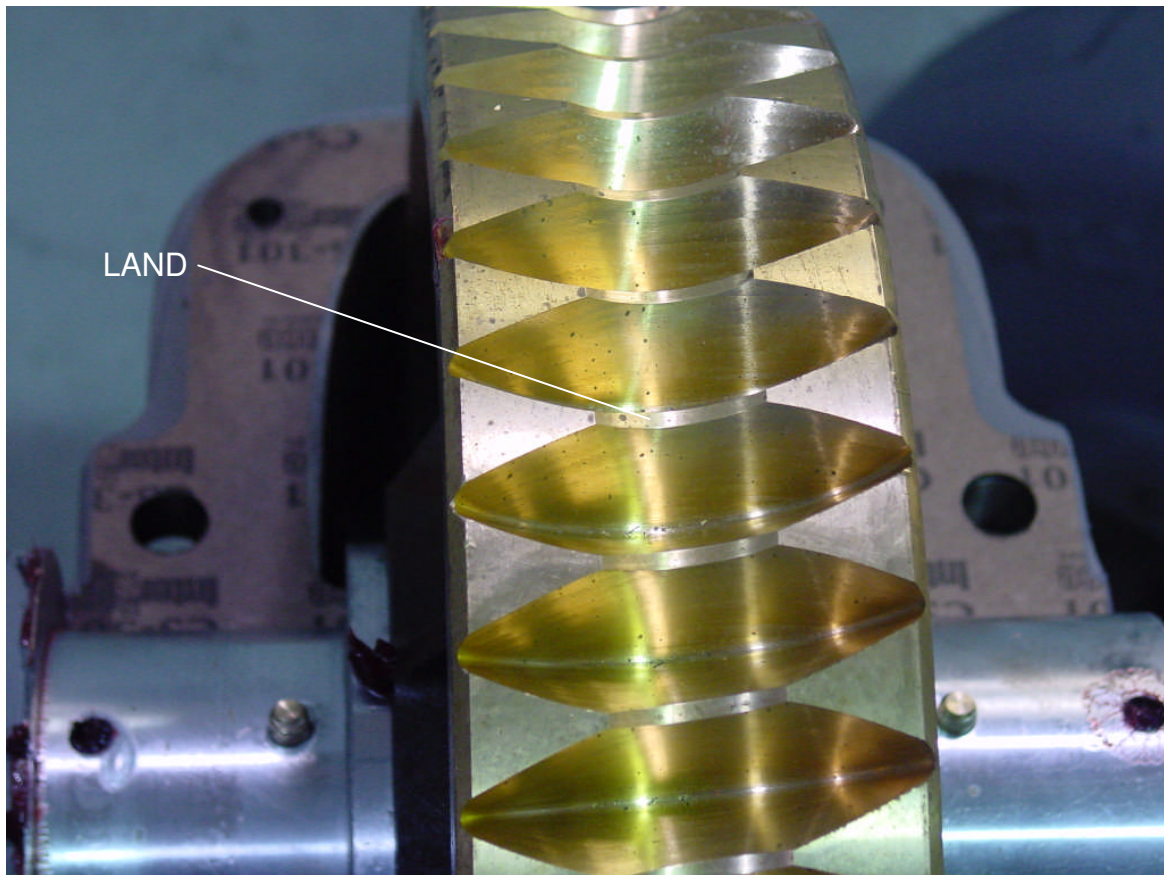
sliding off the bearing retainer (59), along with the two sets of angular bearings (58). Finally, remove the third set of bearings (91).

NOTICE

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

7. Inspect parts as follows, replacing them if necessary:
 - A. Inspect the inner carriers (74) for damage.
 - B. Inspect the gear (71) for excessive wear or damage. See page 16 for detailed instructions.
 - C. Inspect the keys (76) and bushings (77) for damage.
 - D. Inspect the worm (60) for excessive wear or signs of heat checking or cracks.
 - E. Inspect the bearings (58 & 91) and seals (37 & 58) for excessive wear or damage.

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 ASSEMBLY

1. Press the angular bearings (58) into the bearing retainer (59), then slide the bearing retainer and bearings onto the worm (60) and secure with nut (54) and washer (55).

WARNING

When installing the two angular bearings, it is imperative that they are installed with the surface text facing the outside of the housing.

2. ***For winches driven by a hydraulic motor:***

Install the motor adapter (103) and worm assembly with eight capscrews (104), using gasket (68). Attach the motor (99) with four capscrews (101), using gasket (102).

For winches driven by a PTO sprocket and chain:

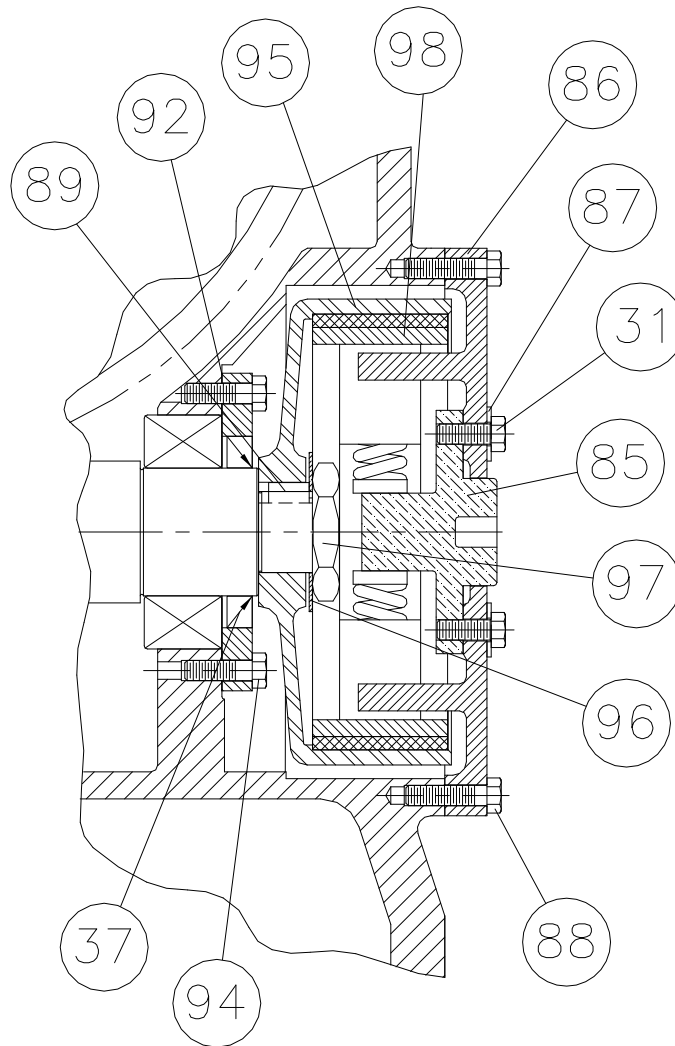
Press a new oil seal (48) into the end cap (50). Install the worm assembly into the gearbox (90), using gasket (68). Secure the end cap (50) with

eight capscrews (53), using gasket (51). Install the key (65) into the worm (60) shaft.

3. Install the keys (76) into the output shaft (78).
4. Slide the carrier (74) over the keys (76). Install the spacer (73) using two pins (72). Slide the gear (71) and the other carrier (74) onto the shaft and secure with sixteen capscrews (75), nuts (24), and washers (25).
5. Install the assembled gear onto the shaft (78). Slide the bushings (77) onto both ends of the shaft.
6. Install the output shaft assembly into the housing (90).
7. Install both gaskets (81) onto the housing (90). Attach the cover (80) to the housing, using capscrews (1 & 43), nuts (17 & 34), washers (16 & 35), using gaskets (81).

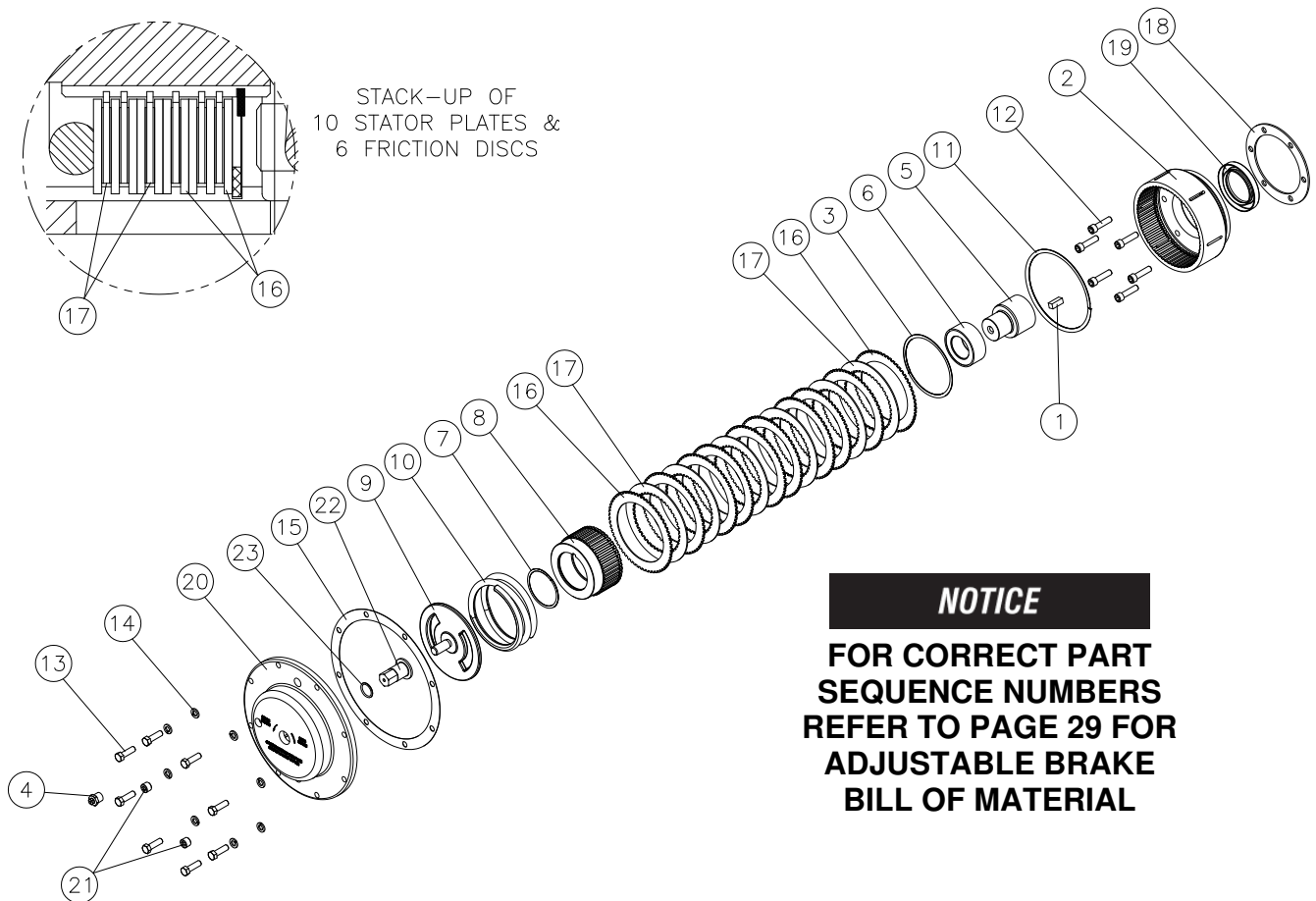
DRUM BRAKE ASSEMBLY

1. Press the oil seal (37) into the end cap (93). Install the gasket (92), and attach the end cap (93) to the gearbox with six capscrews (94), using gasket (92).
2. Install the brake drum (95) and key (89) onto the worm shaft (60). Secure the brake drum with the nut (97) using washer (96). Bend two tabs of the washer (96) over the flats of the nut (97).
3. If removed, reattach the cam (85) to the brake cover (86) using two capscrews (31) and washers (87).
4. Install the brake cover (86), cam (85), and brake shoes (98) into the gearbox.
5. Secure the brake cover (86) using eight capscrews (88).
6. Adjust the brake using the procedure on page 8 of this manual.



ADJUSTABLE OIL BRAKE ASSEMBLY

1. Press the oil seal (19) into the reaction housing (2), then mount the reaction housing to the gearbox with six capscrews (12), using a gasket (18).
2. Install the key (1), coupler (5), and clutch/driver assembly (3, 6, 7, 8), onto the worm shaft (57).
3. Install the retaining ring (11) into the reaction housing (2), then install the stator plates (16) and friction discs (17) in the correct stack up, as shown below.
4. Install the spring (10) and then press the adjusting mechanism assembly (items 9, 22, 23) into the brake cover (20).
5. Attach the brake cover (20) with eight capscrews (13) and washers (14), using a gasket (15).
6. Fill the gearbox and brake with the proper oil. Refer to the winch maintenance section of this manual for oil type and amounts.

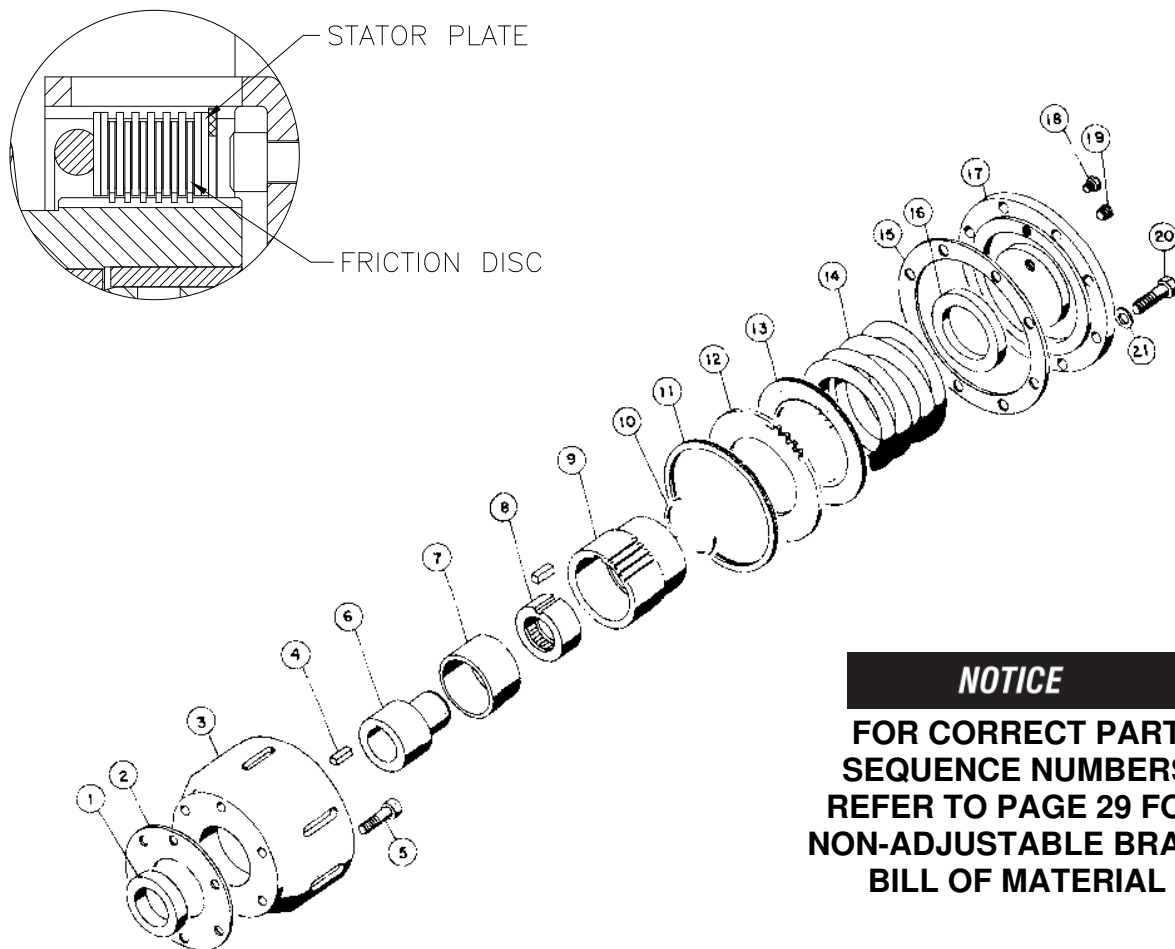


NOTICE

**FOR CORRECT PART
SEQUENCE NUMBERS
REFER TO PAGE 29 FOR
ADJUSTABLE BRAKE
BILL OF MATERIAL**

NON-ADJUSTABLE OIL BRAKE ASSEMBLY

1. Press the oil seal into the reaction housing (3), then mount the reaction housing to the gearbox with six capscrews (5), using a gasket (2).
2. Install the key (4), coupler (6), and clutch/driver assembly (7, 8, 9, and 10), onto worm shaft (60).
3. Install the retaining ring (11) into the reaction housing (3), then install the stator plates (12) and friction discs (13) in the correct stack up, as shown below.
4. Install the spring (14) then press the washer (16) into the brake cover (17).
5. Secure the brake cover (17) with eight capscrews (20) and washers (21), using a gasket (15).
6. Fill gearbox and brake with proper oil. Refer to winch maintenance section of this manual for oil type and amounts.

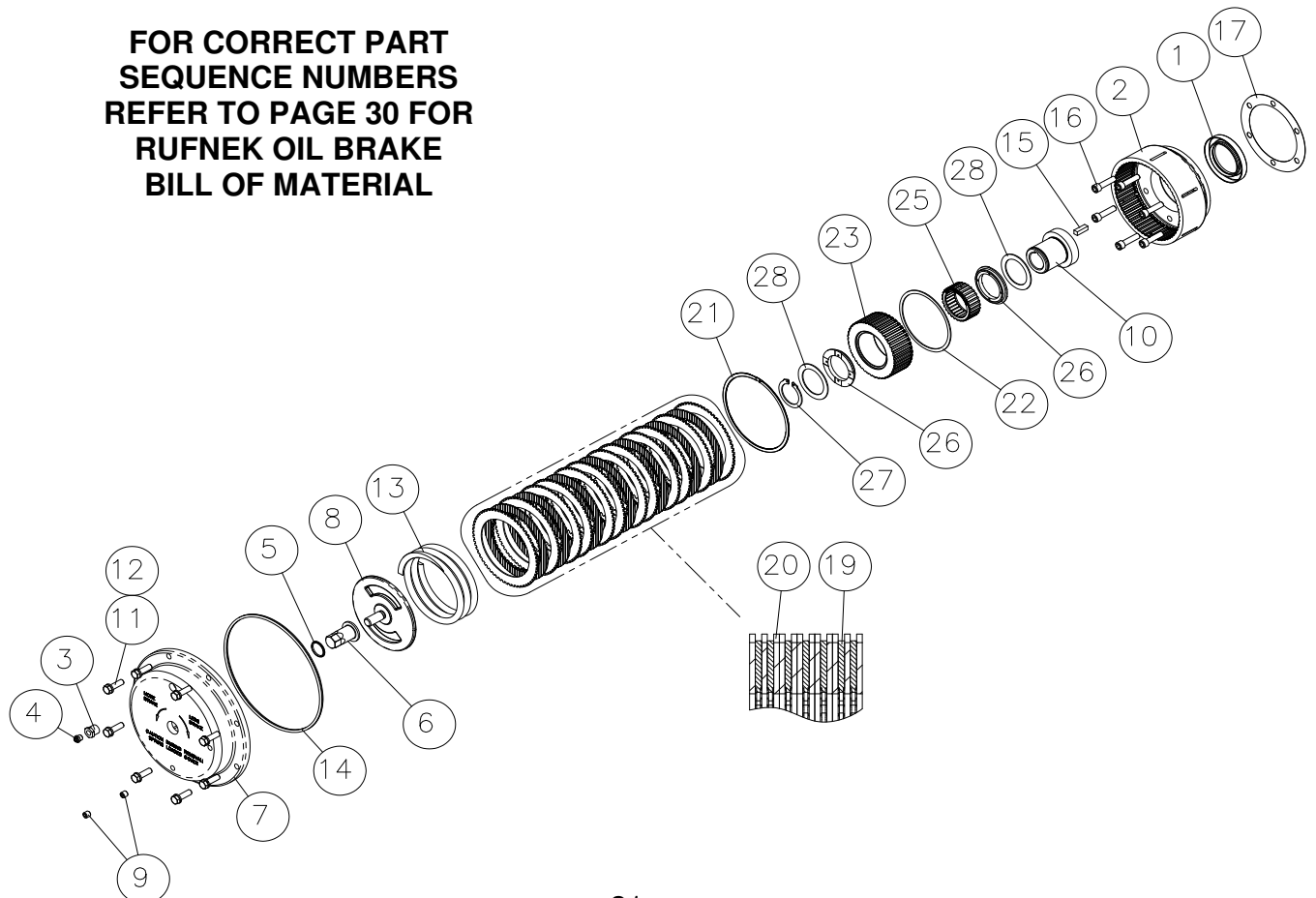


RUFNEK ADJUSTABLE OIL BRAKE ASSEMBLY

1. Press the oil seal (1) into the reaction housing (2). Attach the reaction housing to the gearbox with eight capscrews (16) using gasket (17).
2. Install the key (15) and coupler (10) onto the worm. Next, install the clutch/driver assembly (Items 21, 22, 23, 25, 26, 27, and 28), onto the coupler (10).
3. With the retaining ring (22) on the clutch driver (23). Install the stator plates (20) and friction discs (19), in the correct layout as shown below.
4. Install the spring (13).
5. Install the adjusting mechanism assembly (items 5, 6, and 8) into the
6. Install the drain plug (9) into the bottom of the brake cover (7).
7. Fill gearbox and brake with proper oil. Refer to winch maintenance section of this manual for oil type and amounts.
8. Adjust the brake using the procedure on page 9 of this manual.

NOTICE

**FOR CORRECT PART
SEQUENCE NUMBERS
REFER TO PAGE 30 FOR
RUFNEK OIL BRAKE
BILL OF MATERIAL**



CLUTCH AND DRUM ASSEMBLY

1. Install bushings (12) into drum (14). Install the drum (14) onto the output shaft (78).
2. Slide the thrust washer (6) onto the output shaft (78). Install the keys (79) into the output shaft.
3. Install the clutch indicator kit (100) onto the sliding clutch (7) and slide the clutch over the keys (79).
4. Install the end bracket (32) and the yoke assembly or clutch position indicator assembly (100) onto the output shaft (78) and mount it to the frame using four capscrews (61), nuts (63), and washers (62).
5. Install the end cap (3) and bushing (23) and secure them with four capscrews (1), nuts (34), and washers (35).

CLUTCH POSITION INDICATOR ADJUSTMENT (FOR RUFNEK WINCHES ONLY)

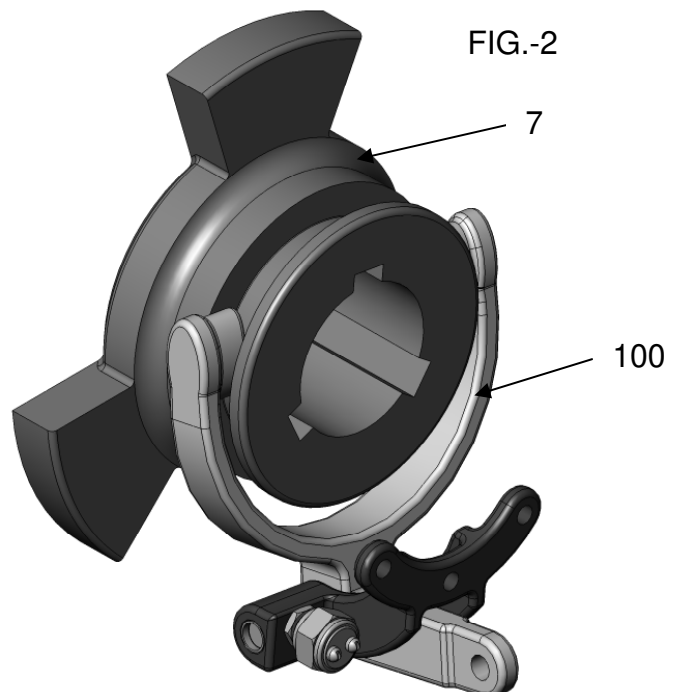
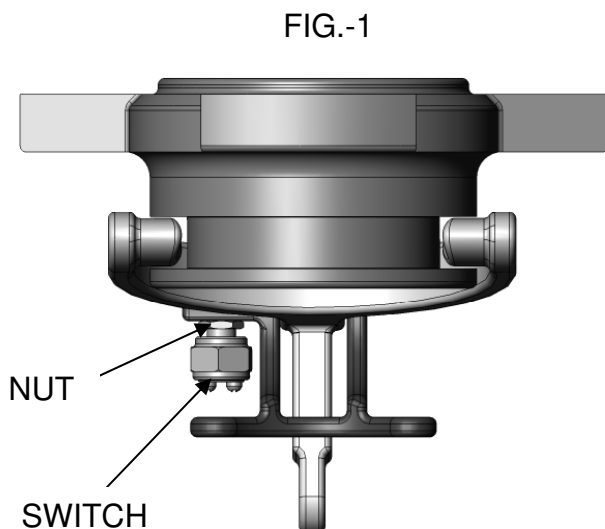
Make sure that the sliding clutch (7) is fully engaged and that the yoke assembly (100) is not binding on the drum clutch. The lugs of the yoke MUST be centered in the groove with the clutch fully engaged in order for the clutch position indicator to be properly adjusted (See FIG-1)

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°.



TROUBLESHOOTING

FAILURE	PROBABLE CAUSE
Clutch handle won't latch	<ul style="list-style-type: none"> a) Clutch jaws aren't aligned. Align the jaws by rotating drum. b) Damaged yoke or linkage. Replace the yoke or clutch
Oil leaks from housing	<ul style="list-style-type: none"> a) Seal damaged or worn. Replace the seal(s). b) Too much gearbox oil. Drain excess oil. c) Gasket could be worn. Replace the gasket.
Load drifts	<ul style="list-style-type: none"> a) The brake is out of adjustment or worn. Adjust brake until load doesn't drift. Replace the parts as required.
Winch runs too slow	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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.
Hydraulic fluid leaks from vent in the gearbox	<ul style="list-style-type: none"> a) Damaged motor shaft seal. Replace the seal.
Winch won't pick up heavy loads.	<ul style="list-style-type: none"> a) Too much cable on the drum. Use the snatch block or remove some cable from the drum. b) System pressure too low. Increase the hydraulic system pressure. c) Winch not broke-in. Run winch at half of rated load for several pulls.

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

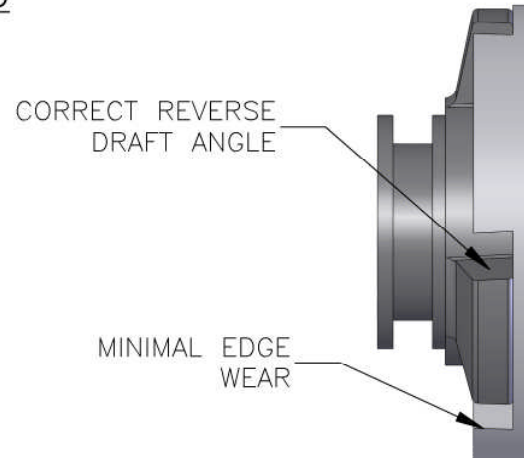
D = NOMINAL BOLT SIZE (IN.)

* ALL TORQUE VALUE TOLERANCES ARE ± 5%

CLUTCH INSPECTION

GOOD

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



NOTICE

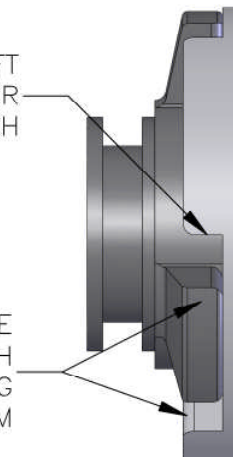
THE REVERSE DRAFT ENSURES THE CLUTCH STAYS ENGAGED DURING PAY-IN.

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

BAD

NO REVERSE DRAFT ON THE SLIDING OR DRUM CLUTCH

EXCESSIVE EDGE WEAR ON BOTH THE SLIDING CLUTCH AND DRUM

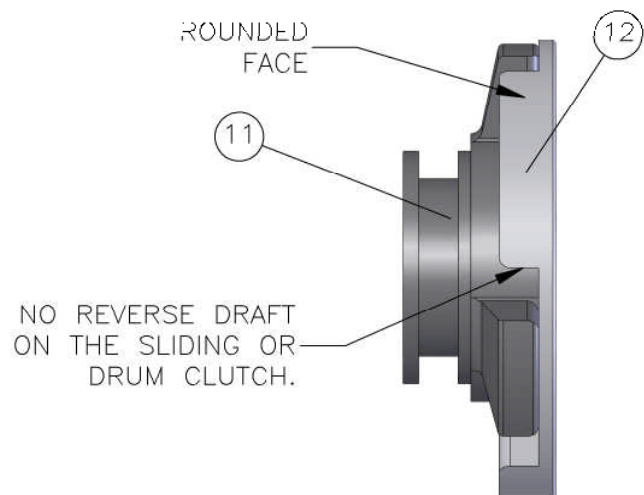


CLUTCH REPLACEMENT CRITERIA



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.



BILL OF MATERIAL

BOM DATED SEPTEMBER 2005					
SEQ		QTY		P/N	DESCRIPTION
1		8		20886	CAPSCREW
2		5		21128	GREASE ZERK
3		1		20579	END CAP
4		1		20129	BRACKET
5		1		939310	BRAKE BAND ASSEMBLY
6		2		20603	WASHER
7		1		20591	CLUTCH
8		1		23600	CLUTCH
9		2		21214	NUT
10		1		21180	U BOLT
11		6		21644	CAPSCREW
12		2		21360	BUSHING
13		5		20517	PIN
14		1		33449	DRUM
15		2		20404	SHAFT
16		13		20526	WASHER
17		12		20271	NUT
18		2		20070	CONTROL ARM
19		3		939243	PIN
20		3		20514	COTTER PIN
21		1		20648	CONTROL ARM
22		6		20193	SET SCREW
23		1		20599	BUSHING
24		23		20267	NUT
25		20		20518	WASHER
26		2		20913	WASHER
27		2		20311	CAPSCREW
28		3		20054	CLEVIS
29		1		939251	ROD
30		3		20521	NUT
31		5		20522	CAPSCREW
32		1		31668	BRACKET
33		1		20958	SPRING
34		8		20274	NUT
35		8		20520	LOCKWASHER
36		1		20593	YOKE
37		1		20775	OIL SEAL
38		1		21164	ROD
39		1		20072	CONTROL ARM
40		4		20230	COLLAR
41		2		24724	SNAP RING
42		1		20116	PIN
43		12		20276	CAPSCREW
44		1		20607	BRACKET
45		4		20105	KEY
46		1		20278	CAPSCREW
47		1		20320	WASHER

BILL OF MATERIAL CONTINUED

SEQ		QTY		P/N		DESCRIPTION
48		1		20621		OIL SEAL
49		2		20266		CAPSCREW
50		1		20583		COVER
51		3		20637		GASKET
52		--		--		OMIT
53		8		30204		CAPSCREW
54		1		20625		NUT
55		1		939232		WASHER
56		--		--		OMIT
57		--		--		OMIT
58		2		20620		BEARING
59		1		20581		HOUSING
60a		1		20618		LEFT HAND MECHANICALLY DRIVEN WORM
60b		1		20534		RIGHT HAND MECHANICALLY DRIVEN WORM
60c		1		40695		LEFT HAND HYDRAULICALLY DRIVEN WORM
60d		1		40694		RIGHT HAND HYDRAULICALLY DRIVEN WORM
60e		1		44075		RUFNEK MECHANICALLY DRIVEN WORM
60f		1		44077		RUFNEK HYDRAULICALLY DRIVEN WORM
61		8		20650		CAPSCREW
62		8		20652		WASHER
63		8		20653		NUT
64		1		25731		LEFT FRAME
65		1		20314		KEY
66		3		20286		PLUG
67		1		25730		RIGHT FRAME
68		1		939263		GASKET
69		--		--		OMIT
70		--		--		OMIT
71a		1		20619		LEFT GEAR
71b		1		20538		RIGHT GEAR
72		2		164056		PIN
73		1		20569		SPACER
74		2		22458		CARRIER
75		16		23884		CAPSCREW
76		3		20600		KEY
77		2		20546		BUSHING
78a		1		25729		OUTPUT SHAFT (EXTENDED)
78b		1		32715		OUTPUT SHAFT (FLUSH)
79		3		20608		KEY
80a		1		44036		RUFNEK GEARBOX COVER
80b		1		20540		GEARBOX COVER
81		2		20610		GASKET
82		1		29311		BUSHING
83		1		32789		BUSHING
84		1		13050		BREATHER
85a		1		20602		LEFT HAND CAM
85b		1		20597		RIGHT HAND CAM
86		1		20595		COVER
87		2		20617		WASHER
88		8		20289		CAPSCREW

BILL OF MATERIAL CONTINUED

SEQ		QTY		P/N		DESCRIPTION
89		1		20314		KEY
90		1		20536		HOUSING
91		1		20776		BEARING
92		1		20117		GASKET
93		1		939296		END CAP
94		6		939261		CAPSCREW
95		1		20542		BRAKE DRUM
96		1		20313		WASHER
97		1		20312		NUT
98		2		939311		BRAKE SHOE ASSEMBLY
99a		1		41412		MOTOR (57.4 CUBIC INCH DISPLACEMENT)
99b		1		40487		MOTOR (40.6 CUBIC INCH DISPLACEMENT)
100		1		4360		YOKE ASSEMBLY WITH CLUTCH POSITION INDICATOR
101		4		28212		CAPSCREW
102		1		40424		GASKET
103		1		40692		MOTOR ADAPTER
104		8		40705		CAPSCREW

ADJUSTABLE BRAKE BILL OF MATERIAL

SEQ		QTY		P/N		DESCRIPTION
1		1		33420		KEY
2		1		32946		REACTION HOUSING
3		1		42695		RETAINING RING
4a		1		12208		BUSHING
4b		1		13050		BREATHER
5		1		32942		COUPLER
6		1		33407		CAM CLUTCH
7		1		31076		RETAINING RING
8		1		3687		DRIVER
9		1		42692		SPRING PLATE
10		1		32949		SPRING
11		1		32950		RETAINING RING
12		6		939256		CAPSCREW
13		8		939261		CAPSCREW
14		8		20526		WASHER
15		1		32951		GASKET
16		10		32952		STATOR PLATE
17		6		32953		FRICTION DISC
18		1		20117		GASKET
19		1		20775		OIL SEAL
20		1		42690		BRAKE COVER
21		2		32220		PIPE PLUG
22		1		41406		ADJUSTING MECHANISM
23		1		41411		O-RING

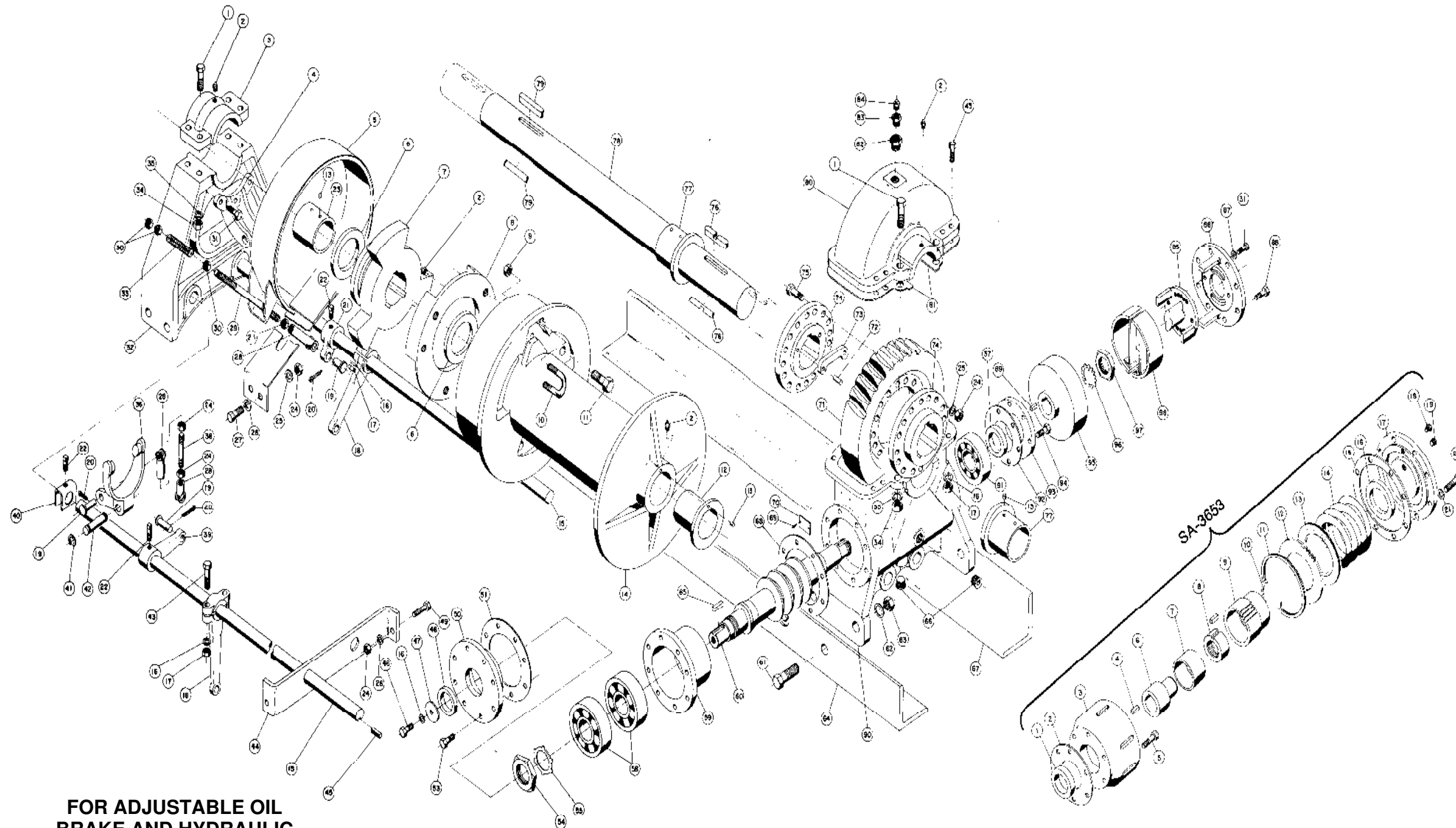
NON ADJUSTABLE BRAKE BILL OF MATERIAL

SEQ		QTY		P/N		DESCRIPTION
1		1		20775		OIL SEAL
2		1		20117		GASKET
3		1		32946		REACTION HOUSING
4		1		33420		KEY
5		6		939256		CAPSCREW
6		1		32942		COUPLER
7		--		--		OMIT
8		1		33407		CAM CLUTCH
9		1		3687		DRIVER
10		1		31076		RETAINING RING
11		1		32950		RETAINING RING
12		9		32952		STATOR PLATE
13		6		32953		FRICTION DISC
14		1		32949		SPRING
15		1		32951		GASKET
16		1		32944		WASHER
17		1		32941		BRAKE COVER
18		1		13050		BREATHER
19		1		20286		PIPE PLUG
20		8		939261		CAPSCREW
21		8		20526		WASHER

RUFNEK BRAKE BILL OF MATERIAL

SEQ		QTY		P/N		DESCRIPTION
1		1		20775		OIL SEAL
2		1		32946		REACTION HOUSING
3		1		12208		BUSHING
4		1		13050		BREATHER
5		1		41411		O-RING
6		1		41406		ADJUSTING MECHANISM
7		1		43974		BRAKE COVER
8		1		42692		SPRING PLATE
9		2		21684		PLUG
10		1		44139		COUPLER
11		8		939261		CAPSCREW
12		8		20526		WASHER
13		1		32949		SPRING
14		1		44146		O-RING
15		1		25519		KEY
16		6		939256		CAPSCREW
17		1		20117		GASKET
19		7		32953		FRICTION DISC
20		12		32952		STATOR PLATE
21		1		32950		RETAINING RING
22		1		42695		RETAINING RING
23		1		44140		DRIVER
24		--		--		OMIT
25		1		41759		CLUTCH
26		2		41743		BUSHING
27		1		26980		RETAINING RING
28		2		41723		RACE

ISOMETRIC VIEW



FOR ADJUSTABLE OIL
BRAKE AND HYDRAULIC
MOTOR, SEE PAGE 32

ADJUSTABLE BRAKE, HYDRAULIC MOTOR, & CLUTCH POSITION INDICATOR VIEWS

