Service Manual
Model 506W Winch

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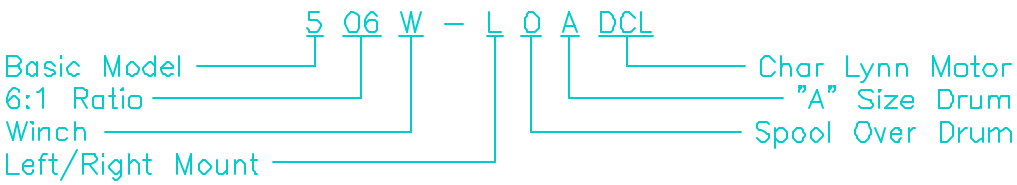
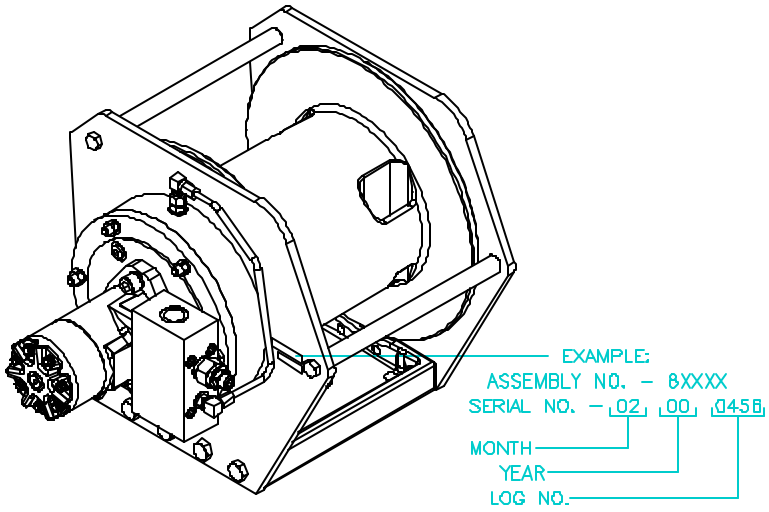
MODEL-CODE



PART & SERIAL NUMBER LOCATION

Part and serial numbers can be located on the winches as shown below:



SAFETY NOTES

WARNING

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

Tulsa winches are not to be used to lift, hoist, or move people. If your task involves lifting or moving people, you MUST use the proper equipment, not this winch.

Cable anchors on Tulsa winches are not designed to hold the rated load of the winch. You must keep at least five (5) wraps of cable on the drum to insure that the cable doesn't come loose.

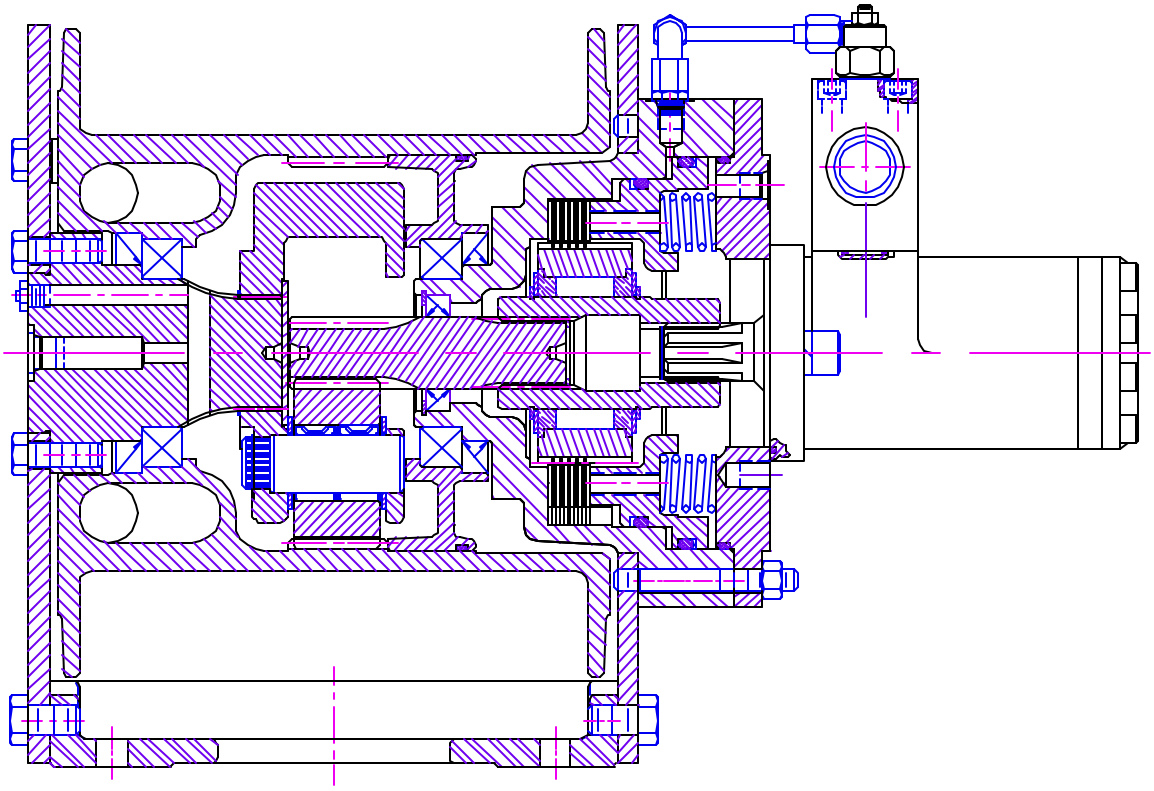
Stay clear of suspended loads and of cable under tension. A broken cable or dropped load can cause serious injury or death.

Make sure that all equipment, including the winch and cable, is maintained properly.

Avoid shock loads. This type of load imposes a strain on the winch many times the actual weight of the load and can cause failure of the cable or of the winch.

Winch operators must be trained in the proper, safe operation of the winch.

INTRODUCTION AND THEORY OF OPERATION

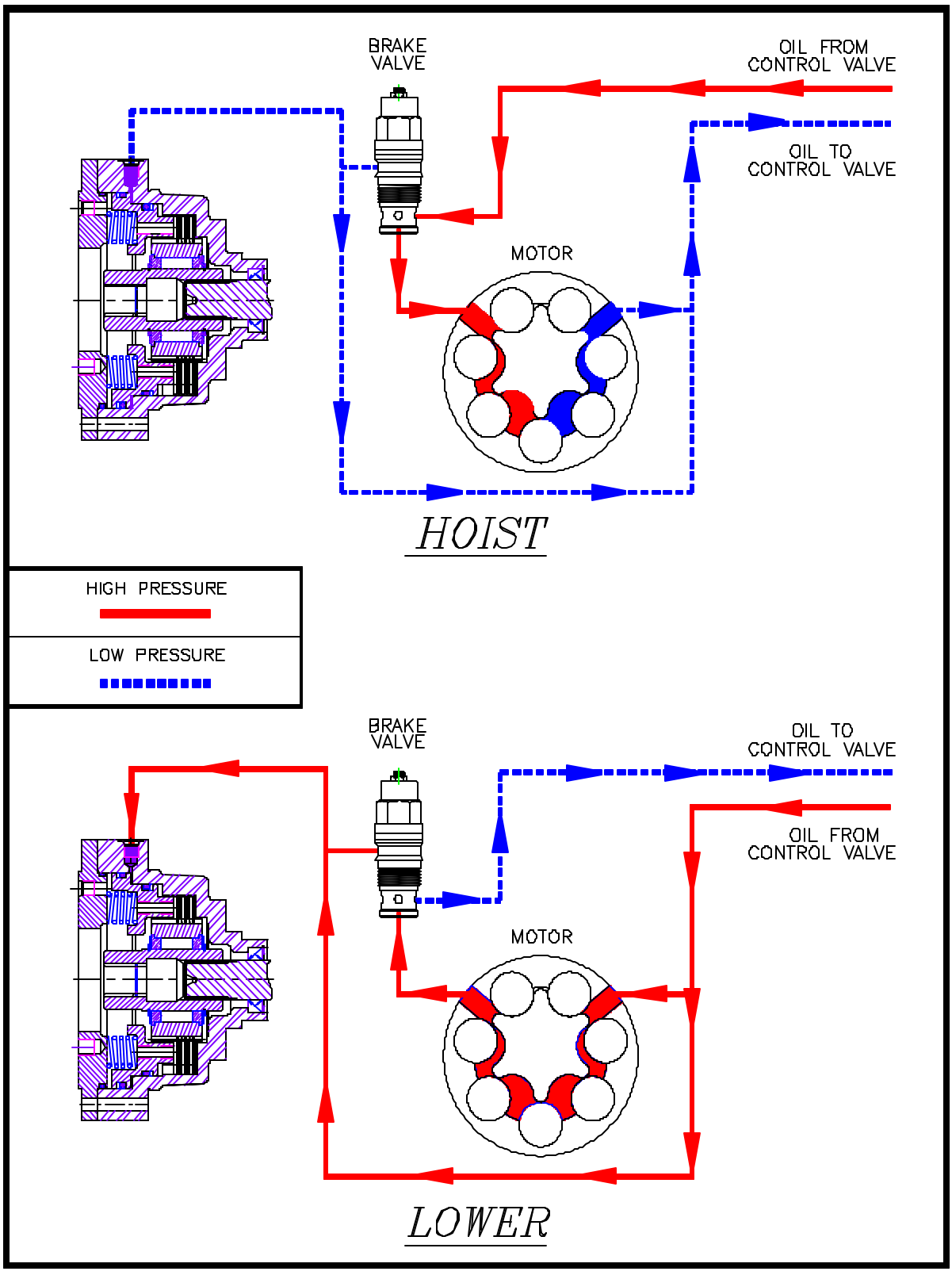


The 506W planetary winch design is composed of an input from a high torque, low speed geroler motor or a high speed gear or piston motor, driving through a multiple disc brake, through a planet set to the cable drum.

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 a 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.

During payout, a brake valve is used to prevent the load from moving faster than desired. This brake valve partially blocks the main line from the motor back to the directional control valve, allowing only a limited amount of oil through the motor. The brake valve is modulated by sensing pressure on the other main line, the line from the directional control valve to the motor. Also, any time there is sufficient pressure to modulate the brake valve, this same pressure releases the multiple disc brake.

HYDRAULIC SCHEMATIC



MAINTENANCE

Tulsa Model 506W planetary winches, like any other pieces of machinery, need to be periodically serviced and well maintained to insure their proper operation.

Good maintenance consists of three steps:

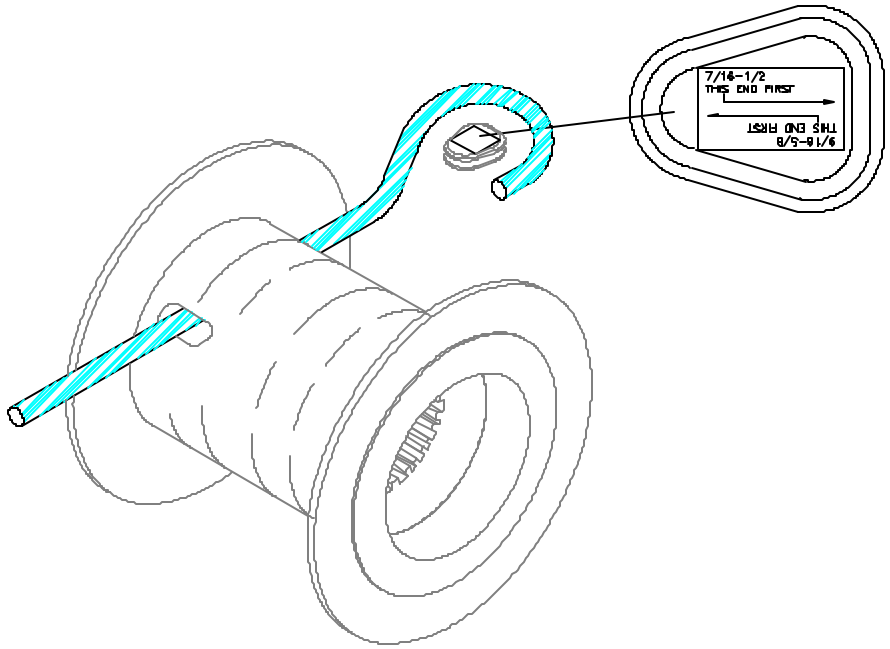
1. A daily inspection to insure that there are no oil leaks present, that all mounting bolts and other fasteners are tight, and that wire rope is in good condition.

2. Periodic servicing of the winch including changing the oil in both the gearbox and the brake section. Severity of use will determine the need for oil changes but it should be checked at a minimum of every 500 operating hours and changed every 1000 operating hours. Factors such as extremely dirty conditions or widely varying temperature changes may dictate even more frequent servicing.

3. Complete teardowns and component inspections. Again, severity and frequency of use will determine how often this should be done. If the crane or other equipment, which this winch is mounted on, 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.

WIRE ROPE

Wire rope should be installed as shown in the drawing below. Note that the wedge will satisfy cable diameters from 7/16" to 5/8", depending on how it is installed in the cable drum



LUBRICATION

The hydraulic system should use only high quality hydraulic oils from reputable suppliers. These oils should contain additives to prevent foaming and oxidation in the system. All winch hydraulic systems should be equipped with a return line filter capable of filtering 10-micron particles from the system.

Tulsa Model 506W Winches are shipped from the factory with SAE 90 EP gear lube in the gearbox and SAE 20-20W motor oil in the brake section. This oil should be satisfactory for operation in ambient temperatures from -10º F. to +110º F. If your work calls for operation in temperatures outside this range, contact Tulsa Winch for recommendations.

Gearbox oil is drained by first removing the level plug (*Item 35*) in the center of the output shaft (*Item 6*). The drain plug (*Item 35*) is then removed by rotating the drum so that the plug is visible through the lower hole in the side plate (*Item 1*). Screw in a piece of 1" black pipe to allow the oil to drain, then with a 3/8" hex wrench remove the drain plug located inside of 1" pipe *(See Fig. 2)*. Examine the used oil for signs of significant metal deposits and then dispose of it in a proper manner. Remove 1" pipe. Rotate drum so that the plug (*Item 35*) is visible through upper hole in side plate. Install 1" pipe and elbow through upper hole in side plate *(See Fig. 3)*. Fill the gearbox with 1 quart of new SAE 90 EP gear lube. Remove the 1" pipe and elbow. Replace the plugs (*Item 35*). Make sure the poppet breather (*Item 36*) is not frozen and replace if necessary.

Drain the brake section by removing the drain plug (*Item 38*) under the motor and the fill plug (*Item 37*) above the motor *(See Fig. 4)*. On some units, the drain and fill plugs may be located on the edge of the motor cover. Inspect the oil for signs of metallic particles and/or burning and re-install the drain plug. Fill with 1/2 to 1 pint of SAE 20-20W motor oil.

⚠ WARNING

Do not use EP type gear lubes in the brake section of this winch. EP lubes may prevent the clutch from locking up, causing a load to fall and resulting in property damage, personal injury, or death.

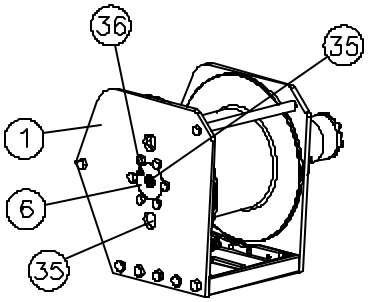


Fig. 1

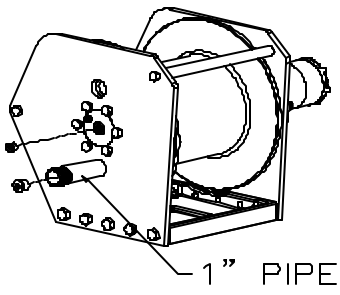


Fig. 2

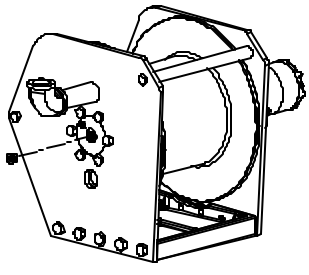


Fig. 3

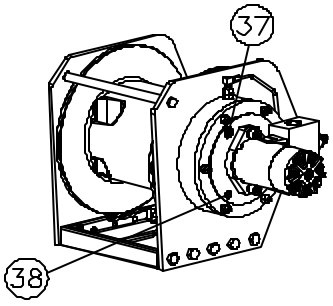


Fig. 4

DISASSEMBLY

1. Drain brake and gear oil. *See lubrication Section for instructions*.

2. Stand the winch on its end with the motor pointing up.

3. Remove the brake line from the brake housing (*Item 11*). Remove the motor and brake valve assembly from the winch by removing two capscrews (*Item 53*) holding the motor to brake cover. *See Servicing The Motor section for motor and counterbalance valve dis-assembly.*

4. Remove the brake sub-assembly from the winch by removing one capscrew (*Item 41*) and five nuts (*Item 40*) holding the brake housing to the side plate (*Item 2*). Spring pressure will raise the cover as the nuts are loosened. *See Servicing The Brake section for brake repair*.

5. Using two crows foot pry bars, hook the bearing carrier (*Item 9*) from inside and pull it out of the cable drum. If necessary remove and replace the bearing (*Item 5*), o-ring (*Item 10*) and seal (*Item 4*) located in the bearing carrier.

6. Remove the input sun gear (*Item 16*) from the input planet assembly (*Item 8*).

7. Install three 1/4" eyebolts into the three planet pins in the planet set (*Item 8*) and with a piece of chain, pull the planet set from the drum. Inspect the planet set for wear and repair as needed. *See Servicing The Planetary Set section for dis-assembly and repair.*

8. Check the drum teeth for wear. This wear can be measured as follows: place a magnetic base dial indicator on the planet carrier and adjust the plunger of the dial indicator at the approximate middle of one of the planet gear teeth. Using a screwdriver or your finger, rotate the planet gear back and forth, reading the movement on the dial indicator. If the total movement is greater than 0.025", then the drum should be replaced.

9. Carefully turn winch over so motor side is down.

10. Remove five capscrews (*Item 39*) holding side plate (*Item 2*). Remove two capscrews (*Item 43*) from support rod ends. Remove five capscrews (*Item 42*) holding output shaft (*Item 6*). Remove side plate.

11. Slide output shaft (*Item 6*) out of drum (*Item 3*). Inspect retaining ring (*Item 7*) to insure it is still in groove and is not bent over, replace if necessary.

12. Inspect bearing (*Item 5*) for signs of spalling or pitting and if necessary replace the bearing (*Item 5*) and seal (*Item 4*) located in the drum.

REASSEMBLY

1. Thoroughly clean all parts. Replace those, which show wear or damage.

2. Inspect the drum (*Item 3*) and base (*Item 15*) for structural integrity and replace if necessary. Install bearing (*Item 5*) and seal (*Item 4*) into drum. Slide drum onto shaft (*Item 6*) aligning and seating bearing to shaft.

3. Install snap ring (*Item 7*) onto shaft (*Item 6*).

4. Attach side plate (*Item 1*) to shaft (*Item 6*) using six capscrews (*Item 42*) making sure the vent is oriented properly. Then using five capscrews (*Item 39*) attach side plate to base plate (*Item 15*). Using two capscrews (*Item 43*) attach side plate to support rods (*Item 19*)

5. Carefully turn winch over so motor side is up.

6. Install the planet carrier (*Item 8*) using the same eyebolts and chain used to disassemble the unit making sure the planet set is seated against retaining ring (*Item 7*) properly.

7. Install the sun gear (*Item 16*) into the planet set.

8. Install a new o-ring (*Item 10*) and if necessary bearing (*Item 5*) & seal (*Item 4*) into the bearing carrier (*Item 9*). Grease the o-ring and seal on the bearing carrier and install the bearing carrier into the drum. It must be installed with the o-ring nearest the motor end.

9. Place the brake sub-assembly into the side plate (*Item 2*), making sure that the pilot of the brake section aligns with the bore in the bearing carrier and that the bolts for the motor are oriented properly. Install one capscrew (*Item 41*) and five nuts (*Item 40*), tighten capscrew and nuts evenly to 100 to 110 ft. lb. torque. Also make sure that the level and vent plugs in the cover are properly oriented.

10. Install a new o-ring or gasket on the face of the motor and re-install the motor/counterbalance valve assembly, then re-connect the hose.

11. Fill both the gearbox and the brake section with the proper amount and type of lubricants as discussed in the Lubrication section.

SERVICING THE MOTOR

1. Tag brake line for proper re-installation and remove them from the motor and counterbalance block.

2. Remove the four capscrews (*Item 47*) and the counterbalance block (*Item 18*) from the motor (*Item 17*).

3. Remove the counterbalance valve from the counterbalance block and inspect the small metering hole located on the side of the cartridge valve to make sure it is not obstructed *(See Fig. 5)*. Also, inspect the O-rings (*Item 50*) to insure that they are not cut or flattened. Replace if necessary.

4. Motors and cartridge valves are not serviceable in the field. Return them to an authorized dealer for service.

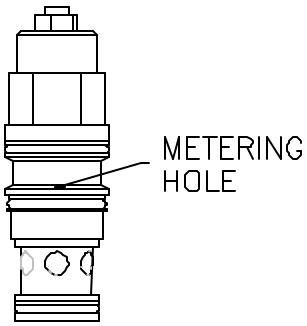


Fig. 5

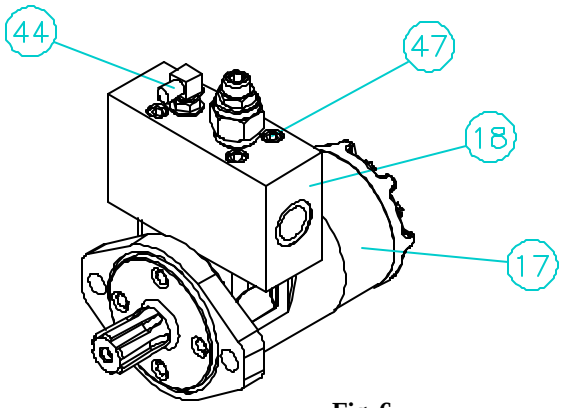


Fig. 6

SERVICING THE BRAKE

1. Evenly remove the one capscrew (*Item 41*) and five nuts (*Item 40*) holding the brake cover in place. Spring pressure will raise the cover up as the capscrew and nuts are loosened. Remove the cover from the brake housing.

2. Remove the springs (*Item 32*) from the piston (*Item 13*) and check them for free height. Each spring should measure at least 1.200 inches with no force on them.

3. Remove the brake piston (*Item 13*) by installing two pieces of 3/8"-16NC all-thread in the bottom of two spring pockets. Using jam nuts, screw the all-thread pieces in evenly until the piston is clear of the housing. An alternate way of removing the piston is to use a portable power unit or air to slowly pressurize the brake cavity and blow the piston out of the bore.

4. Grasp the brake driver/clutch assembly (*Item 14*) and remove it from the brake housing.

5. Remove the stator plates (*Item 48*) and friction discs (*Item 49*) from the brake housing and check them for excessive wear. Replace if necessary. Be sure to check the top stator plate for scoring caused by the removal tools and polish if necessary. Friction discs should measure no less than 0.055 in. thickness and stator plates should measure no less than 0.068 in. thickness.

6. With a hook wire or pry bar, remove the seal (*Item 34*).

7. Remove brake housing (Item 11) from winch, examine the journal on the brake housing where the seal (*Item 4*) runs for wear. If severely worn, replace the brake housing.

8. Carefully dis-assemble the brake driver/clutch assembly noting the direction of lockup for the clutch (Item 26). The clutch assembly must be re-assembled with the arrow pointing in the proper direction for the winch to function properly. Inspect the surface on the brake driver (*Item 14*) where the clutch (*Item 26*) runs. If there is any pitting or spalling on the driver, then it and the clutch must be replaced.

9. Re-assemble the driver/clutch assembly, making sure that the clutch is installed properly.

10. Install a new seal (*Item 34*) into the brake housing, and reinstall brake housing into winch.

11. Install the stator plates (*Item 48*) and friction discs (*Item 49*) into the brake housing starting with a stator and alternating friction discs and stator plates. There is one more stator plate than friction disc so you will finish with a stator plate.

12. After installation, check the brake stack up to make sure that the dimensions are within the tolerance shown on *(See Fig. 7)* drawing. If your measurement is greater than shown, either some friction discs and stator plates have been left out, or the friction discs are worn beyond acceptable tolerances. If your measurement is less than shown, too many plates or discs have been inserted or they are not seated properly.

13. Install o-ring (*Item 28*) and back-up ring (*Item 29*) onto piston making sure back-up ring is closest to outer edge (*See Fig. 7*). Next install o-ring (*Item 30*) and back-up ring (*Item 31*) onto piston making sure back-up ring is closest to outer edge (*See Fig. 7*).

14. Lubricate seals and back-up ring then install the piston into the brake housing tapping it gently down until it is seated.

15. Install the springs (*Item 32*) into the spring pockets of the piston. If working in a horizontal position, coat the bottom of each spring with chassis lube to keep it in position.

16. lubricate the new o-ring (*Item 10*) with light oil and install it into the groove on the brake cover.

17. Install the cover onto the brake housing (*Item 11*) and draw it down evenly, alternating between opposite capscrew (*Item 41*) and nuts (*Item 40*). Make sure that the cover is aligned properly with the brake housing to orient the motor and oil fill/level ports, as they should be.

18. Check the brake release with a portable hydraulic pump. Full release should be obtained at 340 psi, plus or minus 20 psi. Also, check the brake for proper operation by applying 280 psi to the brake port and adapting a torque wrench to the input shaft. The torque here in the payout direction should be 95 to 115 ft. lb.

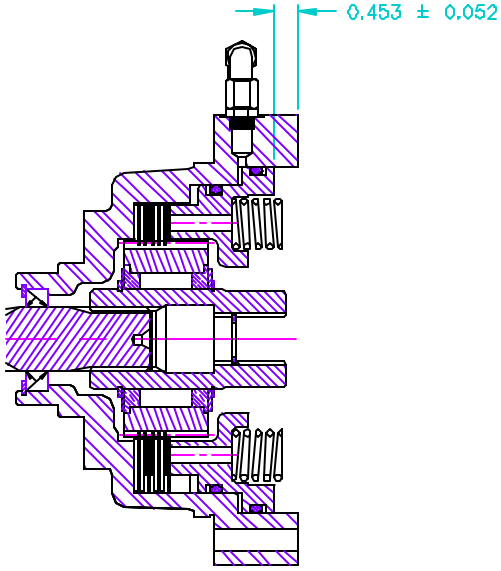


Fig. 7

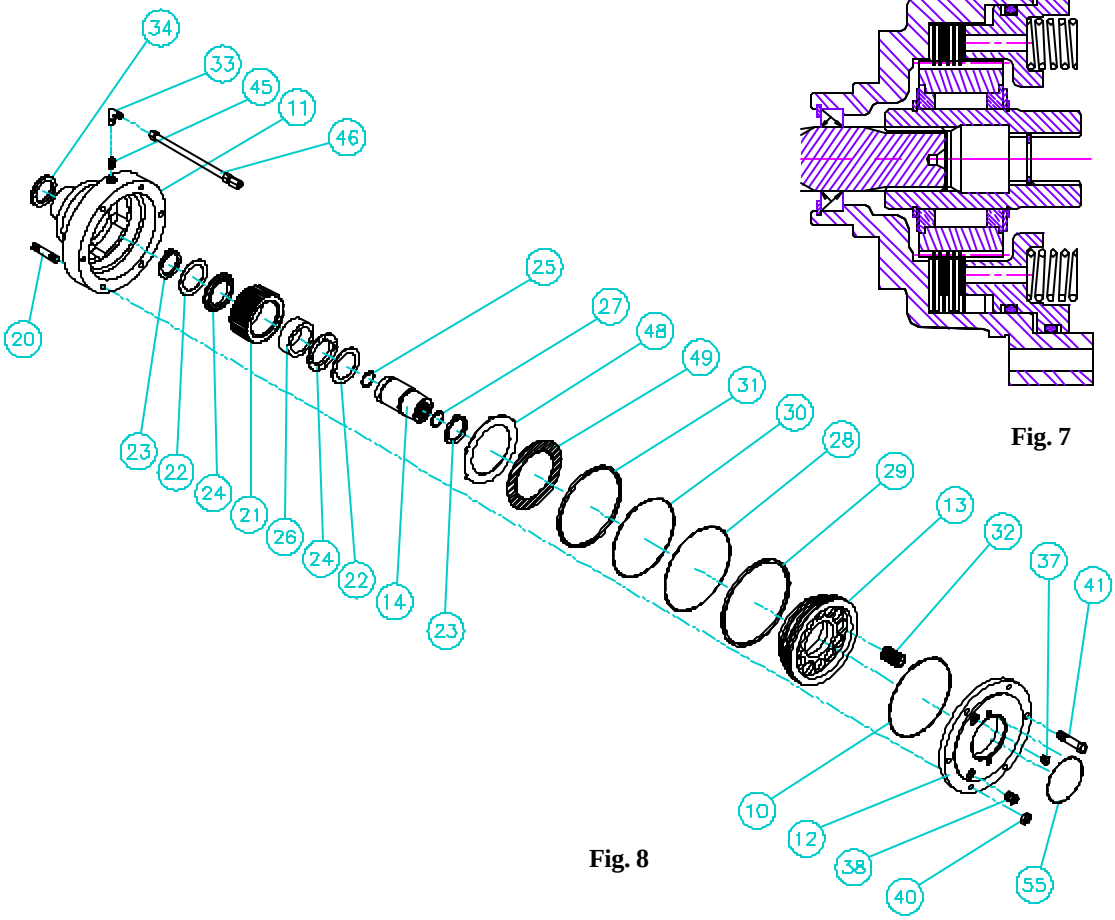
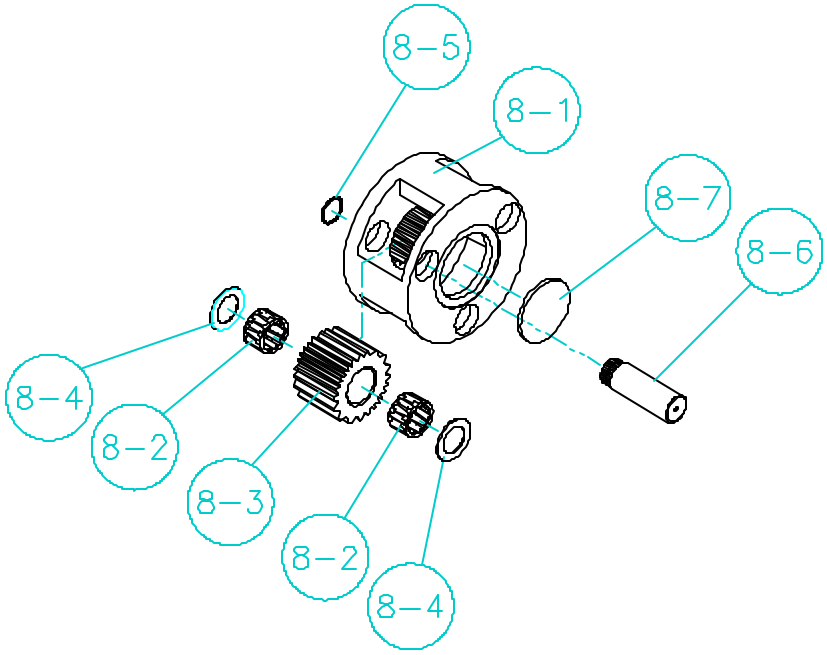


Fig. 8

SERVICING THE PLANETARY SET

1. Remove the spiral rings from the planet pins.
2. Remove the pins from the carrier by carefully tapping them out.
3. Remove the planet gears, thrust washers and bearings from the carriers.
4. Inspect the pins, bearings, and gear bores for evidence of wear and replace if necessary.
5. Before reassembly, be sure to insert the round plates into the carriers.
6. To re-assemble, be careful to line up the planet pins with the thrust washers and bearings and then press the knurled part of the pin into the carrier. If the pins are not lined up properly, the thrust washers can be shattered during the pressing operation.



TROUBLESHOOTING

Problem: Winch won't hold load

Solution 1: Excessive back pressure in the system. Check the system for restrictions and reduce the backpressure.

Solution 2: Brake discs are worn out. Replace brake discs.

Solution 3: Winch clutch is slipping. Inspect the clutch and driver for wear and replace worn parts.

Problem: The winch will not raise the load it should.

Solution 1: Relief valve setting may be too low to allow proper lifting. Increase relief valve pressure setting.

Solution 2: Load being lifted may be more than the winch's rating. Reduce the load or re-rig to increase mechanical advantage.

Problem: The winch will not lower the load.

Solution 1: The brake valve was improperly hooked up after being disconnected. Check plumbing and connect lines properly.

Solution 2: The cartridge in the brake valve may have a plugged metering hole. Remove the cartridge and clean it if necessary.

Problem: Oil leaks from the vent on the motor side of the winch.

Solution 1: The motor shaft seal may have failed. Replace this seal and reduce backpressure if that caused the shaft seal to fail.

Solution 2: Brake piston seals may have failed. Service the brake section and replace worn parts.

BILL OF MATERIALS

ITEM NO.	TWI PART NO.	QTY.	DESCRIPTION
1	CONTACT FACTORY	1	SIDE PLATE
2	CONTACT FACTORY	1	SIDE PLATE
3	42351	1	DRUM (7 1/2" barrel, 11 1/8" flange)
	42834	1	DRUM (7 1/2" barrel, 11 7/8" flange)
	42837	1	DRUM (7 1/2" barrel, 12 3/4" flange)
	43142	1	DRUM (7 1/2" barrel, 12" flange)
4	42381	2	OIL SEAL
5	42386	2	BEARING
6	42356	1	SHAFT
7	996456	1	RETAINING RING
8	4178	1	PLANETARY GEAR SET
8-1	42377	1	OUTPUT CARRIER
8-2	30484	6	NEEDLE BEARING
8-3	42380	3	PLANET GEAR
8-4	28771	6	RACE
8-5	41715	3	RETAINING RING
8-6	42184	3	PLANET PIN
8-7	42383	1	PLATE
9	42379	1	BEARING CARRIER
10	33094	2	O-RING
11	42355	1	BRAKE HOUSING
	43168	1	BRAKE HOUSING
	43509	1	BRAKE HOUSING
	43512	1	BRAKE HOUSING
12	42353	1	BRAKE COVER (2B-A)
	42514	1	BRAKE COVER (2B-A)
	42636	1	BRAKE COVER (2B-A)
	43604	1	BRAKE COVER (2B-A)
	43608	1	BRAKE COVER (2B-A)
13	42358	1	BRAKE PISTON
14	42359	1	BRAKE DRIVER
	42637	1	BRAKE DRIVER
15	42347	1	BASE
16	42378	1	INPUT SUN GEAR
	43510	1	INPUT SUN GEAR
17	42529	1	MOTOR (2 BOLT-"A", 11.9 Cu. In.)
18	42386	1	COUNTER BALANCE VALVE
19	42384	2	SUPPORT ROD
20	42396	5	STUD
21	41740	1	BRAKE DRIVER
22	41723	2	RACE
23	26980	2	RETAINING RING
24	41743	2	BUSHING
25	29043	1	RETAINING RING
26	41759	1	CLUTCH
27	41994	1	RETAINING RING

28	32186	1	O-RING
29	42337	1	BACK UP RING
30	42335	1	O-RING
31	42336	1	BACK UP RING
32	41718	12	BRAKE SPRING
33	41873	1	SWIVEL ADAPTER
34	41805	1	OIL SEAL
35	42392	2	O-RING PLUG
36	13050	1	BREATHER
37	41307	1	O-RING PLUG
38	32220	1	PIPE PLUG
39	24943	10	CAPSCREW
40	20271	5	NUT
41	42365	1	CAPSCREW
42	42397	6	CAPSCREW
43	30379	4	CAPSCREW
44	42089	1	ELBOW
45	41838	1	STRAIGHT ADAPTER
46	CONTACT FACTORY	1	TUBING
47	42398	4	CAPSCREW SOCKET HEAD
48	42148	6	STATOR PLATE
49	32765	5	FRICTION DISC
50	32647	2	O-RING
51	42283	2	CAPLUG
52	40884	1	WEDGE
53	31486	2	CAPSCREW SOCKET HEAD
54	41000	2	LOCK WASHER
55	32566	1	O-RING

EXPLODED ISOMETRIC ASSEMBLY DRAWING