CARCO

SERVICE SECTION

MODEL 50
POWER SHIFT WINCH

CONTENTS Page

CARCO® WINCH PRODUCTS

A DIVISION OF PACCAR / 1400 NORTH 4TH STREET, RENTON, WA 98055 U.S.A. (206) 251-7834/TELEX: 32-8942

3245-F-3-1-83

TROUBLE SHOOTING THE WINCH

CAUTION: CARCO POWER SHIFT WINCHES are equipped with accumulators. If the hydraulic system requires disassembly, discharge accumulator by cycling power shift control lever, with tractor engine stopped, until no pressure appears at operator's gauge.

Preliminary Procedures

If winch does not operate correctly, perform a visual inspection for obvious faults, such as leaking oil, loose, damaged, or broken parts. If cause of trouble is not readily apparent, check operation of winch in each of the four positions, as described in the following operating test, and determine the trouble. The numbers following the trouble refer to item numbers in the TROUBLE column of the trouble shooting table. When the trouble has been isolated, use the table to determine the cause and correction procedures. Procedures given in the CORRECTION column are covered in the Service Section, unless otherwise stated.

Operating Test

BRAKE-ON (NEUTRAL)

Normal Conditions: Brake applied, forward clutch released, reverse clutch released, and no pressure at operator's gauge.

Operating Problems:

1. No hydraulic pressure at operator's gauge 1
2. Brake does not hold
   - A. Valve spool position incorrect 3
   - B. Damaged or defective brake 4
3. Winch winds in wire rope 3
4. Tractor converter or engine stalls 5
5. Winch pays out wire rope 3

BRAKE OFF

Normal Conditions: Brake released, forward clutch released, reverse clutch released, system operating pressure indicated on operator's gauge. Tractor can walk away from load.

Operating Problems:

1. No hydraulic pressure 1
2. Brake does not release
   - A. Low pressure in hydraulic system 2
   - B. Valve spool position incorrect 3
3. Winch winds in wire rope 3, 6
4. Tractor converter or engine stalls 5

FORWARD (HAUL-IN)

Normal Conditions: Brake released, forward clutch engaged, reverse clutch released, winch gear train rotates, winding cable on the cable drum. System operating pressure indicated on operator's gauge.

Operating Problems:

1. No hydraulic pressure 1
2. Winch does not pull
   - A. Low pressure in hydraulic system 2
   - B. Valve spool position incorrect 3
   - C. Forward (haul-in) clutch defective 7
   - D. PTO driveline failure 8
   - E. Gear train in free spool 9

3. Tractor converter or engine stalls
   A. Brake not releasing
   B. PTO pinion bearings defective
   C. Winch gear train bearing and/or gear failure 11

4. Drum rotates in reverse (pay-out), power shift lever in haul-in 10

REVERSE (PAY-OUT)

Normal Conditions: Brake released, forward clutch released, reverse clutch engaged, winch gear train rotates, unwinding cable from cable drum. System operating pressure indicated on operator's gauge.

Operating Problems:

1. No hydraulic pressure

2. Drum will not pay-out
   A. Low pressure in hydraulic system 2
   B. Valve spool position incorrect 3
   C. Reverse (pay-out) clutch defective 7
   D. PTO driveline failure 8
   E. Gear train in free spool 9

3. Tractor converter or engine stalls
   A. Brake not releasing
   B. PTO pinion bearing failure
   C. Winch gear train bearing and/or gear failure 11

4. Drum rotates forward (haul-in), power shift lever in reverse 10

TROUBLESHOOTING TABLE

TROUBLE	CAUSE	CORRECTION
1. No hydraulic pressure. NOTE: Remove gauge line and snubber and install calibrated gauge for hydraulic system checks, 300-315 psi required.	Control lever in neutral (brake on) position.	Normal, no hydraulic pressure will appear at operator's gauge until control lever is moved to forward, brake-off, or reverse positions.
	Oil level too low.	Park tractor on level surface and add oil until oil level is visible in sight gauge.
	Tractor converter stalls when operating winch.	Operating at too low engine RPM, increase RPM. Operating under excessive line load, use sheave block and two-part line if excessive line pulls are encountered.

TROUBLESHOOTING TABLE (Continued)

TROUBLE	CAUSE	CORRECTION
1. No hydraulic pressure. (Continued) NOTE: Remove gauge line and snubber and install calibrated gauge for hydraulic system checks, 300-315 psi required.	Relief valve defective or seized open.	Clean and adjust relief valve. Install relief valve kit.
	Defective pump.	Establish flow reading of pump. Should be 3 to 3.5 gal/min at engine idle. Replace pump as required.
	Loose or disconnected hydraulic fitting and damaged or broken hydraulic hose.	Tighten all hydraulic fittings. Replace hoses as required.
	Suction tube not in proper position.	Repair as required.
	Operator's gauge defective.	Remove gauge line and snubber at winch and install calibrated pressure gauge. System pressure 300-315 psi in forward, brake off, and reverse. Replace gauge as required.
	Pump gears slipping or defective.	LOCTITE pump drive gear on bevel pinion. Replace key on pump shaft. Replace gears as required.
2. Low hydraulic pressure. NOTE: Remove gauge line and snubber and attach calibrated gauge to monitor system pressure, 300-315 psi required.	Relief valve out of adjustment.	Adjust relief valve to obtain 300-315 psi.
	Relief valve seized.	Clean and adjust relief valve. Replace relief valve kit as required.

TROUBLESHOOTING TABLE (Continued)

TROUBLE	CAUSE	CORRECTION
2. Low hydraulic pressure. (Continued) NOTE: Remove gauge line and snubber and attach calibrated gauge to monitor system pressure, 300-315 psi required.	Suction strainer plugged.	Drain oil, clean suction strainer, and add new oil. Service interval is every 1000 hours or 6 months.
	Low oil level.	Park tractor on level surface, add oil until oil level is visible in sight gauge.
	Defective pump.	Determine pump flow reading. Should be 3 to 3.5 gal/min at engine idle.
		Replace pump.
	Hydraulic fittings loose or damaged.	Tighten fittings.
		Replace hydraulic hose as required.
	Air leak in suction tube or suction strainer.	Inspect suction tube O-rings.
		Replace components as required.
	Internal leak in hydraulic system from defective O-rings or seals.	Determine leakage area by pressure testing forward, brake-off, and reverse functions. Test ports are located in the carrier covers on the ends of the clutch line.
		Replace O-rings and seals as required.
	Control valve defective.	Inspect valve components.
		Check valve body for signs of internal leakage.
		Replace components as required.

TROUBLESHOOTING TABLE (Continued)

TROUBLE	CAUSE	CORRECTION
3. Valve spool not properly positioned.	Control cable not threaded to proper depth in valve spool.	Screw control cable core into valve spool until 5-1/8 in. measurement is obtained from center of pin hole on control stand end to the first thread on the control cable housing.
	Improper control cable installation at control stand.	Attach control cable to power shift lever, place lever in neutral and depress button to maintain neutral position. Position control cable in control stand anchor slot. Tighten jam nuts on each side of anchor slot.
	Control cable damaged or binding.	Reroute cable to eliminate binding. Replace cable as required.
	Valve spool seized.	Remove control valve, disassemble and replace components as required.
	Valve spool centering spring weak or broken.	Remove control valve, disassemble and replace valve spool return springs as required.
4. Defective or damaged brake.	Frequent lowering of loads by stripping through the brake generates excessive heat buildup. This can destroy friction disc material and warp steel plates.	Remove brake assembly, disassemble and replace friction discs if oil grooves are no longer visible. Replace steel plates if warped or scored.
	Lower loads by placing power shift lever in reverse position.	Replace damaged discs and plates. Instruct operator to use pay-out for lowering of loads.

TROUBLESHOOTING TABLE (Continued)

TROUBLE	CAUSE	CORRECTION
5. Tractor converter or engine stalls.	Bearings defective in PTO pinion carrier assembly.	Remove winch, remove carrier assembly and replace bearing set.
	Gear train bearings and/or gears defective.	Replace components as required.
	Hydraulic line loose or disconnected, brake not releasing.	Repair as required.
6. Control handle will not spring-return to neutral.	Control stand through bolts over tightened.	Adjust as required to free control handle. Add shims to spacers if necessary.
	Control cable damaged and/or binding.	Reroute control cable, replace as required.
	Valve spool scored.	Disassemble control valve, clean up spool and valve body. Replace components as required.
	Valve spool centering springs weak or broken.	Replace springs as required.
7. Clutch damaged or defective.	Friction discs wore out and steel discs warped.	Replace discs and plates. Adjust system pressure to 300-315 psi.
		Instruct operator not to "feather" clutch under load.
	Clutch piston return springs weak or broken.	Replace springs as required.
	Clutch piston seized or O-rings defective.	Clean up and replace components as required.
	Check ball in clutch housing stuck open.	Clean ball and seat assembly. Replace components as required.

TROUBLESHOOTING TABLE (Continued)

TROUBLE	CAUSE	CORRECTION
8. PTO driveline failure.	Universal joint failure.	Replace components. Lubricate to manufacturer specifications.
	Coupler or shaft failure.	Replace as required. Check for any evidence of driveline interference.
9. Winch gear train in free spool.	Free spool position enables operator to pull cable off drum by hand.	To engage gear train, apply light pressure on free spool lever and move P.S. lever to align gear teeth allowing gear train engagement.
10. Power shift lever in haul-in; drum rotates in pay-out. Power shift lever in pay-out; drum rotates in haul-in.	Clutch pressure hoses reversed at control valve.	Drain oil level below valve housing cover. Remove valve housing cover and change location of two hoses attached to flow control valves at control valve.
11. Winch gear train bearing and/or gear failure.	Defective bearing and/or gear.	Replace as required.
	Gear train overloaded.	Replace components. Operate winch within limits, using multi-part line and sheave blocks on excessive line-pull requirements.
12. Winch overheating. (Winch runs hot) (Above 180°)	Improper oil level.	Park on level surface. Drain oil and clean suction strainer. Add oil until oil level is visible in sight gauge.
	Driveline too long.	Check driveline length.
		Check driveline coupling engagement on tractor and winch.
		Replace components as required.
13. Winch runs noisy.	Improper bevel gear/pinion backlash.	Establish clutch line end play of .005-.010 and bevel gear/pinion backlash of .004-.012.
	Defective gear train bearing and/or gear.	Isolate noise area. Replace components as required.

GENERAL INSTRUCTIONS

This manual contains procedures for disassembly and reassembly of the winch, and also provides adjustment procedures. The necessary clearances, backlash, and other data for proper reassembly of the winch are given in the component assembly section and on the data sheet at the end of the Service Section.

These recommendations should be followed for best results.

For repair, disassemble the winch only to the extent necessary to accomplish the required replacement of parts.

Before starting any repair procedures, be sure to thoroughly clean the parts to be removed and adjacent areas on the tractor to avoid entry of dirt into the winch. Do not leave any ports or access openings exposed to the weather. Seal or cap the openings to prevent entry of dust, moisture, or other foreign material. Cap or plug all exposed hydraulic ports and fittings.

During disassembly, care should be taken not to damage gaskets, shims, seals, and O-rings that are to be reused. Replace any such parts that are damaged or otherwise defective. Certain O-rings and seals specified in the replacement instructions must not be reused. In general, seals and O-rings that work under operating hydraulic pressures, or that require extensive disassembly to replace, should be replaced with new parts at time of reassembly.

During assembly, coat the threads of all cap screws that penetrate the winch case, using suitable thread sealing compound. Take care to prevent excess sealing compound from entering the winch case.

Maintain strict cleanliness during rebuild to prevent entry of dirt or moisture into winch case. Hydraulic components should be rebuilt under cleanest possible conditions.

Do not wash new bearings when removed from packing.

Do not blow bearings dry with compressed air. Lightly oil all parts when reassembling into winch.

PREPARATION FOR WINCH REMOVAL

CAUTION: Winches are equipped with accumulators. If hydraulic system requires disassembly, discharge accumulator by cycling power shift control lever with engine stopped until no pressure appears at operator's gauge.

Remove drain plug from left side of winch to drain oil.

Remove filler plug from top of case to permit complete draining of oil.

CAUTION: To prevent damage to pump, do not run tractor engine after oil is drained from winch.

Disconnect winch control cables from control stand.

Support winch with suitable hoist or chain block, and remove nuts and cap screws securing winch to tractor. See Figure 1.

When winch and PTO shaft have been removed from tractor transmission case, cover opening in rear of tractor to prevent entry of dirt.

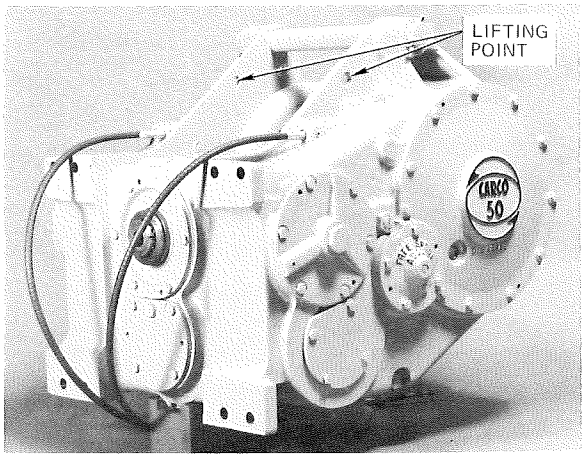


FIGURE 1

IMPORTANT: HYDRAULIC SYSTEM TESTS

CAUTION: Winches are equipped with accumulators. If hydraulic system requires disassembly, discharge accumulator by cycling power shift control lever with engine stopped until no pressure appears at operator's gauge.

Service or replacement of hydraulic components requires winch tear down. Thorough tests with proper equipment (Flow Meter) should be made to determine exact component(s) requiring attention.

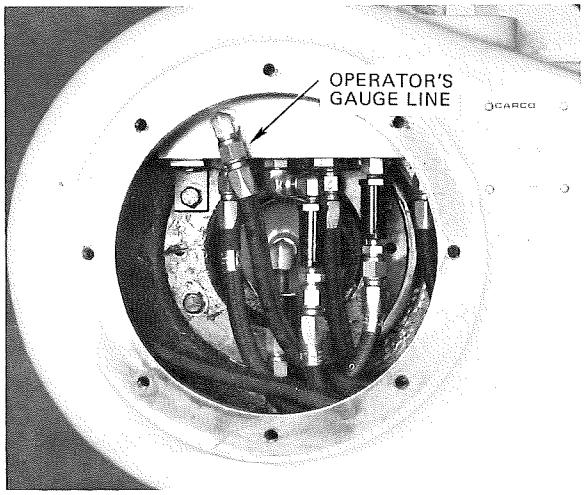


FIGURE 2

Drain oil level below bottom bolt hole of valve housing cover.

Remove valve housing cover.

Disconnect operator's gauge line.

Attach hydraulic test equipment (Flow Meter) to operator gauge line fitting on control valve. See Figure 2.

Spill return oil from flow meter into winch case.

Start tractor engine and run at low idle.

Cycle power shift control lever through positions. In the forward, brake off, and reverse positions, the pump should produce a minimum of 3-1/2 gallons per minute at 300-315 psi.

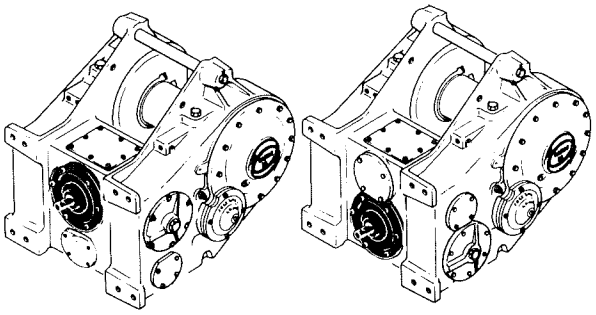
No oil will flow to this port in the neutral position.

BEVEL PINION CARRIER ASSEMBLY

Removal and Disassembly

Remove oil from winch.

Remove winch from tractor. Remove winch only. Leave winch adaptor mounting plates attached to tractor rear face.



STD PTO **LOW PTO**

FIGURE 3

The PTO carrier is located in the upper winch case bore on a STD PTO winch and in the lower winch case bore on a LOW PTO winch.

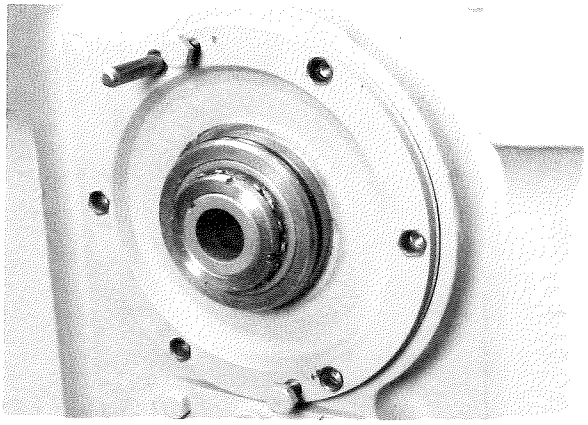


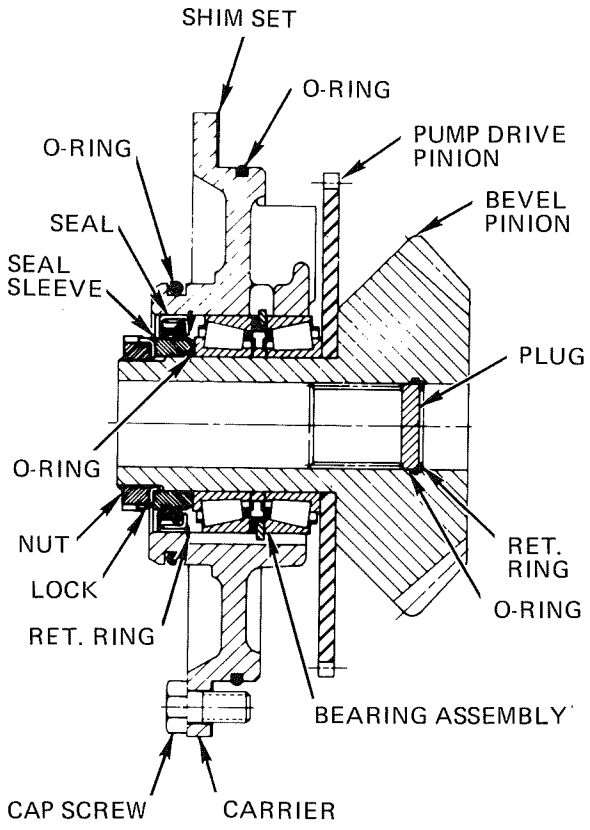
FIGURE 4

Remove cap screws securing carrier assembly to winch case. Use alignment pin to aid in removal and to eliminate shim pack damage.

Use two of the cap screws as jackscrews and remove the carrier assembly.

FIGURE 5

Retain shim pack for reassembly. Remove O-rings from carrier grooves.



BEVEL PINION CARRIER ASSEMBLY

FIGURE 6

Bend tang of lock washer away from lock nut. Remove lock nut and lock washer.

Support carrier assembly in suitable hydraulic press. Place support toward outer diameter of carrier and remove bevel pinion, with pump drive pinion and inner bearing cone attached. Remove bearing cone set spacer from bevel pinion.

Position bevel pinion in press with support placed under pump drive pinion as close to the bevel pinion gear as possible. Press bevel pinion free of bearing cone and pump drive pinion.

Remove retaining ring and plug from end of bevel pinion. Remove O-ring from groove.

Support carrier in vise and remove oil seal, oil seal spacer and O-ring.

Remove oil seal retaining ring and outer cone of bearing assembly.

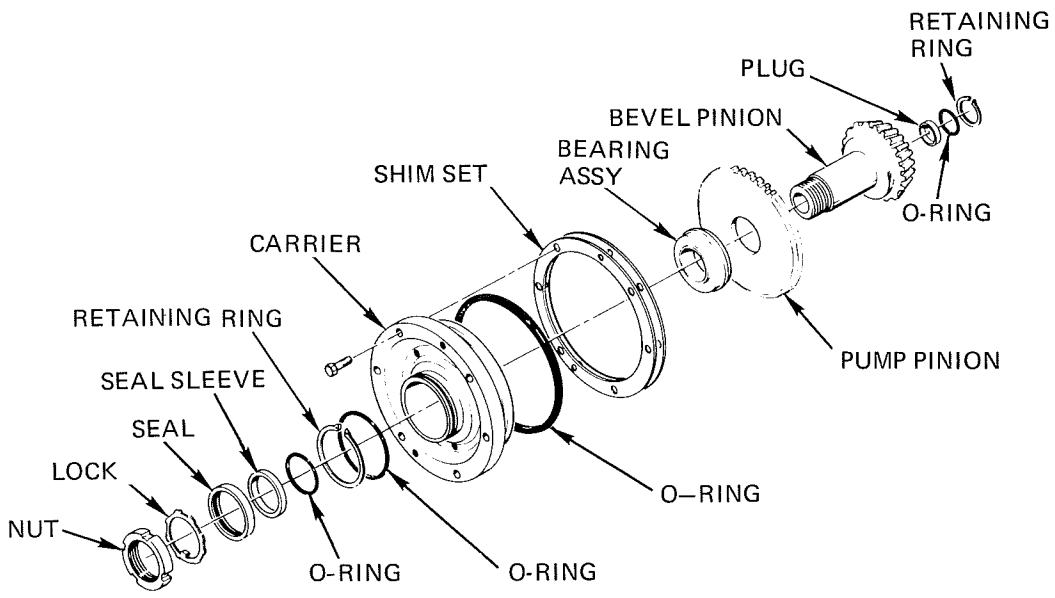
Remove bearing cups of bearing assembly from carrier. Remove bearing cup retaining ring and bearing cup set spacer of bearing assembly.

Assembly and Installation.

Refer to Figure 7.

Clean and inspect all components prior to assembly.

Lubricate and install O-ring in groove in end of bevel pinion. Install plug in end of bevel pinion with tapered side of plug toward inner bore splines. Secure plug in place with retaining ring.



BEVEL PINION CARRIER ASSEMBLY

FIGURE 7

Clean and dry bore of pump drive pinion and mating seat on bevel pinion with LOCTITE primer or equivalent.

Apply LOCTITE 601 or equivalent to pump drive pinion bore and mating bevel pinion surface. Press pump drive pinion on bevel pinion and seat securely against bevel pinion shoulder. Allow LOCTITE to dry.

Press one bearing cone of bearing assembly on bevel pinion and seat securely against pump drive pinion. Install bearing cone set spacer of bearing assembly on bevel pinion.

Refer to Figure 8.

Install bearing cup retaining ring in carrier.

Position carrier on bench with gear side facing up. Install one bearing cup and seat against retaining ring.

Turn carrier over so tractor PTO side faces up. Install bearing cup spacer as shown in Figure 8. Install remaining bearing cup and seat against bearing cup spacer.

Position carrier over bevel pinion so gear side bearing cup seats on bearing cone.

Press remaining bearing cone securely on bevel pinion.

Lubricate and install O-ring on bevel pinion and seat against bearing cone. Install seal sleeve over bevel pinion with tapered edge of seal sleeve facing bearing cone.

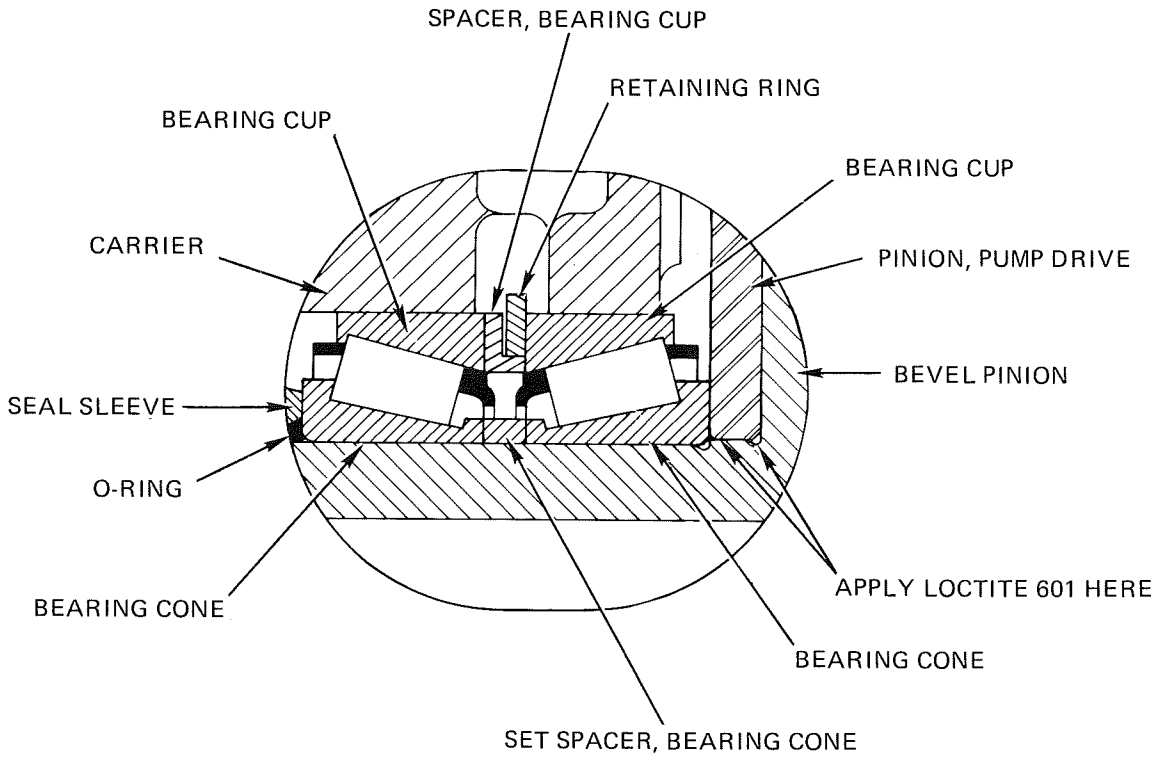


FIGURE 8

Install oil seal retaining ring.

Lubricate and install oil seal and seat against retaining ring.

Install bearing lock washer and lock nut. Torque lock nut to 150 ft-lbs. Bend tang of lock washer into slot of lock nut.

Lubricate and install carrier O-rings.

Apply suitable gear tooth marking compound to bevel pinion and install carrier assembly in winch using original shim set. Install carrier with oil trough in the top position to provide lubrication to pinion bearings.

Check bevel gear and pinion tooth contact pattern.

Remove carrier assembly and add or remove shims as required to obtain correct pattern. See Figure 9.

On final installation of the carrier assembly, coat threads of cap screws with thread sealant and torque to 85 ft-lbs.

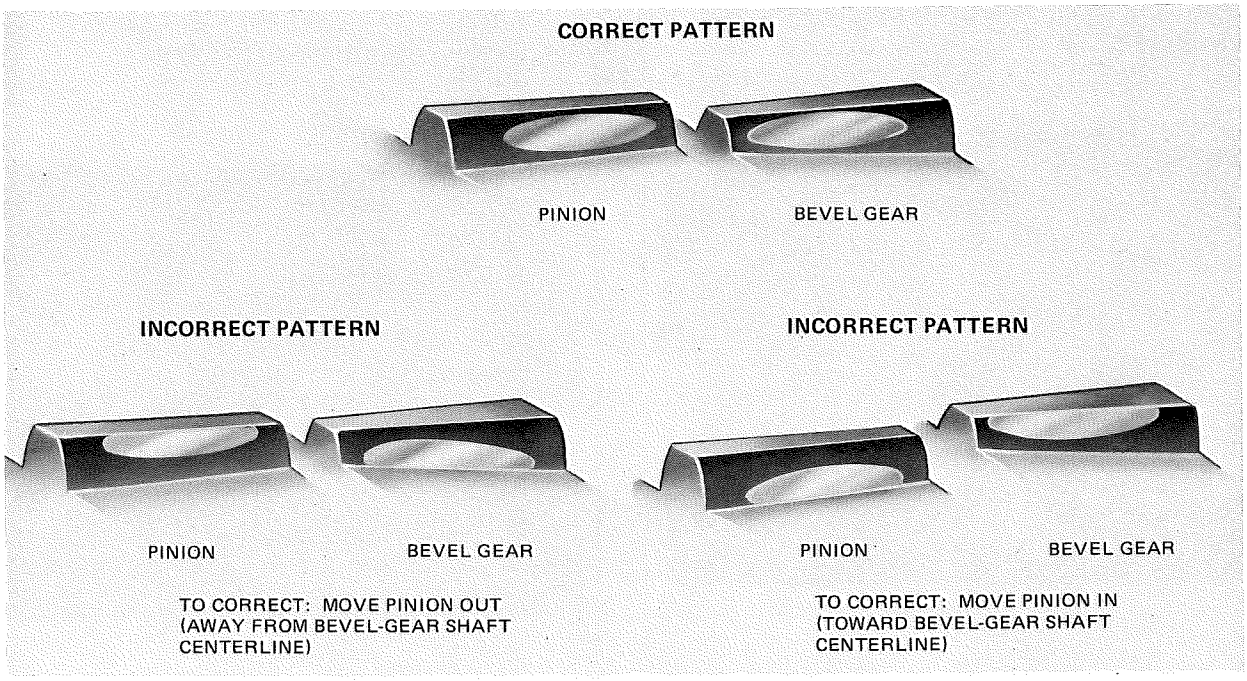


FIGURE 9

CLUTCH SHAFT GROUP NO. 53121

Removal

Drain oil and remove winch from tractor.

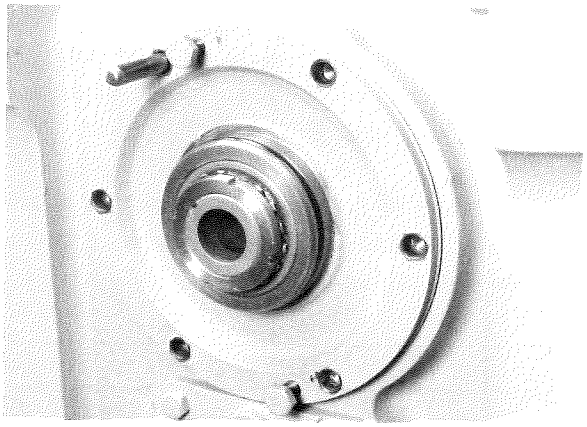


FIGURE 10

Refer to Bevel Pinion Carrier Assembly, page 12. Remove bevel pinion carrier assembly from front of winch. Retain shim set for reassembly.

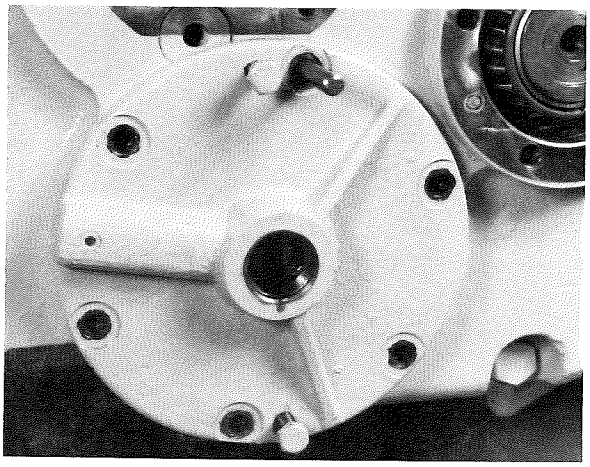


FIGURE 11

Remove PARKER plug and spring from left hand bearing carrier.

Use cap screws as jackscrews and remove bearing carrier. Retain shim set and O-ring sleeve for reassembly.

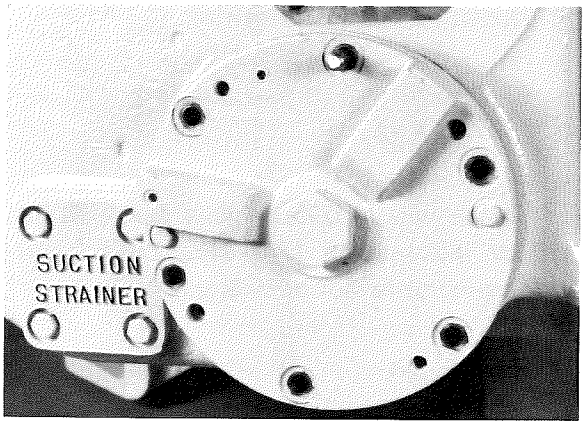


FIGURE 12

Remove PARKER plug and spring from oil brake assembly on right hand side of winch.

Remove (6) 1/2 x 2-1/4 cap screws securing oil brake assembly to winch case.

NOTE: *Do Not remove* (2) 3/8" x 1" cap screws securing outer bearing carrier cover to brake housing.

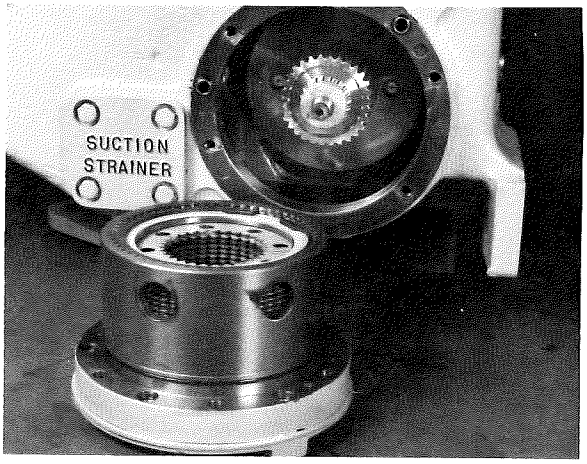


FIGURE 13

Use soft drift on end of clutch line at left hand side to unseat brake assembly.

Remove oil brake assembly. Retain shim set and O-ring sleeves for reassembly.

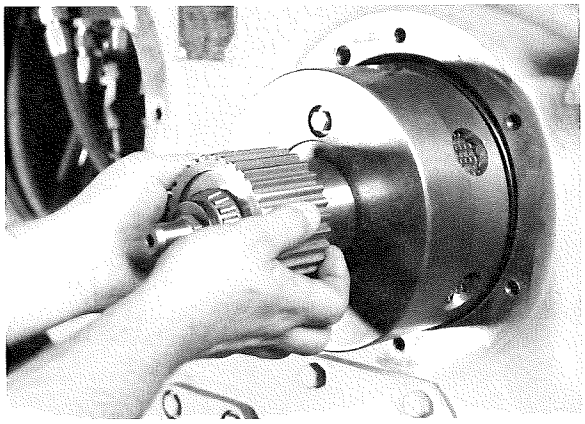


FIGURE 14

Grasp brake hub and pull clutch shaft group out of winch through brake opening.

NOTE: Pull assembly out of winch case enough to place a lifting strap around spacer between bevel gears to aid in removal.

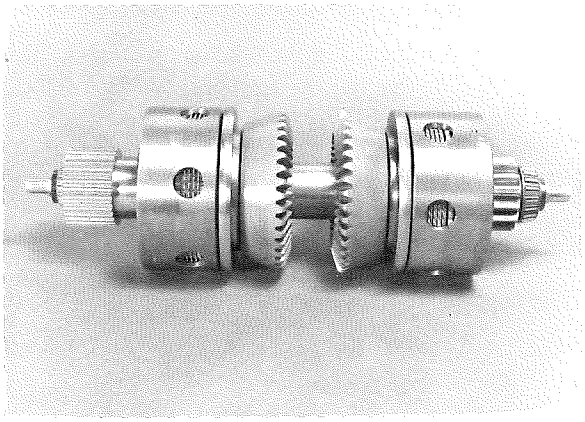


FIGURE 15

Complete the removal from winch case and place clutch shaft group on clean bench surface.

Disassembly

Refer to Figure 20, page 19 for components.

Upon removal, position all components in the order in which they were removed.

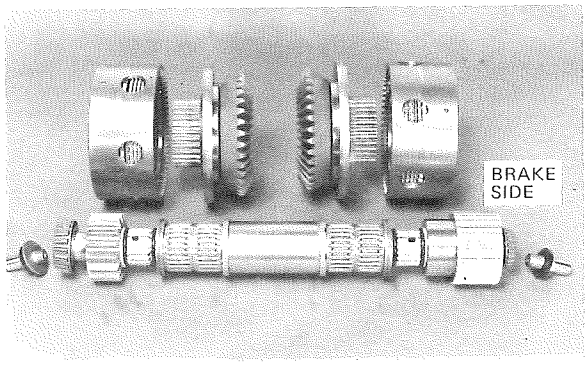


FIGURE 16

Remove stub shafts and retainers from ends of clutch shaft.

Remove bearing cone from each end of clutch shaft.

Remove first reduction pinion and brake hub gear from each end of clutch shaft.

NOTE: If winch is equipped with low speed group 53135, also remove spacer from behind first reduction pinion. See Figure 20, page 19.

Remove backup ring and O-ring seal between clutch assembly and clutch shaft.

Remove clutch assembly from clutch shaft.

NOTE: To keep clutch plates and discs aligned and locked in position for reassembly, remove (2) flush plugs from back side of clutch housing, install (2) 3/8 x 1 UNF cap screws and tighten cap screws until clutch piston is moved against clutch plates and discs holding them in position. For inspection and/or repair of clutch components, refer to Clutch Assembly 53129, page 27.

Remove (2) thrust washers and thrust bearing from next to bevel gear.

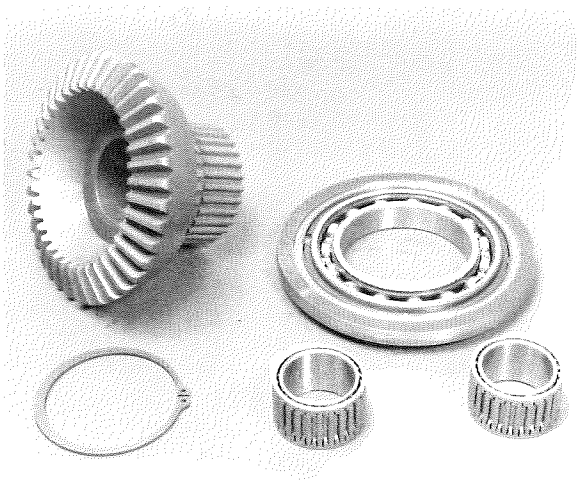


FIGURE 17

Remove bevel gear assembly.

Remove retaining ring and press bearing and carrier assembly free of bevel gear. Note correct position of bearing and carrier assembly on bevel gear.

Bearing assembly is staked in carrier. If bearing is to be replaced, use hydraulic press to unstake bearing and remove from carrier. Restake new bearing after installation on carrier.

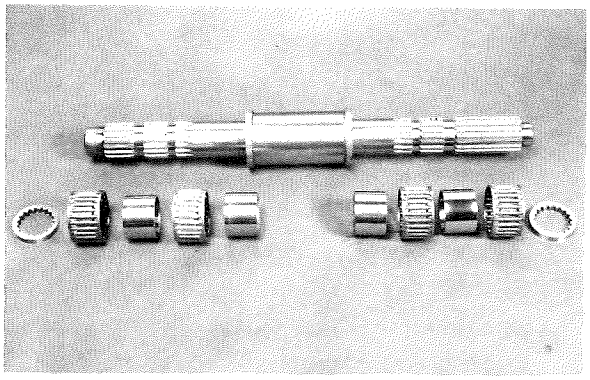


FIGURE 18

Remove remaining O-rings and backup rings from grooves on clutch shaft.

Remove spacer for thrust bearing and thrust washer. Remove bevel gear bearings and races.

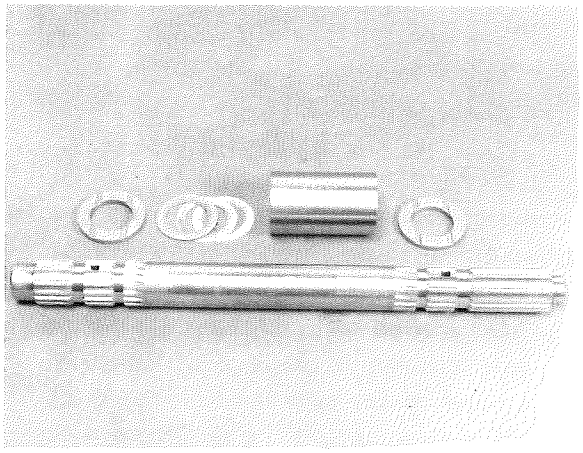
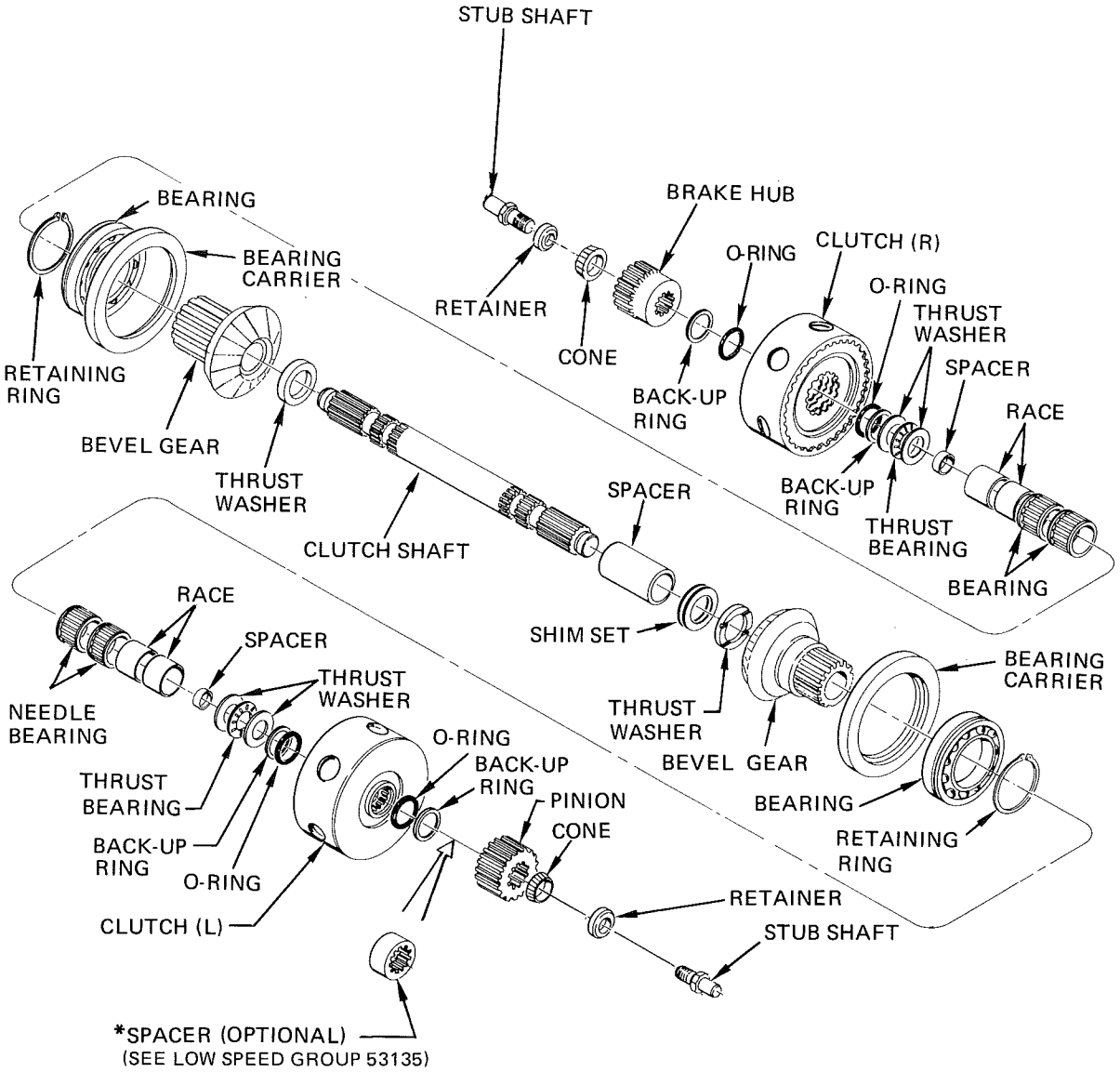


FIGURE 19

Remove bevel gear thrust washers. Remove bevel gear spacer and shim set.



CLUTCH SHAFT GROUP

FIGURE 20

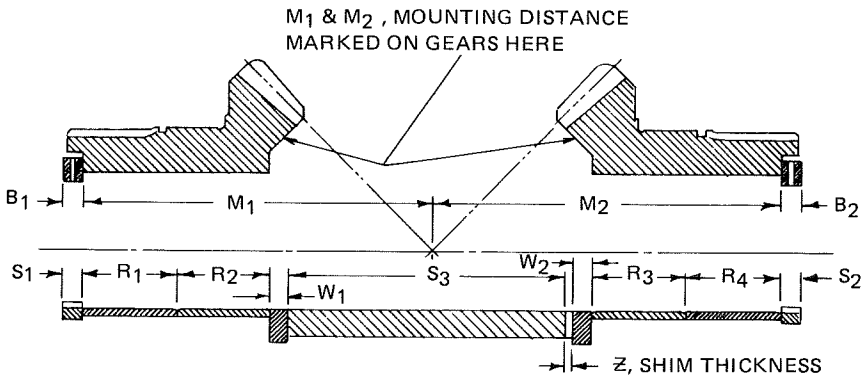
Assembly

Thoroughly clean and carefully inspect all components prior to assembly. If a component's condition is questionable – replace it!

Because of machining tolerances, installation of new components will alter the original shim pack, between the bevel gears, used to establish a .004-.012 in. backlash between the bevel gears and bevel pinion.

Measurements of components must be taken and used to establish a new shim pack thickness to maintain the required .004-.012 in. backlash.

The components to be measured and the formula used to establish the shim pack is as follows:



BECAUSE OF MACHINE TOLERANCES, THICKNESS OF SHIM PACK MUST BE DETERMINED INDIVIDUALLY FOR EACH WINCH. THE SAME PARTS WHICH HAVE BEEN USED FOR MEASURING MUST BE USED TOGETHER.

LETTER	PART NO.	QTY.	DESCRIPTION
B_1	15315	1	BEARING, NEEDLE THRUST
	16066-01	2	WASHER, THRUST
B_2	15315	1	BEARING, NEEDLE THRUST
	16066-01	2	WASHER, THRUST
S_1	53021	1	SPACER, INNER RACE
S_2	53021	1	SPACER, INNER RACE
S_3	53019	1	SPACER, BEVEL GEAR
R_1	15314	1	RACE, INNER
R_2	15314	1	RACE, INNER
R_3	15314	1	RACE, INNER
R_4	15314	1	RACE, INNER
W_1	53026	1	WASHER, THRUST
W_2	53026	1	WASHER, THRUST
M_1	53049-XXXX	1	GEAR, BEVEL
M_2	53049-XXXX	1	GEAR, BEVEL

SHIM PACK

$$Z = B_1 + B_2 + M_1 + M_2 - S_1 - S_2 - R_1 - R_2 - R_3 - R_4 - W_1 - W_2 - S_3$$

The shim pack (Z), P/N 53046, supplied through Service Parts is .120 in. thick.

FIGURE 21

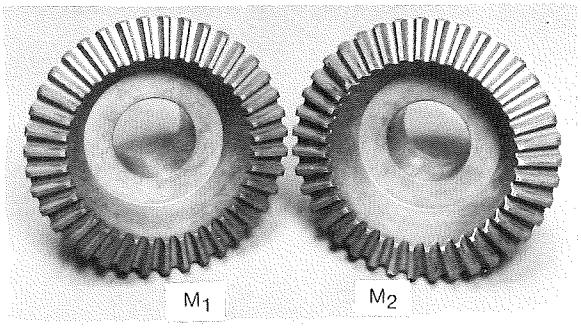


FIGURE 22

Record M_1 and M_2 bevel gear mounting distance. Distance is etched into the inside surface of the bevel gear.

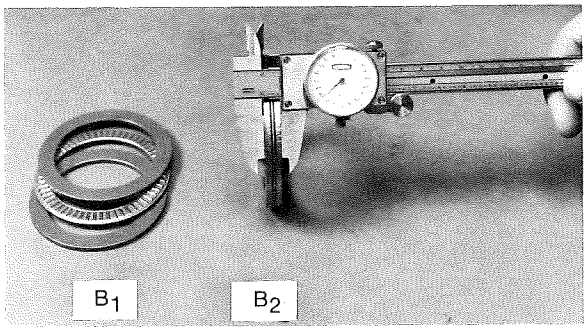


FIGURE 23

Measure and record B_1 and B_2 thrust washer and thrust bearing thickness.

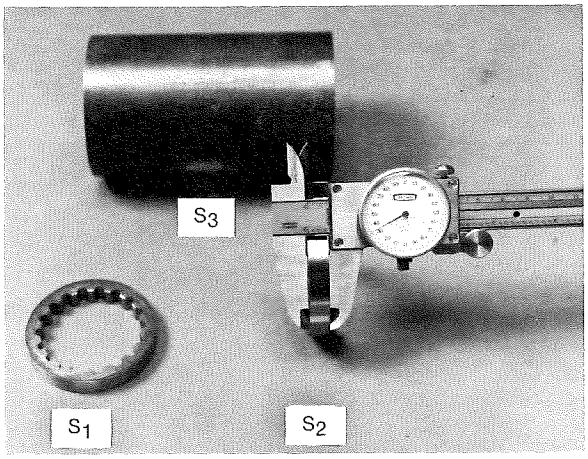


FIGURE 24

Measure and record S_1 and S_2 spacer for thrust washers and thrust bearing. Measure and record S_3 bevel gear spacer.

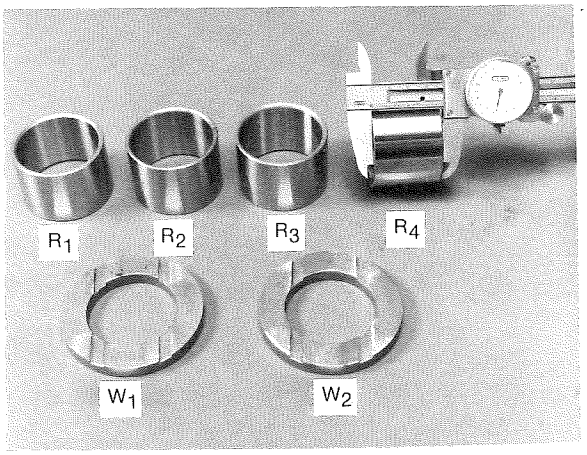


FIGURE 25

Measure and record R_1, R_2, R_3 and R_4 bevel gear bearing races. Measure and record W_1 and W_2 bevel gear thrust washers.

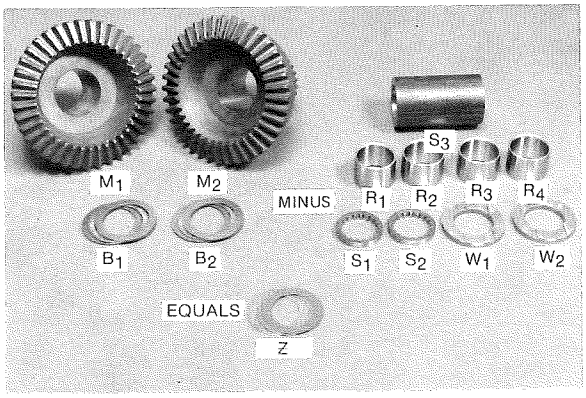


FIGURE 26

The shim pack thickness to use in reassembly of the clutch line is the total distance of the bevel gears, thrust bearings and thrust washers, less the total distance of the inner spacers, thrust washers, bearing races and bevel gear spacer.

Assemble clutch and bevel gear line by first completing the brake side portion of the line.

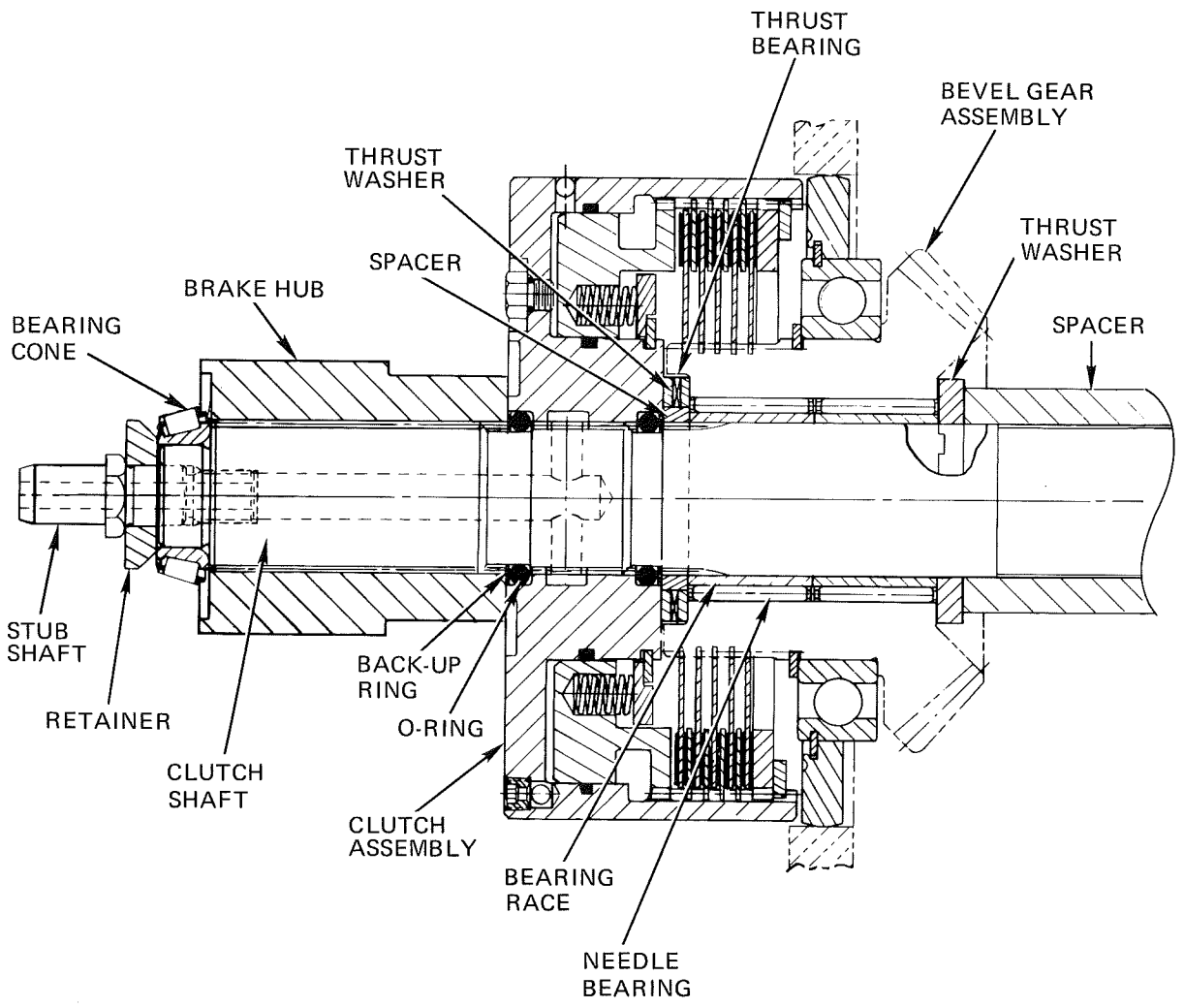


FIGURE 27

Install bevel gear spacer in approximate center of clutch shaft.

Install bevel gear thrust washer on brake side of clutch shaft with smooth side of washer toward the bevel gear spacer.

Install (2) bearing races on brake side of clutch shaft.

Install bevel gear assembly, positioning bevel gear over the bearing races.

Lubricate and install (2) needle bearings between bevel gear and bearing race.

Install splined inner race spacer on clutch shaft next to needle bearing and race.

Lubricate and install (2) thrust washers and needle thrust bearing over inner race spacer with thrust bearing positioned between the thrust washers.

Lubricate and install backup ring and O-ring in inner groove of clutch shaft with backup ring placed next to inner race spacer.

Install clutch assembly on clutch shaft, aligning splines of clutch friction discs over splines of bevel gear. Seat clutch over O-ring in inner groove of clutch shaft.

Lubricate and install O-ring in outer groove of clutch shaft and seat into clutch housing. Install backup ring next to O-ring.

Install brake hub on clutch shaft with smaller diameter end positioned against backside of clutch housing.

Install bearing cone on end of clutch shaft. Press into position until bearing cone seats securely against shoulder of clutch shaft.

Install stub shaft and retainer in end of clutch shaft. Apply LOCTITE 242 or equivalent to threads and pilot shoulder of stub shaft and torque to 40 ft-lbs.

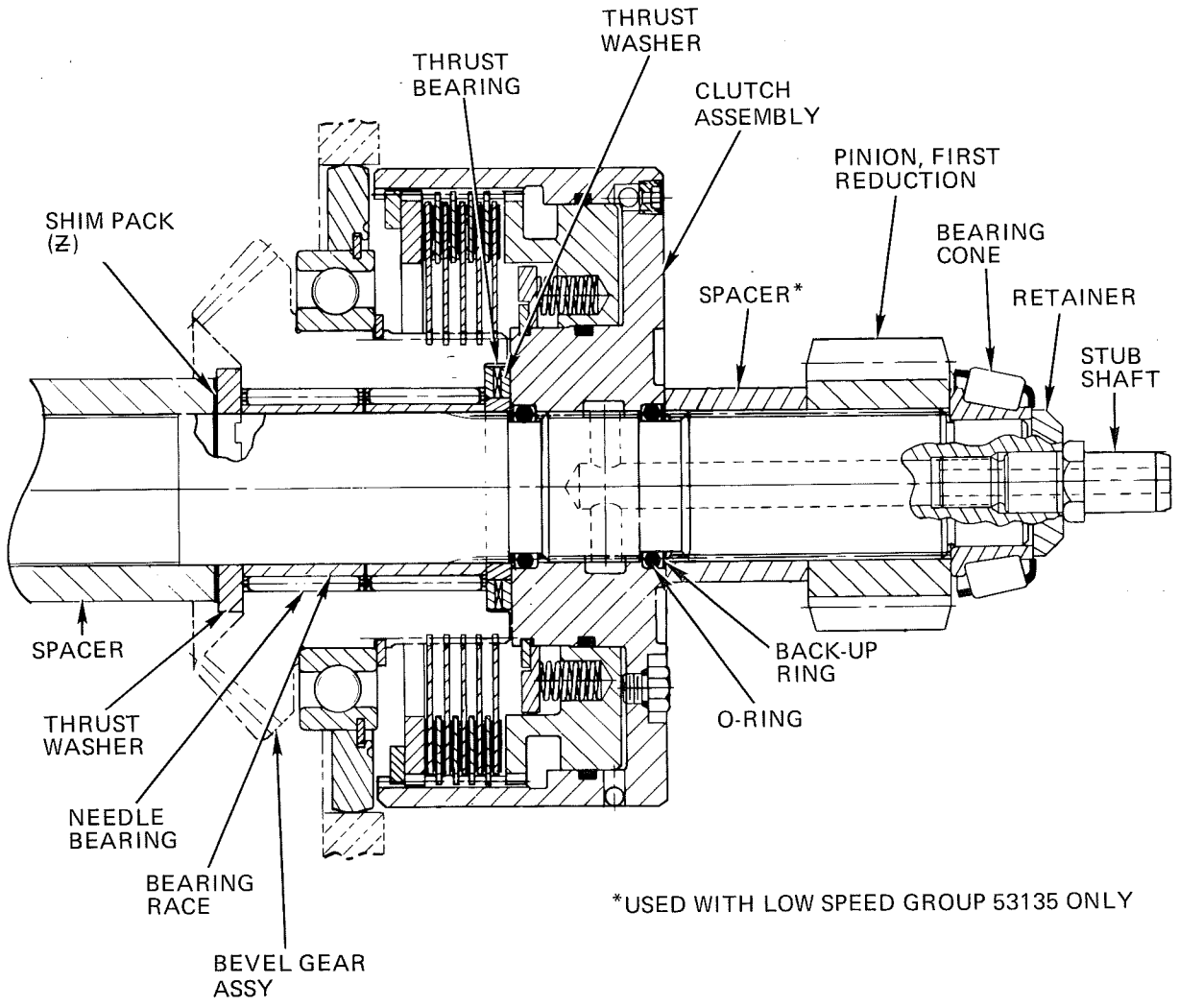


FIGURE 28

Complete the assembly of the clutch and bevel gear line by installing the remaining components on the gear side of the line.

Install shim pack (Ƶ), previously determined by component measurement, next to bevel gear spacer.

Install bevel gear thrust washer on clutch shaft with smooth side of washer toward shim pack (Ƶ).

Lubricate and install (2) bearing races on clutch shaft.

Install bevel gear assembly, positioning bevel gear over bearing races.

Lubricate and install (2) needle bearings between bevel gear and bearing race.

Install splined inner race spacer on clutch shaft next to needle bearing and race.

Lubricate and install (2) thrust washers and needle thrust bearing over inner race spacer with thrust bearing positioned between the thrust washers.

Lubricate and install backup ring and O-ring in inner groove with backup ring placed next to inner race spacer.

Install clutch assembly, aligning splines of clutch friction discs over splines of bevel gear. Seat clutch securely against O-ring.

Lubricate and install O-ring in outer groove of clutch shaft and seat against clutch housing. Install backup ring next to O-ring.

If winch is equipped with LOW Speed Group 53135, see Figure 28, page 23. Install spacer on clutch shaft next to clutch assembly.

Install first reduction pinion on clutch shaft next to spacer if winch is equipped with Low Speed Group 53135.

Install first reduction pinion next to clutch housing if winch is not equipped with Low Speed Group 53135.

Install bearing cone on clutch shaft. Use bearing press and seat cone firmly against first reduction pinion until no clearance remains between components on the clutch shaft.

Install stub shaft and retainer in end of clutch shaft. Apply LOCTITE 242 or equivalent to threads and pilot shoulder of stub shaft and torque to 40 ft-lbs.

Installation

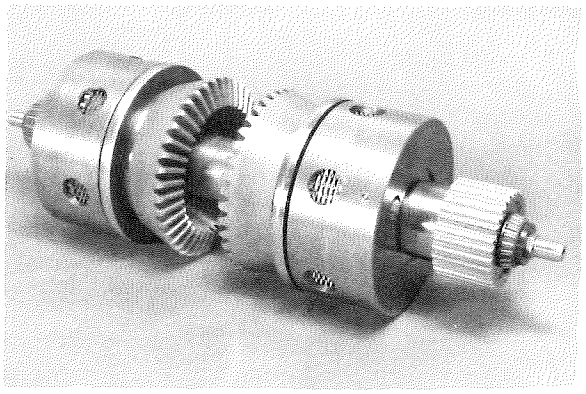


FIGURE 29

Use a lifting device around bevel gear spacer to aid in installation of the clutch and bevel gear line.

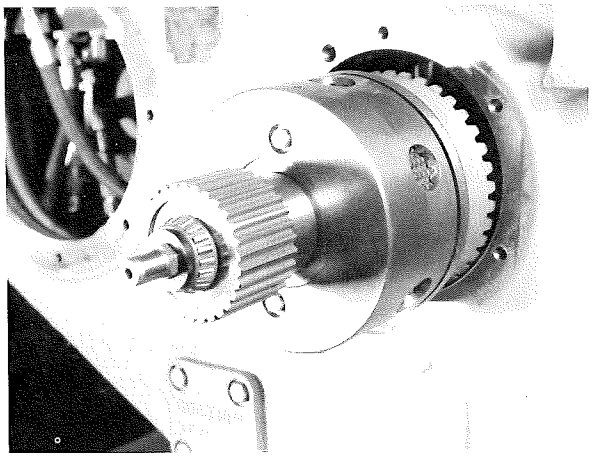


FIGURE 30

Place line into oil brake opening of winch case and remove lifting device. Carefully slide complete line into winch case, positioning bevel gears in approximate center of case.

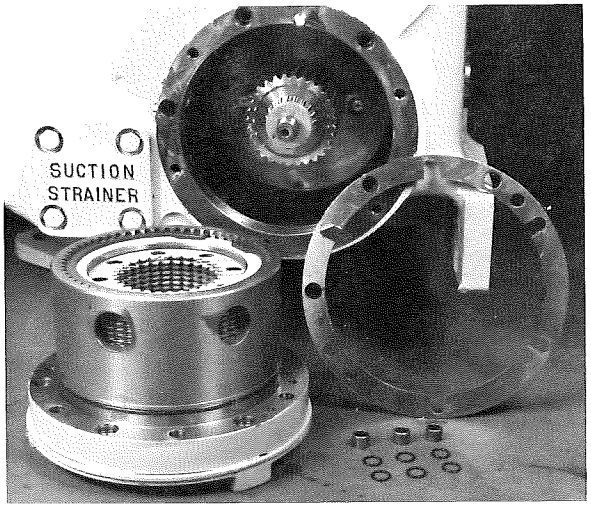


FIGURE 31

Use shim set removed during disassembly or a new shim set of same thickness. Place (3) O-ring sleeves in oil ports of shim set, lubricate and install O-rings over sleeves, one on each side of the shim set. Position shim set over brake housing, aligning oil port sleeves in shim set with oil ports in brake housing.

Lubricate and install O-ring seal around brake housing.

Assemble oil brake and shim set to winch case, carefully aligning oil port sleeves in shim set with oil ports in winch case. Secure with cap screws. Coat threads of cap screws with thread sealant and torque to 85 ft-lbs.

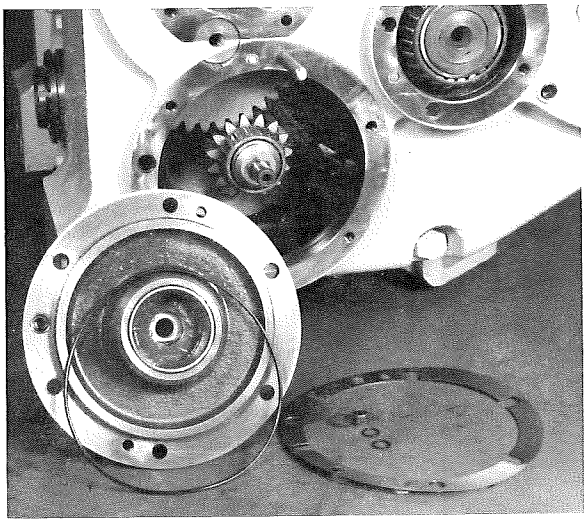


FIGURE 32

Use original shim set or a new shim set of same thickness. Place O-ring sleeve in oil port of shim set, lubricate and install O-rings over sleeve, one on each side of the shim set.

Position shim set over bearing carrier cover, aligning oil port sleeve in shim set with oil port in cover.

Lubricate and install O-ring seal around bearing carrier cover.

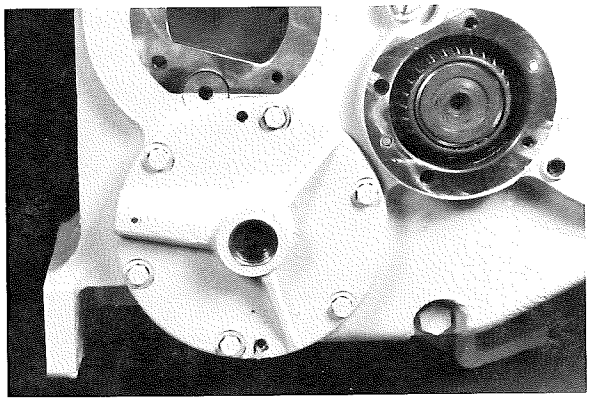


FIGURE 33

Assemble cover to winch case, carefully aligning oil port sleeve in shim set with oil port in winch case. Secure with cap screws. Coat threads of cap screws with thread sealant and torque to 85 ft-lbs.

Set up a dial indicator at the end of the clutch and bevel gear line in the left hand bearing carrier cover.

Move clutch and bevel gear line from side to side. End play should be .005-.010 in.

Remove left hand bearing carrier cover and add or remove shims as required to obtain correct end play.

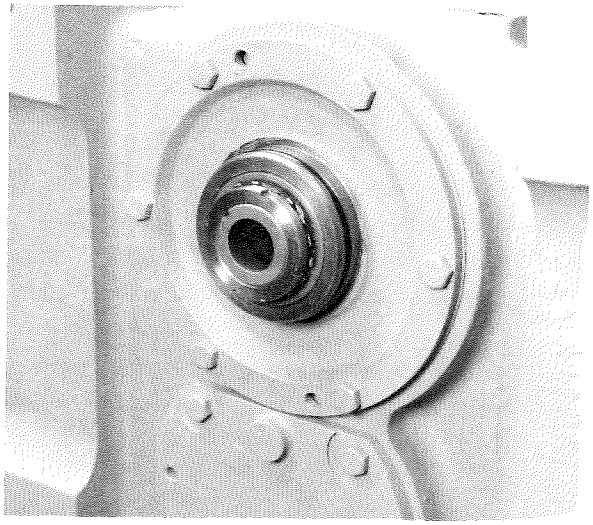


FIGURE 34

Install PTO pinion carrier assembly in the front of the winch with carrier oil trough in the top position. Refer to Bevel Pinion Carrier Assembly, page 15 for installation and procedure for obtaining correct tooth contact pattern.

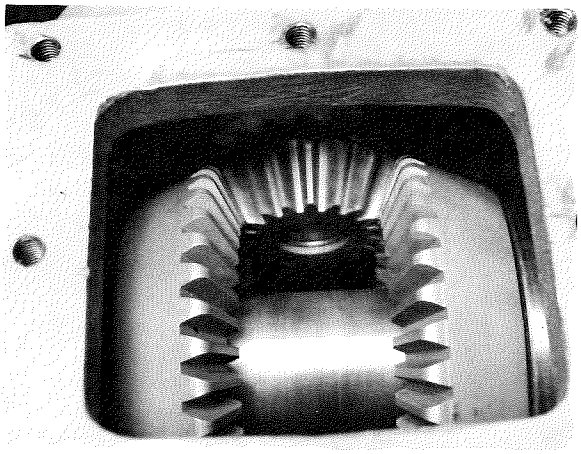


FIGURE 35

With correct tooth contact pattern established, move clutch and bevel gear line to the right. Set up dial indicator on right hand bevel gear and check backlash reading of .004-.012 in.

Move clutch and bevel gear line to the left. Set up dial indicator on left hand bevel gear and check backlash reading of .004-.012 in.

Transfer shims between oil brake and left hand bearing carrier cover to equalize the bevel gear backlash.

If an equalized bevel gear backlash reading between .004-.012 in. is not obtainable, recheck bevel gear and pinion tooth contact pattern and recheck .005-.010 in. end play in clutch and bevel gear line.

Repeat backlash measurements on left hand and right hand bevel gears until an equalized .004-.012 in. reading is obtained.

CLUTCH ASSEMBLY NO. 53129

Removal

Right hand or left hand clutch removal can be accomplished with the winch mounted to the tractor. However, if both clutch assemblies are to be inspected for repair and/or replacement, less winch disassembly is required if the winch is first removed from the tractor.

The PTO pinion carrier assembly is removed from the front of the winch and, after removal of the oil brake assembly, the complete clutch and bevel gear line is removed through the oil brake opening on the right hand side of the winch.

Refer to Clutch Shaft Group 53121, page 16, for removal and disassembly of the clutch and bevel gear line.

Disassembly

Position components on clean surface in the order in which they were removed.

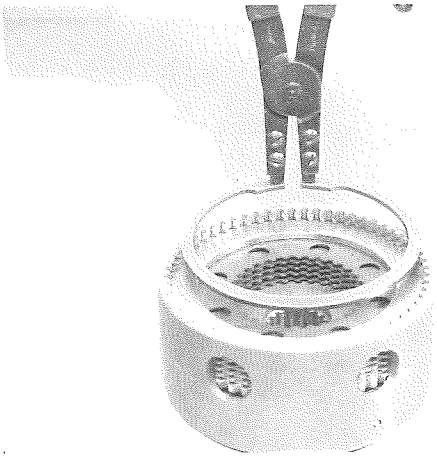


FIGURE 36

Use snap ring pliers and remove pressure plate retaining ring.

Remove pressure plate.

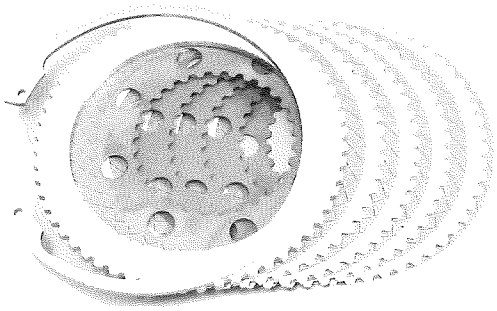


FIGURE 37

Remove clutch friction discs and steel discs, keeping discs in order to maintain established wear pattern. Clutch pack consists of five friction discs and four steel discs. Maximum clutch pack thickness .980", minimum .910".

Inspect friction discs for wear and flatness. Original disc thickness is .138-.144 in. Oil groove depth .015 in. minimum. Replace discs if oil groove is .005 in. or less.

Inspect steel discs for scoring and warpage. Replace as required.

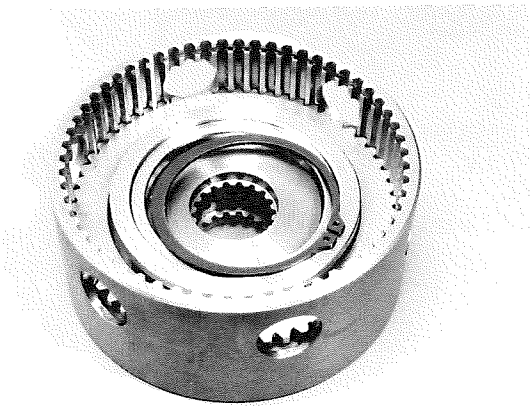


FIGURE 38

Using suitable press, compress spring retainer. Remove retaining ring and clutch spring retainer.

Remove the 8 clutch piston return springs.

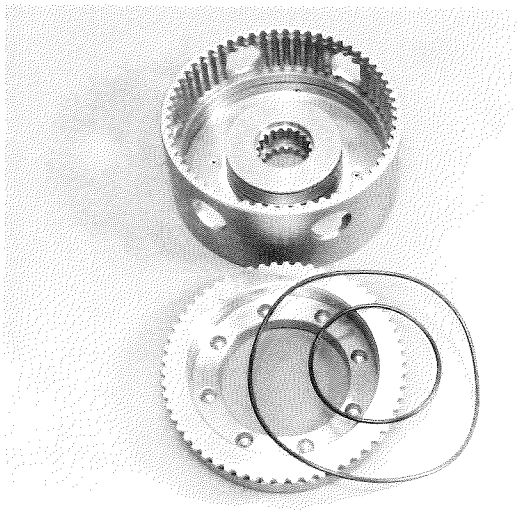


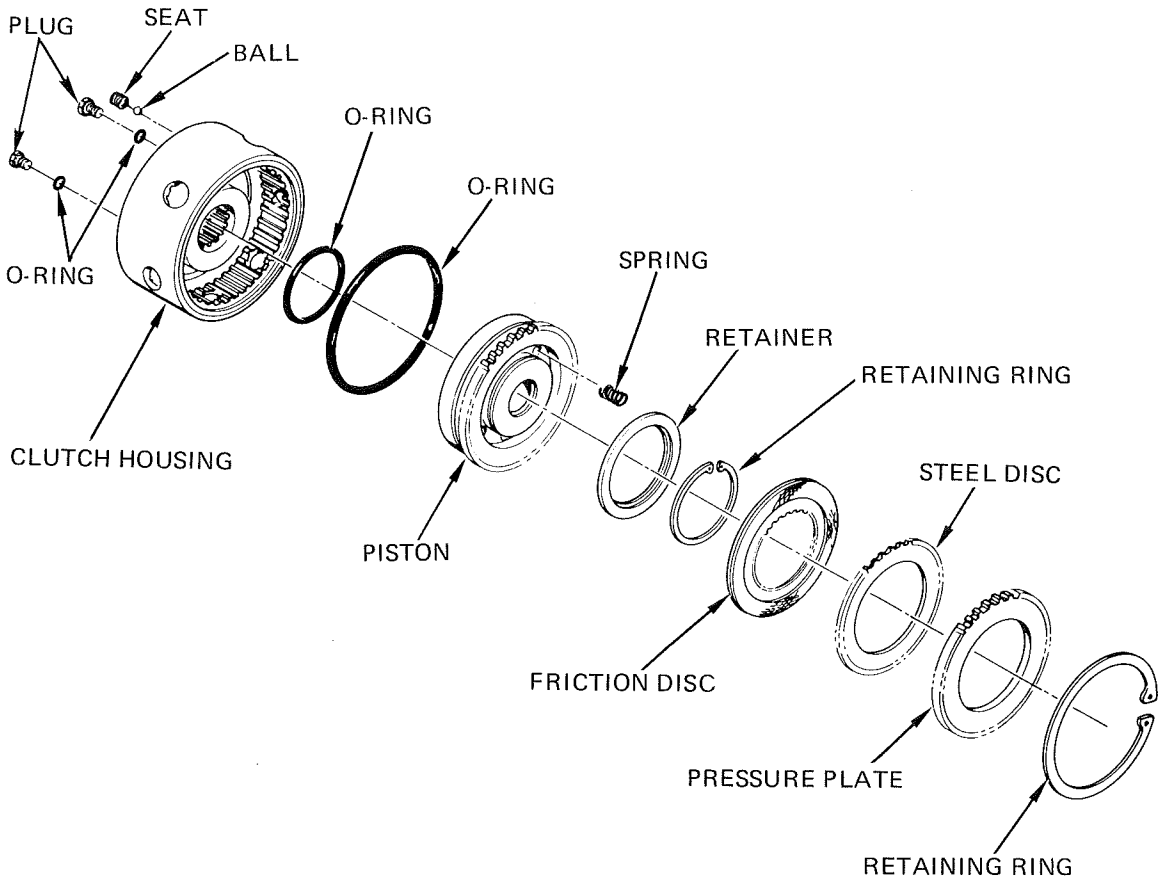
FIGURE 39

Turn clutch housing over and drop on bench top or wooden block to remove clutch piston.

Remove O-ring from inner and outer groove of clutch housing.

Remove valve seat and steel ball from back side of clutch housing. Inspect for wear. Remove foreign material that may restrict steel ball seating action.

Remove (2) flush plugs from back side of clutch housing.



CLUTCH ASSY

FIGURE 40

Assembly

Clean and dry all components prior to assembly.

Install steel ball in back side of clutch housing. Coat threads of valve seat with hydraulic sealant and install flush with surface of clutch housing. Check steel ball to be sure it is free to move.

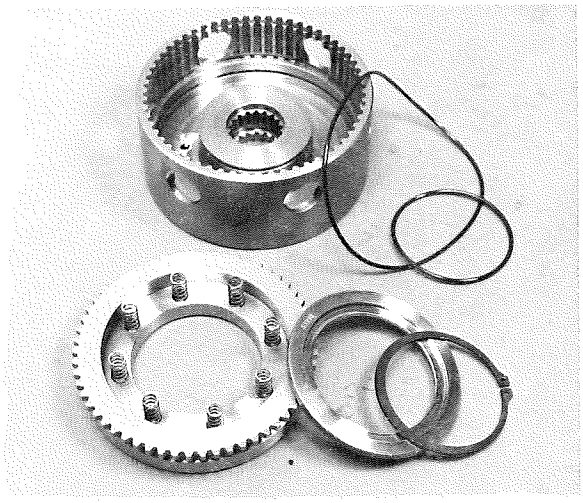


FIGURE 41

Install O-rings in grooves of clutch housing. Lubricate O-rings with hydraulic oil (10W or equivalent).

Lubricate clutch piston sealing surface with hydraulic oil (10W or equivalent).

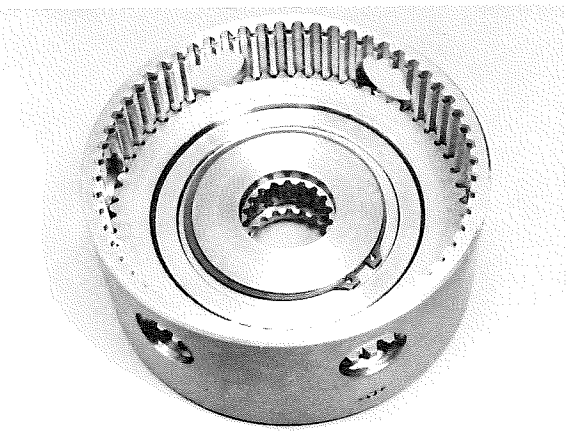


FIGURE 42

Align clutch piston teeth in clutch housing and push piston into bottom of clutch housing.

Install 8 piston return springs into clutch piston.

Install spring retainer over springs.

Use suitable press and compress spring retainer against springs to expose retaining ring groove.

Install retaining ring with sharp edge of inner diameter facing away from springs.

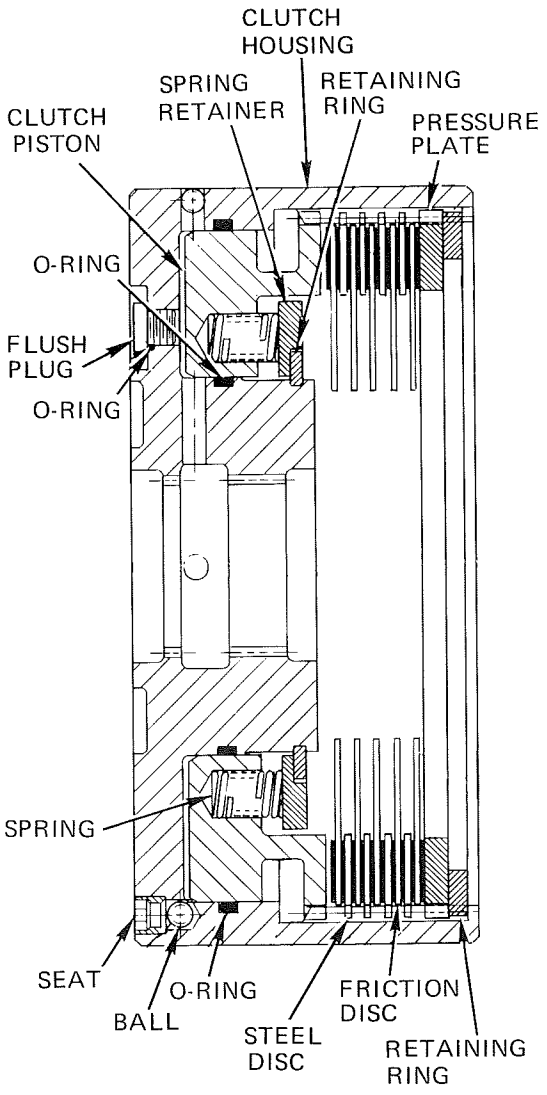


FIGURE 43

If original clutch discs are used, install discs in the same order they were removed.

If new clutch discs are installed, begin with a friction disc (teeth on inside diameter) and alternate with a steel disc (teeth on outer diameter) until a total of 5 friction discs and 4 steel discs are installed.

Align clutch pressure plate and install in clutch housing.

Install pressure plate retaining ring.

NOTE: Assembled clutch should have .100" minimum clutch pack clearance. If clearance exceeds .165", add steel discs (53062) under pressure plate retaining ring to reduce clutch pack clearance.

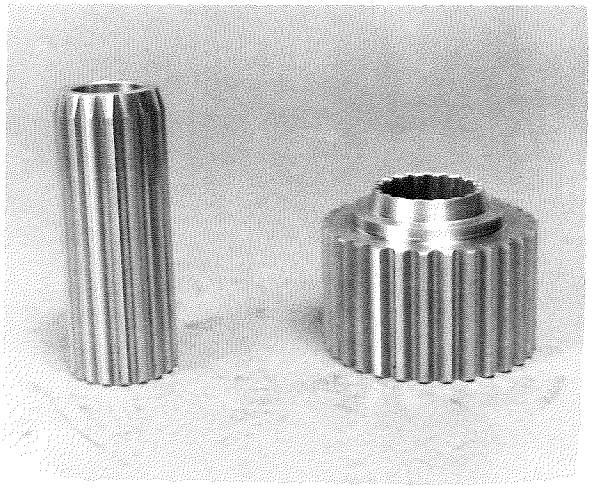


FIGURE 44

To align clutch discs for installation on clutch shaft, remove (2) flush plugs on back side of clutch housing and install two 3/8 x 1 UNF cap screws. Install disc alignment tool and tighten cap screws to push clutch piston against clutch discs, holding discs in aligned position. Remove alignment tool.

If disc alignment tool is not available, the 53014 brake pinion can be used to align the discs.

IMPORTANT: After clutch installation on clutch shaft, be sure to remove the (2) 3/8 x 1 UNF cap screws from back side of clutch housing and install flush plugs.

OIL BRAKE ASSEMBLY NO. 53130

The brake system in a CARCO Model 50 winch is a multi disc spring-applied hydraulically-released oil brake. Under proper operation, no periodic brake adjustment is required.

IMPORTANT: The oil brake can be used to lower a load. Partially releasing the brake and lowering the load through the brake causes excessive heat build-up after repeated cycles. Allow the brake to cool between lowering cycles to avoid overheating and brake damage. Lowering of loads should be accomplished by moving the Powershift lever rapidly through BRAKE-OFF to the REVERSE (Pay-Out) position, completely engaging the reverse clutch and using the tractor throttle to vary the lowering speed.

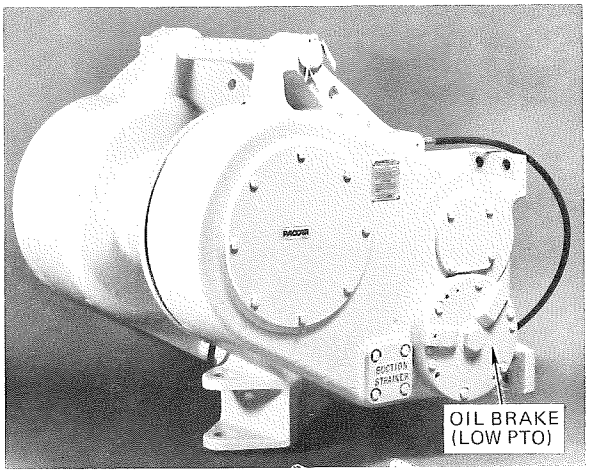


FIGURE 45

The oil brake is located on the right hand side of the winch in the lower winch case bore on a LOW PTO and upper winch case bore on a STD. PTO.

The oil brake assembly can be removed with the winch mounted on the tractor.

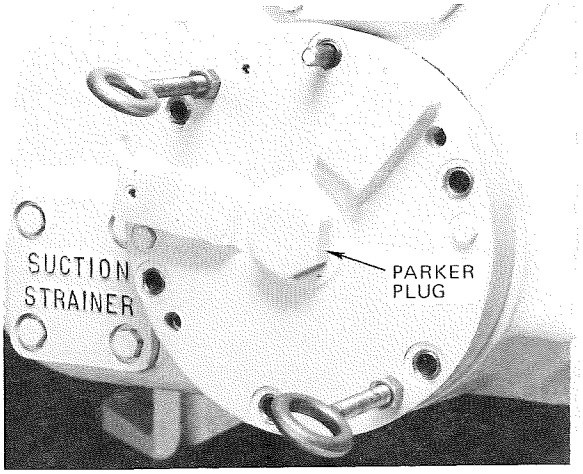


FIGURE 46

Drain oil from winch. Remove PARKER plug and spring from center of brake housing cover.

Remove (6) cap screws securing brake assembly to winch case. Do not remove (2) cap screws securing bearing carrier cover to brake housing at this time.

Thread eyebolts or other means of support into brake cover to aid in removal of the brake assembly.

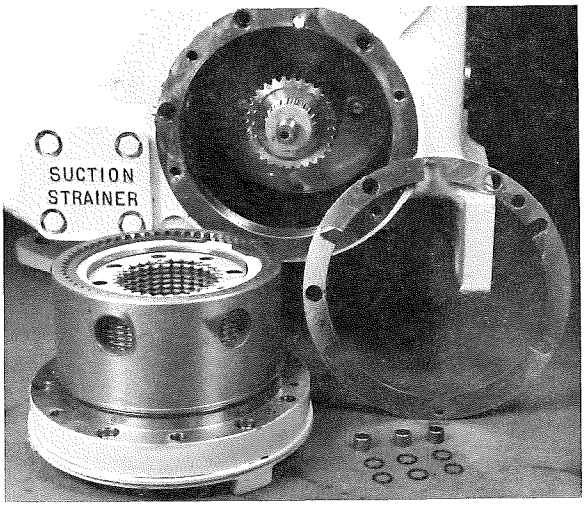


FIGURE 47

Use pry bar between brake housing and winch case to free brake assembly from winch case. Be careful not to damage shim set.

Remove complete oil brake assembly. Retain shim set and oil port sleeves for reassembly.

Disassembly

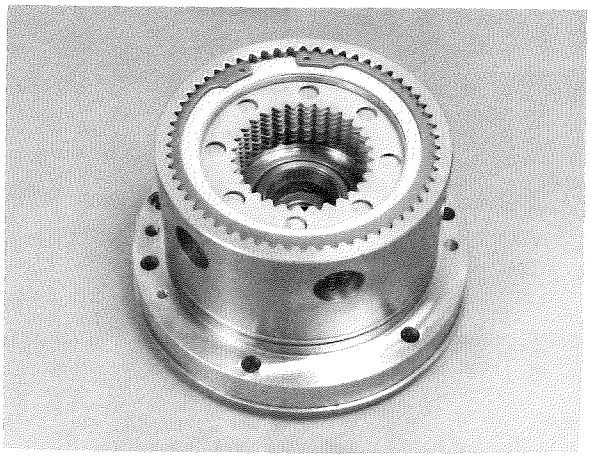


FIGURE 48

Support brake assembly in hydraulic press.

Apply pressure on outer pressure plate to compress spring discs.

Remove retaining ring and slowly release hydraulic pressure.

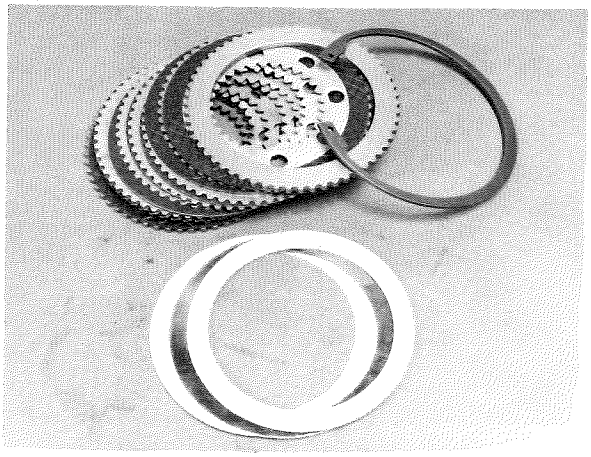


FIGURE 49

Remove shim set and pressure plate. Retain shim set for use in reassembly.

Remove friction discs and steel discs, keeping discs in order during removal.

Inspect friction discs for wear. Original friction disc thickness is .138-.148 in. If oil grooves are worn off friction discs, replace when brake is reassembled.

Steel disc original thickness is .055-.065 in. Flatness should be within .010 in.

Remove inner pressure plate.

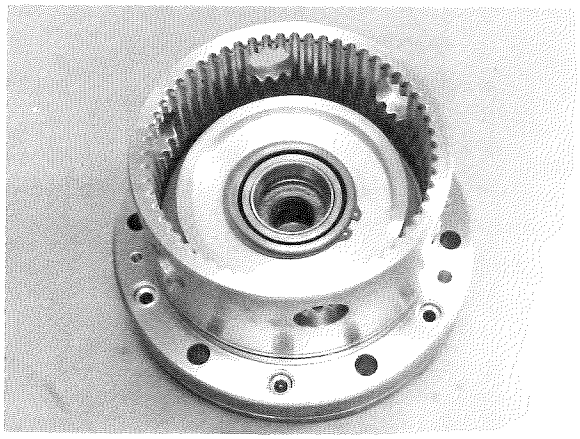


FIGURE 50

Use hydraulic press on spring retainer, compressing spring discs.

Remove retaining ring and slowly release hydraulic pressure.

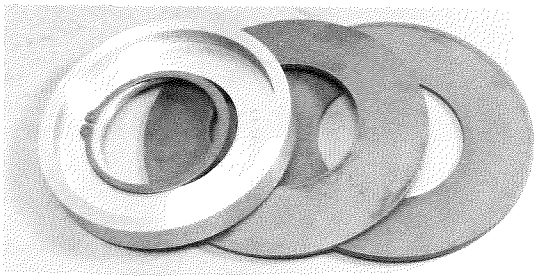


FIGURE 51

Remove spring retainer and (2) spring discs from brake housing.

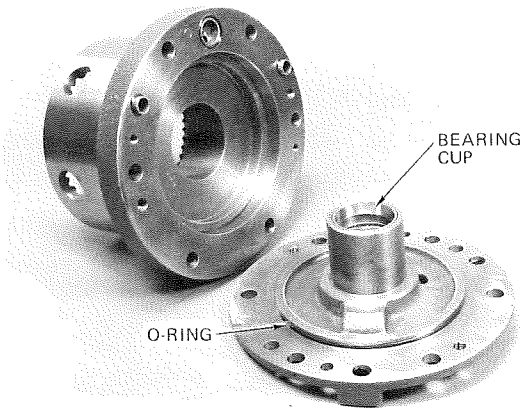


FIGURE 52

Remove (2) 3/8 x 1 UNC cap screws securing bearing carrier cover to brake housing and remove cover.

Inspect bearing cup in cover and remove if required.

Remove rotary seal and O-ring, back-up washer and retaining ring from inside the cover.

Remove O-ring from groove in cover.

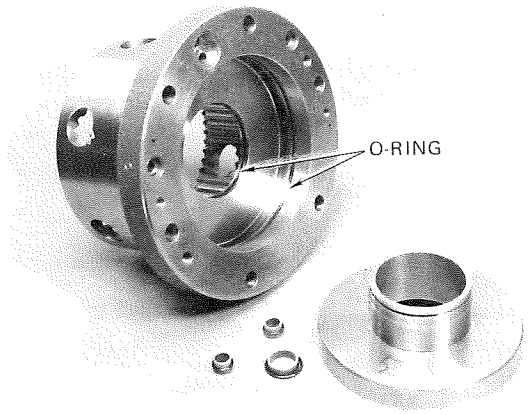
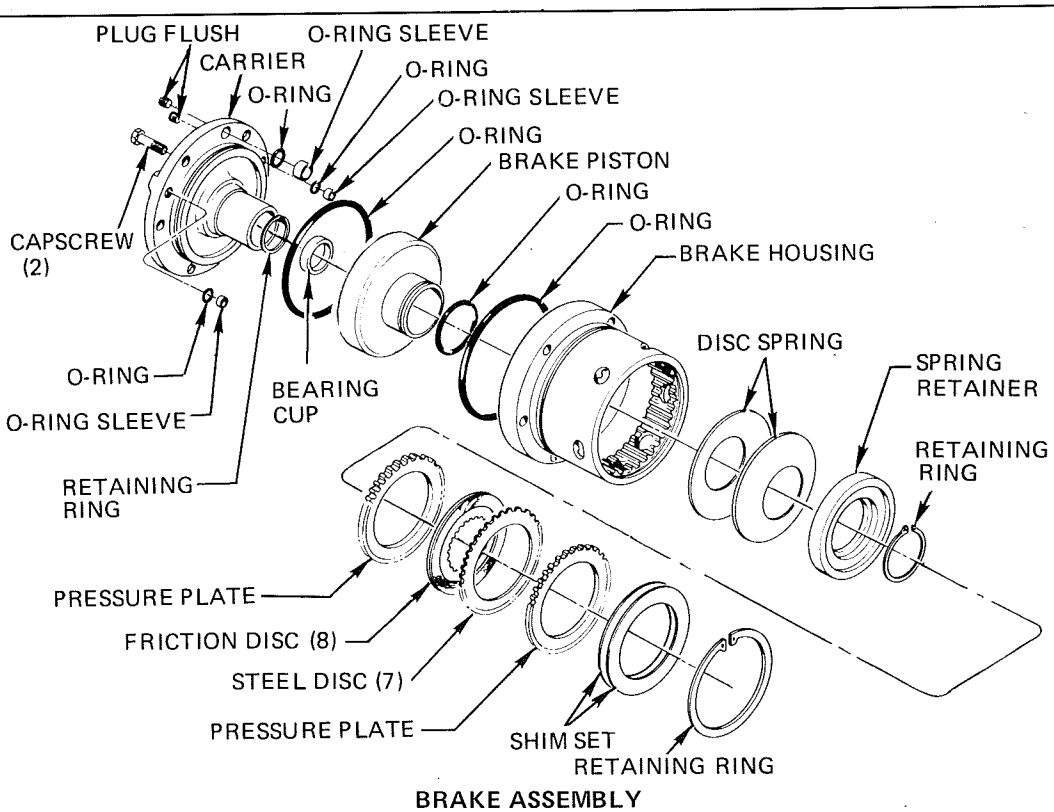


FIGURE 53

Remove O-rings and sleeves from brake housing. Push brake piston free of brake housing.

Remove O-rings from inner grooves of brake housing.



BRAKE ASSEMBLY

FIGURE 54

Assembly

Thoroughly clean and carefully inspect all components for wear or damage prior to reassembly. Replace components as required.

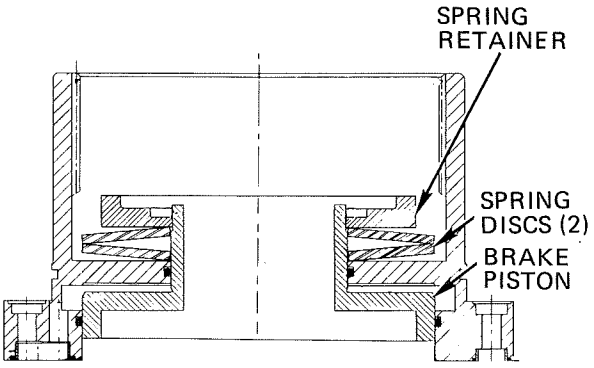


FIGURE 55

Install brake piston sealing O-rings in inner grooves of brake housing. Lubricate O-rings after installation with 10W hydraulic oil or equivalent.

Lubricate brake piston O-ring sealing surfaces and install brake piston into brake housing until fully seated.

Position brake housing with disc pack end of housing facing up. Place spring discs in brake housing over brake piston hub with dished side of spring discs facing each other.

Install spring disc retainer over brake piston hub with flat surface of spring retainer against spring discs.

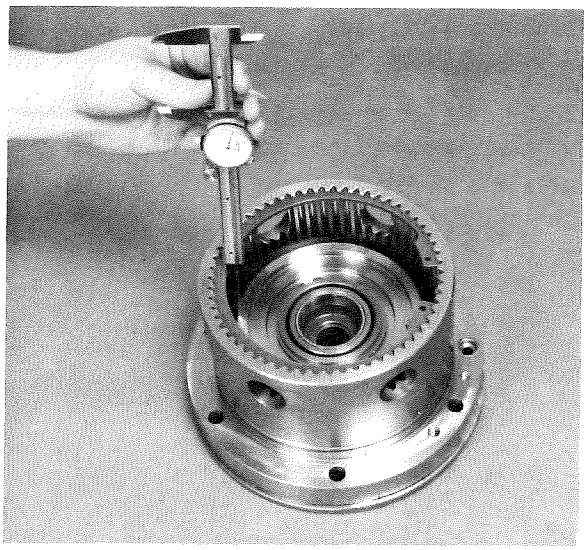


FIGURE 56

Install brake pack retaining ring in groove of brake housing.

Measure distance "A", the distance from the top edge of spring retainer to the top of the retaining ring and record.

Remove retaining ring.

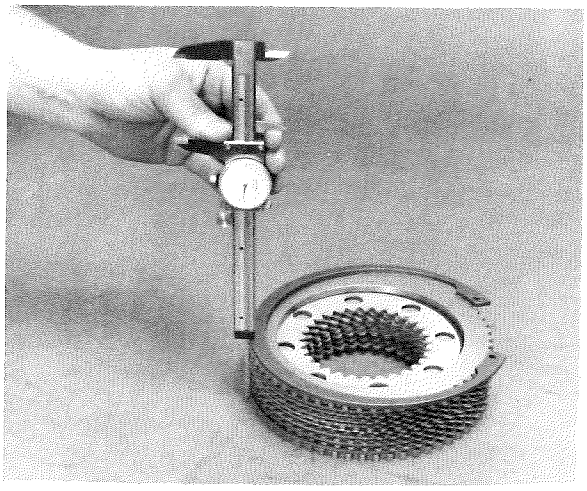


FIGURE 57

Stack retaining ring, pressure plates and disc pack and measure distance "B", the thickness of the stack and record.

The preceding "A" and "B" measurements are taken to determine a shim pack thickness (S) that is used to establish an assembled spring disc deflection of .306 in.

The shim pack is determined as follows:

IF DISTANCE "A" is *greater* than distance "B":

Shim pack (S) = (distance "A" – distance "B") + .306 in.

IF DISTANCE "A" is *less* than distance "B":

Shim pack (S) = .306 in. – (distance "B" – distance "A").

Shim Pack (S) required consists of shim set, P/N 53708 and one or more additional steel discs, P/N 53062 as required. Place shim pack (S) between top pressure plate and outer retaining ring.

Place brake housing in suitable hydraulic press and press disc spring retainer down until retaining ring groove in brake piston hub is exposed. Install retaining ring with sharp edge of inner diameter facing out. Make sure retaining ring is fully seated in groove. Release hydraulic pressure *slowly*.

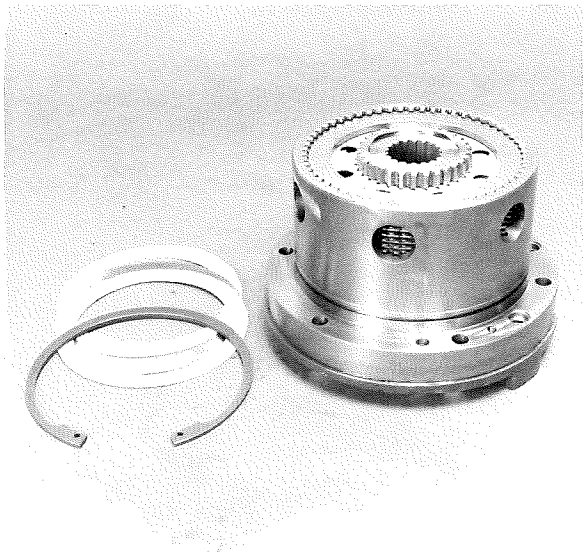


FIGURE 58

Install inner pressure plate into brake housing.

Install disc alignment tool. If alignment tool is not available, brake hub P/N 53014 can be used to keep discs aligned.

If original brake disc pack is used, install discs in the same order in which they were removed.

If new brake discs are to be installed, start with a friction disc (teeth on inside diameter) and alternate with a steel disc (teeth on outside diameter) until a total of 8 friction discs and 7 steel discs have been installed.

Install outer pressure plate. Install established shim pack (S) on top of outer pressure plate.

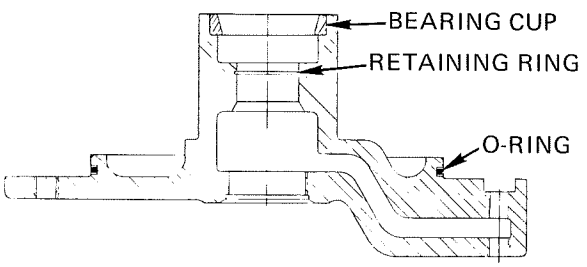
Support brake housing assembly in suitable hydraulic press and compress brake disc pack and spring discs until retaining ring groove is exposed. Install retaining ring and fully seat in groove. Release hydraulic pressure slowly.

Remove disc alignment tool or brake hub.

Position brake housing assembly with large diameter end facing up.

Install large sleeve into brake release pressure port in brake housing. Lubricate and install O-ring in groove around sleeve.

Install two small sleeves in clutch supply port and brake flush supply port in brake housing. Lubricate and install O-rings in counterbore around sleeves.



BRAKE COVER

FIGURE 59

Install rotary seal retaining ring into groove in bearing carrier cover.

If bearing cup was removed, install bearing cup into bearing carrier cover.

Lubricate and install O-ring in groove on bearing carrier cover.

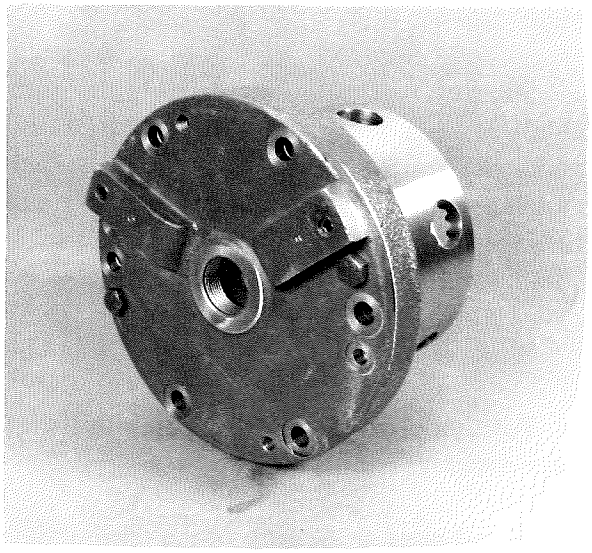


FIGURE 60

Install bearing carrier cover on brake housing, aligning oil port sleeves between the two housings. Install two 3/8 x 1 UNC cap screws and torque to 30 ft-lbs.

Lubricate and install O-ring in groove in outer diameter of brake housing.

Installation

Refer to Clutch Shaft Group for installation, page 16.

Install oil port sleeves in shim set, lubricate and install O-rings over sleeves on each side of shim set.

Install brake assembly in winch case, aligning oil port sleeves between oil ports of winch case and brake assembly.

Install cap screws securing oil brake to winch case. Coat threads of cap screws with thread sealant and torque to 85 ft-lbs.

Install rotary seal back-up washer. Lubricate rotary seal and O-ring and install.

Install PARKER plug and spring.

FREE SPOOL GROUP NO. 53126

The free spool components are located on the left hand side of the winch. Removal of the components can be accomplished with the winch mounted to the tractor.

Removal

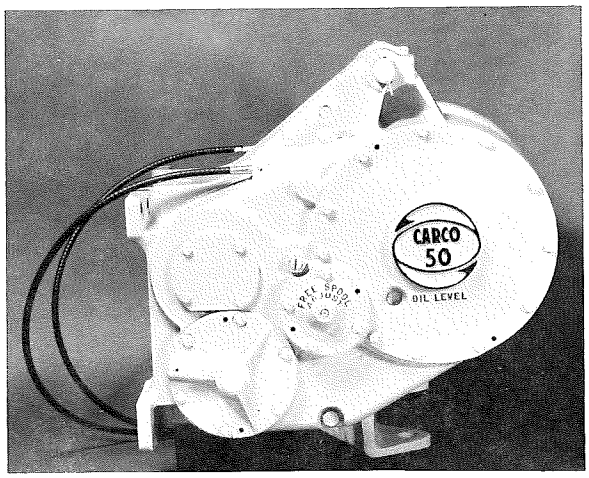


FIGURE 61

Drain oil from winch.

Remove (4) cap screws securing free spool bearing retainer to winch case. Use 2 cap screws as jackscrews and remove bearing retainer. Note location of longer cap screws for reassembly.

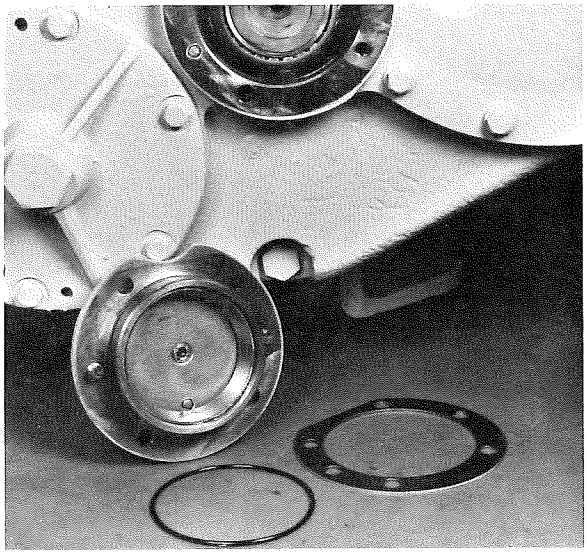


FIGURE 62

Remove O-ring and shim set from bearing retainer. Retain shim set for reassembly.

Inspect bearing cup and replace as required.

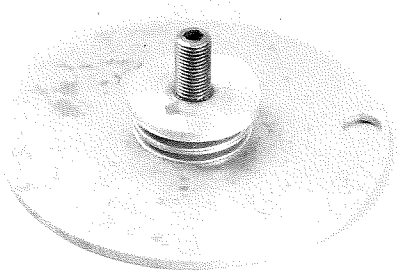


FIGURE 63

To remove the free spool retarder assembly, remove bearing cup from retainer, remove flush plug from outer side of retainer. Use 1/4" Allen wrench and turn retainer assembly clockwise until free of retainer.

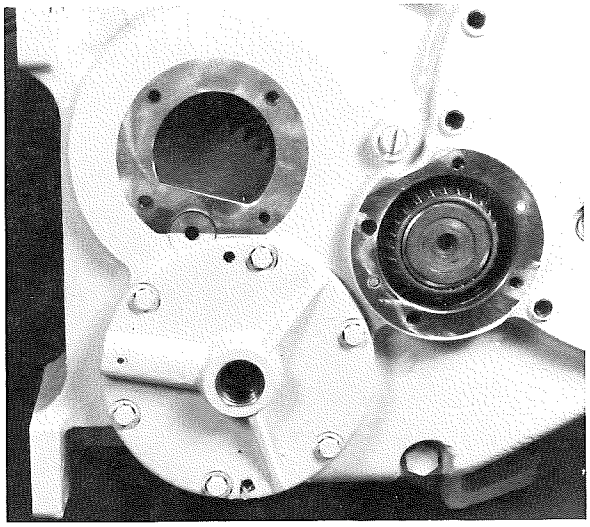


FIGURE 64

Remove left hand access cover.

Remove PARKER plug and spring from clutch shaft bearing carrier cover and remove cover. Retain shim set and oil port sleeve for reassembly.

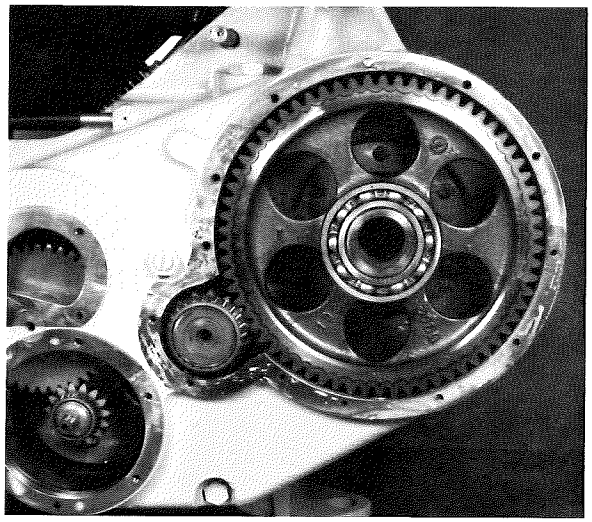


FIGURE 65

Remove cap screws from large diameter bearing carrier cover and remove cover. Use Pry Bar between cover and winch case to unseat cable drum shaft ball bearing from cover.

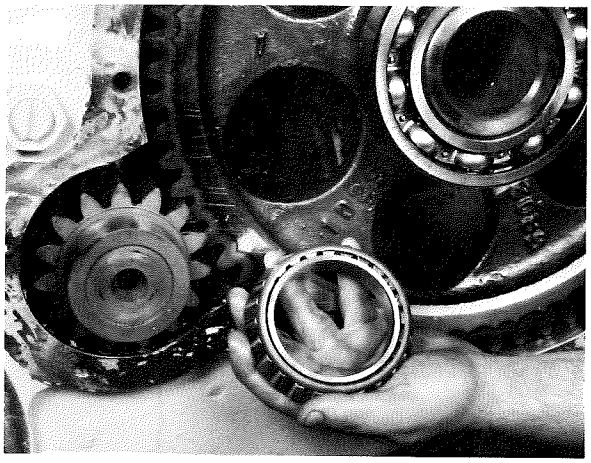


FIGURE 66

Remove bearing cone from end of second reduction pinion to allow cable drum gear and shaft assembly to be removed without interfering with bearing cone.

NOTE: By loosening shift rail jam nut, partially removing shift rail from winch case and turning second reduction gear and pinion assembly sideways, enough clearance may be obtained to remove cable drum gear without removal of bearing cone.

Refer to Cable Drum Group, page 16. Support cable drum gear and shaft assembly and remove from winch case.

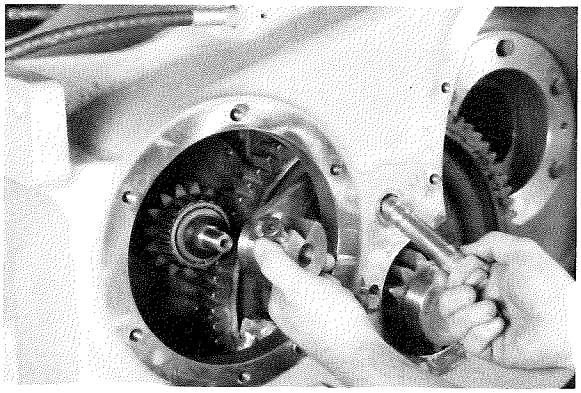


FIGURE 67

Loosen jam nut securing shift rail in winch case. Turn shift rail counterclockwise until threads are free of winch case. Remove shift rail and shift collar and yoke assembly.

Inspect shift yoke for wear and replace as required. Insert shift rail into shift collar and determine detent positions on shift rail.

Replace ball plunger in shift collar if detent is absent or appears weak.

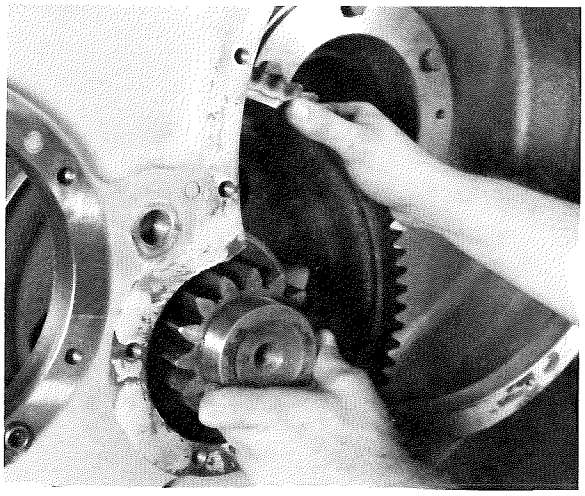


FIGURE 68

Move gear and pinion assembly outward to unseat bearing cone from bearing cup in winch case.

Carefully move gear and pinion assembly into cable drum gear opening and remove from winch case.

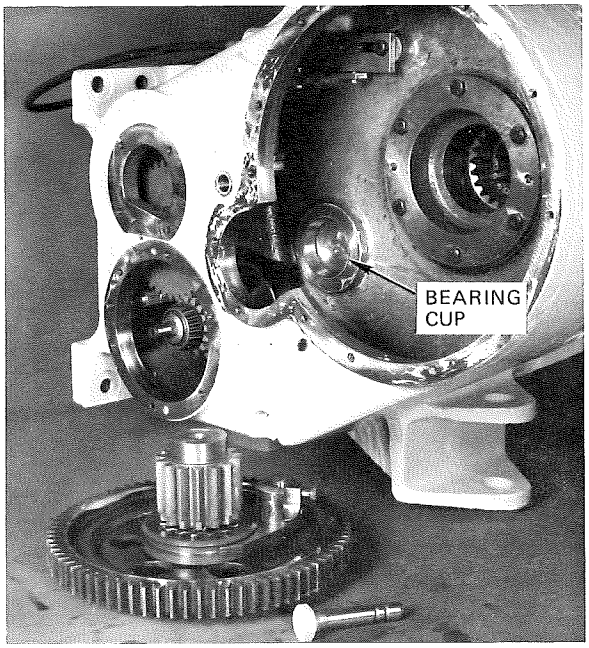


FIGURE 69

Inspect bearing cup in winch case and replace as required.

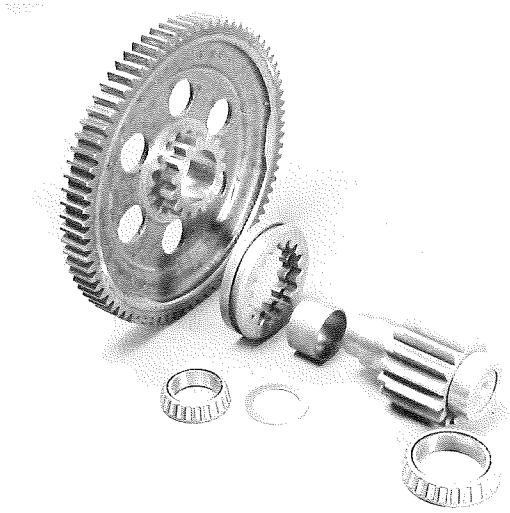


FIGURE 70

Support first reduction gear in suitable hydraulic press and press second reduction pinion free of inner bearing cone.

Inspect bearing cone and thrust washer for wear or damage and replace as required.

Inspect free spool coupling.

Inspect free spool floating bushing. Bushing should slide freely into first reduction gear and slip freely over second reduction pinion.

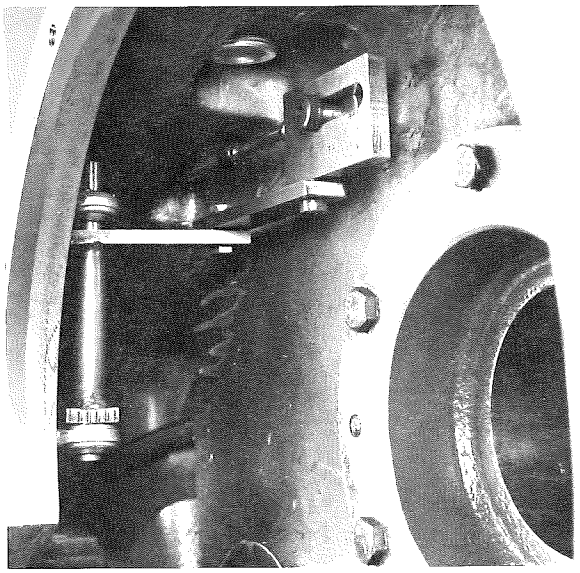
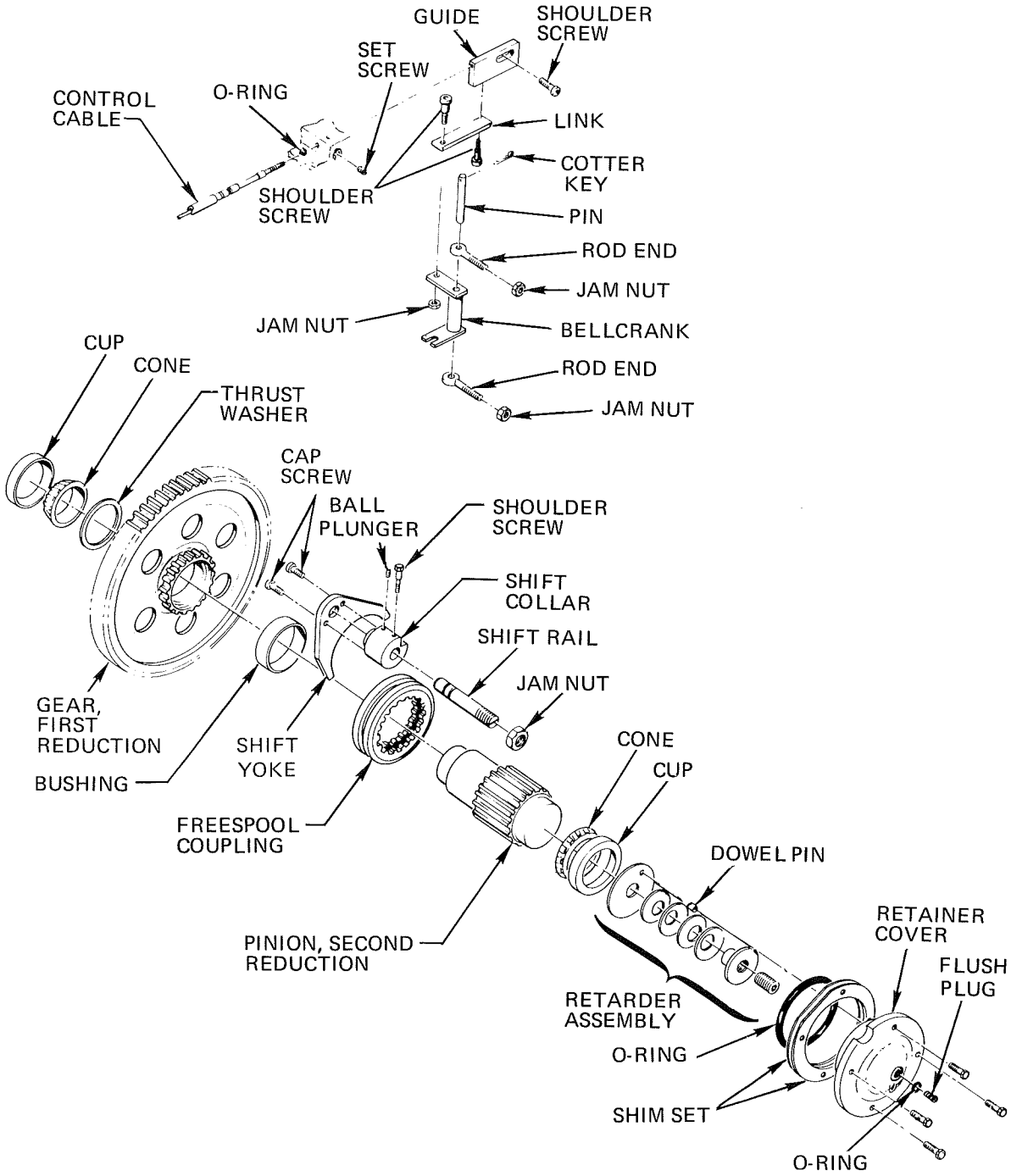


FIGURE 71

Operate remaining free spool linkage within winch case. Check for wear or loose components.

Unscrew free spool control cable core from free spool guide.

Remove control cable and inspect condition of cable and O-ring seal. Replace as required.



FREE SPOOL GROUP

FIGURE 72

Assembly

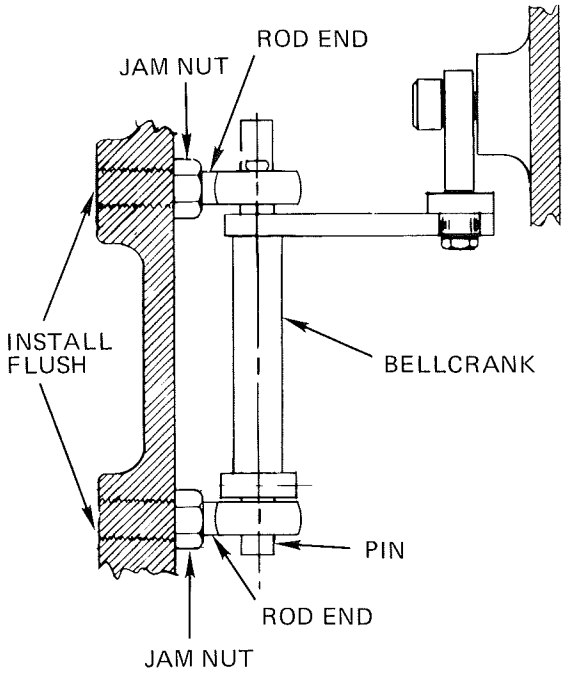


FIGURE 73

If free spool shift linkage was removed from winch case, install linkage as follows:

Install hex jam nuts on rod ends. Apply non-hardening thread sealant to rod ends and install in winch case, locating ends flush with machined surface of winch case.

Position bellcrank between rod ends and insert pin through rod ends and bellcrank. Install cotter pin. Tighten rod end jam nuts.

Attach control cable guide to inner winch case wall with shoulder screw. Coat threads of shoulder screw with LOCTITE 242 or equivalent.

Attach link to control cable guide with shoulder screw. Coat threads of shoulder screw with LOCTITE 242 or equivalent. Position end of link on top of bellcrank arm. Secure in place with shoulder screw and hex jam nut. Coat threads of shoulder screw with LOCTITE 242 or equivalent.

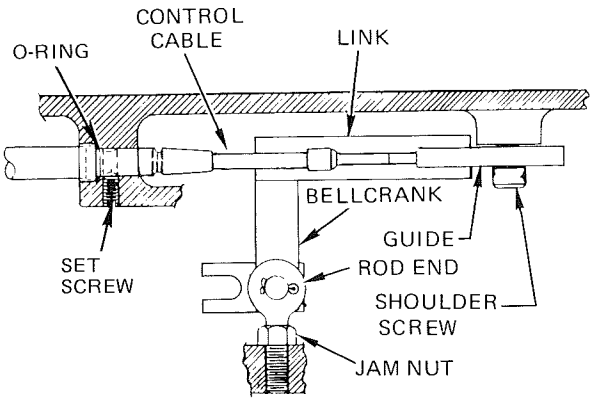


FIGURE 74

Lubricate and install O-ring on shoulder of control cable. Install control cable in winch case and secure with set screw. Rotate outer end of control cable core clockwise and install cable core in free spool shift guide. Operate control cable at outer end and check operation of free spool shift linkage.

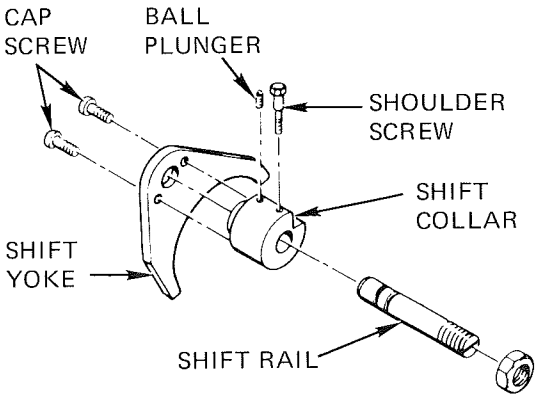


FIGURE 75

Attach shift yoke to shift collar with (2) 3/8 x 3/4 UNC cap screws and torque to 35 ft-lbs.

Install shoulder screw in shift collar. Coat threads of shoulder screw with LOCTITE 242 or equivalent.

Coat threads of ball plunger with LOC-TITE 242 or equivalent and install in shift collar. Insert shift rail into shift collar and tighten ball plunger until shift rail will not rotate. Back-out ball plunger 1/16 turn or until shift rail can be rotated by hand. Check for ball plunger detent in both grooves of shift rail. Remove shift rail.

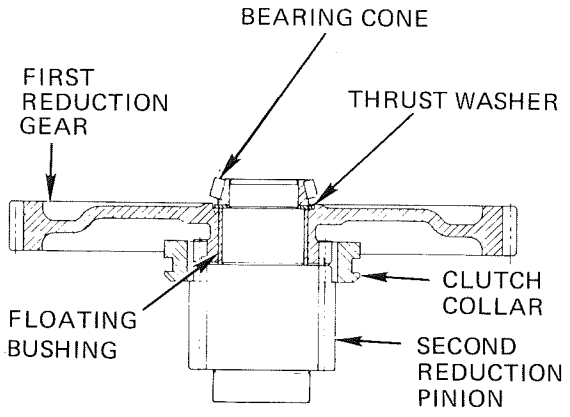


FIGURE 76

Position second reduction pinion on flat surface with small diameter end facing up.

Lubricate floating bushing and mating surface of pinion with 10W hydraulic oil or equivalent and install bushing over pinion.

Install free spool clutch collar over pinion teeth with beveled side of collar facing down.

Lubricate outside diameter of floating bushing and bore of first reduction gear with 10W hydraulic oil or equivalent. Install gear over bushing and pinion, aligning gear teeth with free spool clutch collar teeth.

Install thrust washer over pinion and into recess of first reduction gear.

Lubricate and install bearing cone over end of pinion. Press bearing cone until firmly seated against thrust washer.

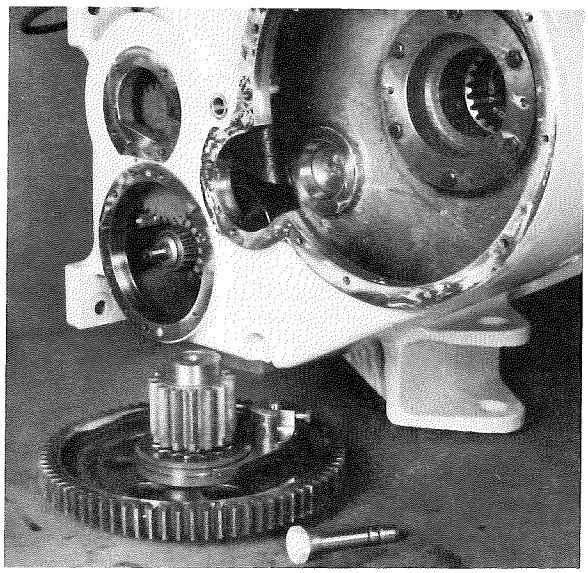


FIGURE 77

Lubricate and install bearing cup in inner wall of winch case.

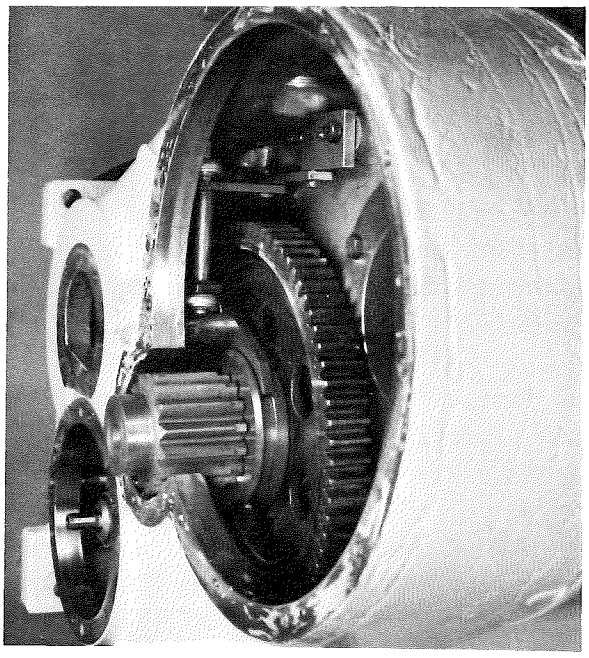


FIGURE 78

Place first reduction gear and second reduction pinion assembly into winch case opening, aligning bearing cone within bearing cup.

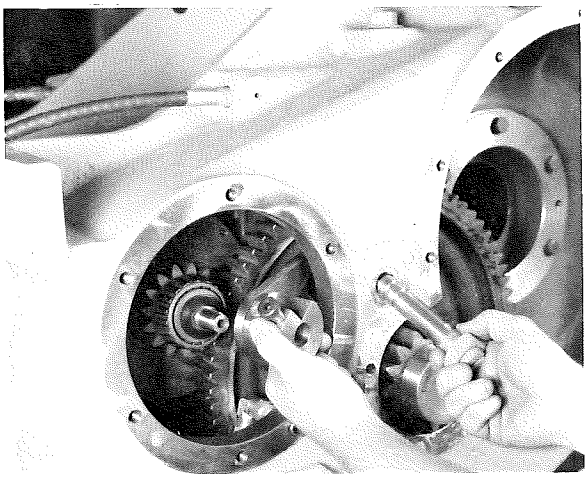


FIGURE 79

Install shift yoke and shift collar assembly in winch case, placing shift yoke in groove of clutch collar and shift collar shoulder screw in slot of free spool shift linkage. At the same time insert shift rail through outer case wall and into shift collar. Apply Silastic Sealant No. 732 RTV or equivalent to shift rail threads and thread shift rail clockwise until approximately one-half of the threads remain exposed.

NOTE: Final free spool shift adjustment is to be made after assembly of remaining components.

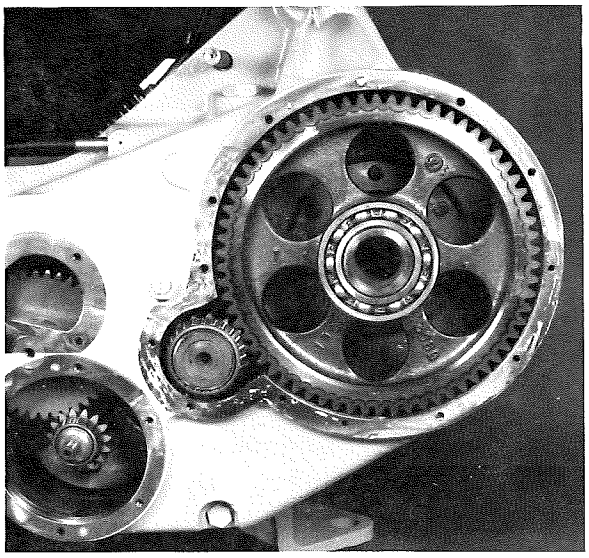


FIGURE 80

Use suitable lifting device and install cable drum gear and shaft assembly in winch case. Lubricate splines of cable drum shaft with multi-purpose grease or equivalent and seat against retaining ring in cable drum bore.

Install outer bearing cone on end of second reduction pinion. Lubricate bearing with 10W hydraulic oil or equivalent and seat securely against pinion shoulder.

Apply Silastic Sealant No. 732 RTV or equivalent to sealing surface of large diameter bearing carrier cover and install to winch case. Apply thread sealant to cap screws and install. DO NOT torque cap screws at this time.

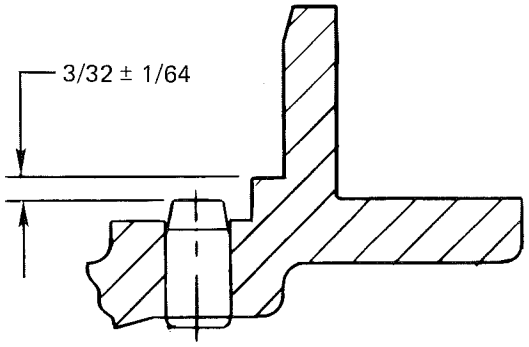


FIGURE 81

Check dowel pin installation distance in "Free Spool Adjust" bearing retainer cover. Distance should be 3/32 in. from bearing cup shoulder seat to the top of the dowel pin.

Dowel pin is used as a stop to prevent the retarder assembly from rotating with the second reduction pinion as the winch is operated.

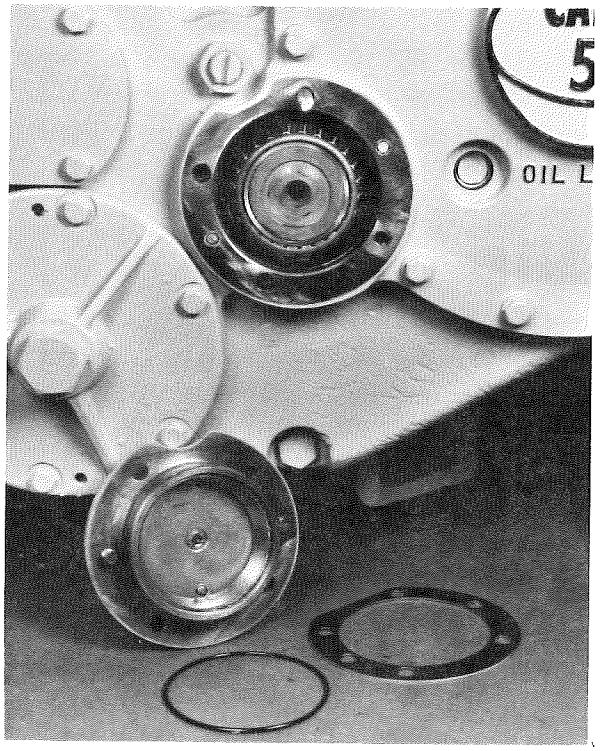


FIGURE 82

Install retarder assembly in bearing retainer cover. Use 1/4 inch Allen wrench and turn retarder assembly counterclockwise until fully installed. Be sure dowel pin in retainer cover is aligned with hole in retarder assembly.

Lubricate and install O-ring in groove of retainer cover.

Use shim set removed during disassembly and install bearing retainer cover and shim set to winch case. Apply thread sealant to cap screws and torque to 80 ft-lbs.

Torque remaining cap screws around large bearing carrier cover to 80 ft-lbs.

NOTE: The shim set behind the bearing retainer cover is used to establish a .000-.005" end play in the free spool group.

If original shim set is lost or destroyed, install bearing retainer cover without shims or O-ring. Moderately tighten cap screws. Use feeler gauge and measure distance between retainer cover and winch case. Add shims to this measurement to arrive at .000-.005 in. end play. Remove retainer cover and install new shim set and O-ring.

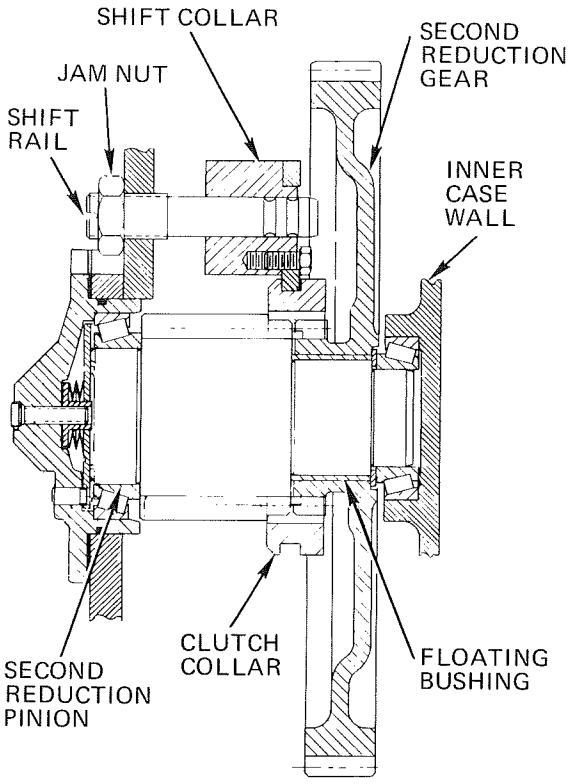


FIGURE 83

Final free spool adjustment procedure:

Position shift collar on shift rail so ball plunger is engaged in detent groove at end of shift rail. Rotate shift rail until shift collar clears end of teeth on second reduction pinion. Lock shift rail in position with jam nut.

FREE SPOOL DRAG ADJUSTMENT

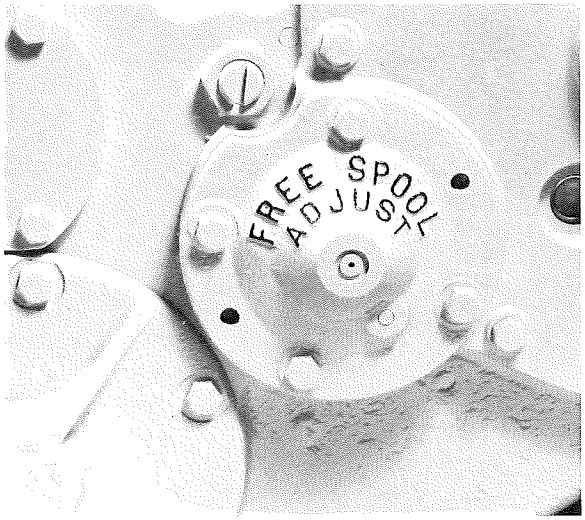


FIGURE 84

The CARCO Model 50 is equipped with a drag-adjustable free spool to control cable drum overrun and eliminate "birdnesting."

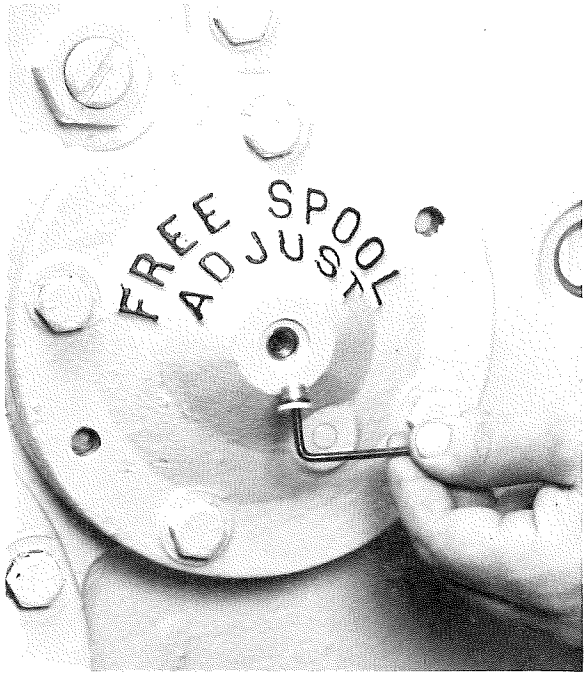


FIGURE 85

To adjust the free spool drag, first use a 1/8" Allen wrench and remove flush plug from the free spool adjust cover.

FIGURE 86

With a 1/4" Allen wrench, adjust the free spool retarder assembly clockwise to increase free spool cable drum drag and counterclockwise to decrease free spool cable drum drag.

When suitable cable drum drag is obtained, install and tighten flush plug.

CABLE DRUM GROUP NO. 53127

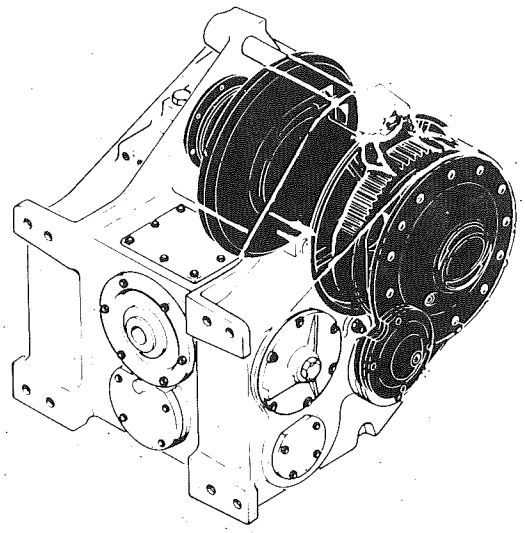


FIGURE 87

Disassembly

Drain oil from winch.

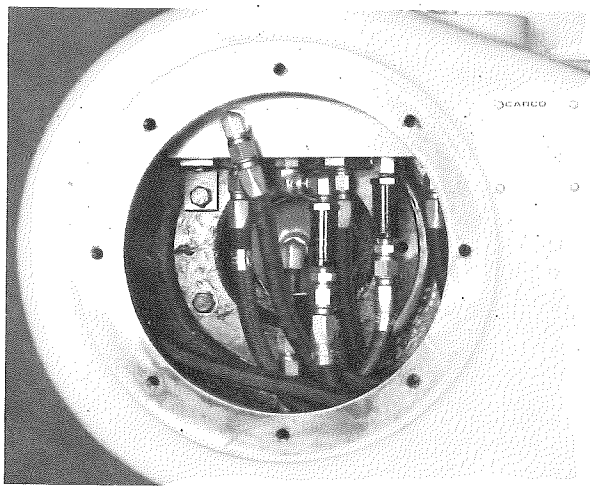


FIGURE 88

Remove right hand cover. Remove oil lines to control valve. Mark oil line location for reassembly. Remove control cable. Remove (2) cap screws securing control valve to winch case and remove control valve.

NOTE: The brake flush oil line is attached to the top of the control valve. The oil line cannot be disconnected while the control valve is in position. As the control valve is lowered for removal, the oil line can be removed.

Remove (1) cap screw securing accumulator assembly to winch and remove accumulator.

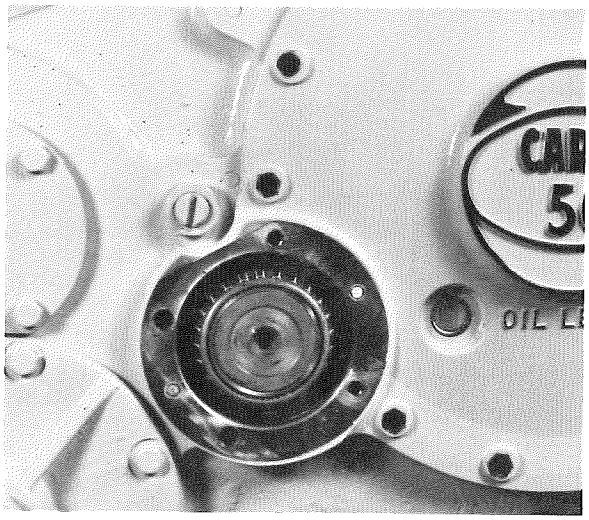


FIGURE 89

Remove free spool drag adjustment cover.

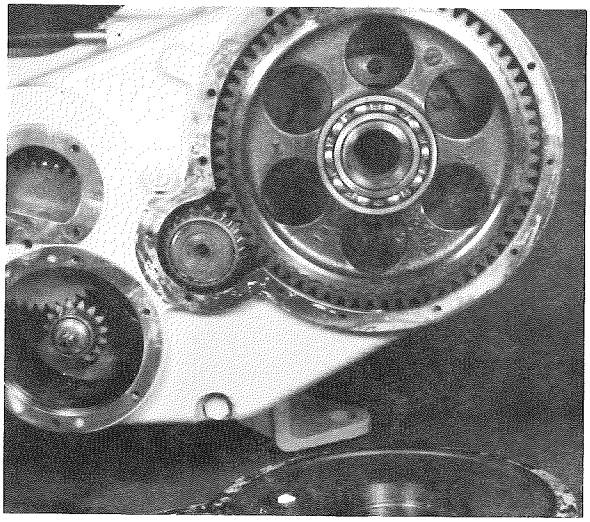


FIGURE 90

Remove large bearing carrier cover. Use Pry Bar between cover and winch case to unseat ball bearing from carrier cover.

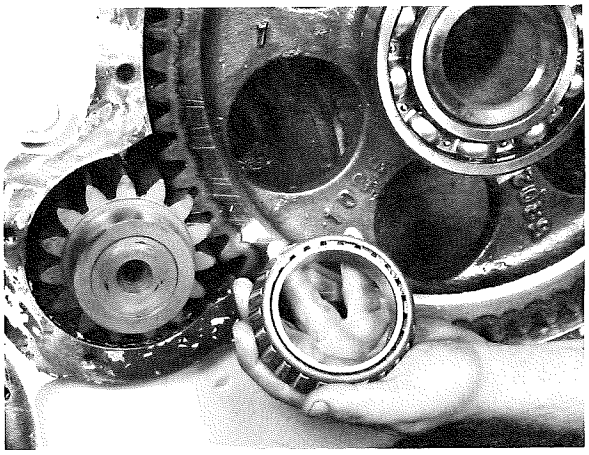


FIGURE 91

Remove bearing cone from idler shaft. This allows cable drum gear to be removed without interfering with bearing cage.

FIGURE 92

Remove cable drum gear and shaft assembly.

CAUTION: Use extreme care during removal. Assembly is heavy and should be supported.

Remove inside retaining ring from drum shaft and remove drum shaft through cable drum gear.

Press ball bearing from drum shaft.

Remove remaining retaining ring from drum shaft.

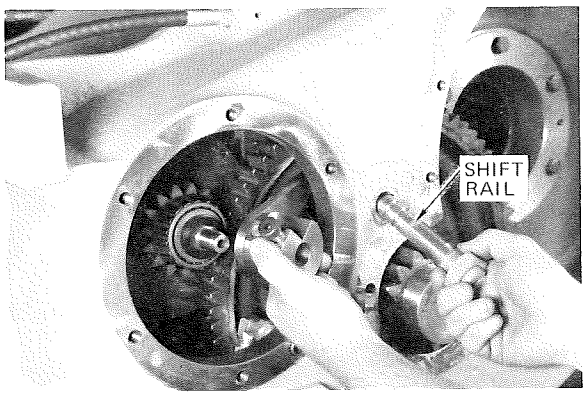


FIGURE 93

Loosen jam nut on shift rail.

Remove shift rail and shift collar and yoke assembly.

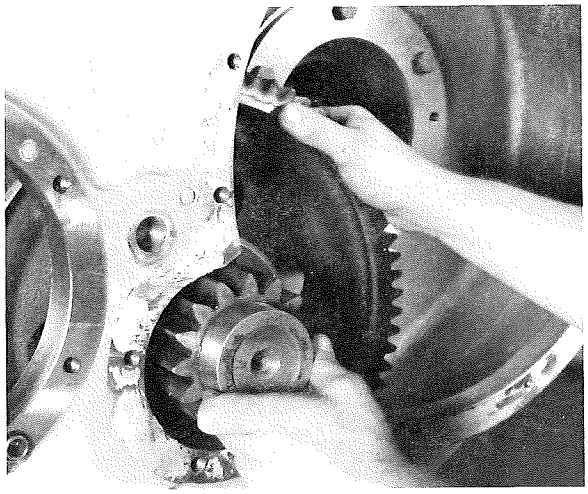


FIGURE 94

Unseat bearing cone on idler shaft and gear assembly from bearing cup located on inner case wall.

Move idler shaft and gear assembly into cable drum gear opening and remove assembly from winch.

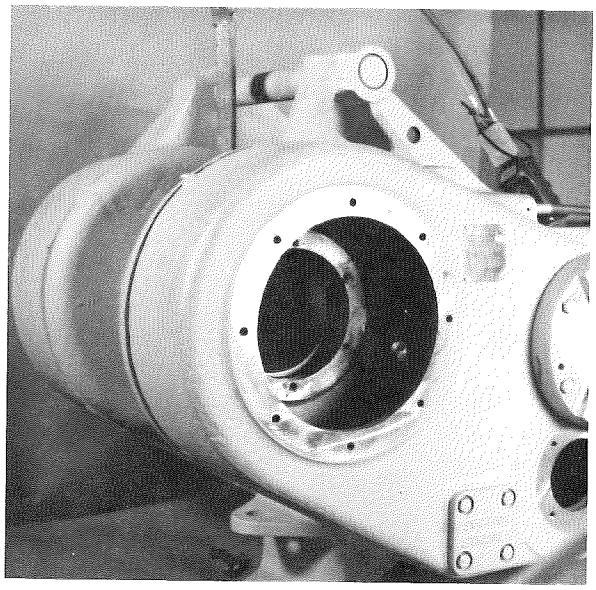


FIGURE 95

Support cable drum. Cable drum will balance at approximately mid point.

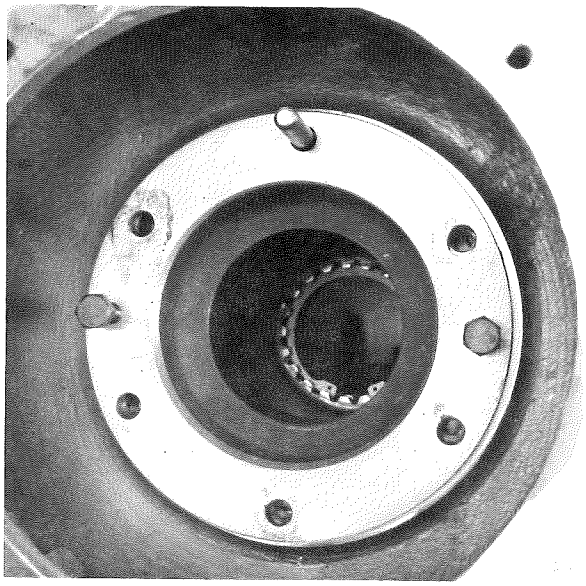


FIGURE 96

Remove cap screws from right and left hand cable drum bearing retainers. Utilize jackscrew holes and remove bearing retainers.

NOTE: Split shims are located between bearing retainers and winch case. Note shim location and retain shims for reassembly.

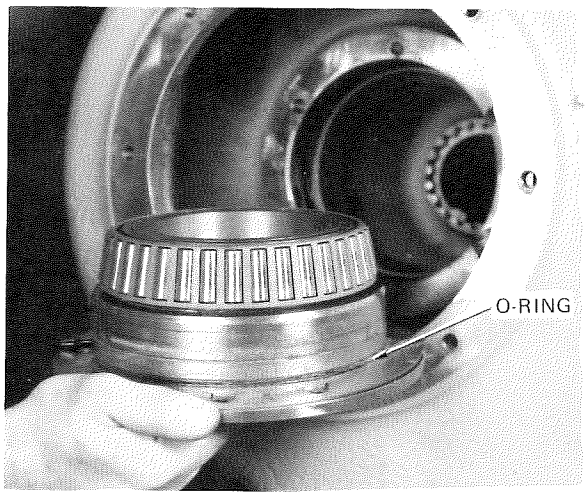


FIGURE 97

Remove bearing cone from bearing retainer. Remove O-ring from bearing carrier.

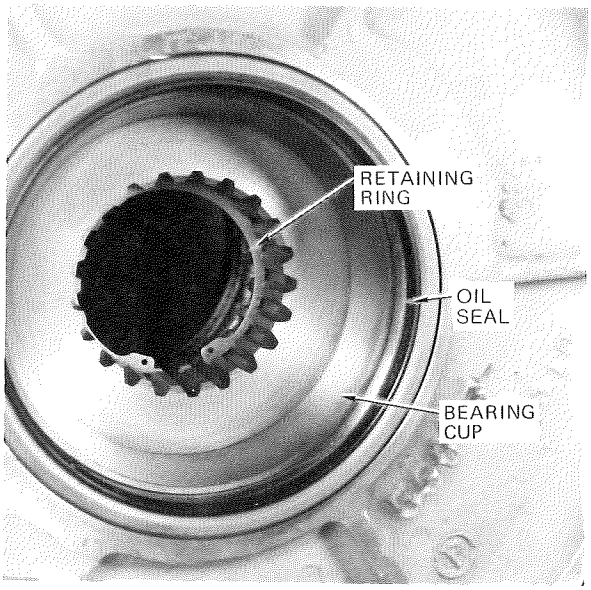
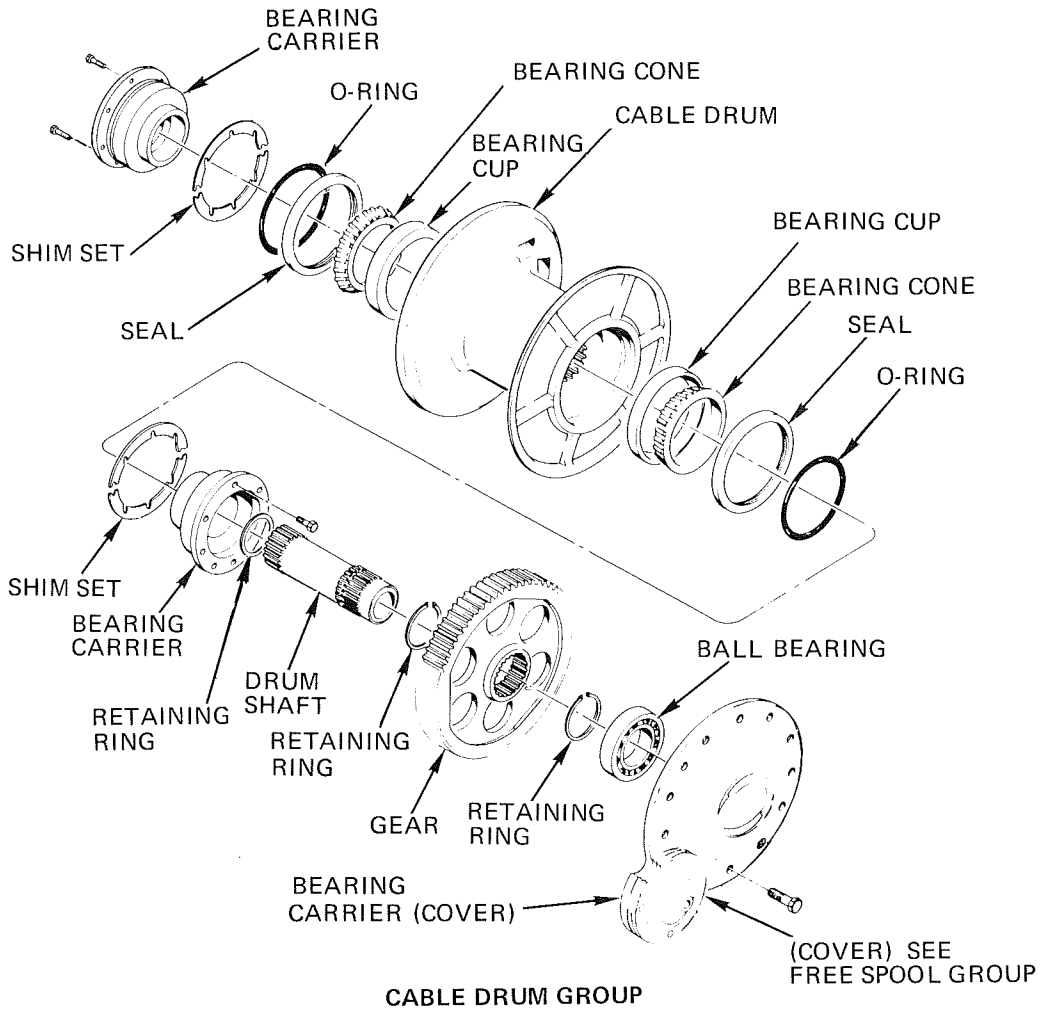


FIGURE 98

Remove cable drum from winch case.

Remove cable drum oil seals. Remove bearing cups.

Remove retaining ring from splined bore of cable drum.



CABLE DRUM GROUP

FIGURE 99

Assembly

Refer to Cable Drum Group, Figure 99.

Install bearing cups in cable drum. Seat securely against shoulder.

Install seals in cable drum. Lubricate inside diameter with multi-purpose grease.

Install retaining ring in groove on splined end of cable drum bore. Position retaining ring with sharp edge facing center of cable drum.

Install cable drum bearing cones on bearing carriers. Lubricate bearing cones with multi-purpose medium grease.

See Figure 99. Suspend cable drum in winch case. Install bearing carriers with original split shims. Apply non-hardening thread sealant to cap screws and torque to 80 ft-lbs.

Attach dial indicator to left hand bearing carrier and position indicator stem against retaining ring in cable drum bore.

Wedge cable drum moderately from side to side and check for end play reading of .005-.010 in.

Add or remove shims as required, keeping cable drum centered in winch case.

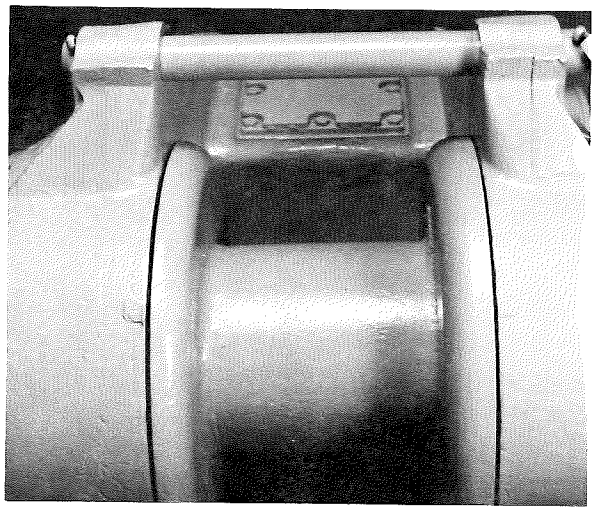


FIGURE 100

To determine shim thickness if original split shims are lost or destroyed:

Install bearing carrier with no shims and snug cap screws.

Keep cable drum centered in winch case and tighten bearing carrier cap screws evenly until drag is noticeable when cable drum is rotated.

Use a feeler gauge and determine opening between each bearing carrier and winch case. Add .005 to each reading. This dimension is the shim pack thickness to install for initial cable drum end play.

Loosen bearing carrier cap screws, move carriers out and install split shims.

Torque bearing carrier cap screws to 80 ft-lbs.

Attach a dial indicator to left hand bearing retainer and position indicator stem against retaining ring in cable drum bore.

Wedge cable drum from side to side to obtain end play reading.

End play to be .005-.010.

Add or remove shims as required, equally to both sides, keeping cable drum centered in winch case.

Install idler gear and shaft assembly in winch case. Refer to Free Spool Group No. 53126, page 37.

Install cable drum shaft in cable drum gear and secure in position with two retaining rings.

Install ball bearing on end of cable drum shaft next to cable drum gear.

Support cable drum gear and shaft assembly and install in cable drum.

Clean mating surface of winch case and bearing cover. Apply Silastic Sealant No. 732 RTV or equivalent.

Install cover. Apply non-hardening thread sealing compound to cap screws and install loosely.

Install free spool drag adjustment cover with shim set. Secure cover with cap screws coated with thread sealing compound, and torque to 80 ft-lbs.

Torque all remaining cover cap screws to 80 ft-lbs.

Refer to Free Spool Group for final free spool shift adjustment, page 37.

LOW SPEED GROUP NO. 53135

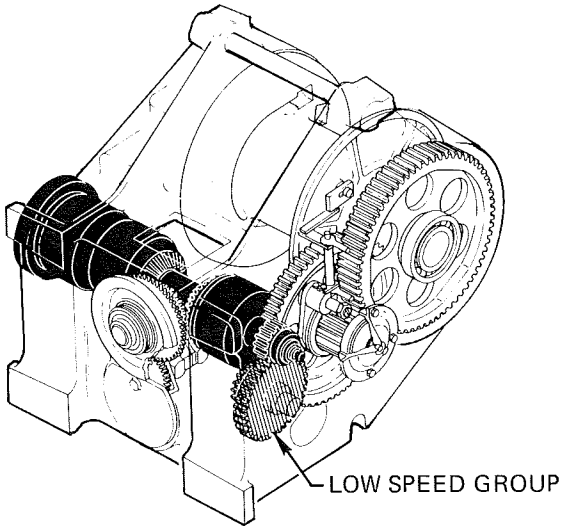


FIGURE 101

The Model 50 may be equipped with a Low Speed Group also called a "Fourth Shaft." Addition of this group results in a 2.35 gear reduction from the standard or "Three Shaft," configuration. Refer to Gear Rotation, pages 8 and 9 of the Operator's Section.

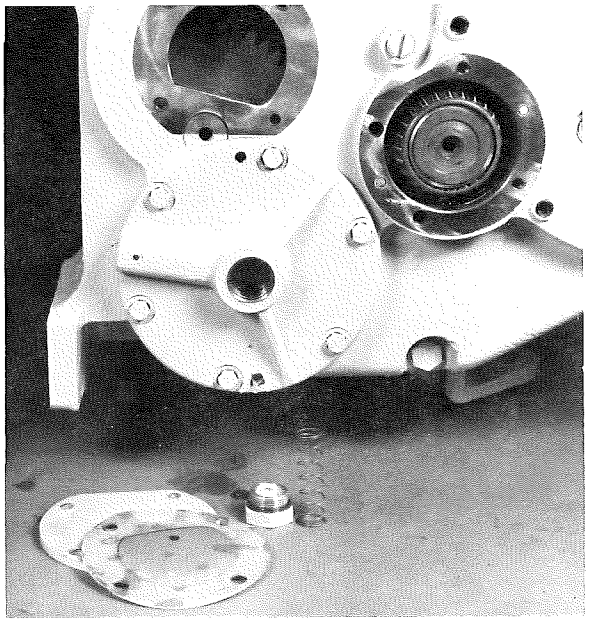


FIGURE 102

Removal and Disassembly

Drain oil from winch.

Remove left hand side access cover.

Remove PARKER plug and spring from left hand bearing carrier cover and remove cover.

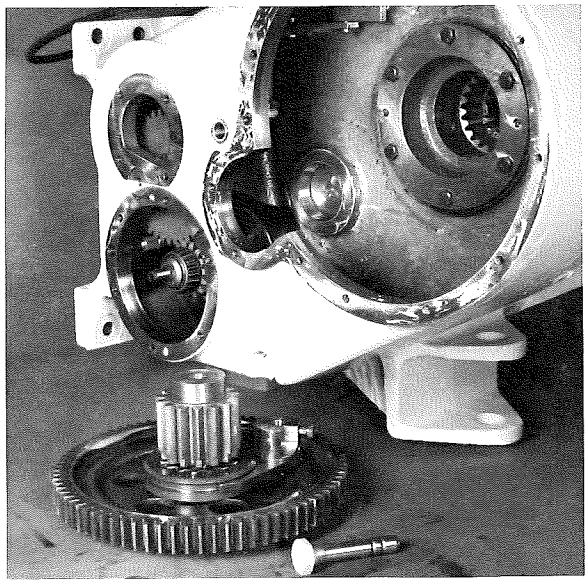


FIGURE 103

Refer to Cable Drum Group No. 53127, page 46. Remove cable drum gear and shaft.

Refer to Free Spool Group No. 53126, page 37. Remove shift rail and shift yoke. Remove first reduction gear and second reduction pinion assembly.

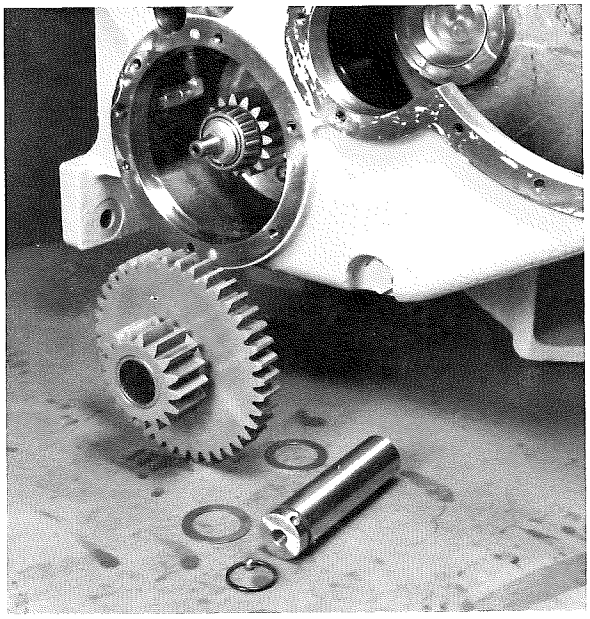
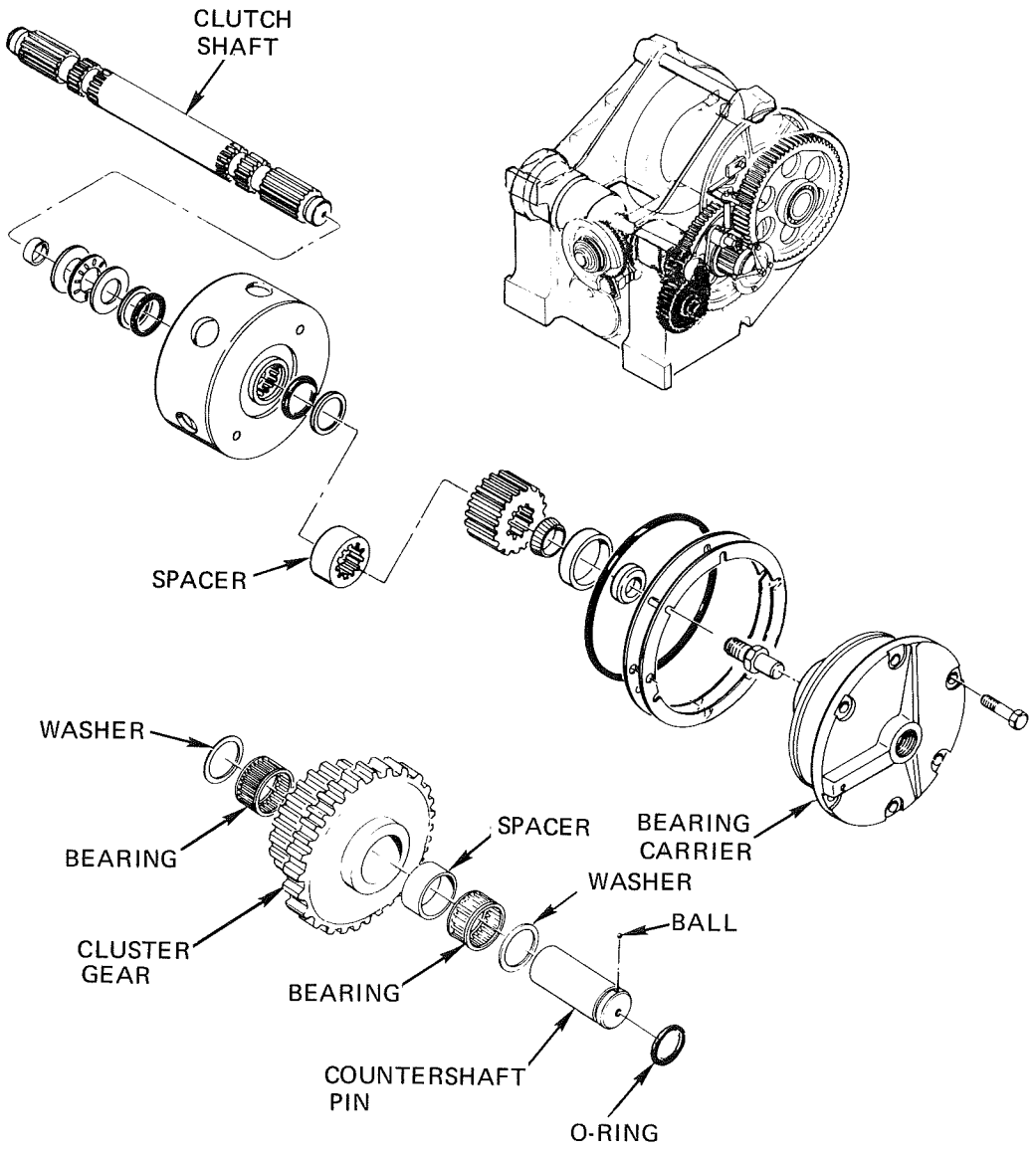


FIGURE 104

Install slide hammer or puller with 5/8" UNC threaded adapter in end of countershaft pin. Remove countershaft pin, cluster gear and thrust washers from winch case. Remove 3/8" diameter steel ball and O-ring seal from countershaft pin.

Remove bearings and spacer from cluster gear.



LOW SPEED GROUP

FIGURE 105

Assembly and Installation

Clean and inspect all components prior to assembly.

Lubricate and install spacer in center of cluster gear.

Lubricate caged roller bearings with 10W oil or equivalent and install in cluster gear, one on each side of spacer.

Lubricate and install O-ring in groove on countershaft pin. Place 3/8" steel ball into seat on countershaft pin.

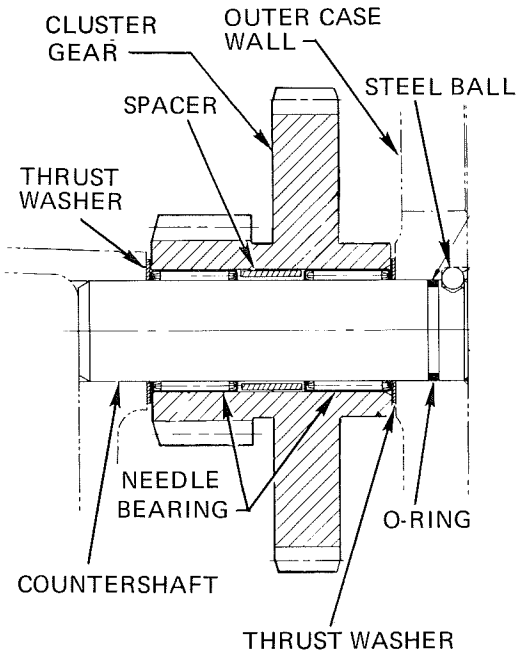


FIGURE 106

Position cluster gear and outer thrust washer in winch case and at the same time insert pin through bore in outer case wall and into thrust washer and cluster gear.

Position inner thrust washer in winch case between cluster gear and inner case wall and install countershaft pin. Install countershaft pin until steel ball in end of pin seats fully in winch case.

Refer to Free Spool Group No. 53126, page 37 and install components.

Refer to Cable Drum Group No. 53127, page 46 and install cable drum gear, shaft and covers.

Refer to Clutch Shaft Group No. 53121, page 16 and install left hand bearing carrier cover. Make sure oil port sleeve is in position in shim set with an O-ring on each side.

Install left hand access cover.

PUMP GROUP NO. 53122

Before removing winch from tractor, thoroughly test hydraulic pump for volume at 300-315 psi. Pump should produce a minimum of 3 gpm at engine idle. See Hydraulic System Tests, Figure 2, page 11.

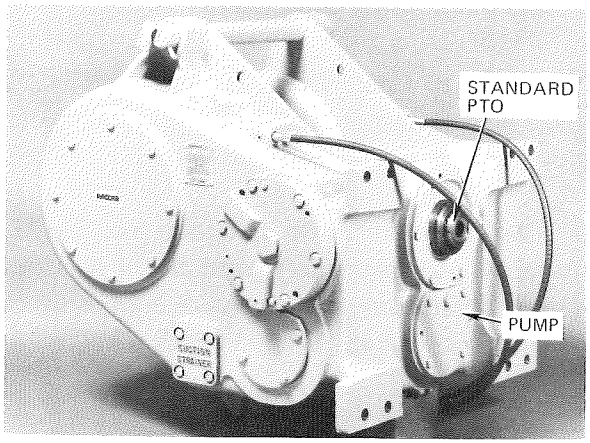


FIGURE 107

Removal

Drain oil from winch and remove winch from tractor. Pump and mount assembly is located at the front of the winch in the lower bore of a STD PTO winch and in the upper bore of a LOW PTO shaft.

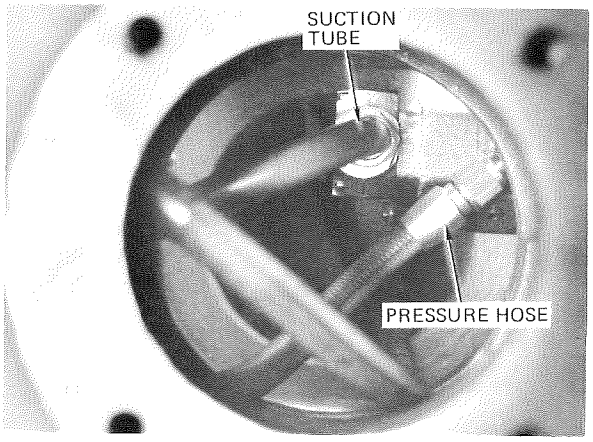


FIGURE 108

Remove small diameter access cover on right hand side. Disconnect pump pressure hose from pump fitting. Remove suction tube and fitting from pump assembly.

NOTE: The pump suction tube is a slip fit in the pump fitting. The suction tube can be removed from the fitting as the pump assembly is removed.

On a LOW PTO winch with the pump and mount assembly located in the upper bore of the winch case, remove the top access cover to disconnect pump pressure hose and suction tube.

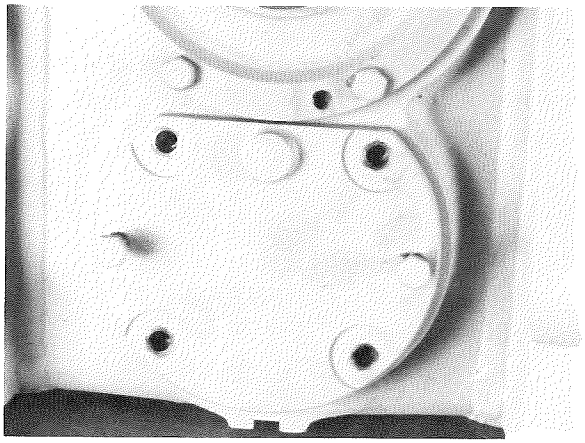


FIGURE 109

Remove cap screws securing pump mount to winch case. Use two cap screws as jackscrews and remove pump and mount assembly.

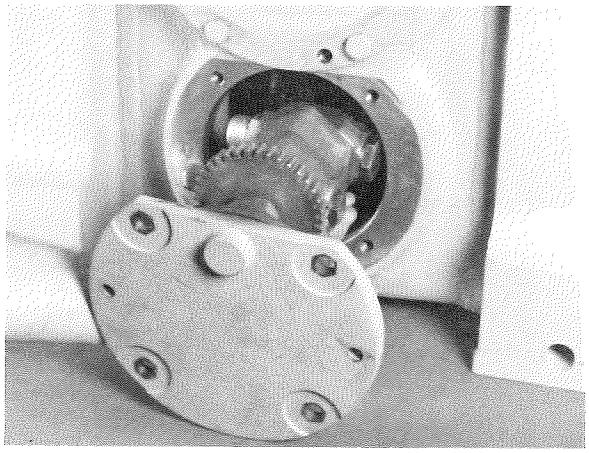


FIGURE 110

As pump and mount assembly is removed, suction tube can be removed from slip fit in pump fitting.

Disassembly

Remove pressure and suction fittings from pump ports. Remove cap screws and washers securing pump to pump mount.

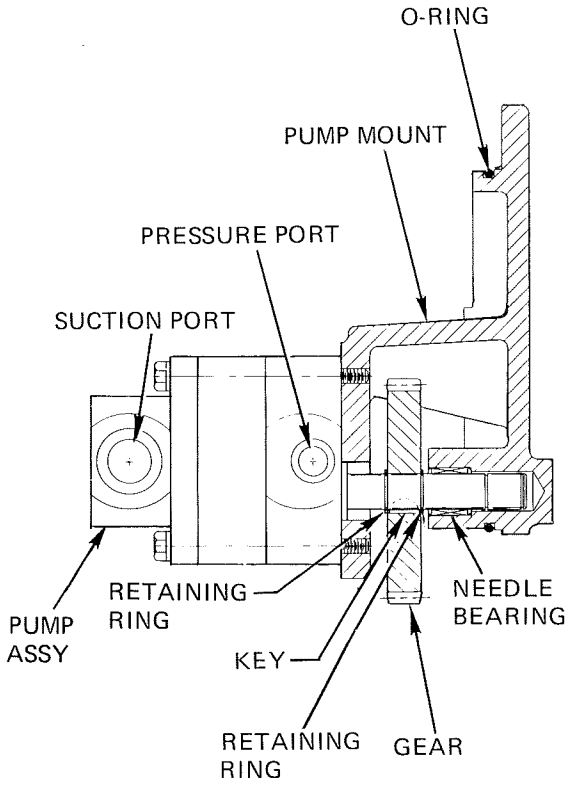


FIGURE 111

Remove retaining ring from pump shaft groove on outer side of pump gear. Slide retaining ring and pump gear off end of pump shaft as pump is removed from pump mount.

Remove woodruff key from pump shaft. Remove remaining ring from inner groove of pump shaft.

Remove needle bearing from bore in pump mount. Remove O-ring from pump mount sealing diameter.

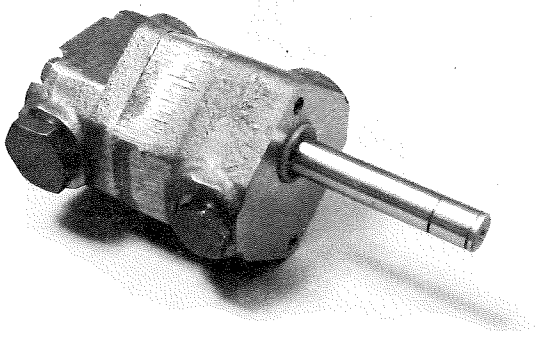


FIGURE 112

Bi-Rotational pumps are used in all models of winches with internal hydraulics systems.

Pump rotation reference is always made by viewing the pump from the shaft end.

Punch mark all pump body sections before disassembly for reference during assembly.

The hydraulic pump gears and body center section are manufactured with a slight interference fit. Initial pump run-in creates a seal in this area through this interference. Score marks in pump center section and slight metal deposits on gear teeth do not necessarily indicate a pump needs to be replaced.

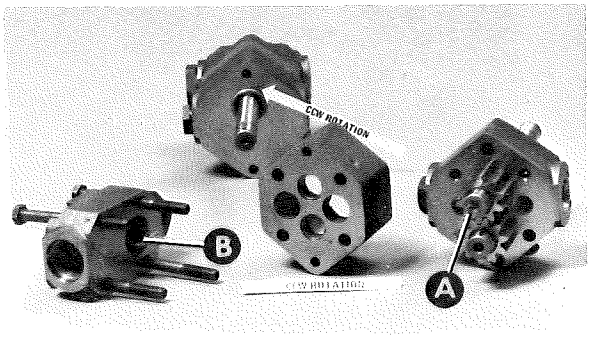


FIGURE 113

When counterclockwise rotation is required, the check plug (A) is installed on the right hand side of pump body. End cap port (B) is in line with plug (A) on the right side of pump.

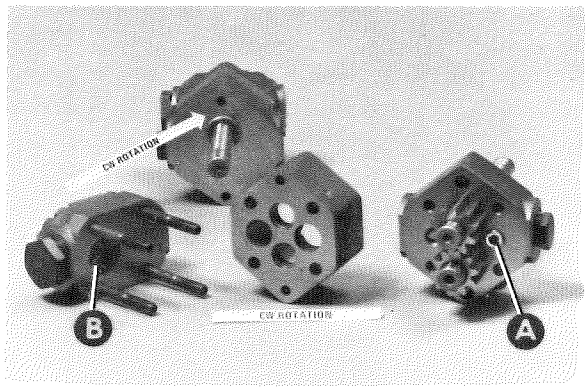


FIGURE 114

When clockwise rotation is required, the check plug (A) is installed in left hand port shown. The end cap port location (B) in the suction section of the pump body must be in line with plug (A) on the left side.

	Pump as viewed from shaft end			
CARCO Part No.	Shaft Rotation	Inlet Port Location	Discharge Port Location	Check Plug & End Cap Port Location
53139	CW	LH	LH	LH
53140	CCW	LH	LH	LH

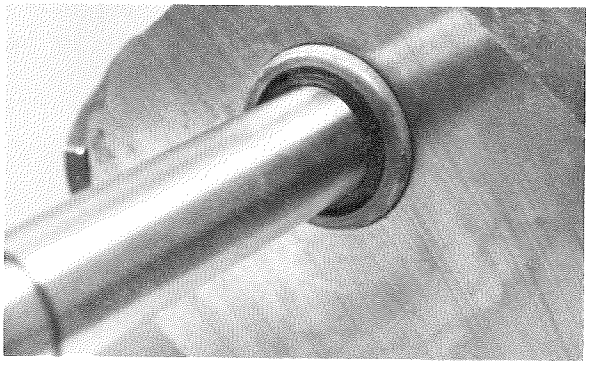


FIGURE 115

Pump shaft seal protrusion is normal (approx. .090).

The shaft seal is the only serviceable item of the pump assembly.

If a pump shaft, gears or body is needed for repair, order complete pump assembly.

Assembly

Assemble pump to correct rotation by aligning punch marks made on pump body sections at time of disassembly. Torque cap screws to 20 ft-lbs.

Install retaining ring in innermost groove of pump shaft. Install 1/8 x 1/2 woodruff key in slot next to retaining ring.

Install needle bearing in pump mount bore and press until bearing is flush with surface of bore. Lubricate bearing.

Support pump mount in suitable vise. Install pump gear and outer retaining ring onto pump shaft and at the same time position pump shaft into pump mount bearing.

Secure pump to pump mount with cap screws and washers. Coat threads of cap screws with LOCTITE 242 or equivalent and torque to 65 in.-lbs.

Make sure retaining rings are in proper grooves on pump shaft, securing pump gear in place over woodruff key.

Install fittings in pressure port and suction port of pump. Suction fitting has O-rings for slip fit of suction tube. Inspect O-rings and replace as required.

Install O-ring in groove of pump mount and lubricate.

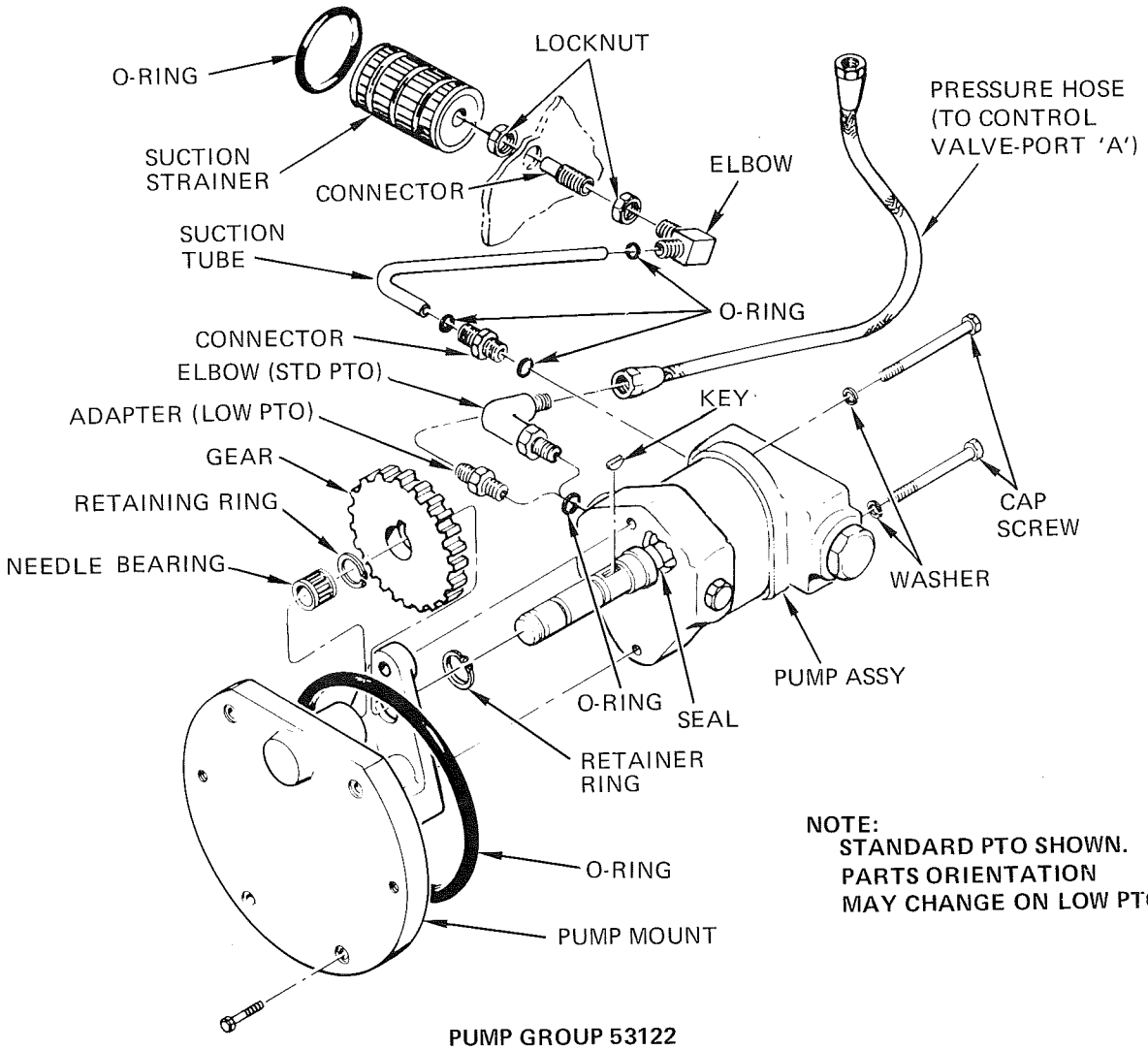
Check proper positioning of suction tube in suction strainer fitting in bottom of winch case.

As pump and mount assembly is placed in opening of winch case, install suction tube into suction fitting of pump.

Complete pump mount installation to winch case with cap screws. Apply thread sealant to cap screws and torque to 85 ft-lbs.

Attach pressure hose to pump fitting. Recheck suction tube to insure proper positioning in suction strainer port and pump fitting.

Install access covers, attach winch to tractor and fill with Grade 10W hydraulic oil or equivalent to level indicated in sight gauge.



PUMP GROUP 53122

FIGURE 116

SUCTION STRAINER

The Model 50 hydraulic system is filtered by a 400 micron, reusable suction strainer with a 5 psi bypass relief valve.

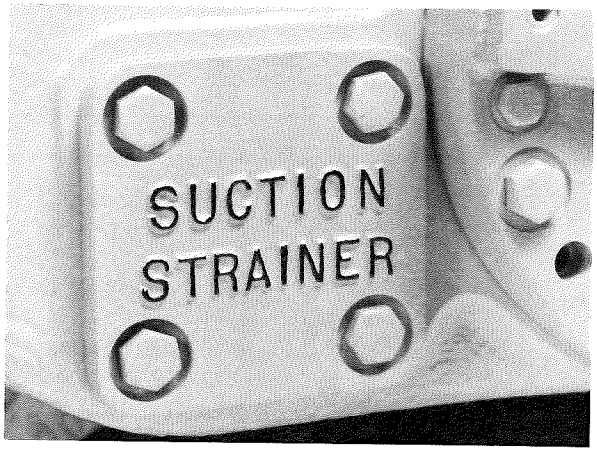


FIGURE 117

The suction strainer is located on the lower right hand side of the winch case.

Recommended service interval of changing oil and cleaning strainer is every 6 months or 1000 hours.

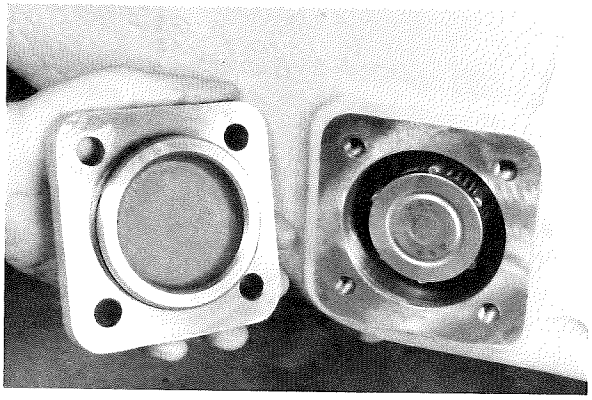


FIGURE 118

Drain oil from winch.

Remove cap screws and remove suction strainer cover and O-ring.

Inspect O-ring condition for use in reassembly.

Grasp end of suction strainer and pull out of winch case.

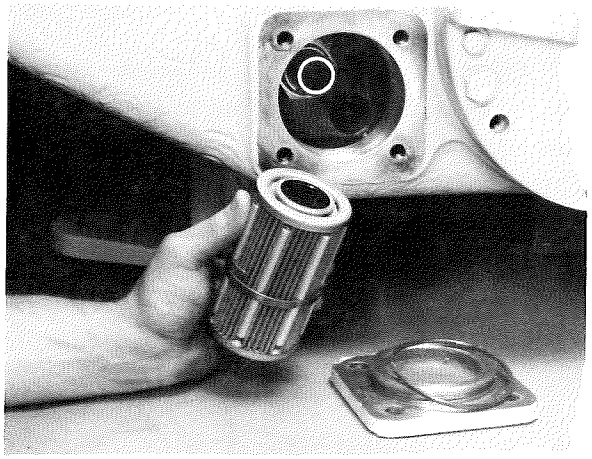


FIGURE 119

Remove metal band securing magnetic rods to strainer.

Thoroughly clean strainer and magnetic rods.

Reassemble.

Install suction strainer, lubricate O-ring and install cover.

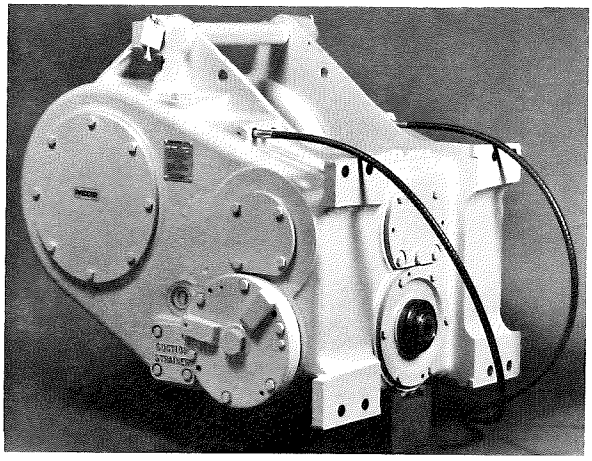


FIGURE 120

Fill winch with oil until oil level appears in sight gauge on right hand side of winch. See Lubrication Specification Sheet for correct oil.

CONTROL VALVE NO. 53133

Removal

Refer to Hydraulic System Tests, Figure 2, page 11, prior to control valve removal.

CAUTION: Bleed Accumulator. Cycle power shift control lever with engine stopped until no pressure appears at operator's gauge.

FIGURE 121

Drain oil from winch.

Control valve is located behind large diameter cover on right hand side of winch.

Remove cap screws securing valve housing cover. Remove cover and gasket.

FIGURE 122

Remove right hand filler plug and loosen jam nut securing control cable core to control valve spool.

Remove control cable from control stand and rotate cable core until free from valve spool.

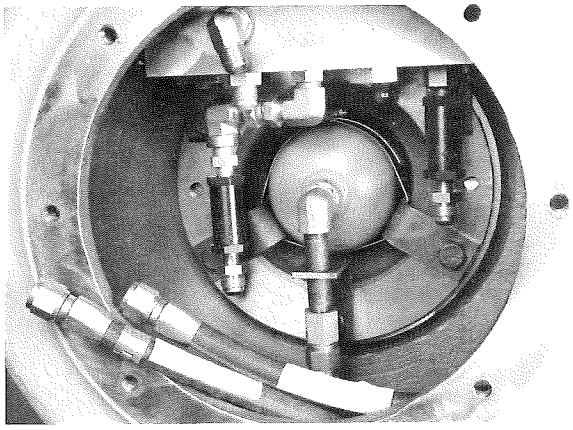


FIGURE 123

Disconnect hydraulic lines from control valve, marking hose location for correct installation upon reassembly.

Remove (2) cap screws securing control valve to winch and remove control valve.

NOTE: As control valve is lowered in winch case for removal, remaining hydraulic line (brake flush) can be disconnected from top of control valve.

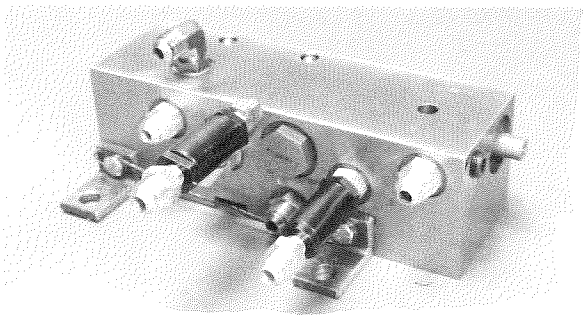


FIGURE 124

Remove flow control valves (2) from clutch port fittings of control valve.

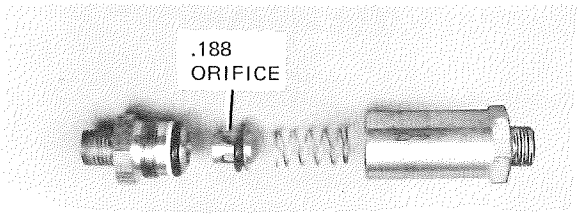
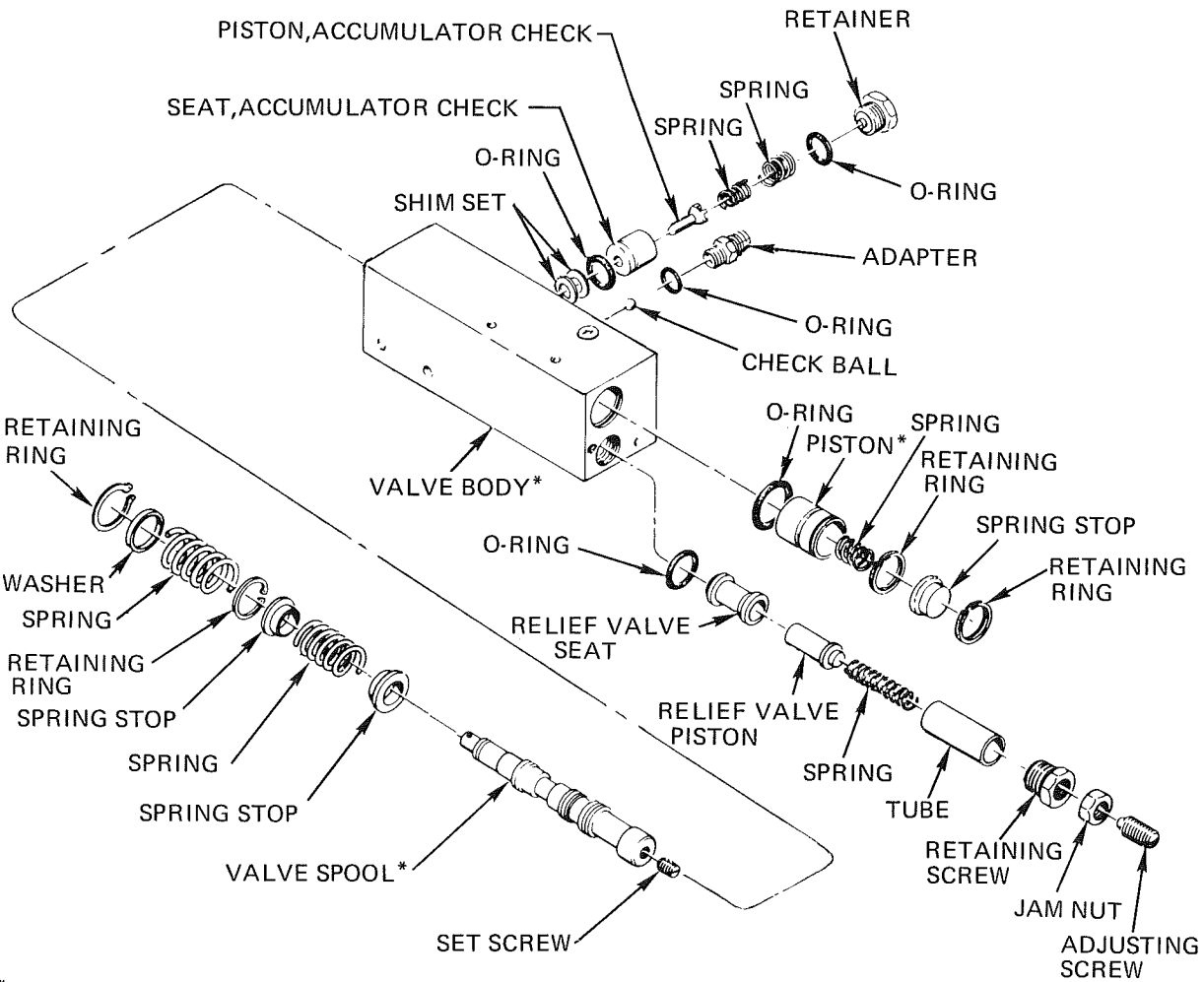


FIGURE 125

Disassemble flow control valve and check condition of orifice and seat assembly. Orifice should be .188" diameter. Inspect O-rings.

Remove remaining hydraulic fittings.



*NOT SERVICED SEPARATELY, ORDER COMPLETE VALVE ASSY

CONTROL VALVE

FIGURE 126

Control Valve Disassembly

See Figure 126, page 60.

Inspect components during disassembly for contamination and/or excessive wear.

Remove accumulator check valve assembly.

Remove retaining ring from each end of valve body.

NOTE: Use press to compress springs slightly to facilitate removal of retaining rings.

Pull spool out of control valve body. Remove retaining ring from end of spool and remove spring.

Remove spring stop and spring from opposite end of valve.

Remove brake piston from valve body.

Remove relief valve retaining screw from valve body.

Remove relief valve spring, spacer and relief valve piston.

Remove relief valve seat and O-ring.

Remove retaining ring from brake piston. With O-ring removed, install piston in valve body. Be sure piston slides freely in and out of bore.

Control Valve Assembly

Refer to Figure 126, page 60.

Clean and inspect shift spool and valve body bore for scoring and wear.

Clean and inspect brake piston and valve body bore for scoring and wear.

Replace all O-rings.

To service the shift spool, order Repair Kit 52651, consisting of nylon check ball, four retaining rings, three springs and an O-ring.

Inspect accumulator check valve and seat assembly. To service, order Repair Kit 52653 consisting of (2) springs, (1) piston (1) seat (1) O-ring and (1) shim set.

The purpose of shimming the seat assembly is to prevent the piston from contacting the center (recessed area) of the shift spool, when the spool is in the neutral position and the piston is seated.

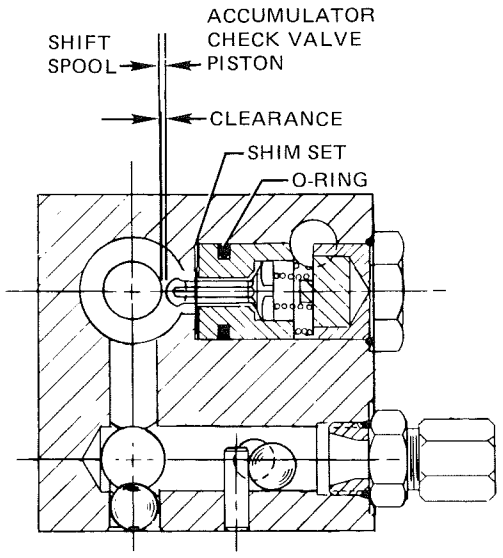


FIGURE 127

To determine the required shims, install the shift spool and accumulator check valve seat, without the O-ring.

Insert the check piston and hold finger pressure against it. Move the shift spool back and forth and "feel" for contact. If no drag is felt, no shims are required.

If drag is encountered, add one shim at a time under the seat until clearance is obtained.

After clearance is established, install O-ring around seat assembly and install in valve body.

To service the pressure relief valve, order Repair Kit 52652 consisting of (1) O-ring (1) seat (1) piston (1) spring and (1) spacer tube. During reassembly, it is easiest to keep the spacer tube centered if the valve body is tipped up on end and the relief valve components are installed from the top.

First install O-ring, then relief valve seat.

NOTE: The control valve body, shift spool and brake piston are not serviceable items because they are matched parts for fit. If repair or replacement of these items is required, order a new 53133 control valve.

Installation

Install hydraulic fittings in proper control valve ports.

Position control valve on bench with operator gauge port, or "J" port, facing up. Position control valve support brackets and secure with cap screws LOCTITE 242 or equivalent applied to the threads.

Lockwire the cap screws in place.

Place control valve in opening of winch case and install brake flush line to top fitting on control valve.

Apply thread sealant to valve mounting cap screws. Position control valve, install cap screws and torque to 80 ft-lbs.

Connect hydraulic oil lines to correct control valve fittings.

Refer to Hydraulic Control Group, Figure 128, page 63.

Install control cable core to correct depth in valve spool and lock jam nut.

Refer to Control Cable Installation. See Figure 128, page 63.

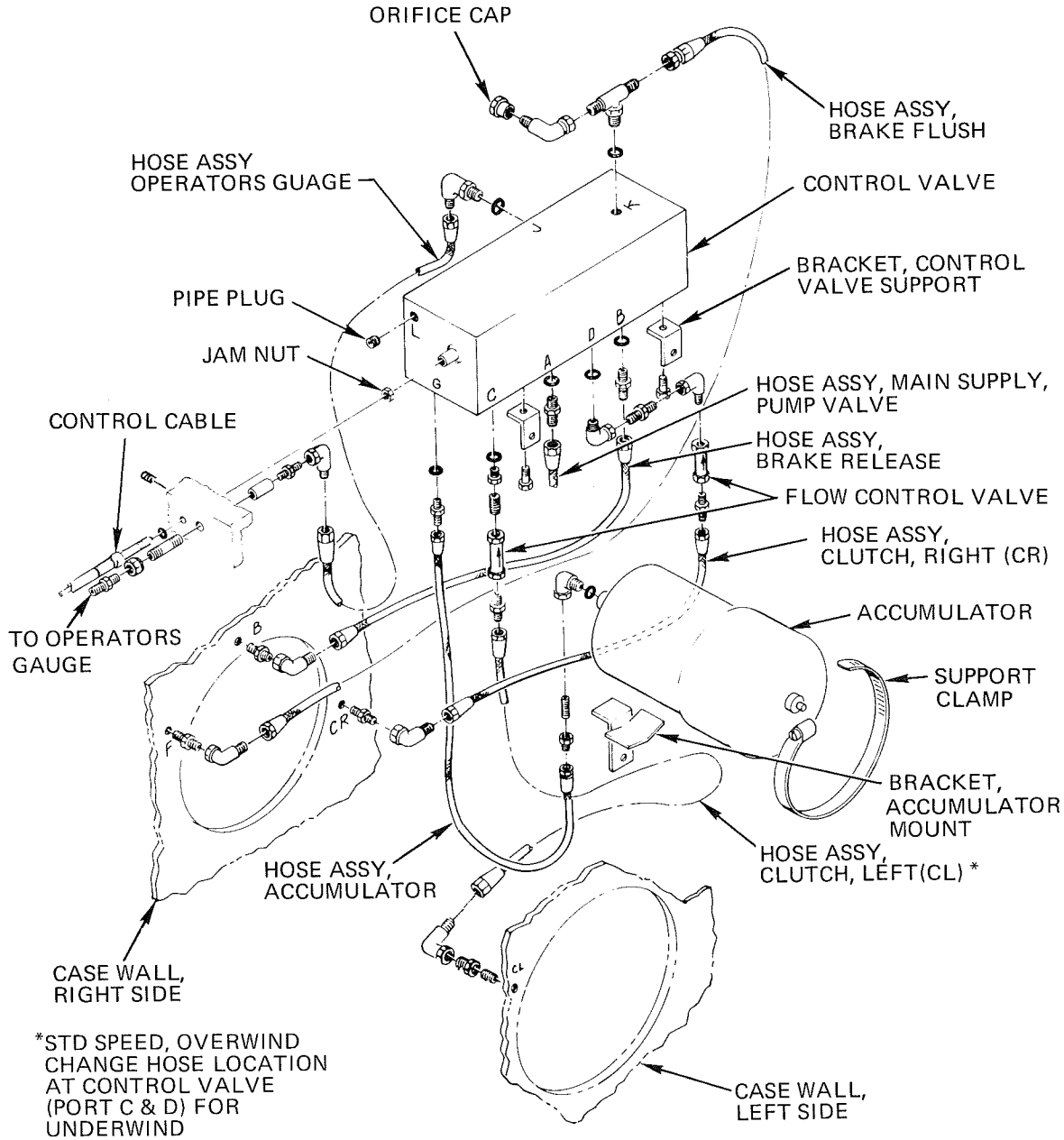
Install gasket and valve housing cover. Fill winch with oil. See lubrication chart for oil recommendations.

Start engine. Place Power Shift lever in brake-off position to charge accumulator.

Loosen operator's gauge fitting at winch end to bleed air from system. Tighten fitting.

Return Power Shift lever to neutral position.

Operate winch in forward and reverse. Monitor operator's gauge for operating pressure. Should be 300-315 psi at engine idle.



HYDRAULIC CONTROL GROUP

FIGURE 128

RELIEF VALVE ADJUSTMENT

NOTE: Upon reassembly, a starting point for system hydraulic pressure is to set the relief valve with approximately four full threads on the adjusting screw exposed beyond the jam nut. See Figure 129.

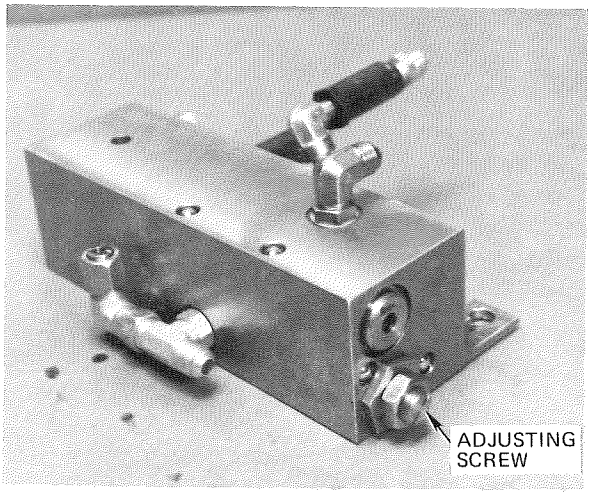


FIGURE 129

When winch is reassembled and operable, adjust the relief valve to final setting as follows with oil warm:

Install gauge of 0 to 600 psi range in 1/4 npt operator's gauge port on winch housing.

Start tractor engine and place control handle in brake-off position.

CAUTION: Before operating winch in clutch positions, review safety recommendations in operator's section of this manual.

Check pressure reading on gauge. Pressure must be 300 to 315 psi at low idle, oil warm. If adjustment is required, lower oil level or park tractor with right side tilted up and remove valve housing cover. See Figure 130.

Loosen jam nut on relief valve adjusting screw. Turn adjusting screw in (CW) to increase pressure, out (CCW) to decrease pressure. Lock adjusting screw with jam nut.

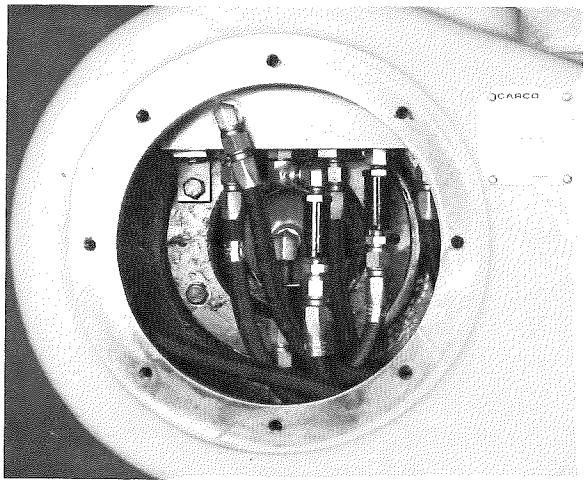


FIGURE 130

Reinstall valve housing cover.

ACCUMULATOR

The Model 50 winch is equipped with a one-quart, steel-cased accumulator. It is the rubber bladder type with a nitrogen charge of 150 psi.

The accumulator may be recharged with nitrogen through the service valve located opposite the hose end.

The accumulator stores oil under system pressure of 300-315 psi. The primary function is to cushion the hydraulic system during clutch applications and to release the oil brake assembly when the tractor PTO or tractor engine is in a stalled condition.

Removal

CAUTION: Discharge accumulator stored oil supply before attempting any repair or service of winch hydraulics. Cycle the power shift control lever several times with the tractor engine stopped. Monitor operator's gauge for system pressure.

Drain oil from winch.

Remove large diameter valve housing cover from right hand side of winch.

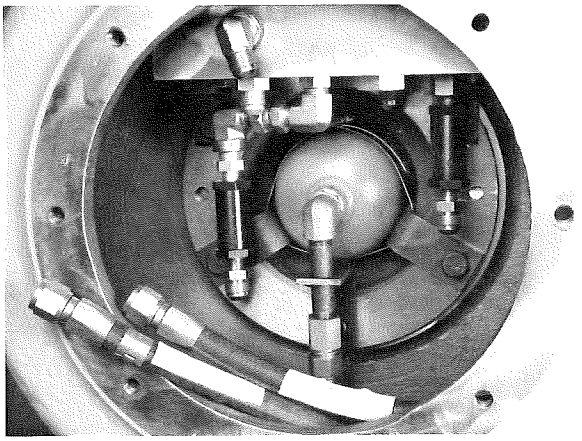


FIGURE 131

Mark (or tag) and disconnect hydraulic lines that will interfere with the removal of the accumulator.

Loosen the pay-out clutch flow control valve fitting and move the flow control valve to the side.

Remove the accumulator line either at the control valve end or the accumulator end.

Remove the cap screw securing the accumulator mount and remove the accumulator assembly.

Remove the support clamp to separate the accumulator from the mount.

Remove hydraulic fittings from end of accumulator.

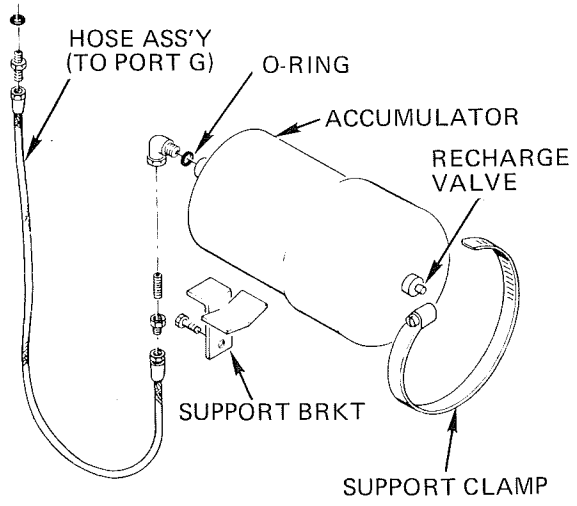


FIGURE 132

Assembly

Remove cap assembly from end of accumulator. Install testing and gauging equipment and check nitrogen charge. Operating charge pressure is 150 psi. Recharge as required.

Position mount assembly on accumulator and secure with support clamp.

Install accumulator assembly in winch case and secure to winch with cap screw. Apply thread sealant to cap screw and torque to 80 ft-lbs.

Lubricate O-ring on 90° elbow and install. Locate elbow so the elbow faces straight down. See Figure 132, page 65.

Install remaining hydraulic fittings and connect hose to accumulator and port "G" on control valve.

Connect remaining hydraulic lines to proper ports on control valve and tighten fittings.

Install valve housing cover and fill winch to proper oil level. See Lubrication Chart for lubrication specifications.

Start tractor engine, place power shift lever in brake-off position to charge accumulator.

Check winch operation.

CONTROL STAND, POWER SHIFT WITH FREE SPOOL

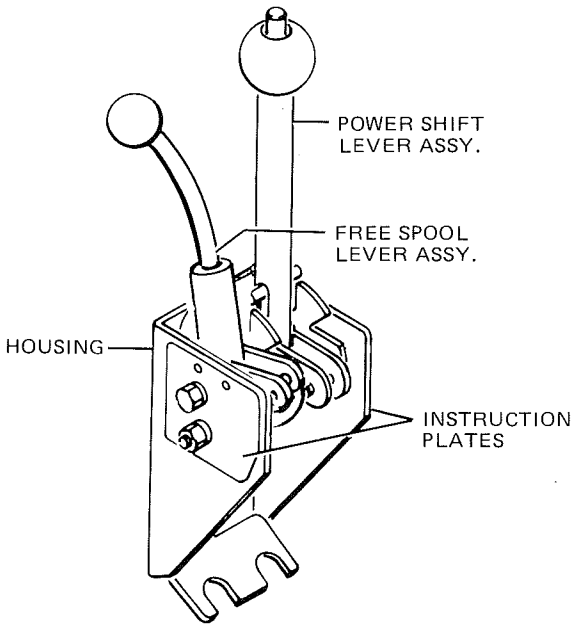


FIGURE 133

This control stand incorporates two levers. One to operate the winch valve, the other the free spool. They are mounted on the right hand side of the operator. Refer to the control group in the Parts Section for additional information.

Instruction plates located on both sides of the control stand assembly provide the operator with information on winch functions.

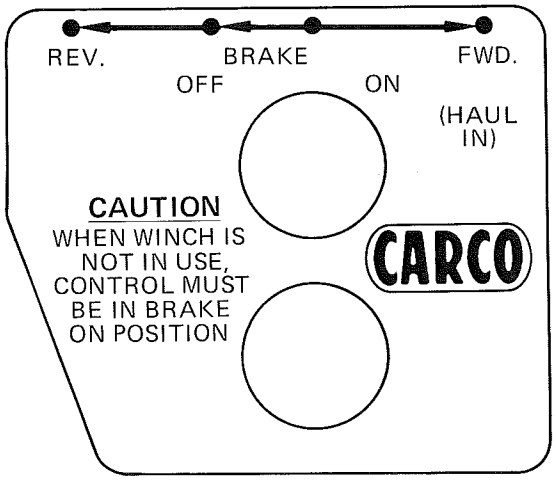


FIGURE 134

The powershift instruction plate is located on the left hand side of the control stand. See page 12 of Operator's Section for proper Powershift Control Operation.

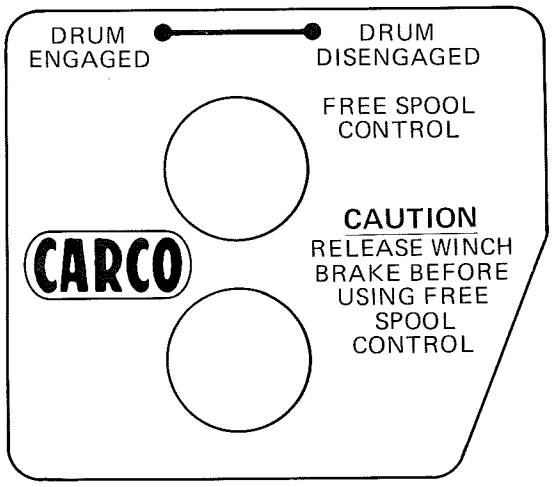


FIGURE 135

The Free Spool Instruction Plate is located on the right hand side of the control stand. The free spool lever is the short curved lever. Refer to page 13 of Operator's Section for proper Free Spool Control Operation.

Removal

IMPORTANT: Mark control cables before removal for identification upon installation.

Remove hitch pins and pins securing control cables to control levers.

Loosen nuts securing cable housings to control stand housing and remove cables.

Remove cap screws and nuts securing control stand to tractor or bracket and remove stand.

Disassembly

Refer to Figure 136.

Remove upper (pivot) cap screw and lock nut from control stand housing and remove

power shift lever assembly, free spool lever assembly, spacers and thrust bearings. Push rod return spring will drop free from power shift lever assembly. Note location of spacers and thrust bearings for assembly purposes.

Remove lower cap screw, spacers and lock plates from housing.

Remove threaded ball and spring pin from power shift lever assembly and remove push rod.

The free spool lever assembly is a fabricated assembly and cannot be disassembled. Replace with a new lever assembly if damaged or worn.

Assembly

Refer to Figure 137, page 69.

Install push rod in power shift lever assembly and secure with spring pin.

Install ball on lever assembly.

Position lock plates and lower spacers in proper position and secure with cap screw and jam nuts. Do not tighten lower cap screw over 20 ft-lbs.

Position power shift lever, free spool lever, spacers, thrust bearing and return spring inside of power shift lever and secure

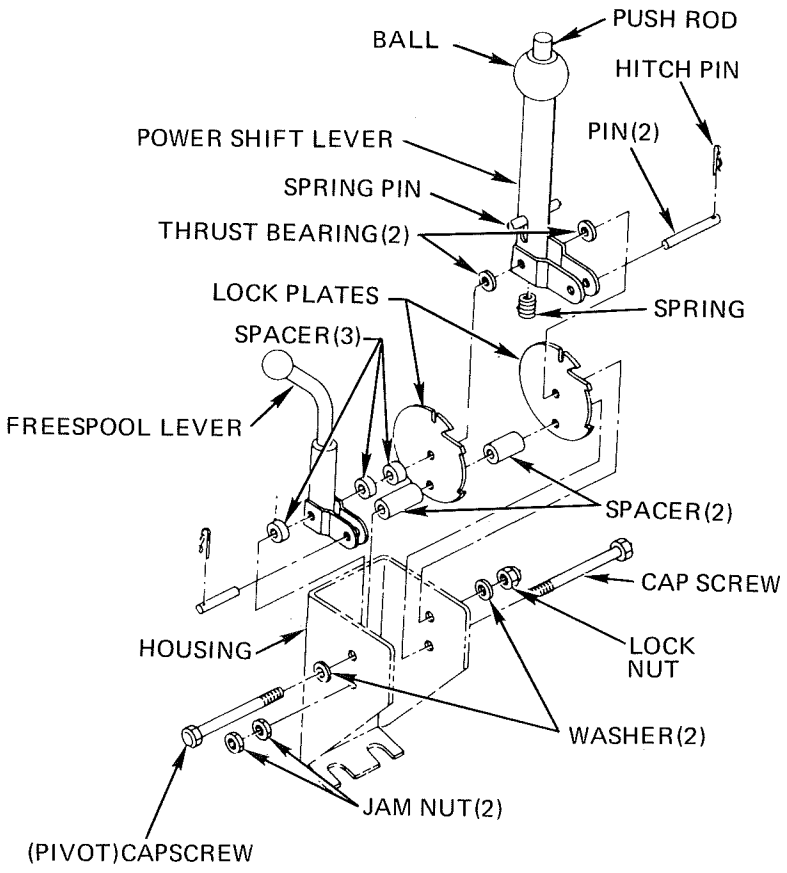


FIGURE 136

with cap screw and lock nut. Adjust upper pivot cap screw to remove side motion from handles.

IMPORTANT: Be sure P.S. control lever is free from any binding. The power shift lever must spring return to neutral position when control cable is installed. See Operators Section.

CONTROL STAND INSTALLATION

Install control stand to tractor or bracket and secure with cap screws and nuts.

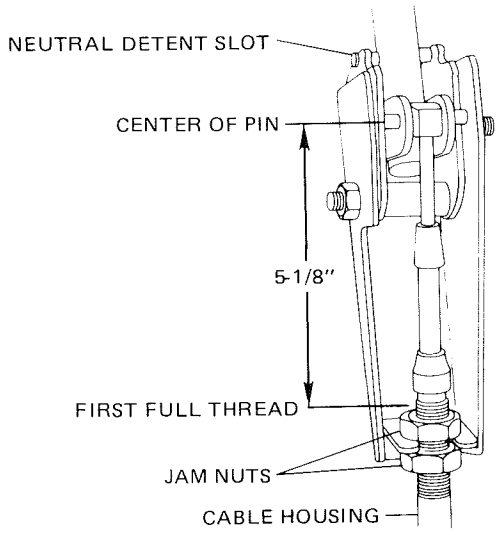


FIGURE 137

Adjust control cable core until a measurement of 5-1/8" is achieved from upper end of threads on cable housing to center of pin hole used to secure cable core to control stand lever. Remove filler plug on right hand side and loosen jam nut securing cable core to control valve spool. Turn cable core clockwise (in) to shorten or counterclockwise (out) to lengthen dimension. Tighten jam nut and install filler plug.

When adjustment is correct, install control cable and secure with pin and clip to control stand lever.

With control handle in neutral position (detent slot), place control cable housing in control stand housing and secure with jam nuts and star washer.

To adjust free spool control, install pin and clip to secure free spool control cable to lever assembly. With winch free spool in engaged position, adjust nuts on control cable housing to position lever 30^{o} from vertical on the engaged side of the instruction plate. The free spool shift lever should not contact control stand housing in the engaged position.

CONTROL CABLES

Removal

Remove hitch pins and pins securing control cable core to power shift lever and free spool lever. Loosen jam nuts securing control cable housings to control stand and remove power shift cable and free spool cable from control stand. Refer to Figures 138 and 139, page 70.

FIGURE 138

To remove power shift control cable, remove right hand oil filler plug in winch case and loosen jam nut that locks control

cable core in place at the control valve spool. Refer to Figure 139. Rotate cable core counterclockwise until core threads are removed from control valve spool. Retain jam nut on control cable core.

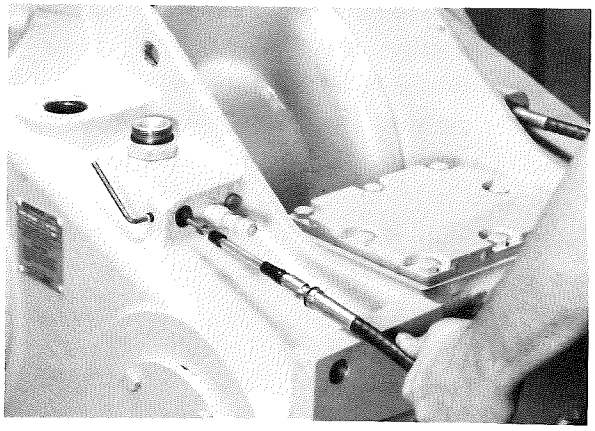


FIGURE 139

Loosen set screw from R.H. winch case anchor boss.

Remove control cable. Refer to Figure 139.

Remove and inspect O-ring seal.

To remove free spool cable assembly, remove left hand oil filler plug. A jam nut is *not* used to secure free spool cable core to free spool shift linkage. Rotate cable core counterclockwise until cable core threads are removed from free spool linkage.

Loosen set screw from left hand winch case anchor boss and remove free spool control cable. Remove and inspect O-ring seal.

Installation

NOTE: For routing of control cables see Control Group in the Parts Section of manual.

POWER SHIFT CONTROL CABLE

Install and lubricate O-ring against shoulder on threaded core end of control cable.

Install 1/4" jam nut on cable core threads.

Remove R.H. oil filler plug and insert control cable through winch case anchor boss. Press cable firmly into anchor boss and secure set screw. See Figure 139.

Engage threads of cable core into control valve spool and rotate the cable core clockwise until the distance from the end of the cable housing threads to the center of the cable core pin hole is 5-1/8". See Figure 140.

Lock jam nut securing cable core to control valve spool. See Figure 140.

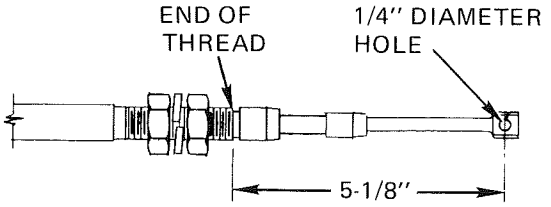


FIGURE 140

Place control cable into stand and secure control cable to power shift lever assembly with 1/4" pin and hitch pin.

Place power shift lever in neutral position. Depress push rod button at top of lever to hold lever in dentent slots.

Insert control cable housing into anchor slot at bottom of control stand and lock with jam nuts. Refer to Control Stand Installation Figure 141, page 71.

Be sure the power shift control lever is free from any binding. The lever assembly must spring return to the neutral position.

Replace R.H. filler plug.

FREE SPOOL CONTROL CABLE

Install and lubricate O-ring against shoulder on threaded core end of control cable.

Remove left hand oil filler plug and insert cable through winch case anchor boss. Press cable firmly into anchor boss and secure set screw.

Thread control cable core into free spool guide by rotating cable core clockwise until all cable core threads are within the free spool guide.

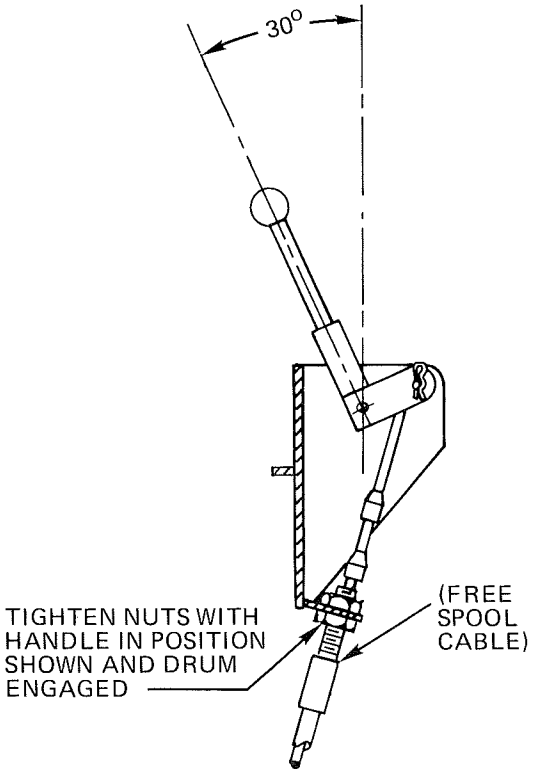


FIGURE 141

Install free spool cable in control stand and secure cable to free spool lever with 1/4" pin and hitch pin.

With the winch gear train in the engaged position, adjust the jam nuts securing the cable housing to the control stand to position the free spool lever 30° from vertical on the engaged side of the free spool instruction plate. See Figure 142.

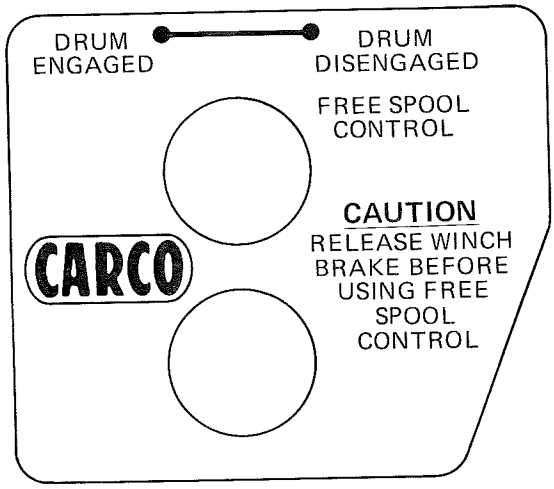


FIGURE 142

SERVICE DATA

CAP SCREW TORQUE VALUES (Grade 5)

Bolt Size	Torque – lb-ft Min.	Max.	Bolt Size	Torque – lb-ft Min.	Max.
1/4	9	10	7/8	420	470
5/16	19	21	1	630	710
3/8	33	37	1-1/8	850	950
7/16	53	60	1-1/4	1200	1350
1/2	80	90	1-1/2	2000	2300
5/8	160	180	1-3/4	3300	3700
3/4	290	320	2	5000	5500

The tabulated values in cap screws apply when:

Tapped holes have sufficient threads to prevent stripping female threads.

All threads are lubricated with engine oil, light grease or LOCTITE.

Joints are rigid; no gaskets or compressible materials are used.

When coated or metallic plated bolts are used, or when lubricants other than engine oil, light grease or LOCTITE are used, multiply values in the table by the following factors:

.85 when metallic plated bolts or nuts are used.

.75 when Parkerized bolts or nuts are used.

.70 when Molykote, white lead, or similar mixtures are used as lubricants.

.90 when hardened surfaces are used under the nut or bolt head, whichever is torqued.

SERVICE DATA

Accumulator nitrogen charge	150 psi
Bevel pinion bearing adjustment	no adj nec
Bevel pinion nut torque	150 ft-lbs
Bevel pinion/Bevel Gear backlash	.004"-.012"
Brake adjustment, oil brake assy	no adj nec
Clutch Shaft Group end play	.005"-.010"
Cable Drum Group end play	.005"-.010"
Free Spool Group end play	0 -.005"
Rotary Seal Shaft (stub shaft) torque	40-45 ft-lbs
Hydraulic System operating pressure	300-315 psi
Pump gear/pinion backlash	no adj nec

CLUTCH DATA

No. of Friction Discs	5
No. of Steel Discs	4
Disc pack thickness	.910-.980 in.
Disc pack clearance	.100-.165 in.

BRAKE DATA

No. of Friction Discs	8
No. of Steel Discs	7
Disc pack thickness	1.489-1.639 in.
Disc pack clearance @ 300 psi	.160-.250 in.*
Brake release pressure range	190-200 psi*

*Note: Brake Disc package must be loose at 250 psi.