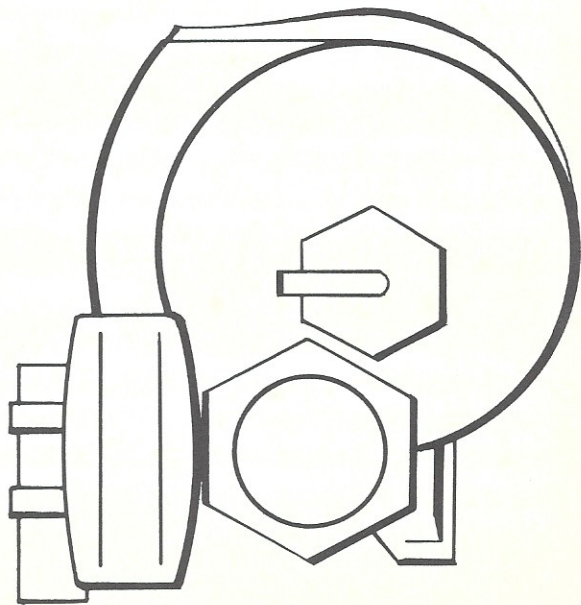


CLARK

**300 AND 400 SERIES
WINCH**



**MAINTENANCE &
SERVICE MANUAL
No. 2561-R2**

WARRANTY

Clark Equipment Company (CLARK) has warranted to the Distributor (Seller) who, pursuant to agreement with CLARK, hereby, on its own behalf, warrants to the Buyer each new CLARK product to be free from defects in material and workmanship under normal use and maintenance as herein provided.

Distributor's sole obligation under this warranty shall be limited to repairing, replacing or allowing credit for, at Distributor's option, any part which under normal and proper use and maintenance proves defective in material or workmanship within six (6) months after delivery to or one thousand (1000) hours of use by Buyer, whichever shall occur first, provided, however, that (i) the product is placed in use not later than one year after shipment from CLARK'S plant; (ii) that notice of any such defect and satisfactory proof thereof is promptly given by Buyer to Distributor; and (iii) such material shall have been returned to Distributor, with transportation charges prepaid and found by Distributor to have been defective.

This warranty does not apply in respect of damage to or defects in any product caused by overloading or other misuse, neglect or accident, nor does this warranty apply to any product which has been repaired or altered in any way which, in the sole judgment of Distributor, affects the performance, stability or general purpose for which it was manufactured.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES (EXCEPT OF TITLE), EXPRESSED OR IMPLIED, AND THERE ARE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL DISTRIBUTOR BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES.

This warranty does not apply to parts of trade accessories not manufactured by CLARK, or attachments not manufactured or sold by CLARK, Buyer shall rely solely on the existing warranties, if any, of the respective manufacturers thereof.

IMPROVEMENTS

It is CLARK'S policy to constantly strive to improve its products. The right therefore is reserved to make changes in design and improvements whenever it is believed the efficiency of the product will be improved thereby, but without incurring any obligation to incorporate such improvements in any product which has been shipped or is in service.

FORWARD

This manual gives the customer and his service personnel information for the maintenance and repair of the **CLARK** winch.

The manual includes an explanation of the operation of the winch, a list of its parts, methods for fault finding, and procedures for winch adjustments.

CLARK makes winches to the highest standards from the best materials. Correct procedures for preventive maintenance keep failures to a minimum and make low cost operation possible.

Use only **CLARK** parts. The **CLARK** Equipment Company warranty does not cover replacement parts other than those made or approved by **CLARK**. The **CLARK** warranty also does not cover failures caused by the use of non approved parts.

Give your distributor the model and serial number of the winch when you order parts.

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FAULT FINDING PROCEDURE

Before you service any of the winch components, see if the control lever linkage is correctly installed. Make a check of the adjustment. See that the control lever moves freely in both directions all the way to the end of its' stroke. If the lever and valve do not move correctly the winch will not function.

Make a check of the oil level in the transmission when the oil reaches normal operating temperature (180-200° F, 80-90° C).

PROBLEM	REASON	REMEDY
The winch does not have enough power.	The oil is too low.	Add transmission oil to the correct level.
	The hydraulic pump does not work.	Replace the pump.
	There is a leak in the hoses, tubes or fittings. Air is entering the system.	Make a check of the hoses. Repair, replace or tighten them where necessary.
	The transmission suction screen is plugged with foreign matter.	Clean the suction screen.
	The input clutch discs are worn.	Replace the disc.
	The freespool clutch is slipping. Oil seals are leaking oil to the clutch discs.	Replace the oil seals and clutch discs.
	The input clutch is slipping. Pressure at the input clutch is below normal.	Make a check of the clutch regulator valve on the transmission.
	The input clutch is slipping. The piston seals are damaged and oil does not actuate the clutch.	Replace the inner and outer piston seals.
The winch will not pull in the load, winch operation is slow or uneven.	The oil pressure is low.	Make a check of the valve on the transmission.
	The hoses are not correctly installed.	Make a check of all hoses and connections.
	There is a malfunction in the control valve.	Make a check of the control valve.
	The pinion sprag is installed backwards.	Remove the sprag, reverse it and install it.
	The discs for the free spool clutch are worn.	Replace the clutch discs.

PROBLEM	REASON	REMEDY
	The free spool clutch is slipping. Oil seals are leaking oil to the clutch discs.	Replace the oil seals and clutch discs.
	The pinion brake will not disengage.	Make a check of the piston, guide pins and brake discs. Repair or replace parts as necessary.
	The discs for the free spool clutch are installed without the correct shim.	Make a check for the correct shim dimensions. Install the correct shim.
The winch will not hold a load.	The free spool clutch is slipping. The clutch discs are worn.	Replace the clutch discs.
	The free spool clutch is slipping. The oil seals are leaking oil to the clutch discs.	Replace the oil seals and clutch discs.
	The control valve linkage is damaged, worn or incorrectly installed.	Repair or replace the linkage as necessary.
	The hoses from the control valve to the winch are incorrectly installed.	See that the hoses are correctly installed.
	The cable is slipping and will not wind onto the drum.	The ferrule is not fastened to the drum correctly. Install the ferrule in the drum.
	The free spool clutch will not engage.	Make a check for leakage in the control valve spool.
	The pinion sprag does not work.	Remove any foreign matter from the sprag. See if the sprag is assembled correctly.
The winch will not operate in the free spool position.	There is a leak or restriction in the hose to the free spool clutch.	Make a check for leaks or restrictions in the hose.
	There is damage or wear to the piston shaft seals in the free spool clutch.	Replace the seals.
	The handle for adjusting free spool tension is too tight.	See if the wear button is in good condition. Adjust the handle.
	The piston assembly for the free spool clutch is not correctly assembled.	See that the drum support is correctly aligned with the clutch piston.

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PROBLEM	REASON	REMEDY
	The control lever will not remain in the free spool position.	Make a check of the detent ball and spring.
	The springs are not installed correctly in the piston assembly for the free spool clutch.	Install the springs correctly.
	The discs of the free spool clutch do not move freely.	Make a check of the clutch discs and separator springs.
	The drum is contacting the winch housing.	Tighten the bolts, replace any defective parts.
	The discs of the free spool clutch are too tight.	Make a check for the correct quantity of discs. Make a check of the shim dimensions.
	Clutch pressure is low.	See if there is a restriction in the pressure line. Make a check of the pump.
	The steel clutch discs are magnetic.	Remove the magnetic field from the plates.
The winch will only pull the cable.	The pressure and lubrication hoses are not correctly installed.	Install the hoses correctly.
	The control valve will not function correctly.	Repair or adjust the valve or linkage.
The oil pressure is low at the input clutch, all other pressures are correct.	There is a leak in the input clutch.	Make a check of the seals for the input clutch.
	The control valve will not function correctly.	Adjust or repair the valve or linkage.
The oil pressure is low at the winch input clutch and the transmission clutches.	The input hose for the winch control valve supply is connected in place of the input hose for the pinion brake.	Connect the hoses correctly.
	The regulator valve for the torque convertor does not work.	Replace the valve.
	The drain hose for the winch control valve is disconnected.	Connect the drain hose.
	There is wear or damage to the charging pump.	Replace the pump if necessary.
	The transmission oil level is low.	Fill the transmission with oil to the correct level.

OVERHAUL PROCEDURE

These instructions give an explanation of the correct procedure for disassembly and assembly for all Clark winch models. Your winch can be different from the model in the photographs.

Clean the outside of the winch carefully before starting disassembly. Careful cleaning will prevent foreign material from entering the system.

WINCH IDENTIFICATION

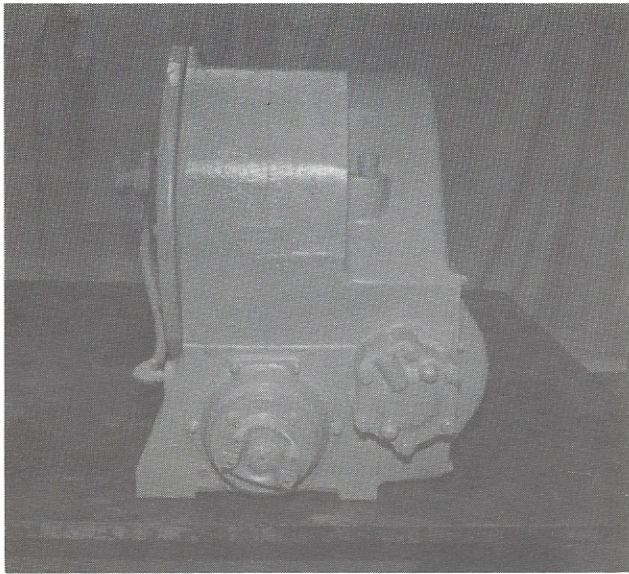


Figure 1

This is the input side of a W series winch.

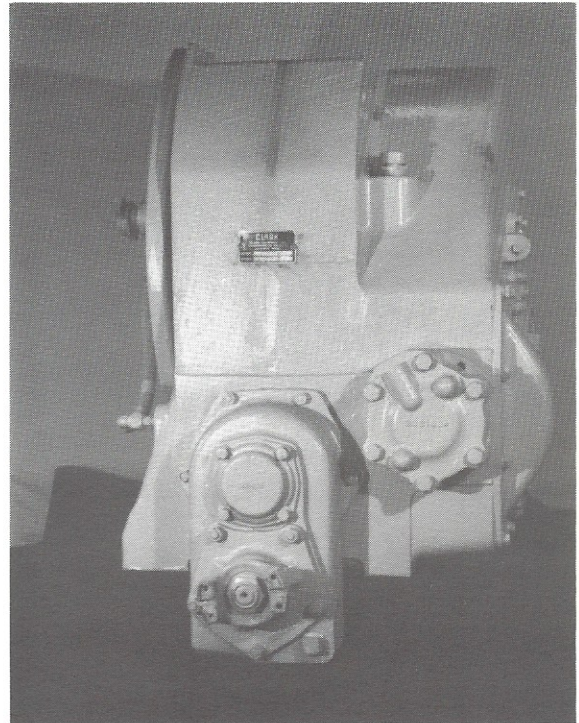


Figure 3

This is the input side of a WD series winch.

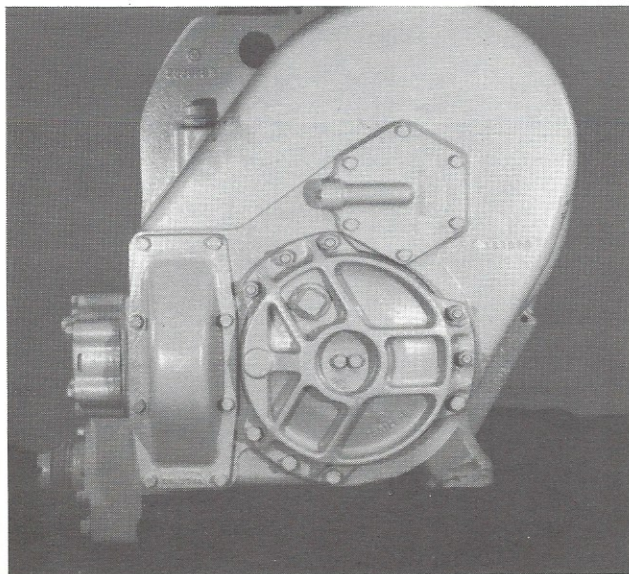


Figure 2

This is the winch from the left side of the machine.

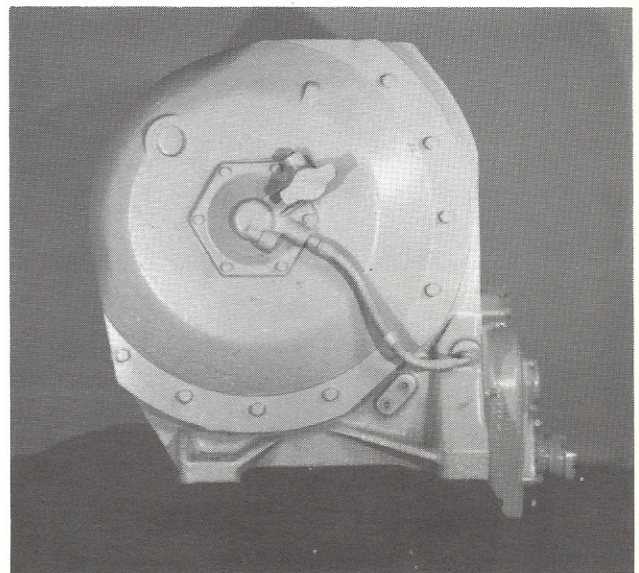


Figure 4

This is the winch from the right side of the machine.

HOW TO REMOVE THE CABLE DRUM COVER

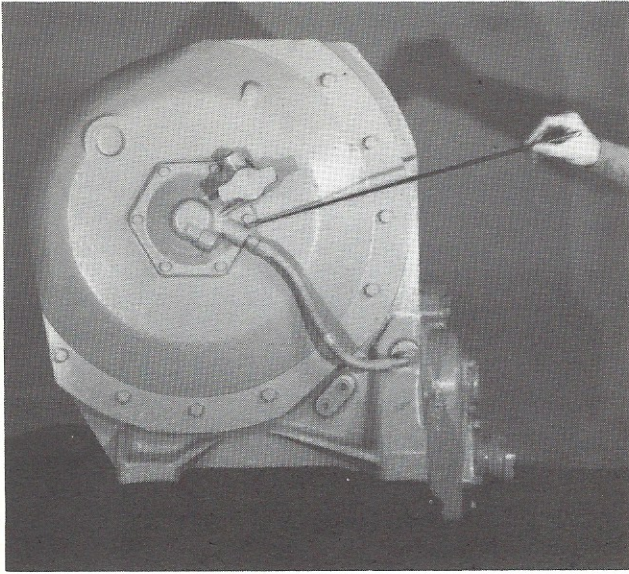


Figure 5

Remove the drain hose assembly and the bearing cap.

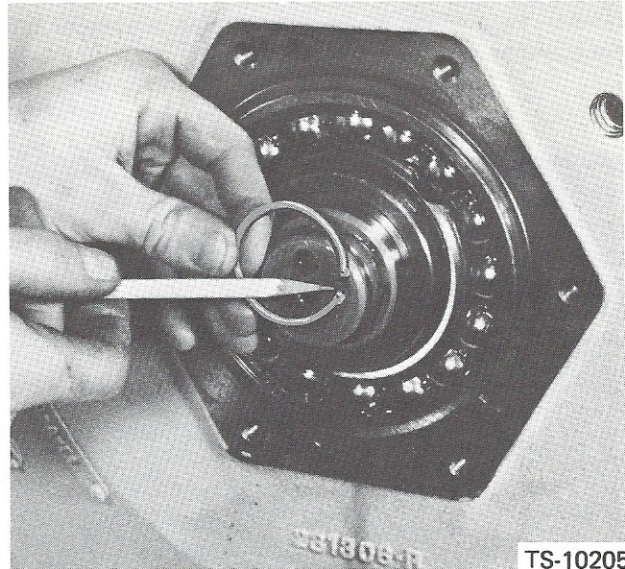


Figure 7

Remove the piston ring from the shaft.

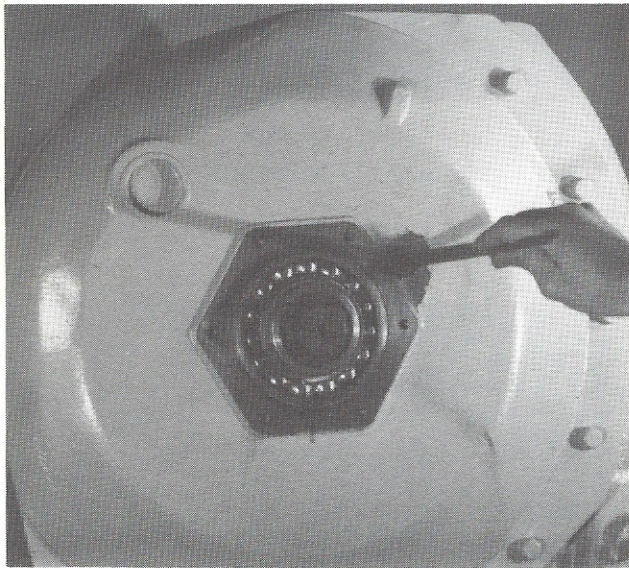


Figure 6

Remove the wear button from the cable drum cover.

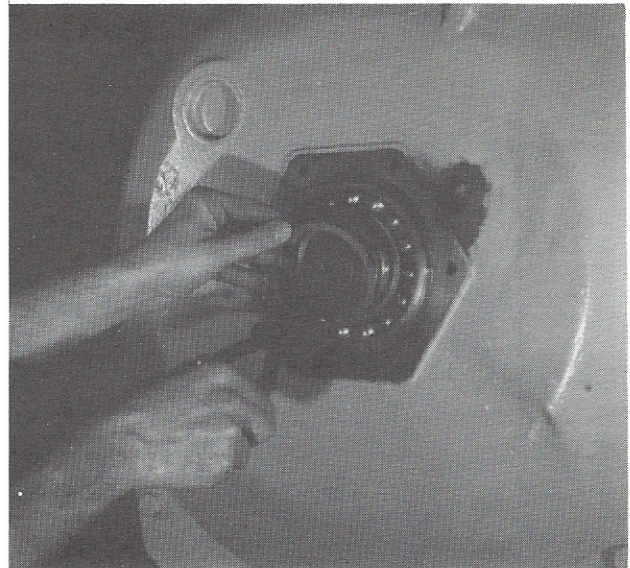


Figure 8

Remove the snap ring that holds the bearing.

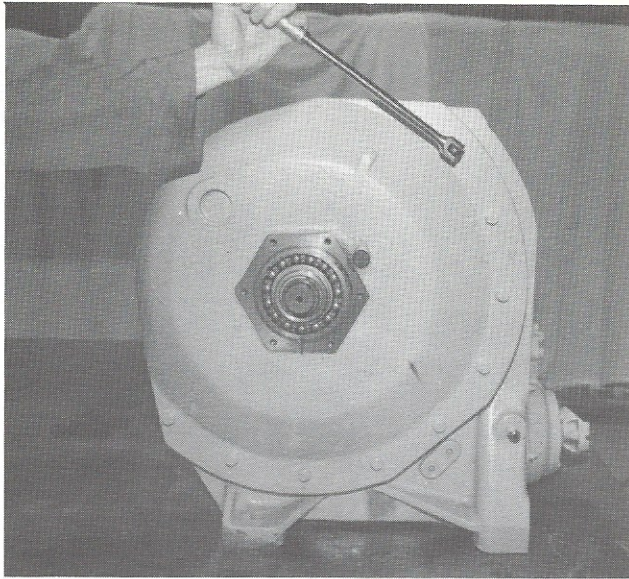


Figure 9

Remove the capscrews that hold the cable drum cover. Use a pry bar to pull the cover 3/8" (9.4 mm) away from the winch housing.

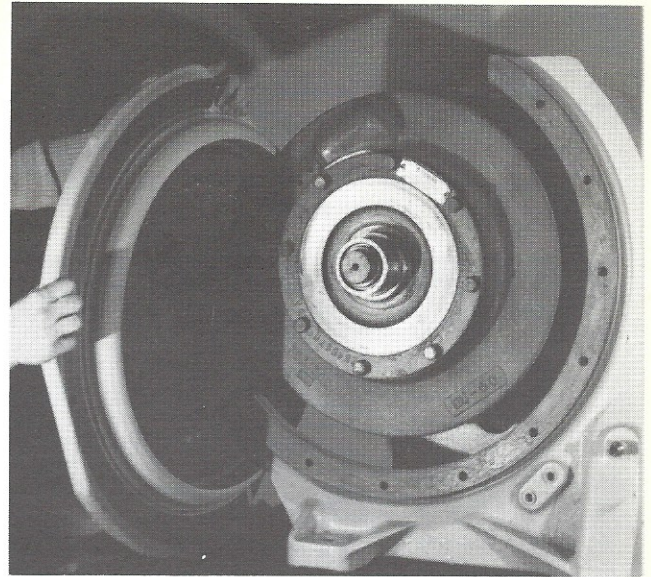


Figure 11

Remove the cable drum cover.

! CAUTION: Pull the cover off in a straight line to prevent damage to the lip seal.

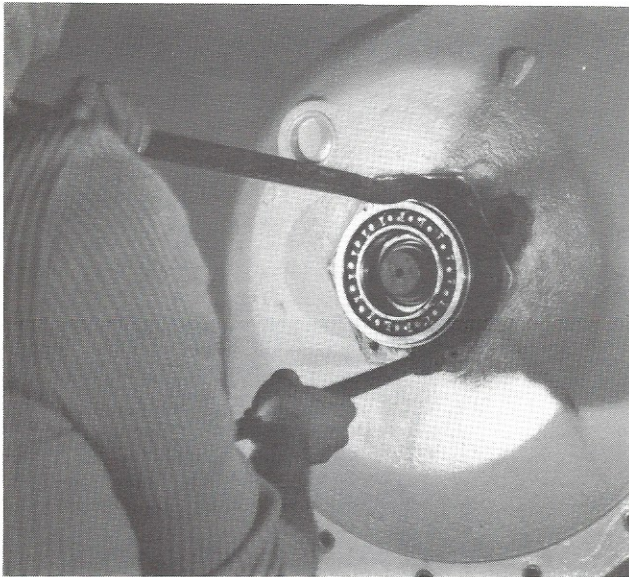


Figure 10

Give support to the cable drum with a hoist and chain or cable. Push the cover back in place so you can see the snap ring around the bearing. Remove the bearing with two pry bars or a bearing puller tool.

HOW TO REMOVE THE FREE SPOOL CLUTCH

WARNING: The free spool clutch is under approximately 10,000 lbs. (4,600 kgm.) of pressure. Use caution and follow these instructions when you remove or disassemble this component. Incorrect procedure will cause personal injury.

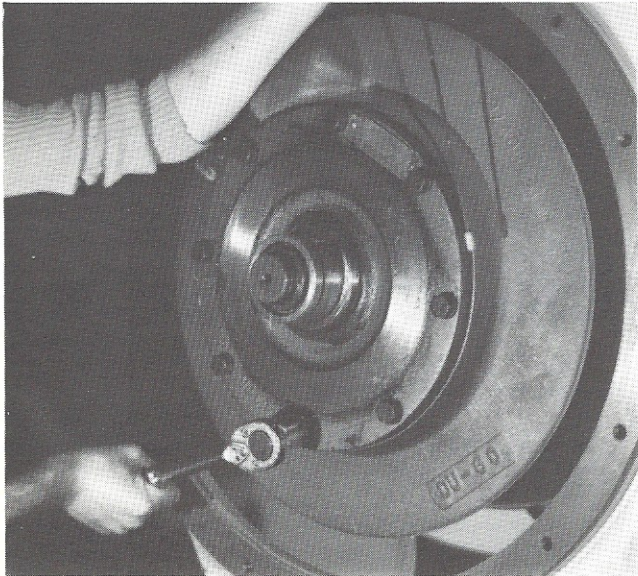


Figure 12

Loosen each capscrew for the free spool assembly one turn at a time until the support plate is 1/2" (12.5 mm) away from the cable drum. See if there is spring tension in the free spool assembly.

WARNING: Spring tension can mean a broken clutch shaft or split rings. Removal of all existing capscrews can release the pressure in the free spool clutch causing personal injury.

If there is no spring tension, and the free spool assembly is loose on the capscrews, remove the capscrews. If there is spring tension, stand to one side of the winch and replace the existing capscrews, one at a time, with capscrews twice as long. After you install all the longer capscrews, loosen each, one turn at a time and remove them.

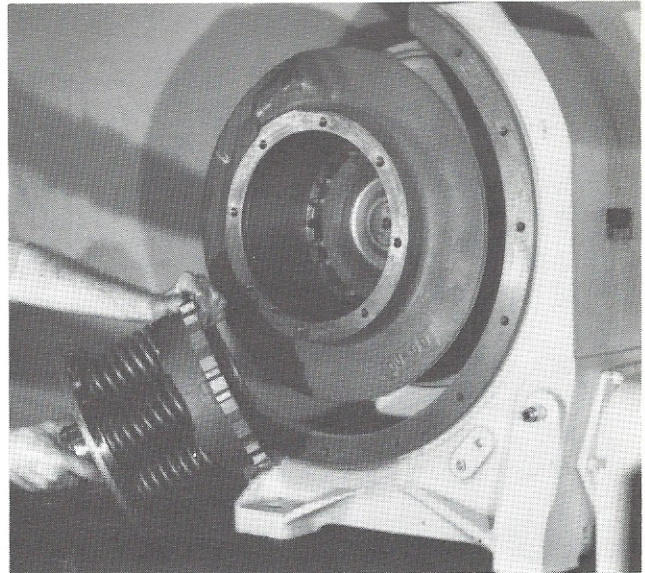


Figure 13

Remove the free spool piston assembly.

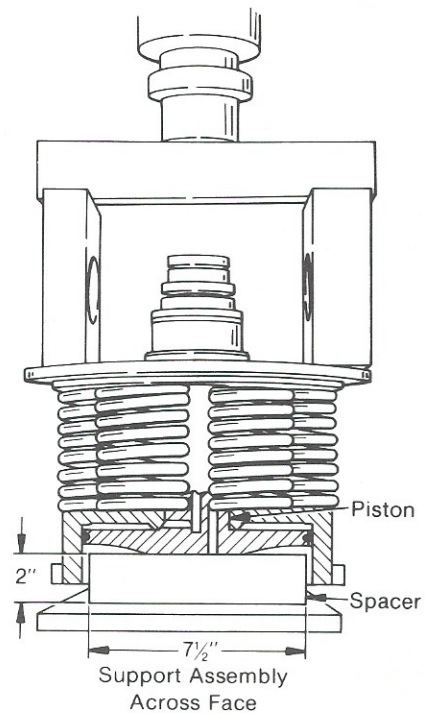


Figure 14

Remove the snap ring from the piston bore. To remove the bore plug, apply air pressure to the small radial hole at the opposite end of the piston shaft. The air will force the plug from the bore. Place the assembly in the press. Put a cylindrical spacer inside the bore between the piston and the press bed. The spacer must be 2 to 2.5 in., (5 to 6 cm.) thick and 7.5 in. (19 cm.) in diameter. You can make a spacer from brass or hardwood. Use the press to slowly apply pressure on the drum support plate. Increase the pressure until the drum support passes the split rings.

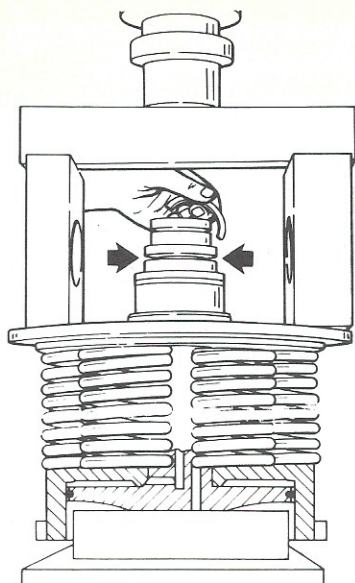


Figure 15

Remove the split rings.

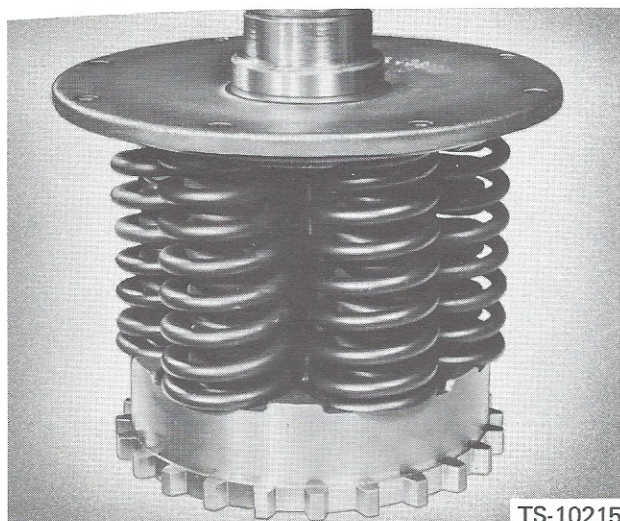


Figure 16

Release the tension on the free spool piston assembly.

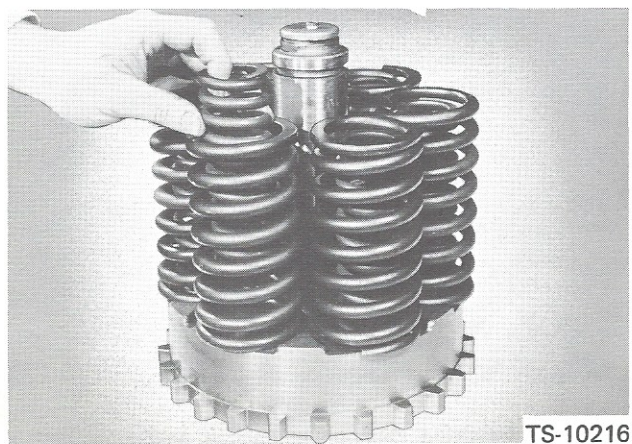


Figure 17

Remove the inner and the outer springs.

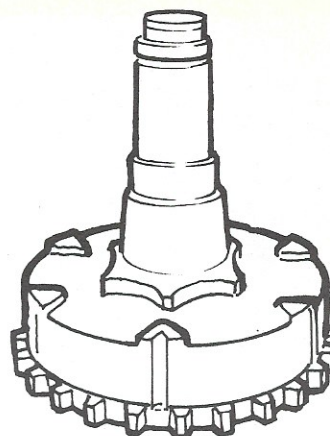


Figure 18

Remove the clutch piston from the clutch shaft and the plate assembly.

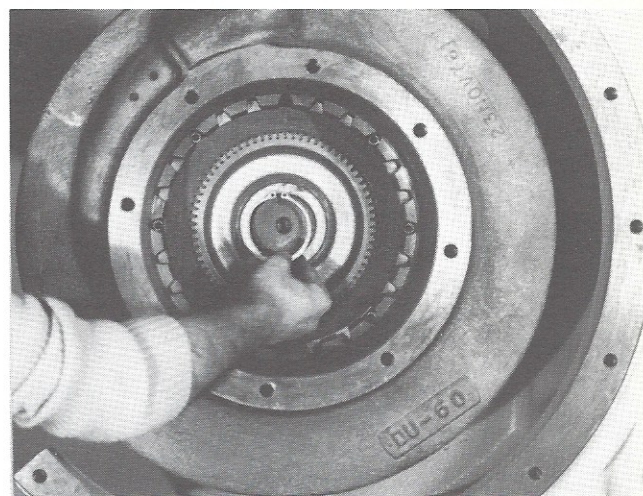


Figure 19

Remove the snap ring from the shaft.

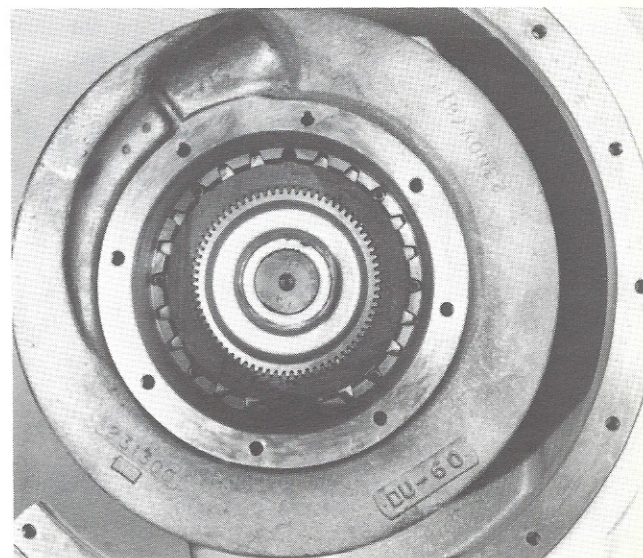


Figure 20

Remove the clutch discs from the cable drum.

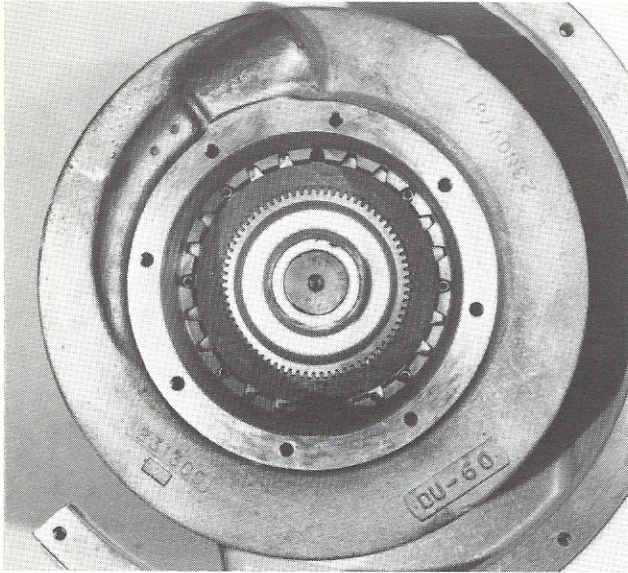


Figure 21

If your winch has 12 separator springs in the channels for the clutch disc teeth, remove them now. If it does not have them, you may add springs for easier free spooling action. See the assembly instructions.

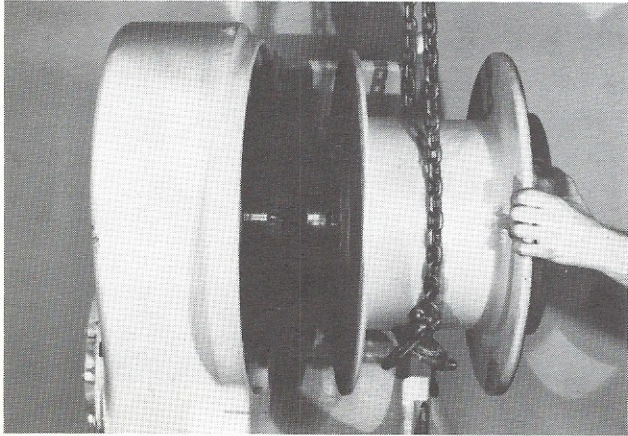


Figure 22

Remove the drum and the hub support from the winch housing. Remove the hub carefully in a straight line so you do not cause damage to the lip seal inside the hub support.

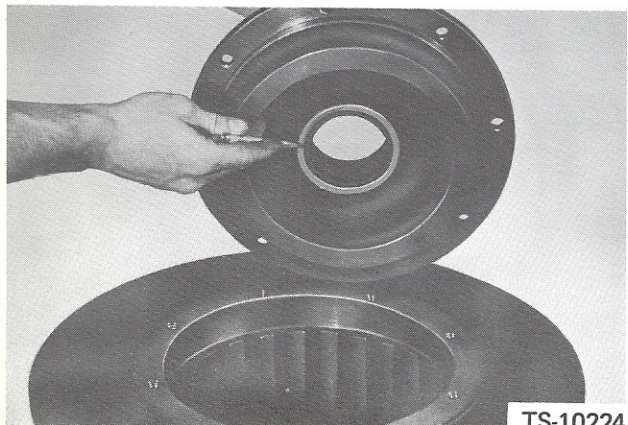


Figure 23

Remove the assembly that gives support to the drum hub.

HOW TO REMOVE THE DRIVE GEAR FOR THE CABLE DRUM FOR ALL MODEL WINCHES.

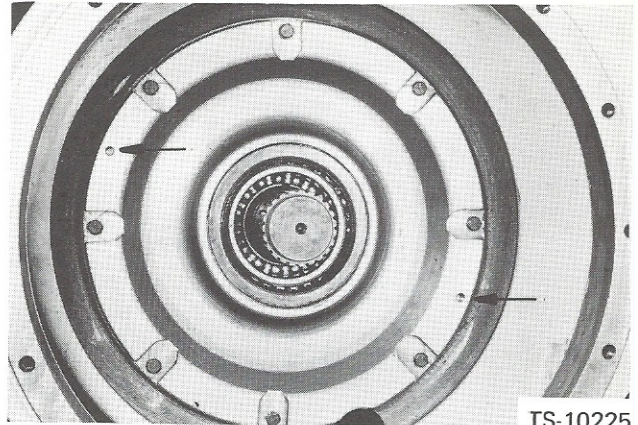


Figure 24

Put puller bolts into the two holes indicated. Remove the drum support.

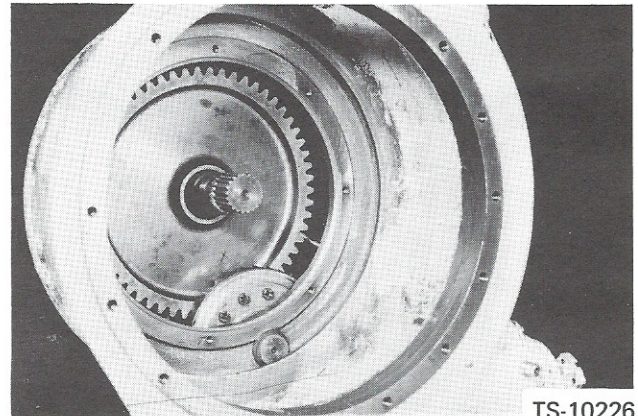


Figure 25

This is the drum drive gear.

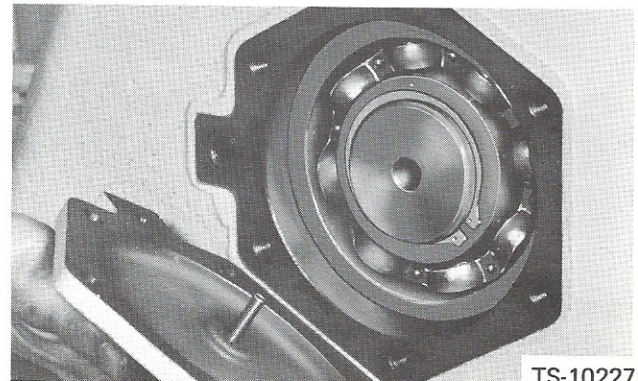


Figure 26

Remove the drum shaft cover and its snap ring. Push the shaft through the bearing and the drive gear. You can remove the drive gear without removing the ring gear.

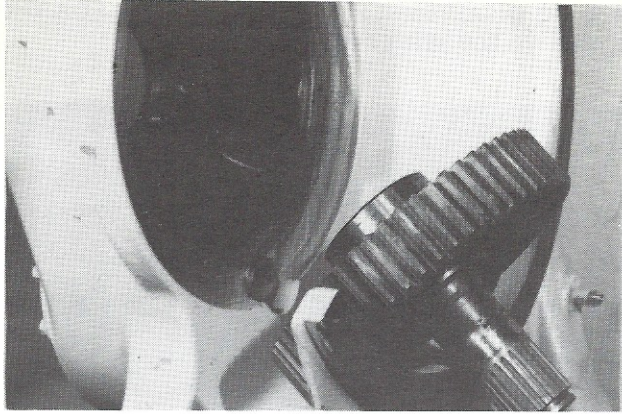


Figure 27
Remove the drive gear and its shaft.

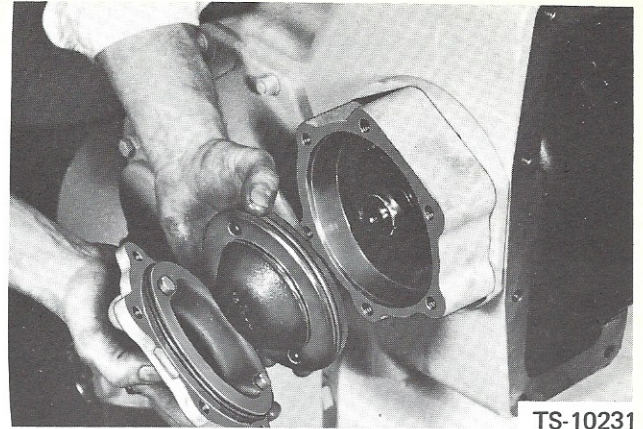


Figure 30
Remove the pinion brake cover and piston.

TS-10231

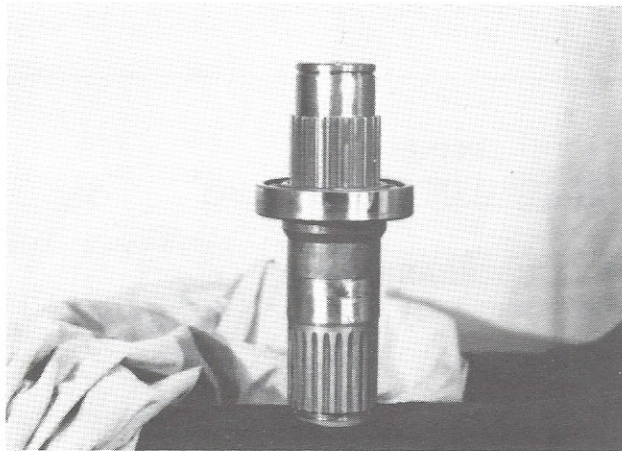


Figure 28
This is the cable drum drive shaft and its bearing.

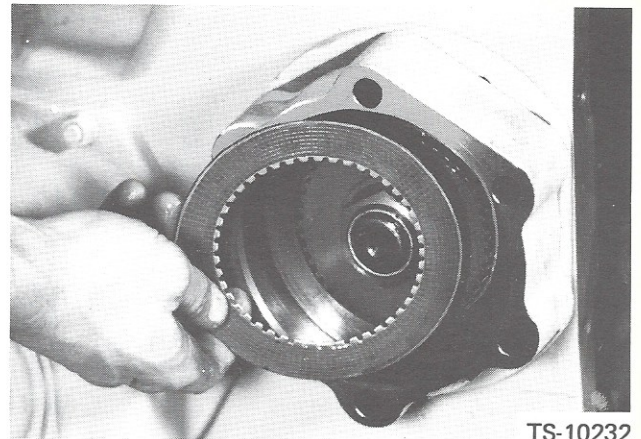


Figure 31
Remove the brake disc and housing.

TS-10232

HOW TO REMOVE THE PINION SHAFT AND BRAKE FOR THE W AND WD SERIES WINCH.

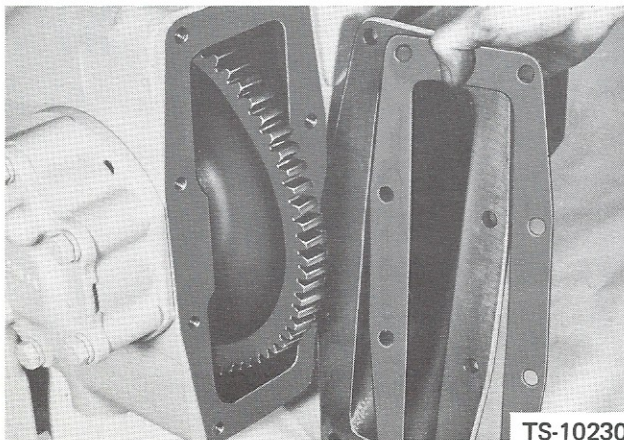


Figure 29
Remove the pinion drive gear cover and gasket.

TS-10230

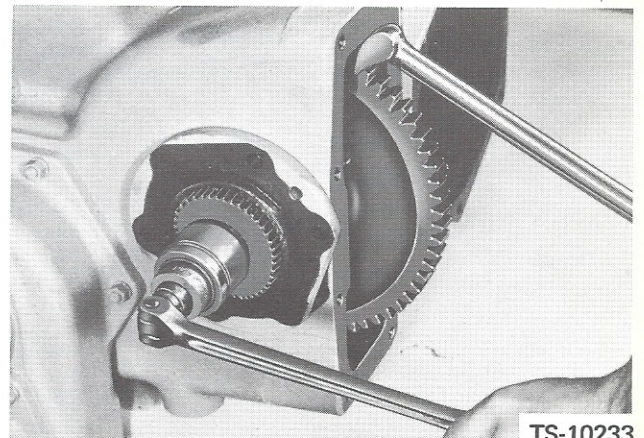
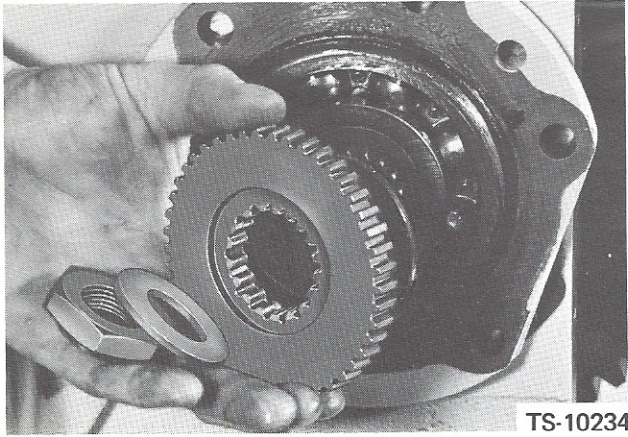


Figure 32
Remove the nut.

TS-10233

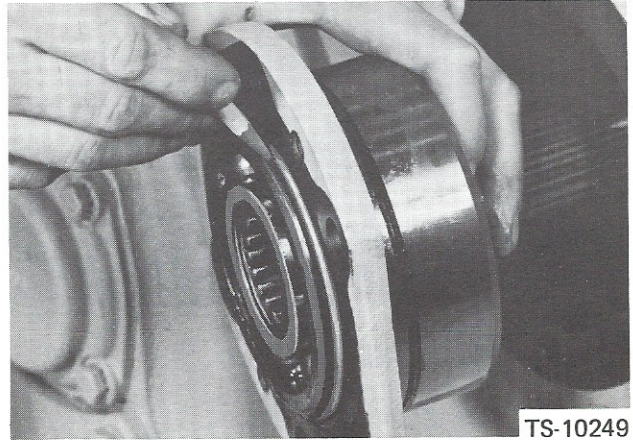


TS-10234

Figure 33

Remove the washer and disc hub.

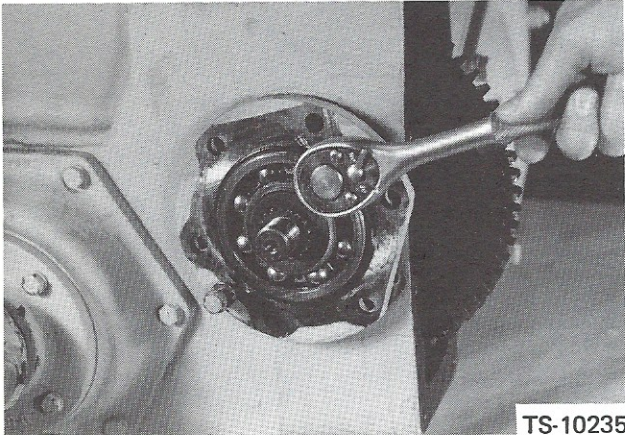
HOW TO DISASSEMBLE THE PINION SPRAG FOR THE W AND WD 300 SERIES WINCH.



TS-10249

Figure 36

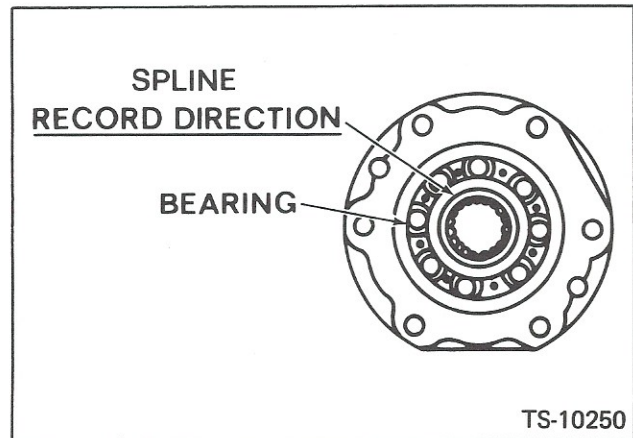
Remove the pinion brake assembly.



TS-10235

Figure 34

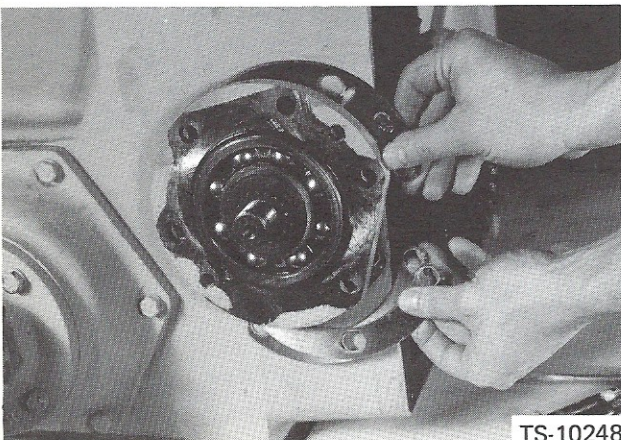
Use two puller screws to pull the outer race a small distance from the housing.



TS-10250

Figure 37

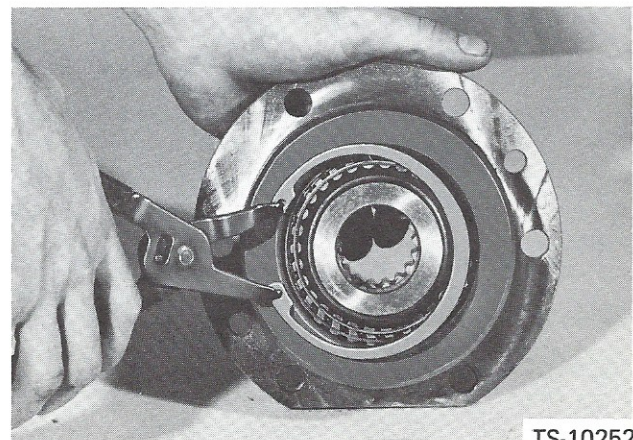
Make a note of the direction the inner race rotates when the outer race is stationary.



TS-10248

Figure 35

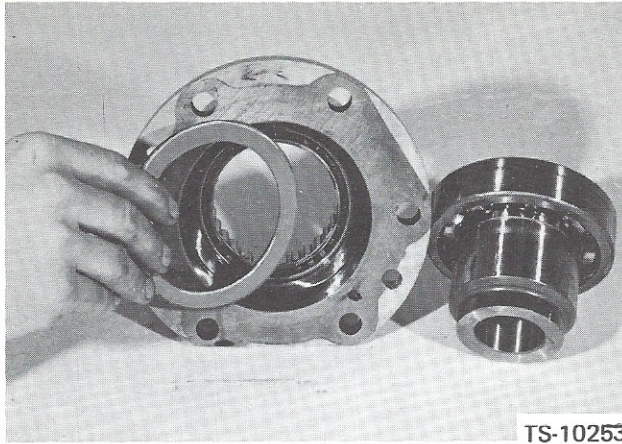
Remove the split shim packs and tag them separately.



TS-10252

Figure 38

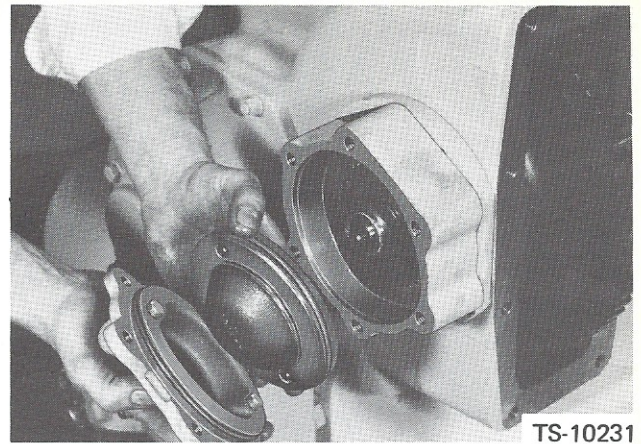
Remove the sprag retaining ring.



TS-10253

Figure 39

Remove the sprag retaining washer.



TS-10231

Figure 42

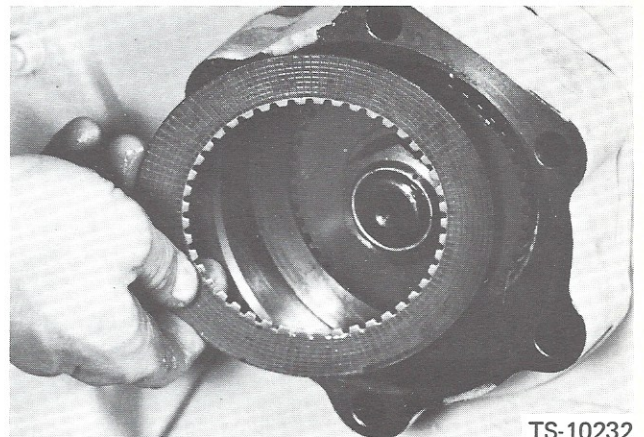
Remove pinion shaft piston and cover.



TS-10254

Figure 40

Slide the sprag assembly from the outer race.

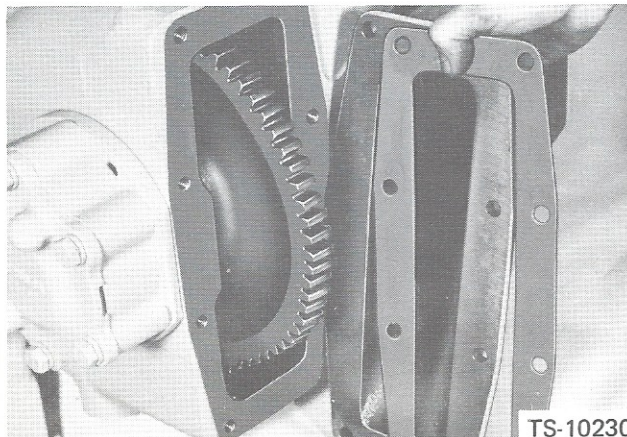


TS-10232

Figure 43

Remove the brake disc and housing.

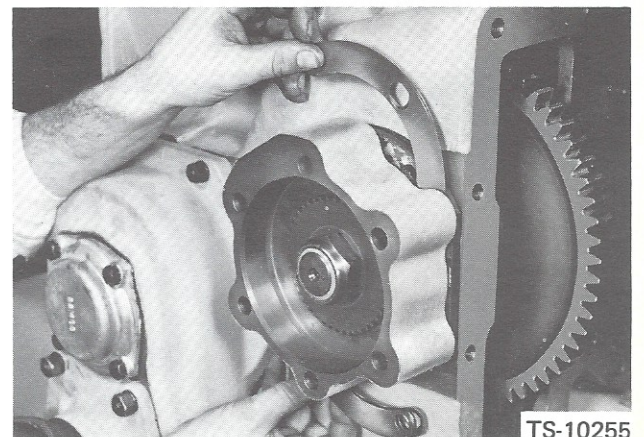
HOW TO REMOVE THE PINION SHAFT AND BRAKE FOR THE W AND WD 311, AND ALL 400 SERIES WINCHES.



TS-10230

Figure 41

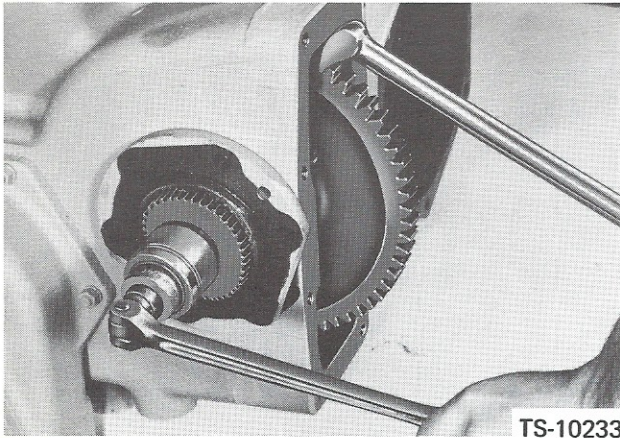
Remove pinion drive gear cover and gasket.



TS-10255

Figure 44

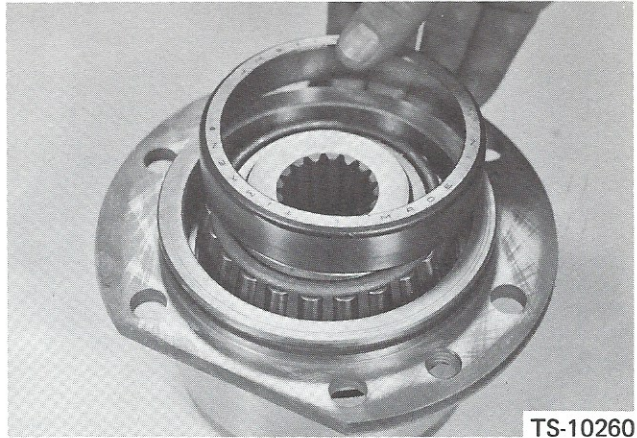
Remove the brake housing and split shim pack.



TS-10233

Figure 45

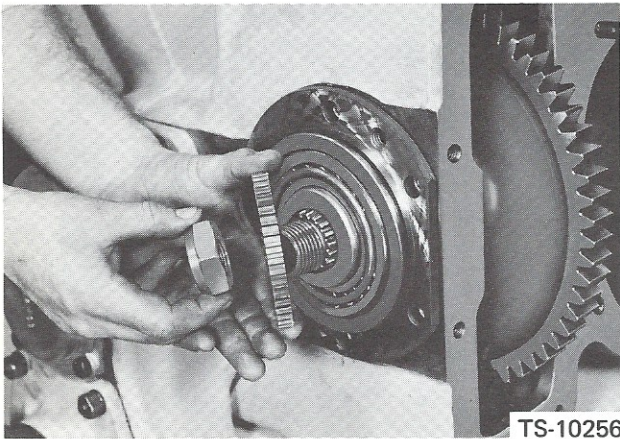
Remove the pinion shaft nut.



TS-10260

Figure 48

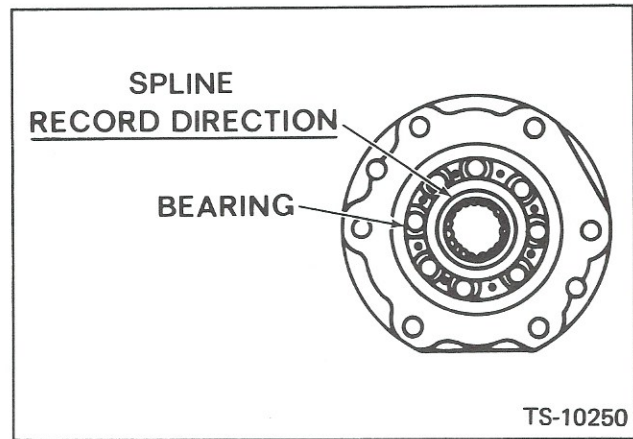
Remove the front bearing cup.



TS-10256

Figure 46

Remove the disc hub and nut for the pinion shaft.

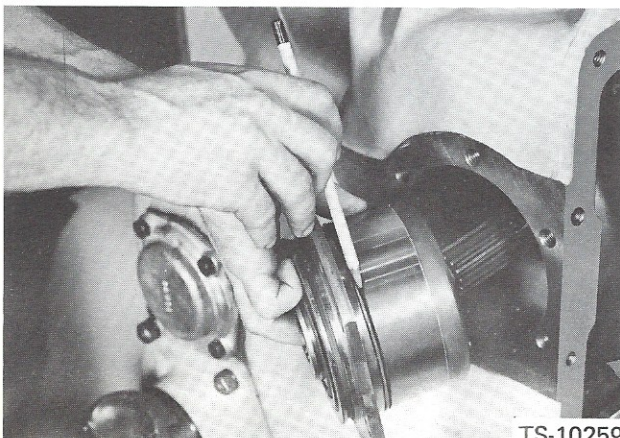


TS-10250

Figure 49

Make a note of the direction the inner race rotates when the outer race is stationary.

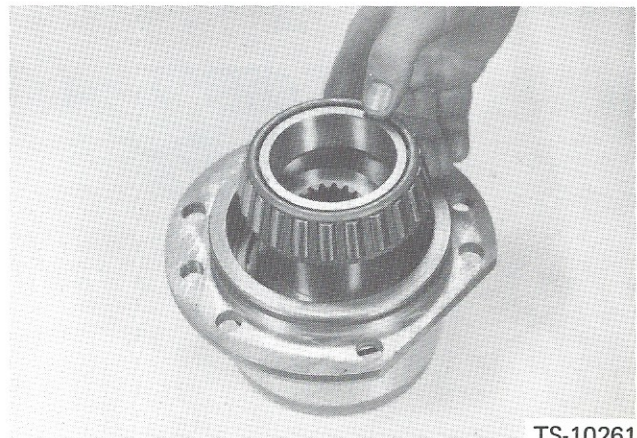
HOW TO DISASSEMBLE THE PINION SPRAG FOR THE W AND WD 311 AND ALL 400 SERIES WINCHES.



TS-10259

Figure 47

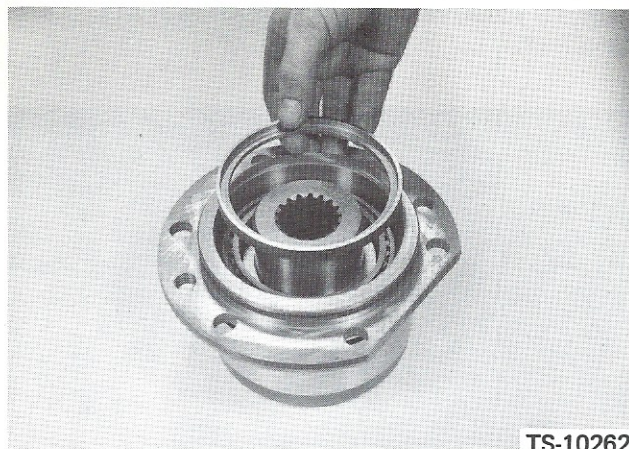
Remove the sprag outer race.



TS-10261

Figure 50

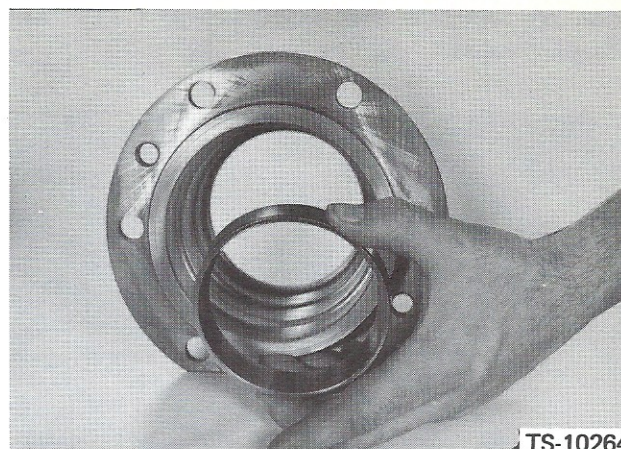
Remove the front bearing cone.



TS-10262

Figure 51

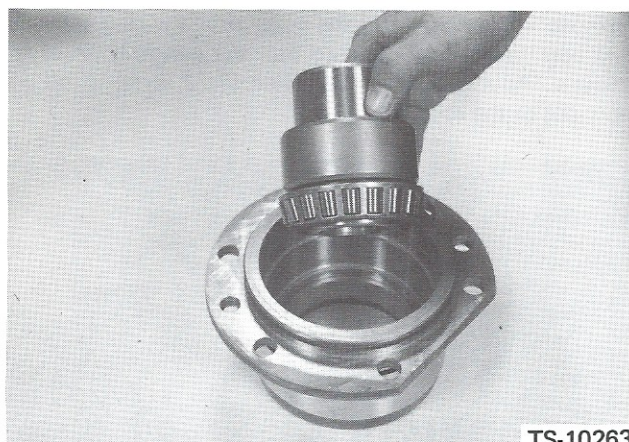
Remove the sprag retainer.



TS-10264

Figure 53

Remove the rear bearing cup.



TS-10263

Figure 52

Remove the sprag, the inner race of the sprag, and the rear bearing cone.



TS-10265

Figure 54

This is the inner race of the sprag with the front and rear bearing cones.

HOW TO REMOVE THE PINION SHAFT FOR ALL MODEL WINCHES.

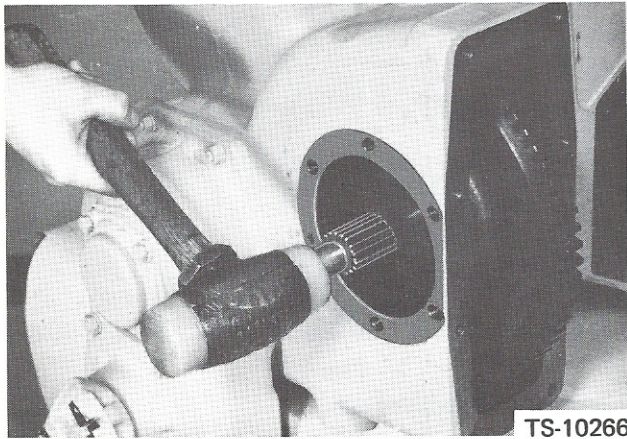


Figure 55

Hit the pinion shaft carefully with a soft headed mallet to push it through the drive gear. Do not damage the shaft.

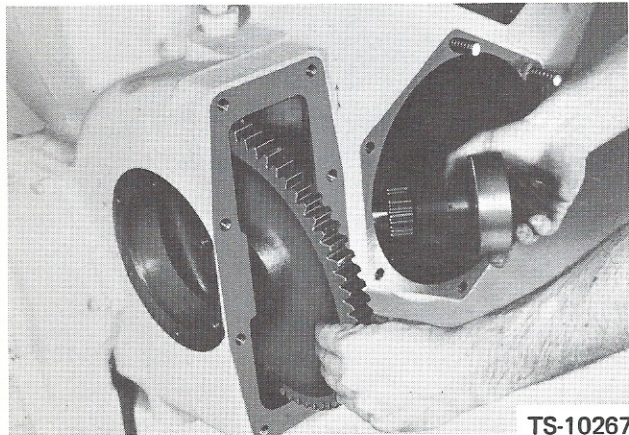


Figure 56

Hold the pinion drive gear. Remove the pinion shaft and its bearing assembly through the ring gear opening.

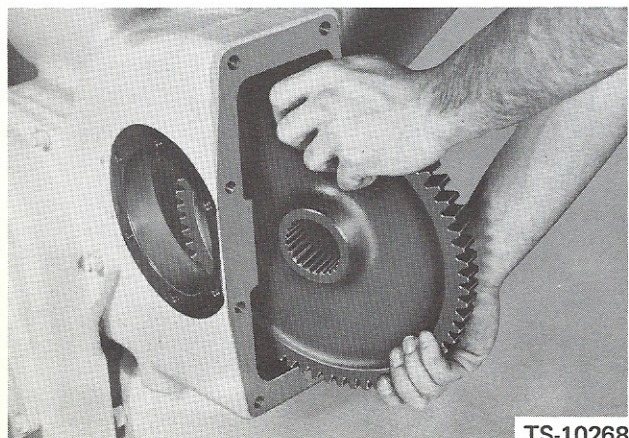


Figure 57

Remove the pinion shaft drive gear.

HOW TO REMOVE THE RING GEAR FOR ALL MODEL WINCHES.

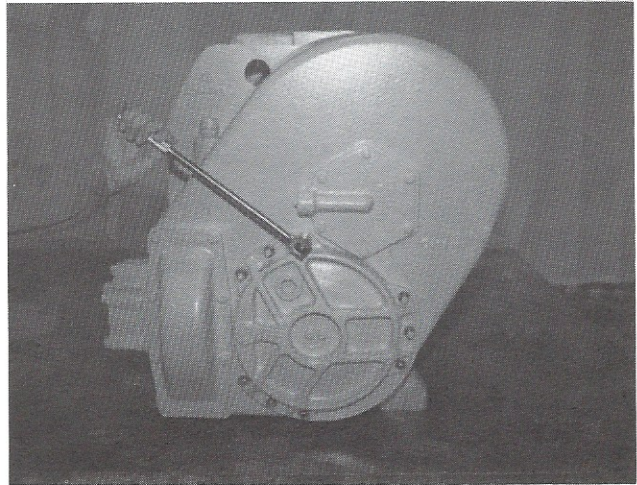


Figure 58

Remove the screws from the cover over the ring gear. Use pry bars in the pry slots to pull the assembly from the housing. Approximately 1/2 gallon (2.77 litres) of oil will flow out of the opening.

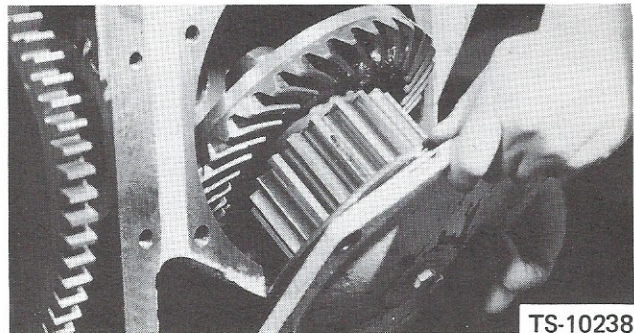


Figure 59

Pull back the pinion and remove the ring gear from the housing.

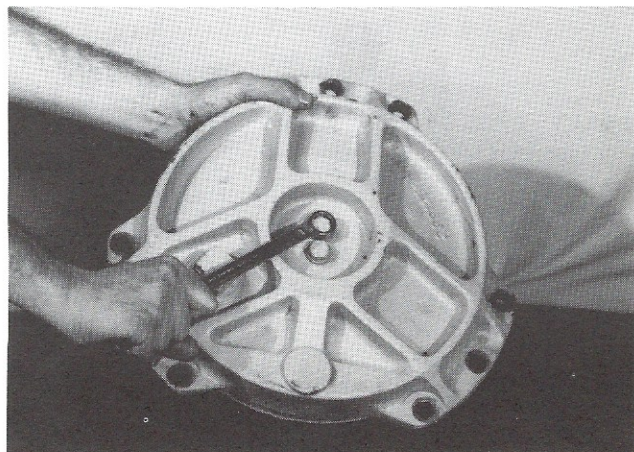


Figure 60

Loosen the two bolts in the cover approximately 1/2 inch (1.27 cm). Hold the cover. Hit the screw heads carefully to remove the friction caused by the o-rings.



Figure 61

TS-10240

These are the cover, the bearing adjustment shims and the shaft o-ring. Fasten the shims together with wire.

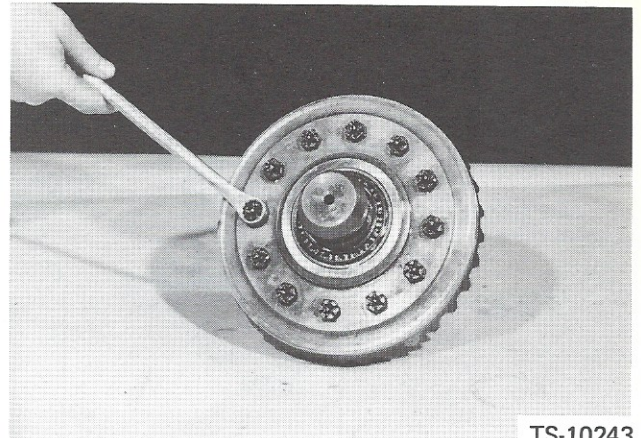


Figure 64

TS-10243

Remove the screws as shown. Remove the ring gear.

NOTE: On some models the ring gear is riveted to the hub. Do not separate them.

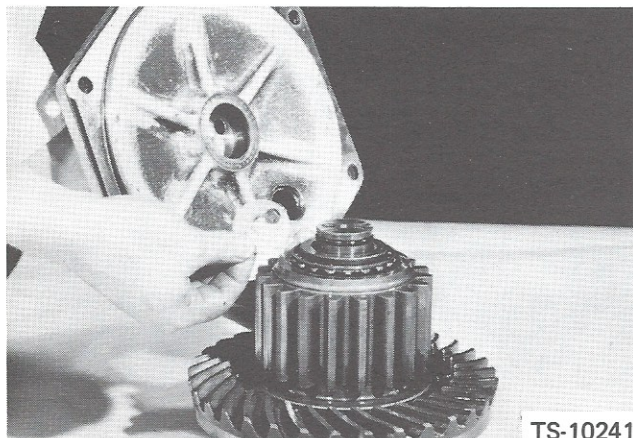


Figure 62

TS-10241

Give the ring gear assembly support as shown. Hit the shaft out carefully with a brass rod and hammer.

HOW TO REMOVE THE INPUT CLUTCH FOR ALL W SERIES WINCHES.

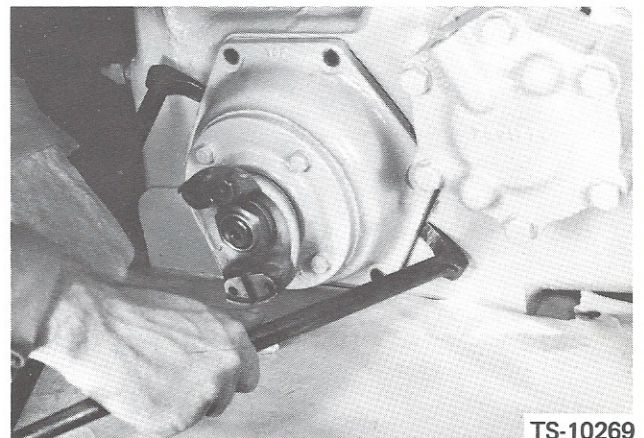


Figure 65

TS-10269

Remove the screws and the nut from the input bearing cap. Loosen the assembly in the housing with pry bars in the pry slots.

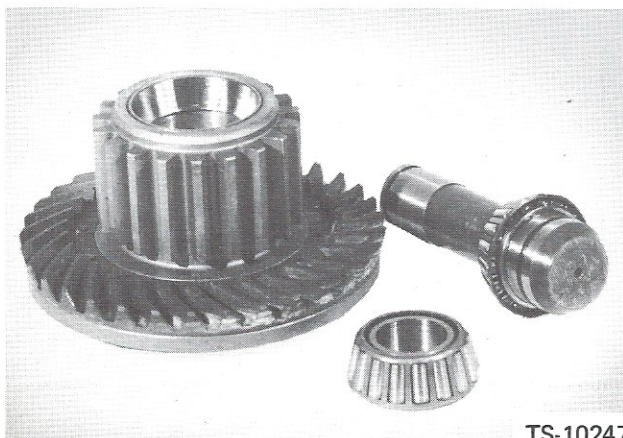
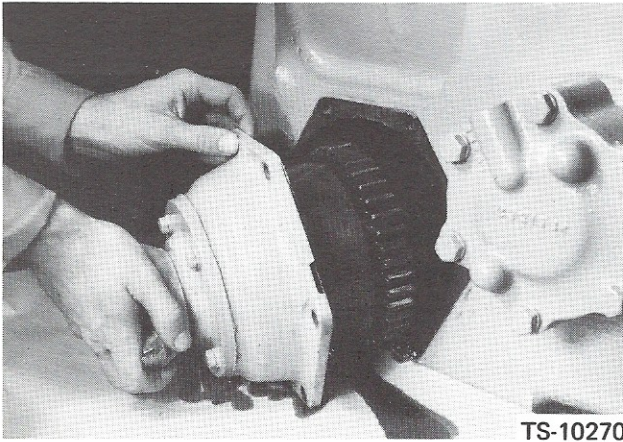


Figure 63

TS-10247

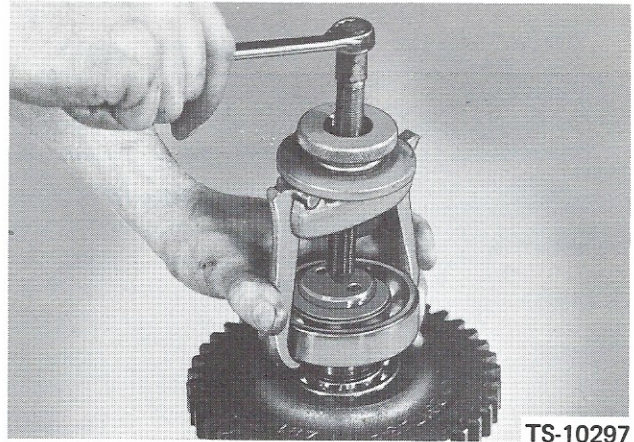
This is the ring gear assembly with the shaft and bearings.



TS-10270

Figure 66

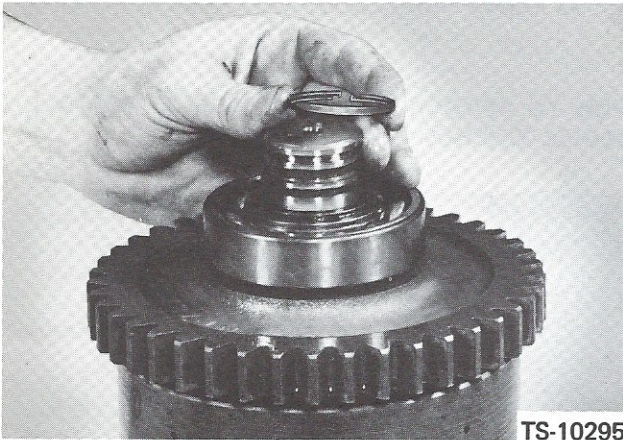
Remove the assembly from the winch case.



TS-10297

Figure 69

Remove the bearing from the shaft.



TS-10295

Figure 67

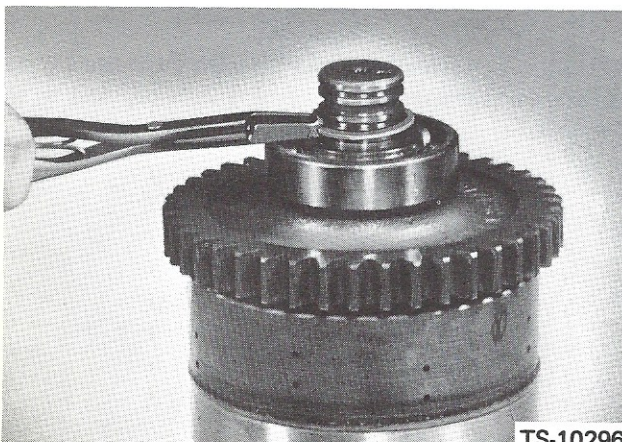
Remove the piston rings from the shaft.



TS-10298

Figure 70

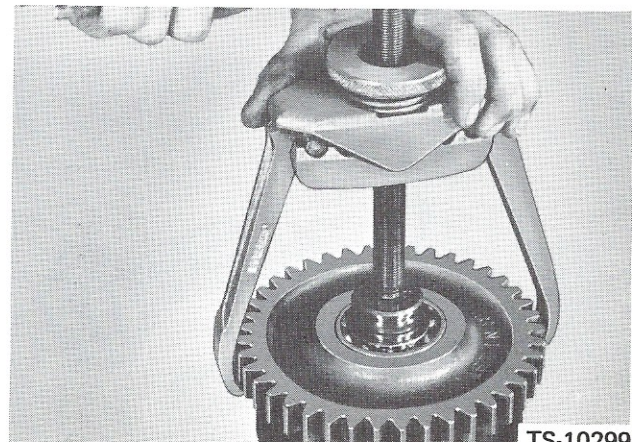
Remove the inner snap ring.



TS-10296

Figure 68

Remove the snap ring that holds the bearing.



TS-10299

Figure 71

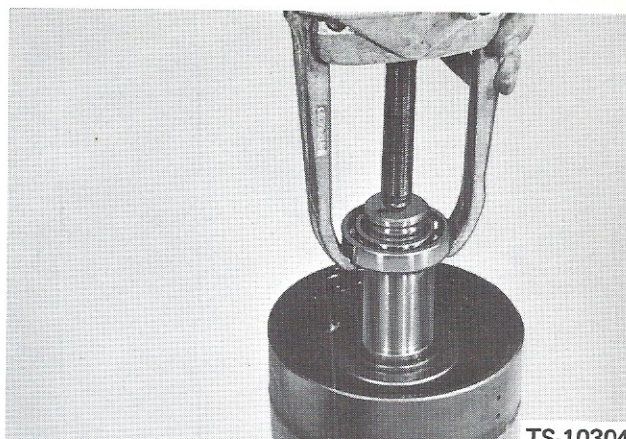
Remove the input gear and its bearing from the shaft.



TS-10301

Figure 72

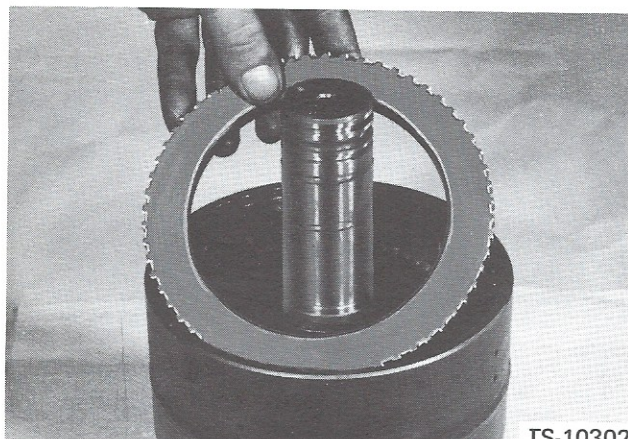
Remove the snap ring on the backing plate.



TS-10304

Figure 75

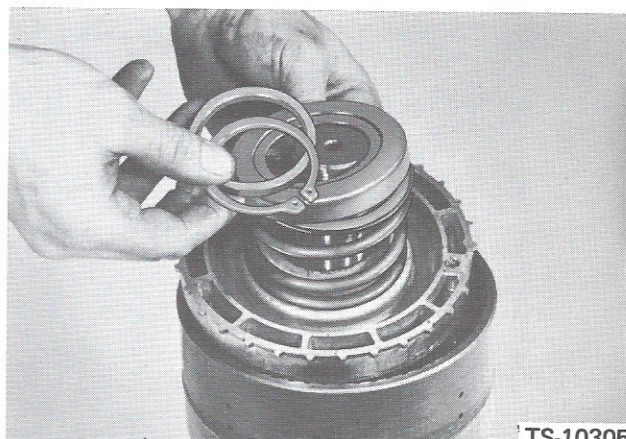
Remove the inner bearing with a bearing puller tool.



TS-10302

Figure 73

Remove the backing plate.

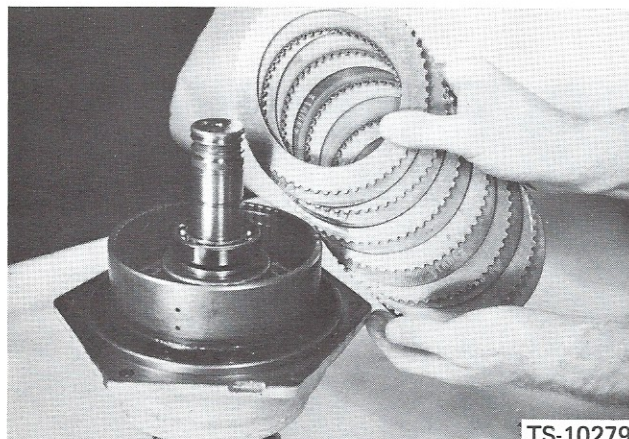


TS-10305

Figure 76

Push down on the release spring and remove the snap ring. Remove the spacer, spring retainer, spring, lip seal and piston assembly.

CAUTION: Be careful when you remove the snap ring and release spring. The spring is under compression.



TS-10279

Figure 74

Remove the inner and the outer clutch discs.

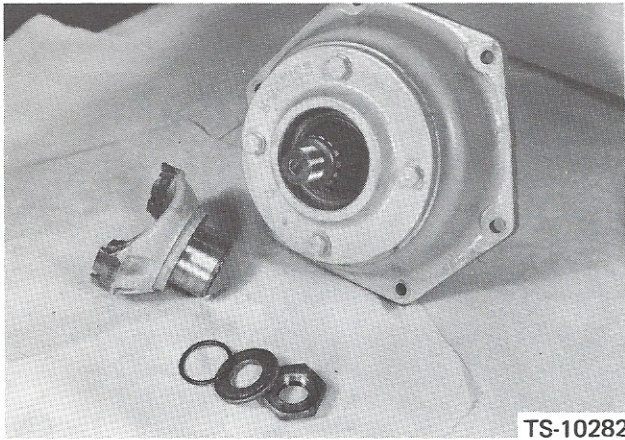


Figure 77

Remove the nut and washer from the pinion shaft. Remove the disc hub and its washer.

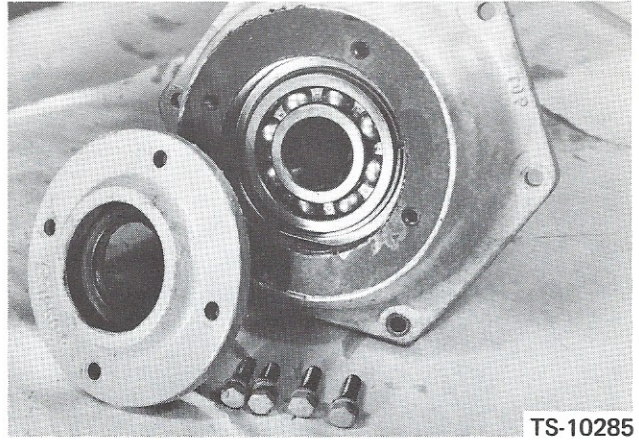


Figure 80

Remove the end cover. Replace the bearing oil seal.

HOW TO REMOVE THE INPUT CLUTCH AND DROP GEAR FOR ALL WD SERIES WINCHES.

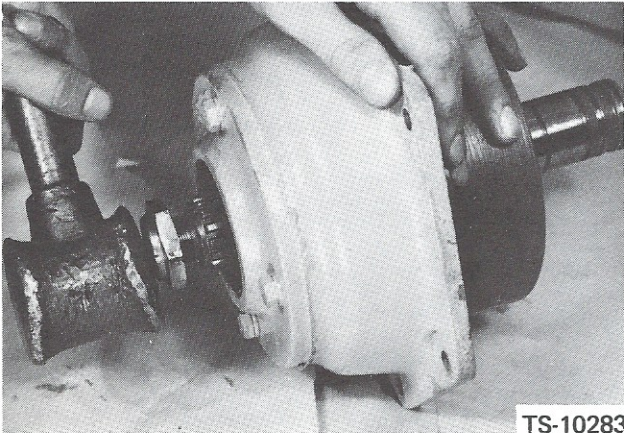


Figure 78

Remove the input shaft.

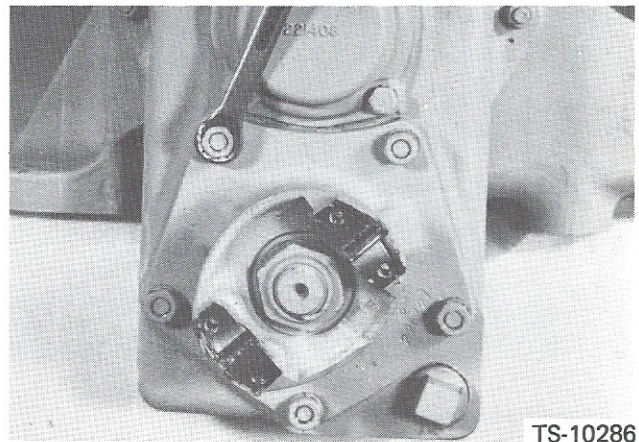


Figure 81

Remove the nuts for the bearing cap of the input shaft. Remove the bearing cap from the drop box.

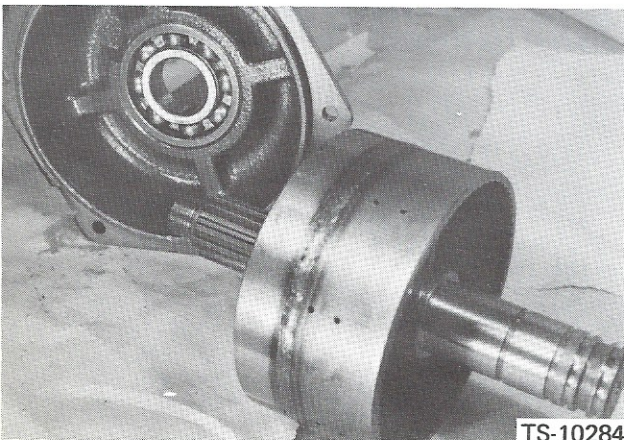


Figure 79

This is the input shaft removed from the bearing cap.

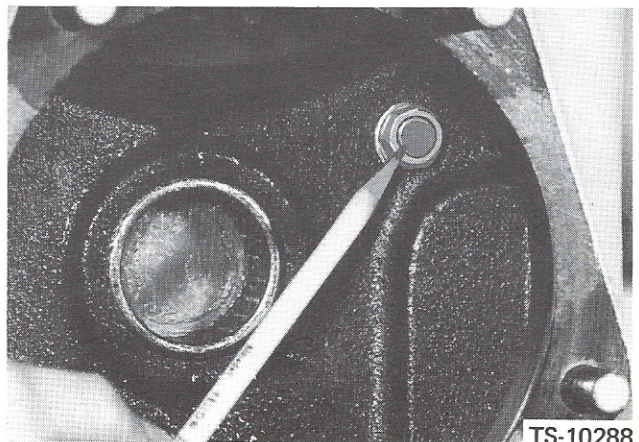


Figure 82

Remove the mounting bolts for the inner drop box.

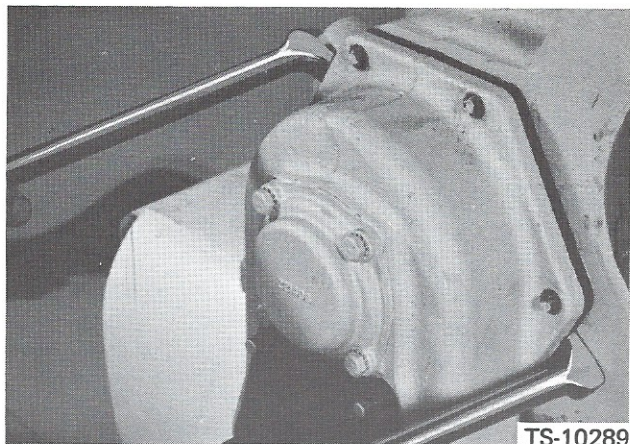


Figure 83

Use pry bars to remove the input clutch assembly.

TS-10289

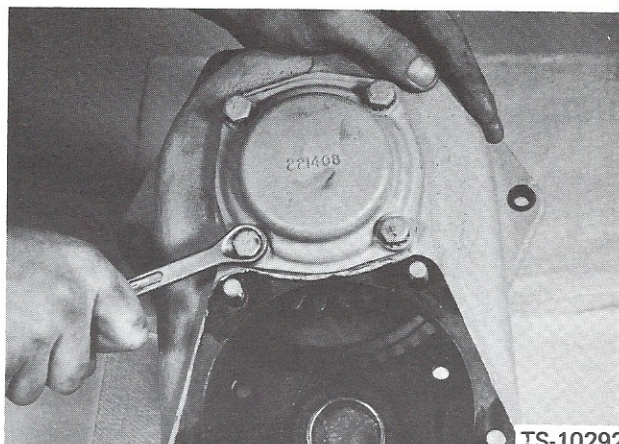


Figure 86

Remove the bolts for the bearing cap. Remove the cap.

TS-10292

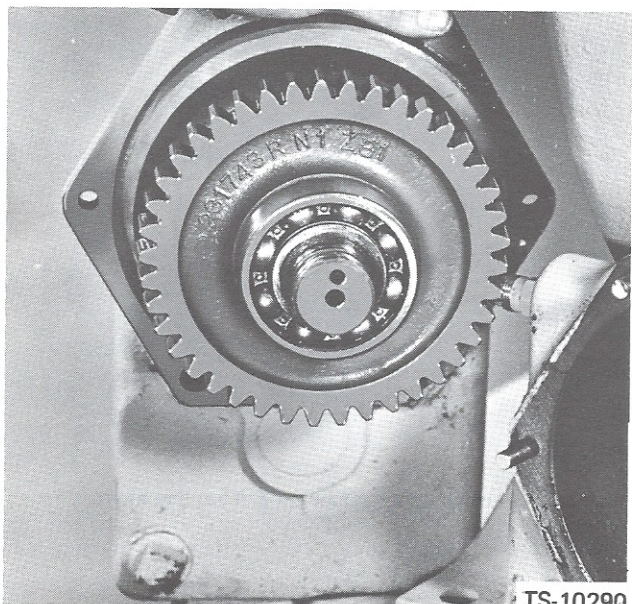


Figure 84

This is the input clutch and housing removed from the winch.

TS-10290

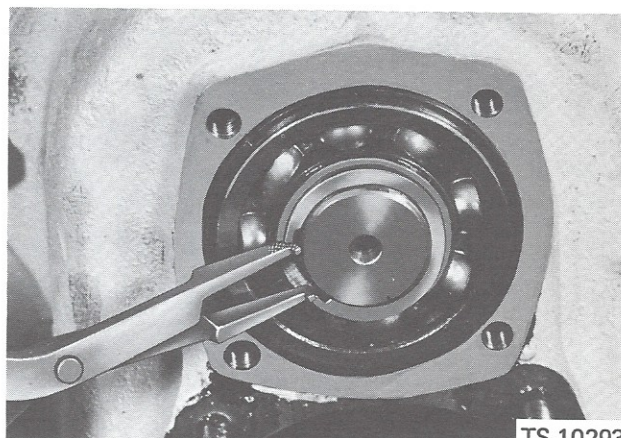


Figure 87

Remove the retaining ring and input shaft.

TS-10293

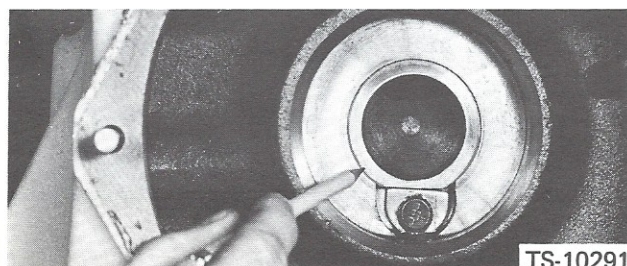


Figure 85

This is the race for the input shaft piston.

TS-10291

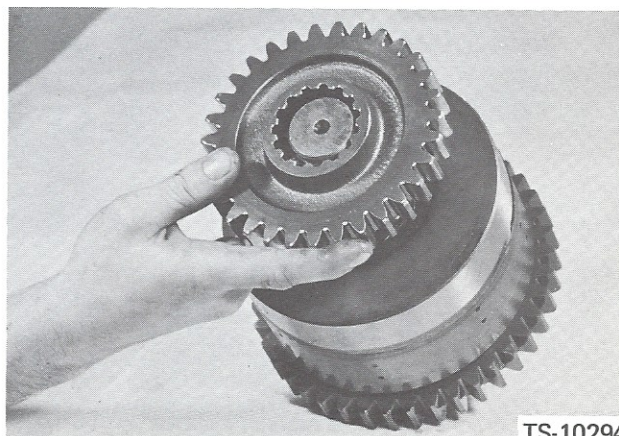


Figure 88

Remove the drive gear for the input clutch.

TS-10294

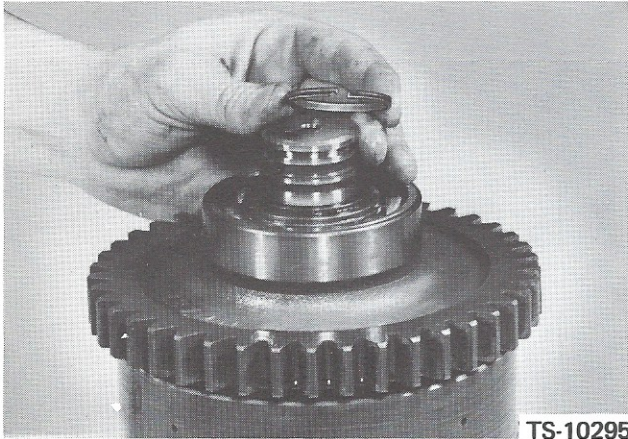


Figure 89

TS-10295

Remove the piston rings from the shaft.

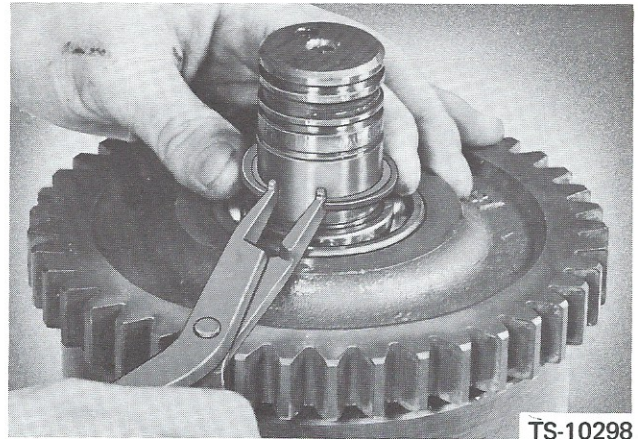


Figure 92

TS-10298

Remove the snap ring from the input gear.

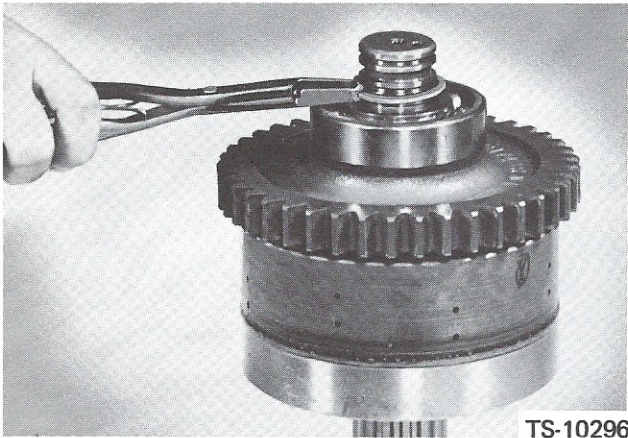


Figure 90

TS-10296

Remove the snap ring that holds the bearing.

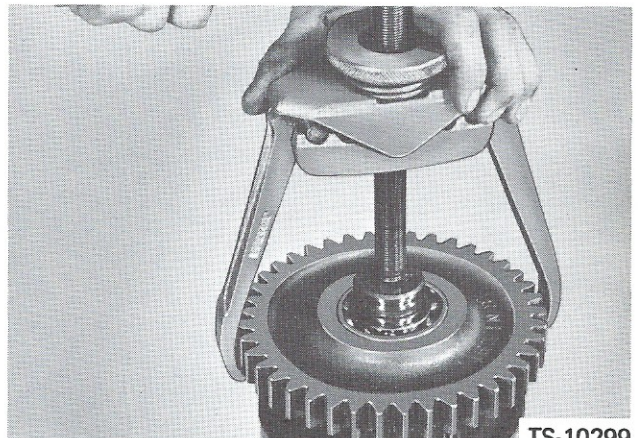


Figure 93

TS-10299

Remove the input gear and bearing from the shaft.



Figure 91

TS-10297

Use a bearing puller to remove the bearing from the shaft.



Figure 94

TS-10301

Remove the backing plate snap ring.

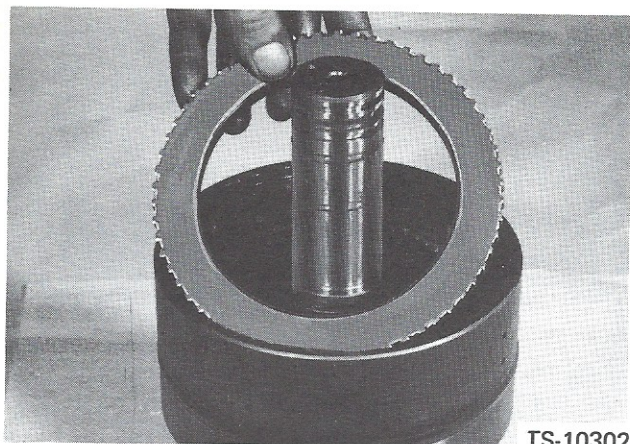


Figure 95

Remove the backing plate.

TS-10302

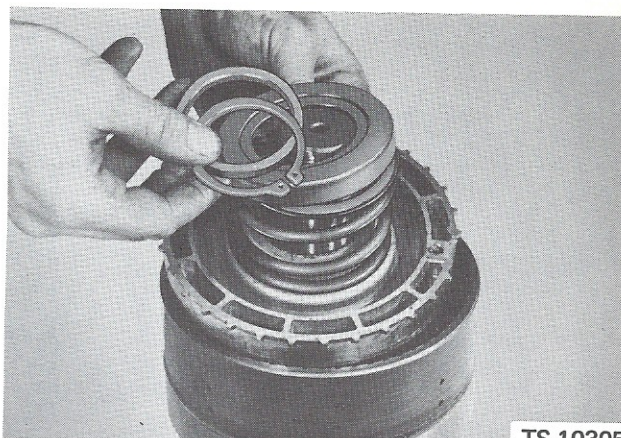


Figure 98

Push down on the release spring and remove the snap ring. Remove the ring, the spring retainer, the spring, and the piston assembly.

TS-10305

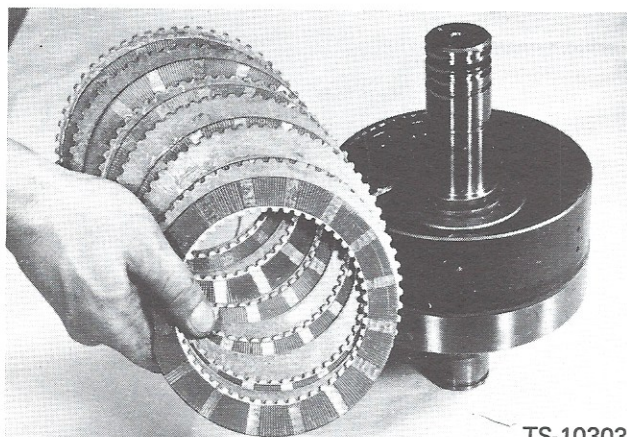


Figure 96

Remove the inner and outer disc.

TS-10303

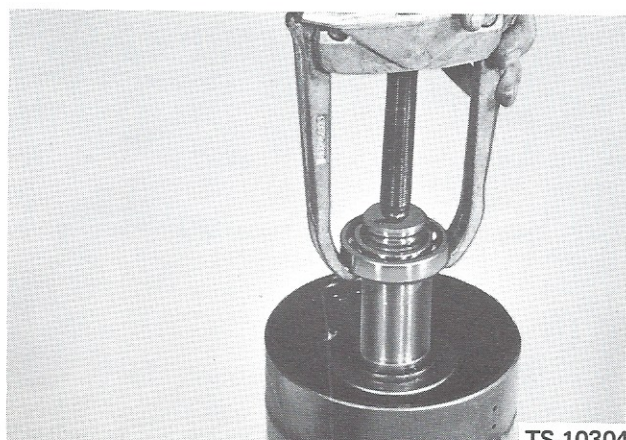


Figure 97

Remove the inner bearing.

TS-10304

! CAUTION: Be careful when you remove the snap ring and release spring. The spring is under compression.

HOW TO DISASSEMBLE THE CONTROL VALVE



Figure 99

Remove the one-way check valve and the breather from the winch housing.

TS-10306

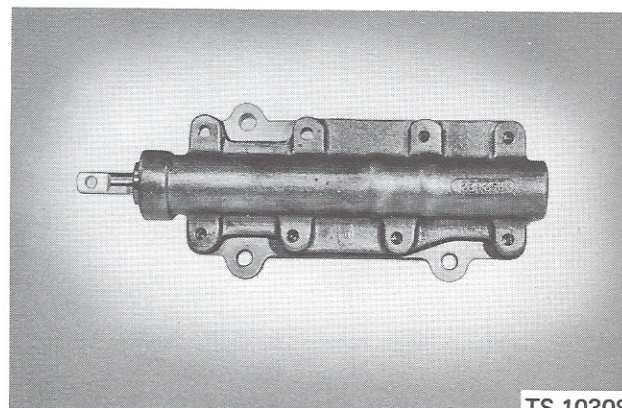
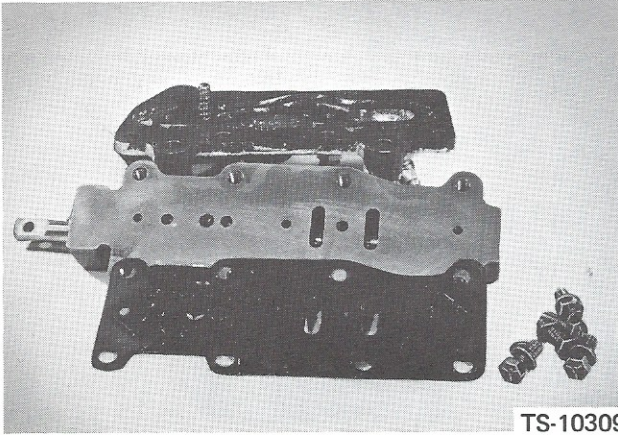


Figure 100

This is the control valve assembly.

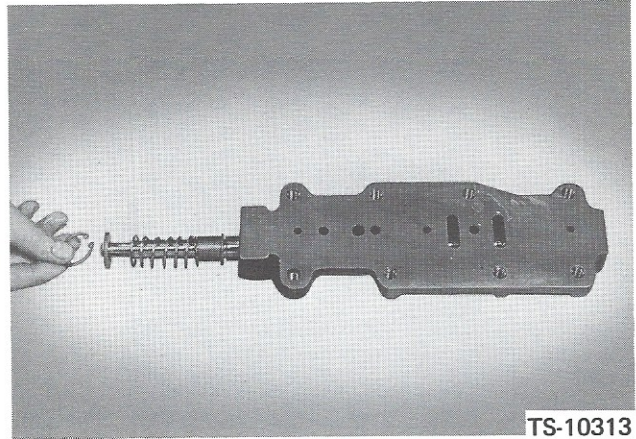
TS-10308



TS-10309

Figure 101

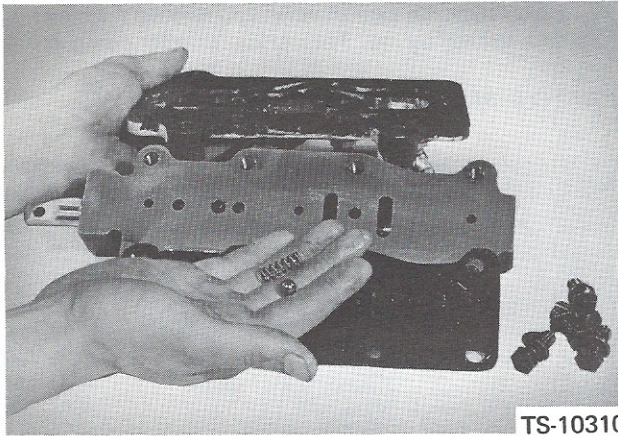
Remove the bolts that fasten the cover to the valve body.



TS-10313

Figure 104

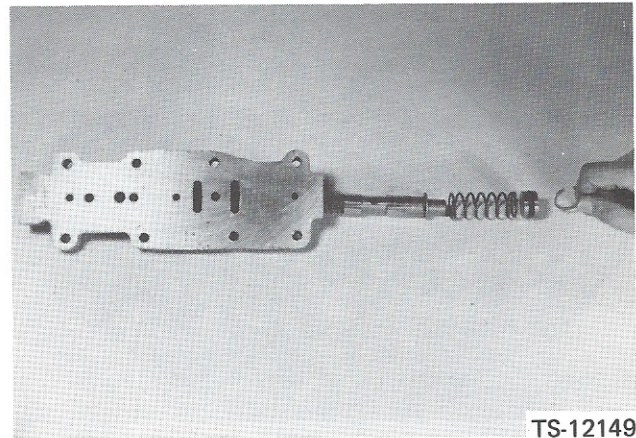
Remove the snap ring on the spring washer. Remove the valve spool, spring, spacer and washer.



TS-10310

Figure 102

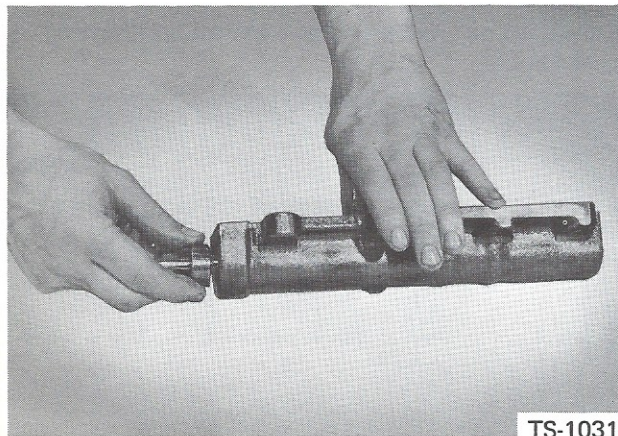
Remove the detent spring and ball.



TS-12149

Figure 105

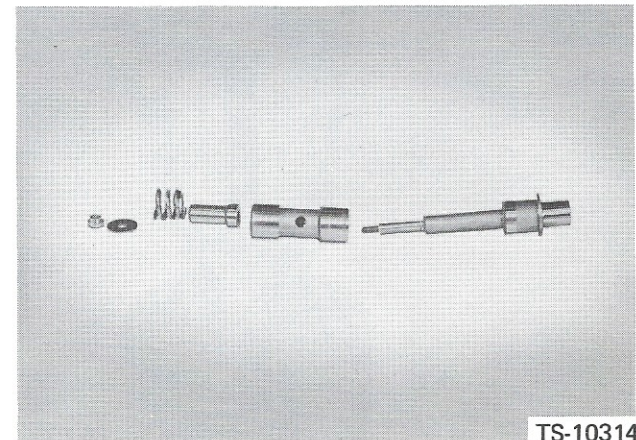
From the opposite end of the control valve, remove the retaining ring for the valve stop. Remove the valve stop, centering spring, regulating spool, spacer, and sleeve.



TS-10311

Figure 103

Remove the oil seal with a pointed tool. This procedure will damage the seal and it cannot be used again. Remove the valve spool.




TS-10314

Figure 106

This is the regulating spool disassembled.

CLEANING AND INSPECTION

Clean parts with solvent. Inspect them carefully. Replace all parts showing wear or stress. Early replacement of parts with defects will reduce the chance of failure later.

 **CAUTION:** Solvents can damage skin and eyes. Solvent vapours can damage lungs; solvent vapours are flammable, and a concentration of vapour will burn. Use solvents only in a well ventilated area. Do not smoke while cleaning parts and do not use solvents near an open flame.

BEARINGS

Put bearings in a container filled with solvent. Move them around in the solvent to remove old lubricant and foreign matter. Remove the bearing from the solvent and carefully hit the larger side against a block of wood to remove foreign matter. Do not damage the bearing. Repeat this procedure until the bearing is completely clean.

Dry bearings with air under pressure. Do not spin bearings while drying them.

Make an inspection of rollers, cages and cups for wear or damage. Lubricate bearings with the correct oil and wrap them in clean paper until you are ready to install them.

GEARS AND SHAFTS

Make an inspection of gear teeth and shaft splines for wear

or damage. Look for bent shafts. Use the "Magna-flux" process whenever possible to look for cracks. Replace any part with wear through the case hardening.

GASKETS AND OIL SEALS

Replace all gaskets, oil seals, o-rings, snap rings and metal sealing rings whenever you disassemble the winch. Install sealing parts carefully. Any damage to a sealing part will cause it to leak. Put a thin layer of Permatex No. 2 to the outside surface of oil seals before you install them. This procedure will prevent leakage between the seal and its' retainer.

Lubricate metal sealing rings with chassis grease to help you install parts more easily. Lubricate all rubber parts with the correct oil before installing them.

HOUSING

Cast parts with polished surfaces can be cleaned with solvent or steam. They must not be cleaned with a hot alkali solution.

Other housings, caps and covers can be cleaned in a hot solution tank until completely heated. Remove all alkali solution from parts with clean water. Dry them immediately with air under pressure or a clean, lint-free cloth.

 **CAUTION:** Alkali solutions and vapour can damage skin, eyes and lungs. Steam will burn skin and eyes.

HOW TO ASSEMBLE THE CONTROL VALVE

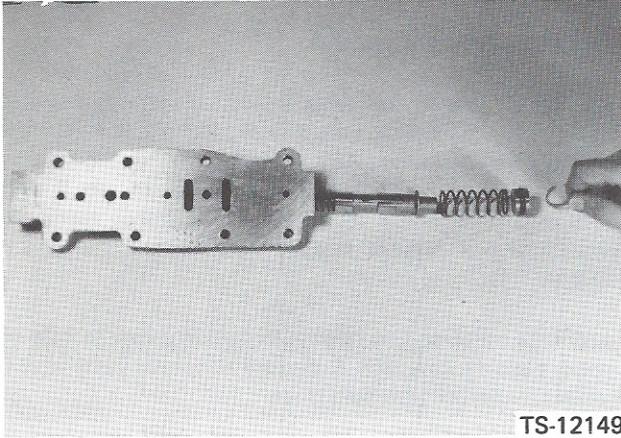


Figure 107

Replace the retaining ring, valve stop, centering spring, regulating spool, spacer and sleeve.

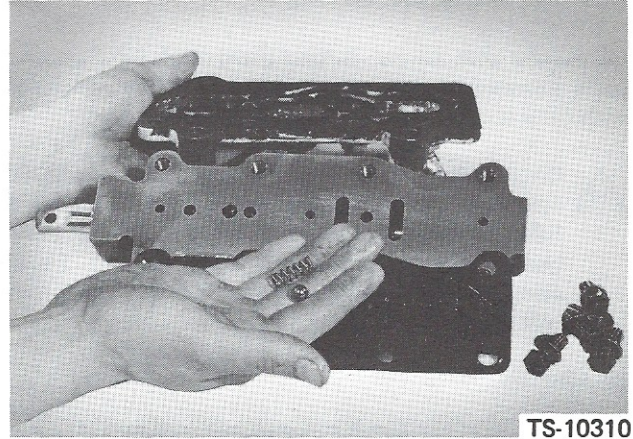


Figure 110

Replace the detent ball and spring.

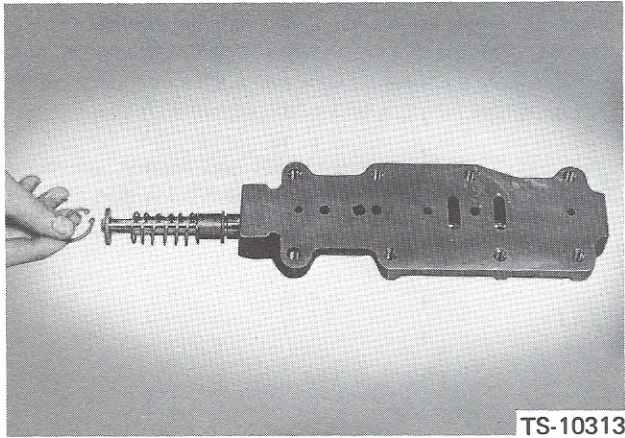


Figure 108

Replace the snap ring and install the valve spool, spring, spacer and washer. Replace the snap ring for the spring.

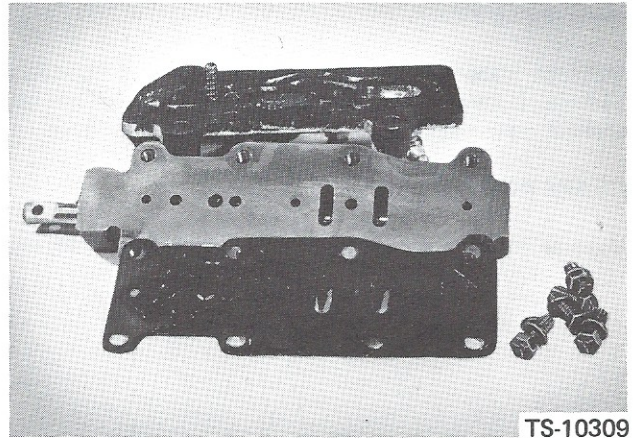


Figure 111

Replace the bolts that fasten the cover to the valve body.

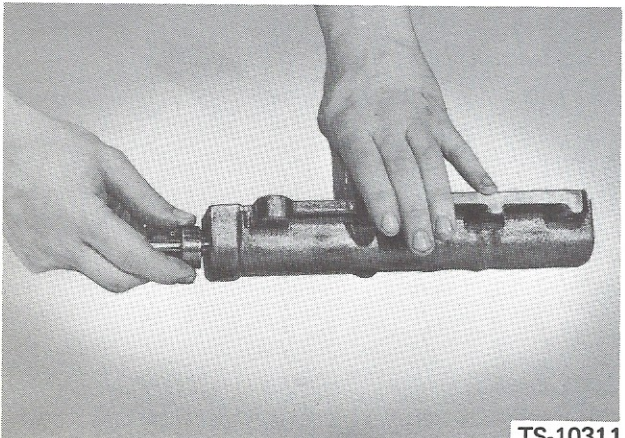


Figure 109

Install a new oil seal.

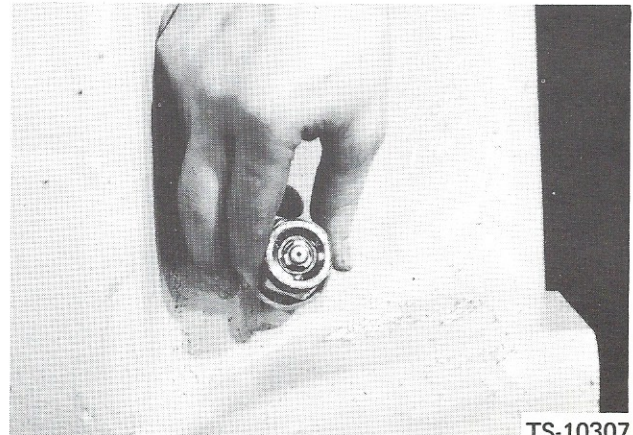


Figure 112

Install the check valve in the winch housing.

HOW TO ASSEMBLE THE INPUT CLUTCH FOR ALL MODEL WINCHES.

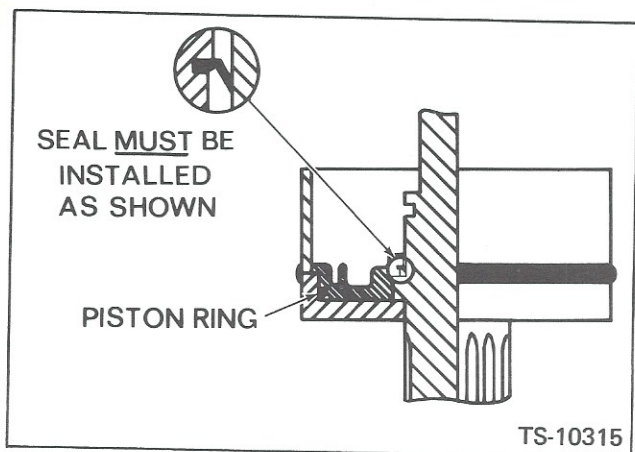


Figure 113

Install the lip seal on the input shaft, and the piston ring on the piston.

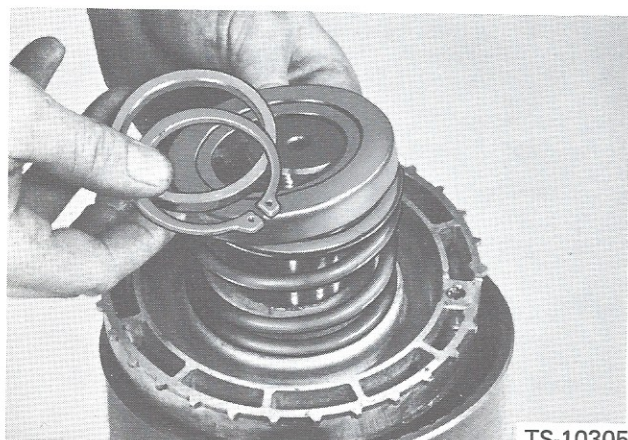


Figure 114

Install the piston, spring, retainer spacer and snap ring.

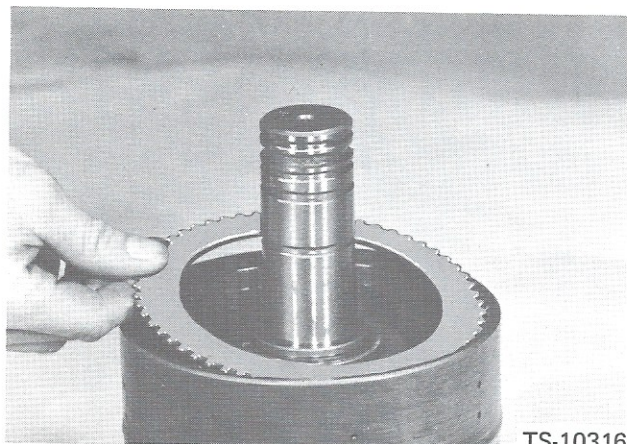


Figure 115

Install the first steel disc with the taper facing into the drum. All discs must have the taper facing the same direction.

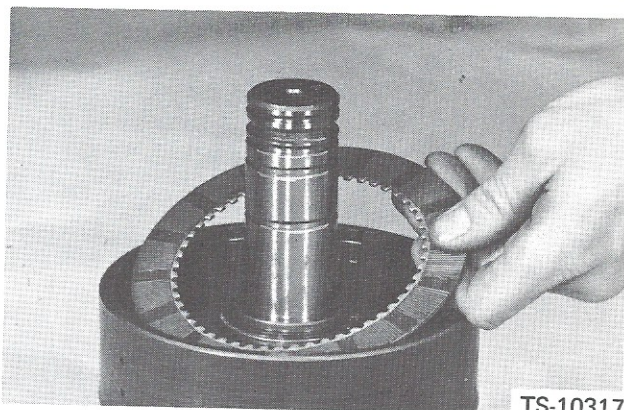


Figure 116

Install the first bronze disc with the rounded side of the inner teeth facing out of the drum. Add another steel, followed by another bronze. Continue this procedure until you add the last bronze.

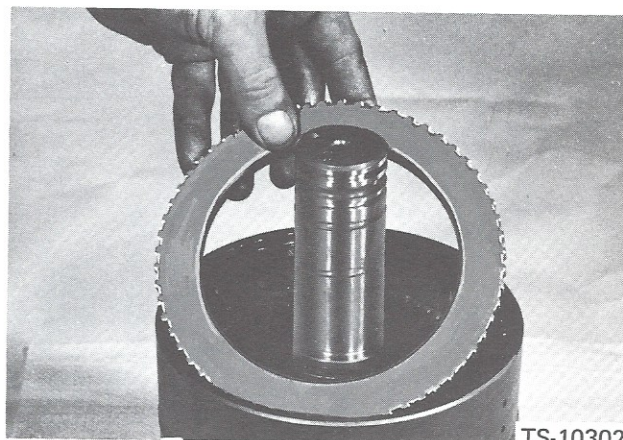


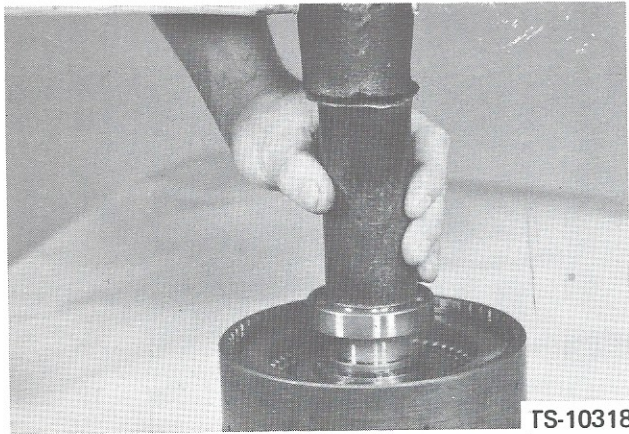
Figure 117

Install the backing plate.



Figure 118

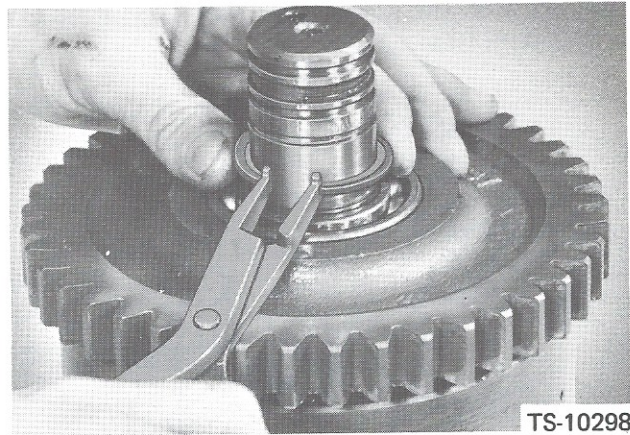
Install the snap ring for the backing plate.



TS-10318

Figure 119

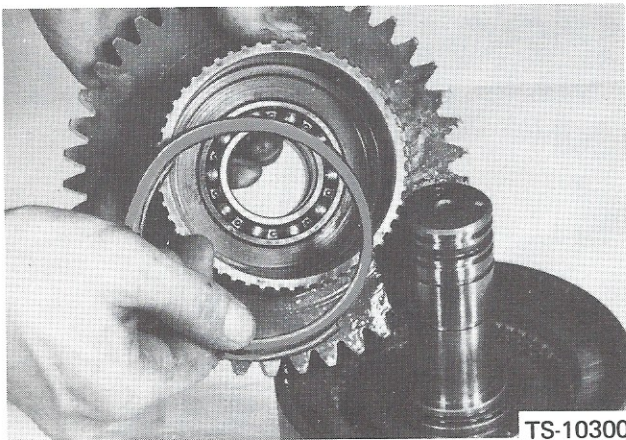
Install the bearing on the clutch driven gear.



TS-10298

Figure 122

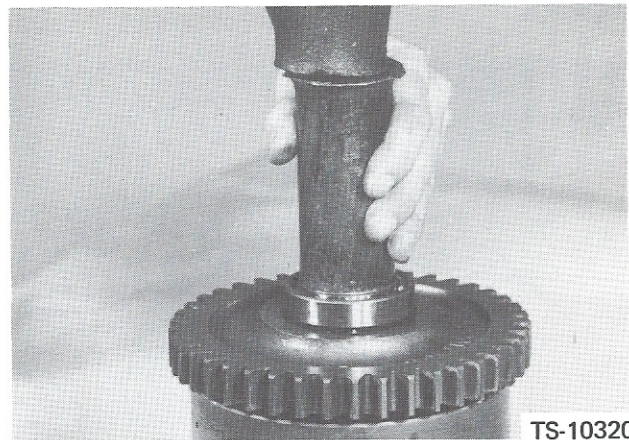
Install the snap ring that holds the bearing.



TS-10300

Figure 120

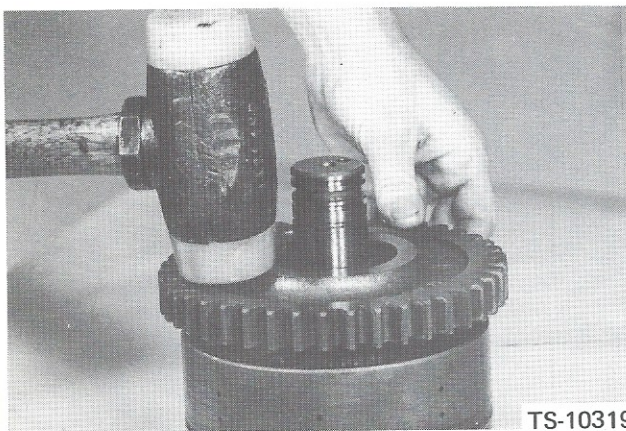
Install the oil baffle ring in the clutch hub gear.



TS-10320

Figure 123

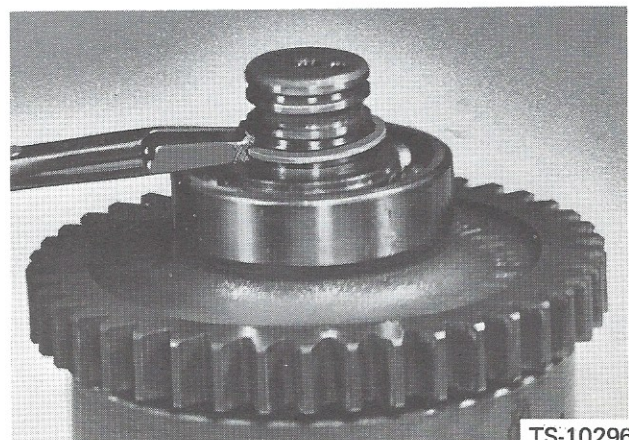
Install the rear bearing on the input shaft.



TS-10319

Figure 121

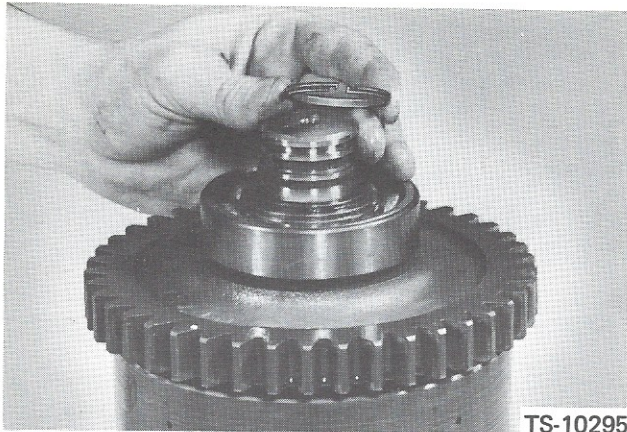
Put the hub gear with the bearing and ring on the input shaft. Rotate the gear until the splines mesh with the teeth of the clutch discs. Use a soft faced hammer to install the hub gear in the clutch assembly. Do not use excessive force.



TS-10296

Figure 124

Install the snap ring on the rear bearing of the input clutch.

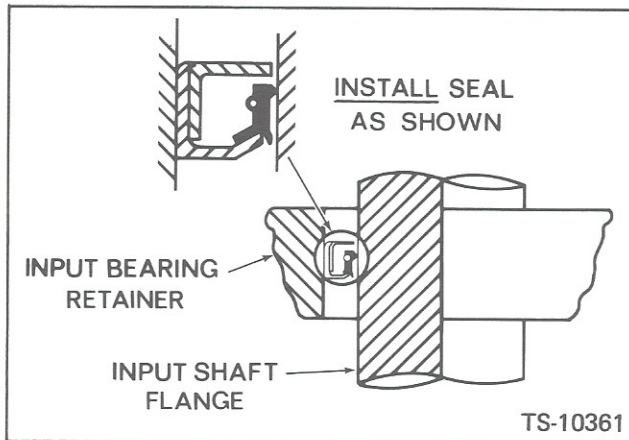


TS-10295

Figure 125

Install piston rings on the shaft.

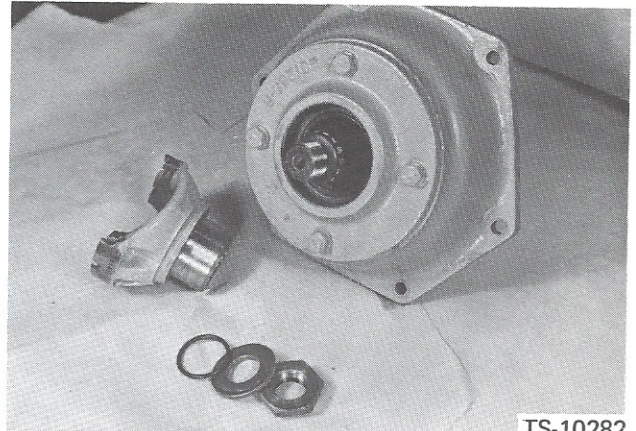
HOW TO INSTALL THE INPUT CLUTCH ASSEMBLY FOR ALL W SERIES WINCHES.



TS-10361

Figure 126

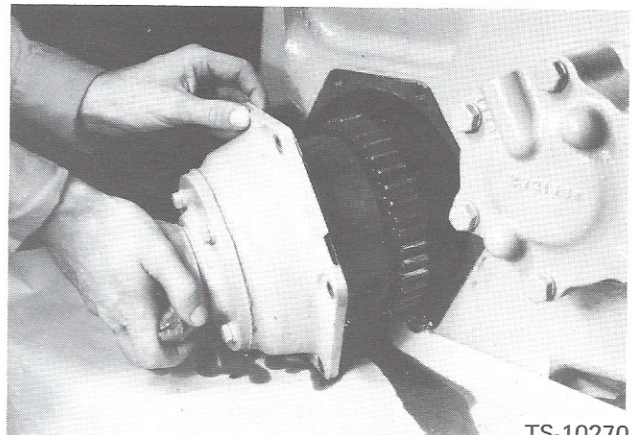
Install the seal in the input bearing retainer.



TS-10282

Figure 128

Install the clutch assembly in the bearing cap. Install the input bearing cap. Install the input flange, o-ring, washer and nut. Tighten the nut to 175 to 200 ft. lbf of torque. (2.0-2.3 kgf/m, 237-271 N.m.).

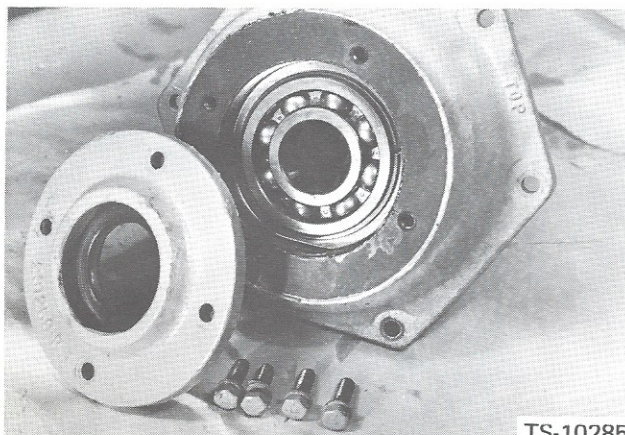


TS-10270

Figure 129

Install the input clutch and bearing cap assembly in the winch. Install the bolts and tighten them to 26 to 29 ft. lbf of torque. (3.4-4 kgf/m, 36-39 N.m.).

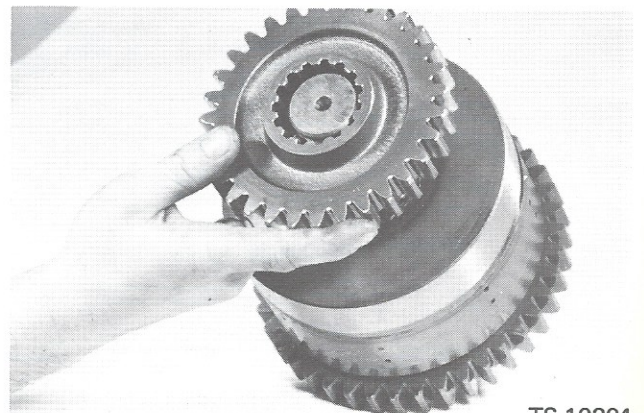
HOW TO INSTALL THE INPUT CLUTCH AND DROP GEAR ASSEMBLY IN ALL WD SERIES WINCHES.



TS-10285

Figure 127

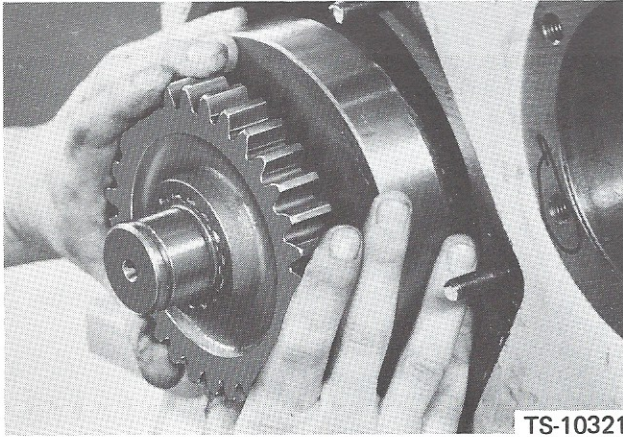
Install the front bearing. Install the retainer and bolts. Tighten the bolts to the correct torque.



TS-10294

Figure 130

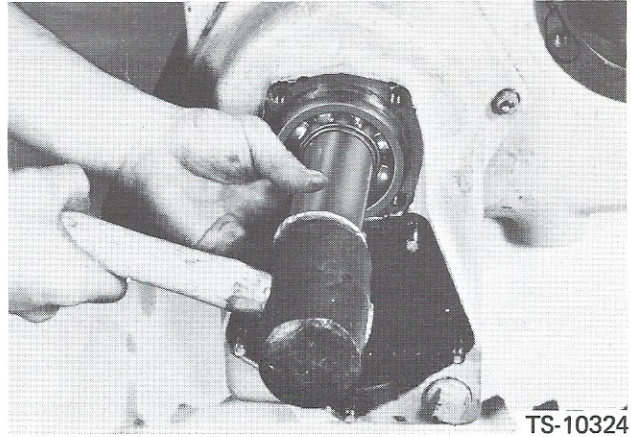
Install the drop gear on the input shaft.



TS-10321

Figure 131

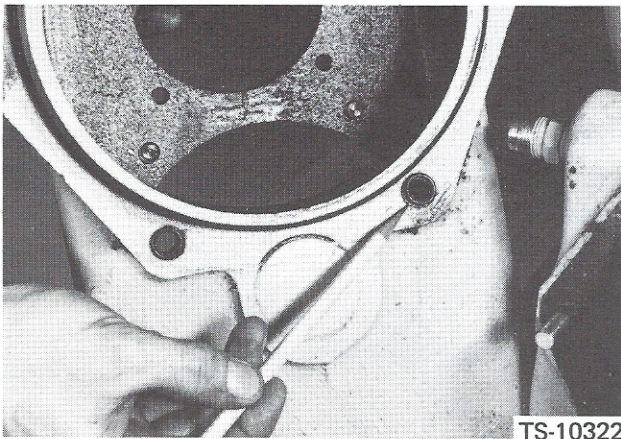
Install the input clutch assembly in the winch.



TS-10324

Figure 134

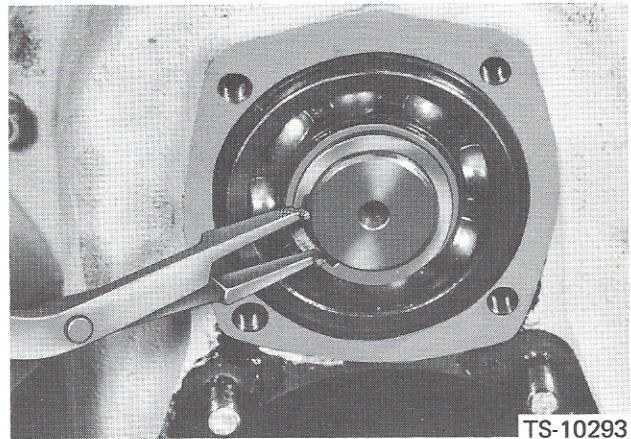
Install the front bearing on the clutch shaft.



TS-10322

Figure 132

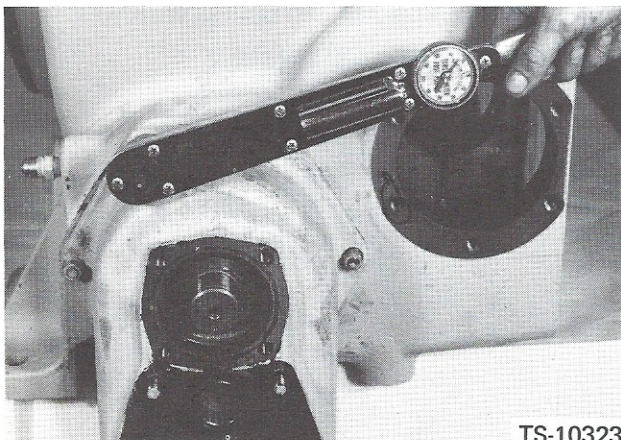
Put the drop gear housing on the studs. Be careful that you do not damage the two o-rings.



TS-10293

Figure 135

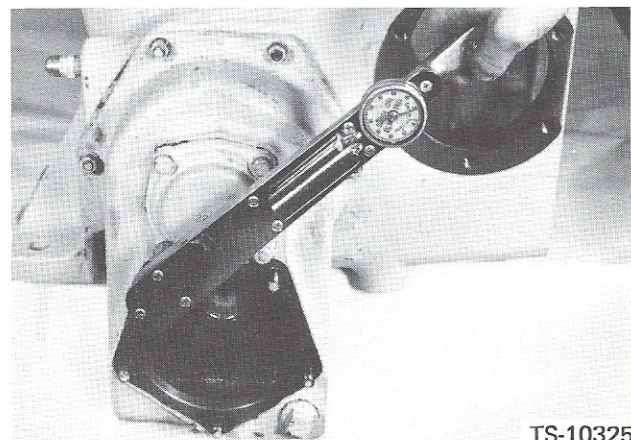
Install the snap ring that fastens the bearing.



TS-10323

Figure 133

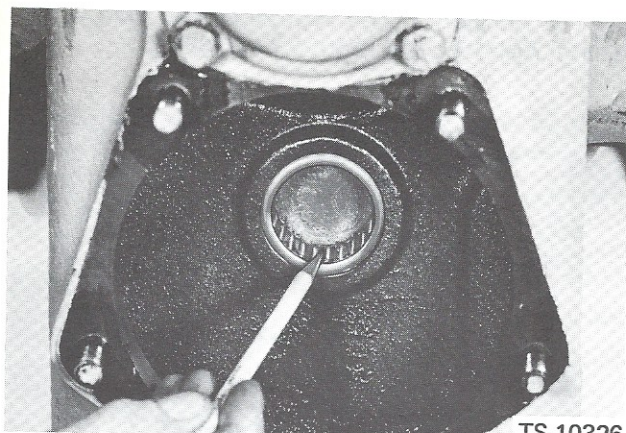
Tighten the nuts on the mounting studs to a torque of 26 to 29 ft. lb. (3.6-4 kgf/m, 35-39 N.m.).



TS-10325

Figure 136

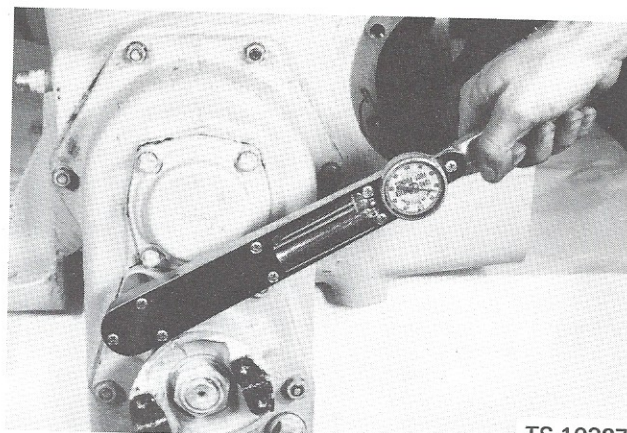
Install the nuts and tighten them to 26 to 29 ft. lbf of torque (3.6-4 kgf/m, 35-39 N.m.).



TS-10326

Figure 137

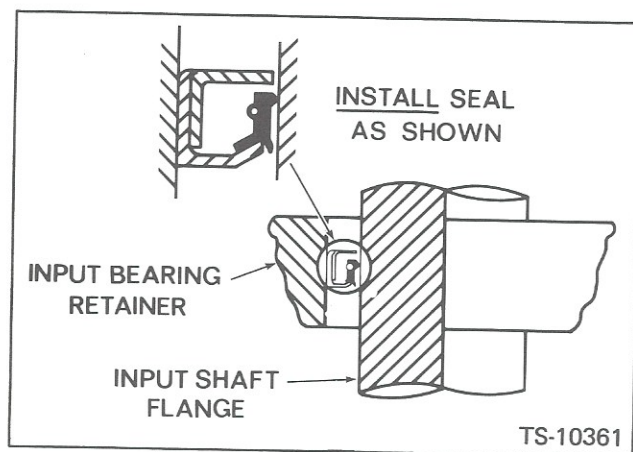
Install the pilot bearing for the input shaft.



TS-10327

Figure 140

Tighten the bolts to 41 to 45 ft. lbf of torque. (5.6-6.2 kgf/m, 56-61 N.m.).

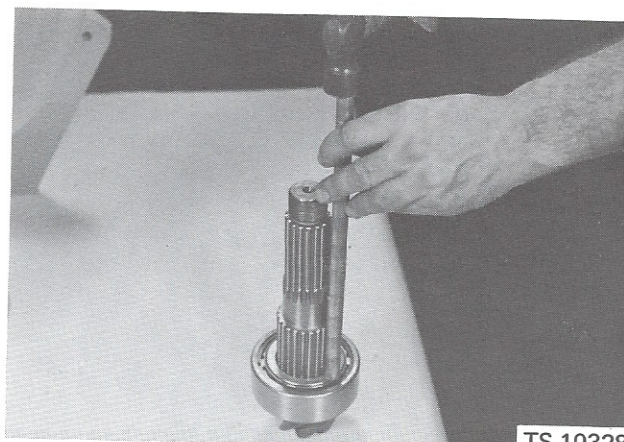


TS-10361

Figure 138

Install the seal on the input shaft.

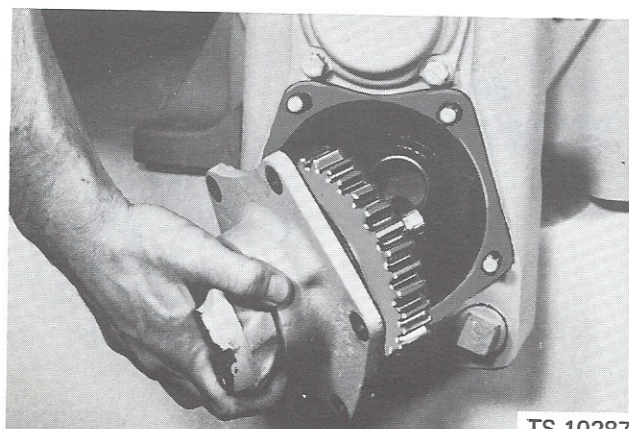
HOW TO INSTALL THE PINION SHAFT FOR ALL MODEL WINCHES.



TS-10328

Figure 141

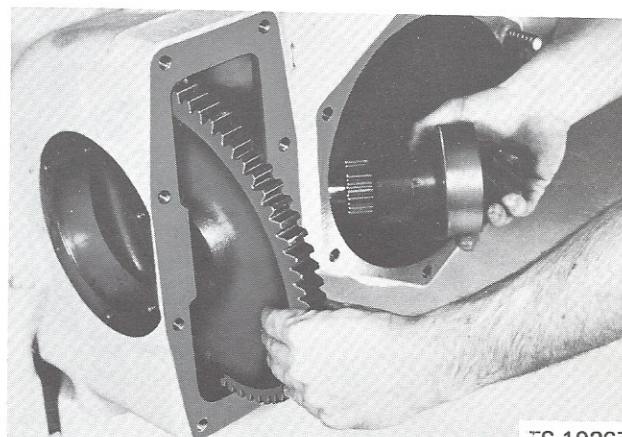
Install the bearing on the pinion gear shaft.



TS-10287

Figure 139

Assemble the input shaft, flange and gear. Install the assembly in the drop gear housing.



TS-10267

Figure 142

Install the pinion and drive gear in the winch. Install the gear spacer on the shaft if you have a 300 series winch.

HOW TO ASSEMBLE THE PINION SPRAG FOR W AND WD 300 SERIES WINCHES.

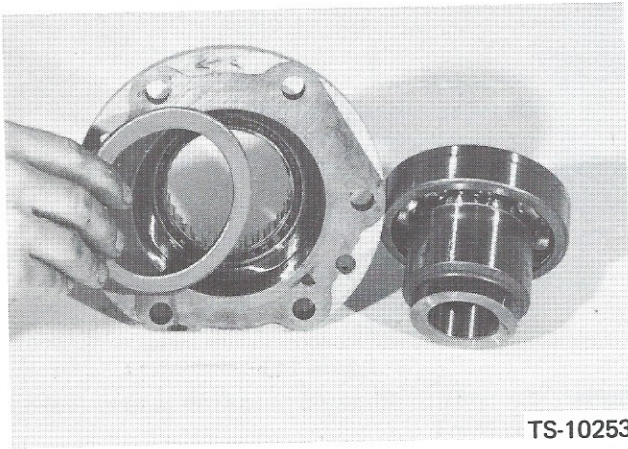


Figure 143

Install the sprag assembly and retaining washer in the outer race. Install the bearing in the inner race of the sprag. Install the inner race and the bearing in the outer race.

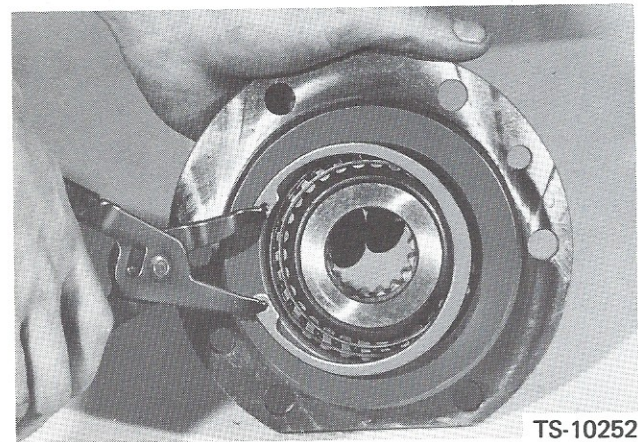


Figure 144

Install the sprag retaining ring.

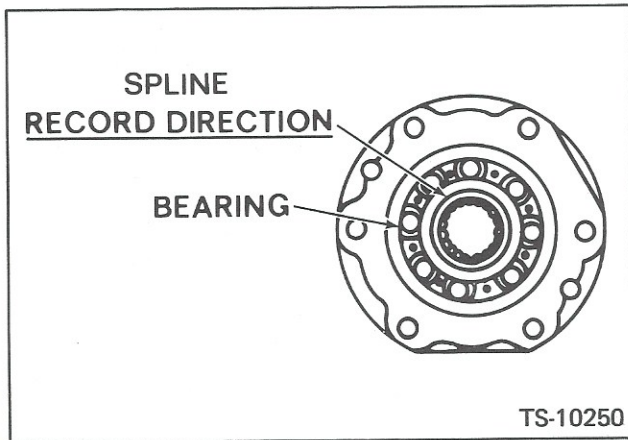


Figure 145

Make a check that the sprag turns in the correct direction. If you did not make a note of the direction of sprag rotation during disassembly, see the chart on page 53.

HOW TO ASSEMBLE THE PINION SPRAG FOR W AND WD 311, AND ALL 400 SERIES WINCHES.

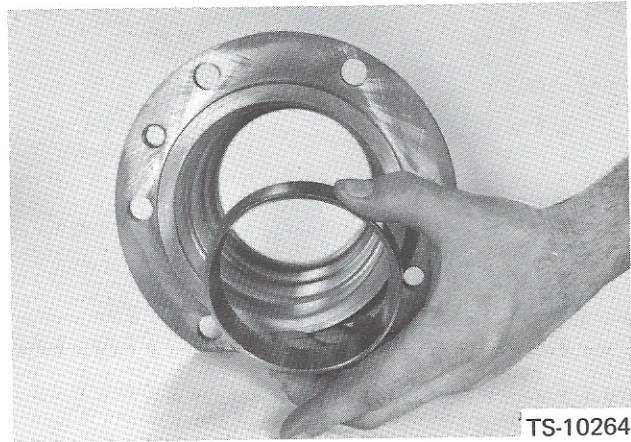


Figure 146

Install the rear bearing cup in the outer race of the sprag.

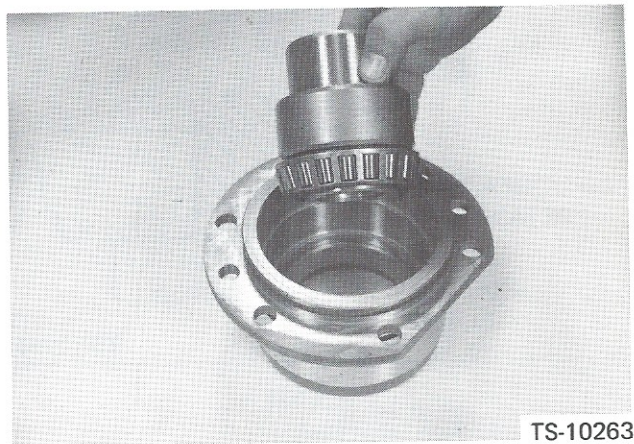


Figure 147

Install the rear bearing cone. Install the inner and outer race.

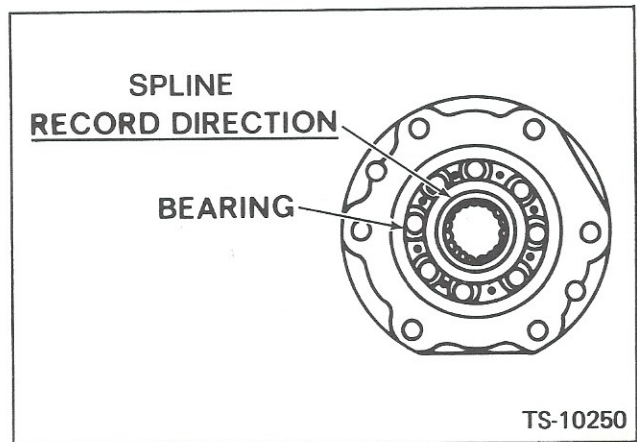
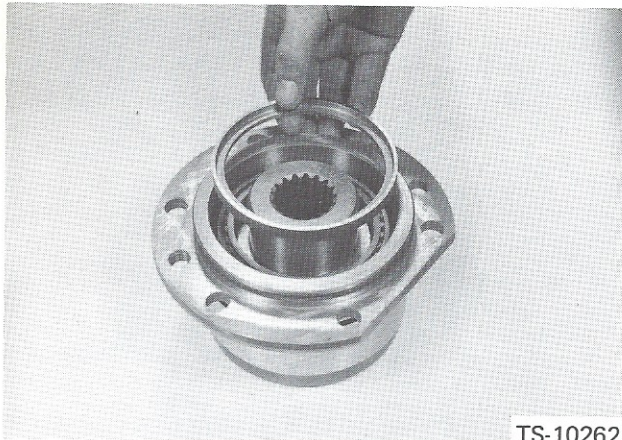


Figure 148

Make a check that the sprag turns in the correct direction. If you did not make a note of the direction of sprag rotation during disassembly, see the chart on page 53.

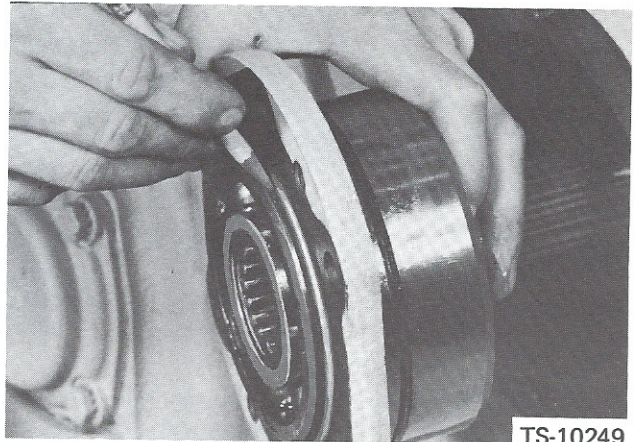
HOW TO INSTALL THE PINION SPRAG FOR ALL MODEL WINCHES.



TS-10262

Figure 149

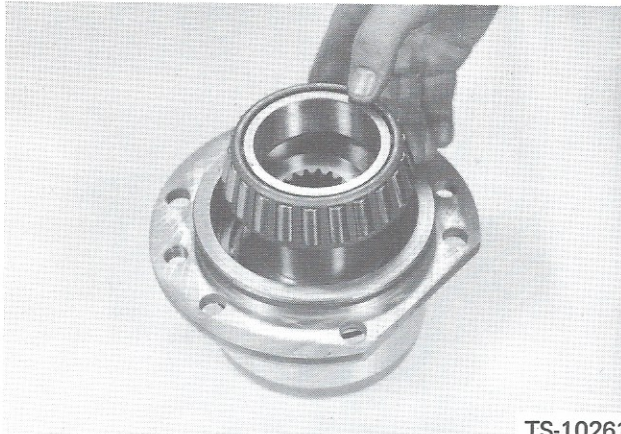
Install the sprag assembly and its retainer in the outer race.



TS-10249

Figure 152

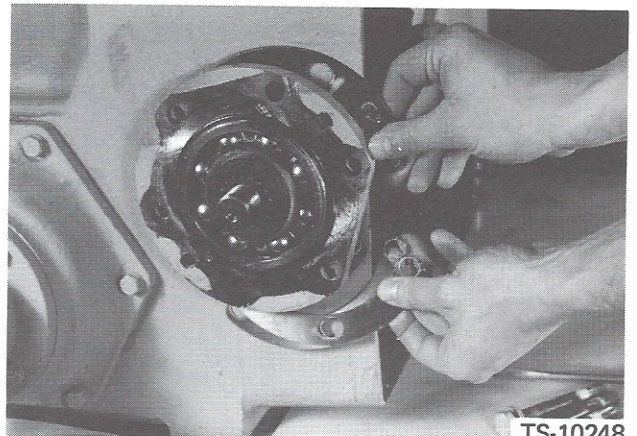
Install the sprag assembly on the pinion shaft.



TS-10261

Figure 150

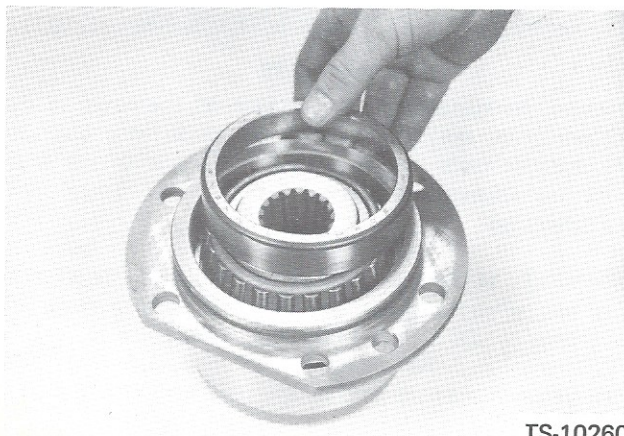
Install the front bearing cone in the outer race.



TS-10248

Figure 153

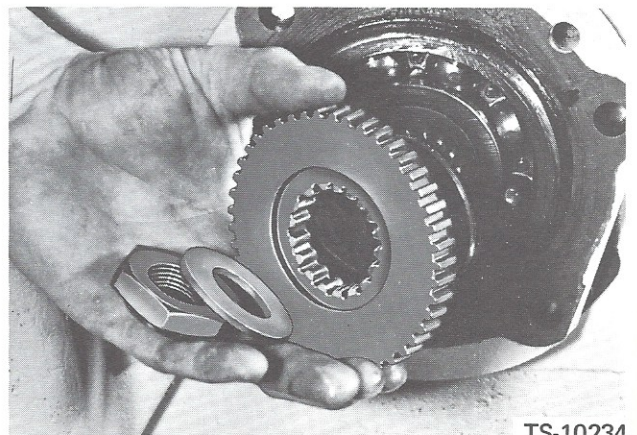
Install the shims on the outer race of the sprag. These shims affect the tooth contact between the ring and pinion gears. If you must adjust or make a check of tooth contact, you must do the procedure for installation of the ring gear before you do the next step.



TS-10260

Figure 151

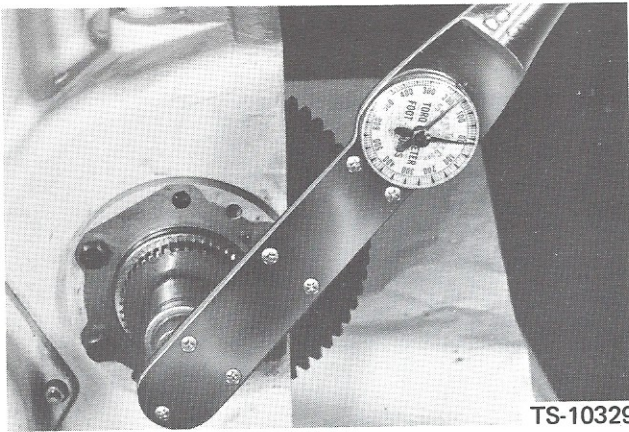
Install the front bearing cup in the outer race.



TS-10234

Figure 154

Install the disc hub, washer and nut.

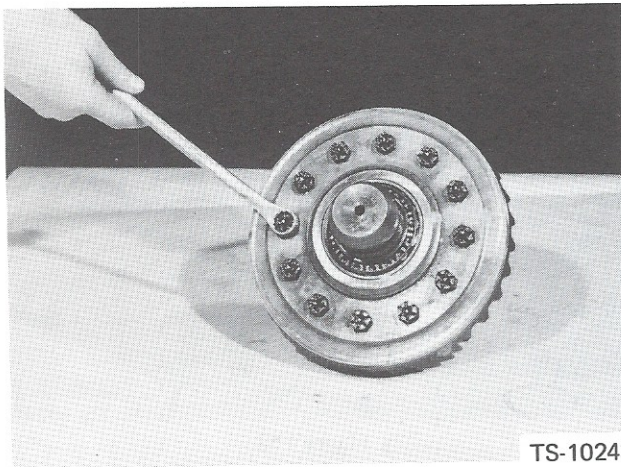


TS-10329

Figure 155

Put a block under the pinion gear to prevent it from moving. Tighten the pinion shaft nut to a torque of 175 to 200 ft. lbs. (24-27 kgf/m, 20-22 N.m.).

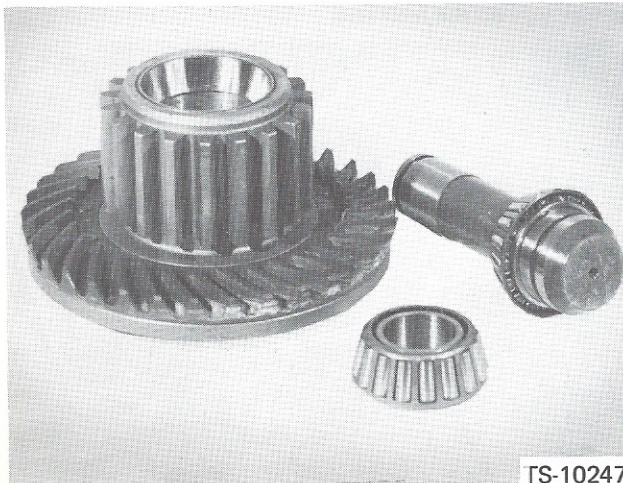
HOW TO ASSEMBLE THE RING GEAR MOUNTED INSIDE THE DRUM DRIVE GEAR.



TS-10243

Figure 156

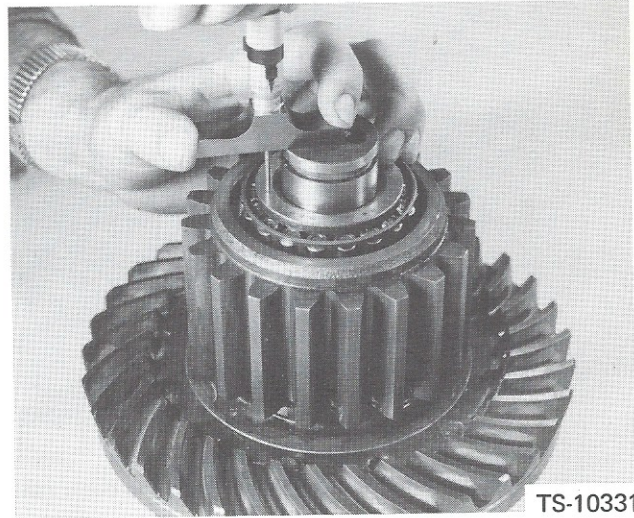
Assemble the ring gear and hub. Tighten the bolts to 40 to 60 ft. lbf of torque (5.53-8.29 kgf/m, 54.23-81.35 N.m.).



TS-10247

Figure 157

Install the ring gear and its shaft and bearings.



TS-10331

Figure 158

Measure the distance from the inner race of the bearing to the end of the shaft. Make a note of this distance.



TS-10332

Figure 159

Measure the distance from the face of the cover to the bottom of the bore. Make a note of this distance. Subtract the distance from the inner race to the end of the shaft from this distance and subtract .005 inch (.1270 mm) from the difference.

EXAMPLE: If the first distance is .740 inch (18.79 mm) and the second distance is .801 inch (20.32 mm) the difference is .061 inch (1.53 mm). Subtract .005 inch (.1270 mm) and the answer is .056 inch (1.4 mm). You need shims with a total thickness of .056 inch (1.4 mm).

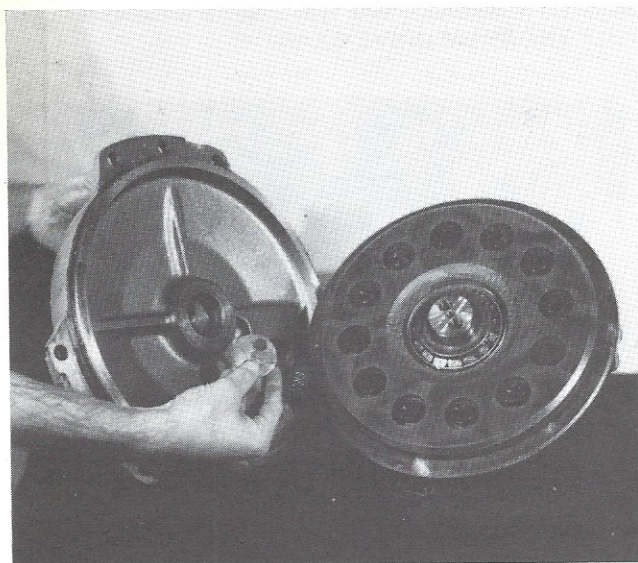


Figure 160

Install the ring gear cap on the shaft. Use the preload shims.

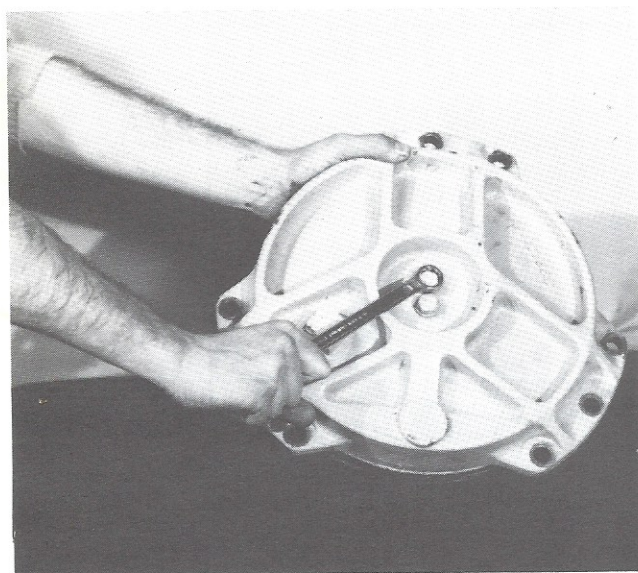


Figure 161

Tighten the bolts to the torque shown in the chart.

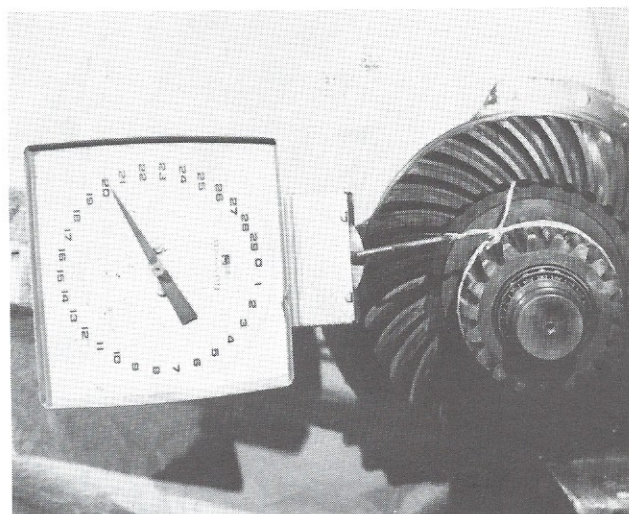


Figure 162

Use a cord and scale to find the preload tension on the bearing. Tie a cord around the splines on the gear as shown. Fasten the end of the cord to the scale. Pull the scale away from the gear. Make a note of the number shown by the scale when the assembly begins to rotate. The scale must show between 19.5 lbs. and 23 lbs (8.6-10.4 kg) this equals 50-60 in. lbs (0.57-0.69 kgf/m, 5.64-6.77 N.m.) preload tension on the bearing.

If the scale shows less than 19.5 lbs (8.8 kg) remove shims. If the scale shows more than 23 lbs (10.4 kg) add shims.

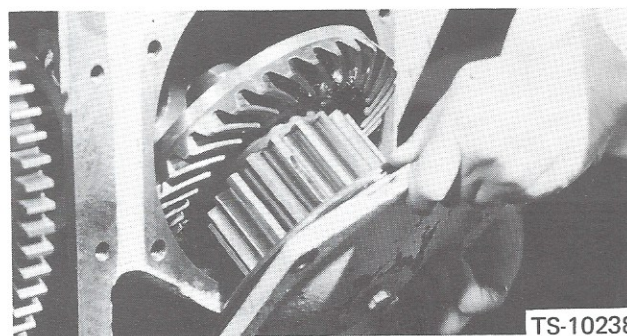


Figure 163

Paint the teeth of the ring gear with Prussion Blue compound. Install the ring gear assembly. Rotate the pinion against the ring gear. Remove the ring gear assembly. Make a check of the tooth contact as shown by the Prussion Blue. See the tooth contact chart on pages 54 and 55. Add or remove shims from between the outer race of the pinion sprag and the winch housing to adjust tooth contact. Repeat this procedure until tooth contact is correct.

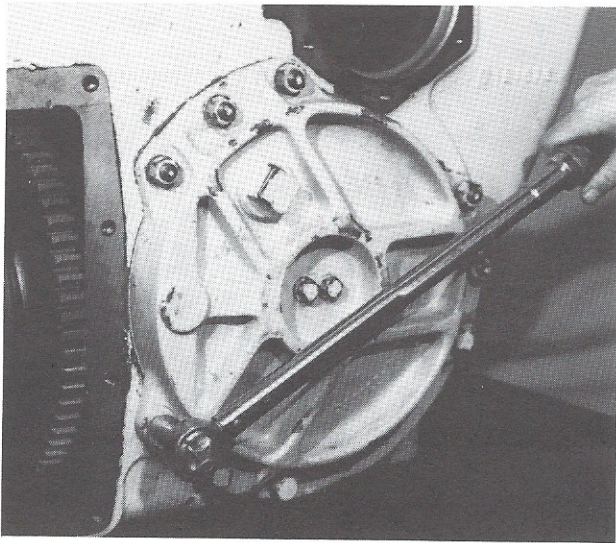


Figure 164

Install the ring gear assembly and fasten it in place. Tighten the mounting nuts and bolts to a torque of 64 to 70 ft. lbs. (8.8-9.6 kgf/m, 86.7-94.9 N.m.).

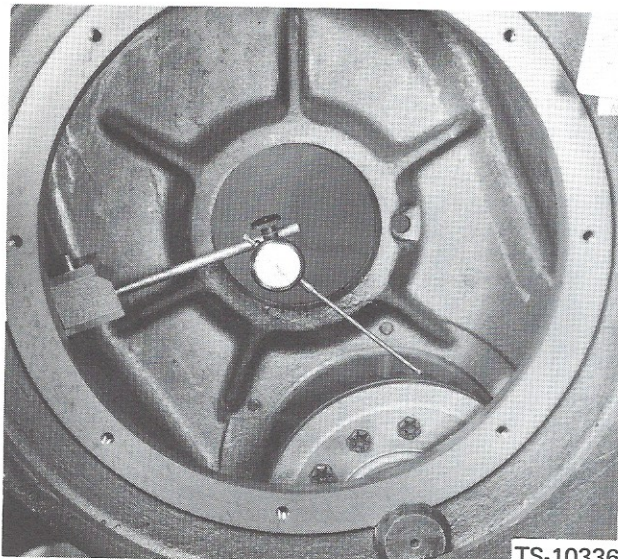


Figure 165

TS-10336

Fasten an indicator in the position shown in the photograph. Hold the pinion so that it cannot move. From the drum side of the housing as shown rotate the ring gear assembly in a clockwise direction until it stops against the teeth of the pinion. Place the end of the indicator stem against the face of a tooth of the ring gear. It must rest at 90° to the tooth face. Adjust the indicator to show zero. Rotate the ring-gear in a counter-clockwise direction until it stops against the teeth of the pinion. Make a note of the number shown by the indicator. It must show between .006 and .011 inches (.152 and .249 mm). See the tooth contact chart on pages 54 and 55.

If the indicator shows more than .011 inches (.279 mm) remove shims between the ring gear cover and the winch housing. If it shows less than .006 inches (.152 mm) add shims.

HOW TO ASSEMBLE THE RING GEAR MOUNTED OUTSIDE THE DRUM DRIVE GEAR.

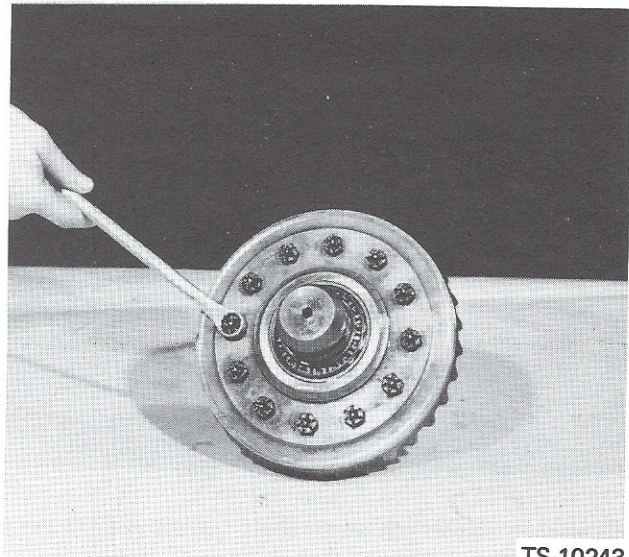


Figure 166

Assemble the ring gear and hub. Tighten the bolts to 40 to 60 ft. lbf of torque (5.53-8.29 kgf/m, 54.23-81.35 N.m.).

TS-10243

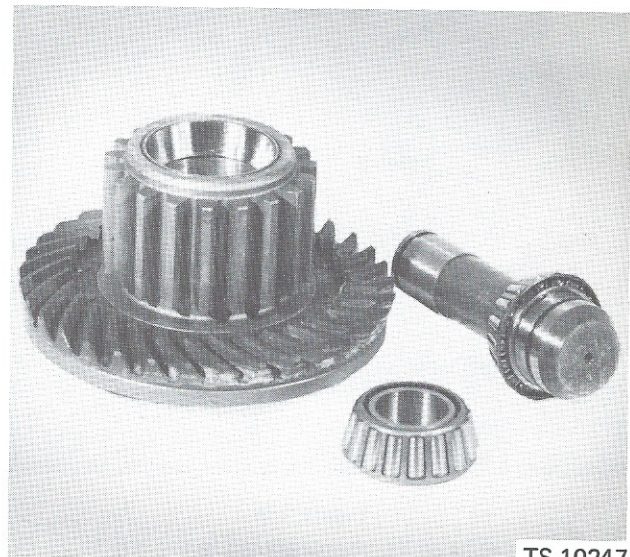
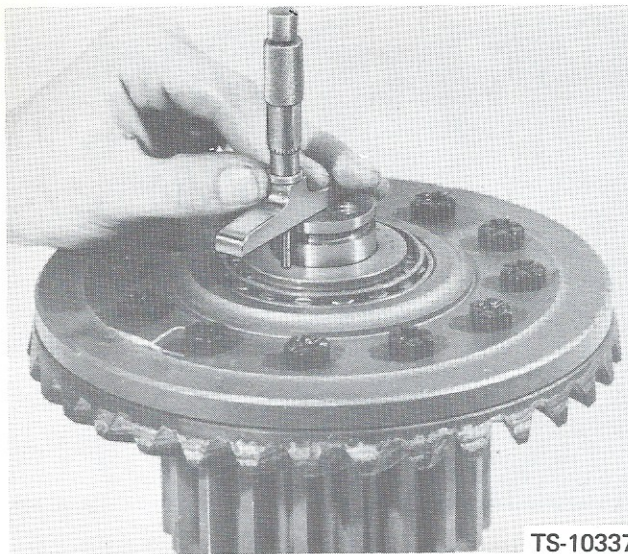


Figure 167

TS-10247

Install the ring gear and its shaft and bearings.



TS-10337

Figure 168

Measure the distance from the inner race of the bearing to the end of the shaft. Make a note of this distance.

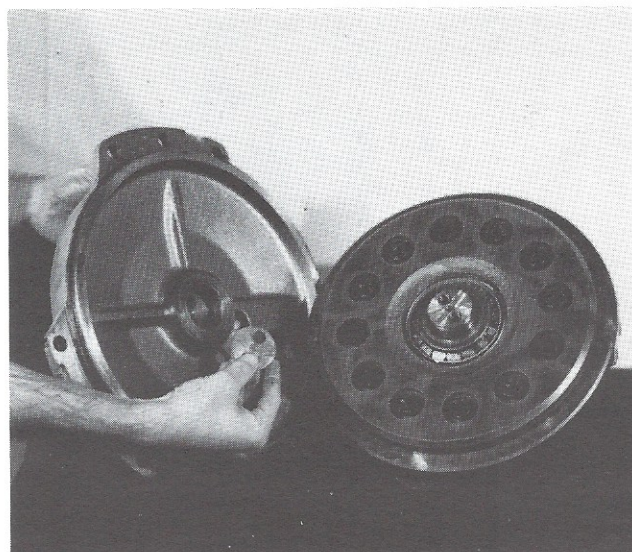


Figure 170

Install the shims.



TS-10332

Figure 169

Measure the distance from the face of the cover to the bottom of the bore. Make a note of this distance from the inner race to the end of the shaft from this distance and subtract .005 inch (.1270 mm) from this difference.

EXAMPLE: If the first distance is .740 in. (18.79 mm) and the second distance is .801 in. (20.32 mm) the difference is .061 in. (1.53 mm). Subtract .005 inch (.1270 mm) and the answer is .056 inch (1.42 mm). You need a shim with a thickness of .056 inch (1.42 mm).

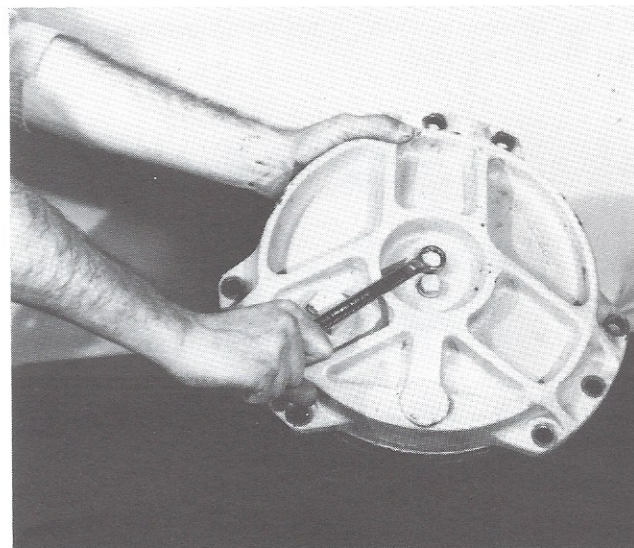


Figure 171

Assemble the ring gear cap to the shaft.

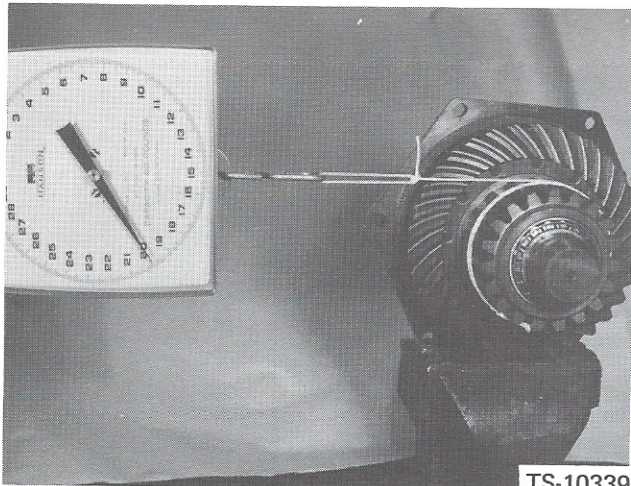


Figure 172

TS-10339

Use a cord and a scale to find the preload tension on the bearing. Wind a cord around the splines on the gear as shown. Fasten the end of the cord to a scale. Slowly pull the scale away from the gear. Make a note of the number shown by the scale when the assembly begins to rotate. The scale must show between 19.5 lbs. and 23 lbs. (8.8 and 10.4 kg). This equals 50-60 in/lbs. (57.6 to 69.1 kgf/cm) preload tension on the bearing. If the scale shows less than 19.5 lbs. (8.8 kg) remove the shims. If the scale shows more than 23 lbs. (10.4 kg) add shims.

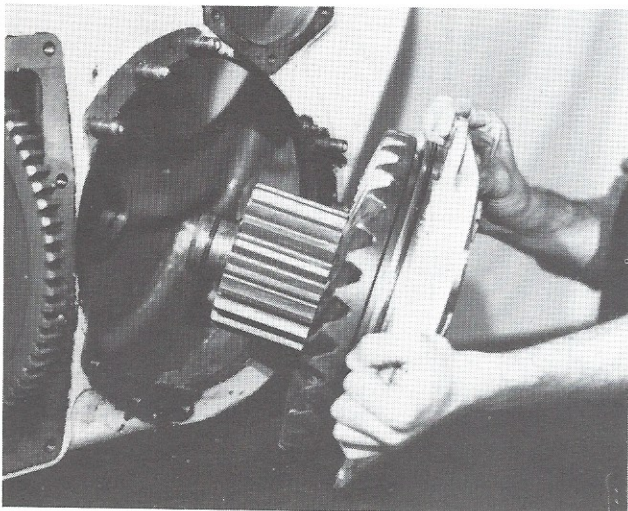


Figure 173

Paint the teeth of the ring gear with Prussion Blue compound. Install the ring gear assembly. Rotate the pinion against the ring gear. Remove the ring gear assembly. Make a check of the tooth contact as shown by the Prussion Blue. See the tooth contact chart on pages 54 and 55. Add or remove shims from between the outer race of the pinion sprag and the winch housing to adjust tooth contact. Repeat this procedure until tooth contact is correct.

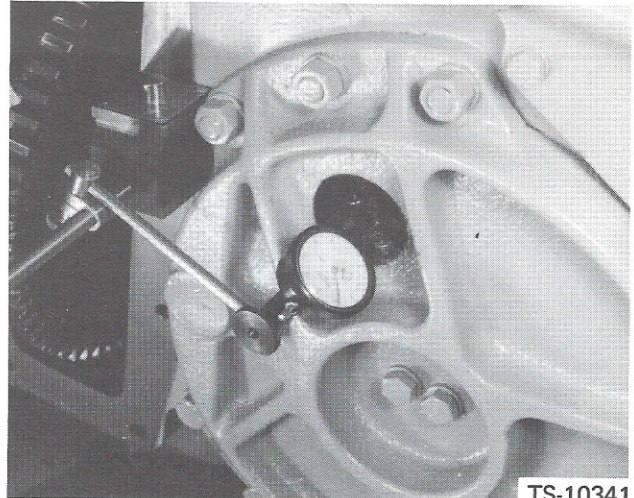


Figure 174

TS-10341

Hold the pinion so it cannot move. Rotate the ring gear assembly in a clockwise direction until it stops against the teeth of the pinion. Fasten an indicator in the position shown in the photograph. Put the right angle adaptor for the indicator at an angle of 90° against the side of the nut rivet. Adjust the indicator to zero. Rotate the ring gear assembly in a counter-clockwise direction until it stops against the teeth of the pinion. Make a note of the number shown on the indicator. It must show between .006 and .011 inches (.15 and .28 mm). See the tooth contact chart on pages 54 and 55. If the indicator shows more than .011 inches (.28 mm) remove shims from between the ring gear cover and the winch housing.

If it shows less than .006 inch (.15 mm) add shims.

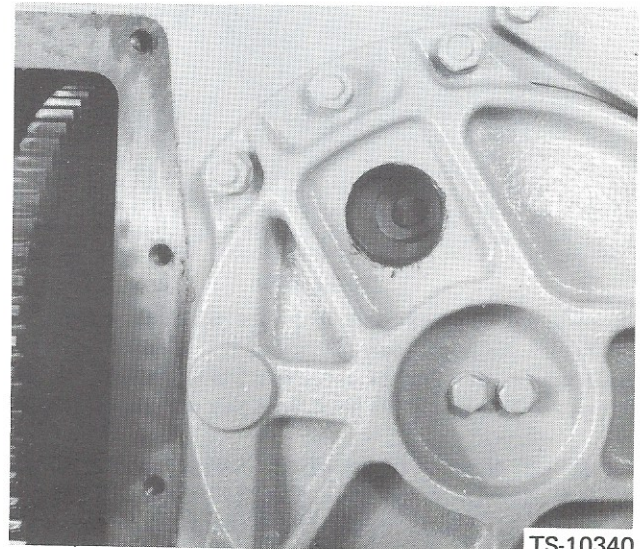


Figure 175

TS-10340

Remove the check plug from the ring gear cover. Rotate the ring gear assembly in a clockwise direction until a bolt, rivet or counter sunk hole appears in the plug hole.

HOW TO INSTALL THE PINION BRAKE

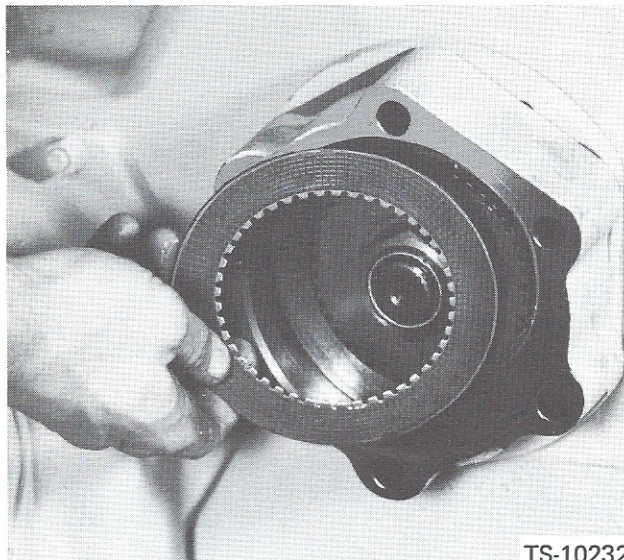


Figure 176

Install the pinion brake disc and housing.

NOTE: Make sure that the teeth on the brake disc align with the disc hub.

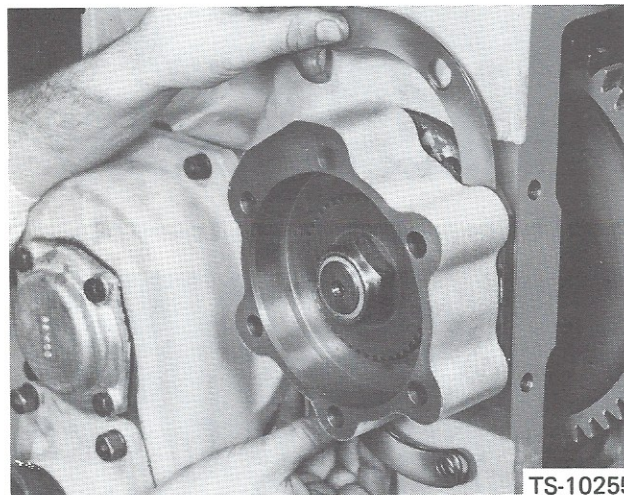


Figure 177

Install the shims behind the housing. Put an inch/lb. (kgf/m) torque wrench on the hub nut. Turn the pinion with the wrench. Make a note of the number shown by the wrench when the pinion begins to turn. Install two bolts in the brake housing and tighten them to the correct torque. Put the torque wrench on the hub nut again.

Turn the pinion. Make a note of the number shown by the wrench when the pinion begins to turn. Compare the two measurements. The second measurement must be 15 to 25 in/lbs (17.28-28.80 kgf/cm, 1.69-2.82 N.m.) greater than the first. Add or remove shims to change this measurement. Repeat this procedure until the measurement is correct.

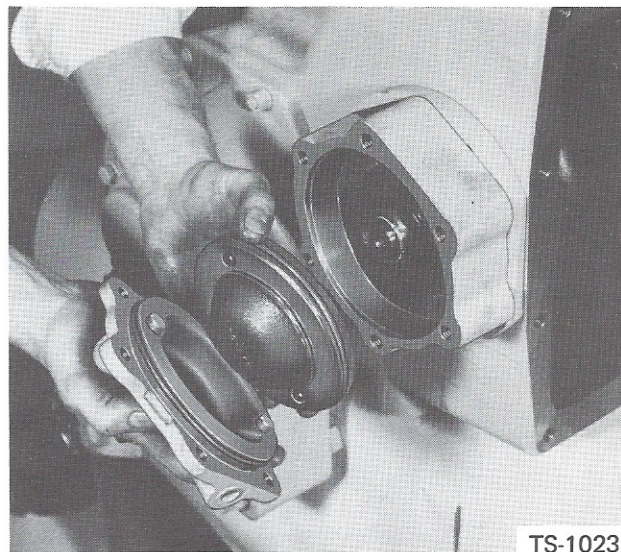


Figure 178

Install the pinion shaft piston and its cover. See the o-rings.

NOTE: The dowel pins must go .188 in. (47.7 mm) beyond the lip of the cover.

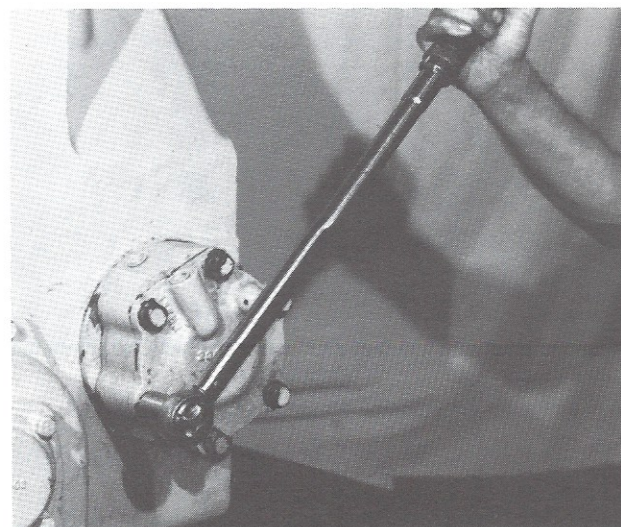


Figure 179

Tighten the mounting bolts to the correct torque.

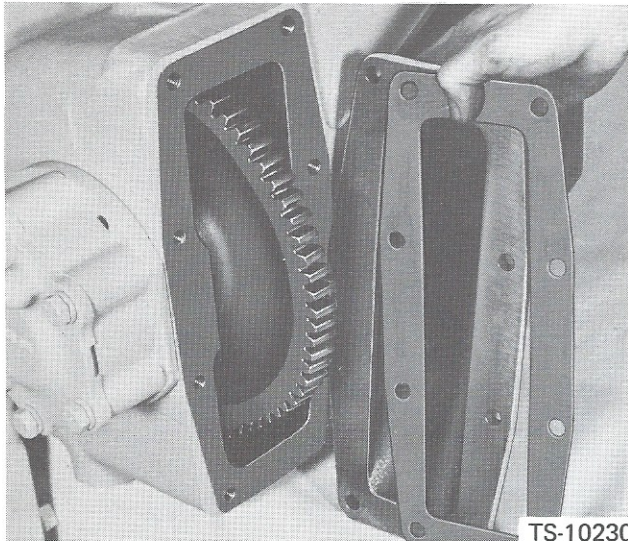


Figure 180

Install the cover and the gasket for the pinion drive gear.

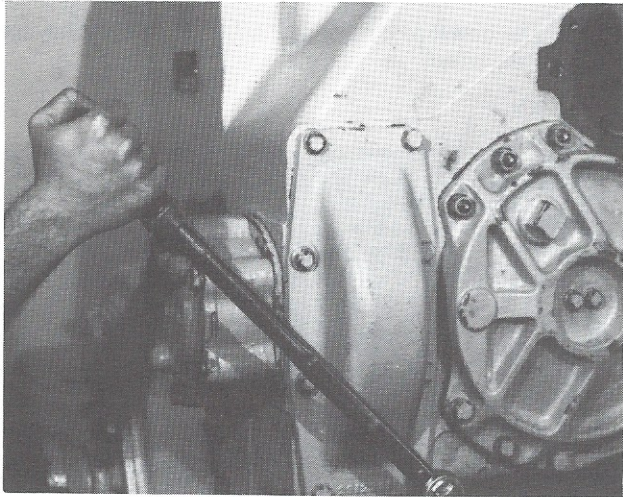


Figure 181

Tighten the cover bolts to the correct torque.

HOW TO INSTALL THE CABLE DRUM AND DRIVE GEAR.

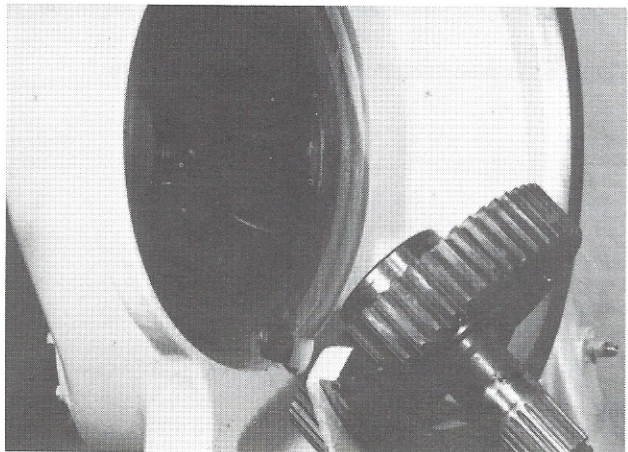


Figure 182

Install the drum drive gear and shaft in the housing.

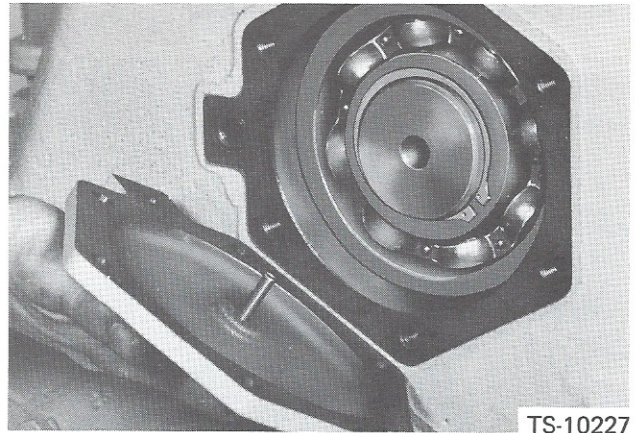


Figure 183

Install the snap ring on the drum shaft. Install the cover.

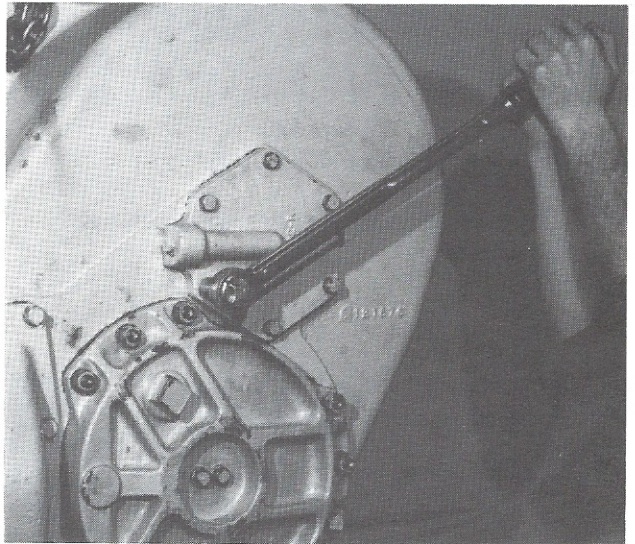


Figure 184

Tighten the cover mounting bolts to the correct torque.

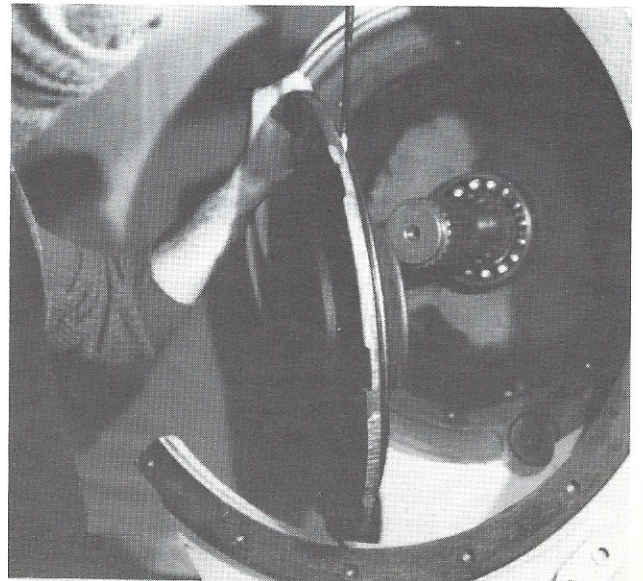


Figure 185

Install the cable drum support.

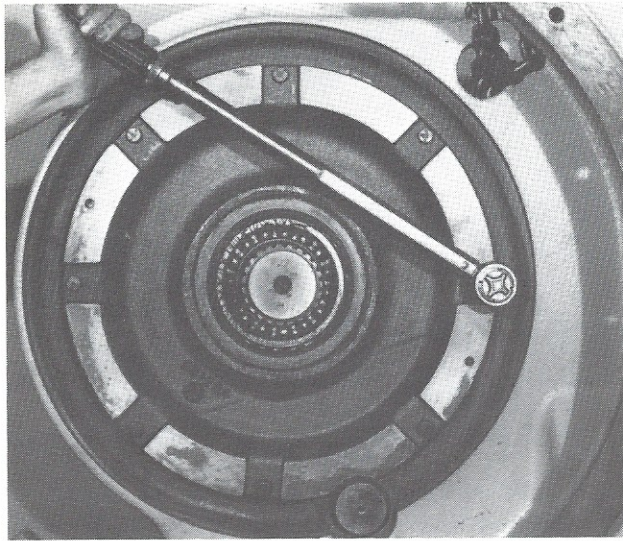


Figure 186

Tighten the support mounting bolts to the correct torque.

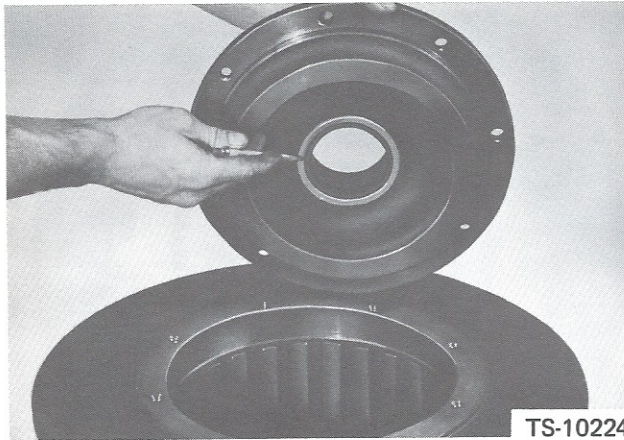


Figure 187

Install the drum hub support on the cable drum. See the oil seal.

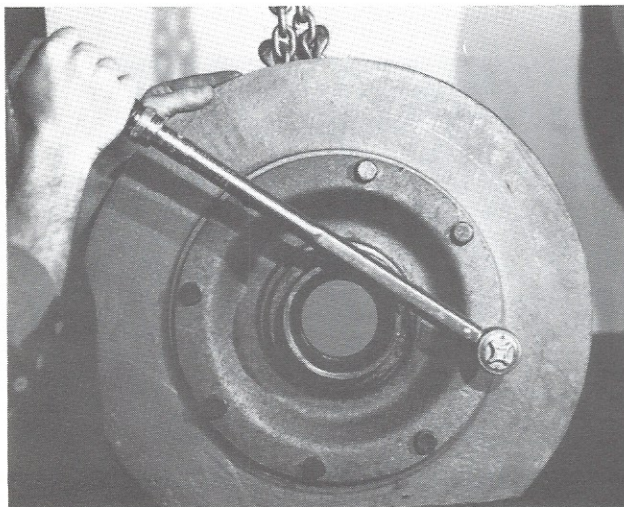


Figure 188

Tighten the hub support bolts to the correct torque. See the torque chart on pages 56 and 57.

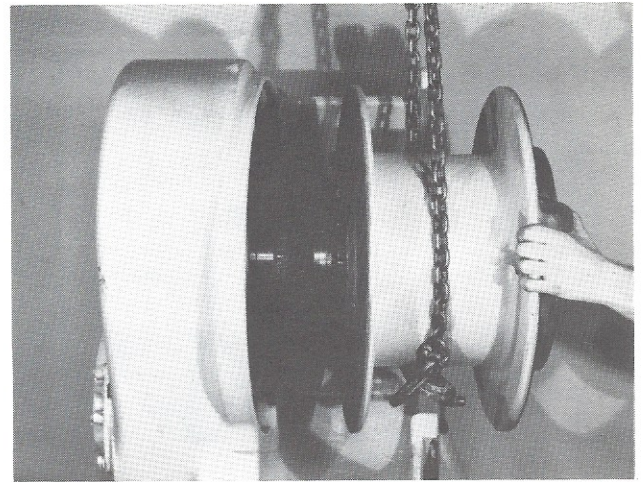


Figure 189

Install the cable drum in the winch.

HOW TO INSTALL THE FREE SPOOL CLUTCH

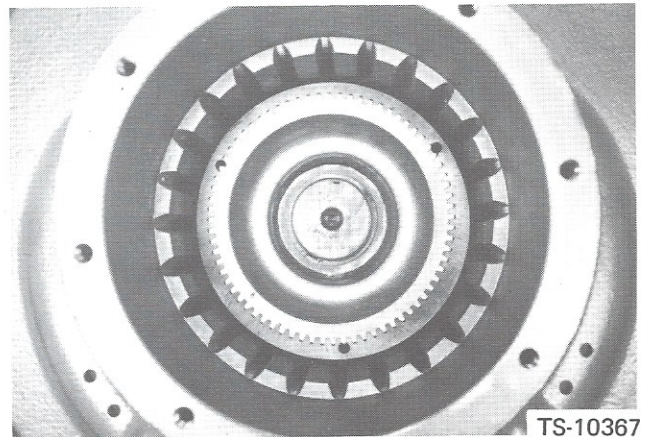


Figure 190

Install the snap ring on the drum hub.

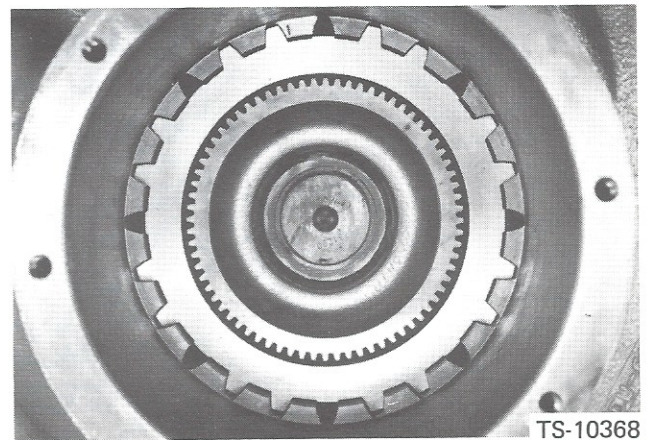


Figure 191

Install a steel clutch disc with teeth on the outer diameter first.

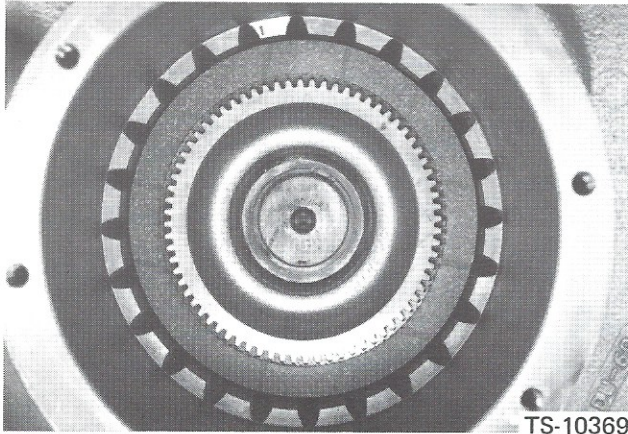


Figure 192

Install a friction clutch disc with teeth on the inner diameter.

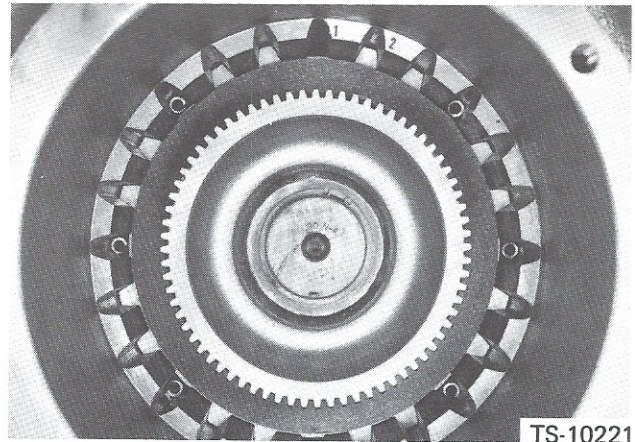


Figure 195

Install three separator springs, one after the other, in a clockwise direction. Do not put a spring in the next channel.

Install three more springs in the following three channels.

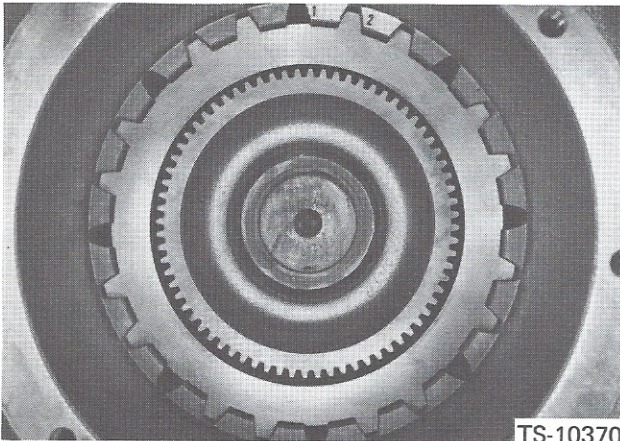


Figure 193

Rotate a second steel disc one notch in a counter-clockwise direction from the position of the first steel disc and install it.

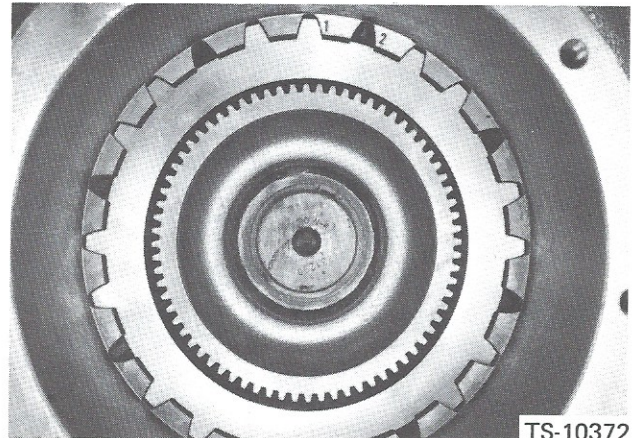


Figure 196

Rotate a steel disc in a counter-clockwise direction one notch from the position of the last steel disc. Install it.

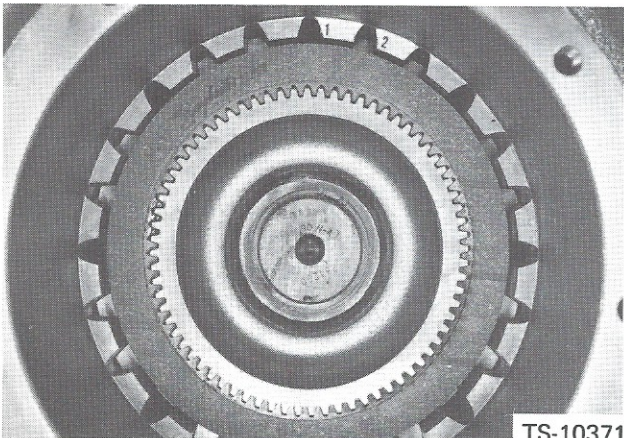


Figure 194

Install a friction disc followed by a steel disc in the same position as the second, until half the discs are installed. The last disc must be friction material.

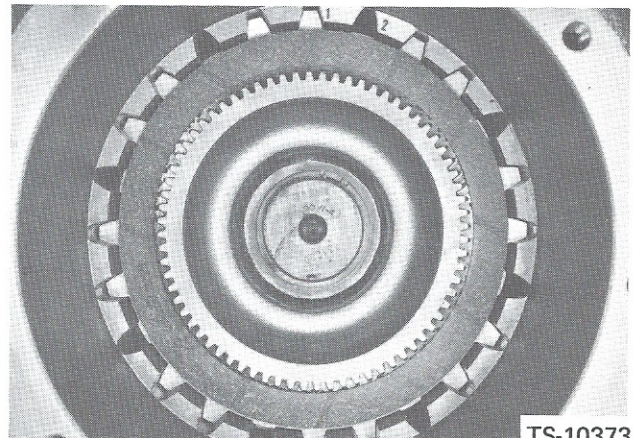


Figure 197

Install one friction disc.

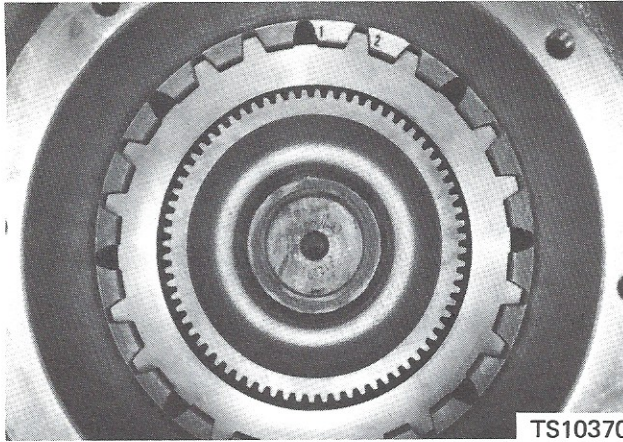


Figure 198

TS10370

Rotate a second steel disc in a clockwise direction one notch and install it.

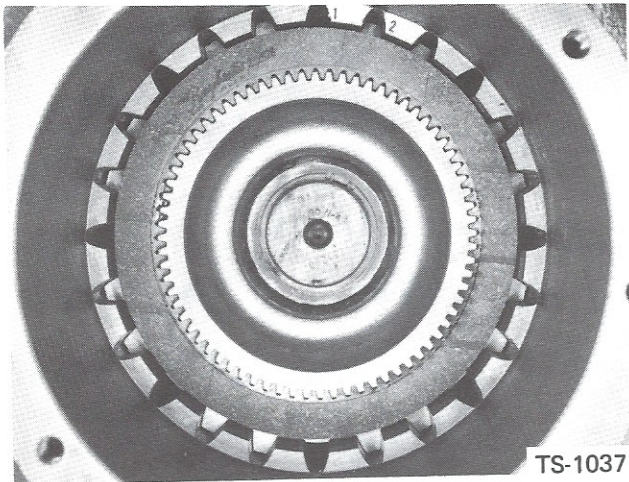


Figure 199

TS-10371

Install another friction disc, followed by a steel disc in the same position as the second until all the discs are installed. The last disc must be friction material.

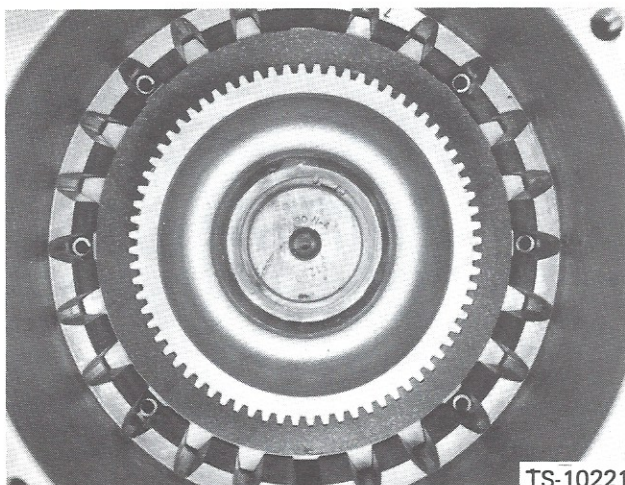


Figure 200

TS-10221

Install three separator springs, one after the other, in a clockwise direction. Do not put a spring in the next channel.

Install three more springs in the following three channels.

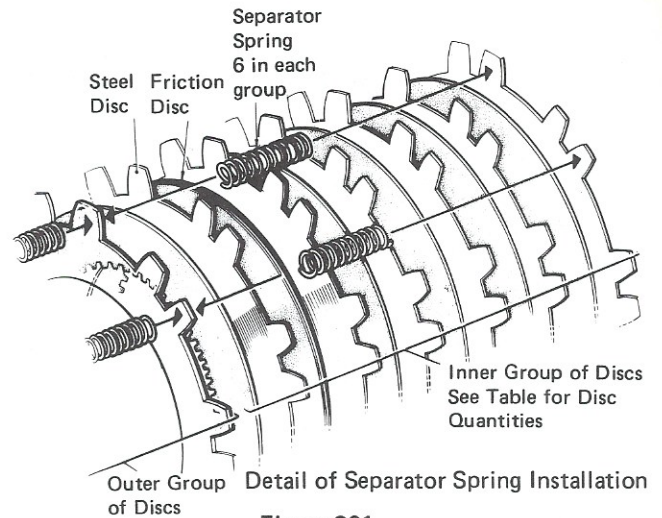


Figure 201

FREE SPOOL CLUTCH DISC CHART

Model	No. of Steel Plates	No. of Fiber Plates
W & WD 300 Series	11	11
W & WD 311 Series	14	11
W & WD 400 Series	16	16
W & WD 401 Series	18	16
W & WD 402 Series	19	18
W & WD 412 Series	19	18

NOTE: Extra Steel Discs for Shimming Are NOT Included.

Figure 202

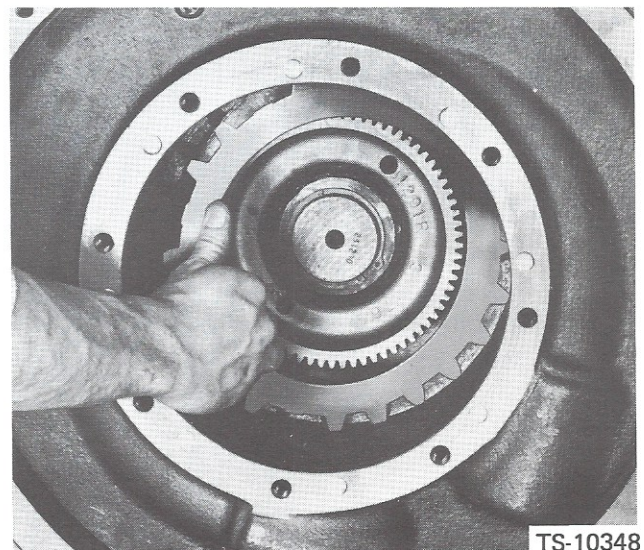


Figure 203

TS-10348

If you have a 300 series winch without separator springs, install a friction disc first. Install a steel disc followed by a friction disc, until all the discs are installed. The top disc must be friction material.

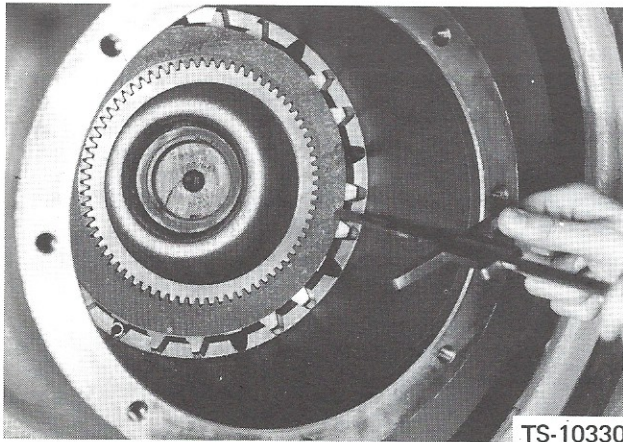


Figure 204

TS-10330

Measure the distance from the last clutch disc to the outer face of the cable drum. This distance must be between 6.669 and 6.768 inches. (169.164-171.704 cm). If it is much more or less, make a check that the correct quantity of clutch discs are used. See the free spool clutch disc chart. Install another steel disc as a shim to decrease distance if necessary. If your winch has separator springs, rotate the shim disc so that its teeth cover all of the spring ends.

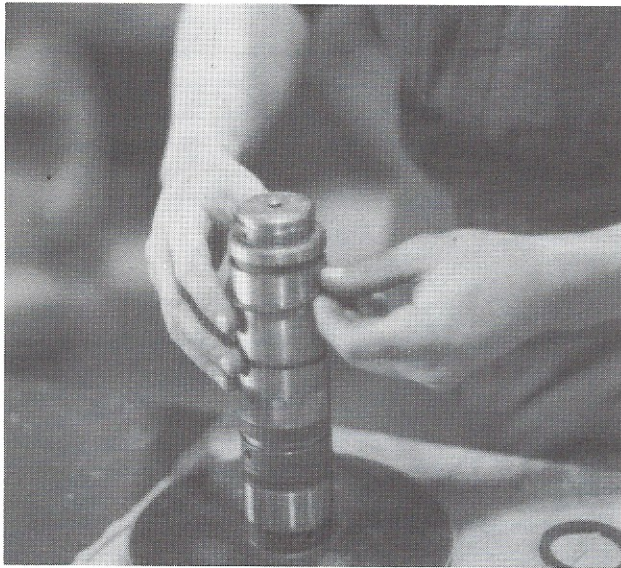


Figure 205

Install o-rings and lip seals on the clutch shaft. See the next illustration for the correct position of the lip.

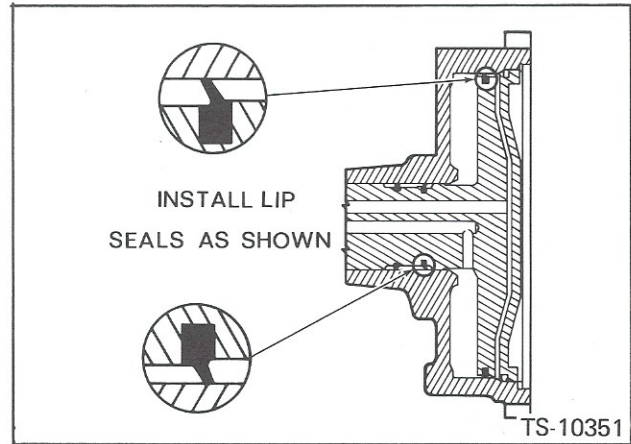


Figure 206

TS-10351

This is a view of the correct position of the lip seals.

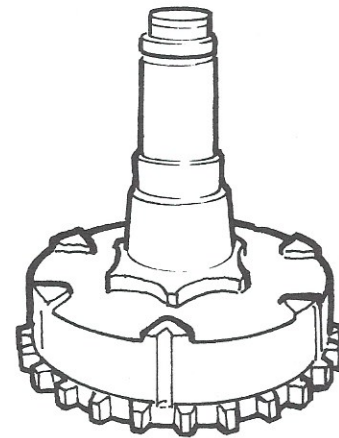


Figure 207

Install the clutch piston on the clutch shaft.

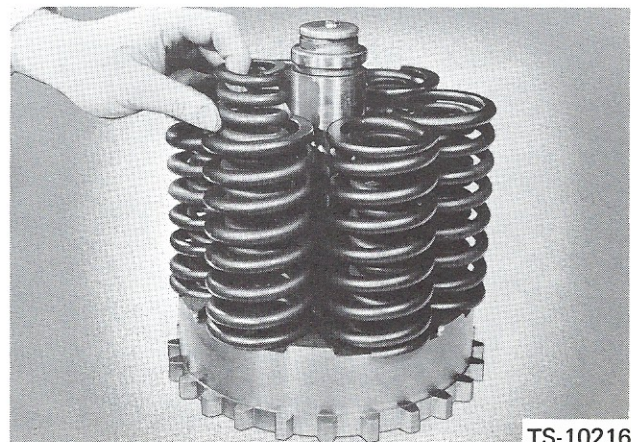


Figure 208

TS-10216

Install the inner and outer springs.

WARNING: When assembled, the free spool clutch is under approximately 10,000 lbs. (4,000 kg) of pressure. Use caution and follow these instructions when you assemble the clutch. Incorrect procedure will cause personal injury.

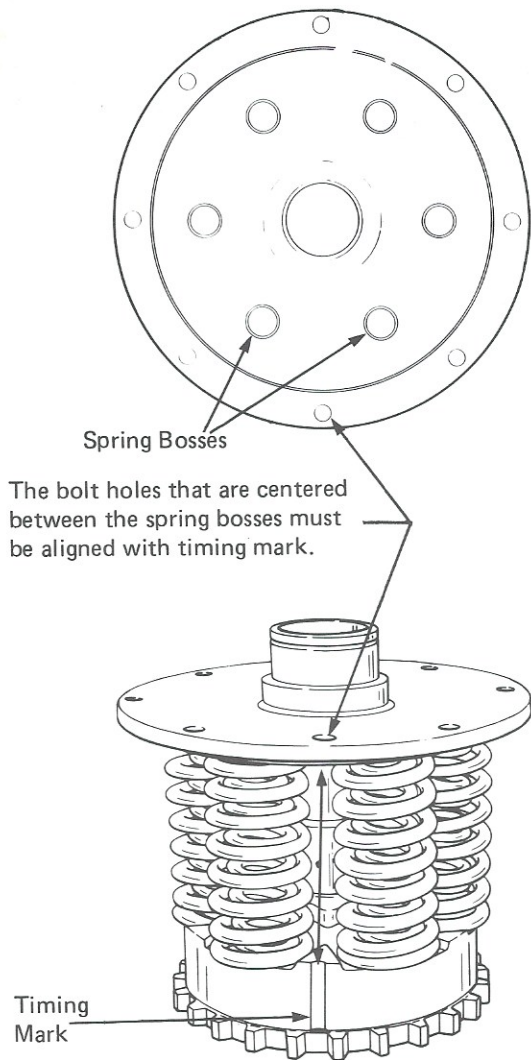


Figure 209

Install the cable drum support on the shaft. Align it with the timing mark as indicated in the drawing. Make a check that the springs are centered and are not on the raised bosses.

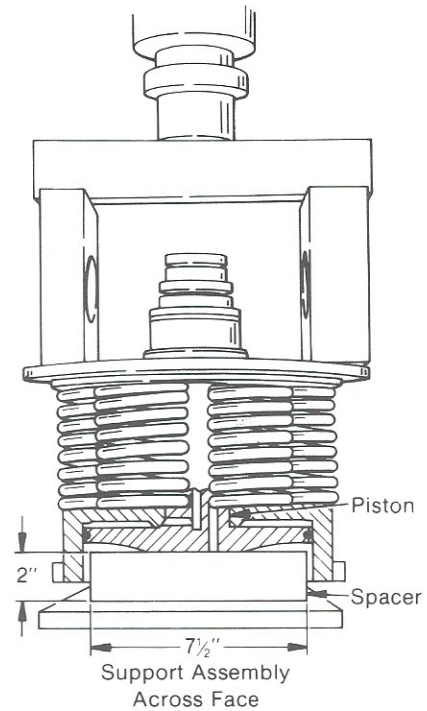


Figure 210

Place the assembly in the press as shown. Put a cylindrical spacer inside the drum between the piston and the press bed. The spacer must be 2 to 2.5 inches (5 to 6.5 mm) thick and 7.5 inches (19 mm) in diameter. You can make it from hardwood or brass. Keep the entire bottom surface of the piston drum in contact with the press bed. Use the press to slowly put pressure on the flange part of the drum support. Increase the pressure until the drum support passes the split ring groove.

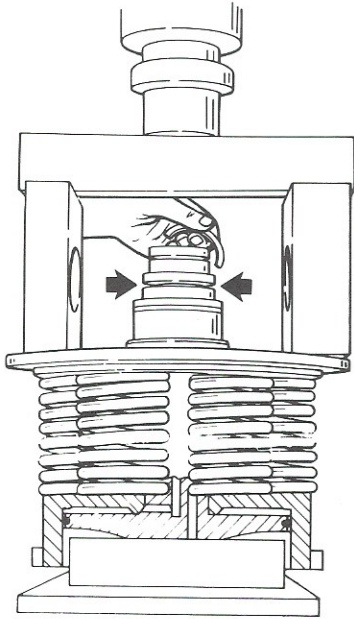
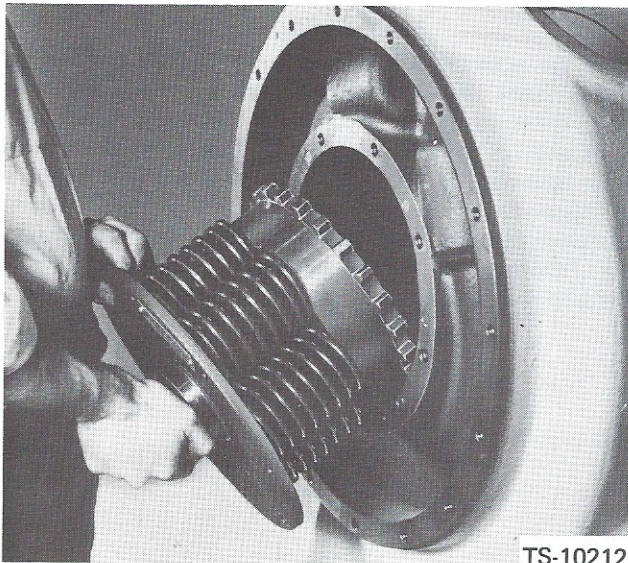


Figure 211

Put a small amount of heavy grease in the split ring grooves to hold the split rings. Install the split rings. Slowly release the pressure from the clutch assembly so the split rings will center in the grooves.



TS-10212

Figure 212

Install the assembly in the drum. The bolt holes in the drum support plate and the drum face must line up directly. If the bolts will not enter the threaded holes in the drum, the drum support plate and the clutch piston are not aligned correctly. Do not attempt to twist or pry the piston assembly to align with the holes. Remove and disassemble the piston assembly. Align the drum support plate and piston. Assemble and install the piston assembly and bolts.

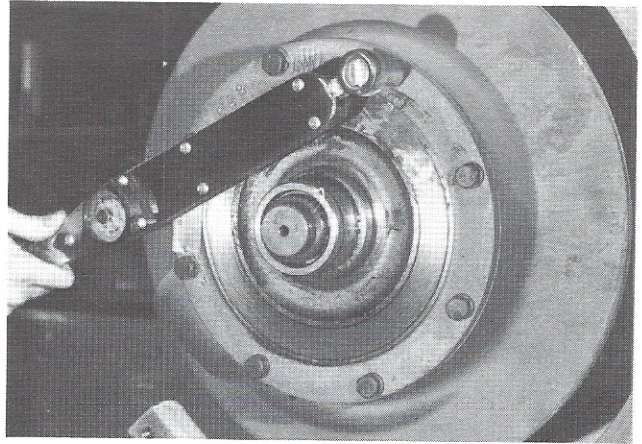
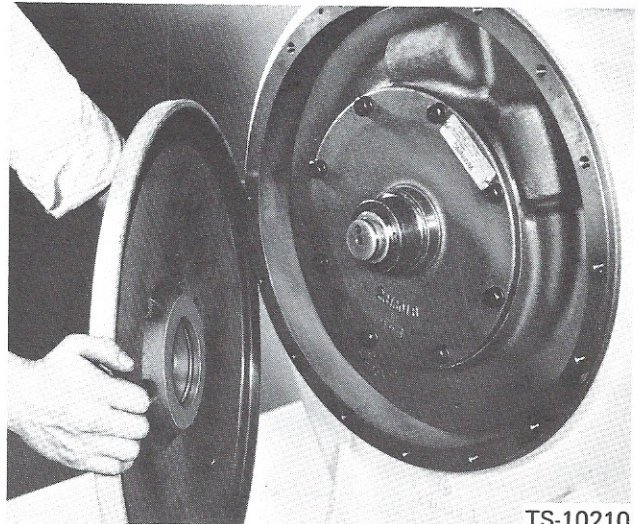


Figure 213

Tighten the mounting bolts to the correct torque.



TS-10210

Figure 214

Install a new seal in the bore. Install the drum cover. Use caution so you do not damage the seal.

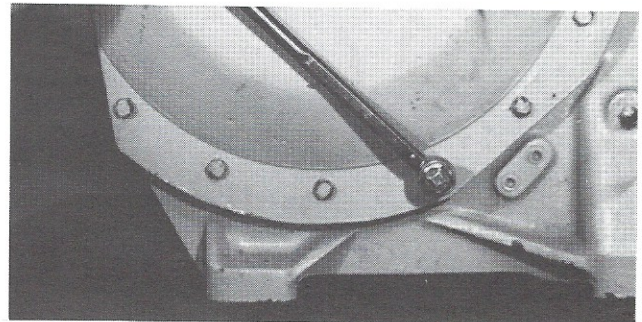


Figure 215

Tighten the cover bolts to the correct torque.

HOW TO INSTALL THE DRUM SUPPORT BEARING AND BEARING CAP ASSEMBLY

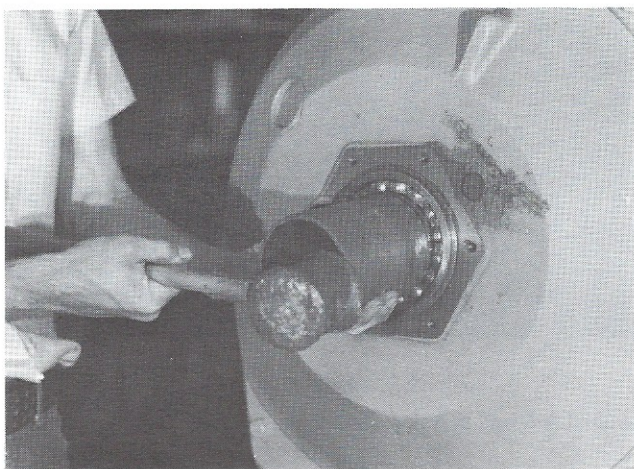


Figure 216

Install the bearing for the drum support.

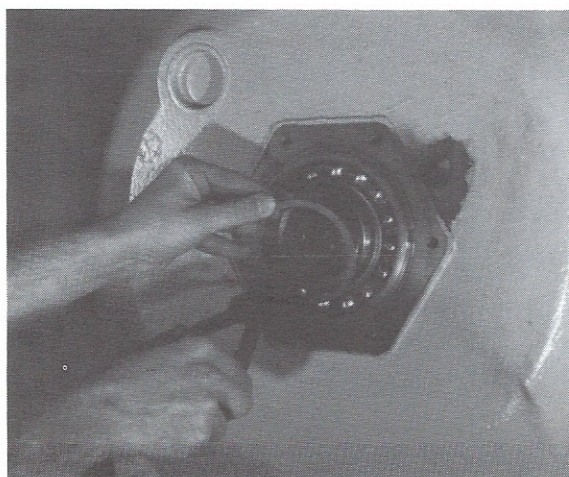


Figure 217

Install the snap ring on the bearing.

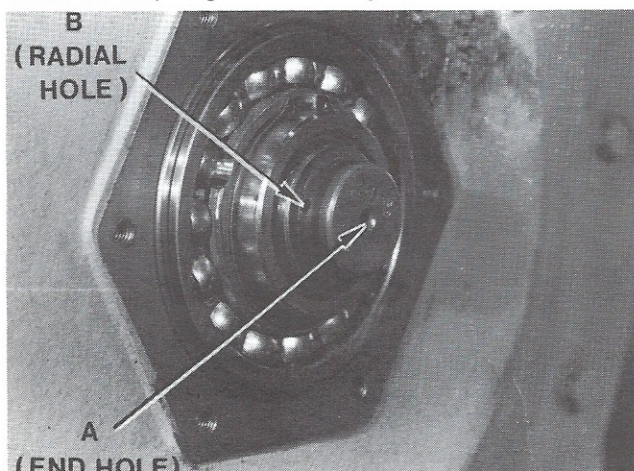


Figure 218

You must now make a check to see if all the seals in the free spool clutch are installed correctly. Make the following tests.

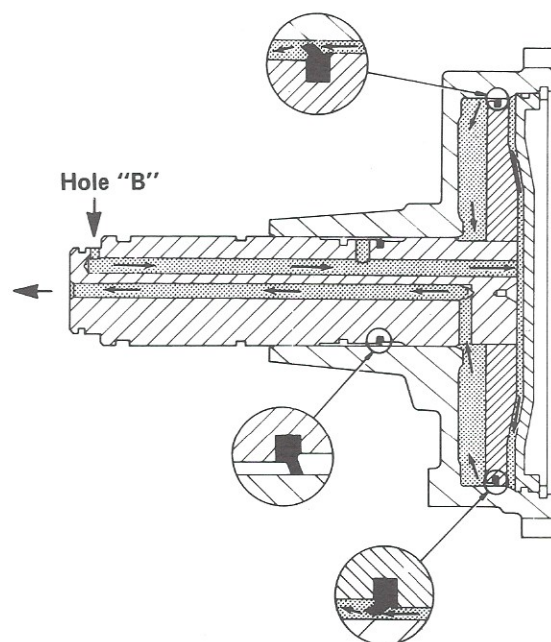
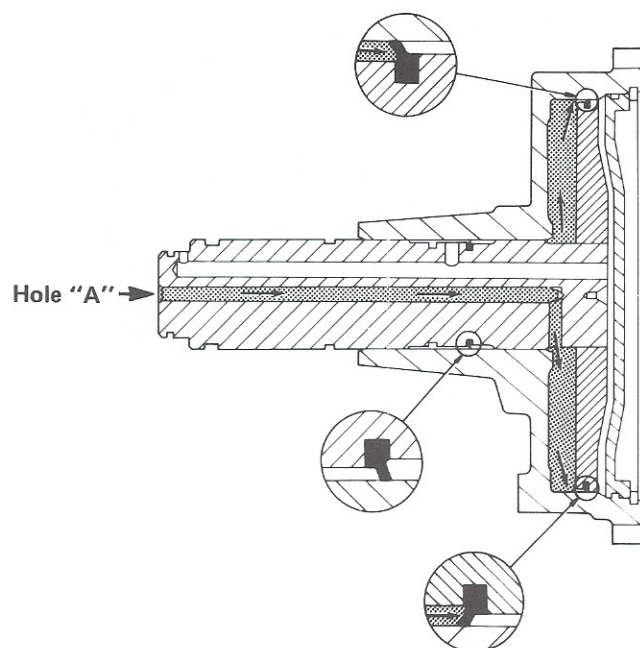


Figure 219

1. Put air pressure less than 100 p.s.i. (7,030.70 kgf/cm², 689.4 kpd) to the centre hole "A" in the end of the shaft. Air must not come out of radial hole "B".
2. Put air pressure in hole "B". Air must come out of hole "A".
3. Repeat "step 2" and put your finger over hole "A". Air must not come out of any part of the assembly. If the assembly leaks air, disassemble it.

See if the seals are damaged or installed backwards.

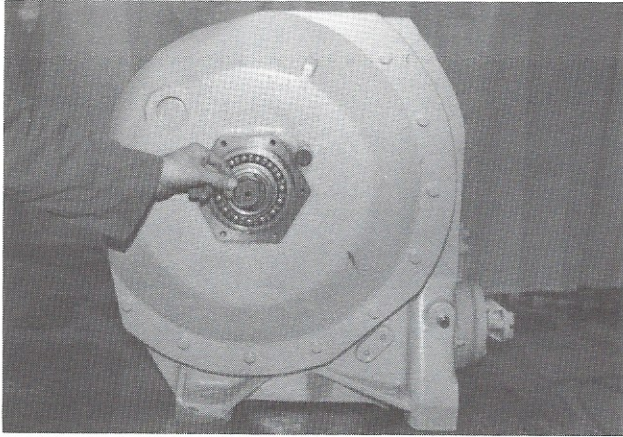


Figure 220

Install the piston ring on the drum shaft.

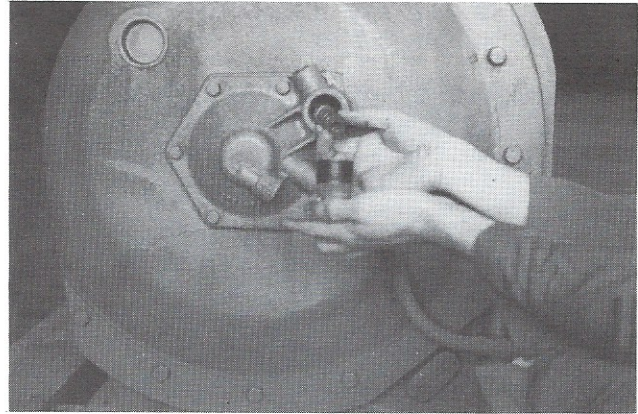


Figure 223

Install the free spool, adjusting handle and spring.

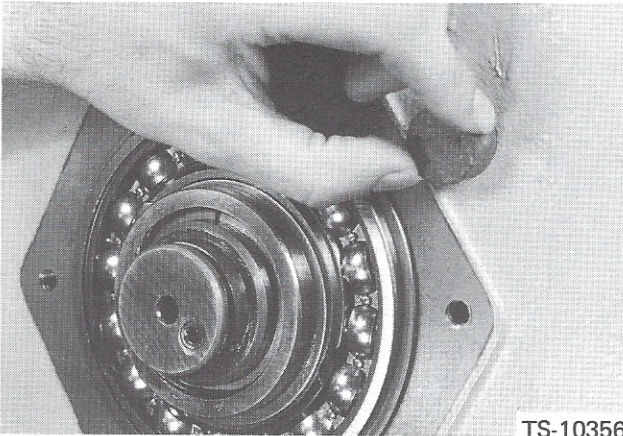


Figure 221

Install the free spool wear button.

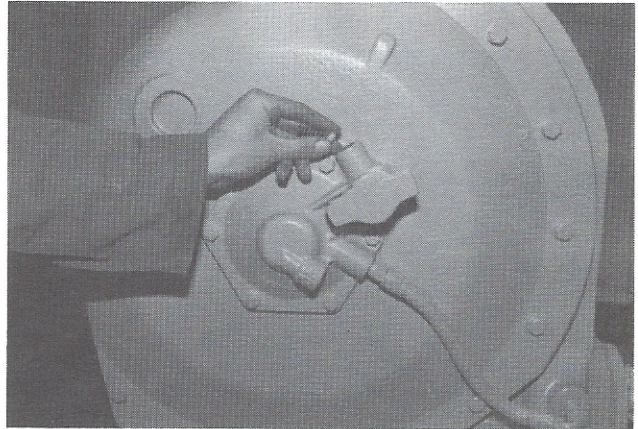


Figure 224

Install the lock button and the lock spring.

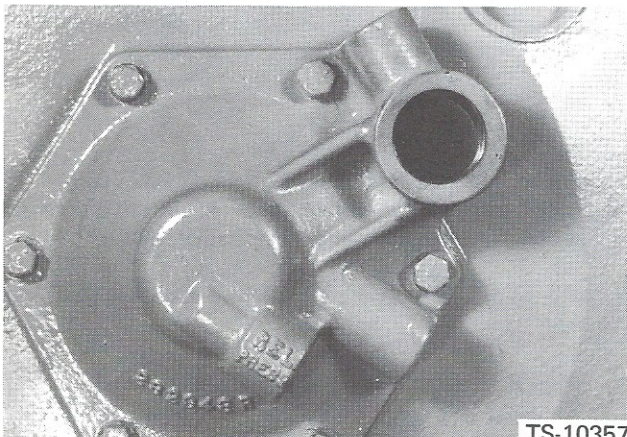


Figure 222

Install the bearing cap and the drain hose. Tighten the mounting bolts to the correct torque.

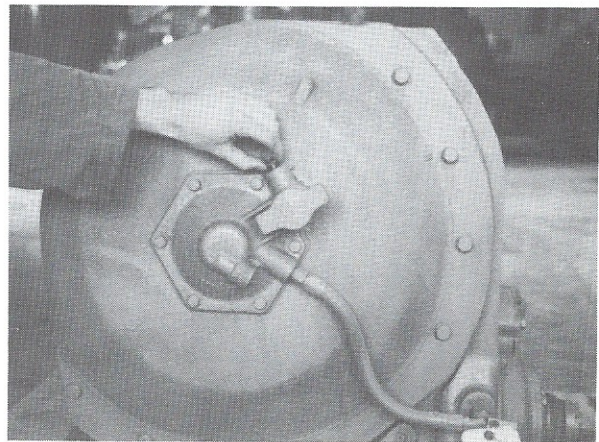


Figure 225

Install the lock screw and tighten it to a torque of 30 to 40 ft. lb.

MACHINE SERVICE AFTER WINCH OVERHAUL

After you make repairs to the winch and install it in the machine, you must clean the torque convertor and transmission hydraulic system. This maintenance procedure removes foreign material that can cause damage to important components.

Follow these steps to clean this system.

1. Remove all oil from the system and its components.
2. Disconnect and clean all hydraulic hoses.
3. Clean all filter cases carefully and replace the elements.
4. Carefully clean the oil cooler at the bottom of the radiator by flushing the cooler with a reverse flow of oil. Only a reverse flow of oil can remove all foreign material. After you do this, remove the oil with compressed air. Repeat this procedure until all foreign material is removed. If necessary, remove the radiator and cooler assembly for easier service. Do not use "flushing compounds" to clean the oil cooler.
5. Remove a cover plate from the torque convertor. Make an inspection of the inside parts. If large quantities of foreign materials are present you must remove

the torque convertor, disassemble and clean it. This procedure is necessary because foreign material will cause damage to the convertor parts, and early failure.

6. Make an inspection of the transmission sump screen. Clean the screen carefully.
7. Install all the system's components. Use new gaskets where necessary.
8. Use the lubrication chart to learn the correct type of oil for your machine. Fill the transmission sump to the correct level with new oil.
9. Operate the engine for two minutes at a speed between 500 and 600 revolutions per minute. This procedure fills the system with oil.
10. Make a check of the transmission oil level with the engine running. Use caution near revolving prop shafts. If the oil is now below the correct level, add more oil until the level is correct. Make a final check of the level when the oil reaches the normal temperature of operation, between 180 and 200 degrees Fahrenheit. (80 and 90 degrees Celcius).
11. Make a check for leaks for all drain plugs and hose connections. Tighten them where necessary.

LUBRICATION

Use the lubrication chart to learn the correct type of oil for your machine.

Use the operator's manual for your specific machine to learn the oil capacity of the system.

Make a check of the oil level every day before starting the machine.

Keep the transmission reservoir filled to the correct level. Change the oil filter element every 250 hrs. Replace the oil every 500 hrs., according to these instructions:

1. Operate the machine until the transmission oil reaches a temperature of between 150 and 250 degrees Fahrenheit (65 and 90 degrees Celsius).
2. Remove the oil from the system at the transmission. Use your operator's manual to learn the correct method for removing the transmission sump screen.

Remove the screen and clean it carefully. Install it with new gaskets.

3. Remove the oil filter elements. Clean the filter casings. Install new filter elements.
4. Fill the transmission reservoir to the correct level with new oil.
5. Operate the engine at a speed of between 500 and 600 revolutions per minute for two minutes. This procedure sends oil through the system.
6. Make a check of the oil level with the engine running. Use caution near revolving prop shafts. If the oil is now below the correct level, add more oil until the level is correct.
7. Make a final check of the oil level when the oil reaches the normal temperature of operation. Add more oil if necessary.

RECOMMENDED OILS for Clark Power Shift Transmissions and Converters having common oil System		
INITIAL FILL	DEXRON	AUTOMATIC TRANSMISSION FLUID
SUBSEQUENT FILL OR REFILLS		
Prevailing Ambient Temp.	SAE Spec.	Type
Above 0° F	DEXRON SAE 10 MIL. 2104B	Automatic Transmission Fluid or MS-DG or Grade 10
Below 0° F	DEXRON	Automatic Transmission

CAUTION

When replacing oil in the hydraulic system do not interchange Dexron Automatic Transmission fluid with military spec., MIL-L-2104A, Supp. 1 or New MIL-L-2104B. The system must be drained and flushed, using only the oil to be added as the flushing agent.

PRESSURES

The following chart shows the correct operating pressures in the winch for each of its operations. The pressure must be taken at a low idle speed with an oil temperature of between 180 and 200 degrees Fahrenheit or 82 and 93 degrees Celcius. All of the pressures listed are "pounds per square inch."

FUNCTION	PRESSURE LOCATION		
	Free Spool Clutch Pressure	Input Clutch Pressure	Input Brake Pressure
FREE SPOOL	240-280	0	240-280
WINCH IN	0	240-280	0
HOLD	0	0	240-280

VOLUME OF FLOW

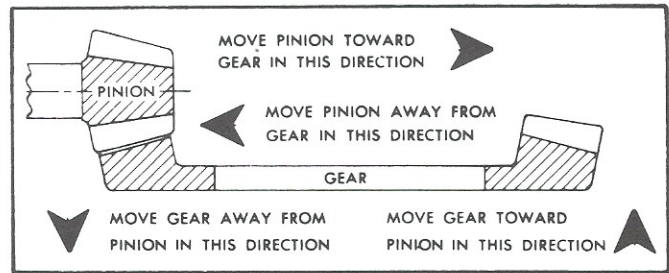
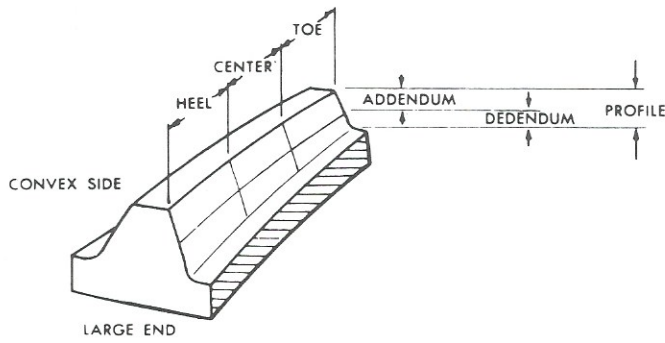
Input Clutch Three gallons (11.4 litres) constant
 Free Spool Clutch not necessary
 Pinion Brake Five gallons (20 litres) minimum

SPRAG ROTATION

Make a check of the operation of the sprag before you connect the input prop shaft. Turn the input flange several revolutions in the normal direction of rotation. See that the drum rotates so as to wind the cable over the top of the drum. The winch drivetrain should move smoothly and evenly. Listen for any unusual noises.

	INPUT	RING GEAR LOCATION	SPRAG ROTATION
	W SERIES	Clockwise	Toward Cover
Counter Clockwise		Away from Cover	Clockwise
WD SERIES	Clockwise	Away from Cover	Counter Clockwise
	Counter Clockwise	Toward Cover	Clockwise

TOOTH CONTACT FOR RING GEAR AND PINION



CONTACT SHOWN BELOW IS FOR A LEFT HAND SPIRAL RING GEAR

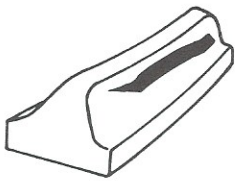


FIG. 1

CORRECT CONTACT ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD.



FIG. 2

TOE CONTACTING BOTH SIDES OF TOOTH — MOVE GEAR AWAY FROM PINION.

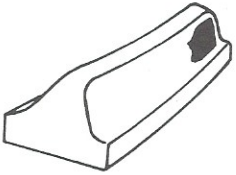


FIG. 3

HEEL CONTACTING BOTH SIDES OF TOOTH — MOVE GEAR TOWARD PINION.

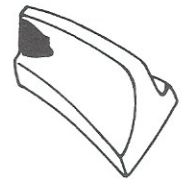


FIG. 4

LOW CONTACT ON GEAR AND HIGH CONTACT ON PINION — MOVE PINION AWAY FROM GEAR.

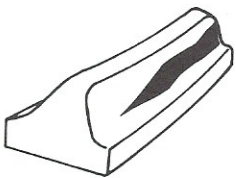
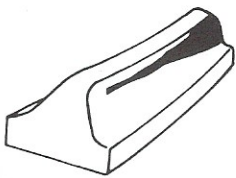
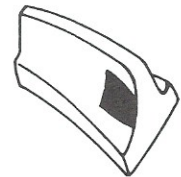
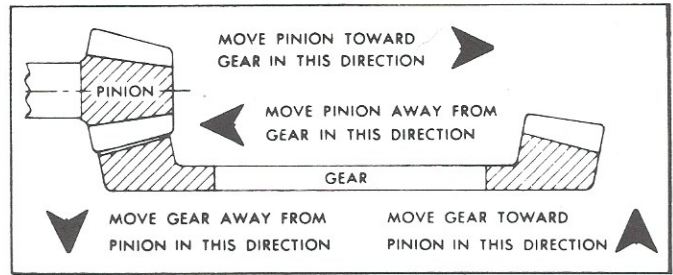
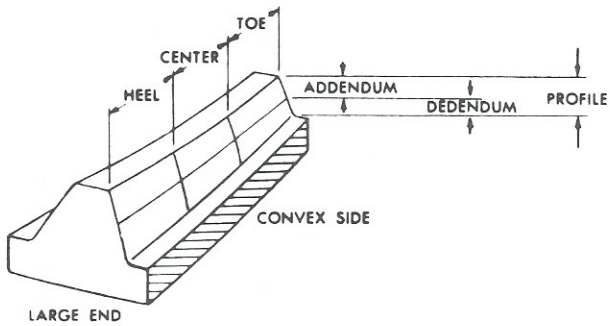


FIG. 5

HIGH CONTACT ON GEAR AND LOW CONTACT ON PINION — MOVE PINION TOWARD GEAR.



TOOTH CONTACT FOR RING GEAR AND PINION



CONTACT SHOWN BELOW IS FOR A RIGHT HAND SPIRAL RING GEAR

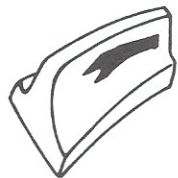


FIG. 1

CORRECT CONTACT ON BOTH SIDES OF TOOTH WHILE UNDER LIGHT LOAD.

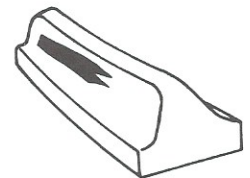


FIG. 2

TOE CONTACTING BOTH SIDES OF TOOTH – MOVE GEAR AWAY FROM PINION.

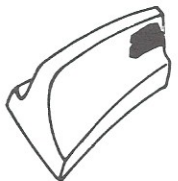


FIG. 3

HEEL CONTACTING BOTH SIDES OF TOOTH – MOVE GEAR TOWARD PINION.

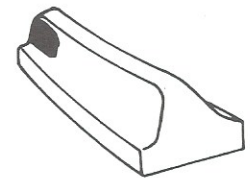


FIG. 4

LOW CONTACT ON GEAR AND HIGH CONTACT ON PINION – MOVE PINION AWAY FROM GEAR.

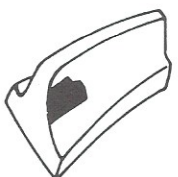
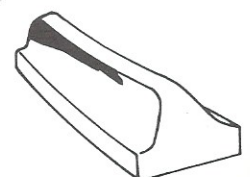
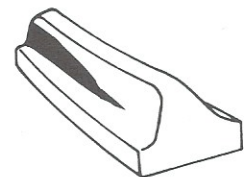
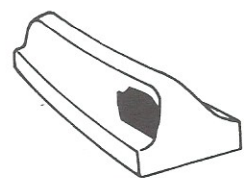


FIG. 5

HIGH CONTACT ON GEAR AND LOW CONTACT ON PINION – MOVE PINION TOWARD GEAR.



CLARK

GRADE 8
TORQUE SPECIFICATIONS

Dry Type Threads

Lubricated or Plated Type Threads

COARSE**THREADS**

	lbf.ft.	kgm f/m	N.M.	lbf.ft.	kgm f/m	N.M.
1/4" - 20	11 - 12	1.5	15 - 16	8 - 10	1	11 - 13
5/16" - 18	20 - 28	3 - 4	27 - 38	26 - 30	3.5 - 4	35 - 40
3/8" - 16	44 - 48	6 - 6.5	60 - 65	33 - 36	4.5 - 5	45 - 49
7/16" - 14	70 - 77	10 - 11	95 - 104	52 - 57	7 - 8	71 - 77
1/2" - 13	106 - 117	14 - 16	144 - 158	80 - 88	11 - 12	109 - 119
9/16" - 12	153 - 168	21 - 23	208 - 228	115 - 127	16 - 18	156 - 172
5/8" - 11	212 - 233	29 - 32	288 - 316	159 - 175	22 - 24	216 - 237
3/4" - 10	376 - 414	52 - 57	510 - 561	282 - 310	39 - 43	393 - 420
7/8" - 9	606 - 667	84 - 92	822 - 904	455 - 501	63 - 69	617 - 679
1" - 8	909 - 1000	126 - 138	1233 - 1355	682 - 750	94 - 104	925 - 1016
1-1/8" - 7	1288 - 1417	178 - 196	1746 - 1921	966 - 1062	135 - 146	1310 - 1441
1-1/4" - 7	1817 - 1999	251 - 277	2464 - 2710	136 - 1496	188 - 207	1844 - 2027

FINE**THREAD**

	lbf.ft.	kgm f/m	N.M.	lbf.ft.	kgm f/m	N.M.
1/4" - 28	13 - 14	2	18 - 19	10 - 13	1 - 2	14 - 17
5/16" - 24	23 - 28	2 - 4	31 - 38	18 - 25	2.5 - 3.5	25 - 33
3/8" - 24	49 - 54	7 - 7.5	67 - 73	37 - 41	5 - 5.5	50 - 55
7/16" - 20	78 - 86	11 - 12	106 - 116	58 - 64	8 - 9	79 - 86
1/2" - 20	120 - 132	16 - 18	163 - 179	90 - 99	12.5 - 13.5	122 - 134
9/16" - 18	171 - 188	24 - 26	232 - 255	128 - 141	18 - 19	174 - 191
5/8" - 18	240 - 264	33 - 36	326 - 258	180 - 198	25 - 27	244 - 268
3/4" - 16	420 - 262	58 - 64	570 - 626	315 - 247	44 - 48	427 - 470
7/8" - 14	668 - 735	92 - 102	906 - 996	501 - 550	69 - 76	679 - 745
1" - 12	995 - 1096	137 - 150	1359 - 1486	746 - 821	103 - 113	1012 - 1113
1-1/8" - 12	1445 - 1590	200 - 220	1960 - 2155	1083 - 1191	150 - 165	1469 - 1613
1-1/4" - 12	2012 - 2213	278 - 305	2728 - 2997	1509 - 1660	208 - 229	2046 - 2250



GRADE 5
TORQUE SPECIFICATIONS

Dry Type Threads

Lubricated or Plated Type Threads

COARSE**THREADS**

	lbf.ft.	kgm f/m	N.M.	lbf.ft.	kgm f/m	N.M.
1/4" - 20	7 - 8	1	10 - 11	8 - 10	1	11 - 13
5/16" - 18	14 - 18	2 - 2.5	19 - 24	10 - 15	1 - 2	13 - 20
3/8" - 16	31 - 34	4 - 4.5	42 - 46	23 - 25	3 - 4	31 - 34
7/16" - 14	49 - 54	7 - 8	66 - 73	37 - 41	5 - 6	50 - 55
1/2" - 13	75 - 83	10 - 11	102 - 112	57 - 63	8 - 9	77 - 85
9/16" - 12	109 - 120	15 - 16	148 - 162	82 - 90	12 - 13	111 - 122
5/8" - 11	150 - 165	21 - 23	204 - 223	113 - 124	16 - 17	152 - 168
3/4" - 10	266 - 293	37 - 40	360 - 397	200 - 220	28 - 30	271 - 298
7/8" - 9	394 - 433	54 - 60	535 - 586	296 - 326	41 - 45	402 - 441
1" - 8	591 - 649	82 - 90	802 - 879	443 - 489	61 - 67	601 - 663
1-1/8" - 7	794 - 873	110 - 121	1077 - 1183	596 - 656	82 - 90	808 - 889
1-1/4" - 7	1120 - 1232	155 - 170	1519 - 1670	840 - 924	116 - 128	1139 - 1252

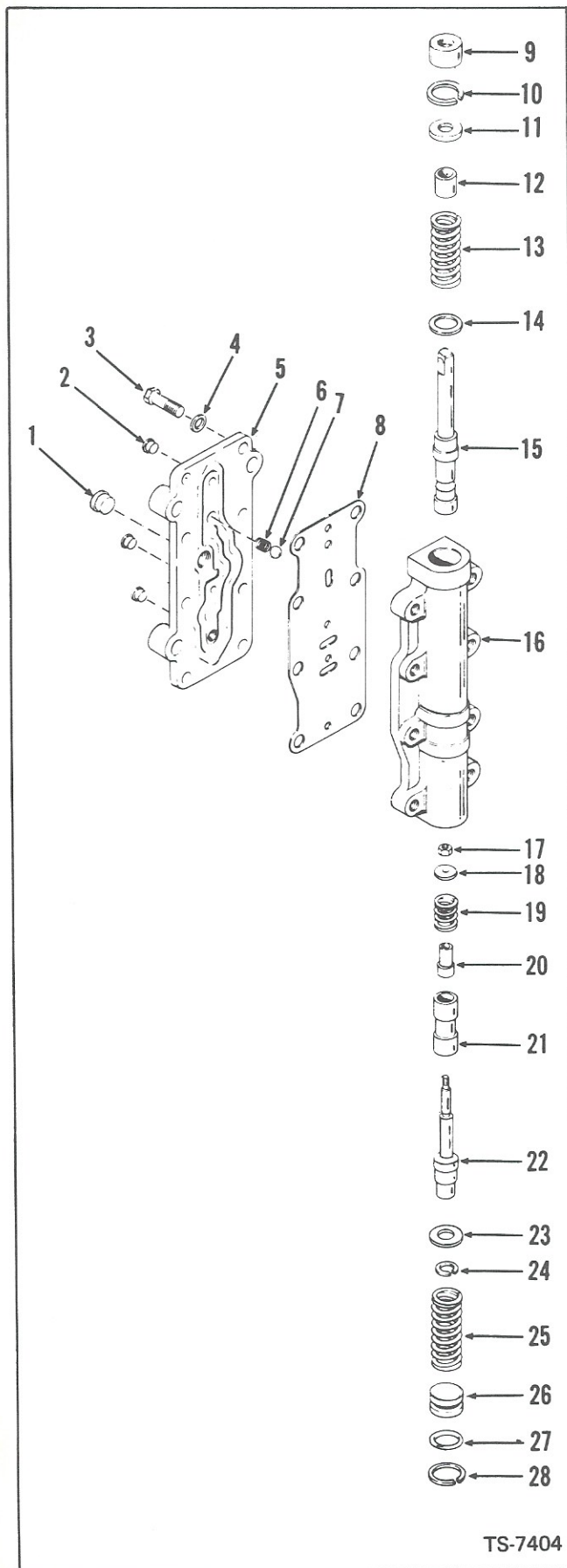


GRADE 5

TORQUE SPECIFICATIONS (Cont'd.)

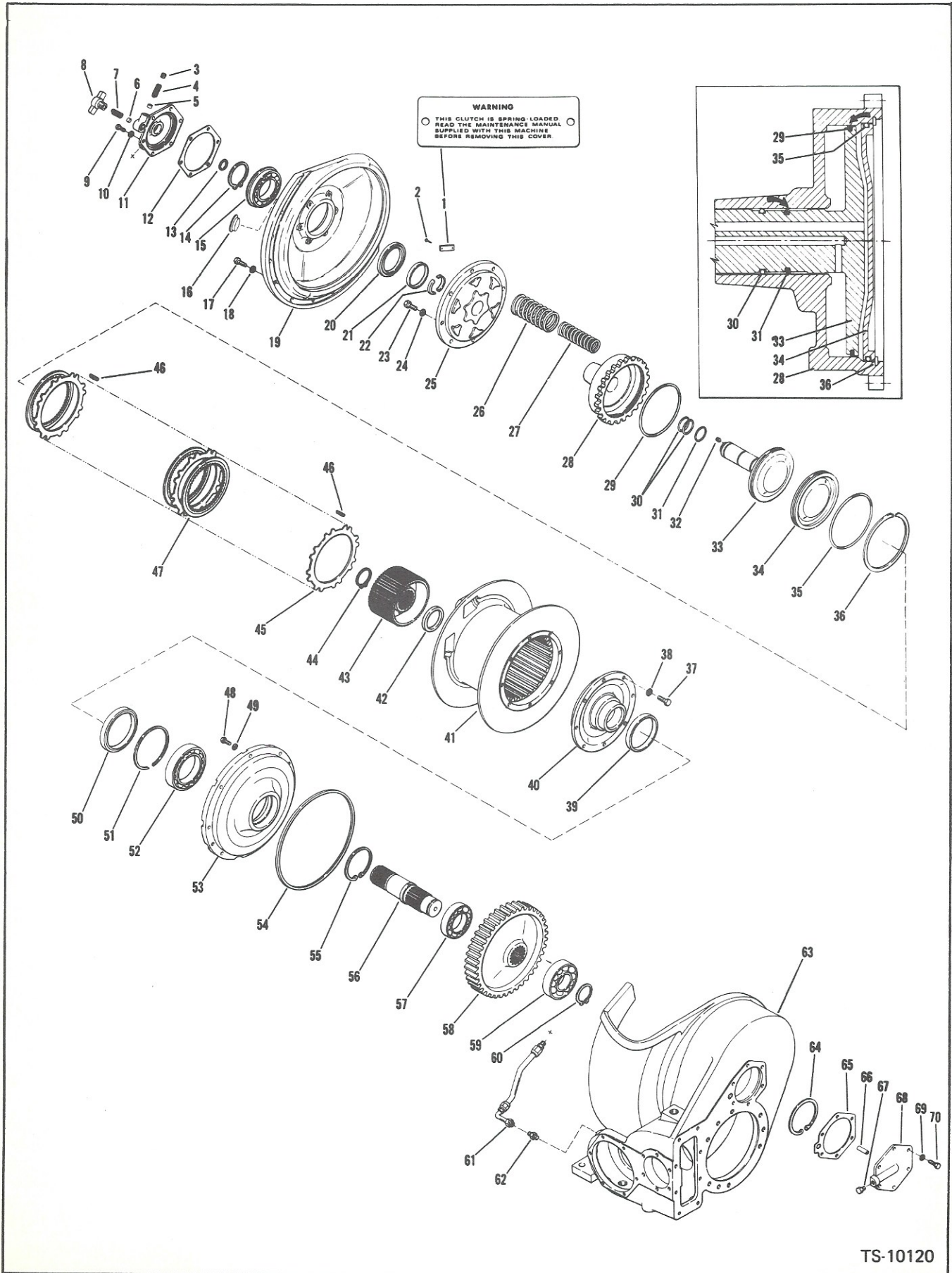
FINE THREADS	Dry Type Thread			Lubricated or Plated Type Threads		
1/4" - 28	9 - 10	1	12 - 13	9 - 10	1	12 - 13
5/16" - 24	17 - 22	2 - 3	23 - 29	16 - 20	2 - 3	21 - 27
3/8" - 24	35 - 39	4 - 5	48 - 53	26 - 29	3 - 4	35 - 39
7/16" - 20	55 - 61	7 - 8	75 - 83	41 - 45	5 - 6	56 - 61
1/2" - 20	85 - 94	12 - 13	116 - 127	64 - 70	9 - 10	87 - 95
9/16" - 18	121 - 133	17 - 18	164 - 180	91 - 100	12 - 13	124 - 135
5/8" - 18	170 - 187	23 - 26	231 - 253	128 - 141	18 - 19	174 - 191
3/4" - 16	297 - 327	41 - 45	403 - 443	223 - 245	31 - 33	303 - 332
7/8" - 14	434 - 477	60 - 66	589 - 646	326 - 359	45 - 49	442 - 486
1" - 12	646 - 711	89 - 98	876 - 712	484 - 534	66 - 73	657 - 724
1-1/8"	891 - 980	123 - 135	1208 - 1328	668 - 735	92 - 101	906 - 996
1-1/4" - 12	1240 - 1364	171 - 189	1682 - 1849	931 - 1024	129 - 132	1262 - 1387

PARTS IDENTIFICATION



MASTER CONTROL UNIT

Item	Description	Qty.
1	Plug (for shipping only)	—
2	Plug (for shipping only)	—
3	Bolt, mounting, valve cover	8
4	Lkwshr, mounting, valve cover	8
5	Cover, valve body	1
6	Spring, detent	1
7	Ball, detent	1
8	Gasket, valve body cover	1
9	Seal, oil, valve spool	1
10	Ring, snap, spring washer	1
11	Washer, spring retaining	1
12	Spacer, valve stop	1
13	Spring, centering	1
14	Retainer, centering spring	1
15	Spool, valve	1
16	Body, control valve	1
17	Nut, regulating spool stop	1
18	Washer, retaining	1
19	Spring, regulating	1
20	Spacer, regulating spool	1
21	Sleeve, regulating	1
22	Spool, regulating	1
23	Retainer, centering spring	1
24	Ring, snap, centering spring retainer	1
25	Spring, centering	1
26	Stop, valve	1
27	O-Ring, valve stop	1
28	Ring, snap, valve stop	1

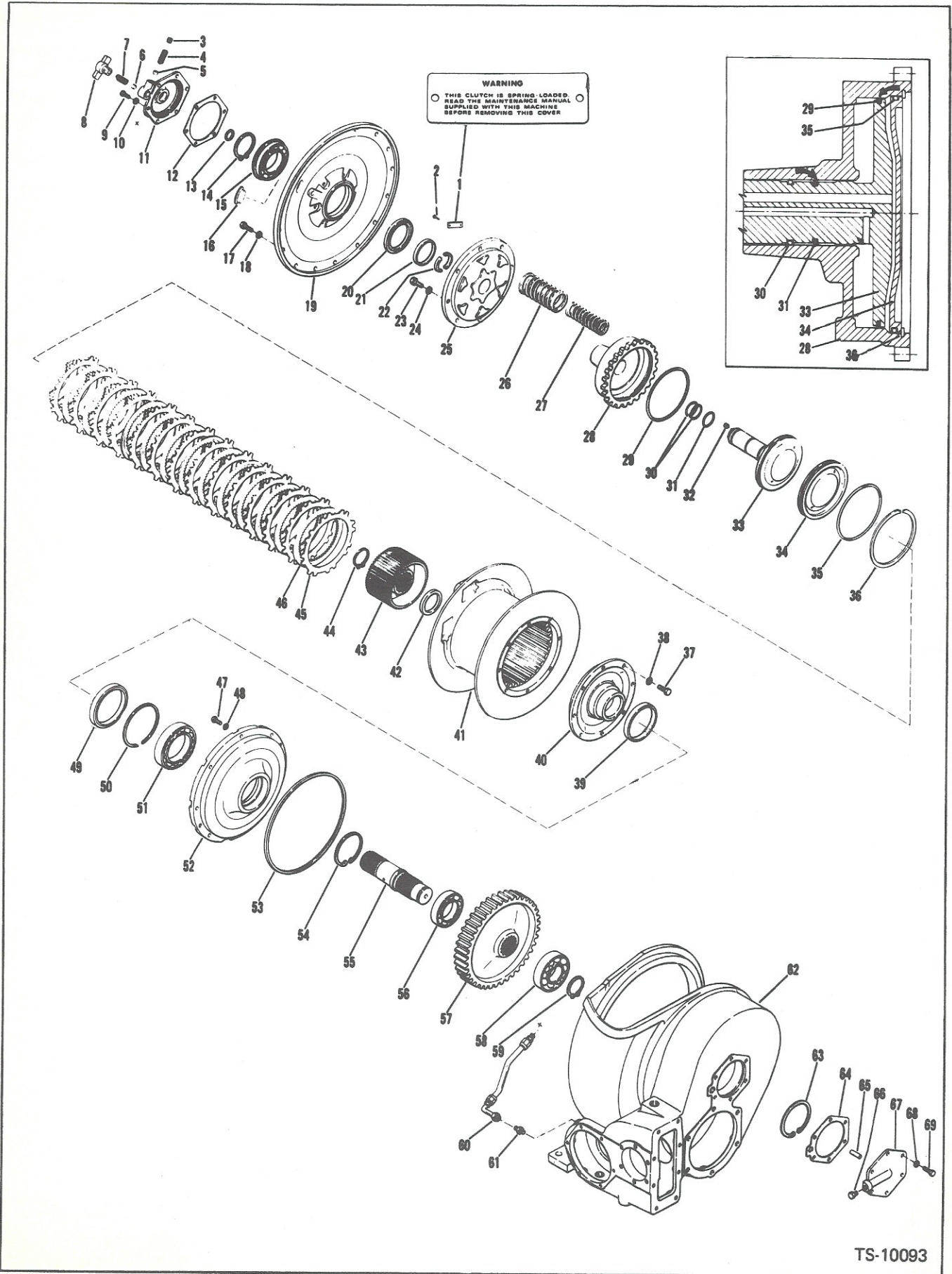


TS-10120

WINCH CABLE DRUM DRIVE SHAFT AND CLUTCH W AND WD 311 AND 400 SERIES WINCHES

Item	Description	Qty.	Item	Description	Qty.
1	Tag, warning	1	38	Lkwshr, mtg., cable drum to hub	8
2	Screw, mounting, tag	2	39	Sleeve, wear, cable drum hub support	1
3	Set Screw	1	40	Support, cable drum hub (Incl.39)	1
4	Spring, lock, adjusting bolt	1	41	Drum, cable	1
5	Lock, bolt, adjusting	1	42	Seal, oil, drum hub bearing retainer	1
6	Wear, button, free spool spring	1	43	Hub & washer assy.	1
7	Spring, adjusting free spool, bolt	1	44	Ring, retaining, clutch hub	1
8	Bolt, adjusting, free spool	1	45	Disc, clutch — outer	18
9	Bolt, mounting, bearing cap	6	45A	Disc, clutch — outer	19
10	Lkwshr., mounting, bearing cap	6	46	Spring, separator, free spool clutch	12
11	Cap, bearing, clutch release support	1	47	Disc, clutch — inner	16
12	Gasket, clutch release support bearing cap	1	47A	Disc, clutch — inner	18
13	Ring, piston drum release support	1	48	Bolt, mtg., cable drum support	8
14	Ring, retaining, bearing	1	49	Lkwshr, mtg., cable drum support	8
15	Bearing, cable drum support	1	50	Seal, oil, drum hub	1
16	Plug, housing	1	51	Ring, snap, bearing	1
17	Bolt, mtg., cable drum cover	10	52	Bearing, hub, cable drum	1
18	Lkwshr., mtg., cable drum cover	10	53	Support, cable drum	1
19	Cover, cable drum	1	54	O-Ring, cable drum	1
20	Seal, oil, cable drum cover	1	55	Ring, snap, cable drum support	1
21	Sleeve, wear (See Item 25)	1	56	Shaft, cable drum support	1
22	Split ring, clutch shaft support	2	57	Bearing, drive shaft front	1
23	Bolt, mtg., cable drum to support	8	58	Gear, cable drum drive	1
24	Lkwshr, mtg., cable drum to support	8	59	Bearing, drive shaft rear	1
25	Support, cable drum (Incl. 21)	1	60	Ring, retaining, front bearing	1
26	Spring, clutch drive — outer	6	61	Drain hose assy.	1
27	Spring, clutch drive — inner	6	62	Adapter, drain hose	1
28	Piston, drum release clutch	1	63	Case, winch	1
29	Seal, clutch shaft & release plate	1	63A	†Nameplate	1
30	O-Ring, piston	2	63B	†Screw, nameplate	2
31	Seal, drum release support	2	64	Ring, locating, rear bearing	1
32	Plug, pipe, clutch shaft	1	65	Gasket, cable drum drive shaft cover	1
33	Clutch shaft & release plate assy (Incl. 32)	1	66	Tube, drive shaft oil	1
34	Plug, piston bore	1	67	Plug, pipe, cable drum drive shaft cover	1
35	O-Ring, piston bore plug	1	68	Cover, cable drum drive shaft	1
36	Ring, retaining, piston bore plug	1	69	Lkwshr, mtg., drive shaft cover	6
37	Bolt, mtg., cable drum to hub	8	70	Bolt, mtg., drive shaft cover	6

†Not Illustrated

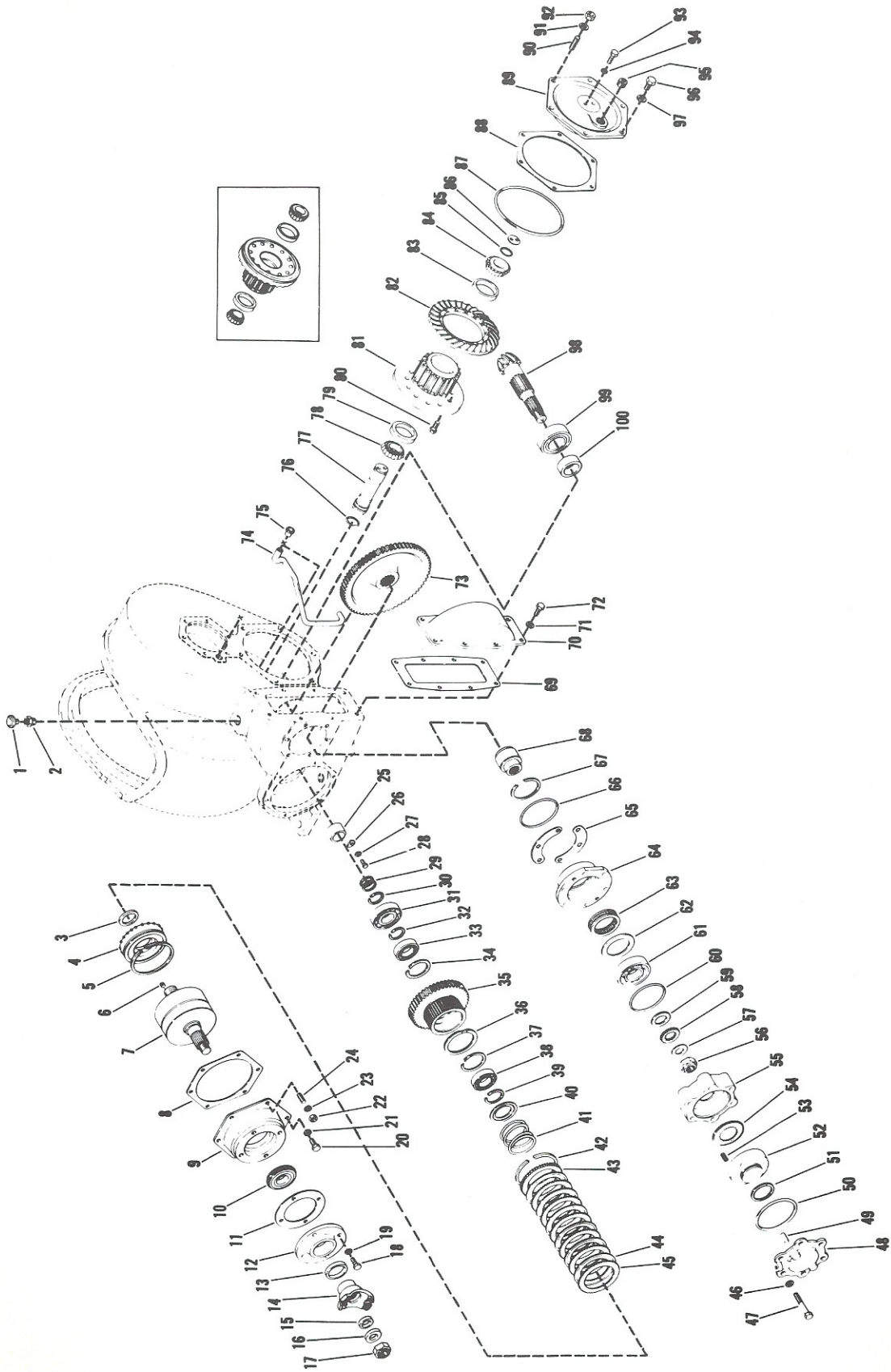


TS-10093

WINCH CABLE DRUM DRIVE SHAFT AND CLUTCH MODEL W AND WD 300 SERIES

Item	Description	Qty.	Item	Description	Qty.
1	Tag, warning	1	36	Ring, retaining, piston bore plug	1
2	Screw, mounting, tag	2	37	Bolt, mtg., cable drum to hub	8
3	Screw, set	1	38	Lkwshr., mtg., cable drum to hub	8
4	Spring, lock, adjusting bolt	1	39	Sleeve, wear, cable drum hub support	1
5	Lock, bolt, adjusting	1	40	Support, cable drum hub (Incl. 36)	1
6	Wear button, free spool spring	1	41	Drum, cable	1
7	Spring, adjusting free spool, bolt	1	42	Seal, oil, drum hub bearing retainer	1
8	Bolt, adjusting, free spool	1	43	Hub & washer assy	1
9	Bolt, mounting, bearing cap	6	44	Ring, retaining, clutch hub	1
10	Lkwshr., mounting, bearing cap	6	45	Disc, clutch – outer	14
11	Cap, bearing, clutch release support	1	46	Disc, clutch – inner	11
12	Gasket, clutch release support bearing cap	1	47	Bolt, mtg., cable drum support	8
13	Ring, piston, drum release support	1	48	Lkwshr., mtg., cable drum support	8
14	Ring, retaining, bearing	1	49	Seal, oil, drum hub	1
15	Bearing, cable drum support	1	50	Ring, snap, bearing	1
16	Plug, cover, cable drum	1	51	Bearing, hub, cable drum	1
17	Bolt, mounting, cable drum cover	15	52	Support, cable drum	1
18	Lkwshr., mtg., cable drum cover	15	53	O-Ring, cable drum support	1
19	Cover, cable drum	1	54	Ring, snap, cable drum support	1
20	Seal, oil, cable drum cover	1	55	Shaft, cable drum support	1
21	Sleeve, wear, cable drum support	1	56	Bearing, drive shaft – front	1
22	Split Ring, clutch shaft support	2	57	Gear, cable drum drive	1
23	Bolt, mtg., cable drum support	8	58	Bearing, drive shaft – rear	1
24	Lkwshr., mtg., cable drum support	8	59	Ring, retaining, front bearing	1
25	Support, cable drum (Incl.21)	1	60	Drain hose assy.	1
26	Spring, clutch drive – outer	6	61	Adapter, drain hose	1
27	Spring, clutch drive – inner	6	62	Case, Winch	1
28	Piston, drum release clutch	1	62A	†Nameplate	1
29	Seal, clutch shaft & release plate	1	62B	†Screw, mounting nameplate	2
30	O-Ring, piston	2	63	Ring, locating, rear bearing	1
31	Seal, drum release support	2	64	Gasket, cable drum drive shaft cover	1
32	Plug, pipe, clutch shaft	1	65	Tube, drive shaft oil	1
33	Clutch shaft & release plate (Incl. 31)	1	66	Plug, pipe, cable drum shaft cover	1
34	Plug, piston bore	1	67	Cover, cable drum drive shaft	1
35	O-Ring, piston bore plug	1	68	Lkwshr., mtg., drive shaft cover	6
			69	Bolt, mtg., drive shaft cover	6

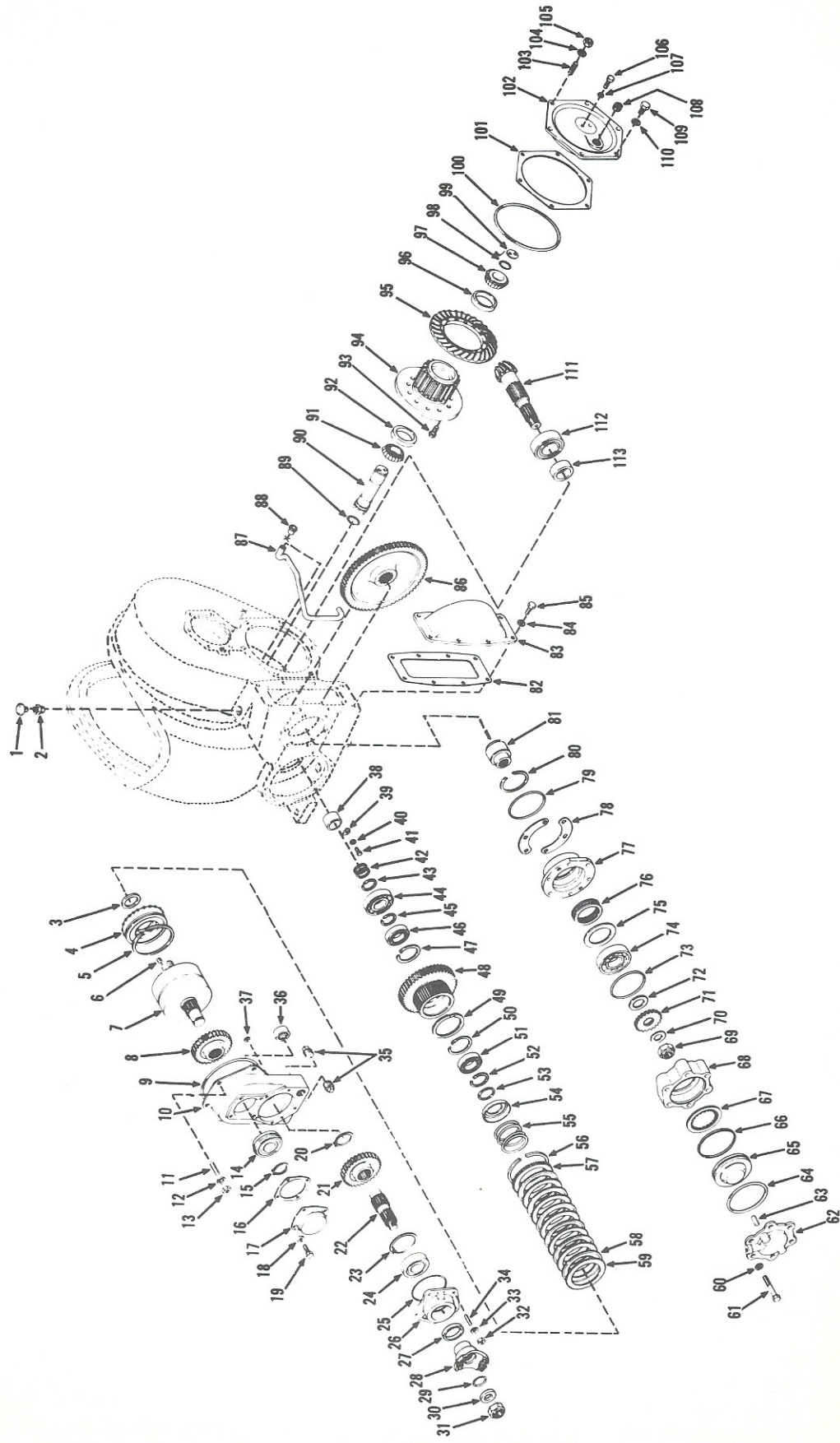
†Not Illustrated



WINCH – INPUT CLUTCH, PINION SHAFT & RING GEAR SHAFT W 300 SERIES WINCH

Item	Description	Qty.	Item	Description	Qty.
1	Air breather, check valve assy. (Incl. 2)	1	54	Disc, pinion shaft brake	1
2	Included in item 1	1	55	Housing, pinion shaft brake	1
3	Seal, clutch piston – inner	1	56	Nut, pinion shaft	1
4	Piston, clutch	1	57	Washer, pinion shaft	1
5	Ring, piston – outer	1	58	Hub, pinion shaft brake disc	1
6	Plug, input shaft	1	59	Washer, pinion shaft brake disc hub	1
7	Input shaft drum & plug assy.	1	60	O-ring, pinion shaft brake housing	1
8	Gasket, input bearing cap	1	61	Bearing, pinion shaft	1
9	Cap, input bearing	1	62	Washer, sprag retaining	1
10	Bearing, input clutch – front	1	63	Sprag assembly	1
11	Gasket, input bearing retainer	1	64	Race, sprag outer	1
12	Input bearing retainer & oil seal assy. (Incl. 13)	1	65	Shim, sprag outer race – .004"	‡
13	Seal, oil	1	65A	Shim, sprag outer race – .007"	‡
14	Flange, input	1	65B	Shim, sprag outer race – .010"	‡
15	O-ring, input flange	1	65C	Shim, sprag outer race – .020"	‡
16	Washer, input flange	1	66	O-ring, sprag outer race	1
17	Nut, input shaft	1	67	Ring, sprag retaining	1
18	Bolt, mounting, bearing retainer	4	68	Race, sprag inner	1
19	Lkwshr, mounting, bearing retainer	4	69	Gasket, pinion drive gear cover	1
20	Bolt, mounting, bearing cap	5	70	Cover, pinion drive gear	1
21	Lkwshr, mounting, bearing cap	5	71	Lkwshr, mounting, pinion drive gear cover	8
22	Nut, bearing cap stud	5	72	Bolt, mounting, pinion drive gear cover	8
23	Lkwshr, bearing cap stud	1	73	Gear, pinion shaft drive	1
24	Stud, bearing cap	1	74	Tube, lubrication	1
25	Race, input shaft piston ring	1	75	Sleeve, lubrication tube	1
26	Lock, race	1	76	O-ring, ring gear shaft	1
27	Lkwshr, race lock	1	77	Shaft, ring gear	1
28	Bolt, race lock	1	78	Cone, bearing, ring gear shaft front	1
29	Ring, piston, input clutch	2	79	Cup, bearing, ring gear shaft front	1
30	Ring, snap, clutch rear bearing rtg.	1	80	Ring gear hub & seal	1
31	Bearing, rear, input clutch	1	81	Screw, mounting, ring gear	12
32	Ring, snap, clutch rear bearing rtg.	1	82	Gear, ring	1
33	Bearing, clutch driven gear	1	83	Cup, bearing, ring gear shaft rear	1
34	Ring, snap, bearing, clutch driven gear	1	84	Cover, bearing, ring gear shaft rear	1
35	Gear, clutch hub	1	85	O-ring, ring gear shaft	1
36	Ring, clutch hub oil baffle	1	86	Shim, ring gear shaft – .004"	‡
37	Ring, snap, bearing, clutch driven gear	1	86A	Shim, ring gear shaft – .007"	‡
38	Bearing, clutch driven gear	1	86B	Shim, ring gear shaft – .010"	‡
39	Ring, snap, spring retainer	1	87	O-ring, ring gear cover	‡
40	Retainer, spring	1	88	Shim, ring gear cover – .004"	‡
40A	Spacer, spring retainer	1	88A	Shim, ring gear shaft – .007"	‡
41	Spring, piston return	1	88B	Shim, ring gear cover – .010"	‡
42	Ring, snap, backing plate	1	89	Cover, ring gear	1
43	Plate, clutch disc backing	1	90	Stud, ring gear cover	2
44	Disc, clutch – inner	6	91	Lkwshr, ring gear cover stud	3
45	Disc, clutch – outer	6	92	Nut, ring gear cover stud	2
46	Lkwshr, mounting, pinion shaft brake cover	6	93	Bolt, mounting, ring gear shaft	2
47	Bolt, mounting, pinion shaft brake cover	6	94	Lkwshr, mounting, ring gear shaft	2
48	Cover, pinion shaft brake (Incl. 49)	1	95	Plug, pipe	1
49	Pin, dowel	2	96	Bolt, mounting, ring gear cover	4
50	O-ring, pinion shaft brake cover	1	97	Lkwshr, ring gear cover stud	3
51	Ring, piston, pinion shaft brake	1	98	Gear, pinion	1
52	Piston, brake, pinion shaft	1	99	Bearing, pinion shaft	1
53	Not used on this assembly	6	100	Spacer, pinion shaft bearing	1

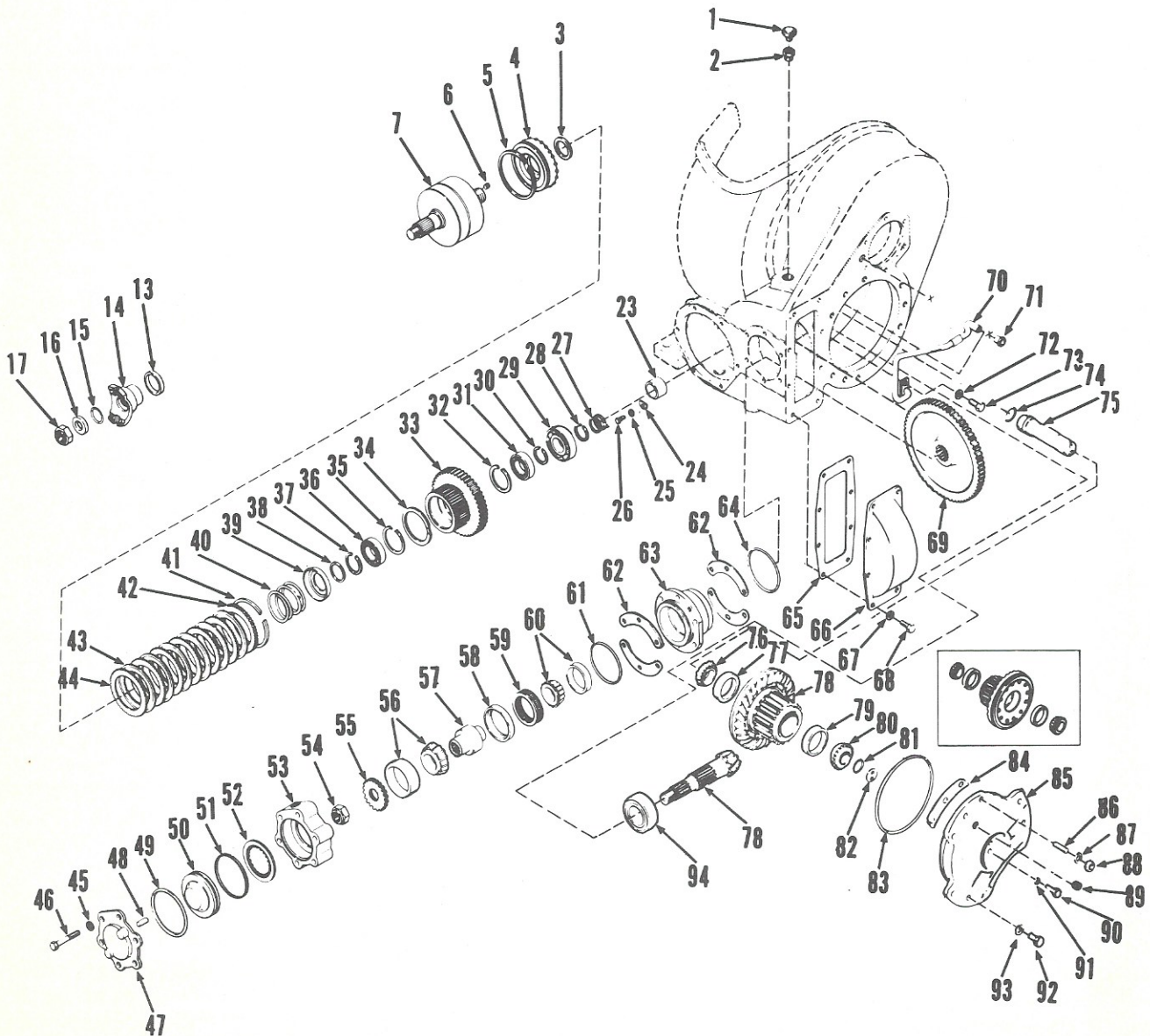
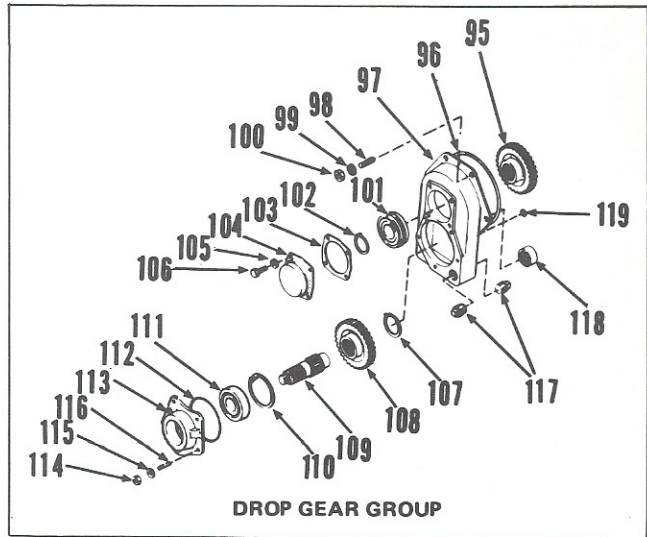
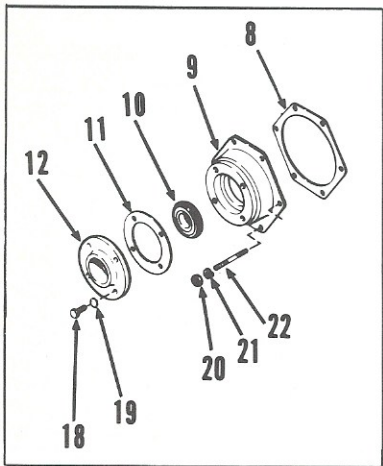
‡ As Required



TS-7479

WINCH – INPUT CLUTCH, PINION SHAFT, RING GEAR SHAFT AND DROP GEAR ASSEMBLY – WD 300 SERIES WINCH

Item	Description	Qty.	Item	Description	Qty.
1	Air breather, check valve assy. (Incl. 2)	1	61	Bolt, mtg., pinion shaft brake cover	6
2	Included in item 1	1	62	Cover, pinion shaft brake	1
3	Seal, clutch piston – inner	1	63	Pin, dowel	2
4	Piston, clutch	1	64	O-ring, pinion shaft brake cover	1
5	Ring, piston – outer	1	65	Piston, brake, pinion shaft	1
6	Plug, input shaft	1	66	Ring, piston, pinion shaft brake	1
7	Input shaft & drum assy.	1	67	Disc, pinion shaft brake	1
8	Gear, drop	1	68	Housing, pinion shaft brake	1
9	O-ring, drop gear housing	1	69	Nut, pinion shaft	1
10	Housing, drop gear	1	70	Washer, pinion shaft	1
11	Stud, drop gear housing	6	71	Hub, pinion shaft brake disc	1
12	Lkwshr, drop gear housing stud	6	72	Washer, pinion shaft brake disc hub	1
13	Nut, drop gear housing stud	6	73	O-ring, pinion shaft brake housing	1
14	Bearing, front, clutch shaft	1	74	Bearing, pinion shaft	1
15	Ring, retaining front bearing	1	75	Washer, sprag retaining	1
16	Gasket, bearing cap	1	76	Sprag assy.	1
17	Cap, clutch, shaft front bearing	1	77	Race, sprag – outer	1
18	Lkwshr, mounting, bearing cap	4	78	Shim, sprag outer race – .004"	‡
19	Bolt, mounting, bearing cap	4	78A	Shim, sprag outer race – .007"	‡
20	Ring, gear retaining	1	78B	Shim, sprag outer race – .010"	‡
21	Gear, input shaft	1	78C	Shim, sprag outer race – .020"	‡
22	Shaft, input	1	79	O-ring, sprag outer race	1
23	Ring, bearing retaining	1	80	Ring, sprag retaining	1
24	Bearing, input shaft – front	1	81	Race, sprag – inner	1
25	O-ring, input shaft bearing cap	1	82	Gasket, pinion drive gear cover	1
26	Cap, input shaft bearing	1	83	Cover, pinion drive gear	1
27	Seal, oil	1	84	Lkwshr, mounting, pinion drive gear cover	8
28	Flange, input	1	85	Bolt, mounting, pinion drive gear cover	8
29	O-ring, input flange	1	86	Gear, pinion shaft drive	1
30	Washer, input flange	1	87	Tube, lubrication	1
31	Nut, input shaft	1	88	Sleeve, lubrication tube	1
32	Nut, bearing cap stud	5	89	O-ring, ring gear shaft	1
33	Lkwshr, bearing cap stud	5	90	Shaft, ring gear	1
34	Stud, bearing cap	5	91	Cone, bearing, ring gear shaft – front	1
35	Plug, pipe	2	92	Cup, bearing, ring gear shaft – front	1
36	Bearing, input shaft – rear	1	93	Screw, mounting, ring gear	12
37	O-ring, housing stud	2	94	Ring gear hub & seal	1
38	Race, input shaft piston ring	1	95	Gear, ring	1
39	Lock, race	1	96	Cup, bearing, ring gear shaft – rear	1
40	Lkwshr, race lock	1	97	Cone, bearing, ring gear shaft – rear	1
41	Bolt, race lock	1	98	O-ring, ring gear shaft	1
42	Ring, piston, input clutch	2	99	Shim, ring gear shaft – .004"	‡
43	Ring, snap, clutch rear bearing retaining	1	99A	Shim, ring gear shaft – .007"	‡
44	Bearing, rear, input clutch	1	99B	Shim, ring gear shaft – .010"	‡
45	Ring, snap, clutch rear bearing retaining	1	100	O-ring, ring gear cover	1
46	Bearing, clutch driven gear	1	101	Shim, ring gear cover – .004"	‡
47	Ring, snap, bearing, clutch driven gear	1	101A	Shim, ring gear cover – .007"	‡
48	Gear, clutch hub	1	101B	Shim, ring gear cover – .010"	‡
49	Ring, clutch hub oil baffle	1	102	Cover, ring gear	1
50	Ring, snap, bearing, clutch driven gear	1	103	Stud, ring gear cover	2
51	Bearing, clutch driven gear	1	104	Lkwshr, ring gear cover stud	3
52	Ring, snap, spring retainer	1	105	Nut, ring gear cover stud	2
53	Spacer, spring retainer	1	106	Bolt, mounting, ring gear shaft	2
54	Retainer, spring	1	107	Lkwshr, mounting, ring gear shaft	2
55	Spring, piston return	1	108	Plug, pipe	1
56	Ring, snap, backing plate	1	109	Bolt, mounting, ring gear cover	4
57	Plate, clutch disc backing	1	110	Lkwshr, ring gear cover stud	3
58	Disc, clutch inner	6	111	Gear, pinion	1
59	Disc, clutch outer	6	112	Bearing, pinion shaft	1
60	Lkwshr, mtg, pinion shaft brake cover	6	113	Spacer, pinion shaft bearing	1



TS-12285

WINCH — INPUT CLUTCH, PINION SHAFT RING GEAR AND DROP GEAR ASSEMBLY W AND WD 311 AND 400 SERIES WINCH

Item	Description	Qty.	Item	Description	Qty.
1	Air breather check valve assy. (Incl. 2)	1	51	Ring, piston	1
2	Included in item 1	—	52	Disc, brake	1
3	Seal, piston — inner	1	53	Housing, brake	1
4	Piston, clutch	1	54	Nut, pinion shaft	1
5	Ring, piston — outer	1	55	Hub, pinion shaft	1
6	Plug, input shaft	1	56	Bearing, assy. — cup	1
7	Input shaft and drum assy. (Incl. 6)	1	56A	Bearing, race — cone	1
8	Gasket, input bearing	1	57	Race, sprag — inner	1
9	Cap, input bearing	1	58	Retainer, sprag	1
10	Bearing, input	1	59	Sprag assy.	1
11	Gasket, input	1	60	Bearing assy.	1
12	Retainer and oil seal (Incl. 13)	1	61	O-ring — front	1
13	Seal, oil	1	62	Shim, outer — .004	‡
14	Flange, input	1	62A	Shim, outer — .007	‡
15	O-ring, flange	1	62B	Shim, outer — .010	‡
16	Washer, flange	1	62C	Shim, outer — .020	‡
17	Nut, flange	1	63	Sprag, outer race	1
18	Bolt, mtg, retainer	4	64	O-ring, outer	1
19	Lkwshr, mtg.	4	65	Gasket, cover	1
20	Nut.	6	66	Cover, pinion shaft	1
21	Lkwshr, mtg.	6	67	Lkwshr, mtg	8
22	Cap stud	6	68	Bolt, mtg, cover	8
23	Race, shaft, ring	1	69	Gear, pinion drive (67T)	1
24	Lock, race	1	70	Tube, lubrication	1
25	Lkwshr, mtg.	1	71	Sleeve, tube	1
26	Bolt, mtg, lock	1	72	Lockwasher	1
27	Ring, piston	2	73	Bolt	1
28	Ring, snap	1	74	O-ring, shaft	1
29	Bearing, input — rear	1	75	Shaft, ring gear	1
30	Ring, snap	1	76	Cone, ring gear — inner	1
31	Bearing, clutch, driven	1	77	Cup, ring gear — inner	1
32	Ring, snap	1	78	Ring gear and pinion set	1
33	Gear, hub (41T)	1	78A	Hub, ring gear (19T)	1
34	Ring, clutch, bearing	1	78B	Bolt, mtg, ring gear	12
35	Ring, snap, bearing	1	79	Cup, ring gear — outer	1
36	Bearing, clutch — rear	1	80	Cone, ring gear — outer	1
37	Ring, snap	1	81	O-ring, shaft	1
38	Spacer, spring	1	82	Shim, shaft — .004	‡
39	Retainer, bearing	1	82A	Shim, shaft — .007	‡
40	Spring, piston, bearing	1	82B	Shim, shaft — .010	‡
41	Ring, snap, plate	1	83	O-ring, cover	1
42	Plate, disc, bearing	1	84	Shim, cover — .004	‡
43	Disc, clutch — inner	6	84A	Shim, cover — .007	‡
44	Disc, clutch — outer	6	84B	Shim, cover — .010	‡
45	Lkwshr, mtg	6	85	Cover, ring gear	1
46	Bolt, mtg, cover	6	86	Stud, mtg, cover	1
47	Cover, pinion brake (Incl. 47)	1	87	Lkwshr, mtg, cover	5
48	Pin, dowel	1	88	Nut, mtg, cover	5
49	O-ring, cover	2	89	Plug, cover	1
50	Piston, brake	1	90	Bolt, mtg, shaft	2

‡ As Required

WINCH – INPUT CLUTCH, PINION SHAFT RING GEAR AND DROP GEAR ASSEMBLY W AND WD 311 SERIES WINCH (Cont'd.)

Item	Description	Qty.	Item	Description	Qty.
91	Lkwshr, mtg	2	106	Bolt, mtg, cap (Incl. 104)	4
92	Bolt, mtg, cover	4	107	Ring, retaining	1
93	Lkwshr, mtg	4	108	Gear, input (31T)	1
94	Bearing, pinion	1	108A	Gear, input (29T)	1
95	Gear, drop (31T)	1	109	Shaft, input	1
95A	Gear, drop (32T)	1	110	Ring, retaining	1
96	O-ring, housing	1	111	Bearing – front	1
97	Housing, drop gear	1	112	O-ring, shaft	1
98	Stud, mtg, cover	6	113	Cap, input	1
99	Lkwshr, mtg	6	114	Nut, cap	5
100	Nut, mtg, housing	6	115	Lkwshr, mtg	5
101	Bearing, front	1	116	Stud, cap	5
102	Ring, retaining	1	117	Plug, pipe	2
103	Gasket, cap	1	118	Bearing – rear	1
104	Cap, clutch shaft	1	119	O-ring, housing	2
105	Lkwshr, mtg, cap (see 105)	4			

OPERATION OF THE WINCH

The Clark winch is mechanically driven. Several hydraulic and mechanical components control the operation of the winch.

The 'Input Clutch' delivers engine power to the cable drum through all other winch drive components.

The 'Pinion Brake' stops the drum from rotating after you wind in the cable without a load. This feature allows better drum control.

The 'Pinion Sprag' holds the load. It prevents reverse rotation of the drum.

The 'Free Spool Clutch' separates the drum from all other drive components. This permits the cable to unwind freely.

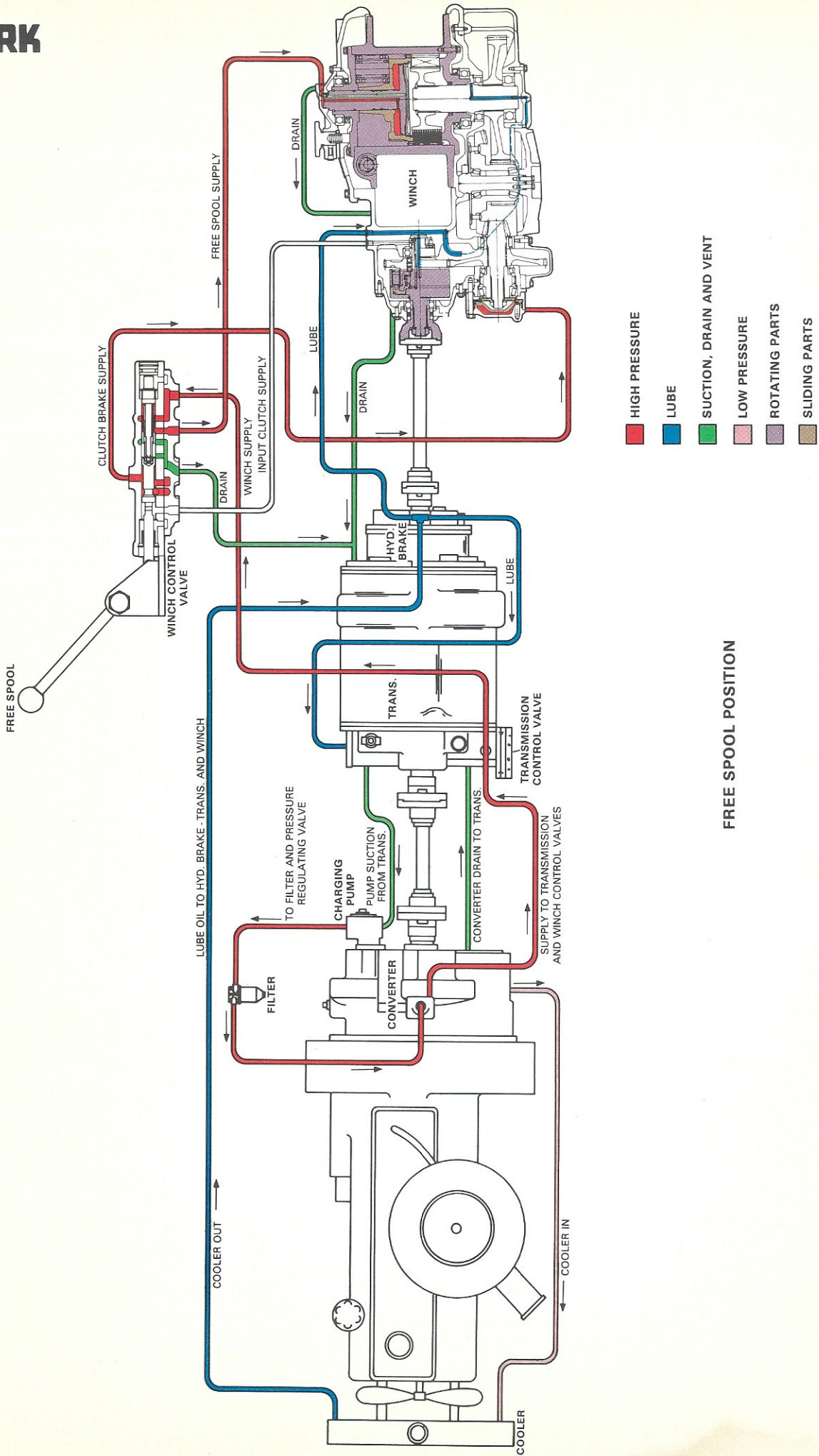
The operator controls the winch through a single lever and control valve with three positions.

The 'winch in' position permits the valve to actuate the 'input clutch'. For the purpose of safety, the lever will not remain in the 'winch in' position when released by the operator.

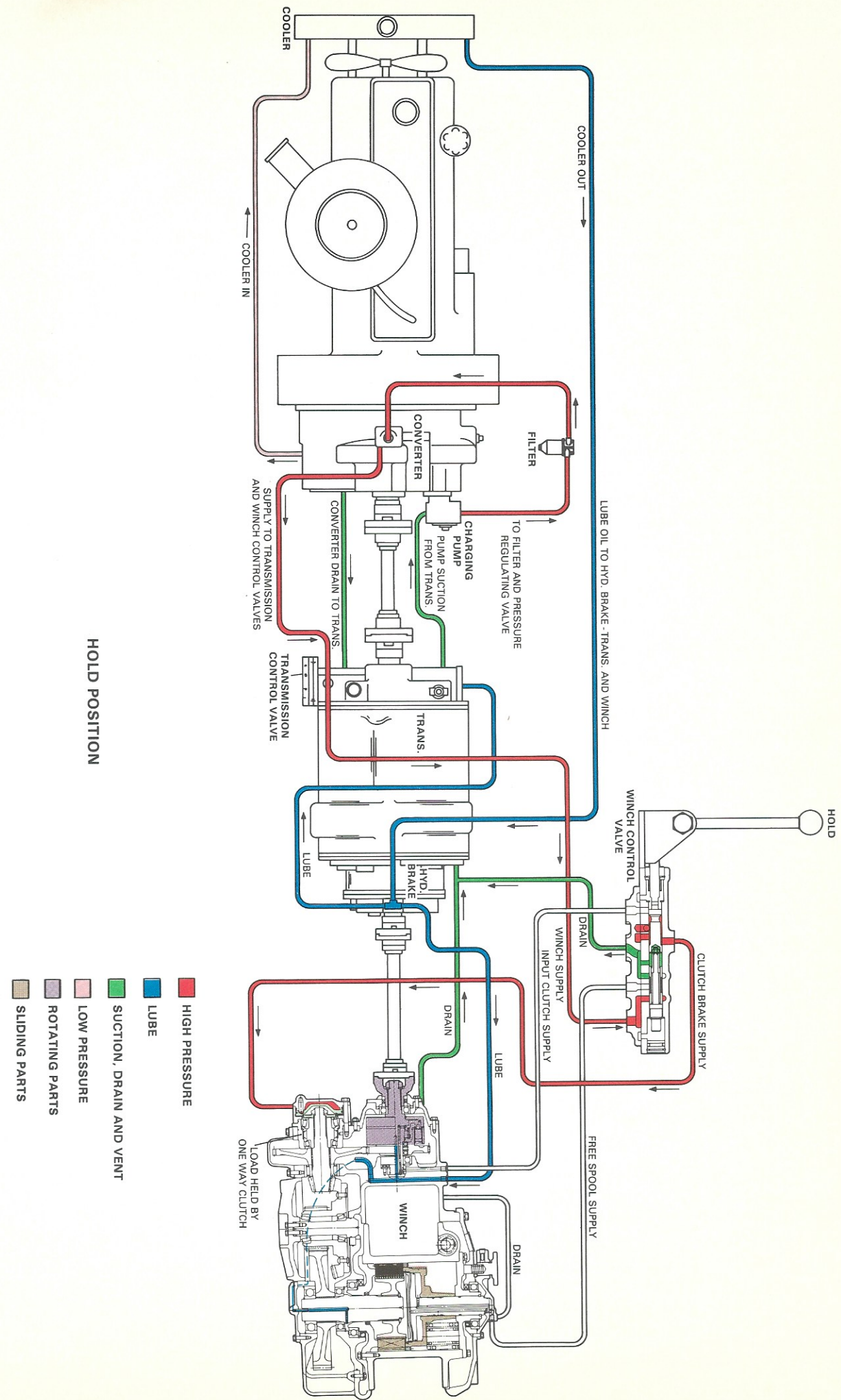
The 'normal' or center position actuates the pinion brake.

The 'free spool' position permits the valve to actuate the free spool clutch and release the drum to rotate freely. This position includes a detent which holds the lever in the free spool position when released by the operator. This feature permits the operator to get off the machine and pull the cable off the drum. In this way only one man is needed for a long skidding operation.

FLOW DIAGRAM

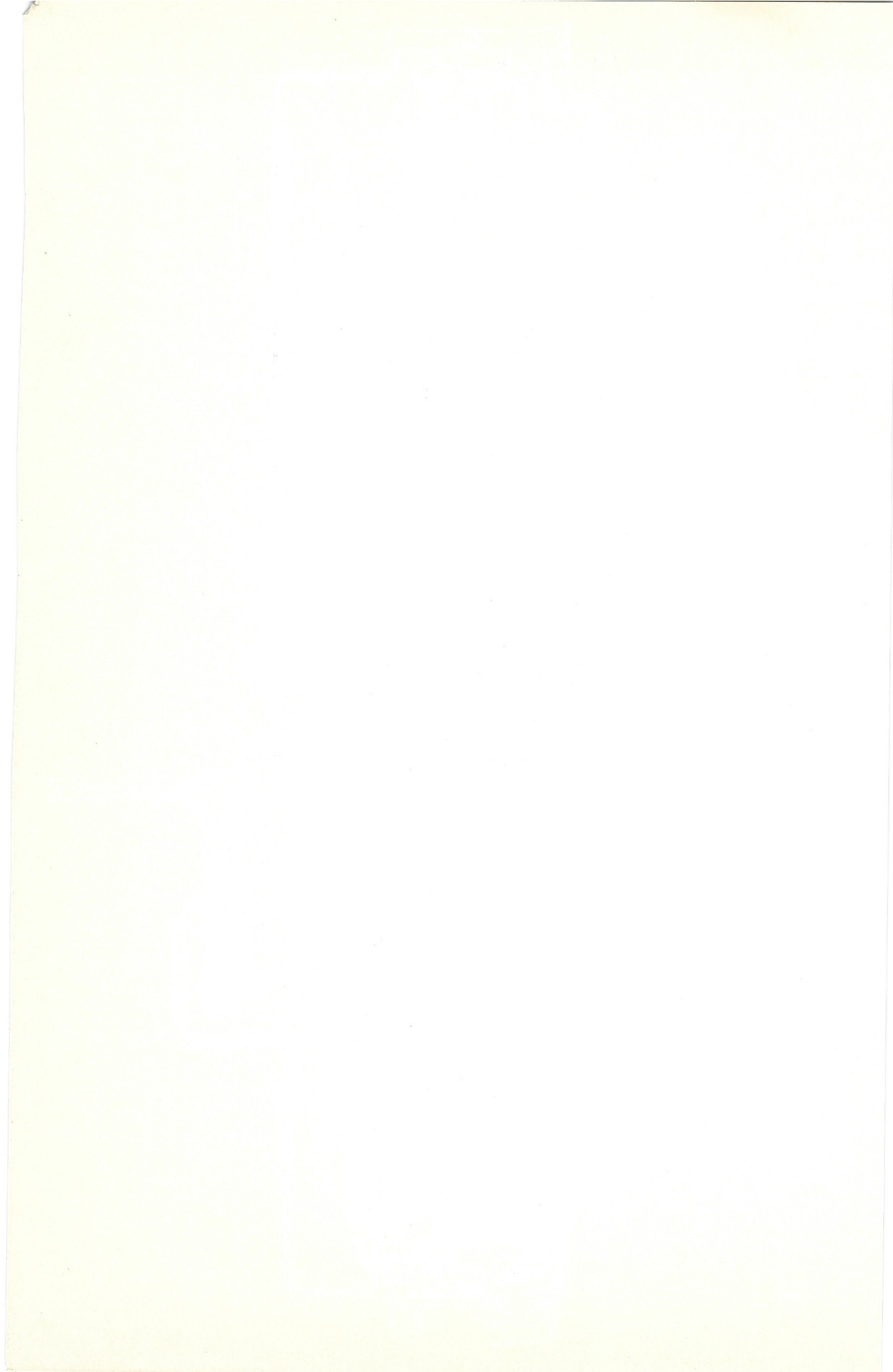


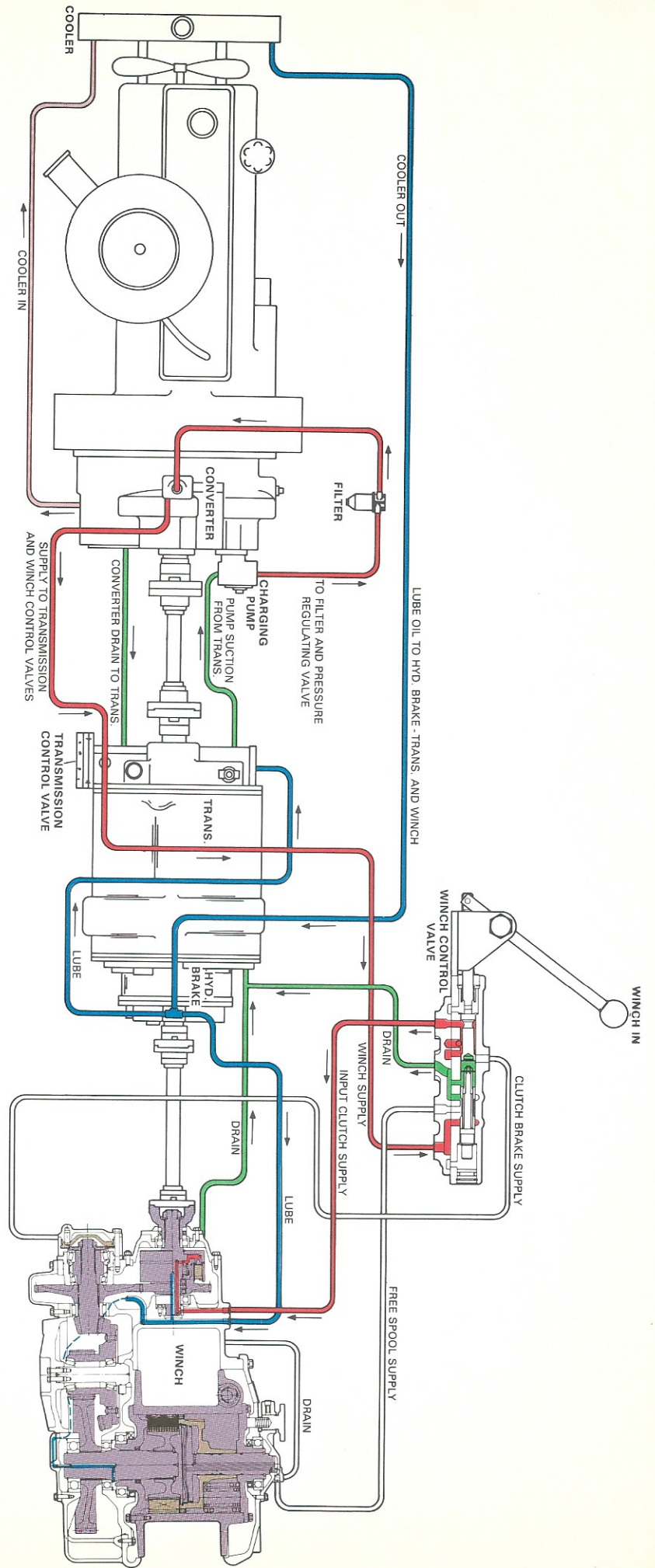
FREE SPOOL POSITION



HOLD POSITION

- █ HIGH PRESSURE
- █ LUBE
- █ SUCTION, DRAIN AND VENT
- █ LOW PRESSURE
- █ ROTATING PARTS
- █ SLIDING PARTS





WINCH IN POSITION

- HIGH PRESSURE
- LUBE
- SUCTION, DRAIN AND VENT
- LOW PRESSURE
- ROTATING PARTS
- SLIDING PARTS

