

**TECHNICAL MANUAL**  
**UNIT, INTERMEDIATE DIRECT**  
**SUPPORT**  
**AND INTERMEDIATE GENERAL**  
**SUPPORT**  
**MAINTENANCE INSTRUCTIONS**  
**STERN ANCHOR WINCH**  
**FOR**  
**LANDING CRAFT UTILITY (LCU)**  
**NSN 1905-01-154-1191**

**INTRODUCTION 1-1**

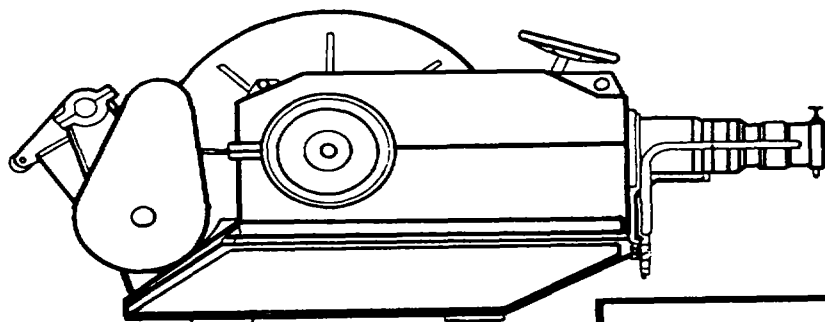
**UNIT MAINTENANCE INSTRUCTIONS 2-1**

**INTERMEDIATE DIRECT SUPPORT MAINTENANCE INSTRUCTIONS 3-1**

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**ALPHABETICAL INDEX INDEX-1**



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17 JANUARY 1989

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NO. 3

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WASHINGTON, D.C., 30 JUNE 1994

Unit, Intermediate Direct Support and Intermediate General Support  
Maintenance Instructions

STERN ANCHOR WINCH  
FOR  
LANDING CRAFT UTILITY (LCU)  
NSN 1905-01-154-1191

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FOR  
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Maintenance Instructions

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FOR  
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**WARNING**

**MODIFICATION HAZARD**

Unauthorized modifications, alterations or installations of or to this equipment are prohibited and are in violation of AR 750-10. Any such unauthorized modifications, alterations or installations could result in death, injury or damage to the equipment.

**HIGH PRESSURE  
HYDRAULIC SYSTEM HAZARDS**

**Hydraulic systems can cause serious injuries if high pressure lines or equipment fail.**

Never work on hydraulic systems or equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment, and who can give first aid. A second person should stand by controls to turn off hydraulic pumps in an emergency. When the technicians are aided by the operators, the operators must be warned about dangerous areas.

**MOVING MACHINERY HAZARDS**

**Be very careful when operating or working near moving machinery.**

Running engines, rotating shafts, and other moving machinery parts could cause personal injury or death.

**ELECTRICAL HAZARDS**

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Do not be misled by the term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions.

Be careful not to contact 115-Vac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through the body.

**For Artificial Respiration, refer to FM 21-11.**

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UNIT, INTERMEDIATE DIRECT SUPPORT  
AND INTERMEDIATE GENERAL SUPPORT  
MAINTENANCE INSTRUCTIONS

STERN ANCHOR WINCH  
FOR  
LANDING CRAFT UTILITY (LCU)  
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**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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**INTRODUCTION**

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**SECTION I. GENERAL INFORMATION**

1-1. **Scope.** The scope of this manual is as follows:

a. Type of Manual. Unit, intermediate direct support, and intermediate general support maintenance manual.

b. Model Number and Equipment Name. Stern Anchor Winch, Model 540 HAW-15/7.5, installed aboard the LCU 2000 Class Watercraft.

c. Purpose of Equipment. To provide payout and haulback of the stern anchor. Also, to provide haulback power for mooring and warping.

1-2. **Maintenance Forms, Records, and Reports.** Department of the Army forms and procedures used for equipment maintenance are those prescribed by DA Pam 738-750, the Army Maintenance Management System.

1-3. **Destruction of Army Materiel.** Refer to TM 750-244-3 for instructions covering the destruction of Army materiel to prevent enemy use.

1-4. **Reporting Equipment Improvement Recommendations (EIR).** If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to: Commander, U.S. Army Troop Support Command; ATTN: AMSTR-QX; 4300 Goodfellow Blvd.; St. Louis, Missouri 63120-1798. We'll send you a reply.

1-5. **Preparation for Storage or Shipment.** Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the Preventive Maintenance Checks and Services (PMCS) charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to assure operational readiness. Repacking of equipment for shipment or short term storage is covered in paragraph 2-19.



## SECTION II. EQUIPMENT DESCRIPTION AND DATA

**1-6. General.** The McElroy model 540 HAW-15/7.5 stern anchor winch is a hydraulic driven anchor winch designed for use with 1-1/4 inch nominal diameter wire rope. The spool stores 1200 feet of wire rope. The winch is rated for 50,000 pound line pull applied to the first layer of cable. The brake is rated at 60,000 pounds, and the dog is rated at 119,000 pounds at the first layer of cable.

**1-7. Characteristics, Capabilities, and Features.** A very broad view of the stern anchor winch is as follows:

a. Characteristics.

- (1) Electrically driven, hydraulically operated, with a triple reduction gearbox.
- (2) Manually operated clutch and brake.
- (3) Automatic failsafe brake.

b. Capabilities and Features.

- (1) Raises and lowers the anchor.
- (2) Winds and stores 1200 feet of wire rope.
- (3) Usable for other kinds of hauling besides anchor handling.
- (4) Handles 35 ft/minute first wrap.

**1-8. Location and Description of Major Components.** The stern anchor winch is made up of the winch and hydraulic power pack assemblies. These major components are illustrated in FIGURES 1-1 and 1-2, and described below.

a. Winch Assembly.

- (1) Spool and levelwind. Winds up and stores the anchor wire rope.
- (2) Brake handwheel. Manually operated brake handwheel for braking during spool operation.
- (3) Failsafe brake.

(a) Automatically brakes the hydraulic motor assembly when winch is at neutral position or during loss of hydraulic pressure.

(b) Automatically brakes the hydraulic motor assembly when there is a loss of or too little pilot pressure from hydraulic valve assembly.

- (4) Flow (speed control) valve. When activated, controls the output rate of speed to the triple reduction gearbox.
- (5) Hydraulic motor assembly. Provides the drive torque to the triple reduction gearbox.

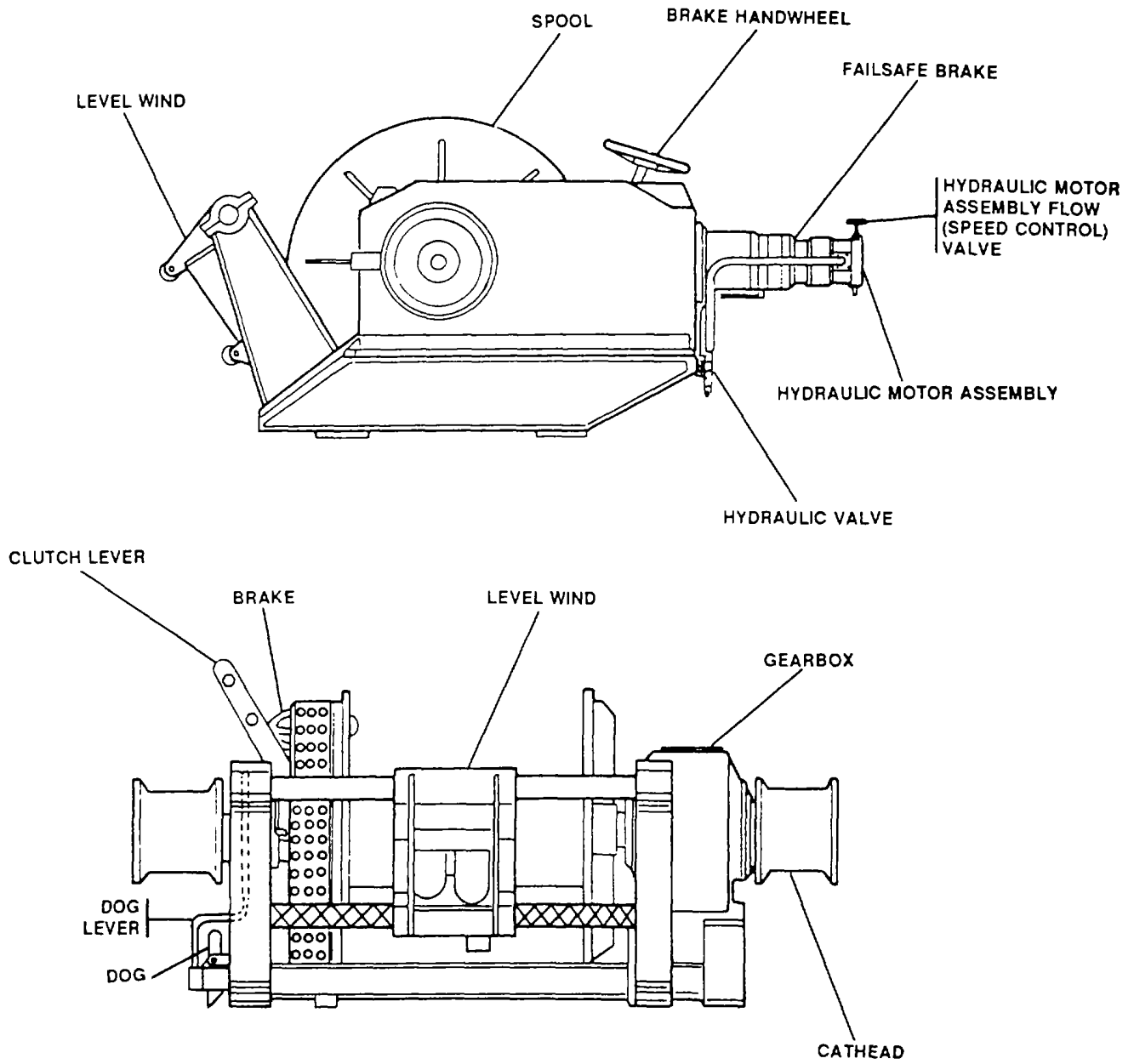


FIGURE 1-1. Stern Anchor Winch Assembly Component Location.

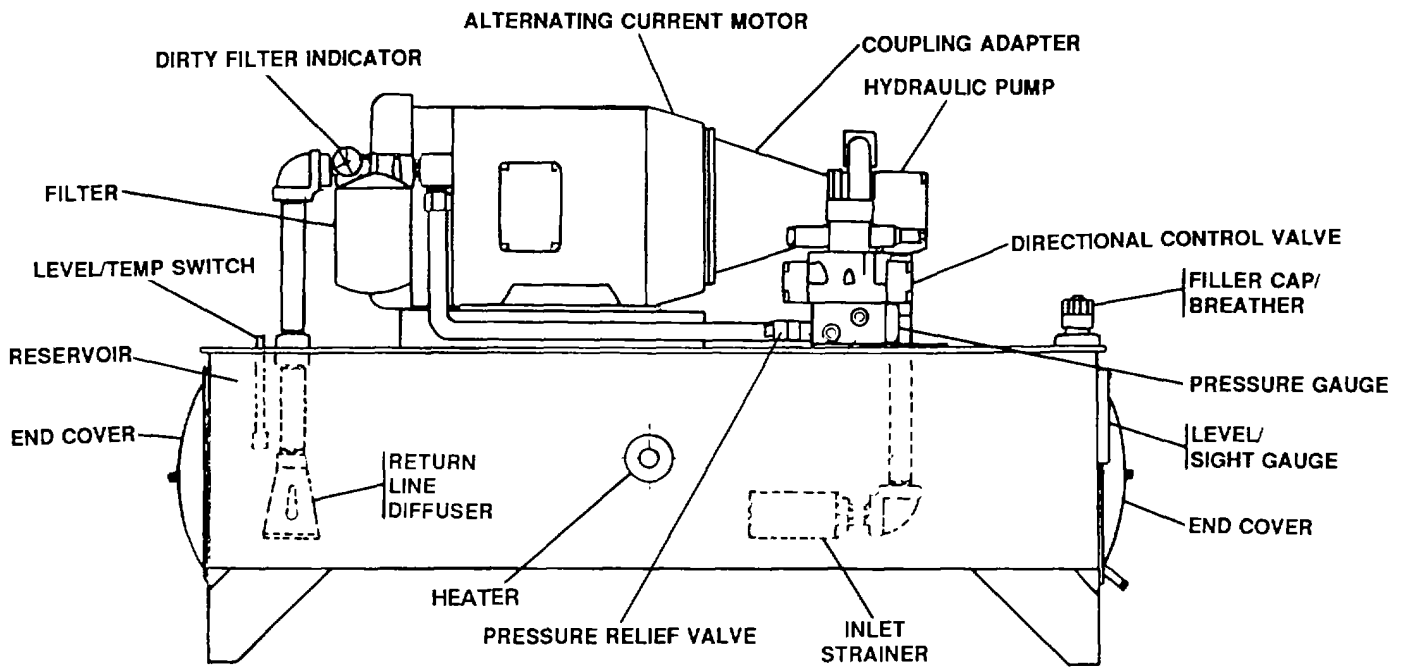


FIGURE 1-2. Hydraulic Power Pack Assembly Component Location.

(6) Hydraulic valve assembly.

(a) This valve functions as a deceleration control and serves as a safety device. It locks the load in case of hydraulic line breakage, or in the event of (accidental or unauthorized) operation of winch controls when hydraulic power pack assembly is shut down.

(b) Pilot pressure setting of the valve makes sure that enough pilot pressure is available to keep the automatic failsafe brake released during winch operation.

(7) Clutch. Manually operated lever that engages the spool for payout or haulback operation.

(8) Brake. Used to brake the spool during operation. Manually operated.

(9) Hydraulic Motor Assembly. Provides the gear reduction between the spool and the hydraulic motor assembly.

(10) Cathead. Used for hauling, independent of the anchor operation.

(11) Dog and dog lever. Lever-operated dog manually activates the locking device for the spool.

b. Hydraulic Power Pack Assembly.

(1) Alternating current motor. This constant-speed, alternating current motor drives the vane-type hydraulic pump through a coupling adapter.

(2) Coupling-adapter. Couples alternating current motor mechanical output to vane-type hydraulic pump.

(3) Hydraulic pump. During operation, the pump supplies fluid under high pressure to the directional control valve.

(4) Directional control valve.

(a) Output ports A and B connect to the hydraulic motor assembly/failsafe brake.

(b) Provides payout, haulback and neutral operation of winch. Under no-load conditions, fluid is circulated through the reservoir.

(5) Filler cap/breather. Provides access to fill reservoir with hydraulic fluid and also acts as a breather for the reservoir.

(6) Pressure gauge. Indicates operating hydraulic pressure within the system.

(7) Level sight gauge. Indicates level of fluid within the reservoir.

(8) End covers. Provide for access inside the reservoir.

(9) Inlet strainer. Traps impurities inside reservoir before hydraulic fluid reaches directional control valve.

- (10) Pressure relief valve. Controls hydraulic pressure (2900 to 3000 psi) within the system.
- (11) Heater. Maintains the proper operating temperature of fluid within the system.
- (12) Return line diffuser. Permits the system hydraulic fluid to freely return to the reservoir.
- (13) Reservoir. Stores hydraulic fluid for use as required by the system.
- (14) Level/temp switch. Transmits low level and hot oil conditions to the winch control box.
- (15) Filter. Cleans the hydraulic fluid from the reservoir before entering the system.
- (16) Dirty filter indicator. Indicates the condition of the filter.

1-9. **Equipment Data.** Table 1-1 lists the characteristics and reference data of the stern anchor winch. Also, see the equipment data given in the operator's manual, TM 55-1905-223-10.

1-10. **Safety, Care, and Handling.** Safety precautions must be observed at all times while performing maintenance. General WARNINGS and first-aid data appear in the front of this manual. Review all safety information before starting any task. Carefully read through an entire maintenance procedure before performing any maintenance function. Make sure the task can be done safely. All WARNINGS, CAUTIONS, and NOTES are of great importance to your safety and the safety of the equipment.

Table 1-1. Equipment Data

Characteristics	Reference Data
Weight	3950 lb
Spool Capacity	1200 feet of 1-1/4 inch diameter rope.
Levelwind Type Drive	Diamond screw Chain driven from spool; staggered vertical rollers
Dog	Rated at 119,000 lb when applied to first layer of cable.
Cathead Dimensions	Manually activated 12 in diameter; fixed to shaft
Clutch Type	Manually operated, four jaw locking mechanism
Brake Type	External contracting band, hand wheel operated. Rated at 60,000 lb on first layer of cable.
Hydraulic Power Pack Assembly Type Hydraulic Pressure Performance	Electric motor driven Remotely mounted 3000 psi maximum 13,500 lb pull at 35 ft/min first layer (high speed) 40,000 lb pull at 7 ft/min second layer (low speed)
Hydraulic Fluid Reservoir	75 gallon capacity

**SECTION III. PRINCIPLES OF OPEELATION**

Overview. This write up on principles of operation should give you an expanded view of the way the subassembly works.

1-11. **General.** The stern anchor winch is hydraulically driven and electrically operated.

a. Spool and Gearbox. The spool, with a capacity of 1200 feet of wire rope, is mounted directly on the shaft of the triple reduction gearbox. The spool is free to rotate on the shaft, and drive is applied by means of a manually operated, four jaw, sliding clutch. The clutch lever is used to lock the clutch in either the engaged or disengaged position. Mechanical braking of the spool is provided by means of a split contracting band. The brake is manually operated by a handwheel. The top band of the brake is spring mounted to prevent dragging when not applied. Adjusting screws are provided for drag adjustment. A lever operated dog, which engages the spool flange, mechanically locks the winch when not in operation.

b. Levelwind. The levelwind provides smooth laying of the wire rope on the spool. A levelwind carriage, consisting of vertical and horizontal rollers through which the wire rope passes, traverses the width of the spool driven by a diamond shaft. The diamond shaft is driven by a series of chains and sprockets from the spool. A pawl in the levelwind carriage engages the slot in the diamond shaft.

c. Hydraulic Motor Assembly/Failsafe Brake. The hydraulic system consists of a hydraulic power pack assembly and a hydraulic motor assembly/failsafe brake assembly.

(1) The hydraulic power pack assembly consists of a vane-type hydraulic pump driven by a constant speed alternating current motor. Both the pump and ac motor are mounted directly on the hydraulic reservoir. The pump, mechanically coupled to the motor via a rubber spider, supplies high pressure fluid (2900 pounds per square inch) to the directional control valve. The hydraulic pump assembly/ failsafe brake assembly is connected across the A and B ports of the directional control valve. The directional control valve provides for payout, haulback, and neutral operation of the winch. In the neutral position, fluid is circulated through the reservoir. A pressure gauge located on the directional control valve indicates operating hydraulic pressure within the system, and system pressure is controlled by an adjustable pressure relief valve that is also located on the directional control valve. The hydraulic power pack assembly is located and installed in the steering gear compartment. The hydraulic power pack assembly is provided with the following features:

- (a) Alternating current motor.
- (b) Hydraulic pump.
- (c) Coupling adapter between motor and pump.
- (d) Solenoid operated directional control valve for winch operations.
- (e) Filler cap/breather.

- (f) Visual level indicator for reservoir fluid level.
- (g) End covers for internal reservoir access.
- (h) Inlet strainer.
- (i) Adjustable relief valve.
- (j) Thermostatically controlled heater.
- (k) Return line diffuser for fluid disbursement.
- (l) Reservoir for replenishing/receiving hydraulic fluid.
- (m) Low fluid/temperature switch control.
- (n) System in-line filter.
- (o) Electrical dirty filter indicator.

(2) Hydraulic Motor Assembly/Failsafe Brake Assembly. The hydraulic motor assembly flow (speed control) valve controls the (low, high) rate of speed of the vane-type motor which is coupled to the gearbox via an automatic failsafe brake. The brake is spring loaded for application and hydraulic pressure is required for release. Connection to the brake is from the pilot outlet of a hydraulic valve assembly with a pilot ratio of 10: 1. Pilot pressure is adjustable at the valve by turning the valve cartridge screw out to increase the pressure setting and in to reduce pressure. Any malfunction that reduces the hydraulic pressure below the release pressure of the brake will cause brake application.

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CHAPTER 2

UNIT MAINTENANCE INSTRUCTIONS

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**SECTION I. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASURNT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPSM**

**2-1. Common Tools and Equipment.** For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your organization.

**2-2. Special Tools, TMDE, and Support Equipment.** Special tools; test, measurement, and diagnostic equipment; and support equipment requirements are listed and illustrated in the Repair Parts and Special Tools List (RPSTL), TM 55-1905-223-24P. These items are also listed in the Maintenance Allocation Chart (MAC), Appendix B of this manual.

**2-3. Repair Parts.** Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL), TM 55-1905-223-24P.

**SECTION II. SERVICE UPON RECEIPT**

**2-4. Checking Unpacked Equipment.**

- a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage in accordance with the instructions of DA Pam 738-750.
- b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.
- c. Check to see whether the equipment has been modified.
- d. Remove protective caps, plugs, inserts, wrappings, and tape when inspection/inventory is completed. Inspect piping openings for damage. Wipe off dirt, grease, or protective films at time of installation.

- e. Remove chocks from resilient mounted components.

**2-5. Deprocessing Equipment.** To move winch assembly, lifting points are indicated in FIGURE 2-1. Detailed replacement procedures are given in general support instructions, Chapter 4, Section V.

**WARNING**

Lift winch by lifting points only, using a sling with four legs to prevent tilting or leaning. Keep the sling legs clear of all winch components when lifting or lowering to prevent damage to equipment or injury to personnel.

**2-6. Preliminary Servicing and Adjustment.** Perform the following procedures to prepare the stern anchor winch subsystem for operation.

Overview. PMCS is required on new equipment, besides all of the preliminary servicing included here. Be sure to review all of the checks and procedures in PMCS. Perform all PMCS tasks required. Be sure to include checks on fluid levels, temperatures and pressures, and the pressure setting of the relief valve. Check the strainer and filter, too.

**WARNING**

Ensure that all personnel are clear of winch wire rope, cathead and levelwind carriage before operating the stern anchor winch subsystem to payout or haulback the stern anchor. Notify operations personnel before starting the stern anchor winch subsystem.

Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, or replacing electrical or mechanical components, disconnect circuit breaker at main switchboard to stern control box.

Hydraulic fluid contains chemical compounds that cause irritation or injury to the skin and eyes. Wear protective clothing, gloves, and eye protection when working in the vicinity of hydraulic equipment.

- a. Add Hydraulic Fluid. Add hydraulic fluid to reservoir (FIGURE 1-2) in the hydraulic power pack assembly as follows:
  - (1) Remove filler cap/air breather from top of reservoir.
  - (2) Add no more than 75 gallons of hydraulic fluid.
  - (3) Replace filler cap/air breather in top of reservoir; check level in sight glass.
- b. Add Oil. Add oil to gear box of winch assembly (FIGURE 2-2) as follows:
  - (1) Remove oil filler plug from top of gear box cover.
  - (2) Fill with oil to center of sight glass. (Refer to LO 55-1905-223-12.)
  - (3) Replace oil filler plug in top of gear box cover.
- c. Connect Power Source. Connect alternating current motor in hydraulic power pack assembly to stern control box.

**WARNING**

Do not activate stern anchor winch control switches at this time. Preliminary service and adjustment of stern anchor winch subsystem must be completed before operation of START and PAYOUT/HAULBACK switches on stern control box.

- d. Start Alternating Current Motor. Start ac motor in hydraulic power pack
  - (1) Momentarily press START pushbutton switch on stern control box. See FIGURE 2-3.
  - (2) Observe that MOTOR RUNNING indicator is lit.
  - (3) Observe that ac motor is operating. Check motor rotation against the rotation marking on motor/pump housing. Rotation can be reversed if necessary by reversing any two power leads.
  - (4) Pump noise and "crackle" are usually caused by air entering pump suction. If such noise occurs, press STOP pushbutton switch to shut down ac motor in hydraulic power pack assembly.
  - (5) Secure suction fittings.
  - (6) If pump fails to prime, fill pump with hydraulic fluid through outlet (top) port on pump. (See Table 2-1.)

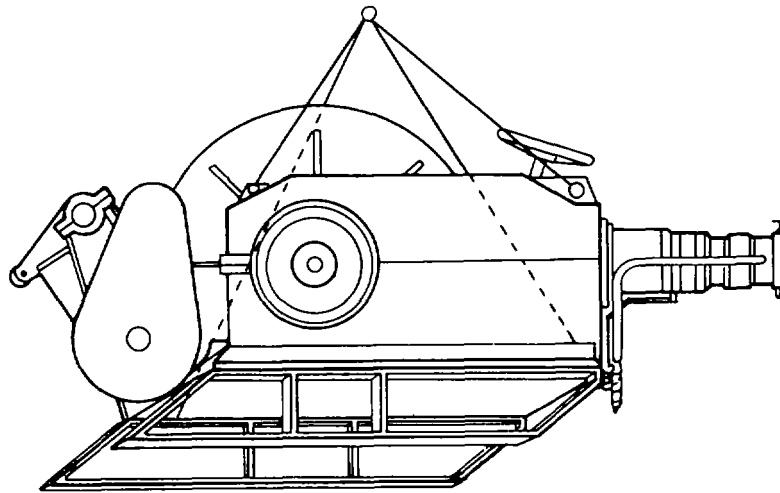


FIGURE 2-1. Stern Anchor Winch Lifting Points.

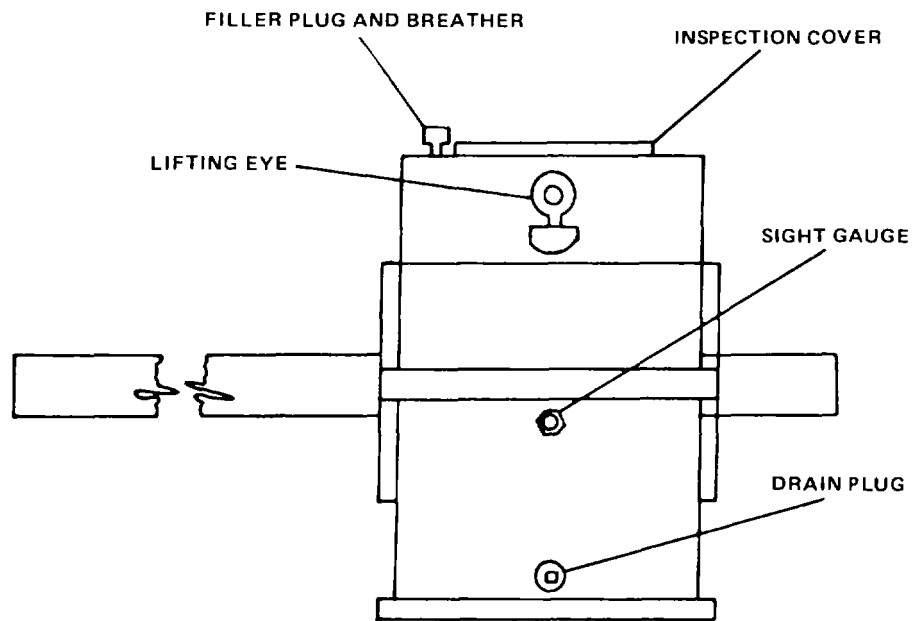


FIGURE 2-2. Winch Assembly Gear Box.

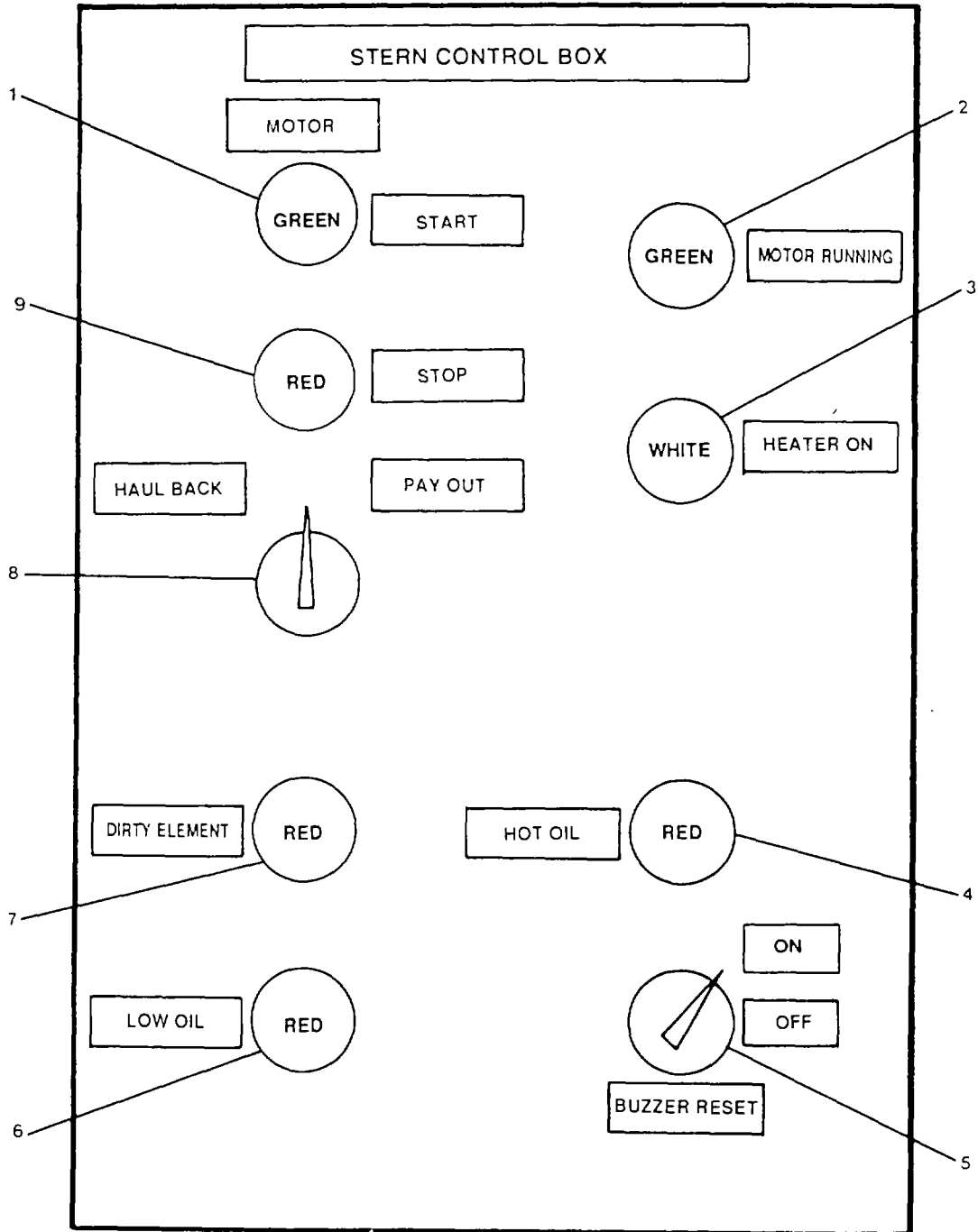


FIGURE 2-3. Stern Anchor Winch Control.

- e. Connect Wire Rope to Stern Anchor. Connect wire rope to stern anchor, using these steps:
- (1) Press START pushbutton switch on stern control box to start ac motor in hydraulic power pack assembly.
  - (2) Operate winch in PAYOUT mode.
  - (3) Unreel wire rope from spool.
  - (4) Thread wire rope through rollers of levelwind and anchor fairlead.
  - (5) Connect eye of wire rope to anchor assembly using supplied shackle, swivel, and detachable chain link.
  - (6) Operate winch in HAULBACK mode to take up slack in wire rope.
  - (7) Connect turnbuckle and adjust for constant tension,
  - (8) Turn off ac motor in hydraulic power pack assembly.
- f. Operational Test of Stern Anchor Winch Subsystem. Test operation of stern anchor winch subsystem as follows:
- (1) Start ac motor in hydraulic power pack assembly.
  - (2) Loosen turnbuckle.
  - (3) Detach shackle from anchor and disengage turnbuckle from anchor.
  - (4) Operate winch in PAYOUT mode and observe that anchor is lowered properly.
  - (5) Operate winch in HAULBACK mode.
  - (6) Observe that anchor is raised to storage position.
  - (7) Manually operate dog lever to activate locking device for spool.
  - (8) Install shackle to anchor and engage turnbuckle to anchor.
  - (9) Adjust turnbuckle for constant tension and turn off ac motor in hydraulic power pack assembly.

**2-7. Initial Setup Procedure.** Includes operational checks and inspections that are not performed for a routine startup. Direct support maintenance personnel will perform initial setup in accordance with the operator's manual, TM 55-1905-223-10.

**2-8. Normal Startup.** Refer to the operator's manual, TM 55-1905-223-10.

**2-9. Shutdown Procedure (Usual or Unusual).** Refer to the operator's manual, TM 55-1905-223-10.

**SECTION III. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)**

**2-10. Explanation of PMCS Table.** PMCS is designed to keep the equipment in good working condition. This is accomplished by performing certain tests, inspections, and services. Table 2-1 lists items to be serviced and the procedures needed to accomplish the PMCS. The "Interval" column tells you when to perform a check or service. If needed, PMCS may be performed more frequently than the indicated interval. The "Procedures" column tells you how to perform the required checks and services. If your equipment does not perform as required, see Table 2-2, Troubleshooting. Report any malfunctions or failures on DA Form 2404. In the Item Number column on DA Form 2404, record the appropriate Item Number from the PMCS table.

Table 2-1 Preventive Maintenance Checks and Services

Item No.	Intervals							Item To Be Inspected/Service	Procedures
	D	W	M	Q	S	A	B		
1	•							Pressure Gauge	<p>HYDRAULIC POWER PACK ASSEMBLY</p> <p>If pressure reading is above 2,900 psi, perform troubleshooting according to Section IV of this chapter.</p> <p style="text-align: center;"><u>CAUTION</u></p> <p>Maximum hydraulic system operating temperature is 150°F. Operating at higher temperatures will reduce hydraulic system efficiency and component service life, and will deteriorate hydraulic fluid more rapidly.</p>
2	•							Temperature/Level Gauge	<p>Temperature readings must be taken when the alternating current motor in the hydraulic power pack assembly is operating. Read temperatures on the temperature/level gauge. If temperature reading is above 150°F, perform troubleshooting according to Section IV of this chapter.</p>
3	•							Hydraulic Fluid Level Indicator	<p>Hydraulic fluid level reading is taken when alternating current motor in the assembly is operating. Check hydraulic fluid level indicator. Keep hydraulic fluid level at full mark. Investigate causes for loss of fluid.</p>
4	•							Hydraulic Pump	<p>Check hydraulic pump for unusual noise during operating (see Table 2-2). Check leaks and ensure that mounting bolts are secure.</p>
5	•							Hydraulic Power Pack Assembly	<p>Thoroughly inspect hydraulic power pack assembly, winch speed control valve, and hydraulic valve assembly. Check for leaks and loose, broken, torn, or missing components. Secure, repair, or replace defective parts.</p>



Table 2-1. Preventive Maintenance Checks and Services

Item No.	Intervals							Item To Be Inspected/Service	Procedures
	D	W	M	Q	S	A	B		
6				•				Reservoir Tank	<p>Drain water from bottom of reservoir. Pressure and temperature vary during hydraulic system operation. This results in condensation of water from air in the reservoir tank. Differences in specific gravities of water and hydraulic fluid cause water to collect in the bottom of the reservoir tank. To prevent rust and hydraulic deterioration, water must be removed. Follow these steps:</p> <ol style="list-style-type: none"> <li>a. Press STOP button on stern control box to turn off ac motor in power pack assembly. Tag control panel "Out of Service."</li> <li>b. Locate drain plug at bottom of reservoir tank.</li> <li>c. Place a suitable container under drain plug.</li> <li>d. Remove filler cap/air breather.</li> <li>e. Using a suitable wrench, unscrew drain plug until water begins to drain.</li> <li>f. Drain tank until hydraulic fluid begins to drain.</li> <li>g. Tighten drain plug.</li> <li>h. Add hydraulic fluid to reservoir tank until fluid level is at FULL mark.</li> <li>i. Replace filler cap/air breather.</li> <li>j. Remove "Out of Service - Do Not Operate" tag.</li> <li>k. Turn on ac motor in hydraulic power pack assembly.</li> <li>l. Check hydraulic fluid level indicator.</li> <li>m. If hydraulic fluid level is below FULL mark, repeat steps a., d., and h. through 1.</li> <li>n. Press STOP button on stern control box to turn off ac motor in hydraulic power pack assembly.</li> </ol>

Table 2-1. Preventive Maintenance Checks and Services

Item No.	Intervals							Item To Be Inspected/Service	Procedures
	D	W	M	Q	S	A	B		
7				•				Return Filter Element	<p>Change return filter element in hydraulic power pack assembly by following these steps:</p> <ol style="list-style-type: none"> <li>a. Press STOP button on stern control box to turn off ac motor in hydraulic power pack assembly. Tag panel "Out of Service - Do Not Operate."</li> <li>b. Locate return filter on top of power pack assembly.</li> <li>c. Place suitable container under return filter.</li> <li>d. Use oil filter wrench and turn filter counterclockwise.</li> <li>e. Remove gasket and filter from filter head.</li> <li>f. Apply film of hydraulic fluid to gasket and install new filter in filter head.</li> <li>g. Secure filter by turning clockwise 1/2 to 3/4 turn after initial gasket contact.</li> <li>h. Turn on ac motor in hydraulic power pack assembly.</li> <li>i. Remove "Out of Service - Do Not Operate" tag.</li> <li>j. Check fluid level indicator. If level is below FULL mark, add hydraulic fluid to FULL mark.</li> <li>k. Turn off ac motor in hydraulic power pack assembly.</li> </ol>
8				•				Drive Coupling	<p>Visually check the drive coupling between ac motor and hydraulic pump. Check rubber insert for wear. Check hubs for looseness and shifting. Check setscrews for looseness; secure as required. Replace defective parts.</p> <p style="text-align: center;">NOTE</p> <p>Access to the coupling is through the opening at the bottom of 'C' adapter.</p>

Table 2-1. Preventive Maintenance Checks and Services

Item No.	Intervals							Item To Be Inspected/Service	Procedures
	D	W	M	Q	S	A	B		
9				•				Valves, Piping, Fitting	Turn on the ac motor in the hydraulic power pack assembly. Check valves, piping, and fittings for leaks. Turn off ac motor in hydraulic power pack assembly. Secure loose fittings. Replace defective parts.
10				•				Pressure Setting of Valve	The cross-port relief valve module is designated to operate at 2,900 psi. Measure the settings on this valve by following these steps:  a. Turn off ac motor in hydraulic power pack assembly. Tag control panel "Out of Service - Do Not Operate." b. Temporarily install a portable gauge in place of existing gauge. c. Remove "Out of Service - Do Not Operate" tag. d. Check hydraulic fluid level indicator. If fluid is below FULL mark, add hydraulic fluid to FULL mark. e. Compare pressure gauge reading with pressure setting of valve. f. Turn off ac motor in hydraulic power pack assembly. g. Adjust or replace defective valve. Install new preformed packing on replacement valve. h. Check valve and fittings for leaks.
11				•				Electrical Wiring Connections	Check electrical wiring connections as follows:  a. Turn off ac motor in hydraulic power pack assembly. Tag stern control box control panel "Out of Service - Do Not Operate." b. Secure power source to stern control box at main circuit breaker in engine control room.

Table 2-1. Preventive Maintenance Checks and Services

Item No.	Intervals							Item To Be Inspected/Service	Procedures
	D	W	M	Q	S	A	B		
11				•				Electrical Wiring Connections - continued	c. Check terminals of ac motor and terminal blocks stern control box for loose connections. d. Secure all loose connections. e. Restore power source to stern control box at main circuit breaker. f. Remove "Out of Service - Do Not Operate" tag from stern control box control panel.
12				•				Air Breather Filter	Clean the air breather filter as follows:  a. Remove filler cap/air breather from top of reservoir tank. b. Remove filter from filler cap/air breather. c. Clean filter with cleaning solvent. d. Install filter in filler cap/air breather. e. Install filler cap/air breather on top of reservoir tank.
13			•					AC Motor Bearings	Refer to LO 55-1905-223-12 and lubricate the ac motor bearings in the hydraulic power pack assembly.
14							•	Suction Strainer and Return Line Diffuser	Clean suction strainer and return line diffuser as follows:  a. Turn off ac motor in hydraulic power pack assembly. Tag stern control box panel "Out of Service - Do Not Operate." b. Locate drain plug at bottom of inspection cover on reservoir tank. c. Place a suitable container under drain plug. d. Remove drain plug. Allow hydraulic fluid to drain from tank. e. Remove inspection covers and cover gasket from each end of the reservoir tank.

Table 2-1. Preventive Maintenance Checks and Services

Item No.	Intervals							Item To Be Inspected/Service	Procedures
	D	W	M	Q	S	A	B		
14						•		Suction Strainer and Return Line Diffuser - continued	f. Disconnect and remove suction strainer from suction pipe inside pump end of reservoir tank. g. Disconnect and remove return line diffuser from pipe inside ac motor end of reservoir tank. h. Clean strainer in cleaning solvent. i. Connect suction strainer to suction pipe inside pump end of reservoir tank. j. Connect return line diffuser to pipe inside ac motor end of reservoir. k. Install inspection covers and cover gaskets to end of reservoir tank. l. Replace drain plug. m. Add hydraulic fluid. n. Check hydraulic fluid level indicator. o. If hydraulic fluid is below FULL mark, add hydraulic fluid to reservoir until fluid level is at FULL mark. p. Start ac motor. Check for leaks. q. Check pressure gauge and temperature/level indicator.
15							•	Hydraulic Fluid	Change hydraulic fluid by following the steps in Item 14.  NOTE  Clean suction strainer and return line diffuser each time the hydraulic fluid is changed.

Table 2-1. Preventive Maintenance Checks and Services

Item No.	Intervals							Item To Be Inspected/Service	Procedures
	D	W	M	Q	S	A	B		
16	•							Oil Level	<p>WINCH ASSEMBLY</p> <p>Check oil level in gearbox of winch assembly as follows:</p> <ol style="list-style-type: none"> <li>Turn off ac motor in hydraulic power pack assembly.</li> <li>Wait 5 minutes for oil to settle in lower portion of gearbox.</li> <li>Verify that oil is visible in sight glass on aft end of gearbox housing.</li> <li>If oil is not visible in sight glass, remove filler plug from top of gearbox cover.</li> <li>Add oil until visible in sight glass.</li> <li>Install filler plug in top of gearbox cover.</li> </ol>
17	•							Winch Assembly	Visually inspect winch assembly for leaks and loose, broken, torn, or missing components. Secure, repair, or replace defective components.
18	•							Hydraulic Motor	Check the hydraulic motor for unusual noise during operation (see Table 2-2). Check for leaks and ensure that mounting bolts are secure.
19		•						Fairlead Rollers	Refer to LO 55-1905-223-12 and lubricate the fairlead rollers in the winch assembly.
20		•						Winch Rollers	Lubricate the winch assembly. Refer to LO 55-1905-223-12 and lubricate the clutch screw, gypsy wildcat, brake screw, bearings and clutch assembly, and gear reducer of the winch assembly.
21			•					Pillow Block	Refer to LO 55-1905-223-12 and lubricate the block.
22			•					Sprocket Wheel Bearings	Refer to LO 55-1905-223-12 and lubricate the sprocket wheel bearings of the winch assembly.

Table 2-1. Preventive Maintenance Checks and Services

Item No.	Intervals							Item To Be Inspected/Service	Procedures
	D	W	M	Q	S	A	B		
23			•					Vertical/Horizontal Level Wind Rollers	Refer to LO 55-1905-223-12 and lubricate the level wind rollers of the winch assembly.
24			•					Side Frame Bushings	Refer to LO 55-1905-223-12 and lubricate the side frame bushings of the winch assembly.
25						•		Gear Reducer	Change oil in the gearbox by following these steps: a. Turn off the ac motor in the hydraulic power pack assembly. b. Wait 5 minutes for oil to settle in the lower portion of the gearbox. c. Remove oil filler plug from top of gearbox cover. d. Place a suitable container under oil drain plug. e. Remove oil drain plug from bottom of gearbox cover housing. Allow oil to drain from gearbox housing. f. Replace drain plug in gearbox housing. g. Add oil until oil is visible in sight glass. h. Install oil filler plug.

**SECTION IV. UNIT MAINTENANCE TROUBLESHOOTING**

**2-11. Troubleshooting.** Both a symptom index and a troubleshooting table are provided. The symptom index will help you locate the information you need for troubleshooting.

**SYMPTOM INDEX**

	Troubleshooting Procedure (Table 2-2)
<b>ALTERNATING CURRENT MOTOR</b>	
Will not operate	Item 14
<b>HYDRAULIC FLUID</b>	
Does not flow	Item 6
Flows too much	Item 8
Has low flow	Item 7
Leakage around pump assembly shaft or housing	Item 12,13
<b>HYDRAULIC PUMP</b>	
Broken parts inside housing	Item 11
Noisy	Item 9
Too much wear	Item 10
<b>HYDRAULIC SYSTEM</b>	
Erratic pressure	Item 3
Low pressure	Item 2
No pressure	Item 1
Temperature too high	Item 5,
Too much pressure	Item 4
<b>WINCH</b>	
Will not rotate/rotates slowly	Item 15

Table 2-2 lists the common fault conditions that may be found during operation or maintenance of the equipment. Look for causes and do corrective actions in the order listed. This manual cannot list every symptom that may show up, and it cannot list all of the possible causes and corrective actions. If a symptom is not listed, or if it keeps up after you have performed the corrective actions, notify your supervisor.



a. **Operating Limitations.** The stern anchor winch subsystem is designed to operate within temperature and pressure limitations. Maximum safe hydraulic fluid operating temperature is 150OF. Maximum safe hydraulic fluid operating pressure is 2,900 psi. In addition, hydraulic fluid in the reservoir tank and lubricating oil in the gear box must be kept at the full level.

b. **Problem Indicators.** Operating temperatures above 150OF; low, erratic, or no hydraulic pressure, and low levels of hydraulic fluid or lubrication oil are usually signs of minor problems. Other indicators are leaks and unusual heat produced by hydraulic system components. Maintenance that corrects these problems prevents damage to subsystem components that result in major difficulties. Unusual noises produced by the alternating current motor, drive coupling, hydraulic pump, hydraulic pump assembly, hydraulic valve assembly, gear box, and winch are usually indications of major problems.

*Table 2-2. Troubleshooting*

Malfunction	Test or Inspection	Corrective Action
1. No pressure in hydraulic system.		<p>STEP 1. Ensure power pack assembly is on line.</p> <p>STEP 2. Check for low hydraulic level in reservoir tank.</p> <p style="padding-left: 20px;">a. Add hydraulic fluid (para. 2-6).</p> <p style="padding-left: 20px;">b. Secure all hydraulic fittings.</p> <p>STEP 3. Check for correct relief valve setting (2900 psi).</p> <p style="padding-left: 20px;">Adjust relief valve (para. 2-13).</p> <p>STEP 4. Check to see if solenoid operated directional control valve is stuck in the open position.</p> <p style="padding-left: 20px;">Repair or replace defective valve (para. 2-18).</p> <p>STEP 5. Check for air leak in suction line.</p> <p style="padding-left: 20px;">Secure all fittings and connections.</p> <p>STEP 6. Check to see if hydraulic fluid viscosity is too heavy to pick up prime (especially in cold weather).</p> <p style="padding-left: 20px;">Use lighter viscosity hydraulic fluid.</p> <p>STEP 7. Check for wrong direction of hydraulic pump rotation.</p> <p style="padding-left: 20px;">Reverse rotation of alternating current motor (para. 2-6).</p> <p>STEP 8. Check for broken shaft or broken parts inside hydraulic pump.</p> <p style="padding-left: 20px;">Replace hydraulic pump (para. 2-17).</p>
2. Low pressure in hydraulic system.		<p>STEP 1. Check for external leakage.</p> <p style="padding-left: 20px;">Repair or replace hydraulic valve (para. 2-14).</p>

Table 2-2. Troubleshooting

Malfunction	Test or Inspection	Corrective Action
		STEP 2. Check for defective hydraulic pump (Item 4, PMCS Table). Replace hydraulic pump (para. 2-17).
3. Erratic pressure in hydraulic system.		STEP 1. Check for air in hydraulic system. Bleed air from system and secure connections (para. 2-13).
		STEP 2. Faulty relief valve. Replace relief valve (para. 4-17).
		STEP 3. Check for contamination in hydraulic fluid. a. Clean or replace suction strainer or filter (para 2-17). b. Change hydraulic fluid (Item 15, PMCS).
		STEP 4. Check for defective hydraulic pump or motor assembly (Items 4 and 18 PMCS Table). Replace hydraulic pump or motor assembly (para.2-17, 2-15).
4. Excessive pressure in hydraulic system.		STEP 1. Check for misadjustment of pressure relief valve (2900 psi). Adjust pressure relief valve (para. 2-13).
5. Excessive temperature in hydraulic system.		STEP 1. Check to see if hydraulic system pressure is too high. Adjust pressure setting of relief valve (para. 2-13).
		STEP 2. Check for cavitation (vacuum in hydraulic fluid). a. Clean or replace air breather filter (para. 2-17). b. Clean or replace suction strainer or filter (para. 2-17).
		STEP 3. Check for air in hydraulic system. a. Secure hydraulic fittings. b. Bleed air from hydraulic system (para. 2-13). c. Make sure hydraulic fluid level is at full mark.
		STEP 4. Check to see if hydraulic fluid level is low. a. Add hydraulic fluid (para. 2-6). b. Secure hydraulic fittings.
		STEP 5. Check for contamination in hydraulic fluid. a. Clean or replace suction strainer or filter (para. 2-17). b. Change hydraulic fluid (Item 15, PMCS Table).
		STEP 6. Check for defective hydraulic pump (Item 4, PMCS Table). Replace hydraulic pump (para. 2-17).

Table 2-2. Troubleshooting

Malfunction	Test or Inspection	Corrective Action
	STEP 7.	Check for defective hydraulic motor assembly (Item 18, PMCS Table). Replace hydraulic motor assembly (para. 2-15).
6. Hydraulic fluid does not flow.	STEP 1.	Check to see if hydraulic pump is receiving hydraulic fluid. a. Clean or replace air breather filter (para. 2-17). b. Clean or replace suction strainer or filter (para. 2-17). c. Make sure hydraulic fluid level is at the full mark. d. Check coupling between the motor and pump (Item 8, PMCS).
	STEP 2.	Check for defective alternating current motor. a. Make sure power source and electrical wiring is connected properly. b. Replace alternating current motor (para. 2-17).
	STEP 3.	Check to see if alternating current motor is turning in the wrong direction. Reverse rotation of alternating current motor (para. 2-6).
	STEP 4.	Check for correct relief valve setting. Adjust pressure relief valve (para. 2-13).
	STEP 5.	Check for defective hydraulic pump. Listen for unusual noise and check system pressure gauge. Replace hydraulic pump (para. 2-17).
7. Hydraulic fluid has low flow. Winch turns slower than normal speed.	STEP 1.	Check for correct relief valve setting (2900 psi). Adjust relief valve (para. 2-13).
	STEP 2.	Check for defective hydraulic pump. Replace hydraulic pump (para. 2-17).
	STEP 3.	Check for external leaks in hydraulic system. Secure all fittings and connections.
8. Hydraulic fluid has excessive flow. Winch turns faster than normal speed.	STEP 1.	Check for correct relief valve setting (2900 psi). Adjust relief valve (para. 2-13).
9. Hydraulic pump is noisy.	STEP 1.	Check for cavitation (vacuums in hydraulic fluid). a. Clean or replace air breather filter (para. 2-17). b. Clean or replace suction strainer or filter (para. 2-17).

Table 2-2. Troubleshooting

Malfunction	Test or Inspection	Corrective Action
		<p>STEP 2. Check for air in hydraulic system.</p> <ul style="list-style-type: none"> <li>a. Secure all fittings and connections.</li> <li>b. Bleed air from hydraulic system (para. 2-13).</li> <li>c. Make sure hydraulic fluid level is at the full mark.</li> </ul>
		<p>STEP 3. Check for loose drive coupling. Tighten drive coupling setscrews (Item 8, PMCS Table).</p>
		<p>STEP 4. Check for defective hydraulic pump (Item 4, PMCS Table). Replace hydraulic pump (para. 2-17).</p>
10.	Excessive wear of hydraulic pump parts (para. 2-19).	
		<p>STEP 1. Check for sustained high pressure operation of system, above 2,900 psi. Make sure pressure gauge and pressure relief settings are correct.</p>
		<p>STEP 2. Check for loose drive coupling. Tighten drive coupling setscrews (Item 8, PMCS Table).</p>
		<p>STEP 3. Check to see if air recirculation is causing chatter in the system.</p> <ul style="list-style-type: none"> <li>a. Secure all fittings and connections.</li> <li>b. Make sure hydraulic fluid level is at the full mark.</li> </ul>
		<p>STEP 4. Check for contamination in hydraulic fluid.</p> <ul style="list-style-type: none"> <li>a. Clean or replace suction strainer or filter (para. 2-17)</li> <li>b. Change hydraulic fluid (Item 15, PMCS Table).</li> </ul>
		<p>STEP 5. Check to see if viscosity of the hydraulic fluid is too low. Make sure you are using the proper hydraulic fluid. Refer to LO 55-1905-223-12.</p>
11.	Breakage inside hydraulic pump housing.	
		<p>STEP 1. Check for excessive hydraulic system pressure. Make sure hydraulic system pressure levels are correct (para. 2-13).</p>
		<p>STEP 2. Check to see if hydraulic pump seizure is due to low fluid level. Make sure fluid level is correct (PMCS Item).</p>
12.	External hydraulic fluid leakage around hydraulic pump shaft or housing.	
		<p>STEP 1. Check for defective hydraulic shaftseal or pump shaft. Repair hydraulic pump (para. 2-17).</p>
13.	External hydraulic fluid leakage around hydraulic motor assembly or housing.	

Table 2-2. Troubleshooting

Malfunction	Test or Inspection	Corrective Action
	STEP 1.	Check for excessive hydraulic fluid pressure (due to excessive drain flow). Replace hydraulic motor (para. 2-17).
	STEP 2.	Check for damaged or defective hydraulic motor assembly housing. Replace hydraulic motor assembly (para. 2-15).
14. Alternating current motor will not operate.	STEP 1.	Check to see if circuit breaker has tripped (Reference TM 55-1905-223-10).
	STEP 2.	Check for defective alternating current motor by making continuity readings. Replace alternating current motor (para. 2-17).
15. Winch will not rotate or rotates too slow.	STEP 1.	Check to see if the hydraulic fluid pressure is low. Make sure the pressure gauges are reading the proper pressure.
	STEP 2.	Check to see if the hydraulic fluid level is low. Add hydraulic fluid if required (Item 3, PMCS Table).
	STEP 3.	Check to see if the failsafe brake is disengaging. Hydraulic pressure is okay but motor will not turn and no audible sound of brake releasing is heard. <ul style="list-style-type: none"> <li>a. Check line from hydraulic valve to failsafe brake for blockage.</li> <li>b. Replace/repair hydraulic valve (para. 2-15).</li> <li>c. Replace/repair failsafe brake (para. 2-16).</li> </ul>
	STEP 4.	Check to see if the winch shaft is binding. If shaft is binding, operation will be erratic and noisy. Lubricate the winch. Refer to LO 55-1905-223-12.
	STEP 5.	Check for overloading on the winch. Reduce load.
	STEP 6.	Check for defective hydraulic motor assembly. Replace hydraulic motor assembly (para. 2-15).

**SECTION V. UNIT MAINTENANCE PROCEDURES**

**2-12. General.** This section provides unit maintenance procedures for the stern anchor winch. The tasks are for removal and replacement of components. Equipment condition consists of the following:

- a. During replace/repair of hydraulic system, all openings should be capped/ plugged to prevent foreign matter or contamination from entering the system.
- b. To perform the following unit maintenance procedures, the winch assembly and hydraulic power pack must be placed in the following conditions:
  - (1) Secure the winch assembly handwheel fully by rotating the brake wheel (FIGURE 1-1) fully clockwise.

**WARNING**

Clearly display a tag marked "Out of Service Do Not Operate" on the main switchboard and control panel on stern control box to prevent accidental re-energizing of the circuits that could result in injury or death.

- (2) Remove power from the hydraulic power pack by opening and tagging the vessel's electrical service circuit breakers "Out of Service."
  - (3) Drain the hydraulic fluid from the reservoir of the hydraulic power pack as required. Be sure to insert and secure the drain plug before refilling reservoir with hydraulic fluid.
- c. Refill hydraulic reservoir and restore electrical power to the power pack upon completion of all unit maintenance procedures.
  - d. Remove "Out of Service" tag.
  - e. Release hand brake if winch assembly is required for immediate service.

**MAINTENANCE OF STERN ANCHOR WINCH**

**2-13. Replace Stern Anchor Winch Assembly Subsystem.**

This task covers: Service.

**INITIAL SETUP**

Tools

Tool kit, general mechanic's,  
5180-00-699-5273  
Tool kit, electrical equipment,  
5180-00-391-1087  
Lifting sling P/N 3375958

Materials/Parts

Electrical tags, Item 16, Appendix C

Equipment Condition

System shut down and tagged "Out of Service - Do Not Operate." Reference TM 55-1905-223-10. (16) are repaired.

General Safety Instructions

Do not work on pressurized system unless specific task requires it. Observe warning when working on high pressure system Lines.

SERVICE (FIGURE 2-4).

- a. Check that winch brake is applied, dog engaged, clutch disengaged, and anchor secured by winch and turnbuckle.
- b. Shut OFF power to stern control box at main switchboard (reference TM 55-1905-223-10) located in engine control room.
- c. Tag circuit breaker on main switchboard and control panel on stern control box "Out of Service - Do Not Operate."
- d. Check pressure gauge (2) on directions1 control valve (1) for zero hydraulic pressure indication in system. If hydraulic pressure is indicated on gauge, allow 5 minutes for hydraulic fluid in system to settle or return to reservoir.

**Change 1 2-23**

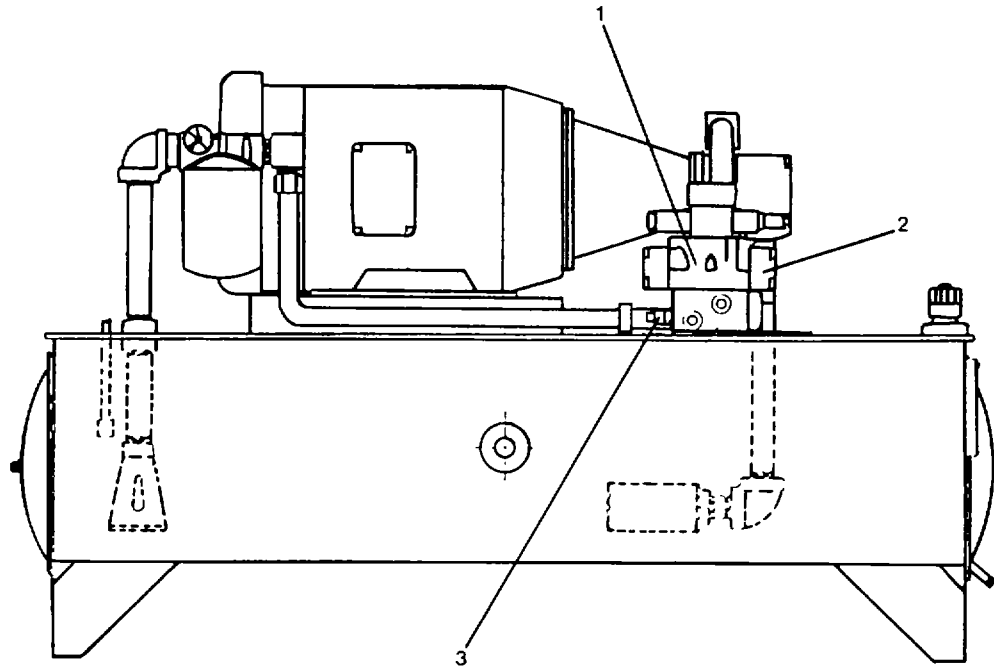


FIGURE 2-4. Hydraulic Power Pack Assembly.



## e. Operate and Test.

- (1) Restore all electrical power.
- (2) Set relief valve (3) clockwise to mid-setting.

**NOTE**

If pump does not prime, shut down hydraulic power pack assembly and correct problem.

- (3) Push motor START button (1, FIGURE 2-3) and check if motor running indicator (2) is lit. Observe pressure gauge (2, FIGURE 2-4) for an increase in pressure build-up.
- (4) Push motor STOP button (9, FIGURE 2-3) on stern control box. Ensure hydraulic lines are secured and hose connections are tight.

---

**WARNING**

Escaping pressurized air and/or liquids can cause serious personal injury.

- (5) Bleed off trapped air in system by momentarily turning relief valve (3, FIGURE 2-4) counterclockwise until hydraulic fluid begins to appear.
- (6) Push motor START button on stern control box.
- (7) Set relief valve (3) clockwise for 2,900 psi while observing pressure gauge (2).

**NOTE**

The spring loaded failsafe brake automatically locks the drive train and prevents winch operation when the hydraulic power pack assembly is shut down or during loss of hydraulic pressure.

- (8) Check that failsafe brake is released by observing cathead rotation when winch control switch (8, FIGURE 2-3) is momentarily set in either PAYOUT/ HAULBACK mode.
- (9) Push motor STOP button (9, FIGURE 2-3) on stern control box to shut down hydraulic power pack assembly.
- (10) Remove "Out of Service - Do Not Operate" tag from circuit breaker on main switchboard and control panel on stern control box.

---

**2-14. Replace/Repair Hydraulic Valve. (FIGURE 2-5)**

---

This task covers: a. Removal, b. Repair, c. Replacement.

---

**INITIAL SETUP**Tools

Tool kit, general mechanic's,  
5180-00-699-5273

Materials/Parts

Hydraulic valve  
P/N CBGH-LJN-YKM  
Cartridge P/N CBGH-LJN (qty 2)  
Electrical tags, Item 16, Appendix C

Equipment Condition

TM 55-1905-223-10: System shut down,  
tagged "Out of Service - Do Not  
Operate."

General Safety Instructions

Do not work on pressurized system.

---

**WARNING**

Do not attempt the following procedure on a pressurized system. Escaping pressurized air and/or liquids can cause serious injury.

Ensure system has been shut down IAW para. 2-13 and system pressure gauge reads zero.

**REMOVAL**

- a. Disconnect Hydraulic Line/Hose Connectors.

**CAUTION**

During replace/repair of hydraulic systems, all openings should be capped/plugged to prevent foreign matter or contamination from entering system.

**NOTE**

When removing lines/connectors, use suitable container to catch escaping fluid.

- (1) Disconnect hydraulic line connectors (1) and (2).
- (2) Disconnect hydraulic hose connector (3) and (8).

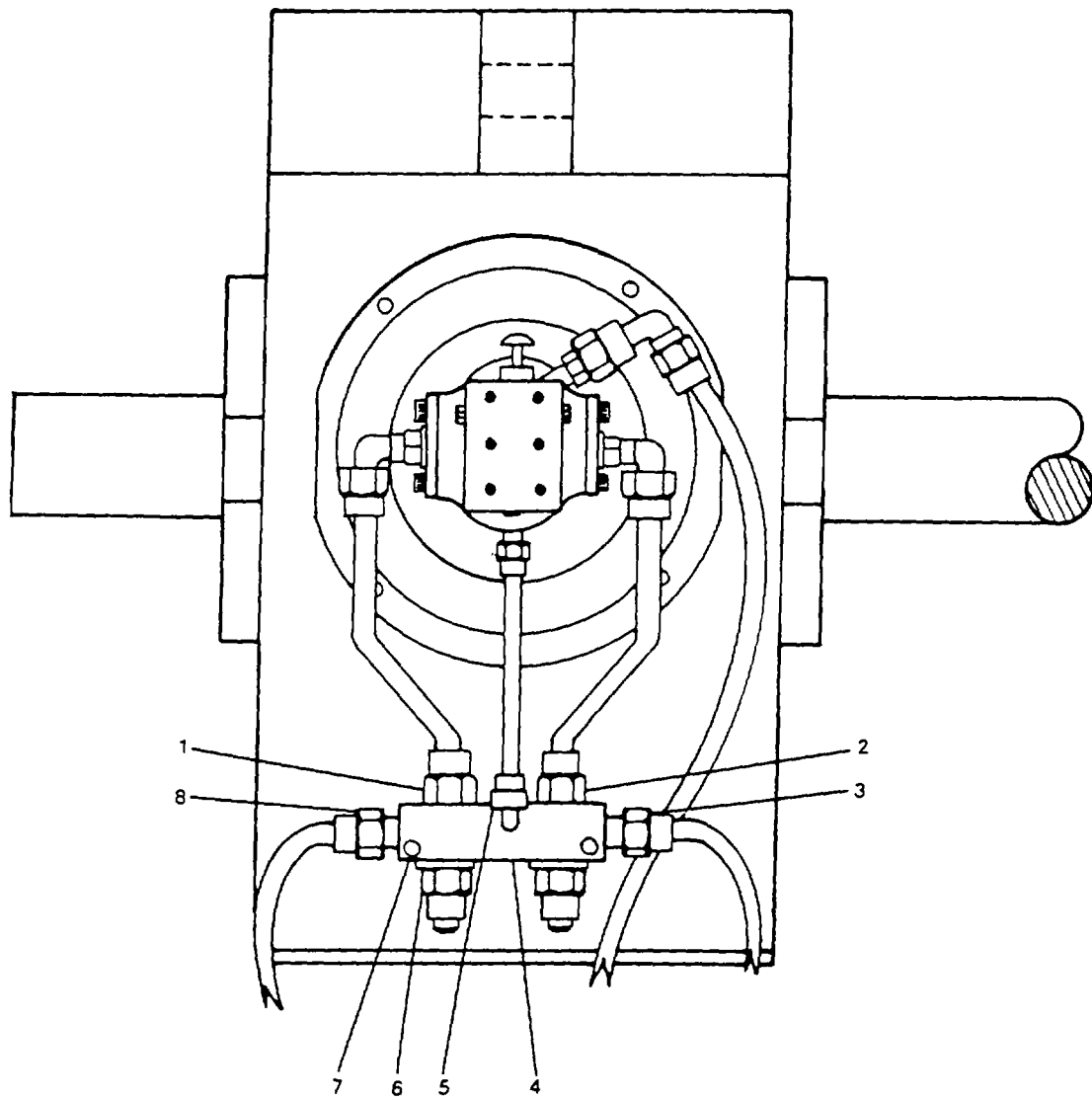


FIGURE 2-5. Hydraulic Valve.

(3) Disconnect failsafe brake pressure line connector (5).

b. Remove Hydraulic Valve.

(1) Remove two mounting bolts (7) securing valve to base plate.

(2) Remove hydraulic valve (4).

(3) Remove two cartridges (6) from hydraulic valve (4).

---

**REPAIR**

Repair consists of replacing hydraulic valve cartridge (6).

---

**REPLACEMENT**

a. Install Hydraulic Valve.

(1) Replace two cartridges into hydraulic valve (4).

(2) Position hydraulic valve (4) over mounting boltholes on base plate.

(3) Install two mounting bolts (7) through boltholes on valve assembly and secure valve to base plate.

**NOTE**

Remove protective caps/plugs from hydraulic lines prior to installation.

b. Connect Hydraulic Line/Hose Connectors.

(1) Connect failsafe brake pressure line connector (5).

(2) Connect hydraulic hose connectors (3 and 8).

(3) Connect hydraulic line connectors (1 and 2).

---

**2-15. Replace Hydraulic Motor Assembly. (Figure 2-6)**

---

This task covers: a. Removal, b. Replacement.

---

**INITIAL SETUP****Tools**

Tool kit, general mechanic's,  
5180-00-699-5273  
Torque wrench,  
5120-01-125-5190

**Equipment Condition**

System shut down, and tagged "Out of  
Service - Do Not Operate." (Reference  
TM 55-1905-223-10.)

**Materials/Parts**

Hydraulic motor assembly  
P/N 015-63-017-31  
Permatex, Item 5, Appendix C  
Electrical tags, Item 16, Appendix C

**General Safety Instructions**

Do not work on pressurized system.  
Be careful. Heavy equipment.

---

**WARNING**

Do not attempt the following procedure on a pressurized system. Escaping pressurized air and/or liquids can cause serious injury.

Two soldiers are required for this procedure. Exercise extreme caution when lifting heavy equipment.

**REMOVAL**

- a. Remove Hydraulic Line Connections.

**CAUTION**

During replace/repair of hydraulic systems, all openings should be capped/plugged to prevent foreign matter or contamination from entering system.

- (1) Disconnect hydraulic line connectors (1, 3) from hydraulic motor assembly (5).
- (2) Disconnect hydraulic line (2) from hydraulic motor assembly.

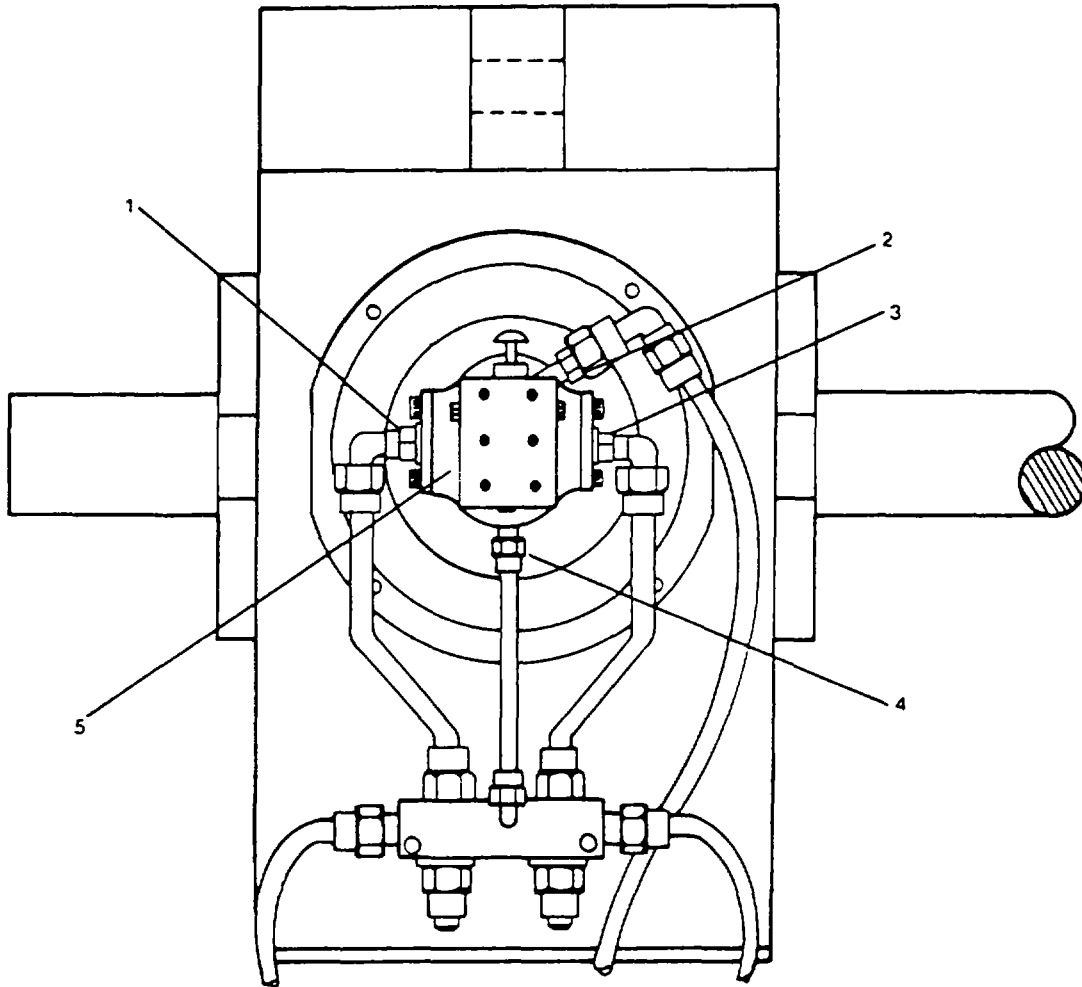


FIGURE 2-6. Hydraulic Motor Assembly.

(3) Disconnect failsafe brake pressure line connector (4) from hydraulic motor assembly (5).

b. Remove Hydraulic Motor Assembly. (FIGURE 2-7)

(1) Remove four mounting bolts (5) and four washers (6) from motor flange (4), failsafe brake (9), and mounting flange (11) on gear reducer coupler (1).

(2) Separate motor (7) from brake (9) by sliding motor shaft (3) out of brake housing. Use suitable soft-face hammer if necessary.

(3) Remove motor and flange gaskets (2).

---

**REPLACEMENT**

a. Install Hydraulic Motor Assembly. (FIGURE 2-7)

**NOTE**

Apply Permatex sealant to flange gasket prior to installation.

(1) Install flange gasket (2) on motor flange (4).

(2) Position motor (7) and flange gasket (2) into brake housing with boltholes aligned. Use rocking motion to engage motor shaft (3) with brake coupler.

(3) Install four washers (6) and four mounting bolts (5) and secure motor/ brake assembly to gear reducer coupler flange (11).

**NOTE**

Shafts must slide freely together. Do not use bolts to force units together.

(4) Tighten bolts sequentially and torque to 75-85 ft-lb.





---

**2-16. Replace/Repair Failsafe Brake Assembly. (FIGURE 2-7)**

---

This task covers: a. Removal, b. Repair, c. Replacement.

---

**INITIAL SETUP**Tools

Tool kit, general mechanic's,  
5180-00-699-5273

Materials/Parts

Failsafe brake assembly  
P/N 37735H  
Gasket P/N 28427  
Permatex, Item 5, Appendix C  
Electrical tags, Item 16, Appendix C

Equipment Condition

System shut down and tagged "Out of  
Service - Do Not Operate." Reference  
TM 55-1905-223-10.  
Hydraulic motor assembly removed  
(paragraph 2-15).

General Safety Instructions

Do not work on pressurized system.  
Be careful. Heavy equipment.

---

**WARNING**

Do not attempt the following procedure on a pressurized system. Escaping pressurized air and/or liquids can cause serious injury.

Two soldiers required for this procedure. Exercise extreme caution when lifting heavy equipment.

**REMOVAL**

- a. Remove two bolts (8) from failsafe brake (9).
- b. Separate brake (9) from gear reducer coupling flange (11) by sliding brake shaft (10) out of gear reducer coupling (1). Use suitable soft-face hammer if necessary.
- c. Remove brake (9) and gasket (2).

---

**REPAIR**

Repair consists of replacing failsafe brake assembly (9) and gasket (2).

**NOTE**

The failsafe brake assembly is a candidate for direct exchange with the vendor.

---

**REPLACEMENT****NOTE**

Apply Permatex sealant to flange gasket prior to installation.

- a. Install gasket (2) onto gear reducer coupling flange (11).
- b. Insert brake shaft (10) into gear reducer coupling (1).
- c. Install two bolts (8) to failsafe brake (9).
- d. Align brake mounting boltholes with gasket (2) and coupling flange (11) in preparation for hydraulic motor assembly installation.
- e. Replace hydraulic motor assembly, paragraph 2-15.
- f. Restore equipment to operational condition and test (TM 55-1905-223-10).

---

**2-17. Repair Hydraulic Power Pack Assembly. (FIGURE 2-8, Sheets 1 and 2)**

---

This task covers: a. Inspection/Service, b. Disassembly, c. Repair, d. Assembly.

---

**INITIAL SETUP**Tools

Tool kit, general mechanic's,  
5180-00-699-5273  
Tool kit, electrical equipment,  
51:86,-66391-1087

Materials/Parts

Inspection cover gasket  
P/N HH80-3786-2  
Fluid filter head P/N SF-120-25-3  
Filter element PIN SE-10  
Suction strainer P/N SS-150-3  
Hydraulic pump PIN T6C-014-1-01-B1  
Alternating current motor  
P/N 10J98Z65-286TC  
Heater, reservoir  
P/N ARMTO-500th  
Breather P/N HC-120  
Liquid sight indicator P/N HSG-55  
Dial indicator pressure gauge  
P/N 25-310-0-5000  
Utility pail, Item 17, Appendix C  
Electrical tags, Item 16, Appendix C

Equipment Condition

System shut down and tagged "Out of  
Service - Do Not Operate." Reference  
TM 55-1905-223-10.

General Safety Instructions

Do not work on pressurized system.

---

**INSPECTION/SERVICE**

Inspection/service for the hydraulic power pack is covered. (See Item 5, PMCS, Table 2-1.)

**WARNING**

Do not attempt the following procedure on a pressurized system. Escaping pressurized air and/or liquids can cause serious injury.

Ensure system has been shut down IWA para. 2-13 and system pressure gauge reads zero.

Two soldiers required for this procedure. Exercise extreme caution when lifting heavy equipment.

**DISASSEMBLY****a. Reservoir Inspection Covers, Cover Gaskets.**

- (1) Remove drain plug (32) and drain hydraulic fluid from reservoir (38), using utility pail. Replace drain plug.
- (2) Use suitable size wrench and turn cover bolt (30) counterclockwise to remove inspection cover (31) from pump end of reservoir. Repeat removal procedure for inspection cover at ac motor end of reservoir.
- (3) Separate inspection cover gaskets (33) from each end of reservoir.

**b. Fittings.**

- (1) Disconnect couplers (40) at fluid filter head (13) and directional control valve (22) outlet port.
- (2) Remove couplers and pipe assembly.
- (3) Disconnect fittings (11) from fluid filter head (13) and directional control valve (22).
- (4) Remove fittings.

**c. Filter Element, Electric Indicator, Fluid Filter Head, Pipes.**

- (1) Unscrew filter element (48) and remove from fluid filter head (13).
- (2) Tag and disconnect electrical wiring from indicator (14) located in junction box above indicator (14).
- (3) Remove indicator from fluid filter head (13).
- (4) Disconnect fluid filter head (13) from adapter (50).
- (5) Use pipe wrench to disconnect adapter (50) from pipe elbow (49).
- (6) Use pipe wrench to disconnect pipe elbow (49) from pipe nipple (47).

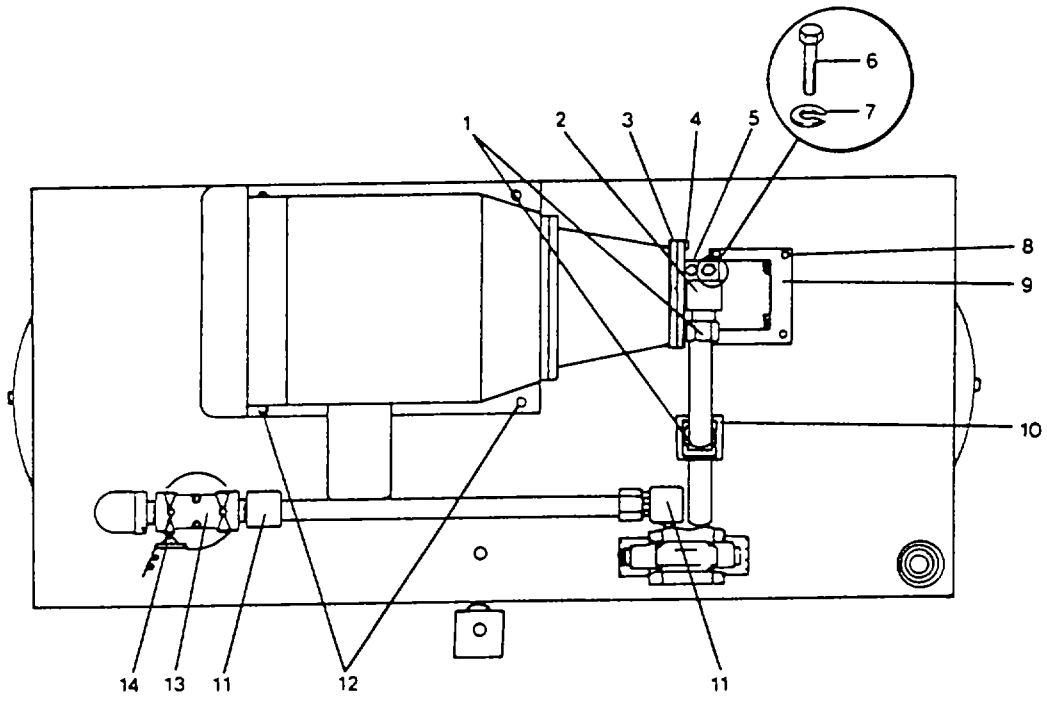


FIGURE 2-8. Hydraulic Power Pack Assembly (Sheet 1 of 2).

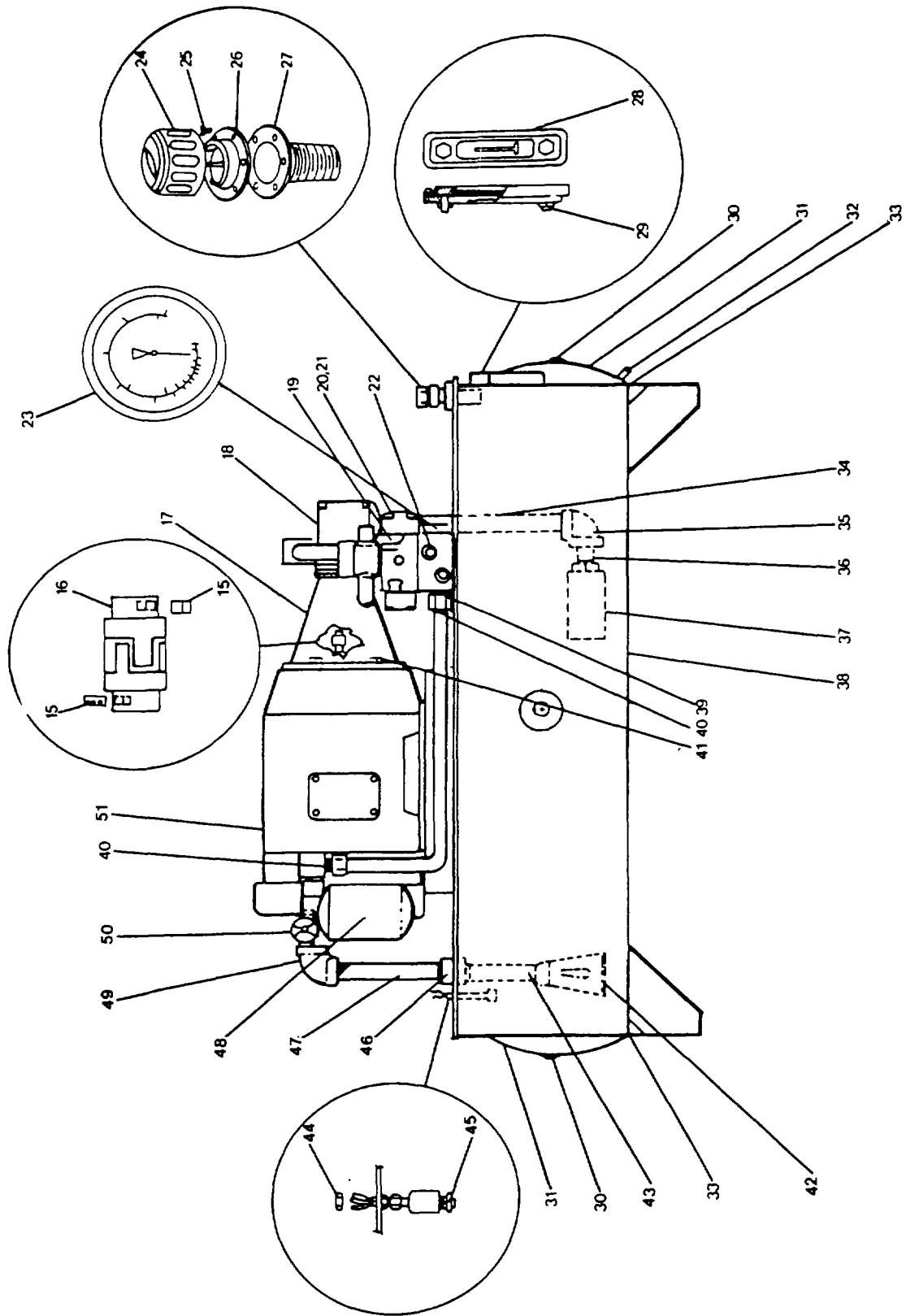


FIGURE 2-8. Hydraulic Power Pack Assembly (Sheet 2 of 2).

- (7) Use pipe wrench to disconnect pipe nipple (47) from welded coupler (46) section on top of reservoir.

**d. Return Line Diffuser, Pipes.**

- (1) Use wrench with 2-inch open end to disconnect return line diffuser (42) from pipe nipple (43).
- (2) Use pipe wrench to disconnect pipe nipple (43) from welded coupler (46) section on interior of reservoir.

- e. Relief Valve.** Remove relief valve (39) from directional control valve (22).

**f. Suction Line Flange, Suction Strainer, Pipes.**

- (1) Remove self-tapping screws (8) securing suction line flange (9) to top of reservoir.
- (2) Suction line flange is removed at step (9) below.
- (3) Use wrench with 2-1/4 inch opening to separate suction strainer (37) from adapter (36).
- (4) Use pipe wrench to separate adapter (36) from pipe elbow (35).
- (5) Use pipe wrench to separate pipe elbow (35) from metallic pipe (34).
- (6) Use pipe wrench to separate metallic pipe (34) from pump fitting (19).
- (7) Lower metallic pipe (34) into reservoir to clear suction line flange (9).
- (8) Remove metallic pipe.
- (9) Remove suction line flange from top of reservoir.

**CAUTION**

**During replace/repair of hydraulic systems, all openings should be capped/plugged to prevent foreign matter or contamination from entering the system.**

**g. Hydraulic Pipe Fittings.**

- (1) Remove capscrews (20) and lockwashers (21) securing pump fitting (19) to the hydraulic pump (18) and remove pump fitting.
- (2) Disconnect couplers (1) from fitting (2) at top of hydraulic pump (18) and top of fitting (10). Remove couplers and pipe assembly.
- (3) Disconnect fitting (2) at top port of hydraulic pump and fitting (10) at directional control valve (22). Remove fittings.

**h. Hydraulic Pump/Alternating Current Motor.**

- (1) Tag and disconnect electrical wiring to ac motor (51).
- (2) Remove mounting bolts (41) securing C-face adapter (17) to alternating current motor (51).
- (3) Separate C-face adapter/pump assembly ac motor mount. This procedure enables flexible shaft coupling jaws (16) to disengage as pump and motor shafts are separated.
- (4) Loosen setscrews (15) on flexible shaft couplings. Slide couplings off pump and motor shafts.
- (5) Remove four ac motor mounting bolts (12). Remove ac motor (51) and pump (18).

**i. Reservoir Level/Temperature Switch.**

- (1) Remove screws from cover.
- (2) Tag and disconnect electrical wiring to level/temperature switch (45).
- (3) Remove mounting nut (44) at top of reservoir.
- (4) From interior of reservoir, slide switch down and out of mounting hole. Remove switch (45).

**j. Breather.**

- (1) Unscrew air filter cap (24).
- (2) Remove mounting screws (25).
- (3) Separate and remove mounting flange (26) and nylon screen (27) from reservoir.

**k. Liquid Sight Indicator.**

- (1) Reaching into interior of reservoir, remove two mounting nuts (29) securing liquid sight indicator (28) to reservoir.
- (2) Remove liquid sight indicator from front of reservoir.

**l. Dial Indicator Pressure Gauge.**

- (1) Position wrench on mounting flange at back of pressure gauge (23).
- (2) Turn wrench counterclockwise to separate gauge from directional control valve (22).



**REPAIR****NOTE**

**This item is a candidate for direct exchange with the vendor.**

Repair consists of replacing: inspection cover gaskets (33), fluid filter head (13), filter element (48), suction strainer (37), pump (18), ac motor (51), breather (24), liquid sight indicator (28), dial indicator pressure gauge (23).

**ASSEMBLY****a. Dial Indicator Pressure Gauge.**

- (1) Install pressure dial indicator gauge (23) into mounting port using hand pressure.
- (2) Position wrench on mounting flange at back of pressure gauge (23) and secure gauge to directional control valve (22).

**b. Liquid Sight Indicator.**

- (1) Position liquid sight indicator (28) over mounting holes on exterior wall of reservoir.
- (2) Reaching into interior of reservoir, install two mounting nuts (29) and secure indicator to reservoir.

**c. Breather.**

- (1) Install nylon screen (27) into opening at top of reservoir.
- (2) Install mounting flange (26) over nylon screen with mounting screwholes aligned.
- (3) Install mounting screws (25) and secure mounting flange and nylon screen to top of reservoir.
- (4) Replace air filter cap (24).

**d. Reservoir Level/Temperature Switch.**

- (1) From interior of reservoir, slide threaded portion of switch (45) up through mounting port at top of reservoir.
- (2) With switch held in position, secure switch to reservoir with mounting nut (44) installed at top of reservoir.

- (3) Connect electrical wiring to level/temperature switch.
- (4) Install cover with screws.

**e. Hydraulic Pump/Alternating Current Motor.**

- (1) Place ac motor (51) on top of reservoir (38) and secure with four mounting bolts (12). Do not tighten at this time.
- (2) Install flexible shaft coupling jaws (16) on pump and motor shafts. Ensure that flexible shaft couplings are aligned accurately both parallel and angularly.
- (3) Secure setscrews (15) to secure flexible shaft coupling jaws on pump and motor shafts.
- (4) Position C-face adapter (17) and pump assembly (18) over flexible shaft coupling jaws (16) and aligned with boltholes on ac motor mount. This procedure enables flexible shaft coupling jaws to engage as pump and motor shafts are mated.
- (5) Install mounting bolts (41) to secure C-face adapter (17) to alternating current motor (51).
- (6) Connect electrical wires as tagged.
- (7) Secure ac motor mounting bolts (12).

**NOTE**

**Remove protective caps/plugs from hydraulic lines prior to installation.**

**f. Hydraulic Pipe Fittings.**

- (1) Connect fitting (10) at directional control valve (22) and fitting (2) at top port of hydraulic pump (18).
- (2) Position pipe assembly and couplers (1) for installation.
- (3) Connect couplers (1) at top of fitting (10) and at fitting (2) at top of hydraulic pump (18).
- (4) Position pump fitting (19) on hydraulic pump with mounting holes aligned.
- (5) Install lockwasher-s (21) and hex head capscrews (20) and secure pump fitting (19) to pump.

**g. Suction Line Flange, Pipes, Suction Strainer.**

- (1) Position suction line flange (9) over opening on reservoir with mounting screw holes aligned. Self-tapping screws are installed at step (5) below.
- (2) Direct metallic pipe (34) through opening in suction line flange (9) and into pump fitting (19). Use pipe wrench to secure metallic pipe to pump fitting.
- (3) Use pipe wrench to connect elbow (35) to metallic pipe (34) and adapter (36) to elbow (35).
- (4) Use wrench with 2-1/4 inch open end to connect suction strainer (37) to adapter (36).
- (5) Install self-tapping screws (8) and secure suction line flange (9) to top of reservoir.

**h. Relief Valve.** Install relief valve (39) on directional control valve (22).

**i. Pipes, Return Line Diffuser.**

- (1) Use pipe wrench to connect pipe nipple (43) to welded coupler section (46) on interior of reservoir.
- (2) Use wrench with 2-inch open end to connect return line diffuser (42) to pipe nipple (43).

**j. Fluid Filter Head, Electric Indicator, Filter Element.**

- (1) Use pipe wrench to connect pipe nipple (47) to welded coupler (46) section on top of reservoir.
- (2) Use pipe wrench to connect pipe elbow (49) to pipe nipple (47).
- (3) Use pipe wrench to connect adapter (50) to pipe elbow.
- (4) Install fluid filter head (13) to adapter (50).
- (5) Install electric indicator (14) on fluid filter head.
- (6) Connect electrical wiring to electric indicator and remove tags.
- (7) Install filter element (48) on fluid filter head (13).

**k. Fittings.**

- (1) Connect fittings (11) at directional control valve (22) and fluid filter head (13).
- (2) Position pipe assembly and couplers for installation.

- (3) Connect couplers (40) at directional control valve (22) outlet port and fluid filter head (13).

**I. Cover Caskets, Reservoir Inspection Covers.**

- (1) Install inspection cover (31) and gaskets (33) on each end of reservoir.
- (2) Use suitable size wrench and turn cover bolt (30) clockwise to secure gasket and cover to reservoir. Repeat installation procedure for inspection cover at ac motor end of reservoir.
- (3) Fill reservoir with hydraulic fluid.

**CAUTION**

**To prevent possible damage to the internal parts, the pump should never be started dry or without internal lubrication.**

- (4) Disconnect coupler (1) from fitting (2) at top of hydraulic pump (18).
- (5) Disconnect fitting (2) at top port of hydraulic pump.
- (6) Fill pump housing with hydraulic fluid.
- (7) Replace fitting (2) at top port of hydraulic pump.
- (8) Connect coupler (1) to fitting (2).

**m. Restore equipment to operational condition (Reference TM 55-1905-223-10).**

---

**2-18. Replace Directional Control Valve. (FIGURE 2-9)**

---

This task covers: a. Removal, b. Replacement.

---

**INITIAL SETUP****Tools      Equipment Condition**

Tool kit, general mechanic's,  
5180-00-699-5273

System shut down, and tagged "Out of  
Service - Do Not Operate."  
Reference TM 55-1905-223-10.

**Materials/Parts**

Directional control valve  
A-3D03-33-BOI-03-03-14CS  
Electrical tags, Item 16, Appendix C

---

**WARNING**

**Do not attempt the following procedure on a pressurized system. Escaping pressurized air and/or liquids can cause serious injury.**

**REMOVAL****a. Remove Hydraulic Pipe Fittings.****CAUTION**

**During replace/repair of hydraulic systems, all openings should be capped/plugged to prevent foreign matter or contamination from entering the system.**

- (1) Disconnect pipe fittings from port A (15) and port B (14) on subplate (16).
- (2) Disconnect couplers (1 and 3) from fittings (2 and 4).
- (3) Disconnect fitting (2) from directional control valve (12).

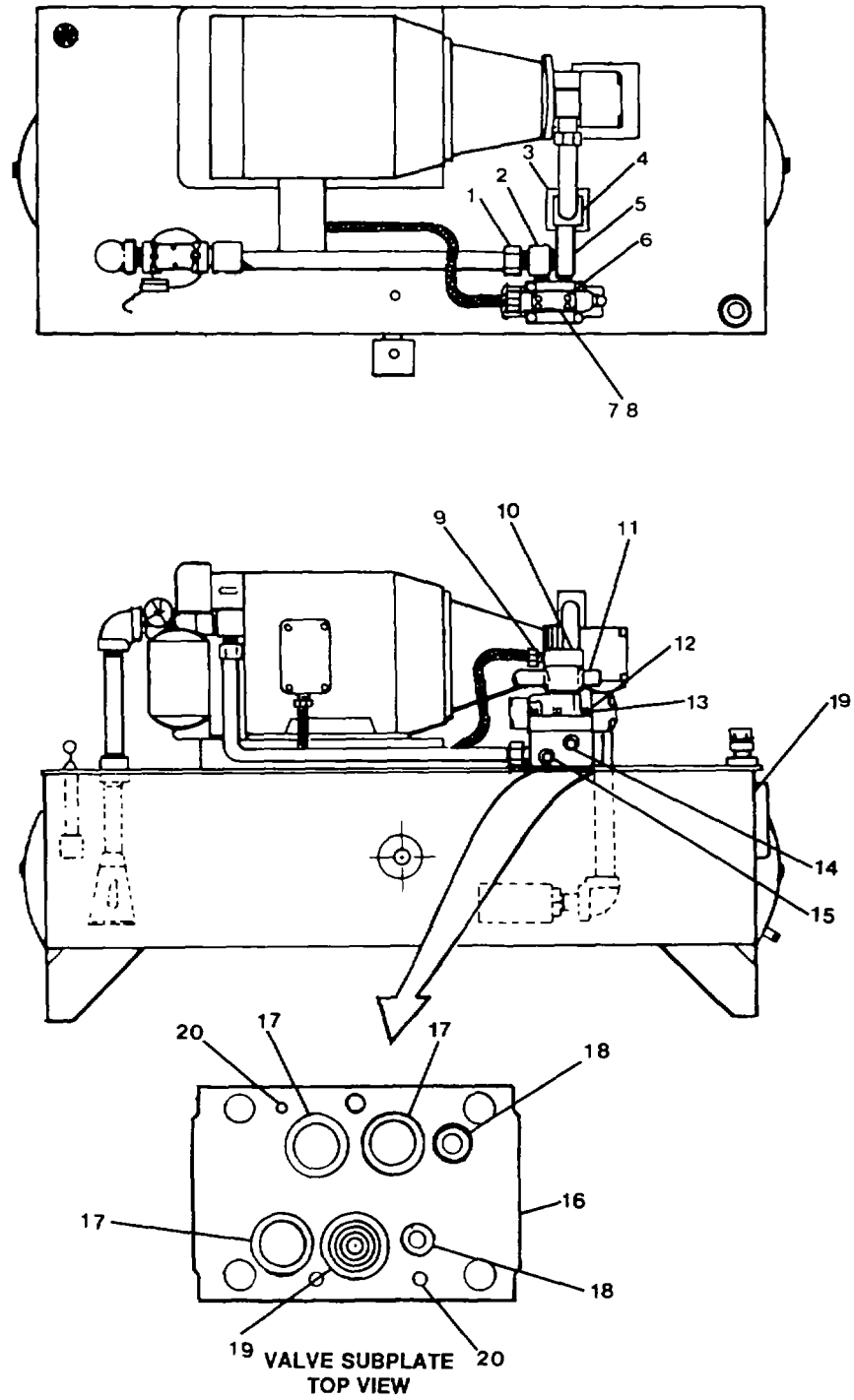


FIGURE 2-9. *Directional Control Valve Component Location.*

- (4) Disconnect pipe nipple (5) and fitting (4) from directional control valve.

**b. Remove Directional Control Valve.**

- (1) Remove machine screws (6) securing symbol plate (7) and preformed packing (8) to wiring box (10). Remove symbol plate and preformed packing.
- (2) From wiring box (10), identify, tag and disconnect electrical wire connections to electrical solenoid (11).
- (3) Disconnect conduit nut (9) from wiring box (10).
- (4) Remove conduit assembly and electrical wire connections from wiring box.
- (5) Remove mounting screws (13) securing directional control valve (12) to subplate (16).
- (6) Separate directional control valve from subplate (16).
- (7) Remove preformed packing (17, 18, 19) and spring pins (20) from subplate (16).
- (8) Install protective covering over subplate ports to prevent entry of dirt.

---

**REPLACEMENT**

**a. Install Directional Control Valve.**

- (1) Remove protective covering from subplate (16) ports.
- (2) Position preformed packing (17, 18, 19) and spring pins (20) in subplate (16).
- (3) Position directional control valve (12) on subplate (16). Ensure that preformed packing and spring pins are properly aligned.
- (4) Install mounting screws (13) and secure directional control valve to subplate (16).

**NOTE**

**Remove thread protective plug from wiring box prior to conduit installation.**

- (5) Position conduit assembly and electrical wire connections at wiring box (10).

- (6) Pull electrical wiring through opening in wiring box.
- (7) Secure conduit nut (9) to wiring box.
- (8) From wiring box (10), connect electrical wire connections to electrical solenoid (11) as tagged.
- (9) Position preformed packing (8) and symbol plate (7) on wiring box (10) and aligned over screw holes.
- (10) Install machine screws (6) and secure symbol plate to wiring box.

**b. Install Hydraulic Pipe Fittings.**

**NOTE**

**Remove protective caps/plugs from hydraulic lines prior to installation.**

- (1) Connect pipe nipple and fitting (5, 4) to directional control valve (12).
- (2) Connect fitting (2) to directional control valve (12).
- (3) Connect couplers (1) and (3) to fittings (2) and (4).
- (4) Connect pipe fittings to port A (15) and port B (14) on directional control valve (12).

**c. Restore equipment to operational condition. (Reference TM 55-1905-223-10.)**



**SECTION VI. PREPARATION FOR STORAGE OR SHIPMENT**

**2-19. Administrative Storage.** Prepare the winch assembly for storage in accordance with the following instructions:

- a. Gearbox. It is always preferable to store speed reducers indoors. When this is not possible, or when storage is for a period longer than 1 year, follow these instructions.
  - (1) Reducers should never be exposed to the elements. They must be protected from the elements in some manner. If stored outdoors, cover with a tarp that can be secured to the base of the reducer housing.
  - (2) Remove plug from breather hole and attach a sufficient length of pipe to extend above the highest part of the speed reducer.
  - (3) Cap the pipe (pipe cap should be drilled and tapped for alemite fitting) and install alemite #317400 fitting to relieve potential internal pressure.
  - (4) Fill reducer completely with a heavy rust inhibitor such as Gulf No-Rust Engine Oil, Grade 3, which conforms to Military Specification MIL-L-21260.
  - (5) At least every 3 months rotate input shaft. Be sure the output shaft rotates more than one revolution. This is done to ensure all internal parts are coated with fresh oil and that the shaft seals are free and the seal journals are coated with oil.
  - (6) At least every 3 months check the speed reducer for water condensation by removing lowest drain plug and allowing small amount of oil to drain from the oil sump. All water that may have accumulated will be at bottom of reducer housing and will drain out first.
  - (7) Check all exposed fittings and shaft projections every 3 months for integrity of the protective coating. Reapply coating if required, to prevent possible corrosion of shafts. Use Cosmoline 11-2 MIL-C-16173 Grade 2 or equivalent.

Before starting the reducer, be sure to drain preservative oil and refill to proper level with the appropriate oil listed in the lubrication instructions.

**b. Hydraulic Power Pack.**

- (1) Remove electrical power from the Hydraulic Power Pack and tag "Out of Service - Do Not Operate."
- (2) Drain hydraulic fluid from the reservoir (paragraph 2-17). Attach a tag stating that the reservoir has been drained and unit cannot be operated until refilled.

- (3) If stored outside, tape all pipe openings and cover with a tarp that can be secured at the base of the reservoir.
- c. Non-painted Winch Components. Treat all exposed parts with Cosmoline 1102 MIL-C-16173 Grade 2 or equivalent.

**CHAPTER 3**

**INTERMEDIATE DIRECT SUPPORT MAINTENANCE INSTRUCTIONS**

There are no direct support maintenance procedures authorized by the Maintenance Allocation Chart.

**3-1/(3-2 blank)**

CHAPTER 4

INTERMEDIATE GENERAL SUPPORT MAINTKNANCE INSTRUCTIONS

	<u>Page</u>
Section I. Repair Parts, Special Tools; Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment .....	4-1
Section II. Service Upon Receipt.....	4-1
Section III. Intermediate General Support Preventive Maintenance Checks and Services (PMCS).....	4-2
Section IV. Intermediate General Support Troubleshooting .....	4-2
Section V. Intermediate General Support Maintenance Procedures .....	4-3
Section VI. Preparation for Storage or Shipment.....	4-93

**SECTION I. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT**

4-1. **Common Tools and Equipment.** For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your organization.

4-2. **Special Tools, TMDE, and Support Equipment.** Special tools; test, measurement, and diagnostic equipment; and support equipment requirements are listed and illustrated in the Repair Parts and Special Tools List (RPSTL), TM 55-1905-223-24P. These items are also listed in the Maintenance Allocation Chart (MAC), Appendix B of this manual.

4-3. **Repair Parts.** Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL), TM 55-1905-223-24P.

**SECTION II. SERVICE UPON RECEIPT**

4-4. **Checking Unpacked Equipment.**

- a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage in accordance with the instructions of DA Pam 738-750.
- b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.
- c. Check to see whether the equipment has been modified.

- d. Remove protective caps, plugs, inserts, wrappings, and tape when inspection/inventory is completed. Inspect piping openings for damage. Wipe off dirt, grease, or protective films at time of installation.
- e. Remove chocks from resilient mounted components.

4-5. **Deprocessing and Preliminary Servicing.** See Chapter 2, Section II.

4-6. **Initial Setup Procedure.** Includes operational checks and inspections that are not performed for a routine startup. Direct support maintenance personnel will perform initial setup in accordance with the operator's manual, TM 55-1905-223-10.

4-7. **Normal Startup.** Refer to the operator's manual, TM 55-1905-223-10.

4-8. **Shutdown Procedure (Usual or Unusual).** Refer to the operator's manual, TM 55-1905-223-10.

**SECTION III. INTERMEIATE GENERAL SUPPORT PREVENTIVE  
MAINTENANCE CHECKS AND SERVICES (PMCS)**

4-9. **PMCS.** There is no PMCS at the general support level. See Chapter 2, Section III.

**SECTION IV. INTERMEDIATE GENERAL SUPPORT TROUBLESHOOTING**

4-10. **Troubleshooting.** Both a symptom index and a troubleshooting table are provided. The symptom index will help you locate the information you need for troubleshooting.

**SYMPTOM INDEX**

	Troubleshooting Procedure (Table 4-1)
<b>HYDRAULIC SYSTEM</b>	
Temperature too high	Item 1
No or low hydraulic pressure	Item 3
External hydraulic fluid leakage	Item 4
<b>WINCH</b>	
Rotates too slow/will not rotate	Item 2

Table 4-1 lists the common fault conditions that may be found during operation or maintenance of the equipment. This table assumes that all corrective measures listed in Table 2-2 have been taken and the problem still persists. Look for causes and do corrective actions in the order listed. This manual cannot list every symptom that may show up, and it cannot list all of the possible causes and corrective actions. If a symptom is not listed, or if it keeps up after you have performed the corrective actions, notify your supervisor.

**Table 4-1. Troubleshooting**

<b>Malfunction</b>	<b>Test or Inspection</b>	<b>Corrective Action</b>
1. Excessive temperature in hydraulic system.	STEP 1.	Check for air in hydraulic system and defective shaft seal. Replace shaft seal plate in hydraulic motor (para. 4-14).
2. Winch rotates too slow or will not rotate.	STEP 1.	Check for defective brake reducer mount. Replace brake reducer mount (para. 4-13 item u).
	STEP 2.	Check for defective brake reducer coupling (para. 4-13 item v).
	STEP 3.	Check to see if the winch shaft is binding. Replace winch (para. 4-13).
	STEP 4.	Check for noise coming from the gearbox. Replace gearbox (para. 4-16).
3. Hydraulic power pack delivers no pressure or low pressure.	STEP 1.	Check for defective hydraulic pump shaft. Replace hydraulic pump shaft (para. 4-19).
	STEP 2.	Check for broken parts inside the hydraulic pump.
	a.	Repair the hydraulic pump (paragraph 3-18).
	b.	Replace the power pack (para. 4-17).
4. External hydraulic fluid leakage around hydraulic pump shaft or housing.	STEP 1.	Check for defective hydraulic shaft seal or pump shaft. Repair hydraulic pump (para. 4-19).

**SECTION V. INTERMEDIATE GENERAL SUPPORT MAINTENANCE PROCEDURES**

4-11. **General.** This section covers intermediate general support maintenance procedures for the stern anchor winch assembly. Principles of operation of the assembly are discussed in Chapter 1, Section III. Step-by-step procedures, supported by illustrations where necessary, are provided for removal, disassembly, inspection, cleaning, repair, assembly and replacement as detailed in the following paragraphs.

<b>MAINTENANCE OF STERN ANCHOR WINCH</b>
------------------------------------------

**4-12. Replace/Repair Stern Anchor Winch Subsystem.**


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This task covers: a. Removal, b. Repair, c. Replacement.

---

**INITIAL SETUP****Tools**

Tool kit, general mechanic's,  
5180-00-699-5273  
Tool kit, electrical equipment,  
5180-00-391-1087  
Tool kit, measuring machinist's,  
5280-01-278-9919  
Torque wrench (30-300 inch-pound),  
5120-01-092-3278  
Torque wrench (30-300 foot-pound),  
5120-01-125-5190  
Lifting sling 3375958

**Materials/Parts**

Shackle P/N G-210,  
Turnbuckle P/N G-227  
Detachable chain link  
P/N 49-9141-0000  
Fluked marine anchor  
P/N 49-0831-0000  
Swivel and link assembly  
P/N 49-9145-0000  
Shackle P/N 43-4120-8070  
Single leg wire rope assembly  
P/N 43-i346-0000  
Machine bolt P/N 41-4898-2030  
Stern anchor winch assembly  
P/N 540-HAW-15/7.5  
Shim stock  
Empty wire rope reel and stand

**REMOVAL**

- a. Detachable Chain Link. (FIGURE 4-1)
- (1) Remove lead pellet (20) from body of detachable chain link (12) with a pointed object.

**Equipment Condition**

Operational.  
Stern anchor secured by turnbuckle when  
FIGURE 4-1 items (12), (13), (14), and  
(16) are repaired.  
Stern anchor secured by winch when  
FIGURE 4-1 items (6), (7), and (8) are  
repaired.

**General Safety Instructions**

Do not work on pressurized equipment.

Be very careful when lifting heavy  
equipment.

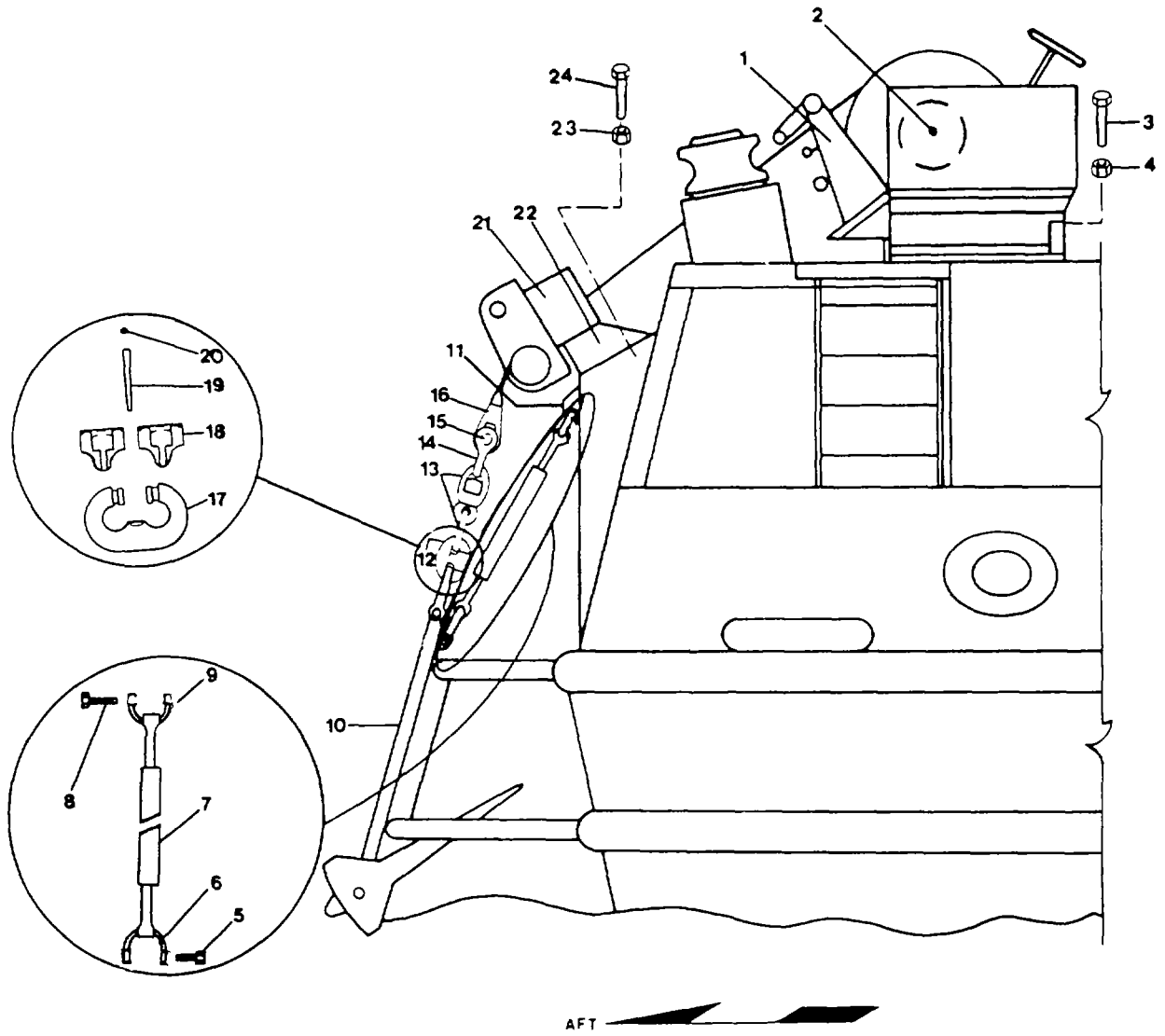


FIGURE 4-1. Stern Anchor Subsystem.



- (2) Drive tapered forelock pin (19) out of detachable chain link body with a punch.
- (3) Detach lugs (18) from detachable chain link body (17).
- (4) Separate anchor (10) and swivel and link assembly (13) from detachable link body (17).
- (5) Remove detachable chain link body and attaching assembly.

**b. Swivel and Link Assembly, Shackle.** (FIGURE 4-1)

- (1) Remove shackle pin (15) from shackle (14).
- (2) Separate swivel and link assembly (13) and single leg wire rope assembly (16) from shackle (14).
- (3) Remove shackle (14), pin (15) and swivel and link assembly (13).

**c. Fluked Marine Anchor.** (FIGURE 4-1)

- (1) Insert sling through mounting eye on anchor (10) and attach to lifting device.
- (2) Lift anchor to release tension on turnbuckle (7).
- (3) Remove shackle pin (5) from shackle (6).
- (4) Separate anchor (10) from turnbuckle (7).
- (5) Remove shackle (6).
- (6) Lower anchor until fluked end of anchor clears storage position.
- (7) Lift anchor clear of stern and secure on dock or deck.

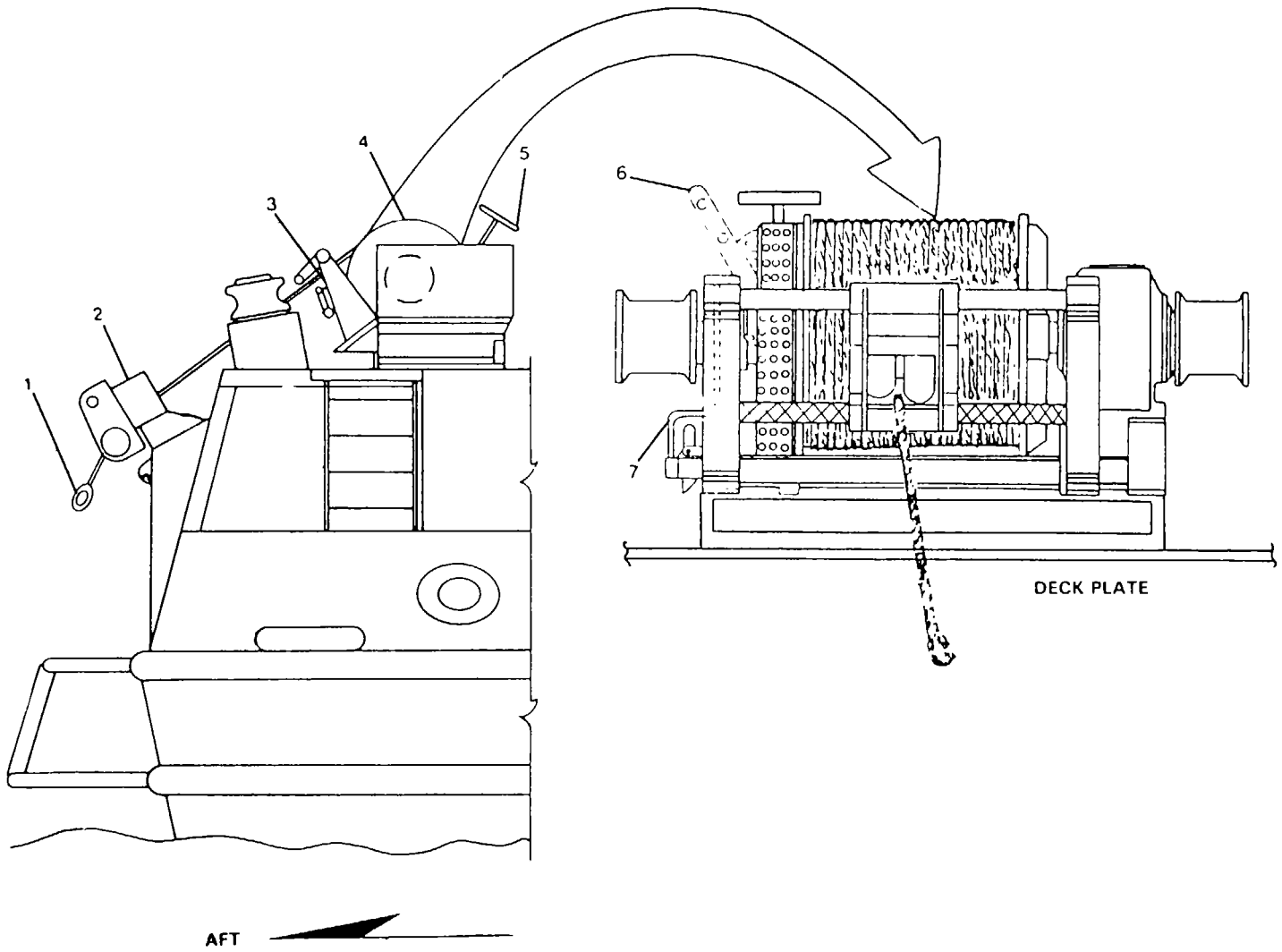
**d. Turnbuckle.** (FIGURE 4-1)

- (1) Remove shackle pin (8) from shackle (9).
- (2) Separate eye of turnbuckle (7) from pad eye (11).
- (3) Remove shackle (9), and turnbuckle (7).

**e. Single Leg Wire Rope Assembly.** (FIGURE 4-2)

- (1) Use lifting sling to position empty reel on a stand at dockside.
- (2) Remove lifting sling.
- (3) On bulkhead directly behind winch assembly, push START button on stern control box.

FIGURE 4-2. Winch Assembly.  
4-7



- (4) At winch assembly, disengage locking device from spool flange by operating dog lever (7).
- (5) Engage clutch lever (6) to engage spool (4).
- (6) Slowly unscrew brake wheel (5) counterclockwise.
- (7) On stern control box, move control switch to HAULBACK mode and haul single end wire rope assembly (1) up and through fairlead with roller swivel (2), levelwind carriage (3) and travel completed at spool (4).
- (8) Attach end of wire rope assembly (1) to empty reel.
- (9) On stern control box, move control switch to PAYOUT mode to transfer wire rope assembly from spool to empty reel.
- (10) Maintain tension on wire rope at empty reel.

**NOTE**

**Transfer of wire rope assembly is from top of spool to top of empty reel.**

- (11) On stern control box, move control switch to neutral when wire rope transfer completed.
- (12) Release clamp provided in flange from end of wire rope on spool and secure remaining wire to reel.
- (13) Use lifting device and sling to remove reel containing wire rope to a clear area.

**f. Fairlead With Roller Swivel.** (FIGURE 4-1)

- (1) Attach lifting sling to fairlead with roller swivel (21).
- (2) Remove ten self-locking hexagon nuts (23) and machine bolts (24) from mounting pad (22).
- (3) Lift fairlead with roller swivel to a secure area.

**g. Stern Anchor Winch.** (FIGURE 4-3)

**CAUTION**

**During replace/repair of hydraulic systems, all openings should be capped/plugged to prevent foreign matter or contamination from entering the system. Mark any shims installed between the winch and deck for reinstallation.**

- (1) Disconnect hydraulic pipe connectors (2, 6, and 7) from hydraulic lines 3, 4, and 5) on deck plate at base of hydraulic pump assembly (1).

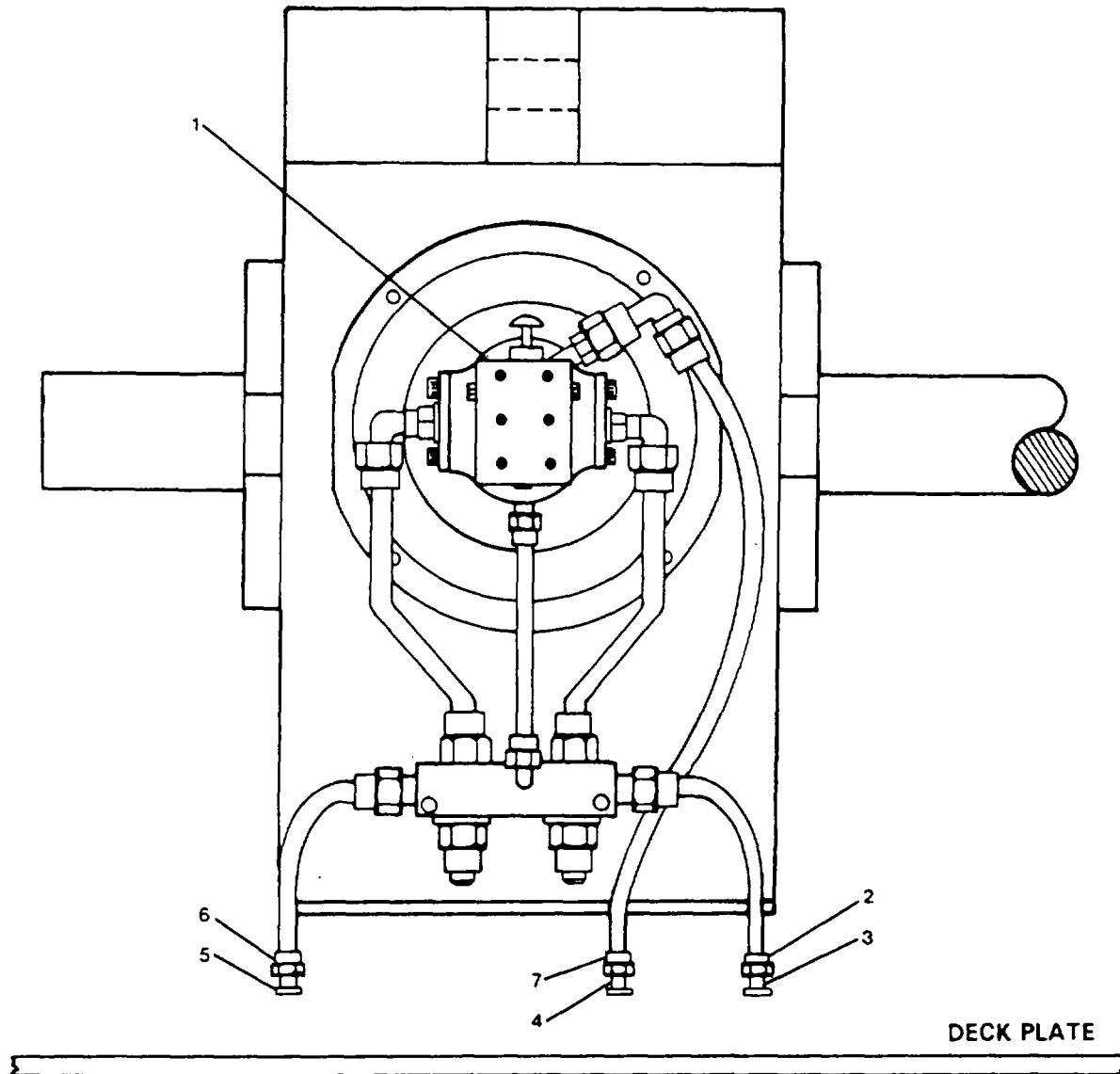


FIGURE 4-3. *Hydraulic Motor Assembly Line Connections.*

- (2) Attach four legged sling to lifting points (FIGURE 4-4).

**CAUTION**

**Keep four legged sling clear of all winch components to prevent damage when lifting.**

- (3) Remove fourteen 1-1/4 in. mounting machine bolts and self-locking hexagon nuts (3, 4, FIGURE 4-1) securing stern anchor winch to mounting platform.

**WARNING**

**Improper lifting/hoisting heavy/bulky items presents hazards to equipment and personnel.**

**Never hoist equipment or cargo over personnel. Ensure proper supervision and lifting techniques are employed at all times.**

**Ensure working areas are cleared of all personnel except those involved with lifting/hoisting operations.**

- (4) Lift winch and position in a clear area.
- (5) Remove four legged sling.

**REPAIR** (FIGURE 4-1)

Repair consists of replacing: shackle (6), detachable chain link (12), turn-buckle (7), fluked marine anchor (10), swivel and link assembly (13), shackle (14), single leg wire rope assembly (16), machine bolts (24), and stern anchor winch assembly (1).

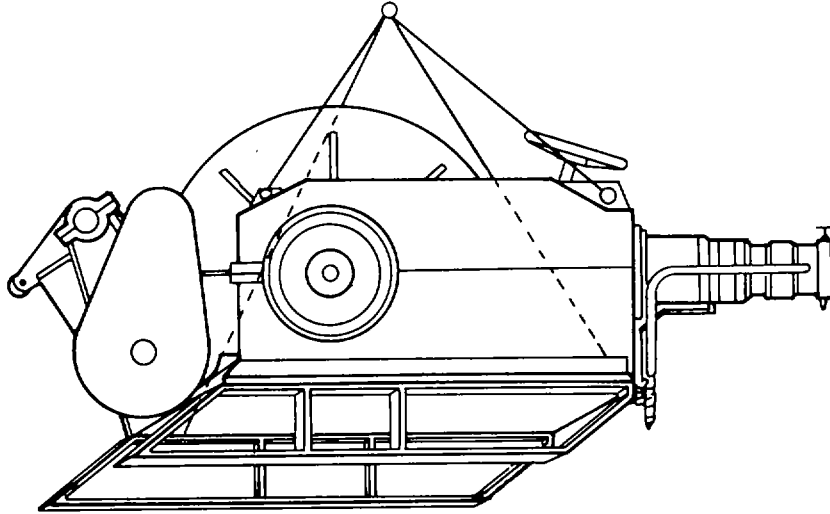
**REPLACEMENT**

a. Stern Anchor Winch.

- (1) Attach four legged sling to lifting points (FIGURE 4-4).

**CAUTION**

**Keep four legged sling clear of all winch components to prevent damage when lifting.**



*FIGURE 4-4. Stern Anchor Winch Lifting Points.*

**WARNING**

**Improper lifting/hoisting heavy/bulky items presents hazards to equipment and personnel.**

**Never hoist equipment or cargo over personnel. Ensure proper supervision and lifting techniques are employed at all times.**

**Ensure working areas are cleared of all personnel except those involved with lifting/hoisting operations.**

**NOTE**

**Reposition any previously removed shims.**

- (2) Lift winch and position winch on mounting platform and check for surface contact at all bolt pads.

**CAUTION**

**Do not pull winch down to platform. Shim the winch properly to keep from bending the winch frame and causing misalignment of gears or other operating mechanism.**

- (3) If gaps exist between bolt pads and mounting platform, shim up to bolt pads.
- (4) Secure winch to mounting platform using fourteen 1-1/4 in. Diameter mounting machine bolts and self-locking hexagon nuts (3, 4, FIGURE 4-1).
- (5) Torque bolts to 550 ft-lb (748 N-m).
- (6) Remove four legged sling.

**NOTE**

**Remove protective caps/plugs from hydraulic lines prior to installation.**

- (7) Connect hydraulic hose connectors (2, 6, and 7) to hydraulic lines (3, 4, and 5) on deckplate at base of hydraulic pump assembly (1).
- (8) Operate and test stern anchor winch. Refer to paragraph 2-12.

**b. Fairlead With Roller Swivel.** (FIGURE 4-1)

- (1) Attach lifting device and sling to fairlead with roller swivel (21).
- (2) Lift fairlead with roller swivel into position over mounting pad and align with boltholes.
- (3) Install ten machine bolts (1) and self-locking hexagon nuts (2) and secure fairlead with roller swivel to mounting pad (22).
- (4) Remove lifting device and sling.
- (5) Grease fairlead with roller swivel (LO 55-1905-223-12).

**c. Single Leg Wire Rope Assembly.** (FIGURE 4-2)

- (1) Use lifting device and sling to position full reel containing new single end wire rope assembly on stand at dockside.
- (2) Pull sufficient amount of wire rope off reel.
- (3) Direct end of wire rope through levelwind carriage (3).
- (4) Attach end of wire rope to spool with clamp provided in flange.

**NOTE**

**Transfer of wire rope assembly is from top of reel to top of empty spool.**

- (5) On bulkhead directly behind winch assembly, push START button on stern control box.
- (6) At winch assembly, ensure that locking device is released from spool flange when dog lever (7) and clutch lever (6) is engaged.
- (7) Slowly unscrew brake wheel (5) counterclockwise.
- (8) On stern control box, move control switch to HAULBACK mode to transfer wire rope assembly from reel to empty spool.
- (9) Maintain tension on wire rope at reel.
- (10) On stern control box, move control switch to neutral when wire rope transfer completed at levelwind carriage (3).
- (11) Use lifting device and sling to remove empty reel and stand to a secure area.
- (12) On stern control box, move control switch to PAYOUT mode. Direct end of wire rope assembly (1) through fairlead with roller swivel (2).



- (13) On stern control box, move control switch to neutral when wire rope travel through fairlead with roller swivel (2) is completed.

**d. Turnbuckle.** (FIGURE 4-1)

- (1) Position turnbuckle (7) at pad eye (11).
- (2) Remove pin (8) and install shackle (9) through turnbuckle (7).
- (3) Position turnbuckle and shackle over pad eye (11).
- (4) Secure shackle (9) to pad eye (11) with shackle pin (8).

**e. Fluked Marine Anchor.** (FIGURE 4-1)

- (1) Lift anchor clear of dock or deck area.
- (2) Position anchor over storage area aft; then lower anchor until fluked end of anchor clears storage position; then raise to the storage position.
- (3) Position turnbuckle (7) at eye on anchor (10).
- (4) Remove pin (5) and install shackle (6) through turnbuckle (7).
- (5) Position turnbuckle and shackle eye mounting eye on anchor.
- (6) Secure shackle (6) to anchor with shackle pin (5).
- (7) Tighten turnbuckle.
- (8) Remove lifting device and sling.

**f. Shackle, Single Leg Wire Rope Assembly.** (FIGURE 4-1)

- (1) Remove pin (15) from shackle (14).
- (2) Install shackle (14) through swivel section of swivel and link assembly (13).
- (3) Position swivel and link assembly (13) and shackle (14) on single leg wire rope assembly (16).
- (4) Secure shackle (14) to single leg wire rope assembly (16) with shackle pin (15).

**g. Detachable Chain Link.** (FIGURE 4-1)

- (1) Connect anchor (10) and link section of swivel and link assembly (13) with detachable chain link body (17).
- (2) Attach lugs (18) to detachable chain link body (17).
- (3) Drive tapered forelock pin (19) into detachable chain link body with a hammer.

- (4) Install lead pellet (20) into body of detachable chain link (12) with a hammer.
- (5) On stern control box, momentarily move control switch to HAULBACK mode to take up slack in wire rope.

**h. Perform Operational Test.**

Refer to the operator's manual, TM 55-1905-223-10.

**4-13. Replace/Repair Stern Anchor Winch Assembly.**

This task covers: a. Removal, b. Disassembly, c. Repair, d. Assembly,  
e. Replacement.

**INITIAL SETUP****Tools**

Tool kit, general mechanic's,  
5180-00-699-5273  
Torque wrench (30-300 inch-pound),  
5120-01-092-3278  
Torque wrench (30-300 foot-pound),  
5120-01-125-5190  
Lifting sling 3375958  
Bearing puller,  
5120-00-595-9304  
Bearing press,  
4920-00-373-9376

**Material/Parts**

Stern anchor winch assembly,  
P/N 540-HAW-15/7.5  
Chain P/N 60RIV1OFTCH  
Bearing P/N CL-25-2  
Wheel sprockets P/N 60B28, 60B48,  
and 60B77, 60A48  
Shaft, Guide  
P/N 540-HAW-1.5/7.5-044  
Pawl, Diamond Shaft  
P/N 540-HAW-1.5/7.5-054  
Shaft, Roller, Horiz  
P/N 540-HAW-1.5/7.5-037  
Roller, Horiz., Levelwind  
P/N 540-HAW-1.5/7.5-035  
Bushing, Roller, Horiz.  
P/N 540-HAW-1.5/7.5-036  
Shaft, Roller, Vertical  
P/N 540-HAW-1.5/7.5-040  
Roller, Vertical, Levelwind  
P/N 540-HAW-1.5/7.5-038  
Bushing, Roller, Vertical  
P/N 540-HAW-1.5/7.5-039  
Bushing, Levelwind  
P/N 540-HAW-1.5/7.5-034  
Cathead, Gypsy Winch  
P/N 540-HAW-1.5/7.5-002  
Coupling, Reducer/Brake  
P/N 540-HAW-1.5/7.5-072

**Equipment Condition**

TM 55-1905-223-10, stern anchor winch shut  
down, tagged "Out of Service - Do Not  
Operate."

Refer to the following paragraphs in this  
maintenance manual:

Single leg wire rope assembly removed,  
paragraph 4-12.

**General Safety Instructions**

Do not work on pressurized system.

Be very careful when lifting heavy  
equipment.

Material/Parts - CONT

Pin, Brake Band, Split  
 P/N 540-HAW-1.5/7.5-083  
 Band, Brake  
 P/N 540-HAW-1.5/7.5-022  
 Lining, Band, Brake  
 P/N 540-HAW-1.5/7.5-023  
 Screw, Brass  
 P/N 540-HAW-1.5/7.5-024  
 Nut, Self Locking  
 P/N 540-HAW-1.5/7.5-025  
 Bolt, Shoulder  
 P/N 540-HAW-1.5/7.5-020  
 Spacer, Pillow Block End  
 P/N 540-HAW-1.5/7.5-009  
 Spring, P/N E 1000-115-2500S

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REMOVAL

- a. Chain (Levelwind). (FIGURES 4-5 and 4-6)
  - (1) Remove attaching hardware securing outer sprocket guard (1, FIGURE 4-5) to winch assembly.
  - (2) Remove attaching hardware securing inner sprocket guard (2, FIGURE 4-5) to winch assembly.
  - (3) Remove retaining clip (10, FIGURE 4-6) from detachable link (9, FIGURE 4-6).
  - (4) Disengage detachable link.
  - (5) Remove levelwind chain (2, FIGURE 4-6) from wheel sprockets (1, 3, FIGURE 4-6).
- b. Chain (Drive). (FIGURE 4-6)
  - (1) Remove retaining clip (7) from detachable link (6).
  - (2) Disengage detachable link.
  - (3) Remove chain (5) from wheel sprockets (4, 8).
- c. Wheel Sprocket (60B28). (FIGURE 4-7)
  - (1) Loosen setscrew.
  - (2) Withdraw wheel sprocket (2) from shaft (3).

d. Wheel Sprocket (60B48). (FIGURE 4-7)

- (1) Loosen setscrew.
- (2) Withdraw wheel sprocket (4) from shaft (3).

e. Wheel Sprocket (60B77). (FIGURE 4-7)

NOTE

Two soldiers are required for removal procedure.

- (1) Loosen setscrew.
- (2) Withdraw wheel sprocket (5) from shaft (6).

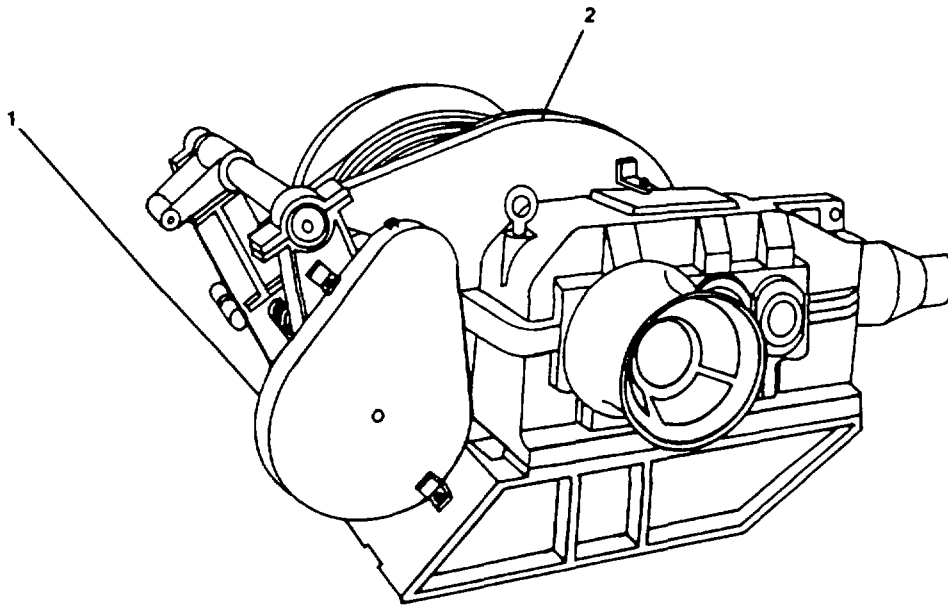


FIGURE 4-5. Inner/Outer Sprocket Guards.

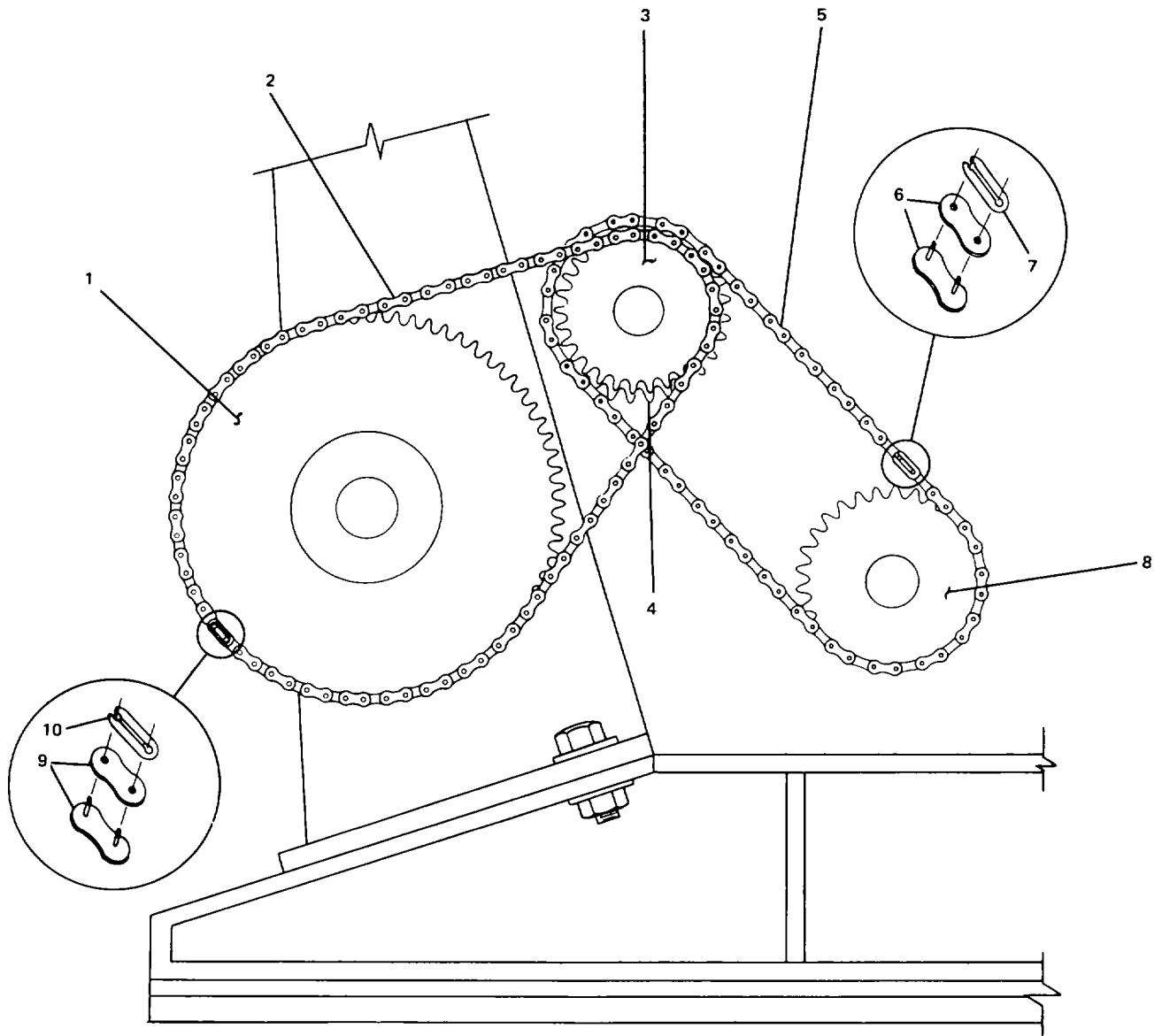


FIGURE 4-6. Chain/Wheel Sprocket Assembly

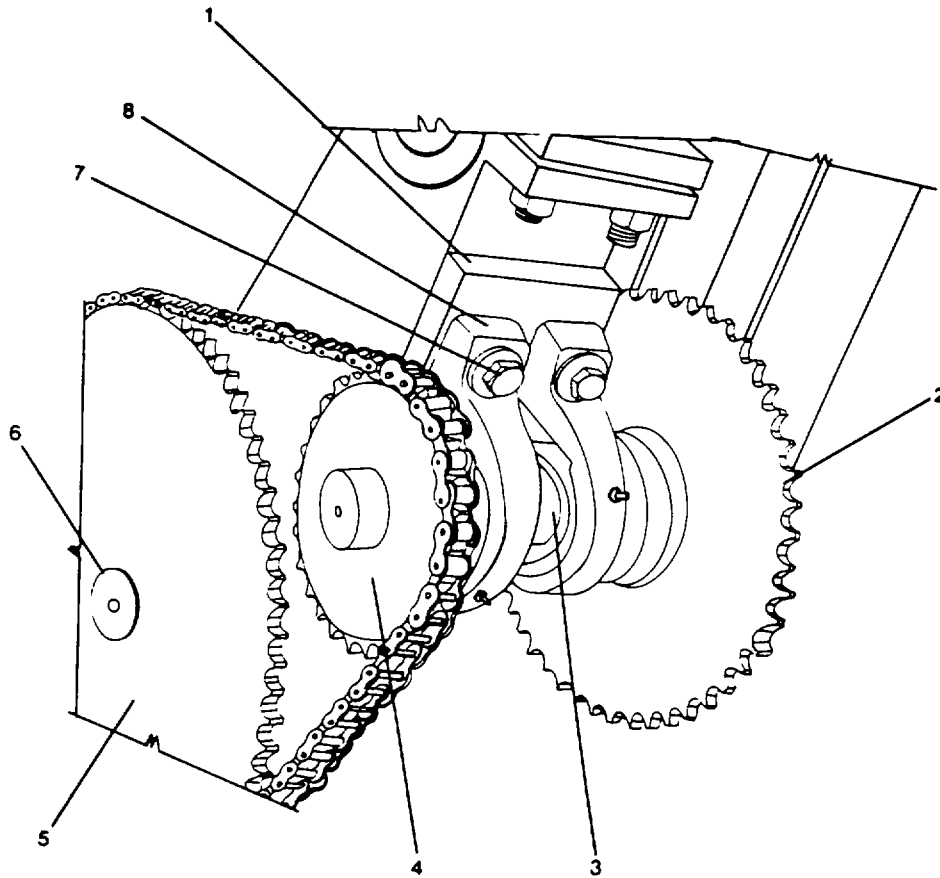


FIGURE 4-7. Wheel Sprocket and Bearing Assembly.

f. Bearings. (FIGURE 4-7)

- (1) Remove four hexagon head capscrews (7) securing bearing caps (8) to levelwind side frame (1).
- (2) Remove bearing caps (8) and shaft (3).
- (3) For disassembly refer to DISASSEMBLY procedures, step a.

g. Shaft Guide. (FIGURE 4-8)

- (1) Slide lifting sling (1) under the top section of the levelwind carriage (2) as shown in FIGURE 4-8 with tension taken off shaft guide (3).
- (2) Remove eight hexagon head capscrews (4), hexagon plain nuts (6) and lockwashers (5) securing access covers (7) to top of levelwind side frames (8).
- (3) Remove access covers (7).

NOTE

Four soldiers are required for shaft guide removal procedure.

Shaft guide can be removed from either end of levelwind carriage.

- (4) Slide shaft guide (3) across top of levelwind side frames (8) and through top section of levelwind guide (9).
- (5) Remove shaft guide to a secure area.
- (6) Lifting device and sling is temporarily left in place to support levelwind carriage during removal procedures.

h. Diamond Shaft Pawl. (FIGURE 4-8)

- (1) Remove four hexagon head capscrews (10) and lockwashers (11) securing pawl cap (12) to pawl cap flange (14) which is welded to the lower section of levelwind guide (15).
- (2) Separate and remove pawl cap (12) from pawl cap flange (14).
- (3) Remove diamond shaft pawl (13) from interior of pawl cap flange (14).



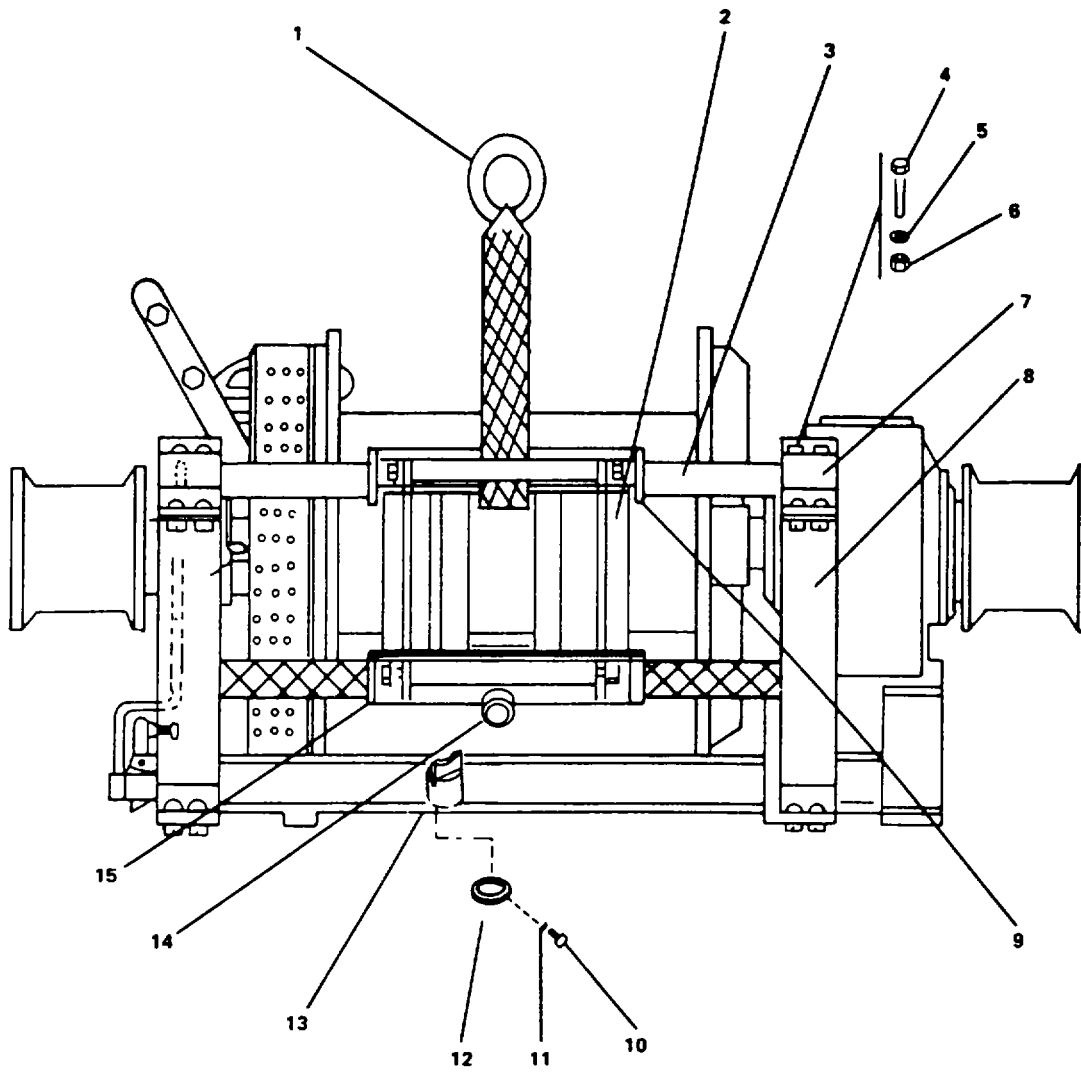


FIGURE 4-8. Stern Anchor Winch Levelwind Assembly.

i. Levelwind Side Frames. (FIGURE 4-9)

## NOTE

Four soldiers are required for removal procedure.

- (1) Make sure that lifting device and sling (1) support weight of levelwind carriage (2).
- (2) Remove four recessed hexagon head capscrews (7), hexagon plain nuts (9), and lockwashers (8) securing levelwind side frame (10) to base of winch platform.
- (3) Disengage levelwind side frame (10) from diamond shaft (11) as levelwind side frame is separated from base of winch platform.
- (4) Remove levelwind side frame (3) to a secure area.
- (5) Disengage diamond shaft (11) from levelwind side frame (3) as diamond shaft is pulled through lower section of levelwind guide (12).
- (6) Remove diamond shaft to a secure area.
- (7) Remove four recessed hexagon head capscrews (4), hexagon plain nuts (6), and lockwashers (5) securing levelwind side frame (3) to base of winch platform.
- (8) Position levelwind carriage (2) on a clean flat surface for disassembly.
- (9) Remove lifting device and sling.

j. Levelwind Horizontal Rollers. (FIGURE 4-10)

- (1) Position levelwind carriage (1) with levelwind horizontal rollers (4, 14) exposed for disassembly.
- (2) Remove two hexagon head machine bolts (7) and lockwashers (6) securing keeper (5) on end of the upper roller shaft (2).
- (3) Remove keeper (5).
- (4) Support weight of roller (4) as shaft (2) is withdrawn from roller (4) and out of shaft support brackets (8). Be sure to catch washers (3) when withdrawing the shaft.

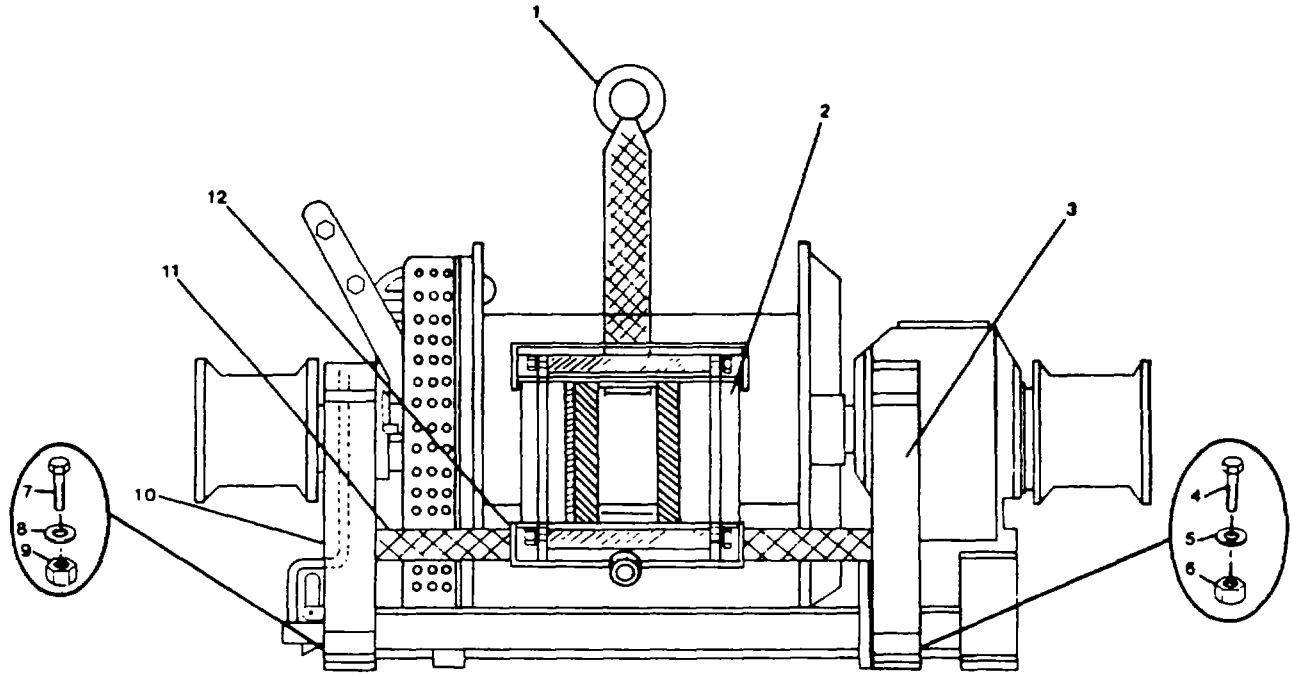


FIGURE 4-9. Stern Anchor Winch Levelwind Side Frames.

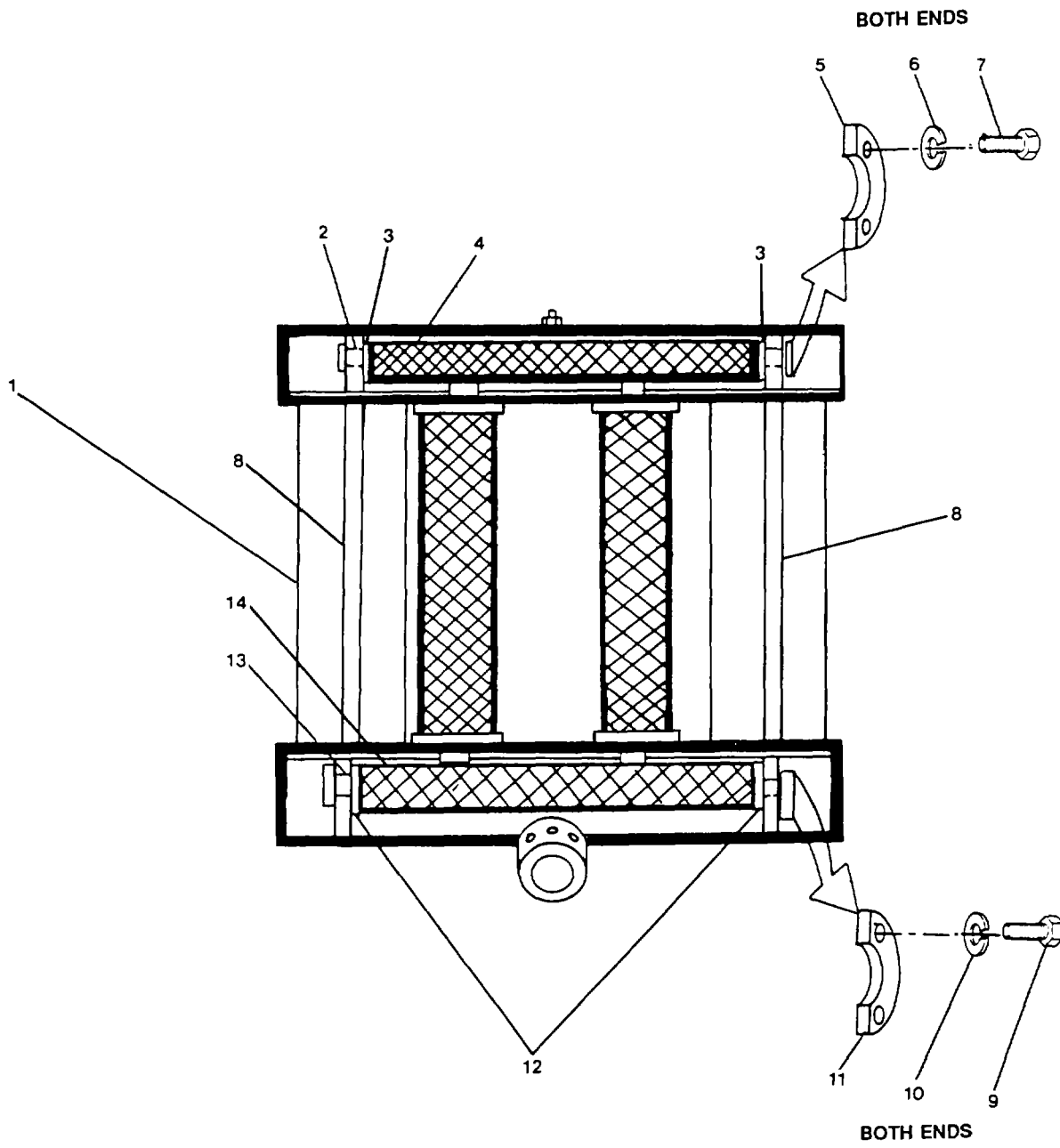


FIGURE 4-10. Levelwind Horizontal Rollers.

- (5) Remove shaft (2) and roller (4).
- (6) Remove two hexagon head machine bolts (9) and lockwashers (10) securing keepers (11) on end of the lower roller shaft (14).
- (7) Remove keeper (11).
- (8) Support weight of roller (14) as shaft is withdrawn from roller (14) and out of shaft support brackets (8). Be sure to catch washers (12) when withdrawing the shaft.
- (9) Position levelwind horizontal rollers (4, 14) on a clean flat surface for disassembly.

k. Horizontal Roller Bushings.

For disassembly, refer to DISASSEMBLY procedures, step c.

l. Levelwind Vertical Rollers. (FIGURE 4-11)

- (1) Position levelwind carriage (1) with levelwind vertical roller (7) exposed for disassembly.
- (2) Remove two hexagon head machine bolts (2) and lockwashers (3) securing keeper (4) on both ends of shaft (5).
- (3) Remove keeper (4).
- (4) Support roller (7) as shaft (5) is withdrawn from roller (7) and out of shaft support brackets (6).
- (5) Remove shaft (5) and roller (7). Be sure to catch washers (8) when withdrawing shaft (5).
- (6) Reposition levelwind carriage (1) with levelwind vertical roller on opposite side exposed for disassembly (FIGURE 4-12).
- (7) Remove two hexagon head machine bolts (2) and lockwashers (3) securing keeper (4) on both ends of shaft (5).
- (8) Remove keeper (4).
- (9) Support roller (7) as shaft (5) is withdrawn from roller (7) and out of shaft support brackets (6).
- (10) Remove shaft (5) and roller (7). Be sure to catch washers (8) when withdrawing shaft (5).
- (11) Position levelwind vertical rollers (7) on a clean flat surface for disassembly.

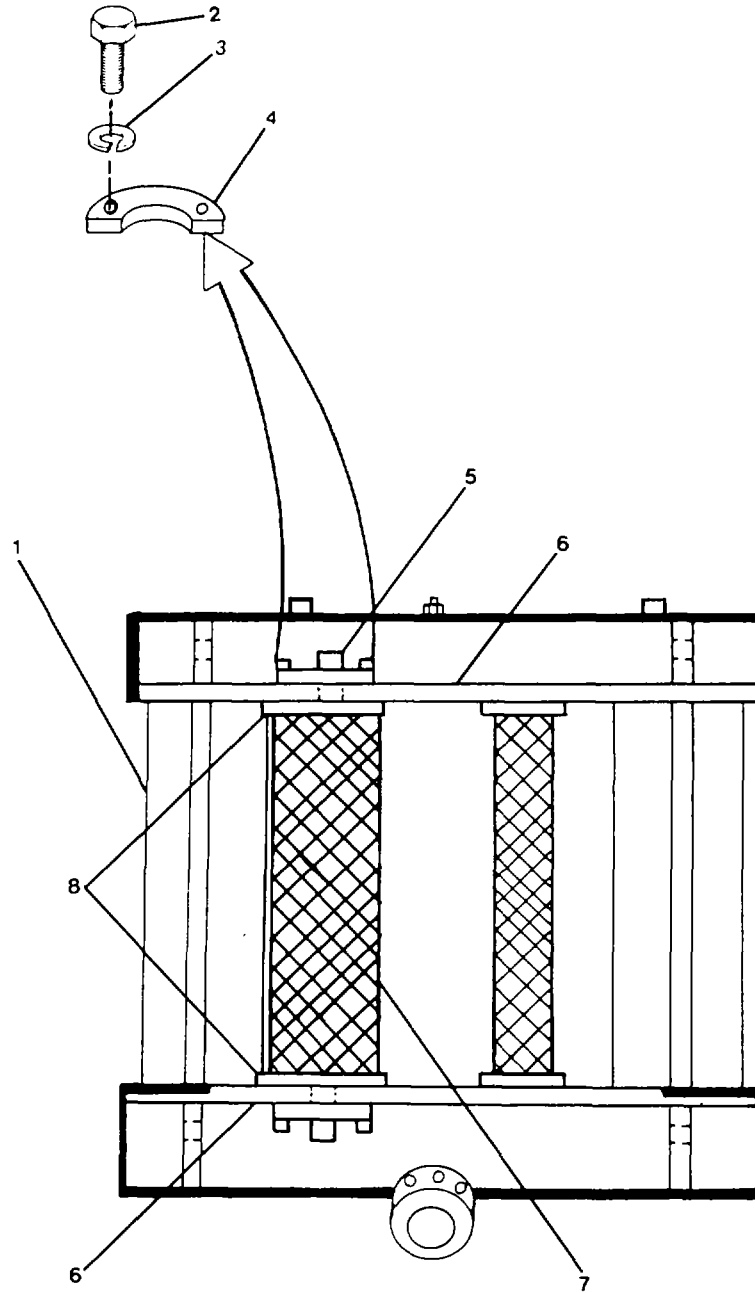


FIGURE 4-11. Levelwind Vertical Roller.

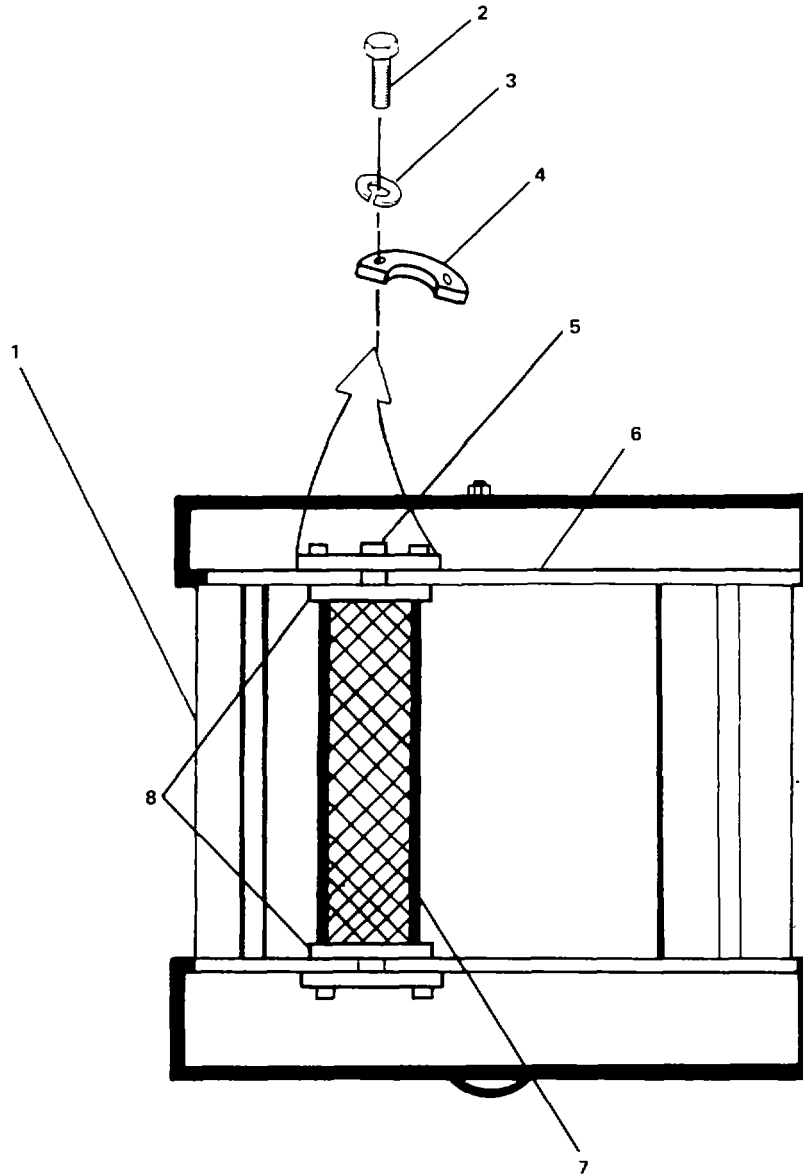


FIGURE 4-12. Levelwind Vertical Roller (Opposite Side).

m. Vertical Roller Bushings.

For disassembly, refer to DISASSEMBLY procedures, step d.

n. Levelwind Bushings.

For disassembly, refer to DISASSEMBLY procedures, step e.

o. Gypsy Cathead Winch. (FIGURE 4-13)

## NOTE

Two soldiers are required for removal procedures.

- (1) Remove two hexagon head capscrews (1) and lockwashers (2) securing cathead retaining plate (3) and gypsy cathead (4) to spool shaft (5).
- (2) Remove gypsy cathead and cathead retaining plate to a clear area.
- (3) Remove two hexagon head capscrews (9) and lockwashers (8) securing cathead retaining plate (7) and gypsy cathead (6) to spool shaft (5).
- (4) Remove gypsy cathead and cathead retaining plate to a clear area.
- (5) Retain machine keys (10).

p. Springs. (FIGURE 4-14)

- (1) Maintain an upward pressure on spring support bracket (14) as hexagon head machine bolts (15) and lockwashers (16) are removed.
- (2) Lower spring support bracket (14) to release springs (9) from spring eyelets (8) and remove as an assembly to a secure area.

q. Split Brake Band Pin. (FIGURE 4-14)

- (1) Turn mechanical brake handwheel (1) counterclockwise to release braking tension.
- (2) Remove cotter pin (5) from rear brake pin (6).
- (3) Support weight of bottom brake band (3) as brake pin (6) is withdrawn from brake band bracket (7). Lower bottom brake band to base of winch platform.
- (4) Remove thread end rod (2) by turning brake handwheel (1) counterclockwise until rod disengages from headless straight pin (18).
- (5) Remove two cotter pins (22) from brake pin (21).
- (6) Withdraw brake pin (21) from anchor brake arm (20) and brake band bracket (23).



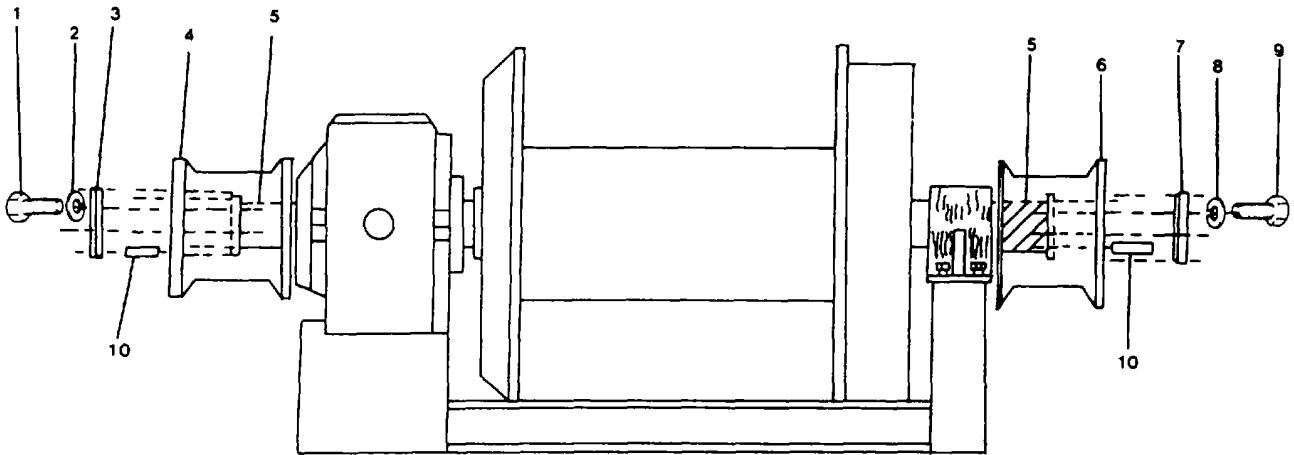


FIGURE 4-13. Gypsy Cathead Winch Assembly.

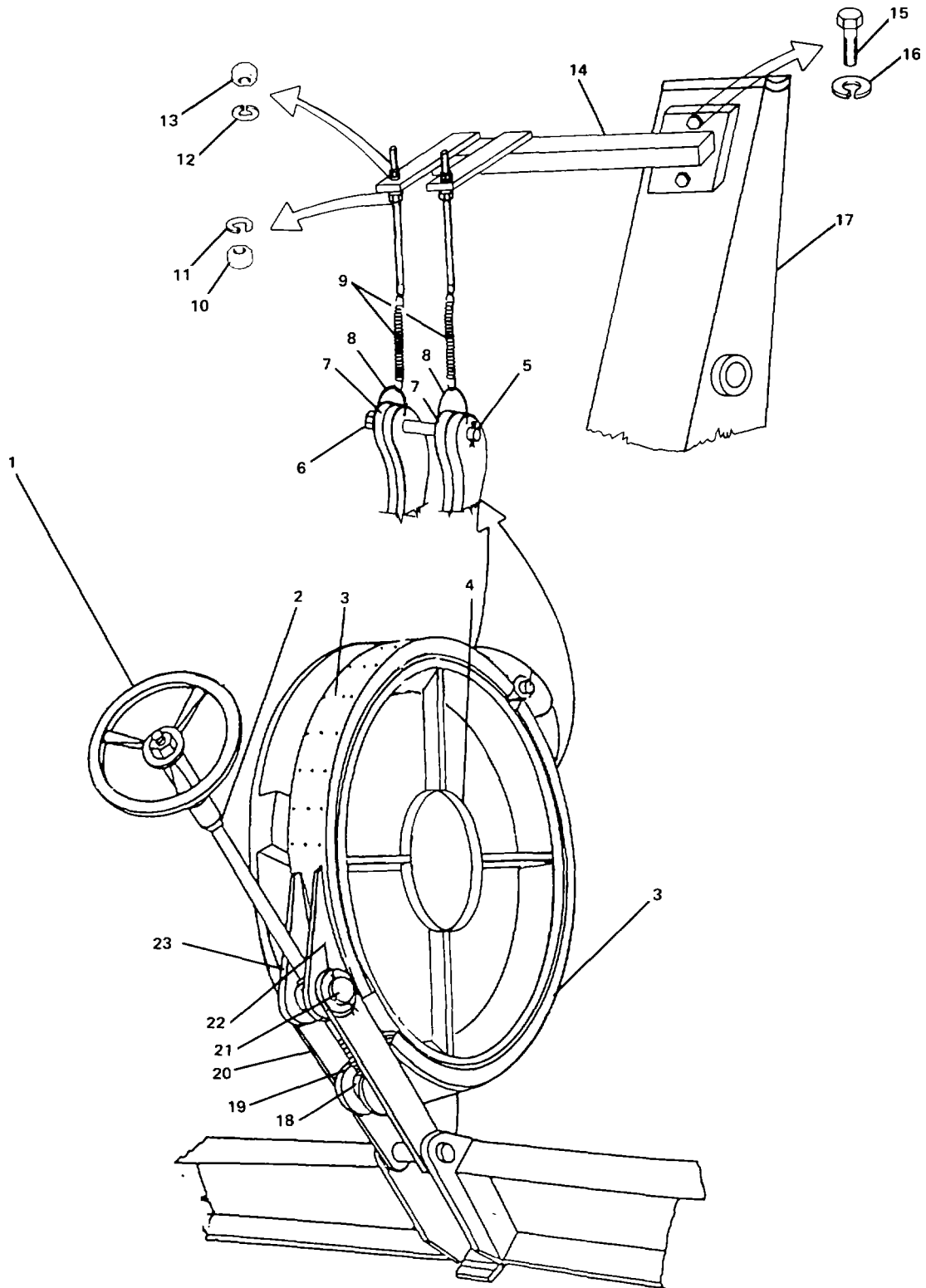


FIGURE 4-14. Mechanical Brake Assembly

(7) Lower anchor brake arms (20) outward to provide clearance for brake band removal.

(8) Withdraw headless straight pin (18) from brake band bracket (19).

r. Brake Bands. (FIGURE 4-14)

Separate brake band halves (3) from brake drum assembly (4) and remove to a clean area for disassembly.

s. Brake Band Lining.

For disassembly, refer to DISASSEMBLY procedures, step b.

t. Mechanical Clutch/Shoulder Bolt. (FIGURE 4-15)

(1) On each side of clutch jaw arms (1) remove two hexagon machine bolts (2, 4) securing clutch handles (3) between clutch jaw arms (1).

(2) Remove clutch handles.

(3) Remove hexagon head shoulder bolt (8), lockwasher (7), and plain hexagon nut (6) securing clutch jaw arms (1) between bracket (9).

(4) Disengage clutch jaw arms (1) from sliding jaw clutch (5).

(5) On each side of clutch jaw arms (1) remove hexagon head machine bolts (13), flat washers (12), and head self-locking nuts (11).

(6) On right side of clutch jaw arm (1) remove clutch lockout arm (10).

u. Brake Reducer Mount. (FIGURE 4-16)

(1) Remove hydraulic motor assembly, paragraph 2-15.

(2) Remove failsafe brake assembly, paragraph 2-16.

(3) Remove four socket head capscrews (1) securing brake reducer mount (2) to gearbox assembly.

(4) Separate and remove brake reducer mount (2).

v. Brake Reducer Coupling. (FIGURE 4-16)

(1) Remove brake reducer mount, step u., above.

(2) Loosen set screw (4) and withdraw brake reducer coupling (3) from high speed shaft (5).

(3) Retain machine key (6).

w. Upper Housing Assembly. (FIGURE 4-17)

(1) Attach lifting device and sling to cast lug (9) and eye bolt (11) on gear box upper housing.

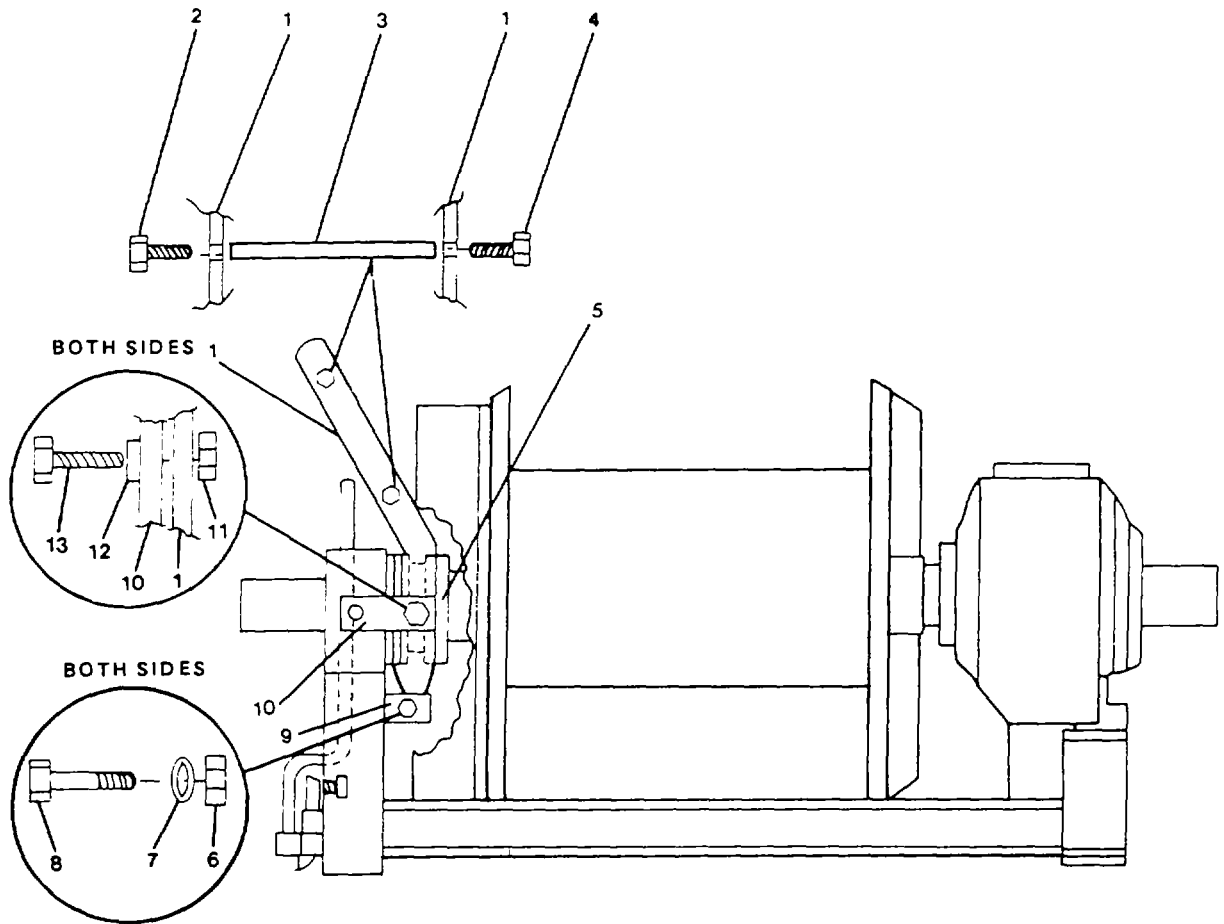


FIGURE 4-15. Mechanical Clutch Assembly.

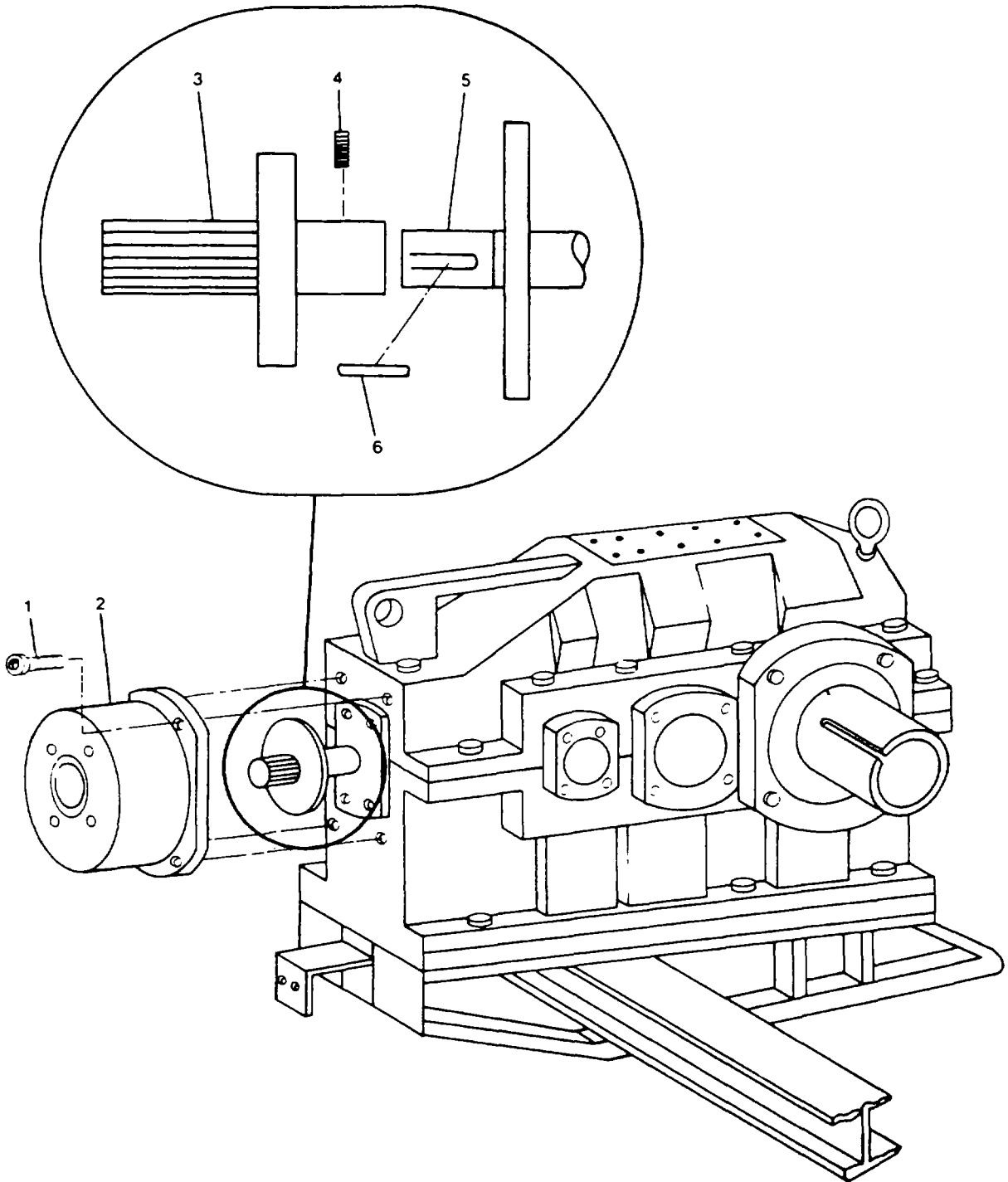


FIGURE 4-16. *Gear Box Brake Reducer Mount/Coupling*

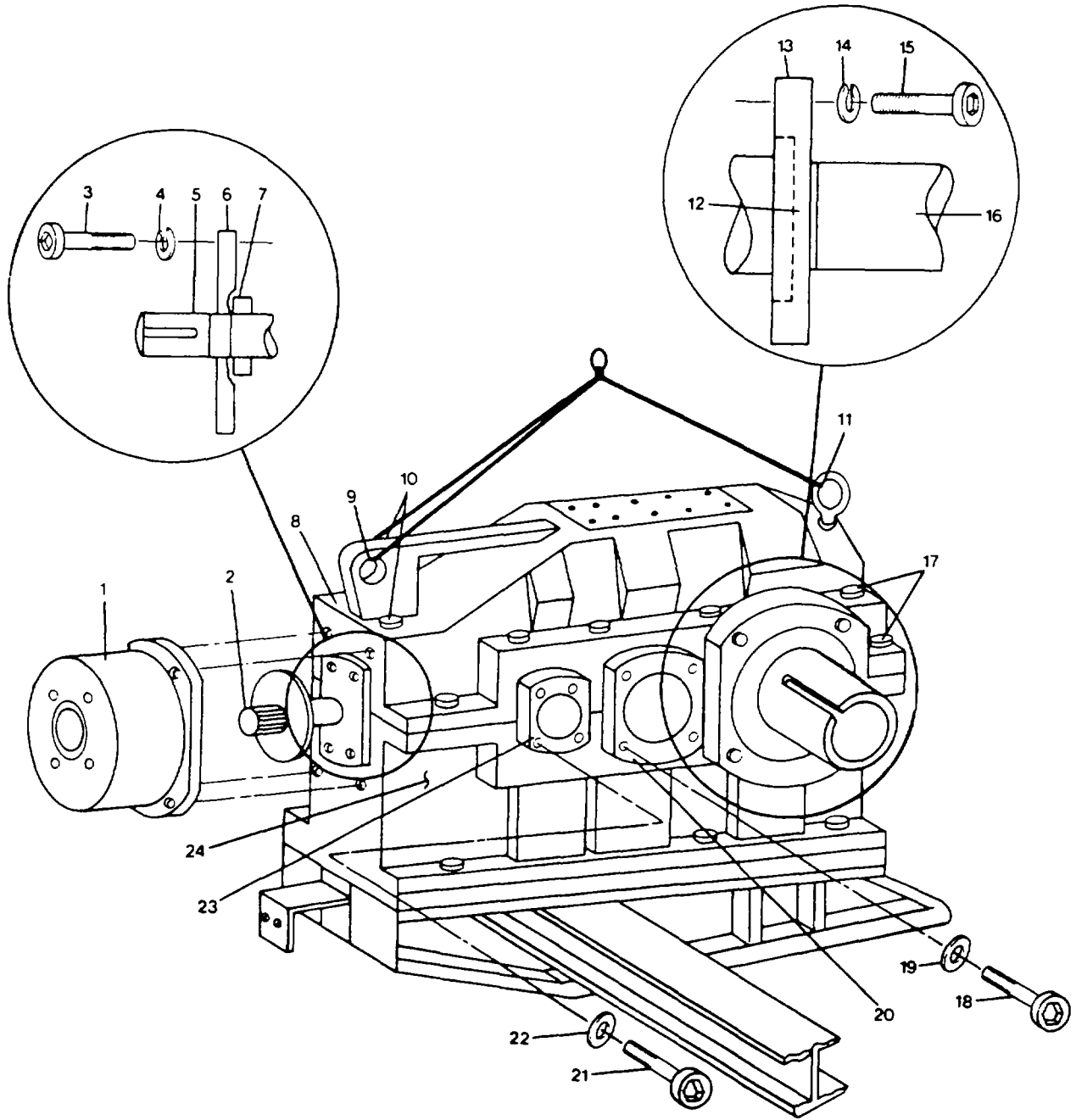


FIGURE 4-17. Upper Housing Assembly

- (2) Remove brake reducer mount (1). Refer to removal task, step u., above.
- (3) Remove brake reducer coupling (2). Refer to removal task, step v., above.
- (4) Remove four hexagon head capscrews (3) and lockwashers (4) securing bearing retainer (6) to gear box.

CAUTION

Cover keyway with tapes, and remove set screw marks, nicks, or burrs to avoid damage to seal.

- (5) Withdraw bearing retainer (6) and oil seal (7) from high speed shaft (5).
- (6) Remove two recessed socket head capscrews (10) and thirteen flush mounted socket head capscrews (17) securing upper housing (8) to lower housing (24).
- (7) Remove eight hexagon head capscrews (15) and lockwashers (14) securing bearing retainers (13) on each side of gear box.

CAUTION

Cover keyway with tape, and remove set screw marks, nicks, or burrs to avoid damage to seal.

- (8) Withdraw bearing retainer (13) and oil seal (12) from winch shaft (16) on opposite side of gear box.

NOTE

Bearing retainer and oil seal closest to spool are only removed when spool is separated from winch shaft.

- (9) Remove eight hexagon head capscrews (18) and lockwashers (19) securing bearing retainers (20) on each side of gear box.
- (10) Remove bearing retainers (20).
- (11) Remove eight hexagon head cap screws (21) and lockwashers (22) securing bearing retainers (23) on each side of gear box.
- (12) Remove bearing retainers (23).
- (13) Use two jack screws in mounting screw holes at both ends of upper housing to break sealant bond between upper and lower housing.

(14) Lift upper housing and remove to a clean and secure area.

x. Spacer Pillow Block End. (FIGURE 4-18)

- (1) Attach lifting device and sling (1) to lifting points on spool (2).
- (2) Remove four hexagon plain nuts (5) and machine bolts (6) securing pillow block (3) to winch platform.
- (3) Use lifting device to take weight off pillow block.
- (4) Withdraw pillow block (3) from spool shaft (4).
- (5) Lift spool vertically while exercising care as low speed gear assembly.
- (7) is separated from lower gear box housing (8).

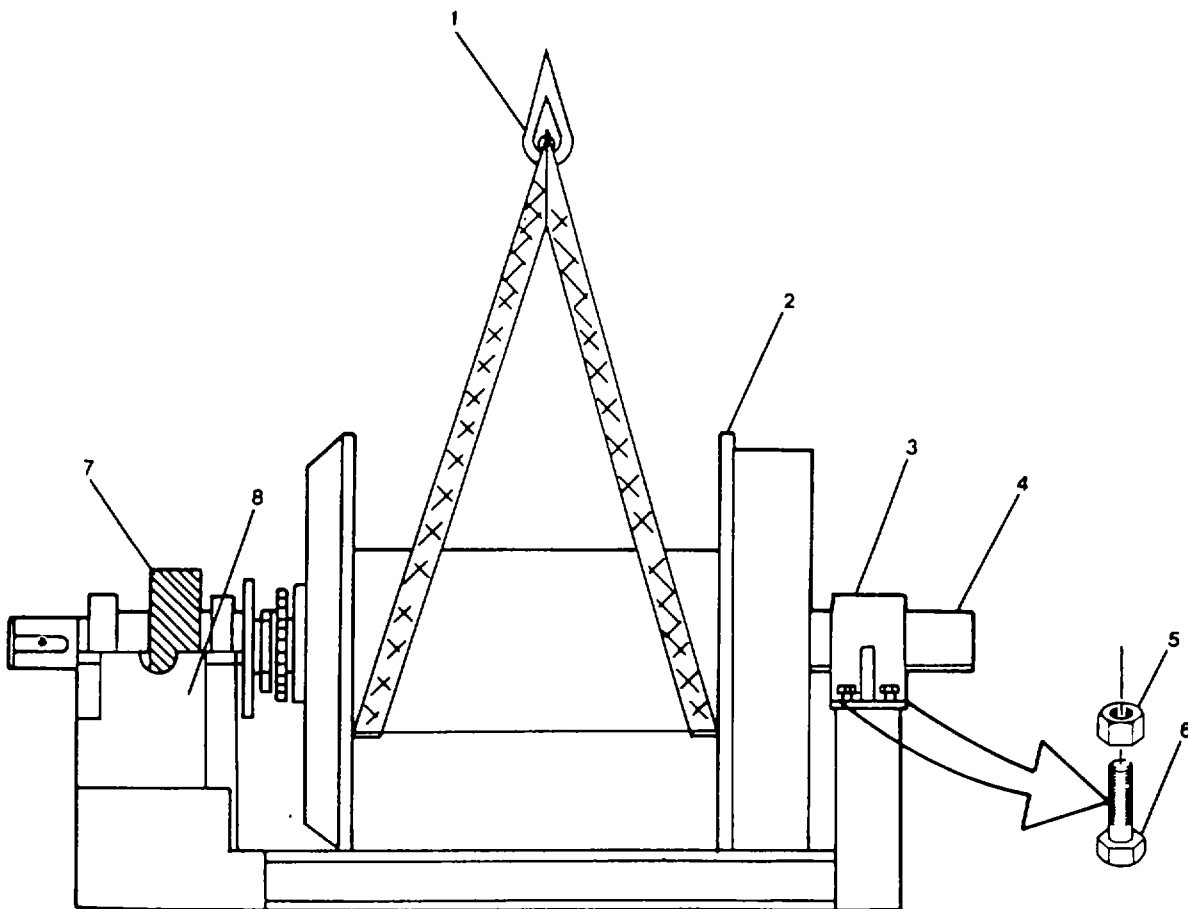


FIGURE 4-18. Lifting Points Pillow Block End/Low Speed Gear Assembly.



- (6) Position spool and low speed gear assembly in a clear area for disassembly.
- (7) For disassembly of spacer pillow block end refer to DISASSEMBLY procedures, step f.

y. Low Speed Gear Assembly. (FIGURE 4-19)

- (1) Attach lifting device and sling (1) to lifting points on low speed gear assembly (2) and take weight off spool (3).
- (2) Separate low speed gear assembly from spool.
- (3) Remove machine key (4) from winch shaft (5).
- (4) Position low speed gear assembly on a clean flat surface for disassembly.

CAUTION

Be sure to restrict movement of low speed gear assembly.

- (5) Remove lifting sling.

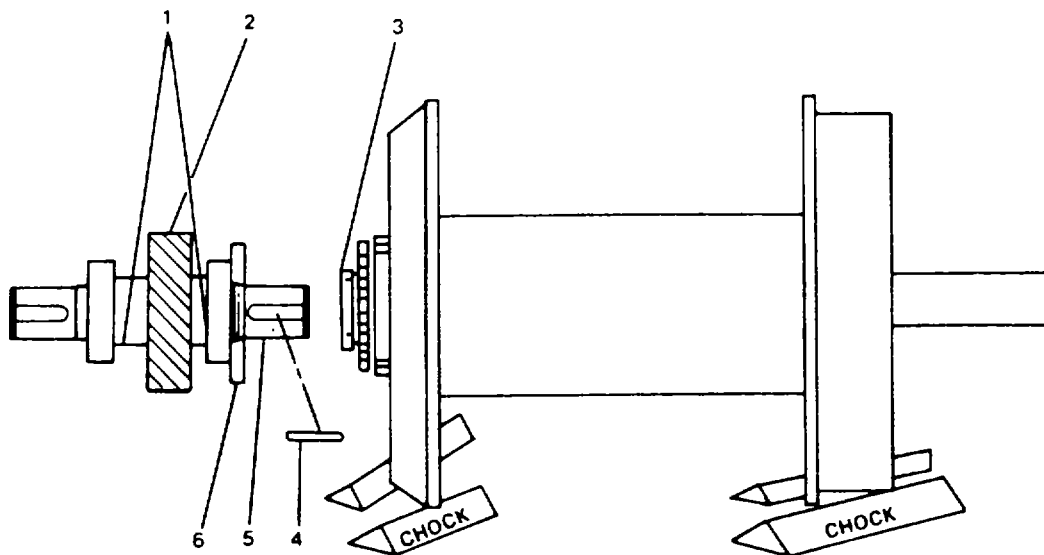


FIGURE 4-19. Lifting Points Low Speed Gear Assembly.

z. Bearing Retainer/Oil Seal. (FIGURE 4-17)CAUTION

Cover keyway with tape, and remove set screw marks, nicks, or burrs to avoid damage to seal.

- (1) Separate bearing retainer (13) from oil seal (12).
- (2) Withdraw bearing retainer from winch shaft (16).
- (3) Withdraw oil seal from winch shaft.

aa. Wheel Sprocket (60A48). (FIGURE 4-20)

- (1) Remove four machine bolts (1) and lockwashers (2) securing wheel sprocket (3) to spool flange (4).
- (2) Separate and remove wheel sprocket from spool flange.

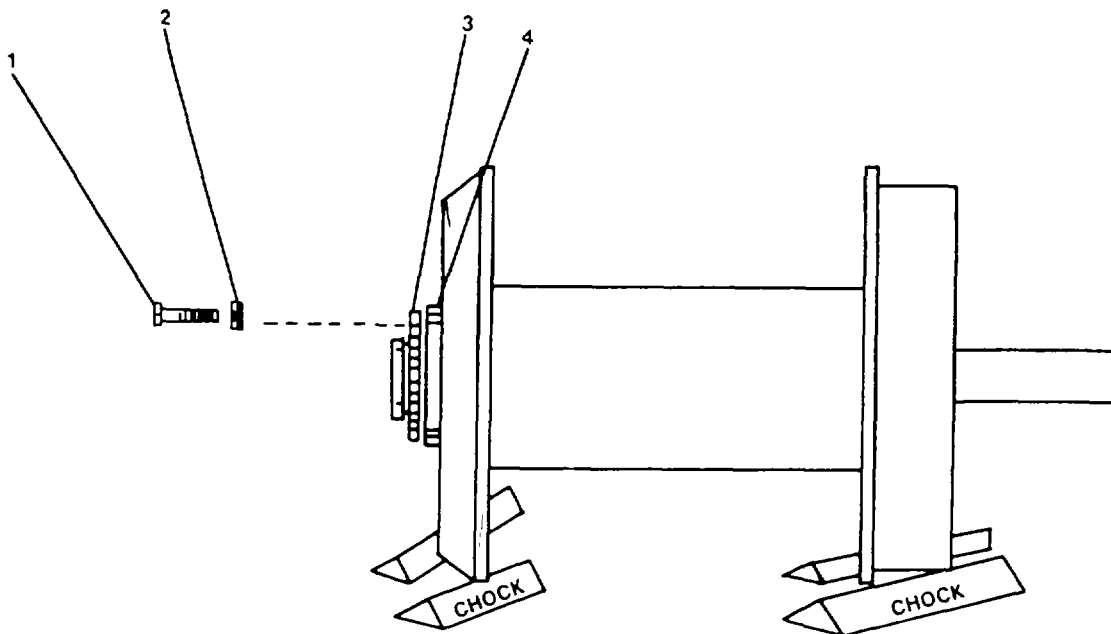


FIGURE 4-20. Wheel Sprocket (60A48).

DISASSEMBLYa. Bearings. (FIGURE 4-21)

- (1) Position bearing assembly (5) on a clean flat surface.
- (2) Remove machine keys (3) from each end of shaft (4).
- (3) Separate bearing caps (1).
- (4) Use gear puller to separate bearings (2) from shaft (4).

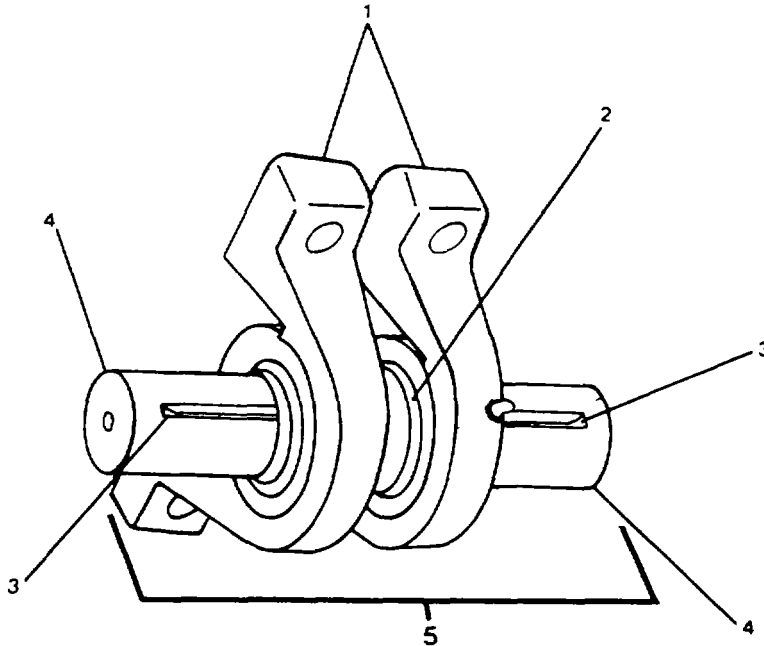


FIGURE 4-21. Bearing Assembly.

b. Brake Band Lining. (FIGURE 4-22)WARNING

ASBESTOS DUST HAZARD. To avoid a possible health hazard, be sure personnel wear protective breathing devices (face mask) to avoid inhalation of asbestos dust particles when performing maintenance on the stern anchor winch brake assembly.

- (1) Position brake bands for brake lining removal.
- (2) Remove 25 hexagon self-locking nuts (2) and 25 brass screws (4) securing brake linings (3) to each brake band (1).
- (3) Separate brake lining from each brake band.

c. Horizontal Roller Bushings. (FIGURE 4-23)

## NOTE

Use a puller of proper size to remove bushings from horizontal rollers.

- (1) Position horizontal roller (1) on a flat surface.
- (2) Withdraw bushings (2) from roller (1).
- (3) Repeat steps for removal of roller bushings from additional horizontal roller.

d. Vertical Roller Bushings. (FIGURE 4-24)

## NOTE

Use a puller of proper size to remove bushings from vertical rollers.

- (1) Position vertical roller (1) on a flat surface.
- (2) Withdraw bushings (2) from roller-(1).
- (3) Repeat steps for removal of roller bushings from additional vertical roller.

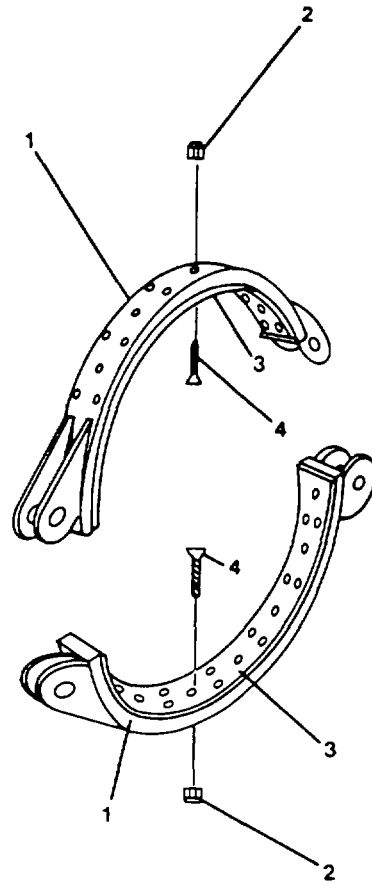


FIGURE 4-22. Brake band Lining.

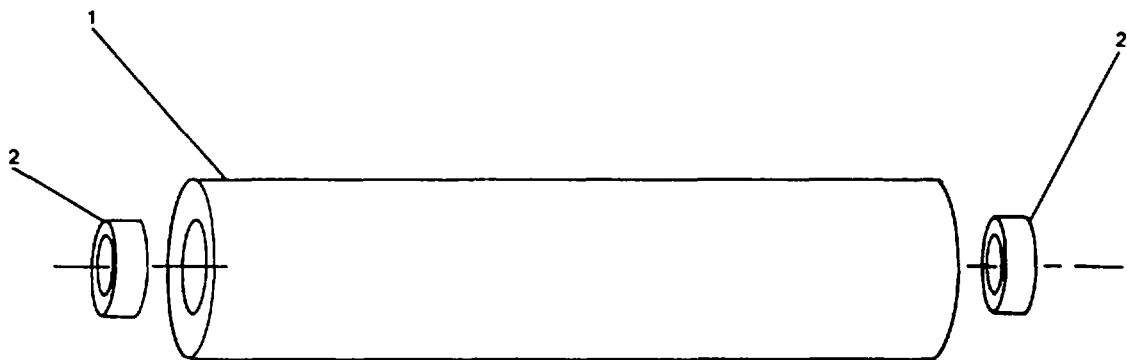


FIGURE 4-23. Horizontal Roller Bushings.

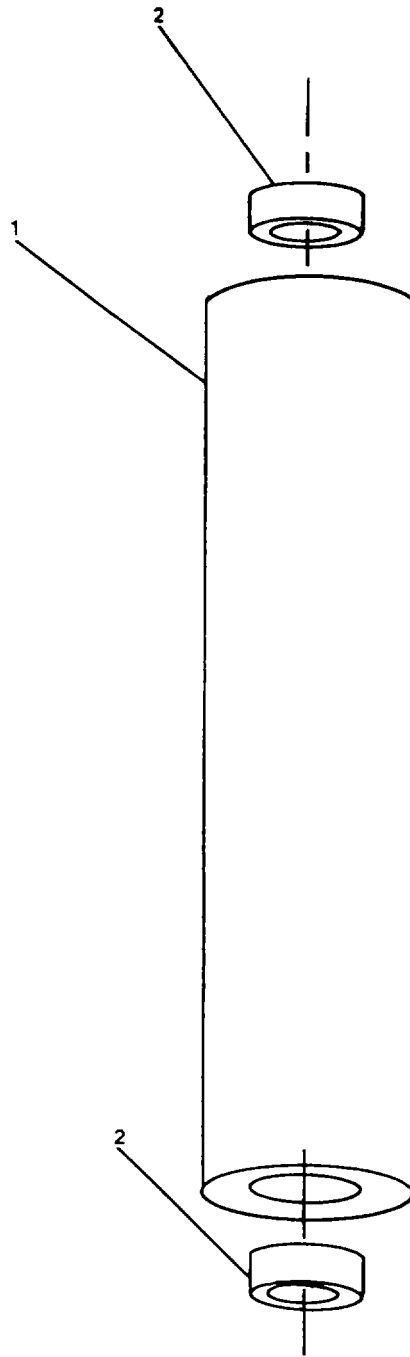


FIGURE 4-24. Vertical Roller Bushings.

e. Levelwind Bushings. (FIGURE 4-25)

NOTE

Use a puller of proper size to remove bushings from levelwind carriage.

- (1) Position levelwind carriage (1) for bushing removal.
- (2) Withdraw bushings (2) from upper section of levelwind carriage.
- (3) Withdraw bushings (3) from lower section of levelwind carriage (1).

f. Spacer Pillow Block End. (FIGURE 4-26)

- (1) Position pillow block end (1) on a flat surface for disassembly.

NOTE

Use a puller of proper size to remove spacer from pillow block end.

- (2) Withdraw spacer (2) from pillow block end (1).

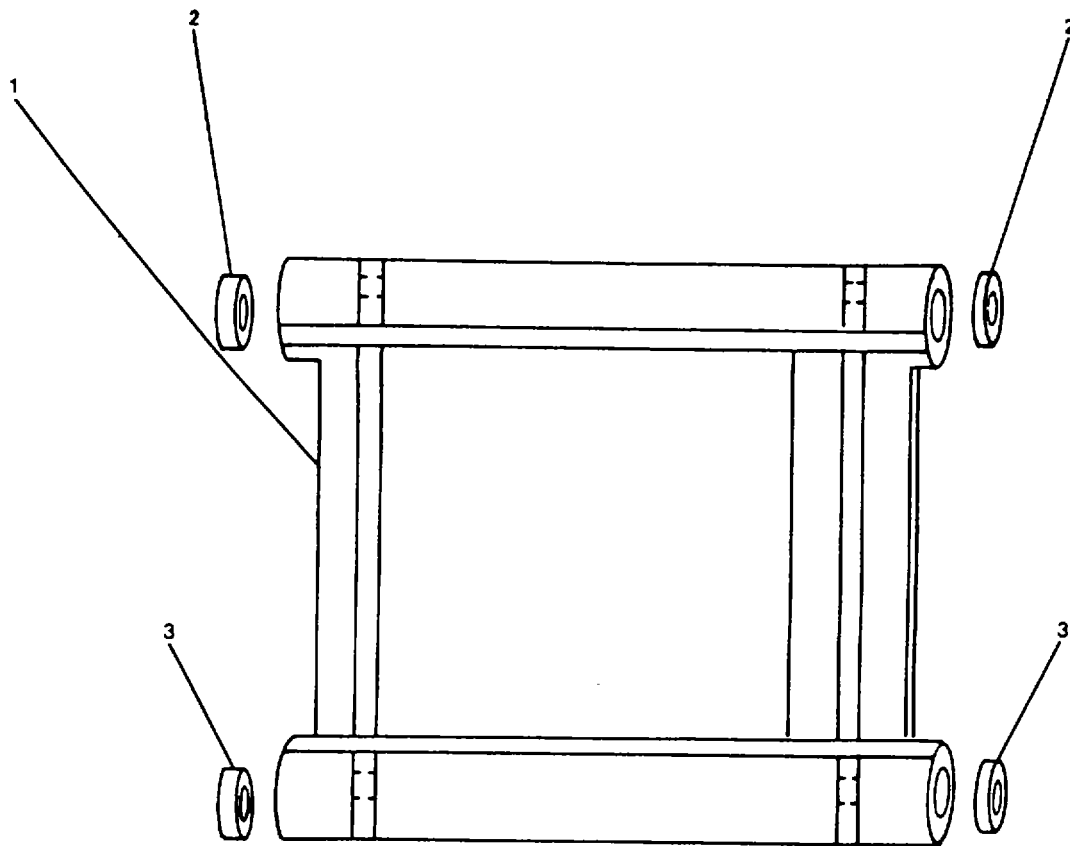


FIGURE 4-25. Levelwind Bushings.

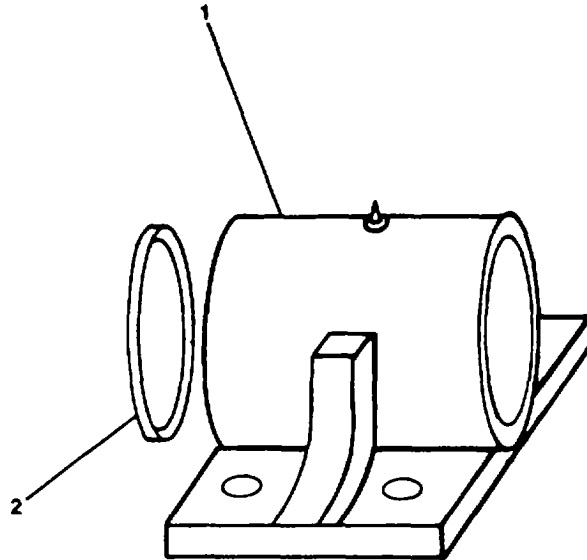


FIGURE 4-26. *Spacer Pillow Block End.*

#### REPAIR

Repair of stern anchor winch assembly consists of replacing: chain, bearings, wheel sprockets, guide shaft, diamond shaft pawl, horizontal roller shaft, levelwind horizontal roller, horizontal roller bushing, vertical roller shaft, levelwind vertical roller, vertical roller bushing, levelwind bushing, Gypsy cathead winch, spring, split brake band pin, brake bands, brake band lining, brass screws, hexagon self-locking nuts, shoulder bolt, spacer pillow block end, and brake reducer coupling.

#### ASSEMBLY

- a. Spacer Pillow Block End. (FIGURE 4-26)
  - (1) Position pillow block end (1) on a clean flat surface.
  - (2) Install spacer (2) in pillow block end.
  - (3) Prepare spacer pillow block end for installation. REPLACEMENT task, step d.



- b. Levelwind Bushings. (FIGURE 4-25)
  - (1) Position levelwind carriage (1) on a flat surface.
  - (2) Install two bushings (3) into lower section of levelwind carriage.
  - (3) Install two bushings (2) into upper section of levelwind carriage.
- c. Vertical Roller Bushings. (FIGURE 4-24)
  - (1) Position vertical roller (1).
  - (2) Install bushings (2) into ends of vertical roller (1).
  - (3) Repeat steps (1) and (2) for additional vertical roller.
- d. Horizontal Roller Bushings. (FIGURE 4-23)
  - (1) Position horizontal roller (1) on a flat surface.
  - (2) Install bushings (2) into ends of roller.
  - (3) Repeat steps (1) and (2) for additional horizontal roller.
- e. Brake Band Lining. (FIGURE 4-22)

**WARNING**

ASBESTOS DUST HAZARD. To avoid a possible health hazard, be sure personnel wear protective breathing devices (face mask) to avoid inhalation of asbestos dust particles when performing maintenance on the stern anchor winch brake assembly.

- (1) Position brake bands for brake lining assembly.
  - (2) Position brake linings (3) onto each brake band (1) with mounting screw holes aligned.
  - (3) Secure each brake lining (3) to brake bands (1) with 25 brass screws (4) and hexagon self-locking nuts (2).
- f. Bearings. (FIGURE 4-21)
    - (1) Use gear press to install bearings (2) onto shaft (4).
    - (2) Install machine keys (3) to each end of shaft.

- (3) Attach bearing caps (1) to bearings (2) and shaft (4).
- (4) Prepare bearing assembly for installation.

## REPLACEMENT

### a. Wheel Sprocket (60A48). (FIGURE 4-20)

- (1) Position wheel sprocket (3) on spool flange (4) with boltholes aligned.
- (2) Install four machine bolts (1) and lockwashers (2) to secure wheel sprocket (3) to spool flange (4).

### b. Bearing Retainer/Oil Seal. (FIGURE 4-17)

- (1) Install oil seal (12) on winch shaft (16).
- (2) Install bearing retainer (13) on winch shaft.
- (3) Engage bearing retainer (13) over oil seal (12).
- (4) Maintain adequate clearance between low speed gear assembly and bearing retainer (2, 6, FIGURE 4-19) to facilitate installation procedure.
- (5) Remove tape from keyway on winch shaft.

### c. Low Speed Gear Assembly. (FIGURE 4-19)

- (1) Attach lifting device and sling (1) to lifting points on low speed gear assembly (2).
- (2) Position low speed gear assembly (2) in alignment with spool (3).
- (3) Install machine key (4) on winch shaft (5).
- (4) Engage low speed gear assembly with spool.
- (5) Remove lifting device and sling.

### d. Spacer Pillow Block End. (FIGURE 4-18)

- (1) Attach lifting device and sling (1) to lifting points on spool (2).
- (2) Lower spool vertically while exercising care as low speed gear assembly (7) is engaged with lower gear box housing (8).
- (3) Install pillow block (3) on spool shaft (4).
- (4) Position pillow block over boltholes.
- (5) Lower spool weight onto pillow block and lower gear box.

- (6) Install four machine bolts (6) and hexagon plain nuts (5) to secure pillow block (3) to winch platform.
- (7) Remove lifting device and sling.

e. Upper Housing Assembly. (FIGURE 4-17)

- (1) Attach lifting device and sling to cast lug (9) and eyebolt (11) on gear box upper housing.

NOTE

Apply Permatex sealant to surface area of lower gearbox housing.

- (2) Position upper housing (8) over lower gearbox housing with mounting screw holes aligned.
- (3) Install two recessable socket head capscrews (10) and thirteen flush mountable socket head capscrews (17) into upper housing. Secure upper housing to lower gear box housing with socket head capscrews.
- (4) Install bearing retainers (23) on each side of gear box.
- (5) Install eight hexagon head capscrews (21) with lockwashers (22) to secure bearing retainers (23) to each side of gear box.
- (6) Install bearing retainers (20) on each side of gear bow.
- (7) Install eight hexagon head capscrews (18) with lockwashers (19) to secure bearing retainers (20) to each side of gear box.
- (8) Remove tape from keyway on winch shaft (16) on opposite side of gear box.
- (9) Install oil seal (12), and bearing retainer (13), on winch shaft on opposite side-of gear box.
- (10) Install eight hexagon head capscrews (15) with lockwashers (14) to secure bearing retainers (13) to each side of gear box.
- (11) Install oil seal (7) and bearing retainer (6) on high speed shaft (5).
- (12) Install four hexagon head capscrews (3) with lockwashers (4) to secure bearing retainer (6) to gear box.
- (13) Replace brake reducer coupling (2). Refer to REMOVAL task, step v., above.
- (14) Replace brake reducer mount (1). Refer to REMOVAL task, step u., above.

(15) Remove lifting device and sling.

f. Brake Reducer Coupling. (FIGURE 4-16)

- (1) Install machine key (6) on high speed shaft (5).
- (2) Install brake reducer coupling (3) on high speed shaft.
- (3) Secure brake reducer coupling to high speed shaft with setscrew (4).

g. Brake Reducer Mount. (FIGURE 4-16)

- (1) Position brake reducer mount (2) on gear box with mounting holes aligned.
- (2) Install four socket head capscrews (1) to secure brake reducer mount (2) to gear box.
- (3) Replace failsafe brake assembly, paragraph 2-16.
- (4) Replace hydraulic pump assembly, paragraph 2-15.

h. Mechanical Clutch/Shoulder Bolt. (FIGURE 4-15)

NOTE

Install clutch lockout arm on right side of clutch jaw arm.

- (1) Position clutch lockout arm (10) over clutch jaw arm (1) with mounting boltholes aligned.
- (2) Install hexagon head machine bolt (13), flat washer (12), and head selflocking nut (11) to secure clutch lockout arm to clutch jaw arm (1).
- (3) Install hexagon head machine bolt (13), flat washer (12), and head selflocking nut (11) on clutch jaw arm (1).
- (4) Engage clutch jaw arms (1) on sliding jaw clutch (5).
- (5) Position clutch jaw arms (1) between bracket (9).
- (6) Install shoulder bolt (8) through right side of bracket (9), clutch jaw arm (1), and out left side of bracket (9).
- (7) Install lockwasher (7) and plain hexagon nut (6) on threaded end of shoulder bolt to secure clutch jaw arms (1) on bracket (9).
- (8) Position clutch handles (3) between clutch jaw arms (1).

(9) Install hexagon head machine bolts (2, 4) to secure clutch handles (3) to clutch jaw arm (1).

i. Brake Band Lining. (FIGURE 4-22)

For assembly procedures, refer to ASSEMBLY task, step e.

j. Brake Bands. (FIGURE 4-14)

Position brake band halves (3) on brake drum assembly (4).

k. Split Brake Band Pin. (FIGURE 4-14)

(1) Make sure brake band halves (3) are positioned correctly over brake drum assembly (4).

(2) Install headless straight pin (18) into brake band bracket (19).

(3) Raise anchor brake arms (20) to the upright position for brake band installation.

(4) Install brake pin (21) into anchor brake arms (20) and brake band bracket (23).

(5) Install cotter pin (22) on brake pin (21).

(6) Install threaded end rod (2) through brake pin (21), and turn brake hand-wheel (1) clockwise until rod engages with threads of headless straight pin (18).

(7) Support weight of bottom brake band (3) as both brake bands are aligned with brake pin mounting holes in brake band bracket (7).

(8) Install brake pin (6) into brake band bracket (7) to secure brake bands (3).

(9) Install cotter pin (5) into brake pin (6).

(10) Turn mechanical brake handwheel (1) clockwise to take up slack in braking assembly.

l. Springs. (FIGURE 4-14)

(1) Position spring assembly above spring eyelets (8) to install springs (9).

(2) Apply upward pressure to spring support bracket (14).

(3) Position spring support bracket over mounting boltholes on levelwind side frame (11).

(4) Install two hexagon head machine bolts (15) and lockwashers (16) to secure spring support bracket (14) to levelwind side frame (11).

## NOTE

Spring assembly is properly adjusted if springs are taut and assembly shows no apparent signs of slackness in spring tension. Make necessary adjustments as required.

- (5) Turn adjustment nuts (10) several turns in clockwise direction, then turn adjustment nuts (13) clockwise to increase tension on spring assembly (9). Repeat steps to further increase spring tension.
- (6) Turn adjustment nuts (13) several turns in counterclockwise direction, then turn adjustment nuts (10) counterclockwise to decrease tension on spring assembly (9). Repeat steps to further decrease spring tension.

m. Gypsy Cathead. (FIGURE 4-13)

## NOTE

Two soldiers are required for removal procedure.

- (1) Install machine keyways (10) at each end of winch shaft (5).
- (2) Position gypsy cathead (6) in alignment with winch shaft and machine keyway (10).
- (3) Engage gypsy cathead over winch shaft and keyway.
- (4) Position cathead retaining plate (7) over mounting boltholes on winch shaft.
- (5) Install two hexagon head capscrews (9) with lockwashers (8) to secure cathead retaining plate and gypsy cathead to winch shaft (5).
- (6) Position gypsy cathead (4) in alignment with winch shaft and machine keyway (10).
- (7) Engage gypsy cathead over winch shaft and keyway.
- (8) Position cathead retaining plate (3) over mounting boltholes on winch shaft.
- (9) Install two hexagon head capscrews (1) with lockwashers (2) to secure cathead retaining plate and gypsy cathead to winch shaft.

n. Levelwind Bushings. (FIGURE 4-25)

For assembly procedures, refer to ASSEMBLY task, step b.

o. Vertical Roller Bushings. (FIGURE 4-24)

For assembly procedures, refer to ASSEMBLY task, step c.

p. Levelwind Vertical Rollers. (FIGURE 4-12)

- (1) Position levelwind carriage (1) with opposite side exposed for assembly.
- (2) Position vertical roller (7) between shaft support brackets (6) and aligned with shaft mounting holes.
- (3) Install roller shaft (5) through top of shaft support bracket (6), roller (7), washers (8) and out of shaft support bracket (6) at bottom of levelwind carriage (1).
- (4) Position keeper (4) in the shaft slot on both ends of shaft (7).
- (5) Install hexagon head capscrews (2) with lockwashers (3) through keeper (4) to secure vertical roller shaft (5) to shaft support bracket (6).
- (6) Reposition levelwind carriage (1) with front side exposed for assembly (FIGURE 4-11). Repeat steps (1) through (5).

q. Horizontal Roller Bushings. (FIGURE 4-23)

For assembly procedures, refer to ASSEMBLY task, step d.

r. Levelwind Horizontal Rollers. (FIGURE 4-10)

- (1) Position levelwind carriage (1) with levelwind horizontal rollers (4, 14) exposed for assembly.
- (2) Position horizontal roller (14) between shaft support brackets (8) and aligned with shaft mounting holes.
- (3) Install roller shaft (13) through shaft support bracket (8), washers (3), roller (14), and out of shaft support bracket (8) at other end.
- (4) Position keeper (11) in the shaft slot on both ends of shaft (13).
- (5) Install two hexagon head machine bolts (9) with lockwashers (10) to secure keeper (11) to shaft support bracket (8) on both ends.
- (6) Position horizontal roller (4) between shaft support brackets (8) and aligned with shaft mounting holes.
- (7) Install roller shaft (2) through shaft support bracket (8), washers (3), roller (4), and out of shaft support bracket (8) at other end.
- (8) Position keeper (5) in the shaft slot on both ends of shaft (2).
- (9) Install two hexagon head machine bolts (7) with lockwashers (6) to secure keeper (5) to shaft support bracket.

s. Levelwind Side Frames. (FIGURE 4-9)

NOTE

Four soldiers are required for replacement procedure.

- (1) Position levelwind side frame (3) over base of winch platform with mounting boltholes aligned.
- (2) Install two recessed hexagon head capscrews (4), lockwashers (5), and hexagon plain nuts (6) to secure levelwind side frame to winch platform.
- (3) Attach lifting sling (1) to levelwind carriage (2).
- (4) Position levelwind carriage for installation of diamond shaft (11).
- (5) Slide diamond shaft (11) through lower section of levelwind guide (12) and engage with levelwind side frame (3).
- (6) Position levelwind side frame (10) over mounting holes on winch platform and engage with diamond shaft (11).
- (7) Install two recessed hexagon head capscrews (7), lockwashers (8), and hexagon plain nuts (9) to secure levelwind side frame (10) to winch platform.
- (8) Lifting sling is temporarily left in place to support levelwind carriage during replacement procedures.

t. Diamond Shaft Pawl. (FIGURE 4-8)

- (1) Install diamond shaft pawl (13) into interior of pawl cap flange (14).
- (2) Install pawl cap (12) over pawl cap flange with mounting holes aligned.
- (3) Install eight hexagon head capscrews (10) with lockwashers (11) to secure pawl cap to pawl cap flange.

u. Shaft Guide. (FIGURE 4-8)

- (1) Ensure that lifting sling (1) supports weight of levelwind carriage (2).

NOTE

Four soldiers are required for shaft guide replacement procedures.

Shaft guide can be installed from either end of levelwind carriage.



- (2) Position shaft guide (3) over top of levelwind side frame on left side.
- (3) Slide shaft guide (3) across top of levelwind side frame (8) and into top section of levelwind guide (9) and onto top of levelwind side frame (8) on right side.
- (4) Position access covers (7) on each end of levelwind side frames (8) and aligned with mounting holes.
- (5) Install eight hexagon head capscrews (4), lockwasher (5), and hexagon plain nuts (6), to secure access covers (7) to top of levelwind side frames (8).
- (6) Remove lifting sling.

v. Bearings. (FIGURE 4-7)

- (1) Position bearing caps (8) and shaft (3) on levelwind side frame (1) with mounting holes aligned.
- (2) Install four hexagon head capscrews (7) to secure bearing caps (8) and shaft (3) to levelwind side frame.

w. Wheel Sprocket (60B77). (FIGURE 4-7)

NOTE

Two soldiers are required for replacement procedure.

- (1) Install machine keyway.
- (2) Position wheel sprocket (5) on shaft (6).
- (3) Secure wheel sprocket on shaft with set screw.

x. Wheel Sprocket (60B48). (FIGURE 4-7)

- (1) Position wheel sprocket (4) on shaft (3).
- (2) Secure wheel sprocket on shaft with set screws.

y. Wheel Sprocket (60B28). (FIGURE 4-7).

- (1) Position wheel sprocket (2) on shaft (3).
- (2) Secure wheel sprocket on shaft with set screw.

z. Chain (Drive). (FIGURE 4-6)

- (1) Install chain (5) on wheel sprockets (8) and (4).
- (2) Engage detachable link (6) on chain.
- (3) Install retaining clip (7) on detachable link.

aa. Chain (Levelwind). (FIGURE 4-6)

- (1) Install chain (2) on wheel sprockets and (3) and (1).
- (2) Engage detachable link (9) on chain.
- (3) Install retaining clip (10) on detachable link.
- (4) Install inner guard (2, FIGURE 4-5) to winch assembly with attaching hardware.
- (5) Install outer guard (1, FIGURE 4-5) to winch assembly with attaching hardware.

ab. Operational test. Refer to paragraph 2-12 and perform steps to check operation of assembly.

4-14. **Repair Hydraulic Motor Assembly.****This task covers:****a. Disassembly****b. Repair****c. Assembly****INITIAL SETUP**Tools

Tool kit, general mechanic's,  
5180-00-699-5273

Tool kit, measuring machinist's,  
5280-01-278-9919

Torque wrench (30-300 inch-pound),  
5120-01-092-3278

Torque wrench (30-300 foot-pound),  
5120-01-125-5190

Bearing puller,  
5120-00-595-9304

Bearing press,  
4920-00-373-9376

Equipment Condition

Stern anchor winch shut down, tagged  
"Out of Service - Do Not Operate."  
Reference TM 55-1905-22310.  
Refer to the following paragraph in this  
maintenance manual:  
Hydraulic motor assembly removed  
paragraph 2-15.

Materials/Parts

Retaining ring P/N 0150111, 0150730

Preformed packing P/N 0150112, 0150113,  
0150114, 0150610, 0150810, 0150811,  
0150812, 0150813, 0150815

Seal plate P/N 0150110

Annular ball bearing P/N 0150710

Roller bearing P/N 0150720

Bearing ball P/N 0150920

**DISASSEMBLY** (FIGURE 4-27)

- a. Drain fluid from hydraulic motor assembly and prepare a clean flat surface for disassembly and repair.
- b. Remove retaining ring (2).
- c. Remove preformed packing (3) and (4).
- d. Remove seal plate (5) and preformed packing (6).
- e. Remove retaining ring (7).
- f. Remove shaft (9) and bearing (8) from housing (11).
- g. Remove bearing (8) from shaft (9) with bearing puller.

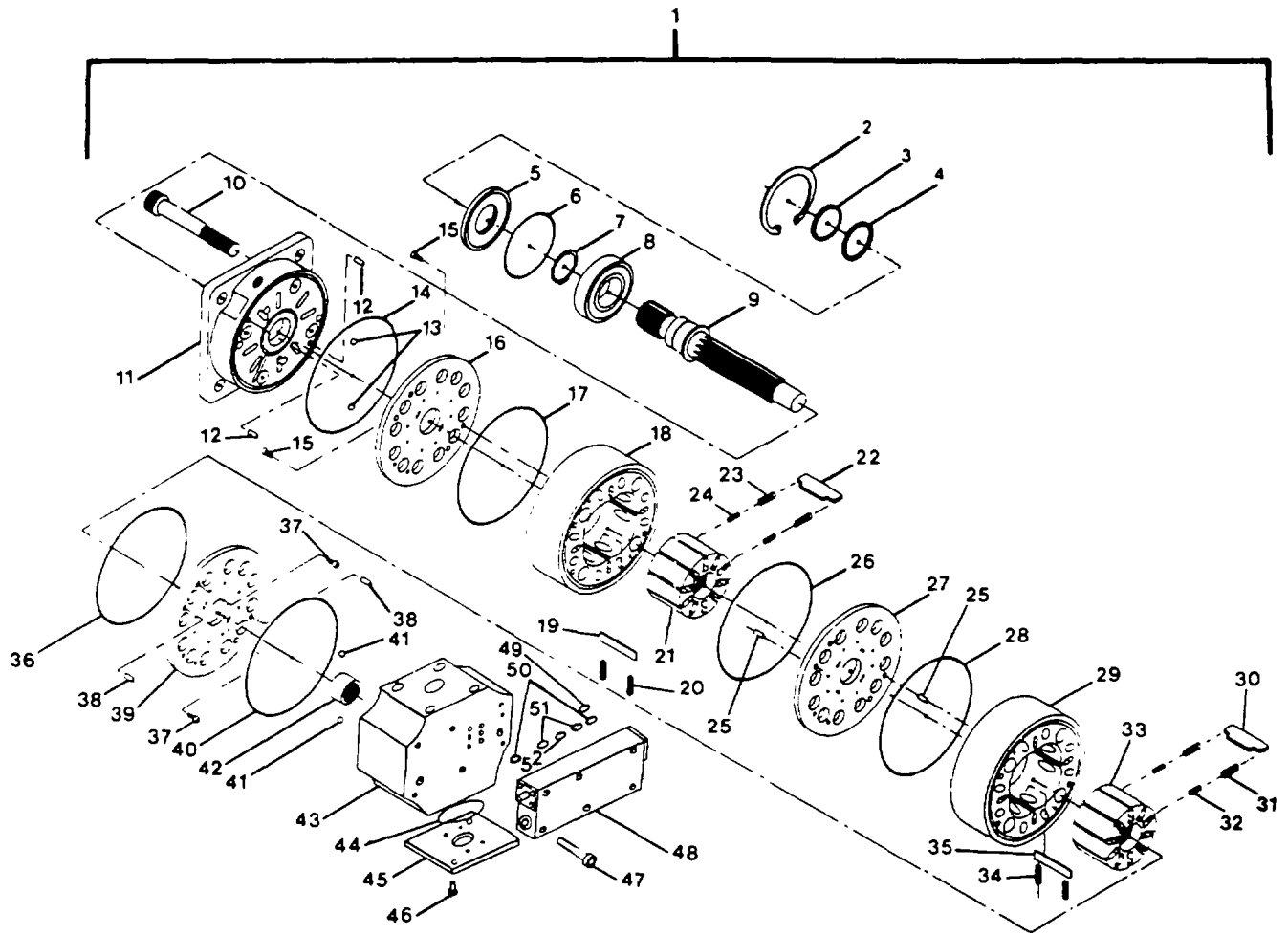


FIGURE 4-27. Hydraulic Motor Assembly.

- h. Observe identifying marks or features on pump housing for alignment during assembly. Stamp housing with alignment marks.
- i. Remove retaining bolts (10).
- j. Separate front internal housing (11) from stator assembly (18).
- k. Remove dowel pins (12), ball bearings (13), and preformed packing (14). Note location of dowel pins and checkballs to be used during assembly.
- l. Remove machine screws (15) securing plate (16) to stator (18).
- m. Remove plate (16) and preformed packing (17).
- n. Separate stator (18) from stacked stator (29).
- o. Remove dowel pins (25), plate (27), and preformed packing (26). Note location of dowel pins to be used during assembly.
- p. Slide rotor (21) out of stator (18).
- q. Separate rotor vanes (22), outer springs (23), and inner springs (24) from rotor (21).
- r. Remove stator vanes (19) and springs (20) from stator (18).
- s. Separate stacked stator (29) from rear housing (43).
- t. Remove dowel pins (38), ball bearings (41), preformed packing (40) and roller bearing (42). Note location of dowel pins and ball bearings to be used during assembly.
- u. Remove machine screws (37) securing plate (39) and preformed packing (36) to stacked stator assembly (29).
- v. Remove plate (39) and preformed packing (36).
- w. Repeat procedures in steps (p), (q) and (r) for disassembly of stacked stator (29).
- x. Remove machine bolts (47) securing rear housing manifold (48) to rear housing (43).
- y. Separate rear housing manifold from rear housing.
- z. Remove preformed packing (49, 50, 51 and 52). Note location of preformed packing to be used during assembly.
- aa. Remove machine bolts (46) securing access cover (45) to rear housing (43).
- ab. Separate access cover from rear housing. Remove preformed packing (44).

REPAIR

Repair of hydraulic motor assembly consists of replacing: retaining rings (2) and (7), preformed packing (3), (4), (6), (14), (17), (26), (28), (36), (40), (44), (49), (50), (51), (52). Seal plate (5), annular ball bearing (8), ball bearings (13 and 41), and roller bearing (42).

ASSEMBLY (FIGURE 4-27)

- a. Position preformed packing (44) and access cover (45) over boltholes on rear housing (43).
- b. Install machine bolts (46) and secure access cover (45) to rear housing (43).
- c. Position preformed packing (49, 50, 51 and 52) over portholes on rear housing (43). Ensure that preformed packing are installed as noted during disassembly.
- d. Position rear housing manifold (48) over boltholes on rear housing (43). Ensure that preformed packing are aligned.
- e. Install machine bolts (47) and secure rear housing manifold (48) to rear housing (43).
- f. Insert stator vane springs (34) and stator vanes (35) into stacked stator (29).
- g. Insert rotor vane inner springs (32), outer springs (31), and rotor vanes (30) into rotor (33).
- h. Prelube the rotor and inside of stators before inserting assembled rotor into stacked stator (29).
- i. Check that rotor turns freely within stacked stator.
- j. Position preformed packing (36), plate (39), and dowel pins (38) on stacked stator (29). Ensure that dowel pins are installed as noted during disassembly.
- k. Secure preformed packing (36) and plate (39) to stacked stator (29) with machine screws (37).
- l. Insert roller bearing (42) into rear housing (43).
- m. Replace ball bearings (41) on rear housing as noted during disassembly.
- n. Position preformed packing (40) between plate (39) and rear housing (43).
- o. Align plate (39), rear housing (43) dowel pins (38) and engage stacked stator (29) with rear housing.
- p. Repeat procedures in steps (f), (g), (h) and (i) for installation of stator (18).

- q. Position preformed packing (26 and 28), plate (27), and dowel pins (25) between stators (18) and (29). Ensure that dowel pins are installed as noted during disassembly.
- r. Align stators (18 and 29) with plate (27) dowel pins (25) and engage both stators. Ensure proper orientation as observed during disassembly.
- s. Position preformed packing (17), plate (16), dowel pins (12) on stator (18). Ensure that dowel pins are installed as noted during disassembly.
- t. Secure preformed packing (17) and plate (16) to stator (18) with machine screws (15).
- u. Replace ball bearings (13) on front housing (11) as noted during disassembly.
- v. Position preformed packing (14) between plate (16) and front housing (11).
- w. Align front housing (11) preformed packing (14) assembled stators (18 and 29) with rear housing assembly (43). Ensure proper orientation as observed during disassembly.
- x. Install retaining bolts (10), but do not tighten.
- y. Press bearing (8) onto shaft (9).

**NOTE**

A rocking motion of shaft may be necessary to allow shaft alignment with stators and front and rear housing assemblies.

- z. Insert shaft (9) through front housing (11) stators (18 and 29) and engage with roller bearing (42) in rear housing (43).
- aa. Press bearing (8) into front housing (11).
- ab. Install retaining ring (7), preformed packing (6), seal plate (5), preformed packings (3 and 4), and retaining ring (2).
- ac. Secure motor assembly with retaining bolts (10).

**CAUTION**

To prevent possible damage to internal parts, hydraulic motor assembly should never be operated dry or without internal lubrication.

- ad. Fill hydraulic motor assembly with hydraulic fluid through ports on rear housing. Rotate shaft to ensure that internal moving parts are lubricated; then, drain hydraulic fluid from motor.

---

**4-15. Repair Failsafe Brake Assembly.**

---

**This task covers:****a. Disassembly****b. Repair****c. Assembly**

---

**INITIAL SETUP**Tools

Tool kit, general mechanic's,  
5180-00-699-5273  
Torque wrench (30-300 foot-pound),  
(41-408 N-m)  
5120-01-125-5190

Materials/Parts

Preformed packing P/N 27808, 32833,  
36701, 37719  
Retaining ring P/N 28285  
Annular ball bearing P/N 28284 (2)  
Casket P/N 35966  
Disk brake P/N 36630, 36224, 36346  
Piston P/N 36339  
Retainer packing P/N 27967

Equipment Condition

Stern anchor winch shut down, tagged  
"Out of Service - Do Not Operate."  
Reference TM 55-1905-223-10.

Refer to the following paragraphs in this  
maintenance manual:  
Failsafe brake assembly removed,  
paragraph 2-16.  
Hydraulic motor assembly removed,  
paragraph 2-15.

---

**DISASSEMBLY (FIGURE 4-28)****NOTE**

Prepare a clean flat surface for disassembly and repair of failsafe brake.

- a. Remove preformed packing (3) and retaining ring (4) from shaft (11). Scribe brake housing with orientation markings to be used during assembly.
- b. Remove retaining ring (21) from power plate (24).

**NOTE**

Identify and record removal sequences of parts to be used during assembly. Observe identifying marks or features on brake housing to be used during assembly.



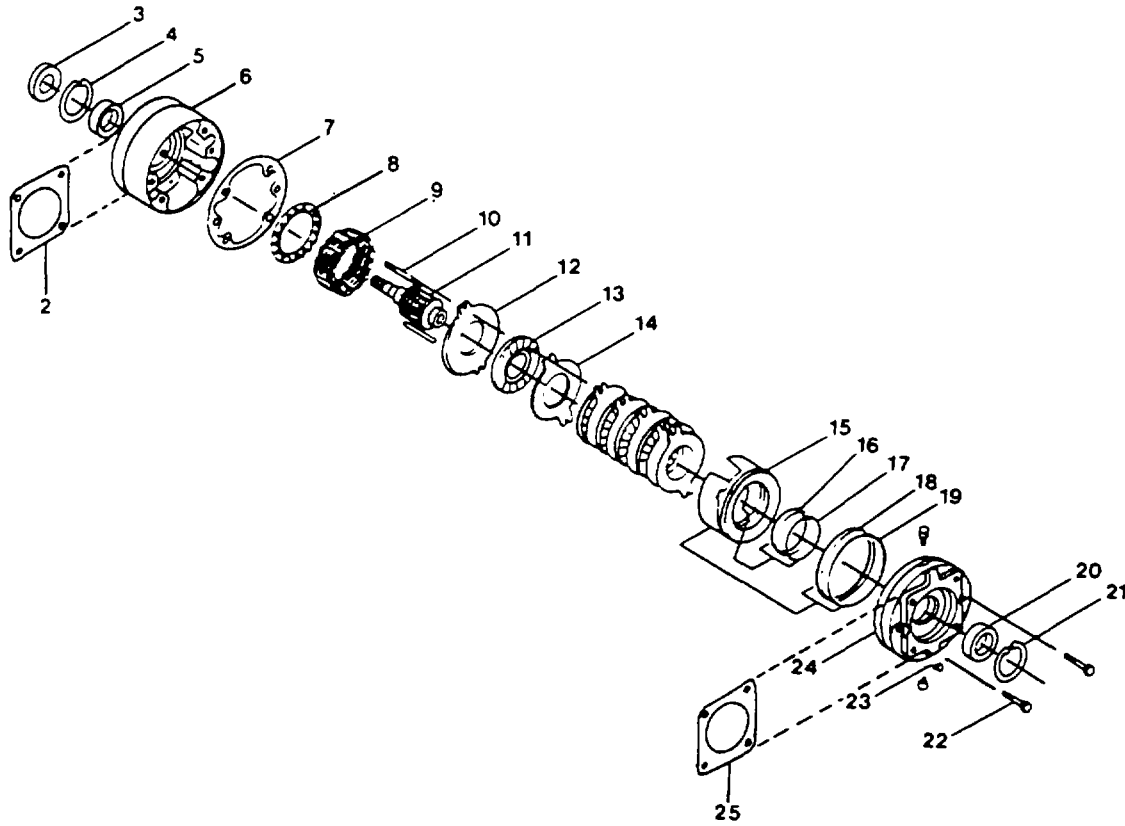


FIGURE 4-28. Failsafe Brake Assembly.

- c. Remove two mounting flanged screws (22).
- d. Separate brake housing (6) from power plate (24).
- e. Slide housing (6) off splined end of shaft (11).
- f. Remove gasket (7), spring retainer (8), compression springs (9), and torque pins (10).
- g. Slide disk brake (12), disk brake-(13), and disk brake (14) off splined end of shaft.
- h. Repeat step for remaining disks.
- i. Secure shaft (11) in a (soft-jaw) vise.
- j. Remove power plate (24) from shaft end by tapping on power plate (24) with soft face hammer.
- k. Remove shaft from vise.

### WARNING

Direct piston away from the body during the following procedure.

- l. Separate piston (1, FIGURE 4-29) from power plate (3, FIGURE 4-29) by introducing low pressure air (15 psi) into failsafe brake hydraulic inlet (2, FIGURE 4-29).
- m. Remove packing retainer (16, FIGURE 4-28), preformed packing (17), and backup preformed packing (18 and 19) from piston (15). Backup preformed packing (18 and 19) will be destroyed during removal. Note location of packing retainer and preformed packing to be used during assembly.
- n. Remove bearings (5 and 20) from housing (6) and powerplate (24).
- o. Remove relief valve (23) and inspect spring-loaded ball to ensure ball operates freely and free from contamination. Replace if necessary.

### REPAIR

Repair of failsafe brake assembly (1) consists of replacing: preformed packing (3), (17), (18) and (19), retaining rings- (4 and 21), annular ball bearings (5 and 20) gasket (7), disk brakes (12), (13) and (14), piston (15), and packing retainer (16).

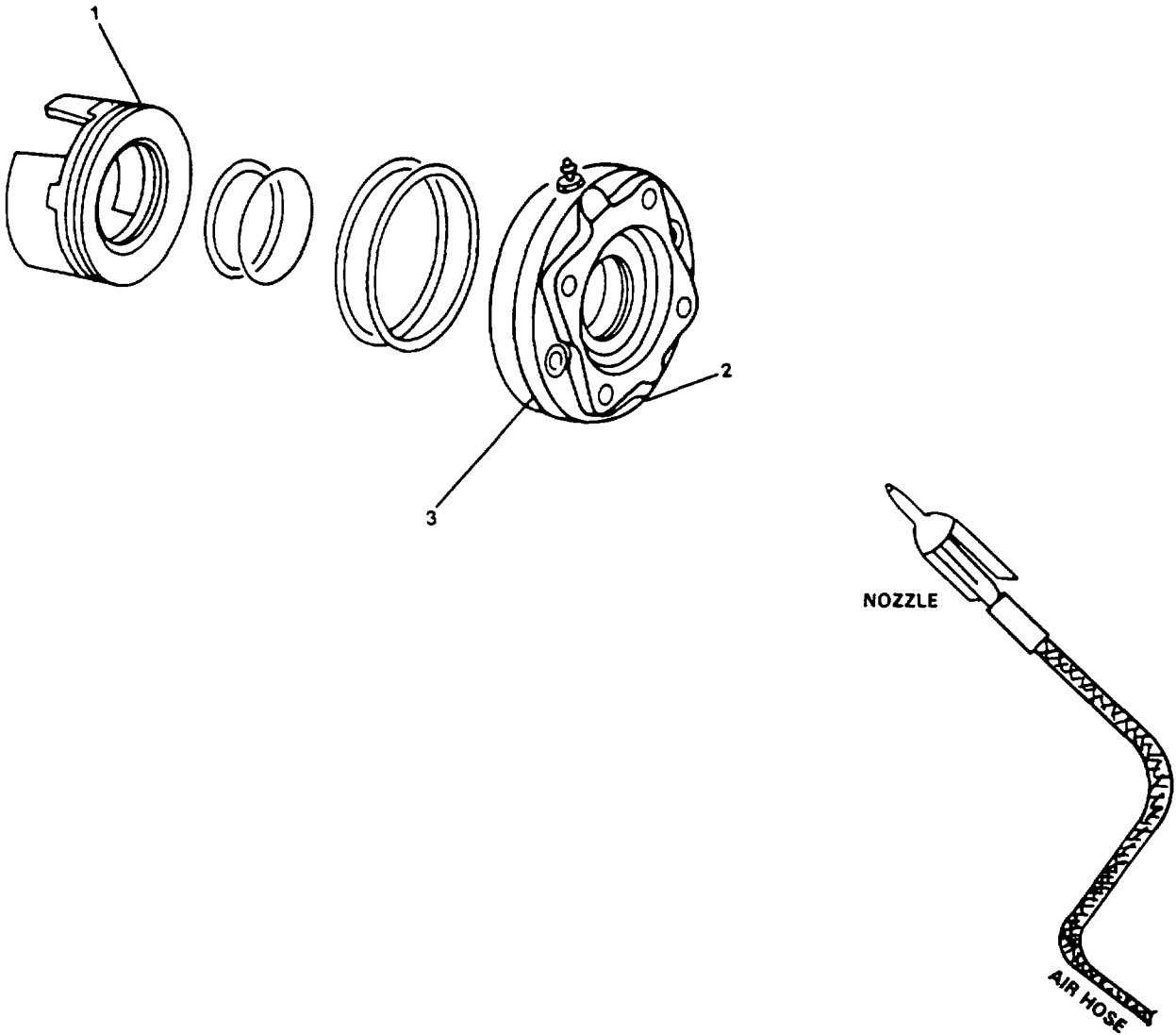


FIGURE 4-29. Failsafe Brake Assembly - Piston Removal.

ASSEMBLY (FIGURE 4-28)

- a. Install relief valve (23) and spring loaded ball into power plate (24).
- b. Install bearings (5 and 20) into power plate (24) and housing (6).
- c. Install packing retainer (16) and preformed packing (17) to interior of piston (15) and preformed packing (18 and 19) on extension of piston (15) as noted during disassembly.

- d. Lubricate piston assembly with hydraulic fluid.
- e. Install piston assembly into power plate (24) using a soft-jaw vise or press.
- f. Secure shaft (11) in a soft-jaw vise.
- g. Install power plate (24) onto shaft.
- h. Remove shaft from vice.

NOTE

Disk brakes must be completely dry before assembly.

- i. Install disk brake (14), disk brake (13), and disk brake (12) onto splined end of shaft.
- j. Repeat step i. for remaining disks.
- k. Install torque pins (10) over disk assembly (14, 13, 12) and align with piston (15) and power plate (24).
- l. Assemble compression springs (9) on spring retainer (8) and install over splined end of shaft (11).
- m. Install gasket (7) with screw holes aligned.
- n. Position brake housing (6) over splined end of shaft with internal parts aligned.
- o. Engage brake housing (6) with power plate (24). Ensure bearings (5 and 20) are seated on shaft.
- p. Align brake housing screwholes and observed identifying marks or features noted during disassembly.
- q. Install flanged screws (22), but do not tighten.
- r. Install retaining rings (4 and 21) on the ends.
- g. Install preformed packing (3) on splined end of shaft.
- t. Torque flanged-screws (22) 75-85 ft-lb (102-116 N•m).
- u. Replace hydraulic motor assembly, paragraph 2-15.
- v. Replace failsafe brake assembly, paragraph 2-16.
- w. Restore equipment to operational condition. (Reference TM 55-1905-223-10).

4-16. **Replace/Repair Gearbox Assembly.**

**This task covers:**

- |                    |                       |                       |                  |
|--------------------|-----------------------|-----------------------|------------------|
| <b>a. Removal</b>  | <b>b. Disassembly</b> | <b>c. Inspection</b>  | <b>d. Repair</b> |
| <b>e. Assembly</b> | <b>f. Adjustment</b>  | <b>g. Replacement</b> |                  |

**INITIAL SETUP**

Tools

- Tool kit, general mechanic's,  
5180-00-699-5273
- Tool kit, measuring machinists,  
5280-01-278-9919
- Torque wrench (30-300 foot-pound)  
5120-01-125-5190
- Lifting sling 3375958
- Bearing puller, 5120-00-  
595-9304
- Bearing Press, 4920-00-373-9376

Materials/Parts

- Gearbox assembly  
P/N LC-280-12V-R-L-I-A
- Oil seal P/N A65x90x10/12,  
A170Y200x15
- Gear set (high speed)  
P/N LC-280-12V-73
- Cartridge bearing PIN 2023x74-1
- Bearing assembly (high speed)  
P/N 31315x.KII-AI00
- Shaft (high speed)  
P/N 2024x29-1
- Oil slinger (high speed)  
P/N 2023W80-A
- Bearing P/N 22316LB/C3
- Pinion (intermediate speed)  
P/N 2024x5-1
- Bearing (intermediate speed)  
P/N 22314LB/C3, 22319LB/C3
- Bearing assembly (intermediate speed)  
P/N 31111Y.KIIA-80.1
- Cartridge bearing (intermediate speed)  
P/N 2023x95-1
- Retainer bearing (intermediate speed)  
P/N LC-280-12V-8, 1960x405-2

Equipment Condition

- Stern anchor winch shut down, tagged  
"Out of Service - Do Not Operate."  
(Reference TM 55-1905-223-10)
- Refer to the following paragraphs in this  
maintenance manual:
- Single leg wire rope assembly removed,  
paragraph 4-12.
- Hydraulic pump assembly removed,  
paragraph 2-15.
- Failsafe brake assembly removed,  
paragraph 2-16.
- Brake reducer mount/coupling removed,  
para. 4-13.
- Spool and shaft removed, paragraph 4-13.

General Safety Instructions

- Be very careful when lifting heavy  
equipment.

Gear (intermediate speed)  
 P/N 2024x4-1  
 Pinion (low speed)  
 P/N 2024x3-1  
 Retainer bearing (low speed)  
 P/N 1960x402-2, LC-280-12V-9  
 Seal retainer P/N LC-280-12V-11  
 Bearing (low speed) P/N 23034LB/C3,  
 LC-280-12V-26  
 Shaft (low speed) P/N 7785x920-A  
 Gear (low speed) P/N 2024x2-1  
 Shims, P/N 2023W78-1, P/N 2023W79-1,  
 P/N 0080X301-1, P/N LC-280-12V-43

---

## REMOVAL

a. Drain Oil.

Drain oil, Table 2-1, item no. 25.

b. Upper Housing Assembly.

Remove gearbox upper housing assembly, paragraph 4-13.

c. Low Speed Gear Assembly.

(1) Remove low speed gear assembly, paragraph 4-13.

(2) For disassembly procedures of low speed gear assembly, refer to DISASSEMBLY task, step a.

d. Intermediate Speed Gear Assembly. (FIGURE 4-30)

(1) Attach lifting sling (1) to lifting points on intermediate speed gear assembly.

### CAUTION

Make sure you restrict movement of gear assembly or equipment could be damaged.

(2) Lift gear assembly vertically while exercising care as gear assembly is disengaged from lower gear box housing.

(3) Position gear assembly on a clean flat surface for disassembly.

(4) Remove lifting sling.

(5) For disassembly procedures of intermediate speed gear assembly, refer to DISASSEMBLY task, step b.

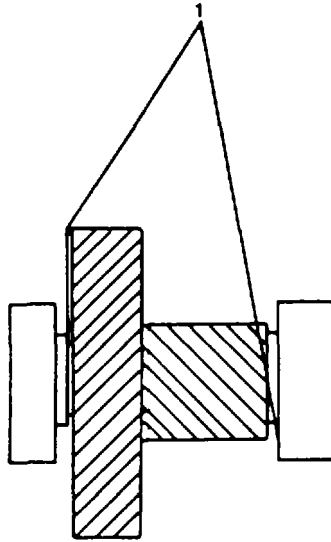


FIGURE 4-30. Lifting Points Intermediate Speed Gear Assembly.

e. Intermediate Speed Pinion. (FIGURE 4-31)

- (1) Attach lifting sling (1) to lifting points on intermediate speed pinion.

CAUTION

Make sure you restrict movement of intermediate speed pinion.

- (2) Lift intermediate speed pinion vertically while exercising care as pinion is disengaged from lower gear box housing.
- (3) Position pinion on a clean flat surface for disassembly.
- (4) For disassembly procedures of intermediate speed pinion, refer to DISASSEMBLY task, step c.

f. High Speed Shaft Assembly. (FIGURE 4-32)

- (1) Attach lifting sling (1) to lifting points on high speed shaft.
- (2) Lift high speed shaft vertically while exercising care as shaft assembly is disengaged from lower gear box housing.
- (3) Position shaft assembly on a clean flat surface for disassembly.
- (4) Remove lifting device and sling.
- (5) For disassembly procedures of high speed shaft assembly, refer to DISASSEMBLY task, step d.

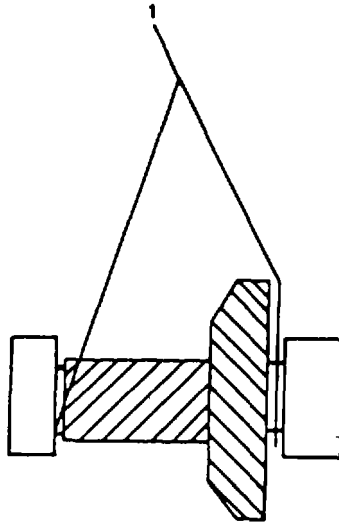


FIGURE 4-31. *Lifting Points Intermediate Speed Pinion.*

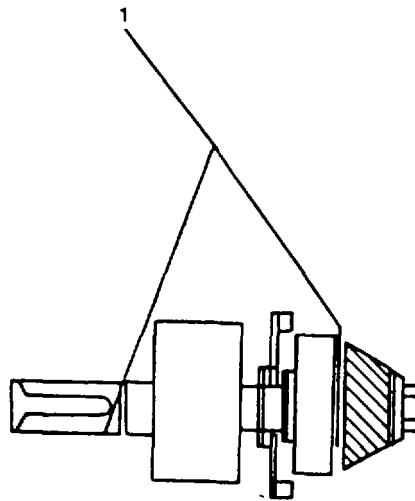


FIGURE 4-32. *Lifting Points High Speed Shaft Assembly.*



DISASSEMBLYNOTE

When parts are to be replaced, remove complete shaft assembly from gearbox.

- a. Low Speed Gear Assembly. (FIGURE 4-33)

CAUTION

Make sure you restrict movement of low speed gear assembly during removal procedure.

NOTE

Use a puller or press of proper size to remove bearings and gear from shaft assembly.

- (1) Remove winch shaft (1) and low speed (L.S.) bearings (2, 3) as a unit from low speed shaft (4).
  - (2) Separate L.S. bearings (2, 3) from winch shaft (1).
  - (3) Separate L.S. bearing (2) from L.S. bearing (3).
  - (4) Remove winch shaft (9) and L.S. bearings (7, 8) as a unit from L.S. shaft (4).
  - (5) Separate L.S. bearings (7,8) from winch shaft (9).
  - (6) Separate L.S. bearing (8) from L.S. bearing (7).
  - (7) Remove snap ring (6).
  - (8) Remove low speed gear (5).
  - (9) Retain machine key (10).
- b. Intermediate Speed Gear Assembly. (FIGURE 4-34)

CAUTION

Make sure you restrict movement of intermediate speed gear assembly during removal procedure.

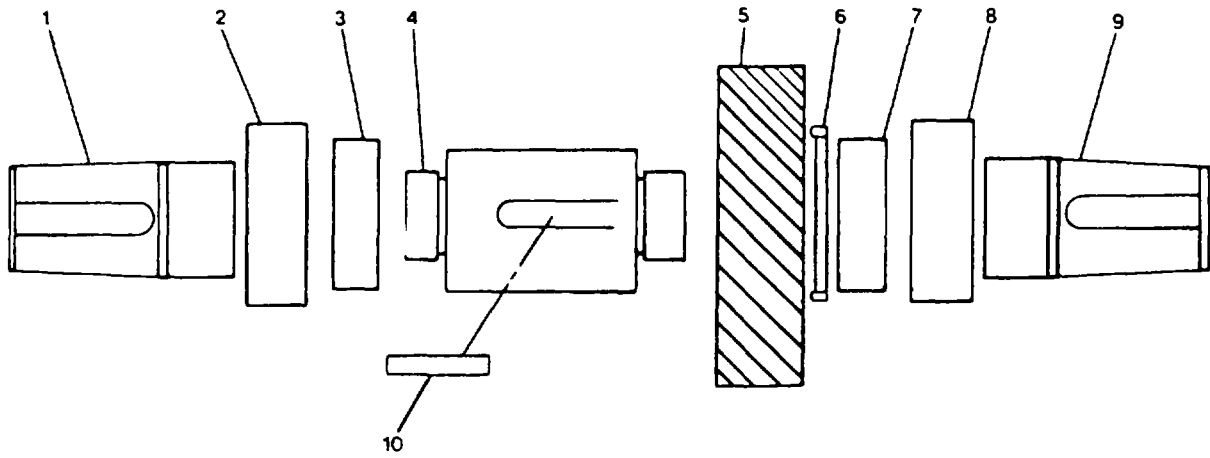


FIGURE 4-33. Low Speed Gear Assembly.

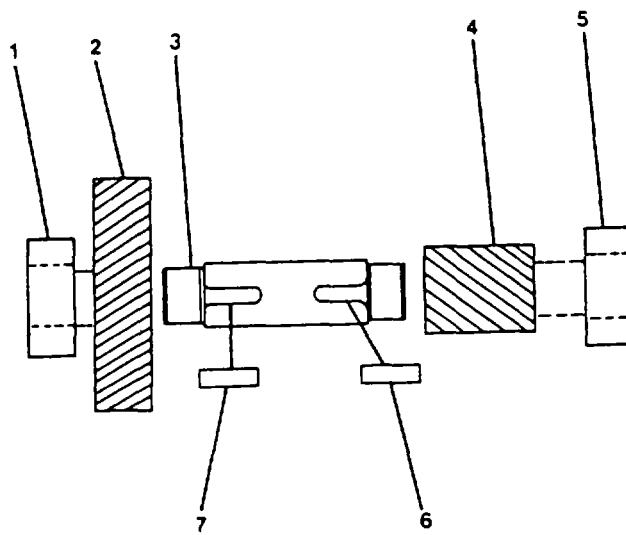


FIGURE 4-34. Intermediate Speed Gear Assembly.

## NOTE

Use a puller or press of proper size to remove bearings and gears from shaft assembly.

- (1) Remove intermediate speed (I.S.) bearing (1) and I.S. gear (2) from L.S. pinion shaft (3).
- (2) Remove I.S. bearing (5) and L.S. pinion (4) from shaft.
- (3) Retain machine keys (6,7).

c. Intermediate Speed Pinion. (FIGURE 4-35)CAUTION

Make sure you restrict movement of intermediate speed pinion during removal procedure.

## NOTE

Use a puller or press of proper size to remove bearings and gears from shaft assembly.

- (1) Remove I.S. bearing (1) from shaft (4).
- (2) Remove spacer (2) from shaft (4).
- (3) Separate I.S. pinion (3) from high speed bevel gear (5) and remove from shaft (4).
- (4) Separate I.S. bearing cartridge (8) from I.S. bearing assembly (7) and remove from shaft.
- (5) Remove I.S. bearing assembly (7).
- (6) Remove spacer (6) and high speed bevel gear (5) from shaft.
- (7) Retain machine keys (9,10).

d. High Speed Shaft Assembly. (FIGURE 4-36)

## NOTE

Use a puller or press of proper size to remove bearings and gear from shaft assembly.

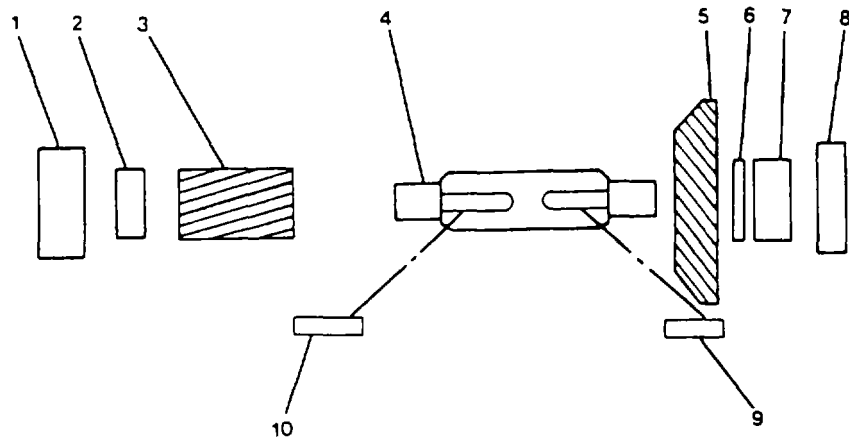


FIGURE 4-35. Intermediate Speed Pinion.

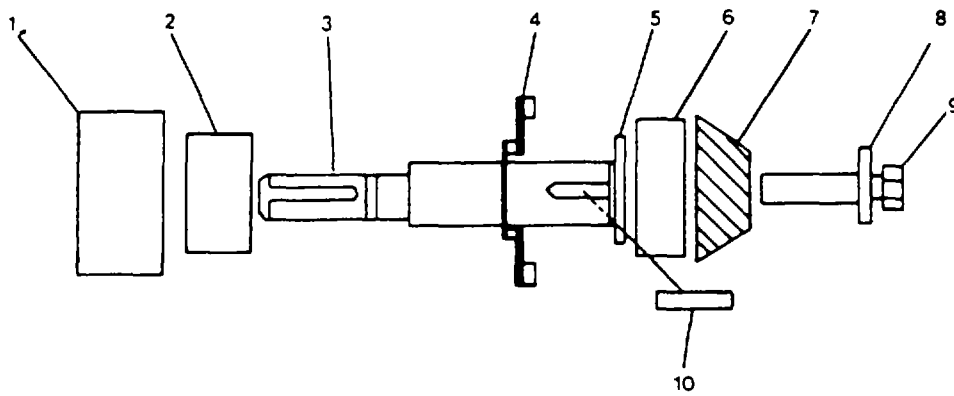


FIGURE 4-36. High Speed Shaft Assembly.

- (1) Remove high speed bearing cartridge (1) and bearing assembly (2) from shaft (3).
- (2) Remove machine bolt (9) and flat washer (8).
- (3) Remove high speed bevel gear (7) and bearing (6) from shaft (3).
- (4) Remove machine key (10).
- (5) Remove snap ring (5) and oil slinger (4) from bolt end of shaft.

#### INSPECTION

- a. Inspect interior of housing cover and base for buildup of sludge, and clean as necessary.
- b. Inspect gear sets and bearings for broken parts, chipped pieces, worn parts, cracks, and evidence of overheating.
- c. Inspect oil slinger.

#### REPAIR

Repair of gear box assembly consists of replacing: oil seals, high speed gear set, cartridge bearing, high speed bearing assembly, high speed shaft, high speed oil slinger, bearing, intermediate speed pinion, intermediate speed bearings, intermediate speed bearing assembly, intermediate speed cartridge bearing, intermediate speed retainer bearings, intermediate speed gear, low speed pinion, low speed retainer bearings, seal retainer, low speed bearings, low speed shaft, and low speed gear.

#### NOTE

Gear box assembly is a candidate for direct exchange with the vendor.

#### ASSEMBLY

- a. High Speed Shaft Assembly. (FIGURE 4-36)

#### NOTE

Use a press of proper size to replace bearings and gear on shaft assembly.

- (1) Install oil slinger (4) and snap ring (5) on shaft (3) from bolt end of shaft.
- (2) Install machine key (10).
- (3) Install bearing (6) and high speed bevel gear (7).
- (4) Install flat washer (8) and machine bolt (9), and secure bearing and gear assembly to shaft (3).
- (5) Install bearing assembly (2) and high speed bearing cartridge (1) on shaft (3).

b. Intermediate Speed Pinion. (FIGURE 4-35)

NOTE

Use a press of proper size to replace bearings and gears on shaft assembly.

CAUTION

Make sure you restrict movement of intermediate speed pinion.

- (1) Install machine keys (9, 10).
- (2) Install high speed bevel gear (5) and spacer (6) on shaft (4).
- (3) Install I.S. bearing assembly (7) and I.S. bearing cartridge (8) on shaft.
- (4) Install I.S. pinion (3) on shaft.
- (5) Install spacer (2) and I.S. bearing (1) on shaft.

c. Intermediate Speed Gear Assembly. (FIGURE 4-34)

NOTE

Use a press of proper size to replace bearings and gears on shaft assembly.

CAUTION

Make sure you restrict movement of I.S. gear assembly.

- (1) Install machine keys (6, 7).
- (2) Install low speed pinion (4) and intermediate speed bearing (5) on low speed pinion shaft (3).
- (3) Install I.S. gear (2) and I.S. bearing (1) shaft.

d. Low Speed Gear Assembly. (FIGURE 4-33)

**NOTE**

Use a press of proper size to replace bearings and gear on shaft assembly.

**CAUTION**

Make sure you restrict movement of low speed gear assembly.

- (1) Install machine key (10).
- (2) Install low speed gear (5).
- (3) Install snap ring (6).
- (4) Assemble low speed (L.S.) bearing (8) over L.S. bearing (7).
- (5) Assemble L.S. bearings (7,8) over winch shaft (9).
- (6) Install winch shaft (9) and L.S. bearings (7,8) as a unit on L.S. shaft (4).
- (7) Assemble L.S. bearing (2) over L.S. bearing (3).
- (8) Assemble L.S. bearings (2, 3) over winch shaft (1).
- (9) Install winch shaft (1) and L.S. bearings (2,3) as a unit on L.S. shaft (4).

**ADJUSTMENT**

**NOTE**

Adjust bearings on intermediate and high speed shafts.

- a. Attach bearing retainers without shims.

- b. Use feeler gauge to check axial end play. The play should be 0.003 to 0.005 inches.
- c. Install shims until the shafts rotate freely with the required axial end play.

## REPLACEMENT

- a. High Speed Shaft Assembly. (FIGURE 4-32)
  - (1) Attach lifting device and sling (1) to lifting points on high speed shaft.
  - (2) Lower high speed shaft while exercising care as shaft assembly engages with lower gear box assembly.
  - (3) Remove lifting sling.
- b. Intermediate Speed Pinion. (FIGURE 4-31)
  - (1) Attach lifting sling (1) to lifting points on intermediate speed pinion.
  - (2) Lower intermediate speed pinion while exercising care as pinion engages with lower gear box assembly.
  - (3) Remove lifting sling.
- c. Intermediate Speed Gear Assembly. (FIGURE 4-30)
  - (1) Attach lifting sling (1) to lifting points on intermediate speed gear assembly.
  - (2) Lower gear assembly while exercising care as gear assembly engages with lower gear box assembly.
  - (3) Remove lifting sling.
- d. Low Speed Gear Assembly.
  - (1) Replace low speed gear assembly, paragraph 4-13.
  - (2) Perform steps b and c under adjustment procedures.
- e. Upper Housing Assembly.
  - (1) Replace gear box upper housing assembly, paragraph 4-13.
  - (2) Replace spool and shaft, paragraph 4-13.
  - (3) Replace brake reducer/mount coupling, paragraph 4-13.
  - (4) Replace failsafe brake assembly, paragraph 2-16.



- (5) Replace hydraulic pump assembly, paragraph 2-15.
- (6) Replace single leg wire rope assembly, paragraph 4-12.
- (7) Restore stern anchor winch to operational condition. Remove tags. Refer to operator's manual, TM 55-1905-223-10.

---

**4-17. Replace/Repair Hydraulic Power Pack Assembly.**

---

This task covers: a. Removal, b. Repair, c. Replacement.

---

INITIAL SETUPTools

Tool kit general mechanic's,  
5180-00-699-5273  
Tool kit, electrical equipment,  
5180-00-391-1087  
Tool kit, measuring machinist's,  
5280-01-278-9919  
Torque wrench (30-300 inch-pound),  
5120-01-092-3278  
Torque wrench (30-300 foot-pound),  
5120-01-125-5190  
Lifting sling, 3375958

Equipment Condition

Stern anchor winch shut down, tagged  
"Out of Service - Do Not Operate."  
(Reference TM 55-1905-223-10)  
Refer to the following paragraph in this  
manual:  
Hydraulic power pack removed (para. 2-17).

Materials/Parts

Hydraulic Power Pack Assembly  
P/N 070085  
Electrical tags, Item 16, Appendix C

---

WARNING

Do not attempt the following procedure on a pressurized system. Escaping pressurized air and/or liquids can cause serious injury.

Exercise extreme caution when lifting heavy equipment or serious injury could result.

REMOVAL (FIGURE 4-37)

- a. Attach lifting sling to reservoir (3).
- b. Remove four machine bolts (1) and hexagon self-locking nuts (2) securing reservoir (3) to deck plate.

## NOTE

This item is a candidate for direct exchange with the vendor.

REPAIR

Repair of hydraulic power pack assembly consists of replacing the hydraulic power pack assembly reservoir (3).

REPLACEMENT

- a. Place reservoir (3) on deck plates and remove lifting sling.
- b. Install four machine bolts (1) hexagon self-locking nuts (2) to secure reservoir (3) to deck plate.

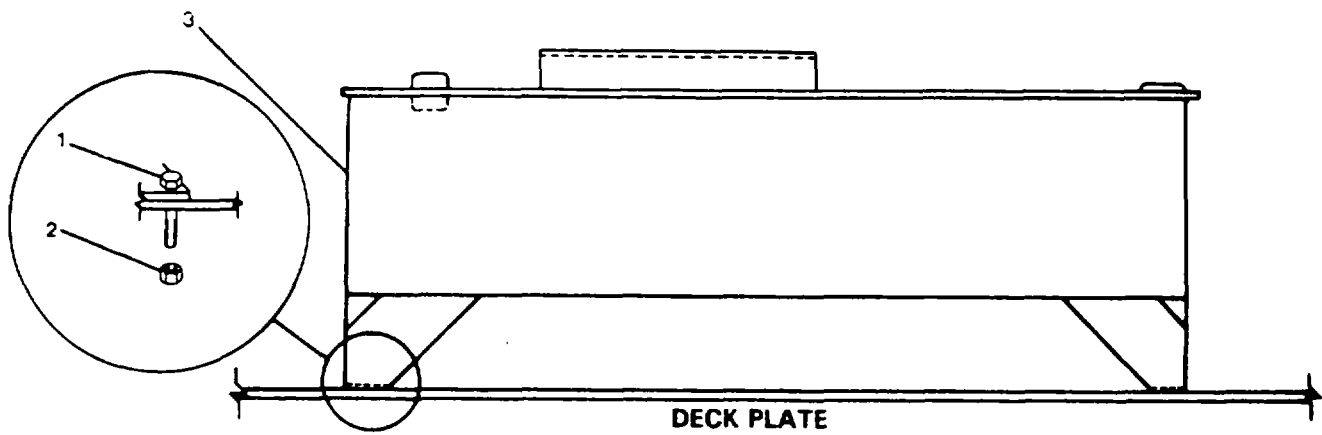


FIGURE 4-37. Reservoir.

---

#### 4-18. Repair Hydraulic Pump.

---

This task covers: a. Removal, b. Cleaning, c. Inspection, d. Repair, e. Replacement.

---

##### INITIAL SETUP

##### Tools

Tool kit, general mechanic's,  
5180-00-699-5273  
Tool kit, measuring machinist's,  
5280-01-278-9919  
Torque wrench (30-300 foot-pound),  
(41-408 N-m)  
5120-01-125-5190

##### Equipment Condition

Stern anchor winch shut down, tagged  
"Out of Service - Do Not Operate."  
(Reference TM 55-1905-223-1O)  
Refer to the following paragraph in this  
maintenance manual:  
Hydraulic pump removed (para. 2-17).

##### Materials/Parts

Preformed packing P/N MS28775-24  
Unitized cartridge P/N S24-10724  
Fine India stone, Item 18 Appendix C  
Fine Lapping abrasive compound, Item 2  
Appendix C  
Cleaning solvent, Item 14, Appendix C  
Lint-free cloth, Item 1, Appendix C  
Electrical tags, Item 16, Appendix C  
Crocus, cloth, fine, Item 4, Appendix C

---

##### REMOVAL (FIGURE 4-38)

- a. Secure pump in a vise with liquid pump housing (12) at topside. Clamp vise on front mounting cap (1), not on the housing.
- b. Remove four hexagon head capscrews (11) from liquid pump housing (12). Remove housing. Note position of the inlet port in reference to pressure port for use during replacement procedures.
- c. Remove preformed packing (10) from liquid pump housing (12).

##### CAUTION

Be sure not to remove the shaft at this time.

- d. Firmly grasp unitized cartridge assembly (9) and, while using a rotating motion, pull outward and remove cartridge from front mounting cap (1). It may be necessary to hook a gear puller, prying bar or screwdriver under cam ring (see FIGURE 4-39), to extract cartridge assembly. Place cartridge assembly on a flat surface for cleaning and inspection. Remove remainder of pump assembly from vise and store in a secure area.

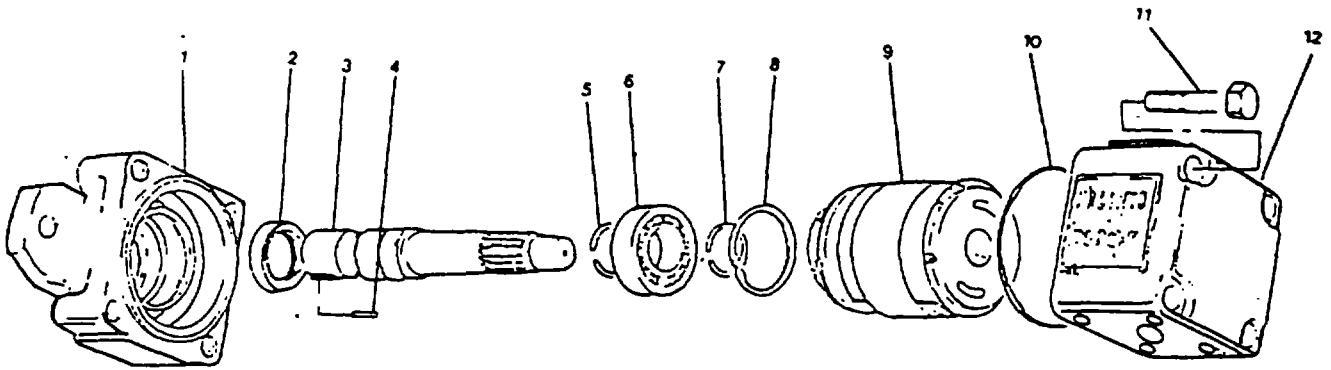


FIGURE 4-38. Hydraulic Pump.

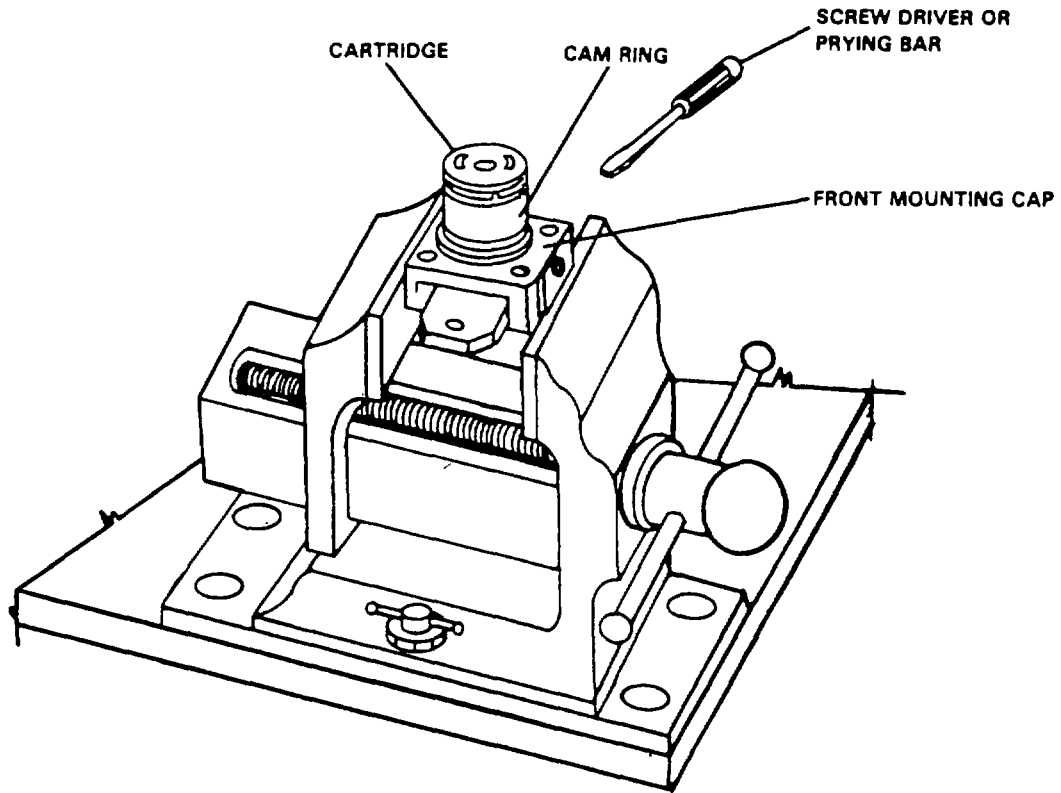


FIGURE 4-39. Unitized Cartridge.

CLEANING

- a. Wash all met parts in cleaning solvent.
- b. Dry all parts thoroughly with compressed air or lint-free cloth.

INSPECTION

- a. Place all parts on a clean lint-free surface and inspect for marks, nicks and burrs.
- b. Remove light scoring on surfaces with a fine abrasive lapping compound and/or crocus cloth.
- c. All metal parts that have been lapped must be washed again in cleaning solvent and dried thoroughly before assembly.
- d. Ensure that all parts are thoroughly cleaned, and lint free.

REPAIR

Repair of hydraulic pump consists of replacing: preformed packing (10) and unitized cartridge (9).

REPLACEMENT

- a. Install unitized cartridge assembly (9) on shouldered shaft (3).
- b. Install preformed packing (10) into liquid pump housing (12).
- c. Position liquid pump housing over unitized cartridge and engage with front mounting cap (1).

## NOTE

Make sure that inlet port and pressure port are in position as noted during removal procedure.

- d. Install four hexagon head capscrews (11) into liquid pump housing (12).
- e. Secure pump in a vise with liquid pump housing at topside. Clamp vise on front mounting cap (1).
- f. Torque four hexagon head capscrews to 115 ft-lb (156 N•m).

---

#### 4-19. Replace/Repair Hydraulic Pump Shaft.

---

This task covers: a. Disassembly, b. Inspection, c. Repair, d. Assembly.

---

##### INITIAL SETUP

###### Tools

Tool kit, general mechanic's,  
5180-00-699-5273  
Tool kit, measuring machinist's  
5180-01-278-9919  
Torque wrench (30-300 foot-pound)  
5120-01-125-5190  
Retaining ring pliers  
5120-00-595-9551  
Bearing puller  
5120-00-595-9304  
Bearing Press, 4920-00-373-9376

###### Equipment Condition

Stern anchor winch shut down, tagged  
"Out of Service - Do Not Operate."  
(Reference TM 55-1905-223-10)  
Refer to the following paragraphs in this  
maintenance manual:  
Hydraulic pump removed (para. 2-17).  
Unitized cartridge removed (para. 4-18).

###### Materials/Parts

Pump shaft P/N S14-24570  
Retaining rings P/N MS16625-1244,  
034-70777(2)  
Annular ball bearing P/N 230-82054  
Plain seal P/N 620-82012  
Hydraulic fluid, Item 19, Appendix C  
Electrical tags, Item 16, Appendix C

---

##### DISASSEMBLY (FIGURE 4-38)

- a. Remove Woodruff key (4) from keyway on shouldered shaft (3).
- b. Remove retaining ring (8) from front mounting cap (1).
- c. Separate remainder of pump by driving shouldered shaft (3) from front mounting cap (1) by gently tapping (keyway) end of shaft with a softface (lead, brass, plastic or rubber) hammer.

**CAUTION**

Make sure you do not score the internal surface of front mounting cap.

- d. If shaft seal (2) is to be replaced, remove seal from front mounting cap (1) .

**NOTE**

Refer to pump shaft assembly (inspection task) to determine if bearing assembly requires replacement.

- e. Remove retaining ring (7) from shouldered shaft (3).

**NOTE**

Use bearing puller of proper size to remove bearing.

- f. Remove bearing (6).

**CAUTION**

Retaining ring is removed by passing over the bearing surface area, rather than the shaft seal surface, and off splined end of shaft (FIGURE 4-40). Damage to the seal surface on shaft can cause the seal to leak.

- g. Remove retaining ring (5) by passing ring over the bearing surface area and off splined end of shaft.

**INSPECTION**

- a. Examine bearing (6) for damage before removal from shaft. Apply pressure to the outer face and rotate bearing to check balls for cracks or looseness. Remove bearing from shaft if a replacement is needed.
- b. If unusual wear damage, looseness, sideplay between bearing and shaft, or broken parts are revealed, bearing must be replaced.



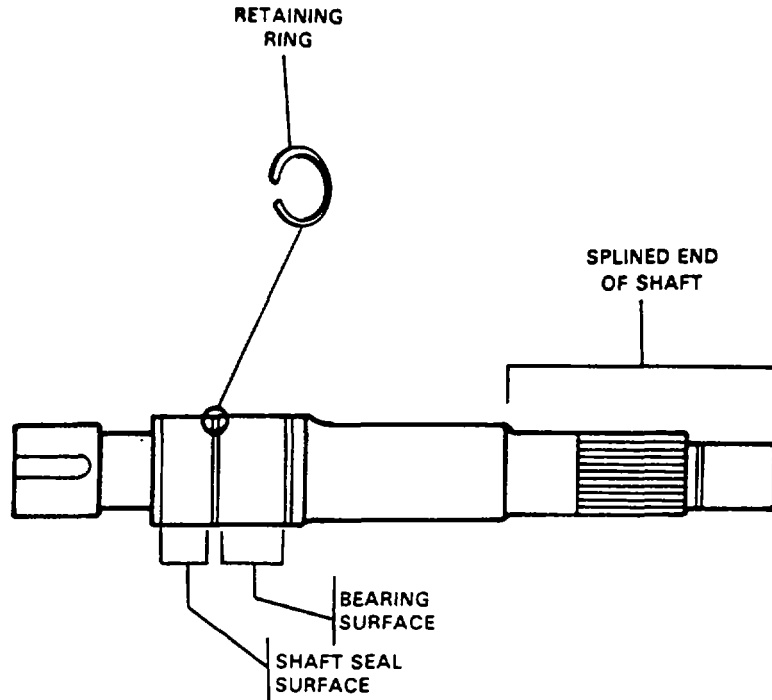


FIGURE 4-40. *Retaining Ring.*

- c. Check outside diameter of shaft at point of contact with bearing or seal. If unusual wear, damage brought on by warpage or metal stress, chips or cracks are revealed, pump shaft must be replaced.

CAUTION

Retaining ring must be removed by passing over the bearing surface area of the shaft and not the shaft seal surface. Damage to the seal surface will cause the seal to leak.

- d. If bearing is defective, remove retaining ring (7) and press bearing (6) from the shaft (3). Remove retaining ring (5) by passing over bearing surface area of shaft.

REPAIR

Repair of pump shaft consists of replacing: retaining rings (5, 7, 8), annular ball bearing (6), and plain seal (2).

ASSEMBLY (FIGURE 4-38)

## NOTE

Immerse seals and bearings in clean hydraulic fluid for easier assembly and to provide initial lubrication.

- a. Position shouldered shaft (3) on a clean flat surface.

CAUTION

Retaining ring is installed by passing over splined end of shaft and bearing surface area, and seated in ring groove (FIGURE 4-40). Damage to the seal surface on shaft can cause the seal to leak.

- b. Install retaining ring (5) onto splined end of shaft by passing over bearing surface area and seating in ring groove.

CAUTION

When installing bearing, be careful not to damage or distort retaining ring and apply pressure to inner face only.

## NOTE

Use gear press of proper size to install gear.

- c. Install bearing (6) and retaining ring (7) on shouldered shaft (3). Ensure that retaining rings (5, 7) are fully seated in ring groove.
- d. Position front mounting cap and shaft seal on a flat surface for installation.
- e. Install shaft seal (2, FIGURE 4-41) in front mounting cap (1) by gently tapping shaft seal with a softface (lead, brass, plastic or rubber) hammer.
- f. Install shouldered shaft (3, FIGURE 4-38) into large open end of front mounting cap (1).
- g. Ensure that shouldered shaft (3) is properly engaged with front mounting cap (1).
- h. Install retaining ring (8) into front mounting cap (1).
- i. Install Woodruff key (4) in keyway of shouldered shaft (3).
- j. Replace unitized cartridge assembly, paragraph 4-18.
- k. Replace hydraulic pump, paragraph 4-13.

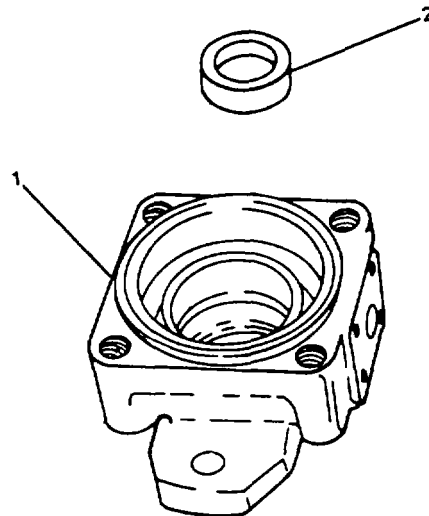


FIGURE 4-41. Front Mounting Cap.

---

**4-20. Repair Directional Control Valve. (FIGURE 4-42)**

---

This task covers: a. Disassembly, b. Repair, c. Assembly.

---

INITIAL SETUPTools

Tool kit, general mechanic's,  
5180-00-699-5273  
Torque wrench,  
5120-01-092-3278  
Torque wrench,  
5120-01-125-5190

Equipment Condition

Directional control valve removed  
(para. 2-18).

Materials/Parts

Directional control valve  
P/N 3D03-33-BO1-03-03-14CS  
Electrical solenoid  
P/N 120-11058  
Preformed packing P/Ns  
695-00118, 695-00013,  
695-00119, 675-00006,  
695-00008, 695-00011,  
695-00012  
Cleaning solvent, Item 14,  
Appendix C  
Electrical ID tags, Item 16,  
Appendix C

---

**NOTE**

This item is a candidate for direct exchange.

**CAUTION**

Upon removal of this item, cover, blank, or otherwise protect all openings to prevent foreign material from contaminating the system.

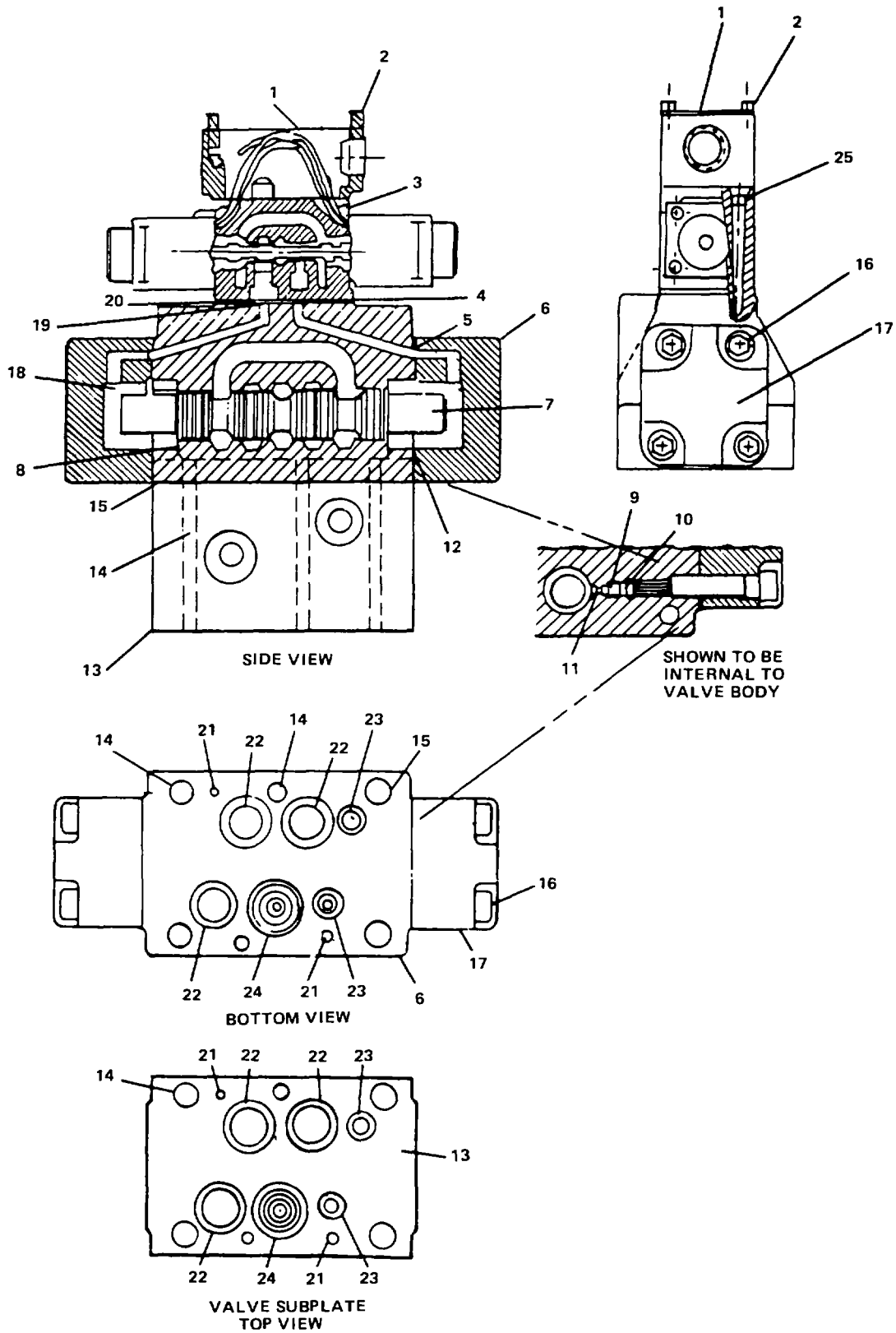


FIGURE 4-42. *Directional Control Valve*

DISASSEMBLY

- a. Remove socket head capscrews (16) both sides of valve.

CAUTION

The washers and springs are under spring tension. Use care in removing these parts to prevent loss, or damage to equipment.

- b. Remove end caps (17), both sides of valve.
- c. Remove spring tension washers (8), both sides of valve.
- d. Remove springs (18), both sides of valve.
- e. Remove linear actuating piston (9).
- f. Remove preformed packing (5, 10, 11, 12, 20) and discard.
- g. Remove orifice plug (4).
- h. Remove check valve (19).
- i. Remove spool (7).
- j. Remove roll pin (21).
- k. Remove plain encased seal (15).

REPAIR

- a. Check the body (6) and subplate (13) for oil sludge deposits or other contamination. Clean with solvent as required.
- b. Check all parts for free fluid passage in all parts, openings, and orifices. Clean with solvent as required.
- c. Check all parts for nicks, dents, cracks, scoring, and other physical defects. Replace as required.
- d. Replace all preformed packings.

ASSEMBLY

- a. Replace roll pin (21).
- b. Replace plain encased seal (15) over roll pins (21).
- c. Replace spool (7).
- d. Replace check valve (19).
- e. Replace orifice plug (4).
- f. Install preformed packings (5, 10, 11, 12, 20).
- g. Replace linear actuating piston (9).
- h. Replace springs (18).
- i. Replace spring tension washers (8).
- j. Replace end caps (17).
- k. Replace socket head capscrews (16).

**SECTION VI. PREPARATION FOR STORAGE OR SHIPMENT**

Refer to Chapter 2, Section VI for detailed information on storage of the stern anchor winch components.



**APPENDIX A**

**REFERENCES**

**A-1. Scope.** This paragraph lists the manuals, bulletins, specifications, and miscellaneous publications referenced in this manual or required for maintenance activities.

**A-2. Field Manuals.**

FM 21-11	First Aid for Soldiers
FM 31-70	Basic Cold Weather Manual
FM 55-501	Marine Crewman's Handbook

**A-3. Technical Manuals.**

TM 43-0139	Painting Instructions for Field Use
TM 55-1905-223-10	Operator's Manual for Landing Craft, Utility (LCU)
TM 55-1905-223-24-18	LCU 2000 Class Basic Craft Maintenance Manual
TM 55-1905-223-24P	Repair Parts and Special Tools List for the LCU 2000 Class Watercraft
TM 750-244-3	Destruction of Army Materiel to Prevent Enemy Use

**A-4. Technical Bulletins.**

TB 43-0144	Painting of Vessels
TB 55-1900-207-24	Treatment of Cooling Water in Marine Diesel Engines
TB 740-97-4	Preservation of Vessels for Storage

**A-5. Military Specifications.**

MIL-C-16173C	Rust Preventive, Type P-1
MIL-L-644	Preservative Oil, Type P-9
MIL-L-21260	Preservative Oil, Type P-10

**A-6. Miscellaneous Publications.**

DA Pam 738-750	The Army Maintenance Management System
LO 55-1905-223-12	Lubrication Order for the LCU 2000 Class Watercraft
*AMC-R 750-11	Use of Lubricants, Fluids, and Associated Products

**A-7. Forms.**

DA Form 2028 and DA 2028-2	Recommended Changes to Publications and Blank Forms
DA Form 2404	Equipment Maintenance and Inspection Worksheet
DA Form 2408-16	Logsheet
DA Form 2410	Logsheet
SF Form 368	Quality Deficiency Report

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\*Supercedes Darcom-R 750-11

## APPENDIX B MAINTENANCE ALLOCATION CHART (MAC)

### SECTION I. INTRODUCTION

#### B-1 THE ARMY MAINTENANCE SYSTEM MAC.

a This introduction (Section I) provides a general explanation of all maintenance and re-pair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown in the MAC in column (4) as:

Unit - includes two subcolumns: C (operator/crew) and 0 (unit) maintenance.

Direct Support - includes an F subcolumn.

General Support - includes an H subcolumn.

Depot - includes a D subcolumn.

c Section III lists the tools and test equipment (both special tools and common tools sets) required for each maintenance function as referenced from Section II.

d Section IV contains supplemental instructions and explanatory notes for a particular maintenance function as referenced from Section II.

**B2 MAINTENANCE FUNCTIONS.** Maintenance functions will be limited to and defined as follows:

**a Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (i.e., by sight, sound, or feel).

**b Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

**c Service.** Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontamination, when required), to replace filters, to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

**d Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper or ex-act position, or by setting the operating characteristics to specified parameters.

**e Align.** To adjust specified variable elements of an item to bring about optimum or de-sired performance.

**f Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

**g Remove/Install.** To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper function-ing of an equipment or system.

**h Replace.** To remove an unserviceable item and install a serviceable counterpart in its place. Replace is authorized by the MAC and is shown as the 3rd position code of the SMR code.

**i Repair.** The application of maintenance services<sup>1</sup> including fault location/trouble-shooting<sup>2</sup>, removal/installation, and disassembly/assembly procedures, and maintenance actions<sup>4</sup> to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

**j Overhaul.** That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

**k Rebuild.** Consists of those service/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Re-build is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment and components.

### B-3 EXPLANATION OF COLUMNS IN THE MAC, SECTION II

**a Column 1 - Group Number.** Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

**b Column 2 - Component/Assembly.** Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

**c Column 3 - Maintenance Function.** Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph A-2.)

**d Column 4 - Maintenance Category.** Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart.

The symbol designations for the various maintenance categories are as follows:

- C Operator or Crew
- O Unit Maintenance
- F Direct Support Maintenance (DS)
- H General Support Maintenance (GS)
- D Depot Maintenance

<sup>1</sup>Service - Inspect, test, service, adjust, align, calibrate, and/or replace.

<sup>2</sup>Fault location/troubleshooting - The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

<sup>3</sup>Disassembly/assembly - The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identification as maintenance significant).

<sup>4</sup>Actions - Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

**e Column 5 - Tools and Equipment.** Column 5 specifies, by number code, those common tool sets (not individual tools); special tools; Test, Measurement, and Diagnostic Equipment (TMDE); and support equipment required to perform the designated function, which shall be keyed to the tools listed in Section III.

**f Column 6 - Remarks.** This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

#### **B-4 EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.**

**a Column 1 - Reference Code.** The tool and test equipment reference code correlates with a number code used in the MAC, Section II, Column 5.

**b Column 2 - Maintenance Category.** The lowest category of maintenance authorized to use the tool or test equipment.

**c Column 3 - Nomenclature.** Name or identification of the tool or test equipment.

**d Column 4 - National Stock Number.** The National stock number (NSN) of the tool or test equipment.

**e Column 5- Tool Number.** The manufacturer's part number.

#### **B-5 EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.**

**a Column 1 - Reference Code.** The letter code recorded in Column 6, Section II.

**b Column 2 - Remarks.** This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

**SECTION II. MAINTENANCE ALLOCATION CHART  
FOR  
STERN ANCHOR WINCH**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
16	STERN ANCHOR WINCH SUBSYSTEM	INSPECT	1.0					1	
		SERVICE	1.0					1	A, B
		REPLACE				24.0			1, 2, 3,5, 6
		REPAIR OVERHAUL	1.5	1.5		15.5		*	1-6 C P
1601	STERN ANCHOR WINCH ASSEMBLY	INSPECT	0.5					1	B
		SERVICE	1.0					1	A, B
		REPLACE				20.0			1,4 -8 C
		REPAIR	0.8			9.5			1,4- 8 C
160101	VALVE, HYDRAULIC	REPLACE	0.8					1	C, J, N
		REPAIR		1.5				1	C, J, N
160102	HYDRAULIC MOTOR ASSEMBLY	INSPECT	0.5						
		REPLACE REPAIR	2.0	1.5				1, 5 1,3-5,7,8	C, D,J,M C,D,J,M
160103	FAILSAFE BRAKE ASSEMBLY	INSPECT	0.5					1	
		REPLACE			1.5			1	C, E, J
		REPAIR			1.5	2.0		1	C, E,J
160104	GEAR BOX ASSEMBLY	INSPECT	0.5						
		SERVICE	0.5					1	K
		REPLACE				20.0			1,3,8 C, L
		REPAIR				20.0			1,3,5 -8 C, L
1602	HYDRAULIC POWER PACK ASSEMBLY	INSPECT	1.0					1,2	
		SERVICE	1.0					1	D,F,H,G
		REPLACE						5.0	1- 6 J, O
		REPAIR	1.5	2.5			6.0	1-6	C
160201	MOTOR, ALTERNATING CURRENT	INSPECT	0.5					1,2	C
		SERVICE	0.5					1	I
		REPLACE	1.5					1-3	I
<b>Change 3 B-4</b>									

**Section II. MAINTENANCE ALLOCATION CHART  
FOR  
STERN ANCHOR WINCH**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
160202	PUMP, HYDRAULIC	INSPECT SERVICE REPLACE REPAIR	0.5 0.5 2.0				2.0	1  1 1,3,5	I C, D, J
16020201	SHAFT, PUMP	REPLACE REPAIR			3.0		5.0 1,3,5	1,3,5,7-9	
160203	VALVE, CONTROL, DIRECTIONAL	INSPECT REPLACE REPAIR	0.5 0.5				1.0	1 1,4,5	C, J

**SECTION III. TOOLS AND TEST EQUIPMENT REQUIREMENTS  
FOR  
STERN ANCHOR WINCH**

(1) TOOL OR TEST EQUIPMENT REF CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL/NATO STOCK NUMBER	(5) TOOL NUMBER
1	C, O, H	Tool Kit, General Mechanics	5180-0 699-5273	(50980) SC-5180- -90-CL-NO5
2	C, H	Tool Kit, Electrician's	5180-00-391-1087	(80064) 9000S6202- 73125ALT2
3	C, H	Tool Set, Measuring, Machinist's	5280-00-278-9919	(50980) SC-5280- -95-CL-A01 -HR
4	H	Torque Wrench (30 - 300 inch - pounds)	5120-01-092-3278	
5	C, O, H	Torque Wrench (30 - 300 foot - pounds)	5120-01 -125-5190	
6	C, O, H	Lifting Sling	3940-01-183-9412	(15434)3375958
7	H	Bearing Puller	5120-00-554-7134	
8	H	Bearing Press	4920-00-373-9376	
9	H	Retaining Ring Pliers	5120-00-595-9551	

**SECTION IV. REMARKS  
FOR  
STERN ANCHOR WINCH**

Reference Code	Remarks
A	WEEKLY: GREASE ALL FITTINGS ON THE FAIR LEAD ROLLERS AND ASSOCIATED GUIDE SLEEVES, IN ACCORDANCE WITH MAINTENANCE MANUAL.
B	WEEKLY: GREASE FITTINGS INSTALLED IN THE CLUTCH SCREW, GYPSY WILDCAT, BRAKE SCREW, BEARINGS AND CLUTCH ASSEMBLY, AND GEAR REDUCER.
C	THIS ITEM IS A CANDIDATE FOR DIRECT EXCHANGE WITH THE VENDOR
D	PROPER FLUID MUST BE USED FOR COMPATIBILITY TO SEALS AND OF VISCOSITY RANGE RECOMMENDED BY THE COMPONENT MANUFACTURERS.
E	REMOVE PISTON FROM POWER PLATE BY INTRODUCING LOW PRESSURE AIR (15 PSO INTO THE HYDRAULIC INLET. MAKE SURE PISTON IS DIRECTED AWAY FROM OPERATOR.
F	CHECK THE RESERVOIR OIL LEVEL AND ADD OIL AS REQUIRED. THE LEVEL MUST BE MAINTAINED BETWEEN THE HIGH AND LOW MARKS ON THE SIGHT GAGE.
G	CHECK THE OIL PRESSURE AND OPERATING TEMPERATURE. OIL PRESSURE AT 2900 PSI IS CONSIDERED MAXIMUM. TEMPERATURE AT 150 DEGREES F IS CONSIDERED MAXIMUM.
H	AT LEAST ONCE EVERY SIX MONTHS, OR 2,000 HOURS OF OPERATION, THE RESERVOIR, PUMP SUCTION FILTER, AND AIR VENT FILTER SHOULD BE CLEANED. AT THIS TIME, CHECK THE ENTIRE SYSTEM FOR POSSIBLE FUTURE DIFFICULTIES.
I	AT 2,000 HOURS OR AT 6 MONTHS MAINTENANCE LEVEL, CHECK THE MOTOR/PUMP COUPLING FOR MISALIGNMENT A FLEXIBLE COUPLING IS USED AND SHAFTS MUST BE ACCURATELY ALIGNED PARALLEL AND ANGULARLY. CHECK SETSCREWS IN COUPLINGS FOR LOOSENING. TIGHTEN AS REQUIRED.
J	DURING REPLACEIREPAIR OF HYDRAULIC SYSTEMS, ALL OPENINGS SHOULD BE CAPPED/PLUGGED TO PREVENT FOREIGN MATTER OR CONTAMINATION FROM ENTERING THE SYSTEM.
K	PERIODICALLY, CHECK OIL LEVEL IN SUMP OF GEAR REDUCER. OIL LEVEL TO BE MAINTAINED TO LEVEL OF PLUGS ON SIDE OF UNIT.
L	MAJOR REPAIR/REPLACEMENT OF GEAR REDUCER WILL REQUIRE REMOVAL OF WINCH AND GEAR REDUCER.
M	ATTACHING HARDWARE FOR THE HYDRAULIC MOTOR TO FAILSAFE BRAKE, AND FAILSAFE BRAKE TO ADAPTER, IS SHOWN ON WINCH ASSEMBLY.

**Change 3 B-7**



**Section IV. REMARKS  
FOR  
STERN ANCHOR WINCH (Cont.)**

Reference Code	Remarks
N	REPAIR OF THE HYDRAULIC VALVE IS BY REPLACEMENT OF THE CARTRIDGE.
O	REMOVE/REPLACE THE ENTIRE HYDRAULIC POWER PAK ASSEMBLY AT THE GENERAL SUPPORT LEVEL.
P	DEPOT LEVEL REPAIR / MAINTENANCE WILL BE PERFORMED ON A CASE BY CASE BASIS SUBJECT TO APPROVAL AND FUNDING BY THE NATIONAL MAINTENANCE POINT (NMP).

**APPENDIX C**

**EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST**

**SECTION I. INTRODUCTION**

**C-1. Scope.** This appendix lists expendable supplies and materials needed to operate and maintain the LCU 2000 Class Watercraft. These items are authorized by CTA 50-970, Expendable/Durable Items (except Medical, Class V, Repair Parts and Heraldic Items), or CTA 8-100, Army Medical Department Expendable Items.

**C-2. Explanation of Columns.**

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (for example, "Use cleaning compound, Item 5, App. C").

b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.

As applicable:

- C - Operator/Crew
- O - Organizational Maintenance
- F - Direct Support Maintenance
- H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the-Federal Supply Code for Manufacturers (FSCM) in parentheses followed by the part number.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (for example, ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

## APPENDIX C

## SECTION II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION  PART NO. AND FSCM	(5) UNIT OF MEAS.
1	O	7920-00-044-9281	Cloth, Lint-free	
2	H	5350-00-193-1348	Compound, Lapping	LB
3		Compound, Thread, Teflon		
4	O	5350-00-221-0872	Crocus Cloth, Fine	
5		Permatex (or equivalent)		
6		Lubricant, Thread, Teflon		
7	O	7050-00-961-7663	Lubriplate (or equivalent)	
8	F	7510-00-223-6708	Metal Marker, Liquid	EA
9	F	8010-00-4441-3931	Mineral Spirits	
10	O	9150-00-240-2251	Oil, Light Machine	CN
11	H	5350-00-264-3485	Paper, Abrasive, Aluminum Oxide (240 grit)	PG
12	H	8010-00-652-3626	Paste, Prussian Blue	
13	F	8030-00-999-6313	Sealant, Cup Plug	LB
14	O	6850-00-110-4498	Solvent, Cleaning (PD 680 - Dry Cleaning Solvent)	CN
15	H	7920-00-965-1709 7920-00-634-2408	Towels, Paper, Lint-free	BX
16	O	8135-00-292-2351	Electrical Tags	EA
17		7420-00-160-4550	Utility Pail	EA
18			Fine India Stone	
19	F	9150-00-985-7237	Hydraulic Fluid	GL

**GLOSSARY**

AFT or AFTER	At, near, or toward the stern.
ANCHOR	Iron device so shaped as to grip the bottom and hold a vessel at her berth by the chain or line attached.
AWEIGH	The position of the anchor when it is raised clear of the ground.
BITTER END	Last end of a line or inboard end of an anchor cable secured to bitt.
BITTS	Pair of heavy posts, set vertically in a deck or on a pier, to which mooring or towing lines are fastened.
BULKHEAD	Partition dividing the interior of a vessel into various compartments.
CHAIN LOCKER	Compartment below the main deck which receives the anchor chain.
CHAIN PIPE	Casting through which the anchor chain passes below deck.
CHOCKS	Heavy fittings with round or oval holes secured to the deck or fitted in a vessel's bulwark, through which hawsers and lines are passed; also blocks of wood for supporting boats and weights.
CLEAT	Wood or metal fitting that has two projecting horns to which a line is secured.
ENGINE ROOM	Compartment containing the propulsion machinery of a vessel.
FAIRLEAD	Fittings or devices used in preserving the direction of line, chain, or wire so that it may be delivered fairly, or on a straight lead, to the sheave or drum.
GROUND TACKLE	Anchor gear,
GYPSY	Drum like portion of the windlass, used for taking in line or chain.
HATCH	Opening in a deck giving access to cargo holds.
HAWSEPIPES	Iron castings in a bow of a vessel through which anchor chains run.

**GLOSSARY - CONT**

HAWSER	Line greater than 5-inch circumference used for mooring or towing.
HELM	The mechanism by which a vessel is steered.
MAIN DECK	First complete deck running the full length of a vessel.
MOORED	Lying with both anchors down; also tied to a pier or anchor buoy.
MOORING LINES	Cables or lines used to tie up a vessel.
PAD EYE	Metal eye permanently secured to a deck or bulkhead, to which lines and cables may be secured.
SCOPE	Length of anchor chain or cable to which a vessel is riding.
SHEAVE	Wheel inside a block.
SNUB	To stop a chain or hawser suddenly.
STERN	The after end of a vessel.
WILDCAT	Sprocket portion of windlass designed to engage the links of anchor chain.
WINCH	Hoisting machine used for loading and discharging cargo or for hauling in lines.
WINDLASS	Apparatus in which horizontal or vertical drums or wheels are operated by means of a steam engine or motor for handling heavy anchor chains and hawsers.

**Glossary 2**

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## The Metric System and Equivalents

### Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

### Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 dekagram = 10 grams = .35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

### Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

### Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

### Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

## Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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