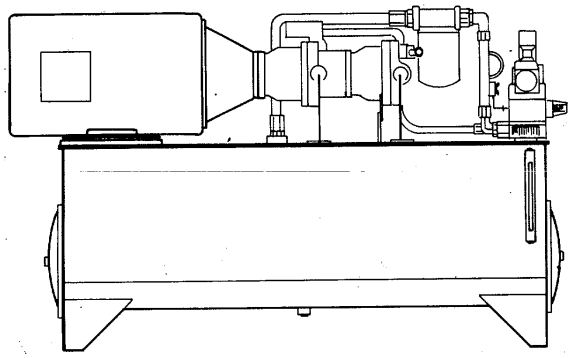
TECHNICAL MANUAL

UNIT, INTERMEDIATE DIRECT SUPPORT AND INTERMEDIATE GENERAL SUPPORT MAINTENANCE INSTRUCTIONS BOW RAMP ASSEMBLY FOR LANDING CRAFT UTILITY (LCU) NSN 1905-01-154- 1191



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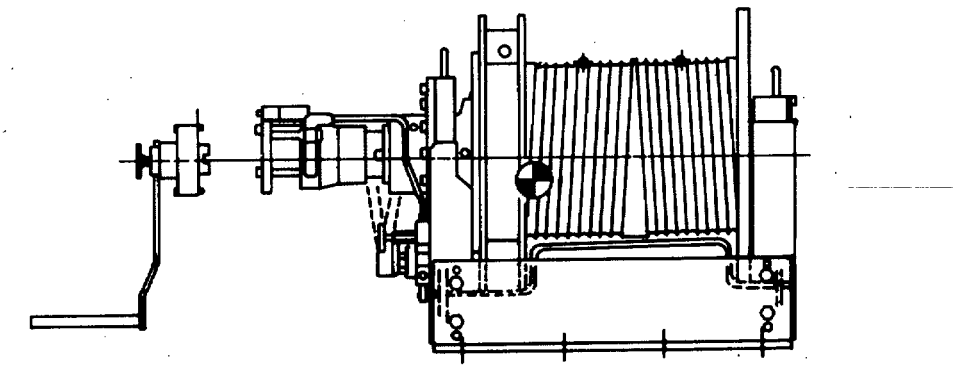

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17 JANUARY 1989

CHANGE
NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 29 July 1994

**Unit, Intermediate Direct Support,
and Intermediate General Support
Maintenance Instructions
for
BOW RAMP ASSEMBLY
for
LANDING CRAFT UTILITY (LCU)
NSN 1905-01-154-1191**

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UNIT, INTERMEDIATE DIRECT SUPPORT AND INTERMEDIATE GENERAL SUPPORT MAINTENANCE INSTRUCTIONS FOR BOW RAMP ASSEMBLY FOR LANDING CRAFT UTILITY (LCU) (NSN 1905-01-154-1191)

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C-1 through C-2	C-1 through C-2

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CHANGE }
NO. 1 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 24 October 1990

Unit, Intermediate Direct Support
and Intermediate General Support Maintenance Instructions

BOW RAMP ASSEMBLY
for
LANDING CRAFT UTILITY (LCU)
NSN 1905-01-154-1191

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Remove pages	Insert pages
2-19 and 2-20	2-19 and 2-20
2-25 and 2-26	2-25 and 2-26
4-3 through 4-8	4-3 through 4-8
4-13 and 4-14	4-13 and 4-14
4-17 and 4-18	4-17 and 4-18
4-29 and 4-30	4-29 and 4-30
4-41 and 4-42	4-41 and 4-42
4-47 and 4 48	4-47 and 4-48
4-51 and 4-52	4-51 and 4-52
4-61 and 4-62	4-61 and 4-62
4-71 and 4-72	4-71 and 4-72
B-5 through B-8	B-5 through B-7/B-8
B-9 and B-10	B-9/B-10
---	B-1/B-12

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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, moving windlass drums and wire rope, operating bow ramps, 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.

COMPRESSED AIR HAZARDS

High pressure compressed air tanks, piping systems, and air operated devices possess potential off serious injury to eyes and exposed areas of skin due to escaping air pressure. To avoid injury, ensure that air supply

For Artificial Respiration, refer to FM 21-11.

TECHNICAL MANUAL

No. 55-1905-223-24-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 17 January 1989

UNIT, INTERMEDIATE DIRECT SUPPORT, AND INTERMEDIATE GENERAL SUPPORT MAINTENANCE INSTRUCTIONS FOR 'THE BOW RAMP ASSEMBLY FOR LANDING CRAFT UTILITY (LCU) NSN 1905-01-154-1191

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.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

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. Name of Equipment. The equipment covered by the manual is the bow ramp winch assembly that is installed aboard the LCU 2000 Class Watercraft. The system is made up of the following components (FIGURE 1-1).

(1) Hydraulic Winch Assembly

(2) Hydraulic Power Pack Assembly

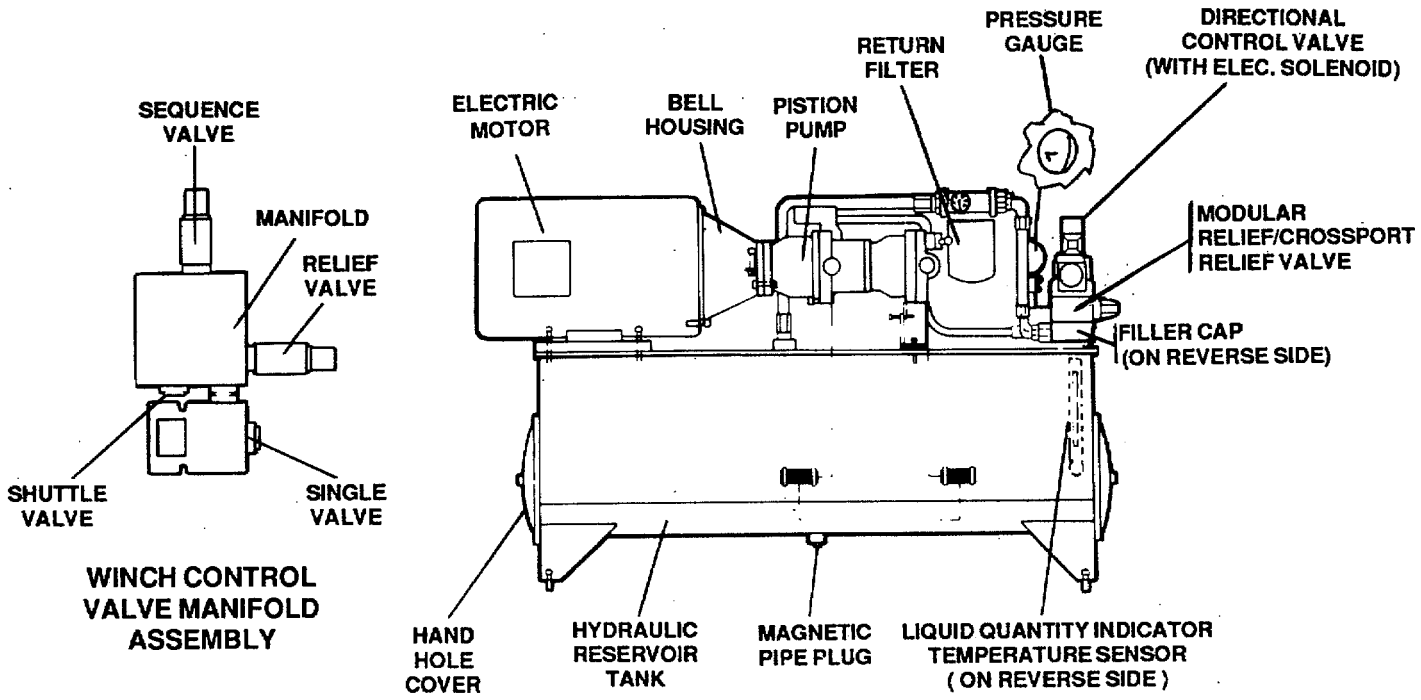
c. Purpose of Equipment. The bow ramp winch assembly is used to lower and raise the bow ramp.

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

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

1-4. **Reporting Equipment Improvement Recommendations** . 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 in 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. Disassembly, and repacking of equipment for shipment or short term storage, are covered in paragraph 2-36.



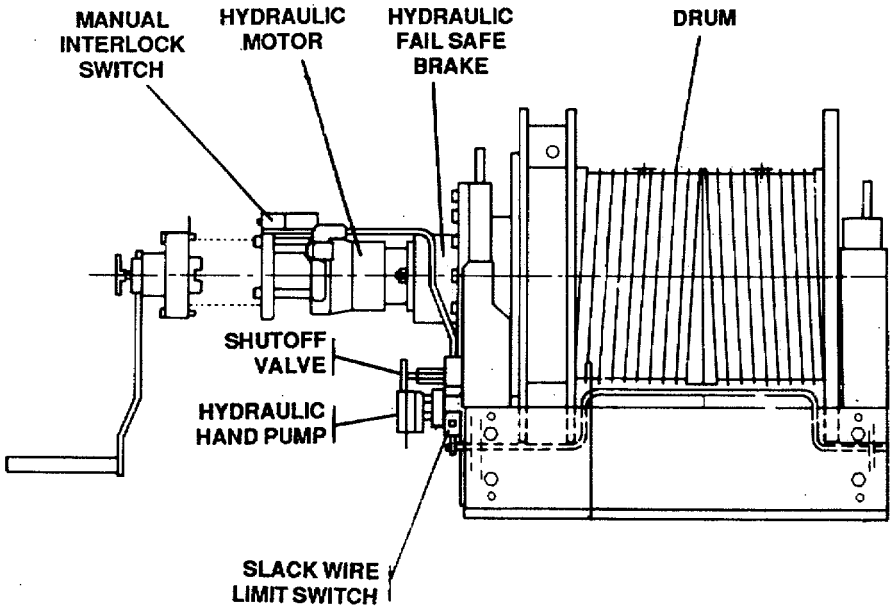


FIGURE 1-1. Bow Ramp Assembly

Section II. EQUIPMENT DESCRIPTION AND DATA

1-6. General Description . The LCU 2000 Class Watercraft bow ramp assembly consists of a winch assembly and a hydraulic power pack assembly. The hydraulic power pack assembly has an electric motor, a drive coupling, a hydraulic pump and reservoir tank, and associated pipes, valves, and gauges. This assembly provides hydraulic motive power to the winch assembly via pipes and valves. The major components of the winch assembly are the emergency handcrank, hydraulic motor, hydraulic brake, brake release pump, gear reducer, and drum. Reference FIGURE 1-1 for major components of the bow ramp assembly.

1-7. Characteristics, Capabilities, and Features . A very broad view of the bow ramp assembly is as follows:

a. Characteristics

(1) Controls the raising or lowering of bow ramp.

(2) Controlled from pilot house, forecastle deck and at th e winch.

b. Capabilities and Features

(1) Can operate at any one of three locations.

(2) When operating from the pilot house control station, all other stations are inoperative.

1-8. Location and Description of Major Components . Both assemblies of the bow ramp assembly are separately located on the forward starboard side of the main deck. The winch control valve manifold assembly is mounted on the starboard bulkhead separately from the hydraulic power pack assembly.

a. Hydraulic Winch Assembly. When the RAISE or LOWER switch is activated, the hydraulic motor energizes the gear reducer which rotates the winch drum. To lower the ramp, the drum unwinds two wire ropes that are connected to one port and one starboard chain. The two chains are secured to the top, outer sides of the ramp. To raise the ramp, the drum winds up the two wire ropes. Deactivating the RAISE and LOWER switch stops the winch. The hydraulic brake and chain stoppers on the two ramp chains, maintain the position of the ramp. During winch operation, loss of electric power or hydraulic fluid or pressure, activates the hydraulic brake to maintain the position of the ramp. An emergency hand crank is used to raise or lower the ramp to the desired position. However, prior to using the emergency hand crank, the hydraulic brake must be released. For this purpose, a brake release pump is part of the winch assembly. One of the winch crew inserts a portable handle into a mounting hole on the brake release pump. The crew member rotates the handle clockwise. This action restores hydraulic pressure and overrides the hydraulic brake. The emergency handcrank is a ratchet type which prevents the load from overrunning the operating during manual operation. It will take approximately 1,450 revolutions of the emergency handcrank to pay out or haul in 25 feet of the two lengths of active wire rope.

b. Hydraulic Power Pack Assembly. Pressing the POWER ON push-button indicator switch starts the electric motor. The electric motor is connected to the

hydraulic pump by a drive coupling. Energized by the drive coupling, the hydraulic pump circulates hydraulic fluid from the reservoir, through valves and pipes to the hydraulic motor of the winch assembly.

1-9. Equipment Data. Reference data for the bow ramp winch assembly is given in Table 1-1. Also see the equipment data given in the operator's manual, TM 55-1905-223-10.

Table 1-1. Bow Ramp Winch Equipment Data

Characteristics	Reference Data
Winch Assembly	Model FH 5-20
Type	Force 5
Dimensions	
Length	47 in
Length with emergency hand crank installed	62 in
Width	35 in
Height	29.50 in
Weight	
Winch drum	380 lb
Inboard upright	130 lb
Outboard upright	100 lb
Side frames (each)	61 lb
Hydraulic motor	41 lb
Automatic brake	16 lb
Gear reducer	315 lb
Total	1550 lb
Winch Safety Factor	5:1 at 22,000 lb combined line pull
Power Requirements	
Hydraulic Flow	30.50 gpm
Normal working pressure	2,060 psi
Maximum working pressure-	3,000 psi
Electrical	Voltages 120V 240V 480V 600V
Limit switches	60Hz amps 60 30 15 12
	brake amps 6 3 1.5 1.2
Environmental	
Operating temperature	-22° F (-30° C) to 140° F (60° C)
Storage temperature	-22° F (-30° C) to 140° F (60° C)
Drum Grooving and Spooling	Two 3/4-in dia. lines
Drum Anchoring	At both outboard ends of drum.

Table 1-1. Bow Ramp Winch Equipment Data - CONT

Characteristics	Reference Data
Spooling Direction	Towards drum centerline
Drum Capacity, Each Half	25 ft active line plus 3 dead wraps. (Approximately 12 ft for dead wraps and 8 in for line anchor)
Planetary Gear Reducer, 3 stages	234:1 overall reduction
Hydraulic Motor	
Type	Gerotor - through shaft design
Displacement	2.54 cubic in per revolution
Maximum Intermittent Pressure	3,000 psi
Operating Features	
Slack Wire Limitation	Slack wire limit switch
Manual Operation	Safety interlock switch and hydraulic motor bypass valve
Emergency Operation	Drive handle with safety brake/ ratchet
Hydraulic Power Pack Assembly	
Model	21-69069
Manufacturer	MacGregor-Navire (USA), Inc.
Type	Hydraulic
Length	68.50 in
Width	37 in
Height	43 in
Weight	1,550 lb
Winch Control Valve Manifold Assembly	MacGregor-Navire (USA), Inc.
Length	4 in
Width	1.75 in
Height	
Weight	
Hydraulic Requirements	
Flow	30 gpm
Pressure	
Normal	2,060 psi across motor
Maximum	3,000 psi
Motor Seal Drain	400 psi maximum
Hydraulic Brake	
Initial Release	220 psi
Full Release	230 psi
Release Displacement	1.0 cubic in, maximum
Maximum Working Pressure	3,000 psi

Table 1-1. Bow Ramp Winch Equipment Data - CONT

Characteristics	Reference Data
Performance	
At Normal Hydraulic Pressure and Flow	
Line Pull	10,000 lb each line
Line Speed	45 fpm
Manual Operation	Approximately 61 lb with a 14 in handcrank

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 personal safety and the safety of the equipment.

Section III. PRINCIPLES OF OPERATION

Overview of bow ramp winch assembly.

The Principles of Operation section will tell you basic information about how this assembly works.

1-11. General. The bow ramp is raised and lowered by a single, split-drum, electro-hydraulic winch subsystem and associated wire ropes, chains, stoppers, and sheaves. The winch has a grooved drum of minimum barrel diameter and stowage capacity to handle two wire ropes, one to control each side of the ramp. Each wire rope is led to forecastle deck and rigged with turnbuckles by two chains, each led through a chain sheave in the bow. Stoppers are provided to prevent loss of ramp elevation in the event of wire rope breakage. Stoppers also provide support for the ramp, as required, without stressing wire ropes or the winch during vehicle handling. The winch is fitted with a hydraulic brake. The winch is capable of up to 10,000 lb of line pull at 45 feet per minute on two 3/4 inch wire ropes. A manual interlock switch prevents starting the motor with the emergency hand crank engaged. A slack wire limit switch is provided to prevent excessive slack in the wire rope when unspooling. The winch is remotely con- trolled from three control stations, one in the pilothouse, one on the forecastle deck and one at the winch. Each control station has a control panel containing toggle switches, push-button indicator switches, and indicator lights. The switches are used to start and stop the electric motor in the winch-assembly and operate the ramp system. Indicator lights indicate subsystem operation status, tension on wire ropes, and high temperature of hydraulic fluid. The pilothouse control station is provided with a power cut-off switch. When operating from the pilothouse control station, all other control stations are inoperative.

CHAPTER 2

UNIT MAINTENANCE INSTRUCTIONS

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

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 unit.

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) technical manual TM 55-1905-223-24P.

Section II. SERVICE UPON RECEIPT

2-4. Checking Unpacked Equipment . When repair equipment and parts are received, the following inspections are required.

a. Inspect the equipment for damage incurred during shipment. If the shipment 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.

2-5. Preliminary Servicing and Adjustment . Perform the following procedures to prepare the bow ramp assembly for operation after installation.

WARNING

- Ensure that all personnel are clear of the winch, wire ropes, sheaves, chains, chain stoppers, wildcats, ramp, and ramp hinges before operating the bow ramp winch subsystem to raise or lower the ramp. Notify operations personnel before starting the bow ramp winch subsystem.
- Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, or replacing electrical or mechanical components, disconnect power supply to three control panels and electric motor in the hydraulic power pack assembly.
- 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.

Overview of preliminary servicing.

Servicing the assembly after installation is important because if the hydraulic system pressure is not adjusted correctly, the bow ramp winch will not work.

a. Add Hydraulic Fluid. Add hydraulic fluid to reservoir tank in the hydraulic power pack assembly as follows:

(1) Remove filler cap/air breather from top of reservoir tank.

(2) Add approximately 150 gallons of hydraulic fluid (Item 2, Appendix C).

(3) Install filler cap/air breather in top of reservoir tank.

b. Bleed Air from System.

(1) Restore power to bow ramp winch.

(2) Operate bow ramp winch back and forth several times. Open outlet fittings slightly until air is removed and only fluid seeps out.. Secure fittings. Observe pressure gauge and check for leaks.

(3) Re-check and fill hydraulic fluid levels in reservoir to proper levels.

(4) Check for system leaks.

(5) Return bow ramp winch assembly to normal operation (TM 55-1905-223-10).

(6) Properly dispose of used hydraulic fluid.

c. Add Oil. Add oil to gear case of winch assembly as follows:

(1) Remove oil fill plug from top of gear case housing.

(2) Add 9 quarts of GO 90 oil (Item 16, Appendix C).

(3) Install oil fill plug in top of gear case housing.

d. Connect Power Supplies. Connect the electrical motor and the three control panels to suitable power supplies.

WARNING

Do not activate ramp, RAISE or LOWER control switches at this time. Preliminary service and adjustment of bow ramp winch subsystem must be completed before operation of ramp RAISE or LOWER switches.

e. Start Electric Motor. Start the electric motor in the hydraulic power pack assembly as follows:

(1) Momentarily press the POWER ON pushbutton indicator switch on the winch room control panel.

(2) Observe that POWER ON pushbutton indicator is lit.

(3) Observe that electric motor is operating.

(4) Pump noise and "crackle" are usually caused by air entering the pump suction. If such noise occurs, secure the suction fittings.

(5) If pump fails to prime, vent discharge pipe into a suitable container to establish hydraulic fluid flow.

CAUTION

Allow hydraulic pump in hydraulic power pack assembly to operate for 5 minutes to fill hydraulic components, valves, and pipes in hydraulic system. Then replenish hydraulic fluid in the reservoir tank.

f. Check Hydraulic Fluid Level. Check hydraulic fluid level (PMCS, Item 3).

g. Check Hydraulic Fluid Pressure. Check hydraulic fluid pressure (PMCS, Item 1).

h. Check Hydraulic Fluid Temperature. Check hydraulic fluid temperature (PMCS, Item 2).

i. Check Oil Level. Check oil level (PMCS, Item 15).

j. Visual Inspection. Make a visual inspection of the bow ramp winch subsystem (PMCS, Item 16).

k. Clean or Install New Elements and Filters. After 2 hours of hydraulic system operation, clean or install new elements and filters (PMCS, Item 7, 11, and 13).

l. Check Pressure Setting of Valves. Check pressure setting of valves (PMCS, Item 9).

m. Connect Wire Ropes to Ramp Chains. Connect wire ropes to ramp chains as follows:

(1) Start electric motor in hydraulic power pack assembly.

(2) Operate winch in LOWER ramp mode.

(3) Unreel wire rope from winch.

(4) Thread wire rope through ramp sheaves.

(5) Securely connect wire ropes to ends of ramp chains using turnbuckles supplied.

(6) Operate winch in RAISE ramp mode to take up slack in wire ropes.

(7) If necessary, adjust turnbuckles until wire ropes are under constant tension.

(8) Turn off switches controlling the bow ramp assembly.

n. Operational Test of Bow Ramp Assembly. Test the operation of the bow ramp assembly as follows:

(1) Turn on electric motor in hydraulic power pack assembly.

(2) Unlock the two manual locking devices on the end of the ramp.

(3) Activate LOWER ramp switch on control panel.

(4) Observe that ramp lowered properly.

(5) Activate the RAISE ramp switch on control panel.

(6) Observe that ramp is raised to closed position.

(7) Lock the two manual locking devices on the end of the ramp.

(8) Turn off electric motor in hydraulic power pack assembly.

(9) If bow ramp winch assembly did not operate properly, troubleshoot according to Section IV of this chapter.

2-6. 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.

2-7. Normal Startup. Refer to operator's manual TM 55-1905-223-10.

2-8. Shutdown Procedure (usual or unusual). Refer to operator's manual TM 55-1905-223-10.

Section III. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-9. Explanation of P MCS 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 "TM" Number column on DA Form 2404, record the appropriate Item Number from the PMCS table.

Table 2-1. Preventive Maintenance Checks and Services

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Serviced	Procedures
	D	M	Q	S	A	B		
								Hydraulic Power Pack Assembly
1	•						Pressure Gauge	Turn pressure gauge shutoff valve on. If pressure reading is above or below 2,900 psi, perform troubleshooting according to Section IV of this chapter. After reading pressure, close pressure gauge shutoff valve. CAUTION Maximum hydraulic system operating temperature is 150° F. Do not operate hydraulic system at temperature above 150º F. Operating at higher temperature will reduce hydraulic system efficiency and component service life, and will deteriorate hydraulic fluid more rapidly.
2	•						Temperature Level Sensor	Temperature readings must be taken when the electric motor in the hydraulic power pack assembly is operating. Read temperatures on the level sensor. If temperature reading is above 150º F, perform troubleshooting according to Section IV of this chapter.
3	•						Hydraulic Fluid Level Indicator	Hydraulic fluid level readings must be taken when the electric motor in the hydraulic power pack assembly is operating. Read hydraulic fluid level on the hydraulic fluid level indicator. Keep hydraulic fluid level at full mark. Investigate causes for loss of hydraulic fluid.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Serviced	Procedures
	D	M	Q	S	A	B		
4	•						Hydraulic Power Pack Assembly	Give the hydraulic power pack assembly and the Assembly winch control valve manifold assembly a thorough visual inspection: Look for anything that is leaking, loose, broken, torn, missing, or out of the ordinary. Secure, repair, or replace defective components.
5		•					Ramp Sheaves	Refer to LO 55-1905-223-12, Lubrication Order. Lubricate the ramp sheaves.
6			•				Reservoir Tank	Pressure and temperature variations occur during hydraulic system operation. These variations result in condensation of water from the air in the reservoir tank. Differences in the specific gravities of water and hydraulic fluid cause water to collect in the bottom of the reservoir tank. To prevent rust and hydraulic fluid deterioration, the water must be removed as follows: (1) Turn off electric motor in hydraulic power pack assembly. Tag the three control panels, "Out of Service - Do Not Operate." (2) Locate the magnetic drain plug at bottom of reservoir tank. (3) Place a suitable container under the magnetic drain plug. (4) Remove the filler cap/air breather.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Serviced	Procedures
	D	M	Q	S	A	B		
6 CONT							Reservoir Tank - CONT	(5) Use a suitable wrench and unscrew the magnetic drain plug until water begins to drain into the container. (6) Allow reservoir tank to drain until hydraulic fluid begins to drain. (7) Secure magnetic drain plug. (8) Add hydraulic fluid to reservoir tank until hydraulic fluid level indicator is at full mark. (9) Install the filler cap/air breather. (10) Remove "Out of Service - Do Not Operate" tags from the three control panels. (11) Turn on the electric motor in the hydraulic power pack assembly. (12) Read hydraulic fluid level at hydraulic fluid level indicator. (13) If hydraulic fluid level is below the full mark, repeat steps (1), (4), and (8) through (12). (14) Turn off the electric motor in the hydraulic power pack assembly.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Serviced	Procedures
	D	M	Q	S	A	B		
7			•				Return Filter Element	Change return filter element in hydraulic power pack assembly as follows: (1) Turn off electric motor in power pack assembly as follows: (2) Locate the return filter on top of the hydraulic power pack assembly. (3) Place a suitable container under the return filter. (4) Turn return filter counterclockwise until it is removed. (5) Remove gasket and filter element from return filter. (6) Install gasket and filter element in return filter. (7) Install return filter by turning it clockwise until snug. (8) Remove "Out of Service - Do Not Operate" tags from three control units. Turn on electric motor in hydraulic power pack assembly. (9) Read hydraulic fluid level on hydraulic level indicator. If level is below full mark, add hydraulic fluid to full mark.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Serviced	Procedures
	D	M	Q	S	A	B		
8			•				Drive Coupling	Check drive coupling between electric motor and hydraulic pump for misalignment. Report misalignment to engineering supervisor. Check rubber insert for wear. Check hubs for looseness and shifting. Check setscrews for looseness. Secure as required. Replace defective parts.
9			•				Valves, Piping and Fittings	Turn on electric motor in hydraulic power pack assembly. Check valves, piping, and fittings for leaks. Secure loose fittings. Turn off electric motor in hydraulic power pack assembly. Replace defective parts.
10			•				Electrical Wiring	Check electrical wiring connections as follows: Connections (1) Turn off electric motor in hydraulic power pack assembly. Tag the three control panels "Out of Service - Do Not Operate." (2) Disconnect power supply to electric motor and control panels (3) Check terminals of electric motor and terminal blocks in all control panels for loose connections. (4) Secure all loose connections. (5) Connect power supply to electric motor and control panels. (6) Remove "Out of Service - Do Not Operate" tags from the top of the reservoir tank.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Serviced	Procedures
	D	M	Q	S	A	B		
11				•			Air Breather Filter	Clean the air breather filter as follows: (1) Remove the filler cap/air breather from the reservoir tank. (2) Remove filter from filler cap/air breather. (3) Clean filter using an approved cleaning solvent. (4) Install the filter in the filler cap/air breather. (5) Install the filler cap/air breather on top of the reservoir tank.
12				•			Electric Motor Bearings	Refer to LO 55-1905-223-12, Lubrication Order. Lubricate the electric motor bearings in the hydraulic power pack assembly.
13					•		Suction Strainer Element	Clean the suction strainer element as follows: (1) Turn off electric motor in hydraulic power pack assembly. Tag the three control panels "Out of Service - Do Not Operate." (2) Locate magnetic drain plug at bottom of reservoir tank. (3) Place a suitable container under the magnetic drain plug. (4) Remove magnetic drain plug. Allow hydraulic fluid to drain from reservoir tank.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Serviced	Procedures
	D	M	Q	S	A	B		
13 CONT							Suction Strainer Element - CONT	(5) Remove hand hold cover from each end of reservoir tank. (6) Disconnect suction strainer from suction pipe inside each end of reservoir tank. (7) Remove suction strainer elements from suction strainer. (8) Clean elements in approved cleaning solvent (Item 5, Appendix C). (9) Install elements in suction strainers. (10) Replace suction strainer elements in suction strainers. (11) Connect suction strainer to suction pipe inside each end of reservoir tank. (12) Replace hand hold cover on each end of reservoir tank. (13) Replace magnetic drain plug. (14) Remove tags from the three control panels and turn on electric motor in hydraulic power pack assembly. (15) Check hydraulic level at hydraulic fluid level indicator. (16) If hydraulic fluid level is below the full level, slowly add hydraulic fluid to reservoir tank until full level reading is obtained.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Servic	Procedures
	D	M	Q	S	A	B		
13 CONT							Suction Strainer Element - CONT	(17) Check pressure gauge (PMCS, Item 1)
								(18) Check temperatire level sensor (PMCS, Item 2).
14						•	Hydraulic Fluid	Change the hydraulic fluid by following the procedure in PMCS, Item 6. NOTE Clean suction strainer elements each time hydraulic fluid is changed.
								<u>Winch Assembly</u>
15	•						Oil level	Check oil level in gear case of winch assembly as follows: (1) Turn off electric motor to power pack assembly. (2) Wait 5 minutes for oil to settle in lower portion of gear case. (3) Locate sight glass on side of gear case housing. (4) Verify that oil is visible in sight glass. (5) If oil is not visible in sight glass, remove oil fill plug from top of gear case housing.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Servic	Procedures
	D	M	Q	S	A	B		
15 CONT							Oil level - CONT	(6) Add oil until visible in sight glass. (7) Install oil fill plug in top of gear case housing.
16	•						Winch Assembly	Give the winch assembly a thorough visual inspection. Look for anything that is leaking, loose, broken, torn, missing, or out of the ordinary. Secure, repair, or replace defective components.
17		•					Outboard Drum Bearing	Refer to LO 55-1905-223-12, Lubrication Order. Lubricate the outboard bearing in the winch assembly.
18		•					Slack Wire Limit Switch	Refer to LO 55-1905-223-12, Lubrication Order. Lubricate the slack wire limit switch. This switch is mounted near the brake release pump of the winch assembly. If control system shows slack/overlapped cable indication, adjust slack/overlapped cable detector bail as follows: (1) Turn off electric motor in hydraulic power pack assembly. Tag the three control panels "Out of Service - Do Not Operate." (2) Loosen screw and nut securing detector bail to switch actuating arm until bail rotates freely in arm. (3) Position bail 3/16 inch from the lowest surface of the cable on the drum and tighten arm screw and nut.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Servic	Procedures
	D	M	Q	S	A	B		
18							Slack Wire Limit Switch -	(4) Remove tag from winch controls, set control system to ON, and verify that control system shows no slack/overlapped cable indication. (5) Press bail downward and verify that control system shows slack/overlapped cable indication. (6) Set winch control system to OFF.
19		•					Interlock Switch	Refer to LO 55-1905-223-12, Lubrication Order. Lubricate the interlock switch. This switch is mounted near the hydraulic motor of the winch assembly.
20					•		Emergency Hand Crank	Refer to LO 55-1905-223-12, Lubrication Order. Lubricate the emergency hand crank of the winch assembly.
21					•		Gear Reducer	Refer to LO 55-1905-223-12, Lubrication Order. Lubricate the gear reducer in the winch assembly.
22					•		Gear Case	Change oil in gear case as follows: Refer to LO 55-1905-223-12, Lubrication Order. (1) Turn off electric motor in hydraulic power pack assembly. (2) Wait 5 minutes for oil to settle in lower portion of gear case. (3) Remove oil fill plug from top of gear case housing.

Table 2-1. Preventive Maintenance Checks and Services - CONT

D - Daily M - Monthly Q - Quarterly S - Semiannually A - Annually B - Biennially

Item No.	Interval						Items To Be Inspected/Servic	Procedures
	D	M	Q	S	A	B		
22 CONT							Gear Case - CONT	(4) Place a suitable container under the oil drain plug. Capacity of the gear case is approximately 10 quarts of oil. (5) Remove oil drain plug from bottom of gear case housing. Allow oil to drain from gear case housing. (6) Install drain plug in bottom of gear case housing. (7) Add oil until oil is visible in sight glass. (8) Install oil fill plug.

Section IV. UNIT MAINTENANCE TROUBLESHOOTING

2-10. **Troubleshooting** . Both a symptom index and a troubleshooting table are provided. The symptom index will help you locate the information you need for troubleshooting. 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 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.

SYMPTOM INDEX

WARNING

- Ensure that all personnel are clear of the winch, wire ropes, sheaves, chains, chain stoppers, wildcats, ramp, and ramp hinges before operating the bow ramp assembly to raise or lower the ramp. Notify operations personnel before starting the bow ramp assembly.
- Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, or replacing electrical components, disconnect the power supply to the electric motor in the hydraulic power pack assembly.
- Hydraulic fluid contains chemical compounds that cause irritation or injury to skin and eyes. Wear protective clothing, gloves, and eye protection when working in the vicinity of hydraulic equipment.

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.

Table 2-2. Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. No pressure in hydraulic system.
STEP 1. After starting unit and allowing warm-up time, pressure gage (18) should read 10 psi. If the gage reads in excess of 20 psi the filter element (17) should be replaced.
STEP 2. Check for loss of power. Energize.
STEP 3. Check for low hydraulic level in reservoir tank.
a. Check hydraulic fluid level indicator (PMCS, Item 3).
b. Check hydraulic system for leaks. Add hydraulic fluid (paragraph 2-5a).
STEP 4. Check to see if suction strainer elements are dirty. Clean or replace suction elements (PMCS, Item 13).
STEP 5. Check for pressure relief valve malfunction.
a. If valve pressure setting is incorrect, reset valve pressure to specification.

Table 2-2. Troubleshooting - Con't

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

b. If valve is leaking, check valve seat for scoring and dirt. Clean or replace valve (p aragraph 2-13).

c. If valve spring is broken, replace valve (paragraph 2-13).

STEP 6. Check for free re-circulation of hydraulic fluid to reservoir tank occurring in hydraulic system due to valve stuck in open position.
Inspect pilot operated check valve and pressure relief valve. Repair or replace defective valves (paragraph 2-13).

STEP 7. Check for air leak in suction line, preventing priming, or causing noise and irregular action of control- circuit.
Repair leak or replace line.

STEP 8. Check to see if hydraulic. fluid viscosity is too heavy to pick up prime (especially in cold weather).
Use lighter viscosity hydraulic fluid.

STEP 9. Check for wrong direction of hydraulic pump rotation.
Reverse direction rotation by reversing controlling pipes connected to hydraulic pump.

STEP 10. Check for broken shaft or parts inside hydraulic pump.
Replace hydraulic pump (paragraph 2-15).

2. Low pressure in hydraulic system.

STEP 1. Check to see if pressure relief valve pressure set too low.
Adjust valve pressure (PMCS, Item 1).

STEP 2. Check for excessive external leakage.

a. Secure connections.

b. Check hydraulic fluid level (PMCS, Item 3).

STEP 3. Check for worn hydraulic pump.
Replace hydraulic pump (paragraph 2-15).

3. Erratic pressure in-hydraulic system.

STEP 1. Check for air in hydraulic fluid.
a. Secure connections.

b. Check hydraulic fluid level (PMCS, Item 3).

STEP 2. Check for contamination in hydraulic fluid.

a. Clean or replace dirty elements or filters (paragraph 2-13).

b. Change hydraulic fluid (PMCS, Item 6).

Table 2-2. Troubleshooting - Con't

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

STEP 3. Check for worn hydraulic pump or hydraulic motor.
a. Replace hydraulic pump (paragraph 2-15).
b. Replace hydraulic motor (paragraph 2-22).

4. Excessive pressure in hydraulic system.

STEP 1. Check for pressure relief valve misadjustment.
Adjust pressure relief valve (PMCS, Item 1).

STEP 2. Check for worn pressure relief valve.
Replace pressure relief valve (paragraph 2-13).

5. Excessive temperature in hydraulic system.

STEP 1. Check to see if hydraulic system pressure is too high.
a. Check hydraulic system pressure (PMCS, Item 1).
b. Check pressure settings of valves. Adjust pressure settings as required (PMCS, Item 1).

STEP 2. Check to see if pressure relief valve pressure is set too high.
Adjust pressure settings of pressure relief valve (PMCS, Item 1).

STEP 3. Check for cavitation (vacuums in hydraulic fluid).
a. Clean or replace dirty air breather filter (PMCS, Item 11).
b. Clean or replace dirty filters and elements (paragraph 2-13).

STEP 4. Check for air in hydraulic fluid.
a. Secure inlet fittings.
b. Check hydraulic fluid level (PMCS, Item 3).
c. Bleed air from hydraulic system (paragraph 2-5b).

STEP 5. Check to see if hydraulic fluid is low.
a. Check for leaks in hydraulic system.
b. Add hydraulic fluid (paragraph 2-5a).

STEP 6. Check to see if hydraulic fluid is dirty.
a. Clean or replace dirty filters and elements (paragraph 2-13).
b. Change hydraulic fluid (PMCS, Item 6).

STEP 7. Check for worn or broken hydraulic pump.
Replace hydraulic pump (paragraph 2-15).

STEP 8. Check for worn or broken hydraulic pump.
Replace hydraulic-motor (paragraph 2-22).

Table 2-2. Troubleshooting - Con't

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. Hydraulic fluid does not flow.

STEP 1. Check to see if hydraulic pump is not receiving hydraulic fluid.
a. Check hydraulic fluid level (PMCS, Item 3).
b. Clean dirty air breather filter (PMCS, Item 11).
c. Clean or replace dirty filters and elements (paragraph 2-13).

STEP 2. Check to see if motor will not operate.
a. Check power supply and electrical wiring connections (PMCS, Item 10).
b. Replace defective electric motor (paragraph 2-14).

STEP 3. Check to see if electric motor is turning in wrong direction.
Reverse rotation of electric-motor.

STEP 4. Check to see if drive coupling is defective.
Replace drive coupling (paragraph 2-14).

STEP 5. Check to see if hydraulic fluid is passing over pressure relief valve.
a. Check pressure of pressure relief valve (PMCS, Item 1).
b. Replace defective pressure relief valve (paragraph 2-13).

STEP 6. Check for broken piston pump.
Replace piston pump (paragraph 2-15).

7. System pressure is low.

STEP 1. Check to see if hydraulic valve pressure is set too low.
Check and reset valve pressures (PMCS, Item 1).

STEP 2. Check for external leak in hydraulic system.
Secure connections (PMCS, Item 4).

STEP 3. Check for worn hydraulic pump.
Replace hydraulic pump (paragraph 2-15).

8. Noisy hydraulic pump.

STEP 1. Check for cavitation (vacuums in hydraulic fluid).
a. Clean or replace dirty air breather filter (PMCS, Item 11).
b. Clean or replace dirty filters and elements (paragraph 2-13).

Table 2-2. Troubleshooting - Con't

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

STEP 2. Check for air in hydraulic fluid.
a. Secure inlet fittings.
b. Check hydraulic fluid level (PMCS, Item 3).
c. Bleed air from hydraulic system (paragraph 2-5).

STEP 3. Check to see if drive coupling is misaligned.
Align drive coupling (paragraph 2-14).

STEP 4. Check for worn or damaged hydraulic pump.
Replace hydraulic pump (paragraph 2-15).

9. Excessive wear of hydraulic pump parts.

STEP 1. Check to see if drive coupling is misaligned.
Align drive coupling (paragraph 2-14).

STEP 2. Check to see if air recirculation is causing chatter in hydraulic system.
a. Secure inlet fittings.
b. Check hydraulic fluid level (PMCS, Item 3).

STEP 3. Check for abrasive material in hydraulic fluid.
a. Clean or replace dirty filters and elements (paragraph 2-13).
b. Change hydraulic fluid (PMCS, Item 6).

STEP 4. Check to see if viscosity of hydraulic fluid is too low for working conditions.
Check recommendations for hydraulic fluid.

10. Breakage of inside hydraulic pump housing.

STEP 1. Hydraulic pump seizure due to lack of hydraulic fluid.
Check hydraulic fluid level (PMCS, Item 3).

11. External hydraulic fluid leakage around hydraulic pump shaft or housing.

STEP 1. Check for worn hydraulic pump shaft or housing.
Replace hydraulic pump (paragraph 2-15).

STEP 2. Check for worn hydraulic pump head seals.
Replace hydraulic pump (paragraph 2-15).

STEP 3. Check for excessive hydraulic fluid pressure due to excessive drain flow.
Replace hydraulic motor (paragraph 2-22).

Table 2-2. Troubleshooting - Con't

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
STEP 4. Check for cracked hydraulic motor housing. Replace hydraulic motor (paragraph 2-22).
12. Electric motor will not operate.
STEP 1. Check to see if power supply is disconnected. Reconnect power supply.
STEP 2. Check for defective electric motor. Replace electric motor (paragraph 2-14).
13. Winch will not rotate or rotates too slowly.
STEP 1. Check for low hydraulic fluid level. Check hydraulic fluid level. Add hydraulic fluid if required.
STEP 2. Winch shaft is binding in shaft mounting bearing, as indicated by excessive heat or grinding noise. Refer to LO 55-1905-223-12, Lubrication Order. Lubricate the winch.

Section V. UNIT MAINTENANCE PROCEDURES

2-11. **General.** This section provides unit maintenance for the Bow Ramp Winch Subsystem. The tasks cover removal and replacement with step-by-step actions provided and illustrations when necessary. There are no separate procedures included for equipment for which repair parts are not stocked.

MAINTENANCE OF BOW RAMP ASSEMBLY

2-12. Repair Bow Ramp Assembly

This task covers: a. Inspection, b. Service, c. Alignment, d. Adjustment, e. Repair.

INITIAL SETUP

Tools

Tool kit, general mechanic's, 5180-00-699-5273
Tool kit, measuring machinist, 5280-00-278-9919

Equipment Condition

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

INSPECTION

Inspection procedures are covered in paragraph 2-9 (PMCS, Item 4).

SERVICE

Service procedures are covered in paragraph 2-5.

ALIGNMENT

Alignment procedures are covered in paragraph 2-15.

ADJUSTMENT

Adjustment procedures are covered in paragraph 2-5.

REPAIR

Repair of the bow ramp assembly at the Unit Maintenance level is limited to the actions listed in Chapter 2.

2-13. **Repair Hydraulic Power Pack Assembly** . (FIGURE 2-1)

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

INITIAL SETUP

Tools

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

Equipment Condition

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

Materials/Parts

Return filter assembly,
P/N OFRS-60-S-3M-PC-C10
Fluid filter element P/N 941190
Pressure gauge P/N 63-1008-020L
Temperature sensor P/N TL-009
Check valve P/N RV20-1-12
Cover with gasket P/N HC-FC-14
Fluid filter element P/N HA-FS-20
Warning tags, Item 1, Appendix C
Hydraulic fluid, Item 2, Appendix C
Utility pail, Item 11, Appendix C

General Safety Instructions

Use lifting sling.

INSPECT/SERVICE

Inspection and service of the hydraulic power pack assembly is covered in PMCS reference Table 2-1, items 1 thru 14.

WARNING

o Fuel, oil and other liquid spills create extremely hazardous decks and passageways. Slippery deck plates and walkways around operating machinery increases risk of injury from falls and moving machinery.

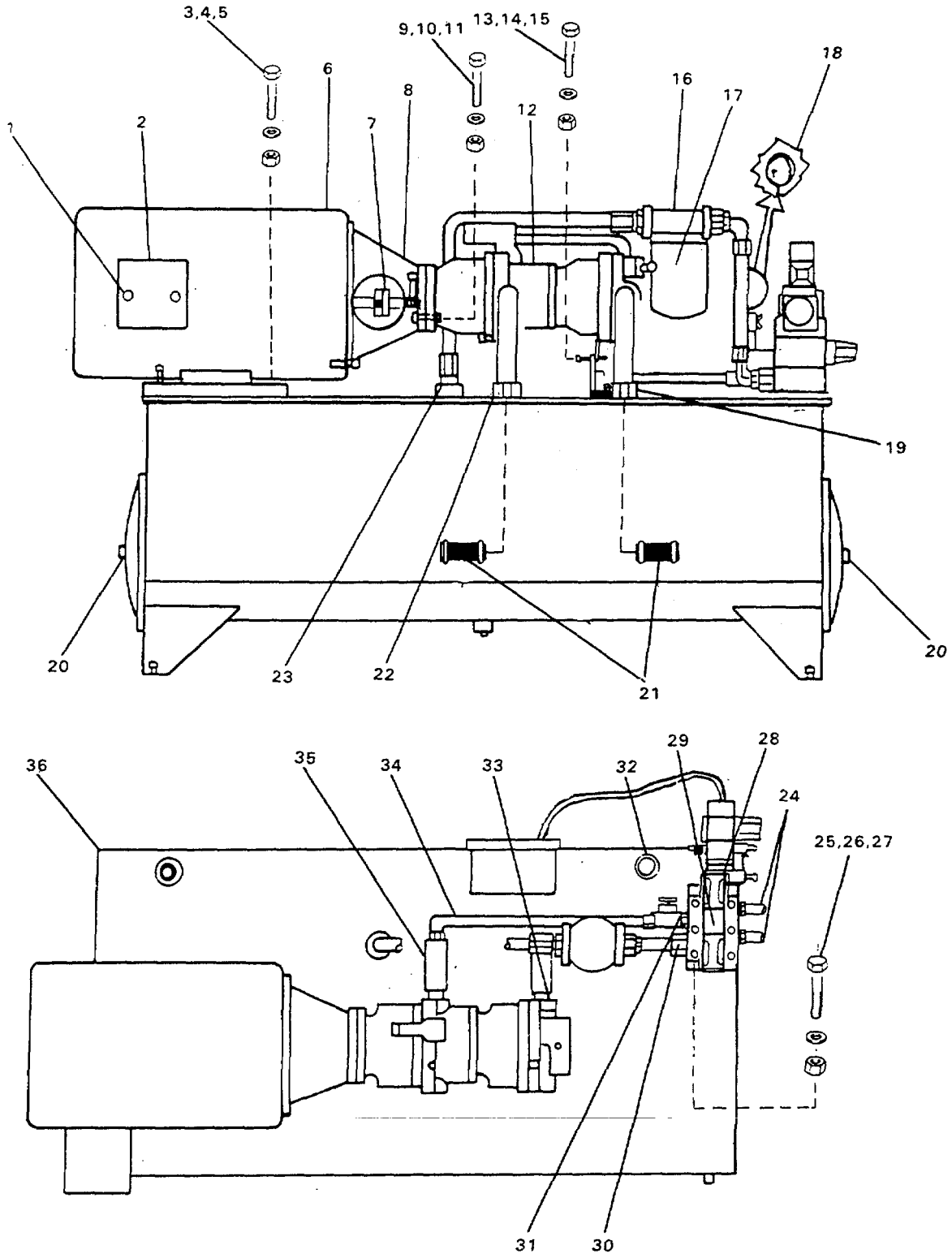


FIGURE 2-1. Hydraulic Power Pack Assembly.

o Immediately clean up spills of fuel and oil and any other debris which creates slippery decks and unsafe working conditions.

o 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.

WARNING

Electrical compounds contain high voltages that can cause severe injury or death. Before servicing, adjusting, or replacing electrical or mechanical components, and disconnect power supply to three control panels and electric motor in the hydraulic power pack assembly. Tag control panels "Out of Service - Do Not Operate".

DISASSEMBLY

CAUTION

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

a. Drain hydraulic fluid from reservoir (PMCS, Item 6).

b. Disconnect and cap/plug hydraulic lines (19, 22, 23, 24, 30, 31, 33, and 34).

c. Place utility pail under return filter assembly (16) and remove fluid filter element (17) by turning counterclockwise.

d. Disconnect return filter assembly (16) from hydraulic lines and remove.

e. Remove pressure gauge (18) by turning counterclockwise.

f. Remove cover with gasket (20), disconnect two fluid filter elements (21) from suction pipes (19, 22) and remove.

g. Remove temperature sensor (32).

h. Place utility pail under check valve (35), disconnect check valve from piston pump assembly (12) and hydraulic line (34), and remove check valve (35)

REPAIR

Repair of this level is by replacement of the following components: return filter assembly (16), fluid filter element (17), pressure gauge (18), cover/gasket (20), fluid filter elements (21), temperature sensor (32), and check valve (35).

ASSEMBLY

CAUTION

Remove caps/plugs on hydraulic lines before assembly.

a. Remove caps/plugs before assembly.

b. Connect check valve (35) to piston pump assembly (12) and hydraulic line (34).

c. Replace temperature sensor (32).

d. Install two fluid filter elements (21) on suction pipes (19, 22) inside reservoir, replace reservoir covers/gaskets (20).

e. Position pressure gauge (18) and turn clockwise until secure.

f. Connect return filter assembly (16) to hydraulic lines and screw fluid filter-element (17) in return filter assembly until secure.

WARNING

Ensure that all personnel are clear of the winch, wire ropes, sheaves, chains, chain stoppers, wildcats, ramp, and ramp hinges before operating the bow ramp assembly to raise or lower the ramp. Notify operations personnel before starting the bow ramp assembly.

g. Operate the bow ramp assembly and check the hydraulic power pack assembly for proper operation, hydraulic leaks. Correct any troubles.

2-14. **Replace Electric Motor**.

This task covers: a. Inspect, b. Service, c. Removal, d. Alignment, e. Replace.

INITIAL SETUP

Tools

Tool kit, general mechanic's, 5180-00-699-5273
Tool kit, measuring machinist, 5280-00-278-9919

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shutdown and tagged "Out of Service - Do Not Operate."

Materials/Parts

Warning tags, Item 1, Appendix C
Shim stock, Item 3, Appendix C
Anti-corrosion compound, Item 4, Appendix C

INSPECTION

Inspection procedures for the electric motor are covered in Table 2-1, PMCS.

SERVICE

Service procedures for the electric motor are covered in Table 2-1, PMCS.

WARNING

Electrical compounds contain high voltages that can cause severe injury or death. Before servicing, adjusting, or replacing electrical or mechanical components, and disconnect power supply to three control panels and electric motor in the hydraulic power pack assembly. Tag control panels "Out of Service - Do Not Operate."

REMOVAL (FIGURE 2-1)

a. Electrical power motor.

(1) Remove cover screws (1) and remove access cover (2).

(2) Disconnect and tag electrical connectors.

(3) Disconnect and cap/plug hydraulic lines (19, 22, 23, 24, 30, 31, 33, and 34).

b. Attach lifting sling to assembly.

c. Remove bolts (3), lockwashers (4), and nuts (5) securing motor to reservoir.

d. From pump end of bell housing (8), remove bolts, lockwashers, and nuts (9, 10, 11). Using care not to damage drive coupling (7), slowly move motor assembly (6) away from piston pump assembly (12).

e. Lift motor off with lifting sling.

REPLACE

a. Using a lifting sling, move electric motor onto reservoir (36).

b. Slowly move motor assembly (6) toward piston pump assembly (12). Ensure drive coupling (7) mates properly.

c. From pump end of bell housing (8), replace bolts, lockwashers, and nuts (9, 10, 11).

d. Replace bolts (3), lockwashers (4), and nuts (5) that secure assembly to deck frame. Align prior to securing. See below for alignment procedure.

e. Remove lifting sling.

f. Remove caps/plugs and connect hydraulic lines (19, 22, 23, 24, 30, 31, 33, and 34).

g. Connect electrical connectors using tags as a guide. Remove tags.

h. Replace cover (2). Secure cover with screws (1).

i. Fill hydraulic reservoir with fluid (paragraph 2-5).

ALIGNMENT (FIGURE 2-2)

NOTE

Alignment must be checked after removal of the electric motor, coupler, or hydraulic pump.

NOTE

If shims are required, coat the shim stock with an approved anti-corrosion compound to prevent dissimilar metal corrosion.

a. Place a level on the electric motor (1) (facing front/rear) and make sure the motor is level. If not level, loosen bolts (11), lockwashers (12), and nuts (13), and secure evenly.

b. If level is not accomplished, repeat step a. and shim between motor (1) and reservoir (10) as required.

c. Loosen bolts, lockwashers, and nuts (3,4,5,7,8 and 9) and carefully ali gn the left/right axis, placing the bell housing (2) and the piston pump (6) evenly centered. Align the piston pump as required to center the components, with the electric motor (1) making sure piston pump (6) is level.

d. When centering is accomplished, carefully secure the bell housing and piston pump bolts, lockwashers, and nuts, (3,4,5,7,8 and 9).

e. Restore power and operate the hydraulic power pack. Check for vibration or noise that may indicate misalignment. If misalignment is suspec ted, repeat the above procedure.

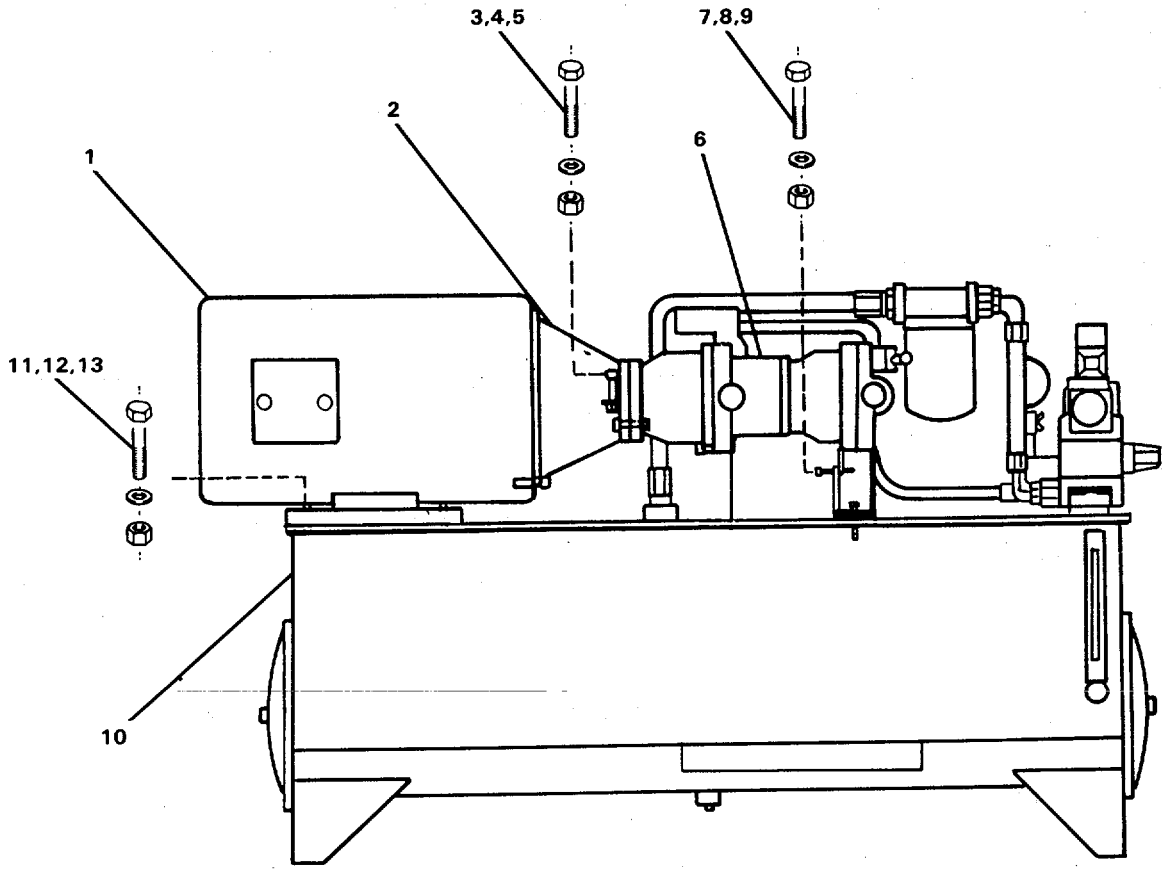


FIGURE 2-2. Electric Motor and Piston Pump Alignment.

2-15. Replace Piston Pump Assembly.

This task covers: a. Inspection, b. Service, c. Remove, d. Replacement,
e. Alignment

INITIAL SETUP

Tools

Tool kit, general mechanic's, 5180-00-699-5273
Tool kit, measuring machinist, 5180-00-278-9919

Equipment Condition

TM 55-1905-223-10, bow ramp assembly secured, tagged "Out of Service - Do Not Operate."

Materials/Parts

Warning tags, Item 1, Appendix C
Shim stock, Item 3, Appendix C
Anti-corrosion compound, Item 4, Appendix C

INSPECTION

Inspection and service procedures for the piston pump assembly are covered in Table 2-1, PMCS.

SERVICE

Service procedures for the piston pump assembly are covered in Table 2-1, PMCS.

REMOVAL (FIGURE 2-1)

a. Drain hydraulic fluid from reservoir (PMCS Table 2-1, Item 6).

b. Attach lifting sling to assembly.

c. Disconnect and cap/plug hydraulic lines (19, 22, 23, 24, 30, 31, 33).

d. Place utility pail under check valve (35); disconnect valve from piston pump assembly (12).

e. From pump end of bell housing (8) remove bolts, lockwashers, and nuts (9,10, 11).

CAUTION

Ensure lifting sling is supporting pump assembly.

f. Remove bolts, lockwashers, and nuts (13, 14, 15) from piston pump support leg.

g. Slowly move pump assembly (12) away from motor assembly (6).

REPLACEMENT

a. Position piston pump assembly (12) to line up with motor assembly. Ensure drive coupling (7) mates properly.

b. Support piston pump assembly with lifting sling.

c. Install bolts, washers, and nuts (9, 10, 11) on pump to bell housing.

d. Align pump assembly with pump support leg and secure with machine bolts, lockwashers and nuts (13, 14, 15). Do not tighten at this point. Check alignment first.

NOTE

Alignment must be checked after removal of the electrical motor, coupler, or piston pump assembly.

ALIGNMENT

Alignment procedures for the piston pump assembly are included in paragraph 2-14.

2-16. Replace Directional Control Valve Assembly.

This task covers: a. Inspection, b. Removal, 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, 5280-00-278-9919

Equipment Condition

TM 55-1905-223-10, bow ramp assembly secured, tagged "Out of Service - Do Not Operate."

Materials/Parts

Directional control valve assembly P/N DG5S8-6C-T-S-M-W-CCB-20
Hydraulic fluid, Item 2, Appendix C
Cleaning solvent, Item 5, Appendix C
Compressed air

INSPECTION

Inspect the directional control valve (3) for external corrosion, evidence of hydraulic fluid leaks, and secure mounting. Clean with solvent, secure fittings and mounting hardware as required.

REMOVAL (FIGURE 2-1)

a. Drain hydraulic fluid from reservoir (PMCS, Table 2-1, Item 6).

b. Disconnect and cap/plug hydraulic lines (19, 22, 23, 24, 30, 31, 33 and 34).

c. Remove six bolts, lockwashers, and nuts (25, 26, 27) from directional control valve cover; remove cover (29).

d. Tag and disconnect electrical wires to electrical solenoid inside directional control valve.

e. Remove directional control valve assembly (28).

REPLACEMENT

a. Replace directional control valve assembly (28).

b. Connect electrical wires (as tagged) to electrical solenoid inside control valve.

c. Replace cover (29); secure valve by installing six bolts, lockwashers and nuts (25, 26, 27).

d. Remove cap/plug from hydraulic lines; connect hydraulic lines (19, 22, 23,24, 30, 31, 33 and 34).

e. Fill hydraulic reservoir with fluid (PMCS, Table 2-1, Item 6).

f. Reference TM 55-1905-223-10 for startup.

2-17. Replace Crossport Relief Valve. (FIGURE 2-3).

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

INITIAL SETUP

Tools

Tool kit, general mechanic's, 5180-00-699-8273
Tool kit, electrical equipment, 5180-00-391-1087

Materials/Parts

Crossport relief valve P/N DGMC-3-AB-BW-BAFCW30
Cleaning solvent, Item 5, Appendix C
Hydraulic fluid, Item 2, Appendix C
Compressed air
Warning tags, Item 1, Appendix C
Preformed packing P/N 262332
Preformed packing P/N 262338

Equipment Condition

TM 55-1905-223-10, bow ramp assembly secured, tagged "Out of Service - Do Not Operate."
Refer to the following paragraph in this maintenance manual.
Directional control valve assembly removed/replaced. Para. 2-16.

WARNING

- Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, replacing electrical or mechanical components tag "Out of Service - Do Not Operate" and disconnect the power supply to the three control panels and the electric motor in the hydraulic power pack assembly.
- 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 on hydraulic equipment.
- Fuel, oil and other liquid spills create extremely hazardous decks and passageways. Slippery deck plates and walkways around operating machinery increases risk of injury from falls and moving machinery.

WARNING

Immediately clean up spills of fuel and oil and any other debris which creates slippery decks and unsafe working conditions.

CAUTION

Avoid contamination of the hydraulic system. Do not use rags, corks, or similar items to plug the hydraulic pipes or ports. If available, use an approved external fitting, cap or plug. Otherwise, let hydraulic pipes and ports drain into a container. The hydraulic system is under pressure. Be sure to vent system to relieve pressure prior to attempting any repairs.

INSPECTION

Inspection procedures are for the crossport relief valve are covered in paragraph 2-9 (PMCS).

REMOVAL

NOTE

Ensure that o-rings do not drop out during removal,

a. Remove four machine bolts (1) from modular relief valve (2) and separate from retaining plate seal (3).

b. Remove crossport (4) valve from valve tapping plate (8).

c. Separate valve tapping plate (8) and (9) and remove.

d. Remove preformed packing (5, 7).

REPLACEMENT

NOTE

Cleanliness and care of newly installed components are important. Before installing new components, plug all ports and thoroughly wash the outside of assembly with cleaning solvent to remove any packing grease or oils. When possible, dry with compressed air.

NOTE

When installing new preformed packing, coat lightly with clean system oil.

a. Install preformed packing (5,7).

b. Position valve tapping plate (8,9) to line up with lock pins (6).

c. Position crossport relief valve (4) to line up with lock pins (6).

d. Place retaining plate seal (3) over crossport relief valve (4).

e. Secure modular relief valve (2) to crossport relief valve assembly with four machine bolts (1).

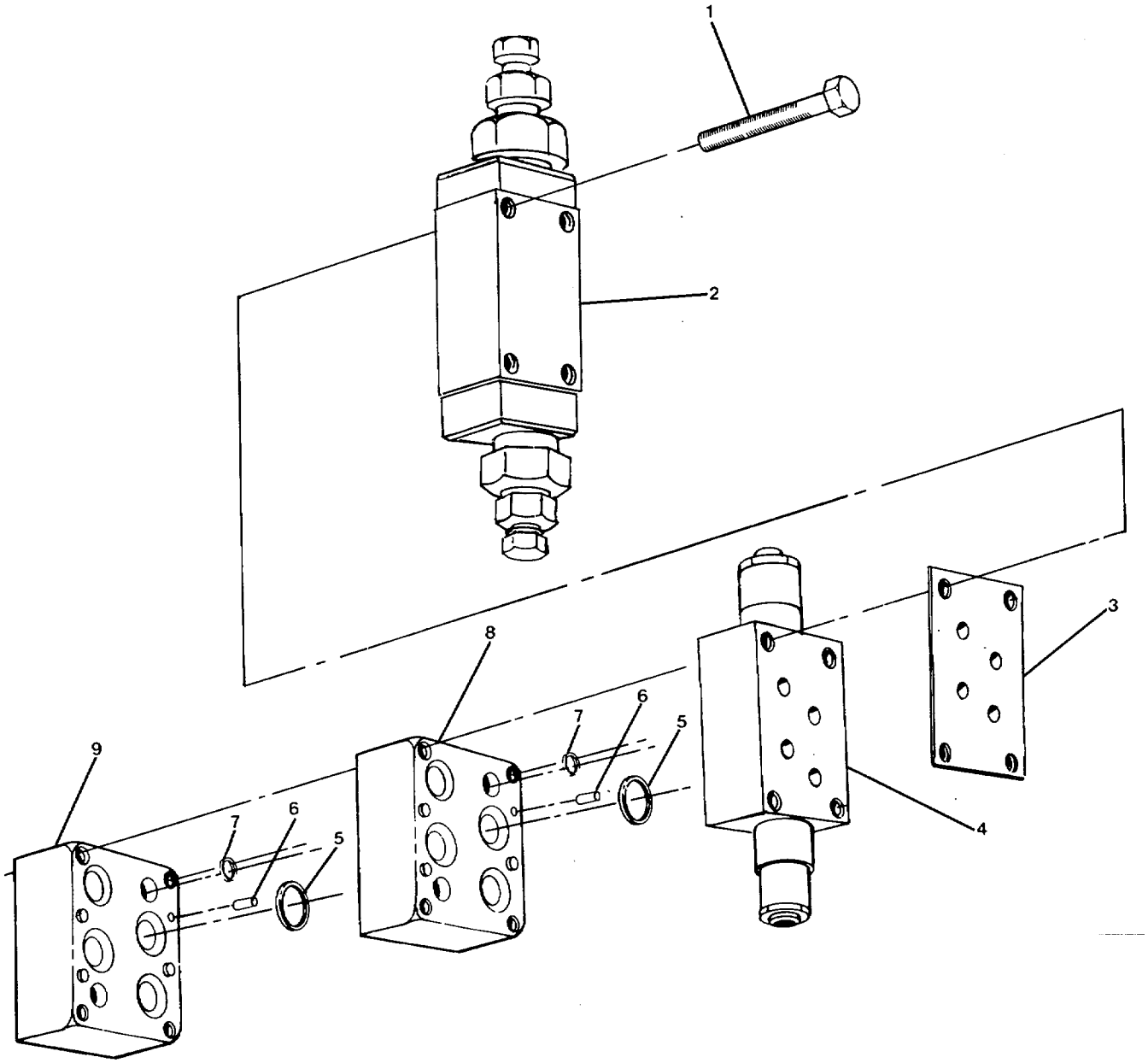


FIGURE 2-3. Crossport Relief Valve.

2-18. Replace Hydraulic System Manifold Accessories . (FIGURE 2-4).

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

INITIAL SETUP

Tools

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

Equipment Condition

TM 55-1905-223-10, bow ramp assembly secured, tagged "Out of Service - Do Not Operate."

Materials/Parts

Hydraulic system manifold P/N M-8261-D
Cleaning solvent, Item 5, Appendix C
Hydraulic fluid, Item 2, Appendix C
Compressed air

WARNING

- 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 on hydraulic equipment.
- Fuel, oil and other liquid spills create extremely hazardous decks and passageways. Slippery deck plates and walkways around operating machinery increases risk of injury from falls and moving machinery.
- Immediately clean up spills of fuel and oil and any other debris which creates slippery decks and unsafe working conditions.

CAUTION

Avoid contamination of the hydraulic system. Do not use rags, corks, or similar items to plug the hydraulic pipes or ports. If available, use an approved external fitting cap or plug. Otherwise, let hydraulic pipes and ports drain into a container.

CAUTION

The hydraulic system is under pressure, be sure to vent system to relieve pressure prior to accomplishing any repairs.

REMOVAL

a. Place a suitable container under the hydraulic system manifold assembly (1).

b. Tag and identify all hydraulic pipes connected to the hydraulic system manifold assembly valves (2, 3, 4, 5).

c. Loosen fittings that connect hydraulic pipes (2, 3, 4, 5) to the manifold assembly by turning the fittings counterclockwise.

d. Carefully position hydraulic pipes so that manifold assembly can be removed.

e. Remove three bolts (8), washers (7), and nuts (6) securing the hydraulic system manifold assembly to the bulkhead.

f. Remove the hydraulic system manifold assembly (1).

INSPECTION

a. Clean valves in an approved cleaning solvent.

b. Inspect manifold, check valve housing, and valves for cracks. Forward defective manifold to int ermediate direct maintenance for repair.

REPLACEMENT

a. Position the mounting holes in the hydraulic system manifold assembly over the mounting holes in the bulkhead.

b. Install three bolts (8), washers (7), and nuts (6) that secure the manifold assembly (1) to the bulkhead.

c. Align hydraulic pipes (2, 3, 4, 5) as tagged and identified with corresponding connectors on the winch control valve manifold assembly.

d. Secure fittings that connect the hydraulic pipes to the connectors on the hydraulic s ystem manifold assembly until the fittings are snug.

e. Check the hydraulic fluid-level (PMCS, Item 3).

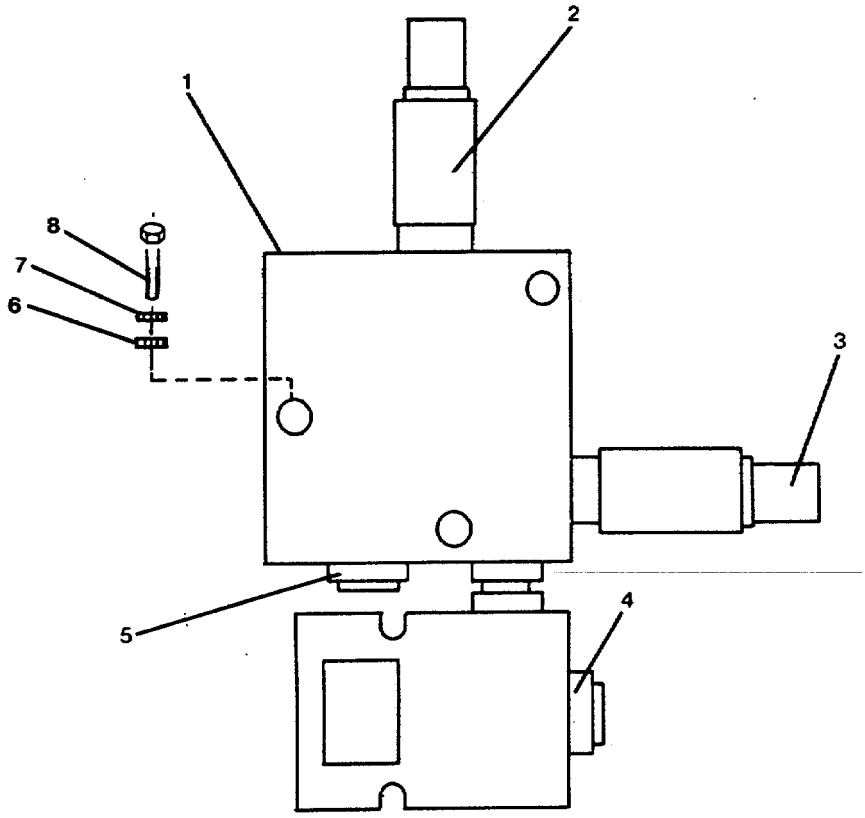


FIGURE 2-4. Hydraulic System Accessories Manifold.

2-19. Repair Hydraulic Winch Assembly. (FIGURE 2-5)

This task covers: a. Inspect/Service, b. Repair.

INITIAL SETUP

Tools

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

Equipment Condition

TM 55-1905-223-10, bow ramp assembly secured, tagged "Out of Service - Do Not Operate."

Materials/Parts

Warning tags, Item 1, Appendix C
Utility pail, Item 28, Appendix C
Shutoff valve P/N 53125

INSPECTION/SERVICE

Inspection and Service of the hydraulic winch assembly are covered in paragraph 2-9, Table 2-1, PMCS, Items 15 thru 22.

REPAIR

a. Place utility pail under shutoff valve (2). Disconnect hydraulic lines (5) from both sides of hydraulic winch assembly, cap/plug lines.

b. Remove four mounting bolts (3) and self-locking nuts (4) from shutoff valve, remove shutoff valve (2) from hydraulic winch assembly (1).

c. Replace shutoff valve (2) and secure to hydraulic winch assembly (1) with four mounting bolts and self-locking nuts (3,4).

d. Remove caps/plugs and connect hydraulic lines (5) to both sides of hydraulic winch assembly.

WARNING

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 on hydraulic equipment.

WARNING

o. Fuel, oil and other liquid spills create extremely hazardous decks and passageways. Slippery deck plates and walkways around operating machinery increases risk of injury from falls and moving machinery.

o Immediately clean up spills of fuel and oil and any other debris which creates slippery decks and unsafe working conditions.

CAUTION

The hydraulic system is under pressure, be sure to vent system to relieve pressure prior to accomplishing any repairs.

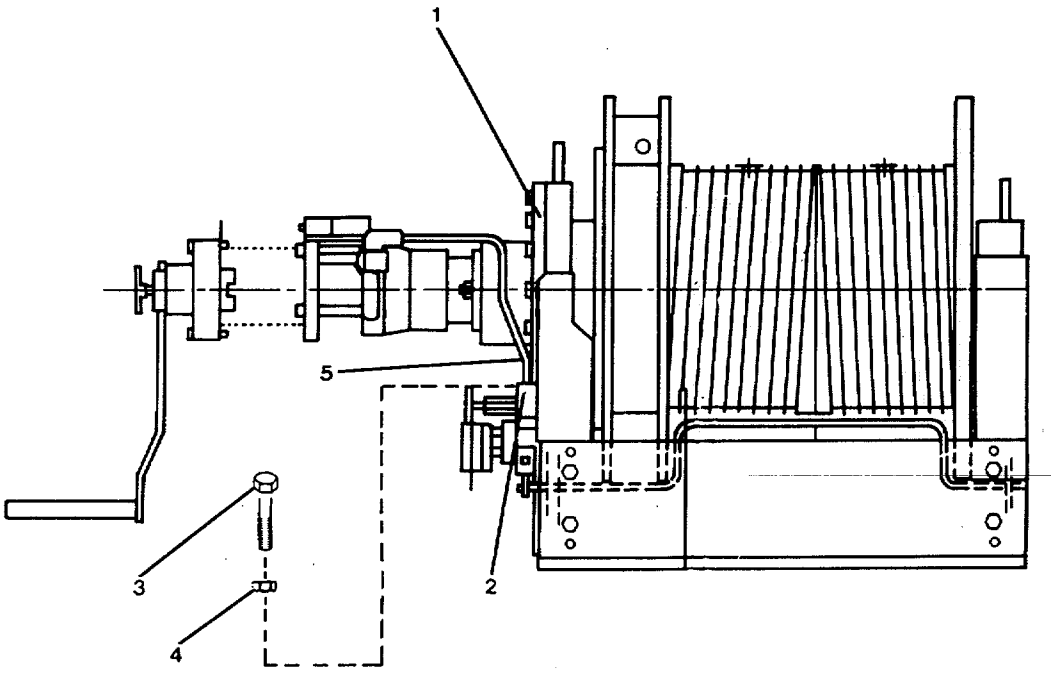


FIGURE 2-5. Hydraulic Winch Assembly Shutoff Valve Replacement.

2-20. Replace Hydraulic Hand Pump. (FIGURE 2-6).

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

INITIAL SETUP

Tools

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

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down, tagged "Out of Service - Do Not Operate."

Materials/Parts

Hydraulic hand pump P/N 06239-31090
Hydraulic fluid, Item 2, Appendix C

WARNING

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.

CAUTION

- Avoid contamination of the hydraulic system. Do not use rags, corks or similar items to plug the hydraulic pipes or ports. If available, use an approved external fitting cap or plug. Otherwise, let hydraulic pipes and ports drain into a container.

- The hydraulic system is under pressure, be sure to vent system to relieve pressure prior to accomplishing repairs.

REMOVAL

a. Position the shutoff valve (2, FIGURE 2-5) on the hydraulic winch assembly to "Close."

b. Place a suitable container under the hydraulic pipe connections (2,3, FIGURE 2-6).

c. Tag, identify, and disconnect the hydraulic pipe at connections (2,3).

d. Remove three bolts, (6) lockwashers, (5) and nuts (4) securing the hydraulic hand pump to the bow ramp winch.

e. Remove the hydraulic hand pump (1).

f. Turn shutoff valve base (2, FIGURE 2-5) counterclockwise until it is removed from bow ramp winch piping assembly.

INSPECTION

a. Inspection and operate the pump handle to confirm freedom of operation.

b. Inspect the body of the pump for cracks, corrosion.

REPLACEMENT

a. Position the mounting holes of the hydraulic hand pump (1, FIGURE 2-6) over the mounting holes in the bow ramp winch.

b. Install three bolts (6), lockwashers (5), and nuts (4), that secure the hydraulic hand pump (1) to the bow ramp winch.

c. Connect the hydraulic pipes at connections (2,3) as identified.

d. Position shutoff valve (2, FIGURE 2-5) into mounting hole of winch piping assembly and turn clockwise until it is snug. Place valve to "Open."

e. Check the hydraulic fluid level, (PMCS, Item 3).

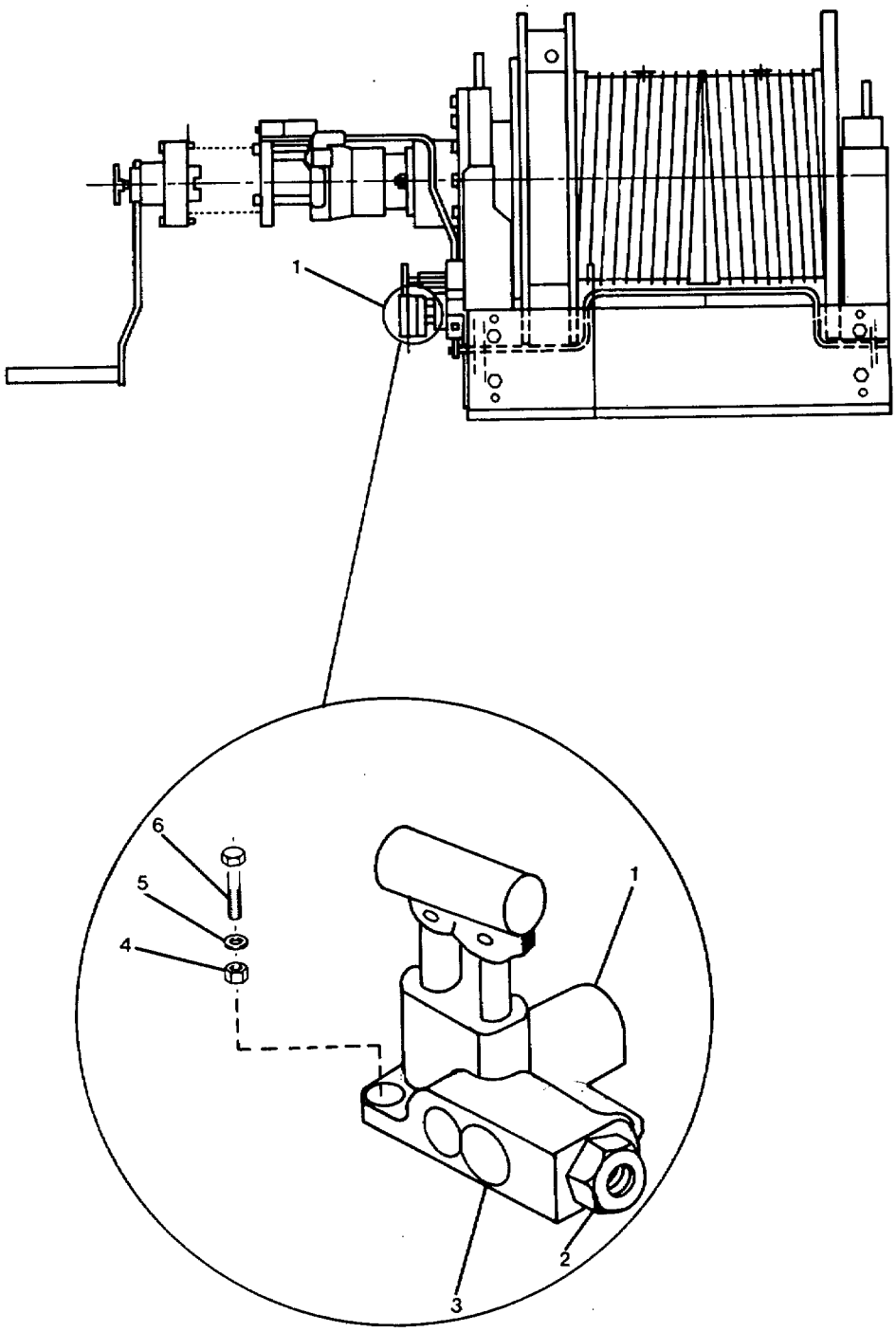


FIGURE 2-6. Hydraulic Hand Pump Removal.

2-21. **Replace Emergency Handcrank.** (FIGURE 2-7)

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

INITIAL SETUP

Tools

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

Materials/Parts

Emergency handcrank handle P/N 286239
Screw, self-locking

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down, tagged "Out of Service - Do Not Operate."

NOTE

When not in use, the emergency handcrank is stored in a remote area.

INSPECTION

a. Inspect crank housing (6) for corrosion or other evidence of broken parts.

b. Turn crank handle (5) listen for ratchet dog engaging ratchet wheel teeth.

c. Check crank handle for secure mounting and freedom of movement.

REMOVAL

a. Pull manual release lever "T" handle (4) on hand pump (2).

b. Set shutoff hand valve (2, FIGURE 2-5) fully clockwise; closed.

c. Turn emergency hand crank handle (5) in both directions to ensure winch is locked in position.

d. Remove three screws (3) securing emergency hand crank to manual interlock switch (1).

e. Remove handcrank (5).

REPLACEMENT

a. Position handcrank handle (5) on manual interlock switch (1), secure with three screws (3).

b. Turn crank handle (5), listen for ratchet dog engaging ratchet wheel teeth.

c. Set shutoff hand valve (2, FIGURE 2-5) fully counterclockwise; open.

d. Push manual release lever "T" handle (4) in on hand pump (2).

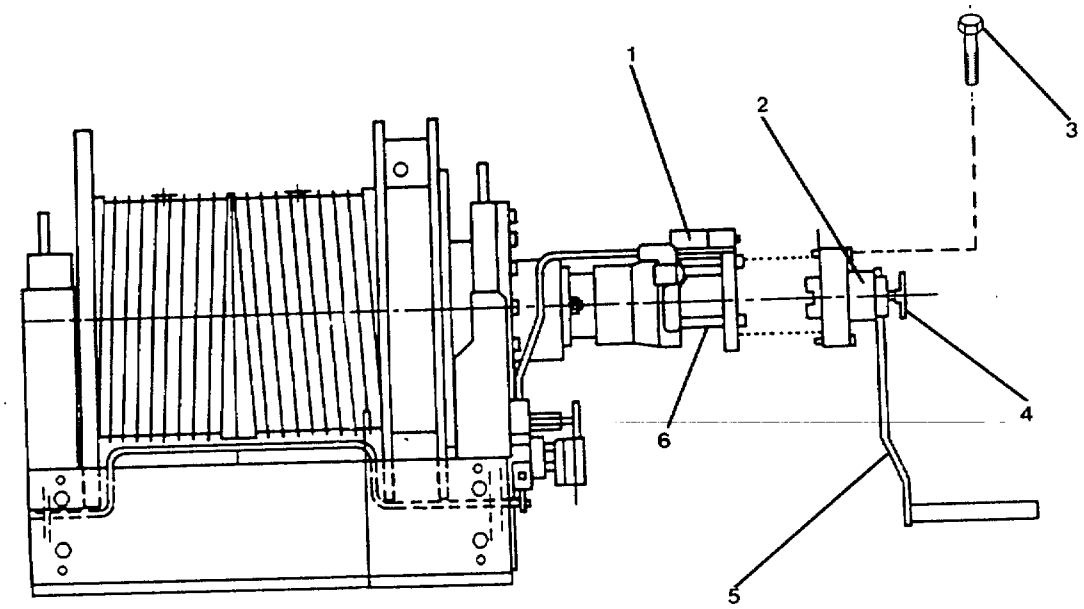


FIGURE 2-7. Emergency Handcrank.

2-22. Replace Hydraulic Motor. (FIGURE 2-8).

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

INITIAL SETUP

Tools	Equipment Condition
Tool kit, general mechanic's, 5180-00-699-5273	TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."
Tool kit, measuring machinist, 5280-00-278-9919	Refer to the following paragraph in this maintenance manual.
Materials/Parts	Emergency handcrank removed. Para. 2-21
Hydraulic motor P/N 53248-543119	
Hydraulic fluid, Item 2, Appendix C	
Gasket material, Item 6, Appendix C	

WARNING

- 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.
- Fuel, oil and other liquid spills create extremely hazardous decks and passageways. Slippery deck plates and walkways around operating machinery increases risk of injury from falls and moving machinery.
- Immediately clean up spills of fuel and oil and any other debris which creates slippery decks and unsafe working conditions.

CAUTION

- Avoid contamination of the hydraulic system. Do not use rags, corks, or similar items to plug the hydraulic pipes or ports. If available, use an approved external fitting cap or plug. Otherwise, let hydraulic pipes and ports drain into a container.
- The hydraulic system is under pressure, be sure to vent system to relieve pressure prior to accomplishing repairs.

INSPECTION

a. Inspect the hydraulic motor (5) for corrosion or other evidence of external damage.

b. Check hydraulic fittings for security, check lines for kinks or abrasion.

c. Check mounting hardware for security and evidence of brok en parts.

REMOVAL

a. Vent hydraulic system to relieve pressure.

b. Tag and disconnect electrical wiring to manual interlock switch (3).

c. Remove two machine screws and locknuts (1,2).

d. Remove the manual interlock switch (3).

e. Turn the shutoff valve (9) clockwise until it is closed.

f. Place a suitable container under the hydraulic motor.

g. Locate the drain plug (10) in the bottom of the hydraulic motor (5).

h. Turn the drain plug counterclockwise until it is free of the hydraulic motor.

i. Allow hydraulic fluid to drain into the container.

j. Tag, identify, disconnect and cap hydraulic pipes (4) from the hydraulic motor.

k. Remove two nuts and lockwashers (6,7) securing the hydraulic motor to the hydraulic failsafe brake (8).

l. Remove the hydraulic motor (5) by pulling straight away from the failsafe brake.

REPLACEMENT

a. Position the mounting holes in the hydraulic motor (5) over the two mounting studs on the hydraulic failsafe brake (8).

b. Install two nuts and lockwashers (6,7) that secure the hydraulic motor to the hydraulic failsafe brake. Tighten bolts to 90 ft-lb (12.4 kg) torque.

c. Remove caps and connect hydraulic pipes (4) to the hydraulic motor as identified.

d. Position the drain plug (10) in the drain hole in the bottom of the hydraulic motor.

e. Turn the drain plug clockwise until it is snug.

f. Turn the shutoff valve (9), counterclockwise until it is open.

g. Install the manual interlock switch (3) and secure with two machine sc rews and lock nuts (1,2).

h. Remove tags and connect electrical wiring to manual interlock switch.

i. Start hydraulic pump; operate ramp through one complete cycle. Shut down equipment (refer to TM 55-1905-223-10).

j. Check the hydraulic fluid level (PMCS, Item 3).

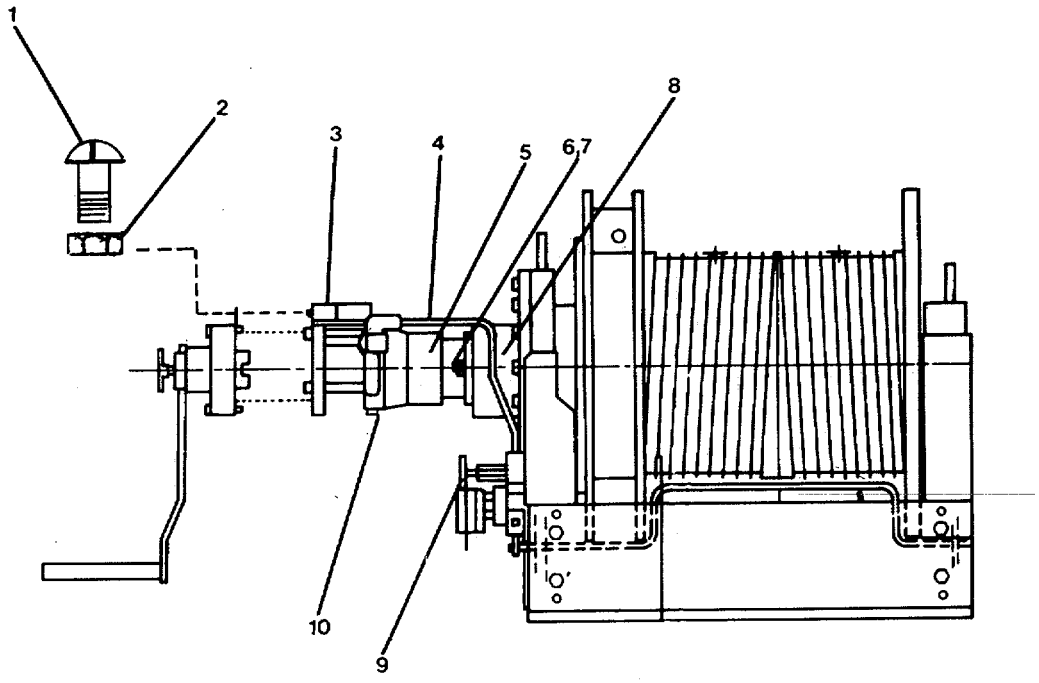


FIGURE 2-8. Hydraulic Motor Removal.

2-23. Replace Hydraulic Failsafe Brake. (FIGURE 2-8).

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

INITIAL SETUP

Tools	Equipment Condition
Tool kit, general mechanic's, 5180-00-699-5273	TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."
Materials/Parts	Refer to the following paragraph in this maintenance manual:
Hydraulic failsafe brake P/N 06239-53120	Hydraulic motor removed. Para. 2-22.
Hydraulic fluid, Item 2, Appendix C	
Gasket Item 6, Appendix C	

WARNING

- Hydraulic fluid contains chemical compounds that cause irritation or injury to the skin and eyes. Wear protective clothing, gloves, and safety glasses when working in the vicinity on hydraulic equipment.
- Fuel, oil and other liquid spills create extremely hazardous decks and passageways. Slippery deck plates and walkways around operating machinery increases risk of injury from falls and moving machinery.
- Immediately clean up spills of fuel and oil and any other debris which creates slippery decks and unsafe working conditions.

CAUTION

Avoid contamination of the hydraulic system. Do not use rags, corks, or similar items to plug the hydraulic pipes or ports. If available, use an approved external fitting cap or plug. Otherwise, let hydraulic pipes and ports drain into a container.

CAUTION

The hydraulic system is under pressure. Be sure to vent system to relieve pressure prior to accomplishing repairs.

REMOVAL

a. Place a suitable container under the hydraulic failsafe brake (8, FIGURE 2-8).

b. Remove the hydraulic failsafe brake (8, FIGURE 2-8).

INSPECTION

a. Inspect the hydraulic brake for corrosion and broken parts.

b. Check mounting holes for security, and corrosion.

c. Check threads of hydraulic ports for clean, undamaged condition.

REPLACEMENT

a. Position mounting holes in hydraulic failsafe brake over mounting studs in the bow ramp winch.

b. Install the hydraulic motor. Reference paragraph 2-22.

2-24. Inspect/Service Gear Reducer Assembly.

This task covers: Inspection/Service.

INSPECTION/SERVICE

Inspection and service for the gear reducer assembly is accomplished in the Table 2-1, PMCS, Item 21.

2-25. Inspect/Service/Adjust Bow Ramp Winch . (FIGURE 2-9).

This task covers: a. Inspection/Service, b. Adjustment.

INITIAL SETUP

Tools

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

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shutdown and tagged "Out of Service-Do Not Operate."

Materials/Parts

Cotton cord, Item 12, Appendix C NSN 4020-00-240-2164
Warning tag, Item 1, Appendix C.

INSPECTION/SERVICE

Inspection, service and adjustment for the bow ramp winch are accomplished in Table 2-1, PMCS, Items 15 through 22.

ADJUSTMENT

a. Stretch cotton cord (1) tightly between wildcat (3) and wire rope pulley (4).

b. Measure distance between cord (1) and turnbuckle (2).

c. If measurement is more than 2 inches, loosen plate stopper ring (3, F IGURE 2-10) and the adjusting turnbuckle outward extension (6).

d. Turn adjusting turnbuckle (7) until measurement is 2 inches.

e. Tighten adjusting turnbuckle inward extension (6) and plate stopper ring (3).

f. Remove cotton cord (1) when adjustment is complete.

g. Remove warning tag and restore bow ramp assembly to operation. Reference TM 55-1905-223-10.

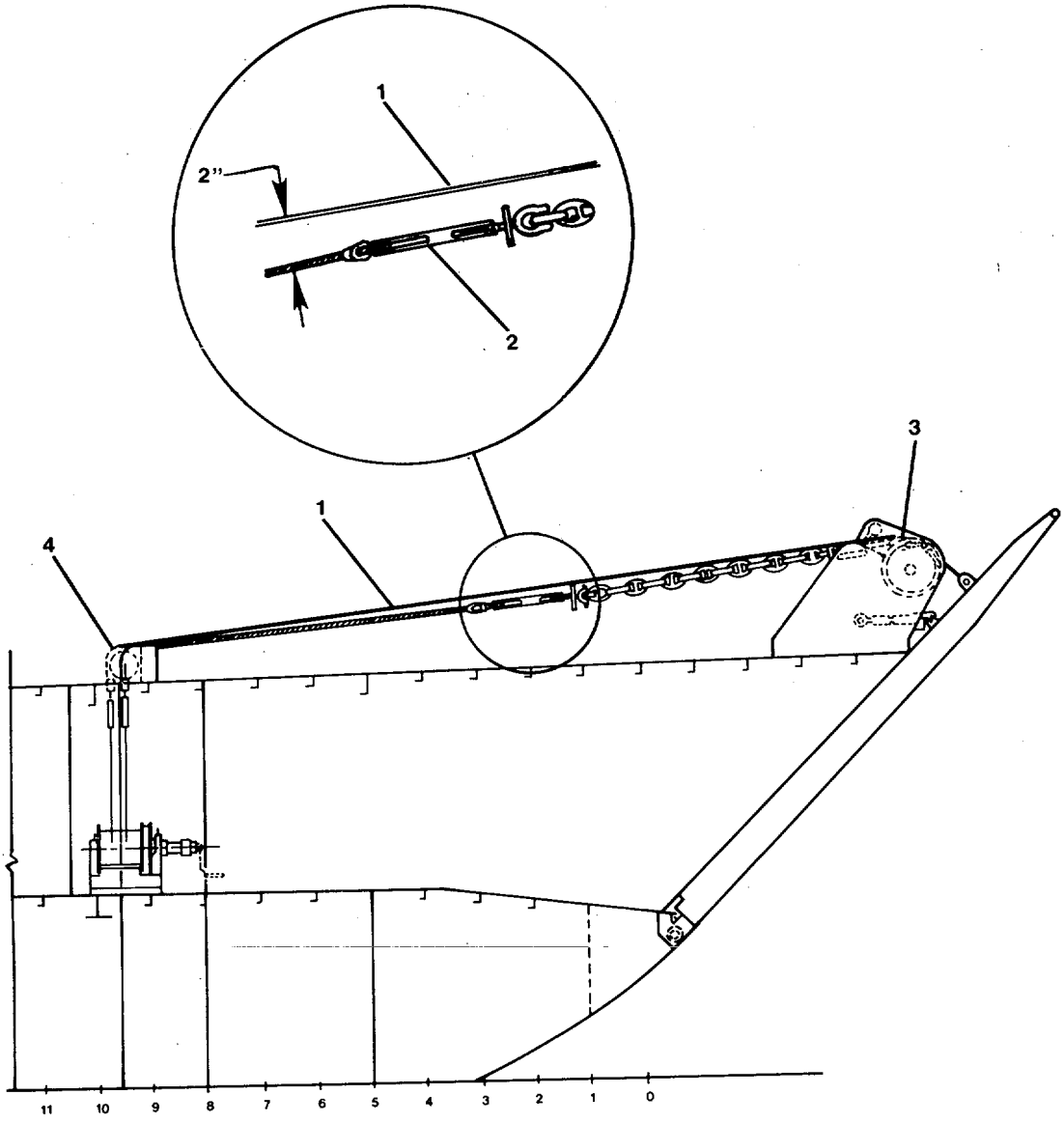


FIGURE 2-9 Turnbuckle Adjustment.

2-26. Inspect/Service Bow Ramp Lifting Assembly .

This task covers: Inspection/Service.

INSPECTION/SERVICE

Inspection and service of the bow ramp lifting assembly consists of lubrication. Reference Lubrication Order LO 55-1905-223-12.

2-27. Inspect/Service Pulley Sheave Assembly.

This task covers: Inspection/Service.

INSPECTION/SERVICE

Inspection and service of the pulley sheave assembly consists of periodic lubrication. Reference Lubrication Order LO 55-1905-223-12.

2-28. Inspect/Service Wildcat Foundation Assembly.

This task covers: Inspection/Service.

INSPECTION/SERVICE

Inspection and service of the wildcat foundation assembly consists of periodic lubrication. Reference Lubrication Order LO 1905-223-12.

2-29. Inspect/Service Chain Stopper Assembly.

This task covers: Inspection/Service.

INSPECTION/SERVICE

Inspection and service of the chain stopper assembly consists of inspecting for and providing lubrication. Reference Lubrication Order LO 55-1905-223-12.

2-30. Inspect/Service Wildcat Sheave.

This task covers: Inspection/Service.

INSPECTION/SERVICE

Inspection and service of the wildcat sheave consists of inspecting for and providing lubrication. Reference Lubrication Order LO 55-1905-223-12.

2-31. Inspect/Service Locking Assembly.

This task covers: Inspection/Service.

INSPECTION/SERVICE

Inspection and service of the locking assembly consists of inspecting for and providing lubrication. Reference Lubrication Order LO 55-1905-223-12.

2-32. Inspect/Service Bow Ramp Hinge Assembly.

This task covers: Inspection/Service.

INSPECTION/SERVICE

Inspection of service of the bow ramp hinge assembly consists of inspecting for and providing lubrication. Reference Lubrication Order LO 55-1905-223-12.

2-33. Inspect/Service Bow Ramp Sealing.

This task covers: a. Inspection, b. Service.

INSPECTION

Inspect rubber liner for cracks, peeling or drying out.

SERVICE

If, upon inspection, the rubber liner shows deterioration, it should be replaced. Reference Intermediate General Support Maintenance, paragraph 4-24 for replacement.

2-34. Repair Turnbuckle Assembly. (FIGURE 2-10).

This task covers: a. Inspection/Service, b. Removal, c. Repair, d. Replacement.

INITIAL SETUP

Tools

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

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."

Materials/Parts

Turnbuckle P/N HG228-10-32B76
Warning tags, Item 1, Appendix C
Grease, Item 7, Appendix C

INSPECTION/SERVICE

a Inspect the turnbuckle assembly for corrosion or evidence of broken parts.

b. Inspect the threads for damage. Check for grease on threaded parts, add grease if required.

REMOVAL

WARNING

If bow ramp is raised, ensure that both chain stoppers are operating and both locking assemblies are locked before removing a turnbuckle. Removal of a turnbuckle with both chain stoppers not operating or the locking assemblies are unlocked may cause the bow ramp to lower endangering personnel and the landing craft.

a. If bow ramp is raised, ensure that both chain stoppers (1) are operating.

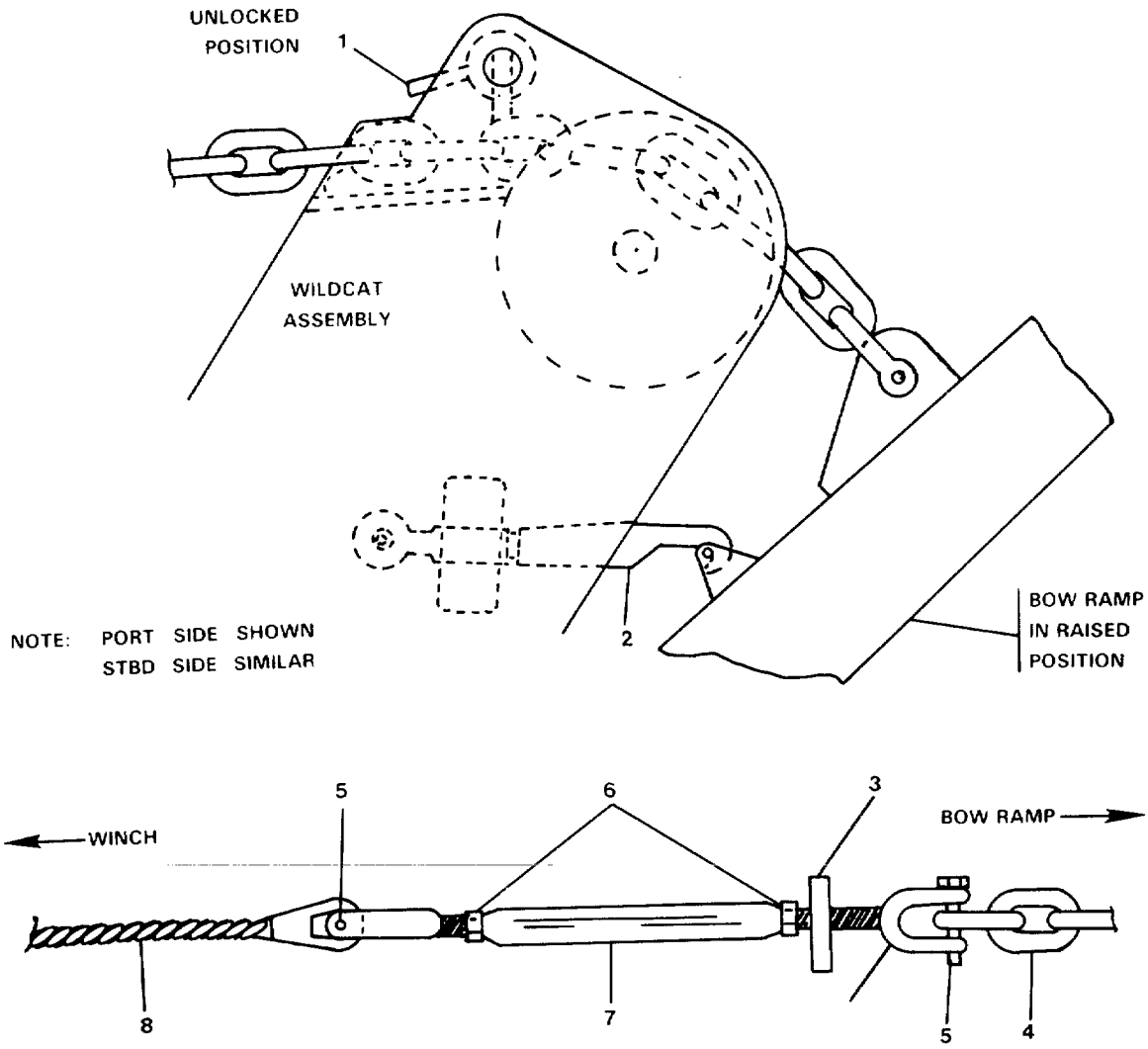


FIGURE 2-10. Turnbuckle, Chain Stopper and Locking Assemblies.

b. If bow ramp is raised, ensure that both locking assemblies (2) are locked.

c. Relieve tension on wire rope and stud chain by loosening plate stopper ring (3) and adjusting turnbuckle outward extension (6).

WARNING

Keep personnel away from areas around or under wire ropes and stud chains. A falling wire rope or stud chain can cause serious injury or death.

d. Secure the turnbuckle ends of the wire rope and stud chain with suitable devices to prevent them from falling.

e. Remove pin (5) connecting end of stud chain (4) to turnbuckle.

f. Remove pin (5) connecting end of wire rope (8) to turnbuckle.

g. Remove the turnbuckle (7).

REPAIR

Repair of turnbuckle assembly consists of replacing any component found to be unserviceable.

REPLACEMENT (FIGURE 2-10).

a. Install pin (5) connecting end of wire rope (8) to turnbuckle (7).

b. Install pin (5) connecting end of stud chain (3) to turnbuckle (7).

c. Remove devices that prevented the wire rope and stud chain from falling.

d. Apply tension to wire rope and stud chain by adjusting turnbuckle inward.

Section VI. PREPARATION FOR STORAGE, OR SHIPMENT

2-35. Administrative Storage. If the bow ramp assembly will remain intact but out of service for an extended period of time (30 days or longer), or subassemblies are reshipped to another location, certain actions must be taken as protection against the corrosive effects of the elements. All internal and external surfaces will rust or corrode if they are not protected. The procedures in the following paragraphs will cover preservation of the system and components prior to extended lay-up, shipping and return to service. Also see TB-740-97-4, "Preservation of Vessels for Storage" and TM 55-1905-223-24, "Hull and Outfitting."

2-36. Temporary Storage Hydraulic Power Pack. If the hydraulic power pack and associated piping and valves remain intact but out of service for an extended period of time (30 days to 6 months or longer) or the power pack is to be reshipped to another location, accomplish the following tasks to minimize rust and corrosion.

a. Short Term Storage (30 days to 6 months) system intact.

(1) Place a suitable container under hydraulic reservoir tank, remove magnetic drain plug, drain oil from system and replace magnetic plug.

(2) Place a suitable container under hydraulic directional control valve supply and return piping connections, vent system, disconnect piping, drain residue fluids from system and reconnect piping fittings.

(3) Fill reservoir tank with preservative fluid conforming to MIL-H-6083. Operate system (reference paragraph 2-6) to cycle preservative throughout system and fill reservoir to capacity.

(4) Install a separate expansion tank above the existing reservoir tank with suitable fittings onto the fill hole, fill expansion tank with additional preservative to provide necessary space for fluid expansion and compensate for minor system leaks.

b. Long Term Storage (over 6 months and longer) system intact.

(1) Accomplish tasks a.(l) through a.(4).

(2) Lightly spray the external surfaces of the hydraulic power pack to include hydraulic pump, electric motor, associated valves and fittings with preservative fluid conforming to MIL-H-6083.

NOTE

After the hydraulic power pack has been in storage for 12 months repeat external coating of preservative. After 24 months of storage repeat storage preparation tasks.

c. Shipping Preparations: This task covers the preparation of the hydraulic power pack removed from the vessel (Chapter 4) for storage on land base or reshipping to another location.

(1) Remove hand hole cover and gasket (FIGURE 1-1) from end of reservoir tank, drain residue oil from power pack assembly on tank top.

(2) Flush power pack assembly with petroleum solvent and dry out with compressed air. Fill pump, valves and filter with P-10 preservative lubricating oil, Type I or II, Grade 30.

(3) Install piping plugs in all open parts, flush external surface with cleaning solvent, dry with compressed air and lightly spray with preservative conforming to Type P-2, also see MIL-STD-107 and MIL-STD- 129 for guidance.

(4) With reservoir tank drained, clean with cleaning solvent, dry with compressed air and spray interior with P-10 Type preservative. Remove magnetic drain plug (FIGURE 1-1) and drain excess preservative, coat hand hole cover and drain plug with P-10 preservative and reinstall. Also see MIL-STD-107 and MIL-STD-129 for guidance.

2-37. Hydraulic Power Pack Restoration. When the hydraulic power pack is to be restored to normal service from extended storage accomplish the following tasks.

NOTE

Systems that are preserved intact by filling with preservative conforming to MIL-H-6083 do not generally require extensive flushing prior to becoming operational as this fluid is, in small quantities, compatible with system operating fluid.

a. Cleaning Hydraulic Power Pack Assembly, system intact.

(1) Accomplish tasks in paragraph 2-13. Remove expansion tank mounted over hydraulic reservoir tank.

(2) Install new filter elements in power pack piping and reservoir tank.

(3) Fill system with new clean hydraulic operating fluid as per LO 55-1905- 223-12, operate system (Chapter 1 Section III) to circulate fluid throughout system piping and components.

(4) When thoroughly circulated and system is at normal or near normal operating temperature, secure system and repeat tasks (1), (2) and (3).

(5) Take a fluid sample and analyze to determine fluid viscosity and minimum flash point. Compare these values with military specification

requirements for the system hydraulic fluid. See MIL-HDBK-113B for selection of lubrication and LO 55-1905-223-12, Lubrication Order for guidance.

(6) If the flashpoint is more than 9°F (50° C) below specification requirements, or the viscosity varies more than 5% from that specified, repeat tasks (1) through (5).

b. Cleaning Hydraulic Power Pack Assembly from Storage.

(1) Move hydraulic power pack assembly to a staging area prior to installation on vessel.

(2) Accomplish tasks in paragraph 2-13, flush power pack assembly with petroleum solvent, and dry out with compressed air.

(3) Install piping plugs in all parts, flush external surface with cleaning solvent, and dry with compressed air. Reinstall hand hole covers with new gaskets and change all filters. Power pack is ready for installation on vessel.

c. Inspection of Hydraulic Power Pack Assembly. Prior to restoring system to normal operation, make the following system checks.

(1) Visually inspect all hydraulic system valves, piping and fittings for leakage, wear or damage. Repair or replace as required.

(2) Visually inspect all electrical system conduit fittings and terminal connectors for tightness.

(3) Visually inspect solenoids and switches for build up of dirt, dust, etc., and clean as required. Apply a light coat of silicone spray lubricant.

(4) If required, paint the power pack assembly as per TM-43-0139, painting instructions for field use.

2-38. Temporary Storage Bow Ramp Winch Assembly. If this bow ramp winch and associated components remain out of service for an extended period (30 days or longer) accomplish the following tasks to minimize rust and corrosion. The following procedures will include preservation of the bow ramp winch assembly, wire ropes, chains, sheaves and associated threaded fittings such as turnbuckles and shackles when the system is to be left intact.

a. Short or Long term Storage system intact.

(1) Operate system (reference paragraph 2-5), lower ramp, and unwind remaining wire rope from drum.

(2) Coat wire rope from winch to bow ramp including chain, shackles and turnbuckles with preservative conforming to FED-VV-L-751 Type II Grade B.

(3) Coat the exposed unpainted surfaces of the drum with the same preservative, operate system to raise ramp, rewind wire rope on drum and shut down system.

(4) Winch hydraulic motor, hydraulic hand pump and associated valves, piping and manifolds shall be filled with preservative fluid conforming to MIL-H-6083 in conjunction with hydraulic power pack (reference paragraph 2-9, PMCS).

(5) Remove gear reducer drain plug (6 o'clock position), drain gear reducer and reinstall plug. Remove fill plug (12 o'clock position) and fill casing with preservative fluid conforming to MIL-P-116-P-10, Type I or II, Grade 30.

(6) Reinstall fill plug and drain off excess fluid until down to operating level at 3 o'clock position.

(7) Visually inspect all electrical conduit and hydraulic piping fittings and connections to the bow ramp winch assembly to ensure system tightness. Inspect to ensure that any open ports on equipment are properly plugged or sealed.

(8) Thoroughly clean and flush exterior surfaces of the winch assembly with fresh water or steam and dry with compressed air, with exception of wire rope and winch drum when system is preserved intact.

(9) Lubricate the winch, wire rope sheaves, wildcat assemblies and bow ramp hinges as per Lubrication Order, LO 55-1905-223-12.

(10) Lightly spray all exterior surfaces using preservative conforming to MIL-P-116 Type P-2, with exception of wire rope or winch drum when system is preserved intact. Remove tension from slack/overlapped cable detector bail return spring.

NOTE

After the bow ramp winch assembly, wire rope sheaves, wildcat assemblies and bow ramp hinges have been in storage for 12 months repeat external coating of preservative and lubrication. After 24 months of storage, repeat storage preparation tasks.

b. Shipping Preparations: This task covers the preparation of the bow ramp winch assembly removed from the vessel (Chapter 4) for storage on land base or reshipping to another location.

(1) Install plugs in the hydraulic motor high pressure, low pressure, drain ports, in emergency brake release pump inlet and reservoir ports and the manual interlock and slack/overlapped cable detector limit switch conduit fittings.

(2) Thoroughly clean and flush the winch with fresh water or steam dry with compressed air. Lubricate the winch assembly as per LO 55-1905-223-12 "Lubrication Order."

(3) Take tension off slack/overlapped cable detector bail return spring.

(4) Preserve hydraulic motor and hand pump as per paragraph a.(4), preserve winch gear reducer as per paragraph a.(5) and a.(6).

(5) Store the winch assembly in an elevated covered area to allow good air circulation. If covered storage is not available use shipping container covered with waterproof tarp.

2-39. Bow Ramp Winch Restoration . When bow ramp winch assembly is to be restored to normal service from extended storage accomplish the following tasks.

a. Cleaning of Bow Ramp Winch System Intact.

(1) Remove from exterior surfaces of winch MIL-P-116, Type P-2 preservative using cleaning solvent conforming to MIL-C-81302, Type II.

(2) Drain preservative fluids from winch hydraulic motor, hand pump, valves, piping and manifolds and fill to operating levels as per Lubrication Order LO 55-1905-223-12.

NOTE

Systems that are preserved intact by filling with preservative conforming to MIL-H-6083 do not generally require extensive flushing prior to becoming operational as this fluid is, in small quantities, compatible with system operating fluid.

(3) Remove gear reducer drain plug, drain off preservative, flush with petroleum cleaning solvent, reinstall drain plug and fill to operating level as per Lubrication Order LO 55-1905-223-12.

(4) Retention slack/overlapped cable detector bail return spri ng.

(5) Flush and operate system in conjunction with hydraulic power pack assembly (reference paragraph 2-13).

(6) Clean threaded fittings such as turnbuckles, shackles and locking devices with suitable cleaning solvent.

(7) Lubricate winch, wire rope sheaves, wildcat assemblies and bow ramp hinges as per Lubrication Order LO 55-1905-223-12.

(8) Refer to paragraph 2-7 and restore system to normal operation.

b. Bow Ramp Winch Assembly from Storage.

(1) Move bow ramp winch assembly to a staging area prior to installation on vessel.

(2) Accomplish tasks in paragraph a.(2) and a.(3). Thoroughly clean and flush the winch with fresh water or steam clean and dry with compressed air. Bow ramp winch is ready to install.

c. Inspection of Bow Ramp Winch Assembly. Prior to restoring system to normal operation make the following checks.

(1) Visually inspect all hydraulic system valves, piping and fitting for leakage, wear or damage, tighten, repair or replace as required.

(2) Visually inspect all electrical conduit fittings and terminal connections for tightness.

(3) Visually inspect solenoids and switches for buildup of dirt, dust, etc., clean as required and apply a light coat of silicone spray lubricant. Check operation and verify proper control system indications.

(4) Check emergency break release pump and hand crank operation, lower and raise the bow ramp.

(5) Visually inspect cable anchors for buildup of dirt, dust or corrosion, clean, inspect for signs of slippage and replace as required, see Chapter 4.

(6) Visually inspect all mounting bolts and secure as required.

(7) If required, paint the bow ramp winch assembly as required per TM-43-0139, Painting Instructions for Field Use.

CHAPTER 3

INTERMEDIATE DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

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

3-1. Common Tools and Equipment . For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your organization.

3-2. 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.

3-3. 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

3-4. 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 equipment 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 and replace 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.

Section III. INTERMEDIATE DIRECT SUPPORT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-5. PMCS. Intermediate general support preventive maintenance checks and services are a function of unit maintenance, Chapter 2, Section III.

Section IV. INTERMEDIATE DIRECT SUPPORT TROUBLESHOOTING

3-6. 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 3-1)
HYDRAULIC SYSTEM	
Erratic pressure	Item 2
Excessive pressure	Item 3
Excessive temperature	Item 4
Low pressure	Item 1

Table 3-1 lists the common fault condition 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 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 3-1. Troubleshooting

Malfunction Test or Inspection Corrective Action
1. Low pressure in hydraulic system.
STEP 1. Check to see if pressure valve is broken. Replace defective valve (paragraph 3-8).
2. Erratic pressure in hydraulic system.
STEP 1. Check to see if pressure relief valve is broken. Replace defective valve (paragraph 3-8).
3. Excessive pressure in hydraulic system.
STEP 1. Check to see if pressure relief valve is broken. Replace defective valve (paragraph 3-8).
4. Excessive temperature in hydraulic system.
STEP 1. Check to see if hydraulic pressure is too high - broken pressure relief valve. Replace defective valve (paragraph 3-8).

Section V. INTERMEDIATE DIRECT SUPPORT MAINTENANCE PROCEDURES

3-7. General. Repair actions for the bow ramp assembly are those repair actions described on the individual components. There are no separate procedures included for equipment for which repair parts are not stocked. Principles of operation that describe the bow ramp assembly are provided in Chapter 1, Section III.

MAINTENANCE OF HYDRAULIC SYSTEM MANIFOLD ACCESSORIES

3-8. Repair Hydraulic Manifold System Accessories . (FIGURE 3-1).

This task covers: Repair.

INITIAL SETUP

Tools

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

Materials/Parts

Shuttle valve P/N DSVI-108-0
Check Valve P/N SPC1-10-P-ST
Pressure relief valve P/N RV5-10-S-0-25
Sequence valve P/N RV2-10-S-0-50

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down, tagged "Out of Service - Do Not Operate."
Refer to the following paragraph in this maintenance manual.
Hydraulic system manifold and hydraulic lines removed. Para. 2-18.

REPAIR

a. Remove sequence valve (1) and replace with new one.

b. Remove pressure relief valve (2) and replace with new one.

c. Remove check valve (3) and replace with new one.

d. Remove shuttle valve (4) and replace with new one.

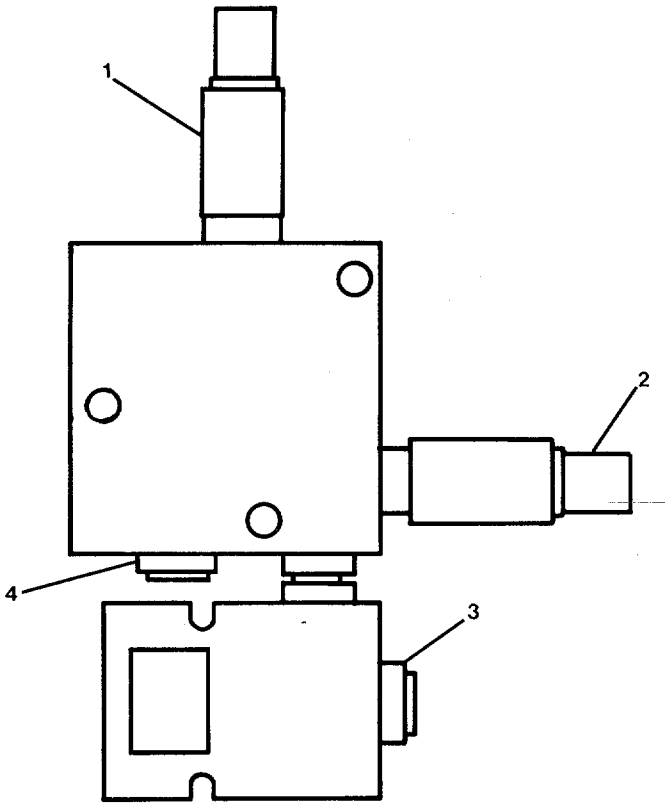


FIGURE 3-1. Hydraulic System Manifold Valves.

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

3-9. 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. Disassembly, and repacking of equipment for shipment or short term storage, are covered in Chapter 2, Section VI.

CHAPTER 4

INTERMEDIATE GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

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 and replace 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.

Section III. INTERMEDIATE GENERAL SUPPORT PREVENTATIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-5. PMCS. Intermediate general support preventive maintenance checks and services are a function of unit maintenance, Chapter 2, Section III.

Section IV. INTERMEDIATE GENERAL SUPPORT TROUBLESHOOTING

4-6. 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

Table 4-1 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 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

Malfunction Test or Inspection Corrective Action
1. Winch will not rotate or rotates slowly.
Step 1. Check for faulty directional control valve. Replace valve (para. 4-11).
Step 2. Check for faulty directional valve. Replace valve (para. 4-11).
Step 3. Check for faulty relief valve. Replace valve (para. 2-17).
Step 4. Check for gear reducer defective as indicated by grinding noises. Replace defective gear reducer (paragraph 4-17).
Step 5. Check for winch shaft binding in shaft mounting bearing as indicated by excessive heat or grinding noise. Replace defective winch (paragraph 4-12).
2. Emergency handcrank will not rotate clockwise.
Step 1. Check for insufficient hydraulic fluid in hydraulic brake. Insert handle in brake release pump and operate pump until brake is released. Turn handle clockwise until hydraulic pressure is restored to hydraulic motor (paragraph 4-14).
3. Excessive temperature in hydraulic system.
Step 1. Check for air in hydraulic fluid. Replace defective shaft seal in hydraulic pump (paragraph 4-10).

Section V. INTERMEDIATE GENERAL SUPPORT MAINTENANCE PROCEDURES

4-7. Repair of Bow Ramp Assembly. Repair actions for the bow ramp assembly are those repair actions described on the individual components, paragraphs 4-8 through 4-26. Principles of operation that describe the bow ramp assembly are provided in Chapter 1, Section III. There are no separate procedures included for equipment for which repair parts are not stocked.

4-8. Replace/Repair Hydraulic Power Pack Assembly.

This task covers: a. Remove, b. Repair, c. Replace.

INITIAL SETUP

Tools

Tool kit, general mechanic's,
5180-00-699-5273
Tool kit, electrician's,
5180-00-391-1087
Tool kit, measuring machinist,
5280-00-278-9919
Torque wrench, (30-300 in-lb)
5120-01-092-3278
Torque wrench (30-300 ft-lb)
5120-01-125-5190

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down, tagged "Out of Service - Do Not Operate."
Refer to the following paragraph in this maintenance manual.
Hydraulic power pack removed/replaced. Para. 2-13.

Materials/Parts

Electric motor P/N CM4110T
Piston pump P/N PVE1919-2-30-CG-C710
Directional control valve P/N DG5S8-6C-T-S-M-WCCB-20
Hydraulic reservoir tank P/N J-100
Cleaning solvent, Item 5, Appendix C
Emery cloth, Item 8, Appendix C
Lubricating oil, Item 9, Appendix C
Compressed air

REMOVAL

Disassembly of the hydraulic power pack assembly consists of removal of the individual components of the assembly, paragraphs 4-9 through 4-12.

REPAIR

Repair of the hydraulic power pack assembly consists of repair of the individual components of the assembly, paragraphs 4-9 through 4-12.

REPLACE

Assembly of the hydraulic power pack assembly consists-of replacement of the individual components of the assembly, paragraphs 4-9 through 4-12.

4-9. Repair Electric Motor. (FIGURE 4-1)

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

INITIAL SETUP

Tools

Tool kit, general mechanic's,
5180-00-699-5273
Tool kit, electrical equipment,
5180-00-391-1087
Tool kit, measuring machinist,
5380-00-278-0019

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down, tagged "Out of Service - Do Not Operate."
Refer to the following paragraph in this maintenance manual.
Electric motor removed/replaced. Para. 2-14.

Materials/Parts

Gasket P/N 12GS1000
Gasket P/N 10GS1000
Warning tags, Item 1, Appendix C
Cleaning Solvent, Item 5, Appendix C
Emery cloth, Item 8, Appendix C
Burnishing tool, Item 10, Appendix C

DISASSEMBLY

a. Loosen retainer ring bolts (12) and remove fan cover (1), retaining fan (2) and mounting studs (3).

b. Remove front endplate (4) from stator assembly (5).

c. Remove bolts (8), pulley endplate (7) and rotor and shaft assembly (6) from stator assembly (5).

d. Remove box lid (11) from conduit box (9) and check box lid gasket (10) for wear and tear.

Overview

In the repair of the electric motor you will accomplish the following:

- Take the motor apart.
- Compute the accurate voltage for testing.
- Perform wear inspections.

REPAIR

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or in well ventilated space. Wear proper eye protection and rubber gloves.

a. Clean equipment and windings using a suitable cleaning solvent.

b. Protect windings and machined surfaces; clean equipment housing, fan, interior and exterior of end bells (2), (8) thoroughly, leaving no residue or injurious effects.

c. Dry the equipment by placing it in an oven at 230 degrees Fahrenheit for 10 hours.

d. Visually inspect for cracks, unbonded insulation, and discoloration of one coil from associated coils.

ASSEMBLY

a. Install new gasket (10) onto box lid (11) and install onto conduit box (9).

b. Install rotor and shaft assembly (6) endplate (7) and bolts (8) onto stator assembly (5).

c. Install front endplate (4) into stator assembly (5).

d. Install fan cover (1) and tighten four retaining screws.

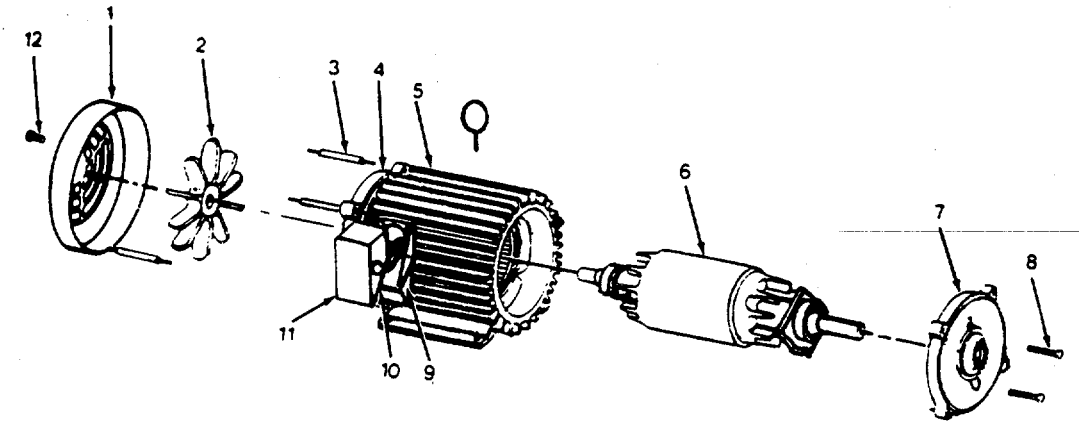


FIGURE 4-1. Electric Motor Repair.

4-10. Repair Piston Pump Assembly. (FIGURE 4-2).

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, 5280-00-278-9919

Materials/Parts

Casket P/N 244956
Preformed packing P/N 262331
Preformed packing P/N 262335
Preformed packing P/N 197573
Preformed packing (2) P/N 174140
Preformed packing P/N 154130
Shaft seal P/N 471965
Preformed packing P/N 427682
Gasket P/N 423617
Shim kit (2) P/N 923938
Annular ball bearing (2) P/N 417381
Annular ball bearing P/N 473914
Annular ball bearing P/N 419627
Cleaning solvent, Item 5, Appendix C
Compressed air
Lubricating oil, Item 9, Appendix C
Warning tags, Item 1, Appendix C

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down, tagged "Out of Service - Do Not Operate."
Refer to the following paragraph in this maintenance manual.
Hydraulic piston pump removed/replaced. Para. 2-15.

NOTE

This equipment is a candidate for direct replacement.

CAUTION

Cleanliness and care during repair is important. Before removing any components, plug all ports and thoroughly wash outside of assembly with cleaning solvent to remove grit and dirt. When removing internal components, care must be taken so that the sealing surfaces are not scratched or otherwise damaged.

DISASSEMBLY

a. Remove hexhead capscrews (2) from compensatory (11) and remove compensatory assembly from valve block (21).

b. Remove retaining ring (12), gasket (13), preformed packing (14), and plug (1) from compensatory body. Discard gaskets and packing.

c. Remove wire (3), seal (4), plug (5), preformed packing (6 and 7), spring (8), seat (9) and spool-(10) from compensatory body. Discard packing.

d. From pump housing (54) remove hex head capscrews (47), covers (48), shim kits (49), preformed packing (50), pintel bearing spacers (51), annular ball bearings (52), retaining ring (57), and shaft seal (56). Discard packing and shaft seal.

e. From pump housing (54) remove hexhead capscrews (55), valve block (21), spring (46), seats (45 and 44), spring pin (43), piston (15), rod (16), preformed packing (17), and housing gasket (53). Discard gasket and packing.

f. From valve block (21) remove plug (20), preformed packing (19), seat (24), valve (23), spring (22), pins (25 and 26), and compression spring (18), piston (15), rod (16), and preformed packing (17).

g. From pump housing (54) remove shaft assembly (40), yoke (41), and annular ball bearing (42).

h. From shaft assembly (40), remove annular ball bearing (27), wafer plate (28), bearing spacer set (29), retaining ring (30), spring washer (31), spring (32), spring washer (33), cylinder block (34), pins (35), pin retainer (36), spherical washer (37), shoe plate (38), and linear piston shoe (39).

REPAIR

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber glove.

a. Wash all metal parts in cleaning solvent, being especially thorough with ports and passages of pump housing (54) and valve block (21). Inspect all packing grooves and mating surfaces for severe wear or other damage. Any metal parts showing severe wear should be replaced. Severe wear is 5.0% of total metal area or greater.

b. Dry each part with compressed air and reassemble using new parts as required.

NOTE

After pump is rebuilt, care should be taken to keep contaminants out of internal components. This can be done by placing plugs in all hydraulic ports or by enclosing pump in polyethylene (plastic) bag.

ASSEMBLY

NOTE

When installing performed packing, backup washers and pistons, coat with clean system oil prior to assembly.

a. Into pump housing (54), install housing gasket (53), spring (46), seats (45 and 44), spring pin (43), yoke (41), annular ball bearings (52), pintel bearing spacers (51), preformed packing (50), shim kits (49), covers (48), and hexhead cap screws (47).

b. On shaft (40), install pump plate (38), spherical washer (37), retainer pin (36), and linear piston (39) into pump plate (38). Then install pin (35), cylinder block (34) spring washer (33), spring (32), spring washer (31), and retaining ring (30).

c. Install into pump housing (54) annular ball bearing (42), shaft assembly (40), shaft seal (56), and shaft retaining ring (57). At opposite end of shaft install wafer plate (28), bearing spacer kit (29) with chamfer toward shoulder of shaft, and annular ball bearing (27).

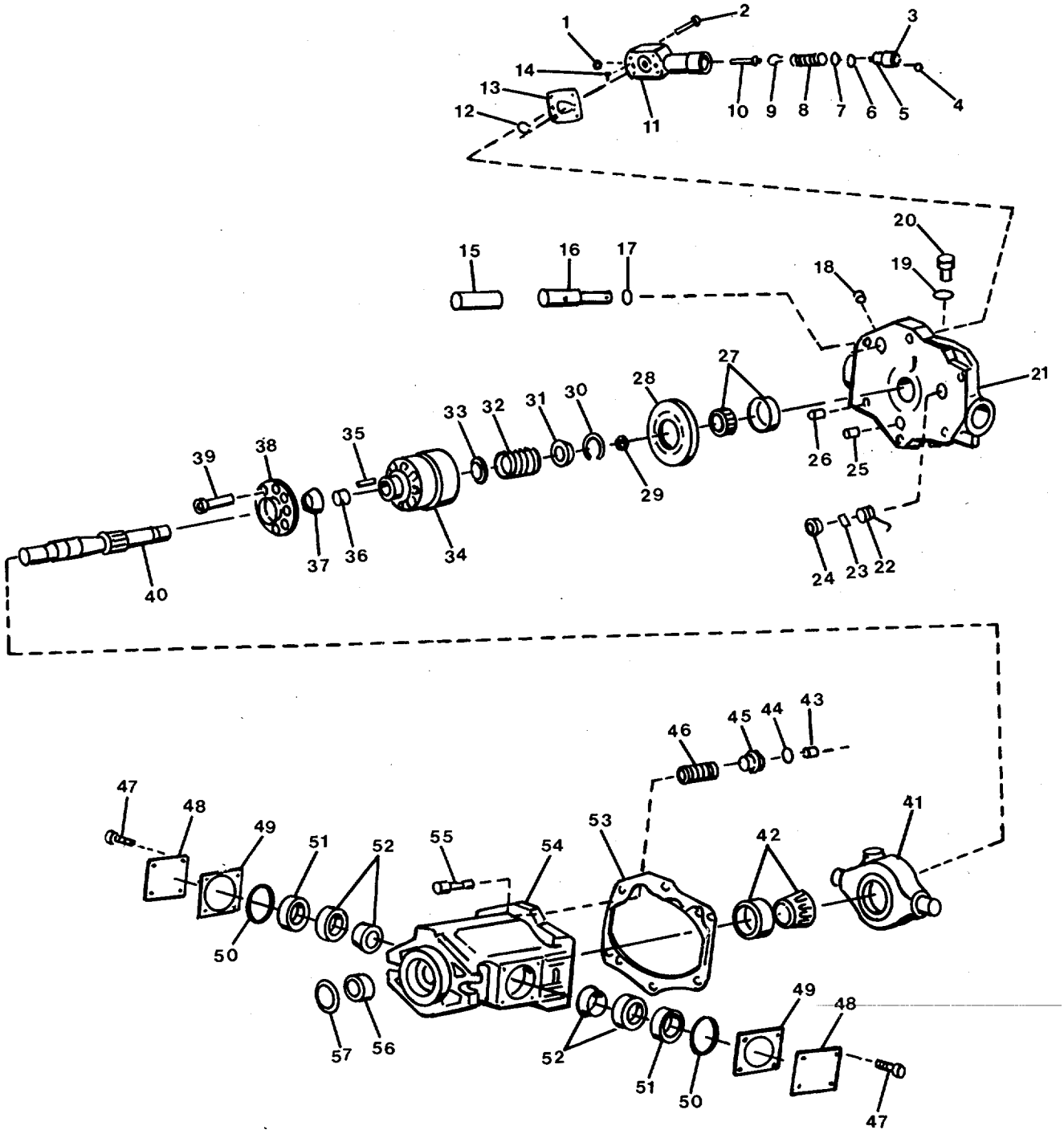


FIGURE 4-2. Piston Pump Assembly

d. Install into valve block (21) spring (22), valve (23), seat (24), pins (25), (2 6), plug (18), preformed packing (19), plug (22), performed packing (17), rod (16), and piston (15).

e. Install into pump housing assembly (54) piston (15), gasket (53), valve block assembly (21), and hex head capscrews (55).

f. Install into compensator body (11), preformed packing (14), plug (1), spool (10), seat (9), spring (8), preformed packing (7), preformed packing (6) onto plug (6) and install plug. Install wire (3) to plug (5) and seal (4) to wire.

NOTE

This installation should be done shipboard.

g. Install into pump assembly preformed packing (12) and gasket (13) positioned with small end of teardrop hole pointing in direction of compensation adjusting plug (5). Mount compensator assembly (11) and install hex head capscrews (2).

4-11. Repair Directional Control Valve. (FIGURE 4-3)

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 in-lb),
5120-01-092-3278

Materials/Parts

Helical compression spring P/N 398132
Valve seat P/N 580449
Electrical solenoid
P/N DG4V-3-6C-M-WB-4CCB-20
Preformed packing (4) P/N 262332
Preformed packing (6) P/N 262394
Preformed packing P/N 262389
Preformed packing (10) P/N 263492
Preformed packing P/N 263493
Preformed packing (2) P/N 262402
Preformed packing P/N 263494
Warning tags, Item 1, Appendix C
Plug P/N 237588
Spring pin P/N 199312
Valve spring P/N 279497

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down, tagged "Out of Service - Do Not Operate."
Refer to the following paragraph in this maintenance manual.

Directional control valve removed. Para. 2-16.

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated spacer. Wear proper eye protection and rubber gloves.

CAUTION

Cleanliness and care during repair is important. Before removing any components, plug all parts and thoroughly wash outside of assembly with cleaning solvent to remove grit and dirt. When removing internal components, care must be taken so that the sealing surfaces are not scratched or otherwise damaged.

DISASSEMBLY

a. Remove solenoid hexhead screws (3) and lift electrical solenoid (1) from valve assembly (12), remove roll pin (2), and preformed packing (4). Discard packing.

b. Remove subplate (25) from base of valve body (12) preformed packing (16), seat (17), valve (18), spring (19), plug (20), preformed packing (21), and rest pin (13). Discard packing.

c. Remove from valve body (12) side parts, plugs (11), preformed packing (10), plugs (15), preformed packing (14), plugs (24), and preformed packing (24). Discard packing.

d. Remove from top of valve body (12) plug (24), preformed packing (23), end plugs (11), and preformed packing (10). Discard packing.

e. Remove from ends of valve body (12) hexhead capscrews (5), covers (6) and preformed packing (27) fr om covers, springs (8), flat washers (9), and spool piece (26). Discard packing.

REPAIR

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

a. Wash all metal parts in cleaning solvent, being especially thorough with ports and passages of valve body (12). Inspect all packing grooves and mating surfaces for nicks, scratches, dents, scoring or any other physical defects. Replace as required.

b. Dry each part with compressed air and reassemble using new parts as required.

ASSEMBLY

NOTE

When installing preformed packing, back-up washers and spool piece coat with clean system oil prior to assembly.

a. Install into valve body (12), spool piece (26), flat washers (9), springs (8), preformed packing (7) into covers (6) and install covers using hex head capscrews (5).

b. Install into valve assembly (12), side parts, plugs (11), preformed packing (10), plugs (15), preformed packing (14), plugs (24), and preformed packing (23).

c. Install at ends of valve assembly (12) end plugs (24), preformed packing (23); install at top of valve assembly plug (24), preformed packing (23), solenoid roll pin (2), preformed packing (3), and electrical solenoid assembly (1) using hex head screws (22).

d. Install at base of valve assembly preformed packing (21), plug (20), spring (19), valve (10), seat (17), preformed packing (16), rest pin (13) and sub plate (25).

NOTE

After valve is rebuilt care should be taken to keep contaminants out of internal components. This can be done by placing plugs in all hydraulic ports or by enclosing valve in polyethlene (plastic) bag.

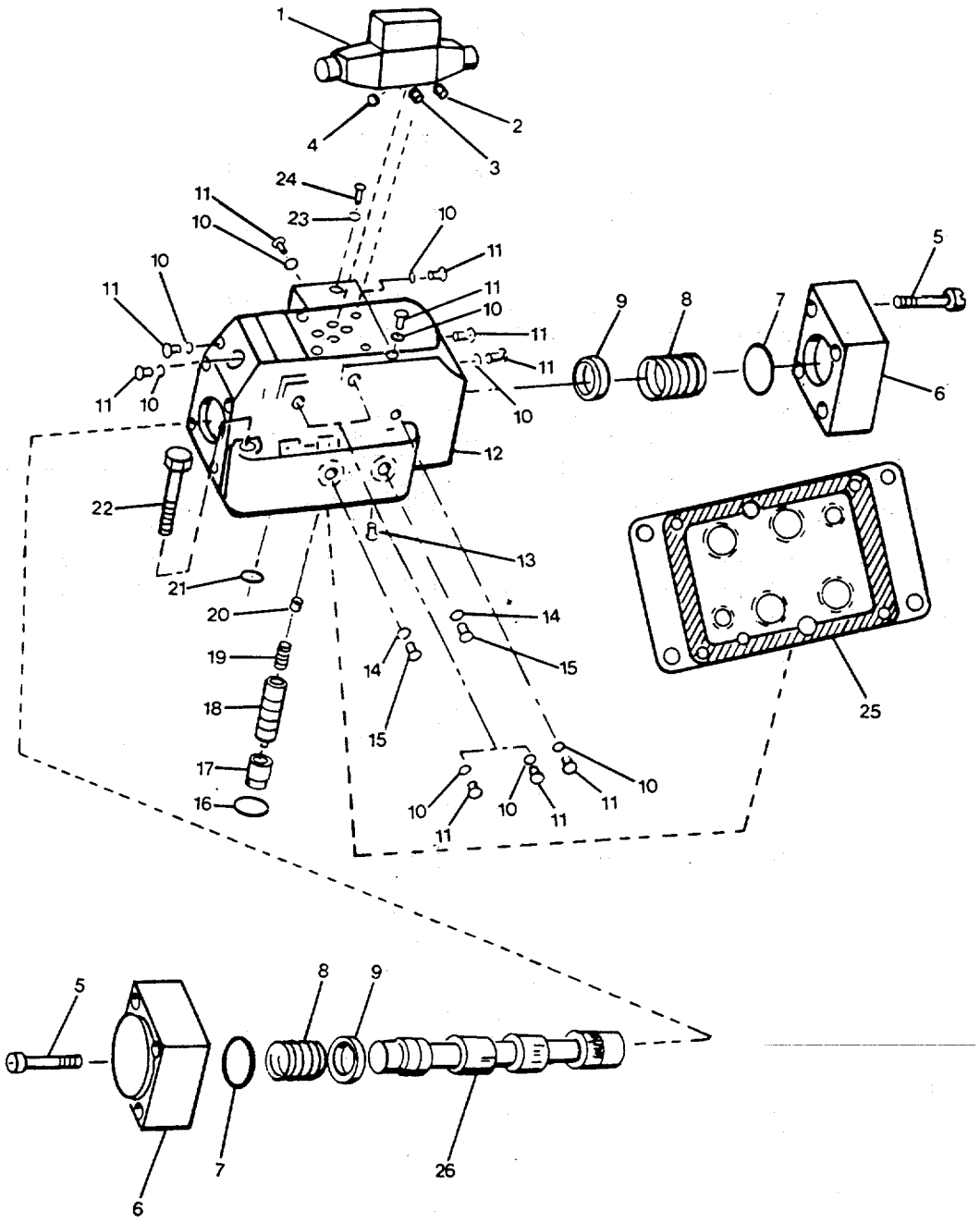


FIGURE 4-3. Directional Control Valve.

4-12. Repair Hydraulic Winch Assembly. (FIGURE 4-4)

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

INITIAL SETUP

Tools

Tool kit, general mechanic's, 5180-00-699-5273
Torque wrench (30-300 ft-lbs), 5120-01-125-5190
Lifting sling P/N 3375958

Materials/Parts

Hydraulic winch assembly P/N FH5-20
Hydraulic fluid, Item 2, Appendix C
Cleaning solvent, Item 5, Appendix C
Lubrication fluid, Item 9, Appendix C
Oil warning tags, Item 1, Appendix C

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down, tagged "Out of Service - Do Not Operate."
Refer to the following paragraphs in this maintenance manual.
Hydraulic hand pump removed/replaced. Para. 2-20.
Emergency handcrank removed/replaced Para. 2-21.
Hydraulic motor removed/replaced. Para. 2-22.
Hydraulic failsafe brake removed/ replaced. Para. 2-23.

REMOVAL

WARNING

- With bow ramp in raised position, ensure that both chain stoppers and both ramp locking assemblies are in locked position before removal of a bow ramp wire rope. Failure to do so prior to removal of a wire rope may cause the bow ramp to lower, endangering personnel and landing craft.

- Keep personnel clear of areas around or under wire ropes and stud chains. A failing wire rope or stud chain can cause serious injury or death.

a. With bow ramp in raised position, ensure that both chain stoppers and both bow ramp locking assemblies are in the LOCKED position.

b. Disconnect the turnbuckles. Reference paragraph 4-20.

c. Refer to TM 55-1905-223-10 and start up bow ramp assembly.

d. Operate bow ramp winch and unwind both wire ropes forming separate coils on deck to prevent snarls.

e. Refer to TM 55-1905-223-10 and shutdown bow ramp assembly.

WARNING

Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, replacing electrical or mechanical components tag "Out of Service - Do Not Operate" and disconnect power supply to three control panels and electric motor in hydraulic power pack assembly.

f. Tag and disconnect power supply to electrical connector box for hydraulic power pack assembly and slack wire limit switch mounted on hydraulic hand pump assembly. Reference paragraphs 2-20 and 4-13.

g. Remove wire rope ends from winch drum anchor holes (1).

WARNING

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

- 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 on hydraulic equipment.

- Fuel, oil and other liquid spills create extremely hazardous decks and passageways. Slippery deck plates and walkways around operating machinery increases risk of injury from falls and moving machinery.

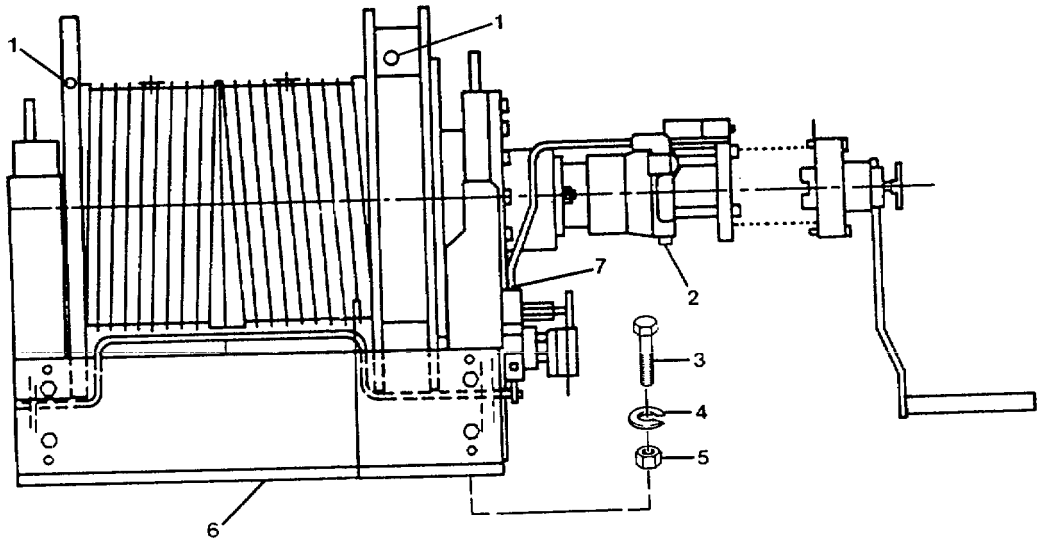


FIGURE 4-4. Hydraulic Winch Assembly.

WARNING

Immediately clean up spills of fuel and oil and any other debris which creates slippery decks and unsafe working conditions.

CAUTION

Avoid contamination of the hydraulic system. Do not use rags, corks or similar items to blank or plug hydraulic pipes or ports. Use an approved external fitting pipe cap or plug.

h. Place a container under hydraulic pipe fittings (7) for supply and return lines to winch assembly. Vent hydraulic system to relieve pressure and loosen fittings securing piping to winch assembly by turning counterclockwise. Push fittings down on piping, carefully positioning and securing piping to allow fluid to drain into container.

i. Place a container under hydraulic motor drain plug (2) and remove drain plug allowing fluid to drain into container. Install drain plug.

j. Remove machine bolts (3), lockwashers (4), and hexhead nuts (5) from winch foundation (6). Using lifting sling and suitable lifting devices, remove the hydraulic winch assembly from the vessel.

REPAIR

Repair of the hydraulic winch assembly consists of repairs to repairable subassemblies. These repairs are provided in the maintenance procedures of this chapter.

REPLACEMENT

a. Using lifting sling, install hydraulic winch assembly in vessel on foundation (6). Install machine bolts (3), lockwasher (4), and hexhead nuts (5). Torque 150 ft-lb.

b. Remove pipe plugs from hydraulic supply and return lines to winch assembly and install piping turning fittings (7) clockwise until secure.

NOTE

Be sure all fittings are properly aligned to avoid cross threadings.

WARNING

- Ensure that all personnel are clear of the winch wire ropes, sheaves, chains, chain stoppers, wildcats, ramp and ramp hinges before operating the bow ramp subsystem to raise or lower ramp. Notify operations personnel prior to starting bow ramp winch subsystem. Connect power supply to electrical connector box for power pack assembly and slack wire limit switch. Hydraulic fluid contains chemical compounds that can cause irritation or injury to the skin and eyes. Wear protective clothing, gloves and eye protection when working in the vicinity of hydraulic equipment.

c. Check fluid levels in reservoir tank and hydraulic motor and add hydraulic fluid as required (Table 2-1, Item 3).

d. Operate bow ram winch until cable anchors are aligned to receive wire rope ends. Install both wire rope ends into cable anchors and secure until wire rope ends are snug.

e. Operate winch very slowly to keep wire rope coils from becoming tangled and install on winch drum. Keep a strain on wire rope to ensure a tight coil on the winch drum.

f. Install turnbuckles. Reference paragraph 4-20.

g. Check fail safe brake to ensure it is not airbound and if required, bleed air from brake using bleeder screw (11, FIGURE 4-9).

h. Remove all system "Out of Service - Do Not Operate" tags. Move both chain stoppers and both bow ramp locking assemblies to the UNLOCK position. Raise and lower the bow ramp to ensure system is operating properly.

i. Set slack wire limit switch to desired setting by turning head of switch clockwise and secure system.

4-13. Repair Hydraulic Hand Pump. (FIGURE 4-5)

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

INITIAL SETUP

Tools

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

Materials/Parts

Shuttle valve P/N 31096
Piston relief valve P/N 33673
Rubber ball (2) P/N 33781
Preformed packing P/N 30805
Preformed packing P/N 31100
Preformed packing P/N 30807
Preformed packing (2) P/N 31099
Preformed packing P/N 31892
Preformed packing P/N 29705
Preformed packing P/N 33951
Preformed packing P/N 33675
Plain encased seal P/N 32401
Cleaning solvent, Item 5, Appendix C
Hydraulic oil, Item 2, Appendix C
Compressed air

Equipment Condition

Refer to the following paragraphs in this maintenance manual.
Hydraulic hand pump removed.
Para. 2-22.
Hydraulic winch assembly removed.
Para. 4-12.

WARNING

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

- The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

CAUTION

Cleanliness and care during repair are important. Before disassembly of any components, plug all ports and thoroughly wash the outside of assembly with cleaning solution to remove grit and dirt. When removing internal components, care must be taken so that sealing surfaces are not scratched or otherwise damaged. Inspect all packing grooves and mating surfaces for severe wear or other damage. Any metal parts showing severe wear should be replaced.

DISASSEMBLY

a. Remove retaining pins (3) and straight headed pins (2) from piston (4).

b. Remove socket handle (1) and spring pin (28)

c. Remove piston pump (4) and rigid connecting link (29). From piston pump, remove preformed packing (5). Remove piston pump wiper (30) from base (20) by forcing a small flat tip screwdriver under one edge of piston wiper. Discard packing.

NOTE

Wiper is a press fit into base.

d. Remove hex plug (21) from pump base (20); remove hex plug (7) and seal (6); and then remove relief valve assembly (parts 6 through 15).

e. Disassemble relief valve as follows:

(1) Press or drift out spring pin (9) from relief valve piston (10).

(2) Remove spring (8).

(3) Remove preformed packings (11,13,14,15).

(4) Remove rubber ball (12).

NOTE

Oil seal is a press fit in the hex plug.

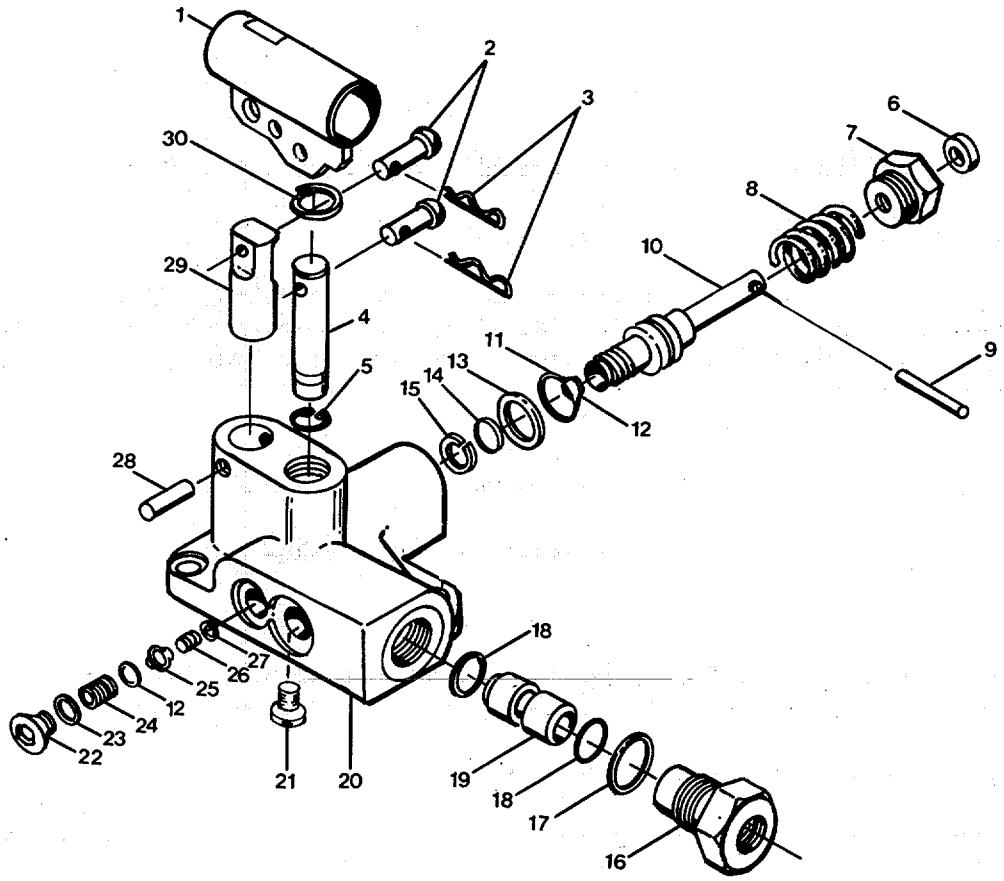


FIGURE 4-5. Hydraulic Hand Pump Assembly.

f. Remove threaded plug (22), preformed packing (23), spring (22), and rubber ball (12) from pump valve cavity in base (20).

g. Insert (25) is permanently bonded into the valve cavity in base (20). It retains the spring (26) and intake ball (27). These items are NOT to be removed.

h. Remove adapter (16), packing (18), shuttle valve (19), and packing (18) from shuttle valve cavity in base (20). Remove packing (17) from adapter (16). Discard packings.

REPAIR

a. Wash all metal parts in cleaning solvent, being especially thorough with the ports and passages of the base (20).

b. Inspect all packing grooves and mating surfaces for severe wear or other damage. Any metal parts showing severe wear should be replaced. Severe wear is in excess of 5.0% of total area of part being repaired or replaced.

NOTE

Prior to assembly packing, pistons and shuttle valve should be coated with clean system oil.

ASSEMBLY

a. Install packing (17) into groove of adapter (16), install packing (18), shuttle valve (19), packing (18) and adapter (16) into shuttle valve cavity of base (20).

b. Install packing (23) into groove of threaded plug (22), install rubber ball (12), spring (24) and threaded plug (22) into pressure ball cavity of base.

c. Install packings (11,13,14,15), into grooves of relief valve piston (10).

d. Place spring (8) and threaded plug (7) into relief valve piston (10), press spring p in (9) into cross hole of relief valve piston (10). Place rubber ball (12) and completed relief valve assembly into relief valve cavity in base (20) and secure threaded plug (7).

NOTE

An installation device (socket wrench, etc.) which has a flat surface as large as diameter of preformed packing should be used.

e. Replace encased seal (6) in threaded plug (7).

f. Press pump piston wiper (30) into counterbored hole in piston cavity of base (20).

NOTE

Rubber lip of wiper must face outward. An installation tool should be used which is smaller than the rubber lip for lip protection.

g. Install packing (5) into groove of pump piston (4) and push pump piston assembly into piston cavity of base (20). Install spring pin (28). Attach handle socket (1) to piston link (29) and pump piston (4) with handle socket pins (2). Insert retaining pins (3) into cross holes of handle socket pins (2). Insert spring pin (28).

CAUTION

When pump has been rebuilt and will not immediately be reinstalled, care should be taken to keep contaminants out of internal components. This can be done by placing plugs in all parts or enclose pump in polyethylene (plastic) bag.

4-14. Repair Emergency Handcrank. (FIGURE 4-6)

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

INITIAL SETUP

Tools

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

Materials/Parts

Ratchet wheel P/N 2178
Pawl P/N 1995
Ratchet dog spring P/N 2002
Retaining bushing P/N 1993
Clutch disk (2) P/N 2207
Spacer sleeve (2) P/N 1997
Spacer sleeve P/N 1996
Shaft retaining plate P/N A13617
Cleaning solvent, Item 5, Appendix C
Compressed air

Equipment Condition

Refer to the following paragraph in this maintenance manual.
Emergency handcrank removed.
Para. 2-21.

DISASSEMBLY

a. Remove locking nut (21), retaining socket screw (22) and remove handle socket assembly (19).

b. Remove hexhead self-locking nuts (13), socket head capscrews (8), front housing plate (23), spacer sleeves (4 and 6); loosen set screw (15); and remove retaining bushing (18).

c. Remove pin (16), adjusting flange nut (20), housing cylinder (5), ratchet dog spring (2), ratchet dog (1), front friction disk (12), ratchet wheel (3), and rear friction disk (12).

d. Remove threaded adjusting pin (11), set screw (14), and hub head flange (10). Separate rear housing plate (9) from side plate (7).

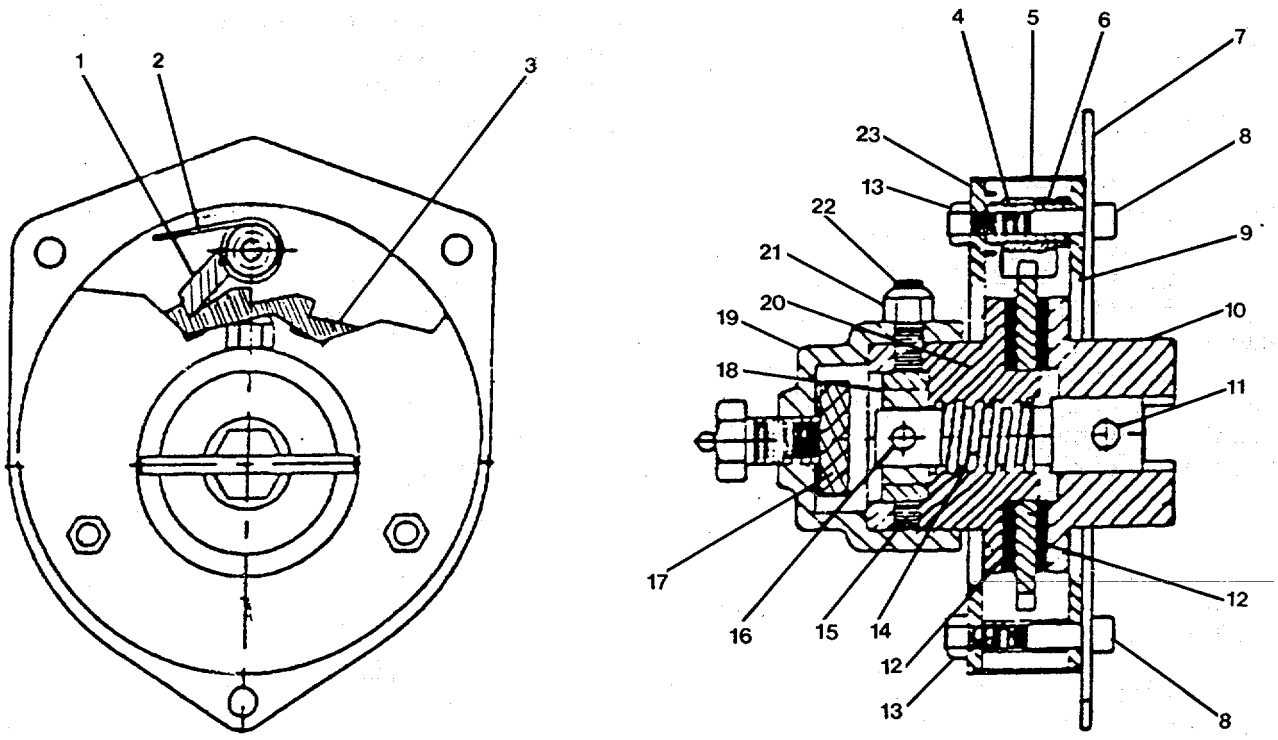


FIGURE 4-6. Emergency Handcrank Repair.

REPAIR

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

a. Wash all metal parts in cleaning solvent; inspect components and mating surfaces for scoring, gouges, severe wear or other damage. Dry clean components with comp ressed air if possible. Severe wear is 0.05m of total area of part being repaired or replaced.

b. Using suitable cleaning solvent, wash clean the friction disks (9). There should be no presence of oil on any lining material or mating surfaces. Worn or scored disks must be replaced, prior to assembly friction disks must be clean and dry.

ASSEMBLY

a. Align side plate (7) with rear housing plate (9). Install hub head flange (10), threaded adjusting pin (11) and set screw (14).

b. On rear housing assembly install housing cylinder (5), rear friction disk (9), ratchet wheel (3), front friction disk (12), install spacer sleeves (4 and 6), ratchet dog (1), ratchet dog spring (2), adjusting flange nut (20), and pin (16).

c. Install retaining bushing (18); secure set screw (15); install front housing plate (23), socket head capscrews (8) and hexhead self-locking nuts (13).

d. Install handle socket assembly (19), retaining socket screw (22), and hex head self-locking nut (21).

4-15. Repair Hydraulic Motor. (FIGURE 4-7)

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 ft-lbs), 5120-01-125-5190

Equipment Condition

Refer to the following paragraph in this maintenance manual.
Hydraulic motor removed. Para. 2-24.

Materials/Parts

Shaft roller bearing (2) P/N 20001-01
Check valve plug (2) P/N 75013-55
Valve disk (2) P/N 10059-04
Preformed packing P/N 25001-37
Preformed packing P/N 25009-24
Preformed packing (2) P/N 25000-43
Hydraulic oil, Item 2, Appendix C
Cleaning solvent, Item 5, Appendix C
Compressed air
Lubricating oil, Item 9, Appendix C

WARNING

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

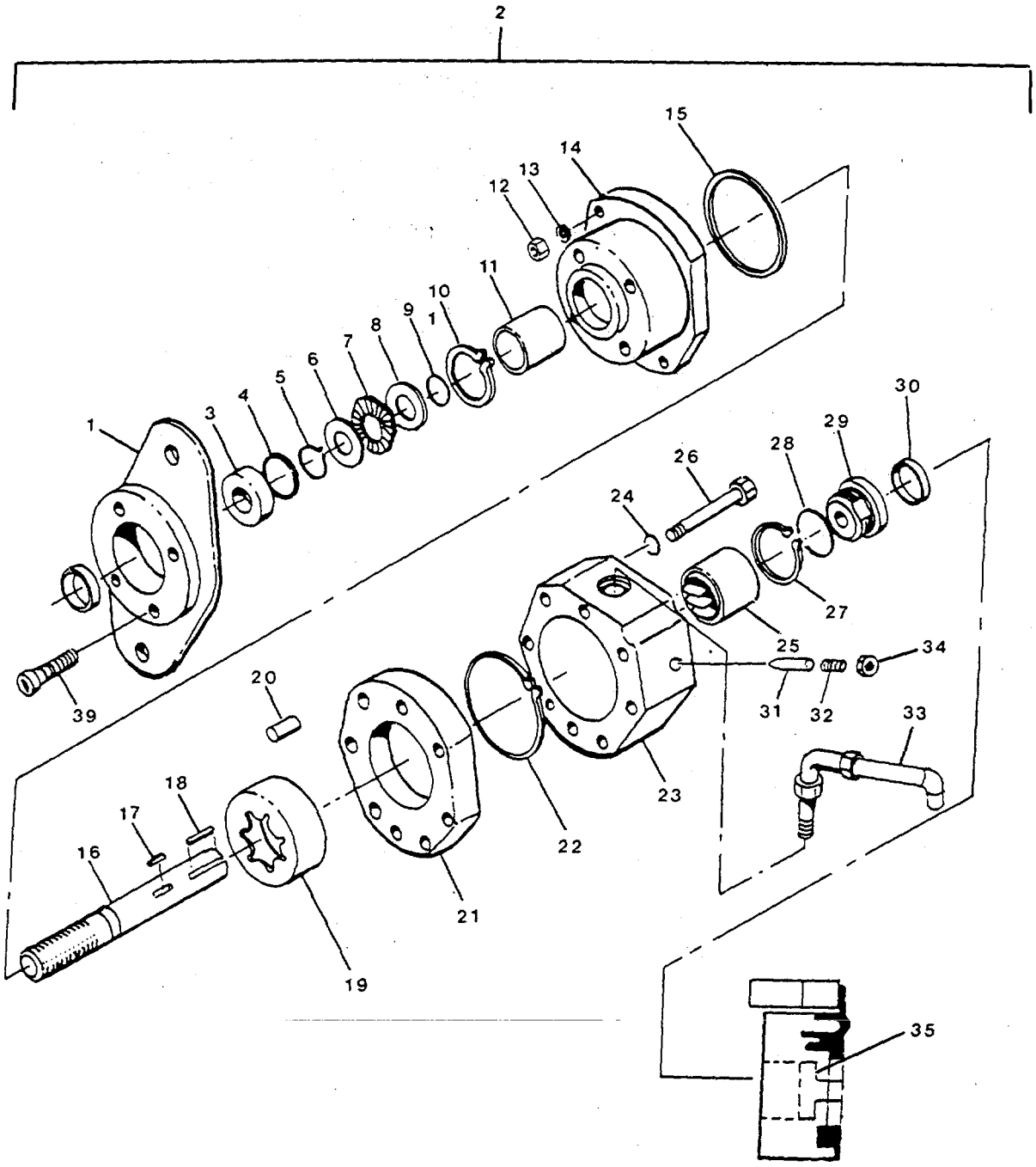


FIGURE 4-7. Hydraulic Motor Repair.

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

CAUTION

Cleanliness and care during repair is important. Before disassembly of any components, plug all ports and thoroughly wash the outside of the assembly with cleaning solution to remove grit and dirt. When removing internal components, care must be taken so that sealing surfaces are not scratched or otherwise damaged. Inspect all packing grooves and mating surfaces for severe wear or other damage. Any metal parts showing severe wear should be replaced.

DISASSEMBLY

a. Remove four mounting screws (39) from mounting flange (1); slowly remove entire assembly from body hub (35).

b. Remove short key (18) from shaft. Slide mounting flange (1) from shaft and remove seal (30) from opposite end of shaft.

c. Remove housing screws (26), lock washers (24), and nuts (12) from body.

d. Place a pry bar in cast slots between cover (14) and housing (21). Separate assemblies.

e. From the motor body (23) remove valve plug (34), spring (32), and valve disk (31). Also remove tube (33) from motor body (23).

f. Remove encased seal (3), preformed packing (4), thrust retainer ring (5), washer bearings and bearing (6, 7, 8), and retainer ring (9). Discard preformed packing.

g. Remove retainer ring (10), roller bearing (11), cover (14), and preformed packing (15). Discard packing.

h. Remove plug (29), preformed packing (28), retaining ring (27), and roller bearing (25).

i. Remove key (17), motor body (23), preformed packing (22), housing (21), and gear rotor set (24).

REPAIR

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

a. Wash all metal parts in cleaning solvent, being especially thorough with the ports and passages in the housings (36,29;21, and 9).

b. Inspect shaft (26) and shaft roller bearings (12) for excessive scoring or other damage.

NOTE

Damage or accumulated hours on unit justify replacement.

c. Inspect front housing (29) and motor body (19) for scratches, nicks, scoring or other damage that will result in excessive leakage. All other parts should be free from nicks and burns and cleaned thoroughly.

CAUTION

When installing preformed packing, back-up washers and gear rotor set should be coated with clean system oil or lubricating oil.

ASSEMBLY

a. On shaft, replace key (17), gear rotor set (24), housing (21), preformed packing (22), and motor body (23).

b. Replace roller bearing (25), retaining ring (27), preformed packing (28), and plug (29).

c. Replace preformed packing (15), cover (14), roller bearing (11), and retainer ring (10).

d. Replace retainer ring (9), washer bearings and bearing (6, 7, 8), thrust retainer ri ng (5), preformed packing (4), and encased seal (3).

e. Screw into motor body the tube (33). Install valve disk (31), spring (32), and valve plug (34).

f. Install housing screws (26), lockwashers (24), and nuts (12) to body (23).

g. Replace seal (30).

h. Install short key (18) on shaft. Slide mounting flange (1) to shaft. Position entire assembly to body hub (35).

i. Install four mounting screws (39) to flange.

j. Replace hydraulic motor; reference paragrap h 2-22.

4-16. Repair Hydraulic Failsafe Brake. (FIGURE 4-8)

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 ft-lbs)
5180-01-125-5190

Equipment Condition

Refer to the following paragraph
in this maintenance manual.
Hydraulic failsafe brake removed.
Para. 2-23.

Materials/Parts

Bleeder valve P/N 29035
Regulating valve P/N 37176
Annular ball bearing P/N 28288
Annular ball bearing P/N 34574
Abrasive disk (3) P/N 37022
Brake disk (3) P/N 37017
Primary disk P/N 37021
Plain encased seal, P/N 37144
Gasket (2) P/N 28426
Gasket P/N 35829
Preformed packing P/N 27808
Preformed packing P/N 27777
Preformed packing P/N 27966
Preformed packing P/N 29767
Cleaning solvent, Item 5, Appendix C
Lubricating oil, Item 9, Appendix C
Compressed air
Hydraulic Press, Item 15, Appendix C

DISASSEMBLY

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

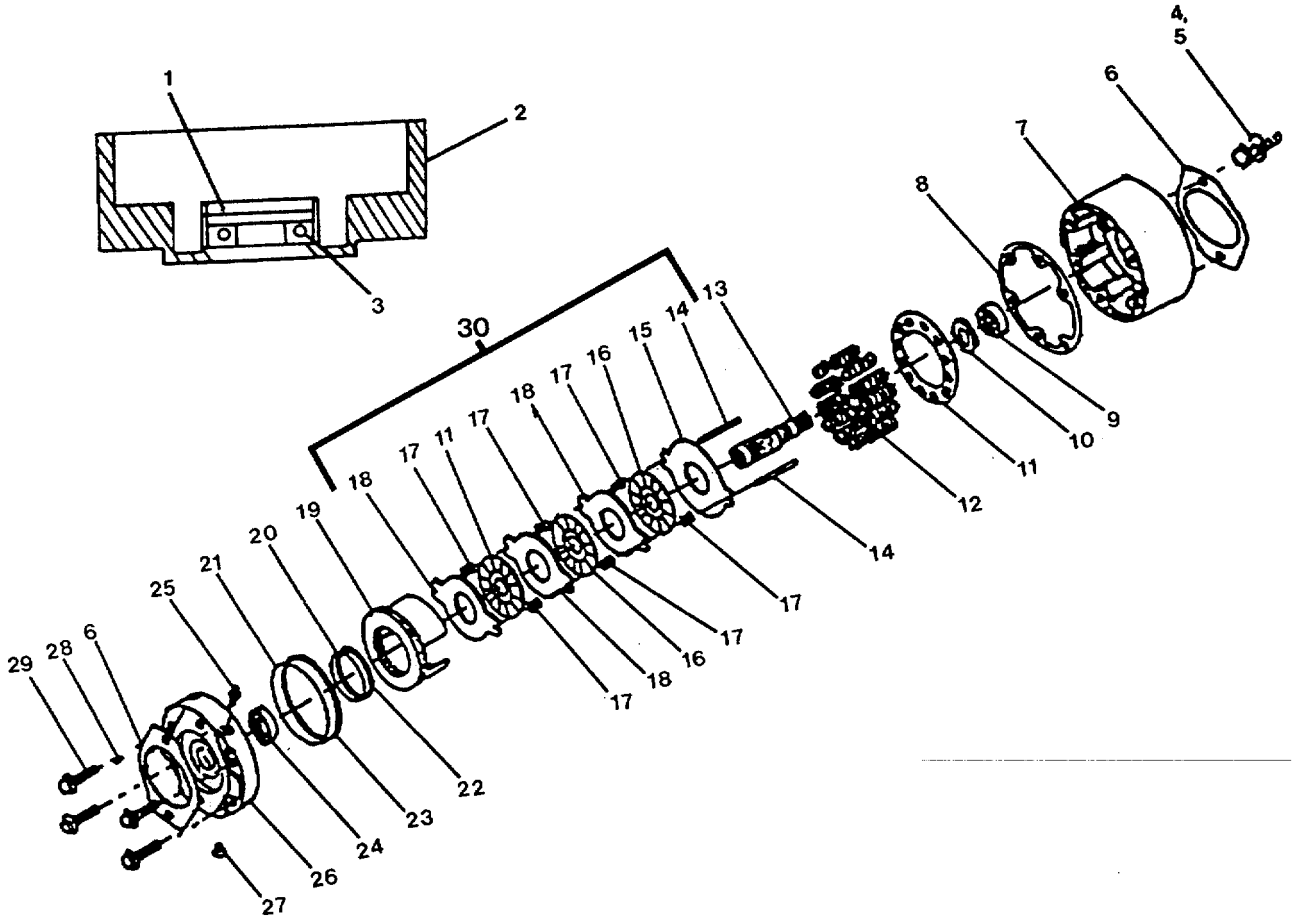


FIGURE 4-8. Hydraulic Failsafe Brake.

CAUTION

o The common mounting surfaces of the brake, the motor and the gear reducer are machined to close tolerances and should be protected from damage during removal, repair and installation.

o Cleanliness and care during repair are important. Before disassembly of any components, plug all ports and thoroughly wash the outside of the assembly with cleaning solution to remove grit and dirt. When removing internal components, care must be taken so that sealing surfaces are not scratched or otherwise damaged. Inspect all packing grooves and mating surfaces for severe wear or other damage. Any metal parts showing severe wear should be replaced.

CAUTION

This assembly is spring loaded. Springs may fly free in disassembly.

a. With shaft protrusion down, alternately remove assembled washer/screws (29), power plate (26), and housing gasket (8) from housing (7). Discard gasket.

b. Remove straight shaft (13) and stack assembly (30) from housing (7) by lightly tapping or pressing on small external spline end of the shaft.

c. To disassemble stack assembly (30), remove ball bearing (24), torque pins (14), stationary disks (18), rotating disks (16), compression springs (17), and primary disk (15) from straight shaft (13).

d. From housing (7), remove compression springs (12), spring retainer (11), oil seal (10), and ball bearing (9).

WARNING

High pressure compressed air tanks, piping systems, and air operated devices possess potential for serious injury to eyes and exposed areas of skin due to escaping air pressure.

e. To disassemble power plate (26), remove pressure valve (28); then, remove piston (19) by introducing low pressure air (15 psi) into hydraulic inlet wher e valve (28) was.

f. Remove preformed packing (20, 21, 22 and 23) from piston (19) od and id grooves. Remove threaded plug (27) and hydraulic bleeder valve (25) from power plate (26).

WARNING

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

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

CAUTION

The common mounting surfaces of the brake, the motor and-the gear reducer are machined to close tolerances and should be protected from damage during removal, repair and installation.

REPAIR

a. Wash all parts thoroughly with cleaning solvent being especially thorough with power plate (26), piston (19), and disk plates (15,16, and 18).

b. Inspect all metal parts especially rotating disks (16) fo r wear, scratches, nicks, heavy scoring or other damage.

c. Inspect pressure relief valve (28) spring loaded ball to assure it is free of contamination and moves freely.

d. Wash all metal parts prior to assembly and dry with compressed air if possible. Rotating disks (16) must be clean and dry, with no presence of oil on any lining material or mating surfaces of the stationary disks (18).

CAUTION

- The common mounting surfaces of the brake, the motor and the gear reducer are machined to close tolerances and should be protected from damage during removal, repair and installation.
- When performing the following maintenance procedures torque, bolts and screws according to data listed in Appendix D.

ASSEMBLY

a. Cylinder of the power plate (26) and piston (19) must be clean prior to assembly. Pre-lube new preformed packing (20, 21, 22 and 23), piston (19) and power plate (26) with system hydraulic fluid.

b. Install preformed packing (20, 21, 22 and 23) onto piston (19), visually align center of cutouts in piston with torque pin (14) holes in power plate (26) and push piston into power plate using a hydraulic press. Use care not to damage packing or push piston all the way to bottom of cylinder in power plate.

NOTE

Keep the top surface of the piston flush to 1/8 inch below the machined surface of the power plate.

c. Press ball bearing (9) into housing (7) ensuring that bearing is seated against shoulder in housing. Lubricate the lip of oil seal (10) with system hydraulic fluid and press into place in housing (7) by pressing evenly around od of seal.

d. Face the lip of the oil seal (1) toward the outside of the brake in order to keep gear box oil or other external contaminants out of brake. The back of the seal must be installed flush to surface of housing (7).

e. Install straight shaft (13) into housing (7) supporting the inner race of ball bearing (9) when pressing shaft into bearing.

f. Install torque pins (14), and properly align and install housing gasket (8) into housing (7). Install spring retainer (11) and compression springs (12).

g. Align over torque pins (14) and install primary disk (15), springs (17), rotating disks (16), and stationary disks (18) in proper sequence.

h. Properly support shaft assembly and press on ball bearing (24). Install power plate (26) subassembly using a shop press and install assembled washer/screws (29).

i. Tighten sequentially one turn at a time until power plate is properly seated. Torque to 50-60 ft-lb.

j. Install in power plate pressure relief valve (28), threaded plug (27), and hydraulic bleeder valve (25).

4-17. Replace/Repair Gear Reducer. (FIGURE 4-9)

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 ft-lb), 5120-01-125-5190

Materials/Parts

Carrier planet P/N 53180
Annular ball bearing P/N 53209
Annular ball bearing P/N 53209
Plain encased seal P/N 53181
Preformed packing P/N 53218
Preformed packing P/N 53215
Preformed packing (2) P/N 53189
Preformed packing (2) P/N 53195
Preformed packing (2) P/N 53199
Cleaning solvent, Item 5, Appendix C
Lubricating oil, Item 9, Appendix C
Compressed air
Lubricating grease, Item 7, Appendix C

Equipment Condition

Refer to the following paragraphs in this maintenance manual.
Hydraulic hand pump removed. Para. 2-20.
Hydraulic failsafe brake removed. Para. 2-23.
Hydraulic winch system removed. Para. 4-12.

REMOVAL

a. To remove gear reducer assembly from bow ramp winch drum remove the following parts from the winch assembly:

(1) Prior to removal of gear reducer, set winch on end or block drum to maintain alignment for easy removal.

(2) Loosen socket head capscrews (1, FIGURE 4-9), remove the headless straight pins (2) and remove socket head capscrews (1).

(3) Remove socket head capscrews (36) from adapter (40) and remove adapter.

(4) Remove coupling (38), drum shaft (37), and packing (39) from winch assembly.

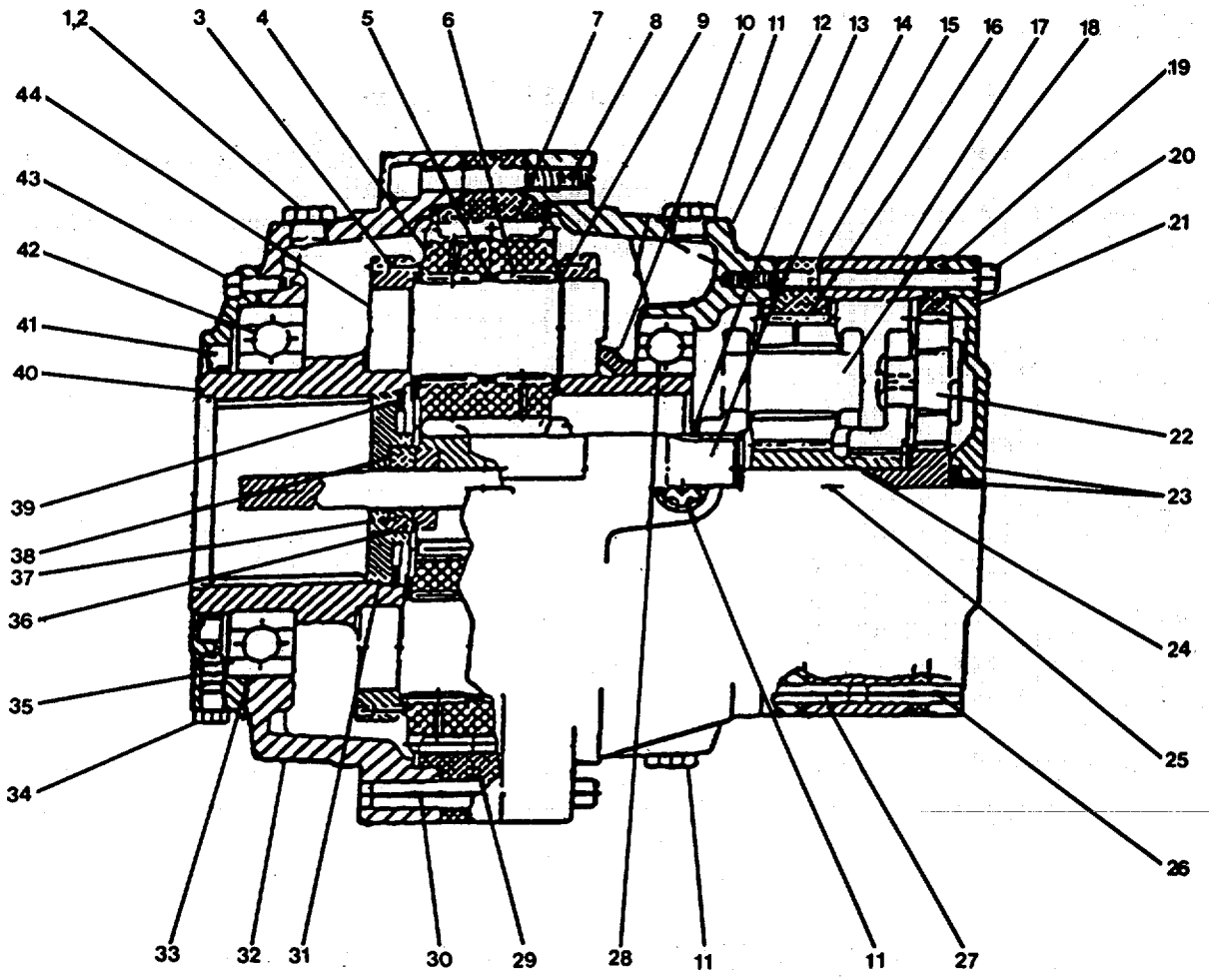


FIGURE 4-9. Gear Reducer Assembly.

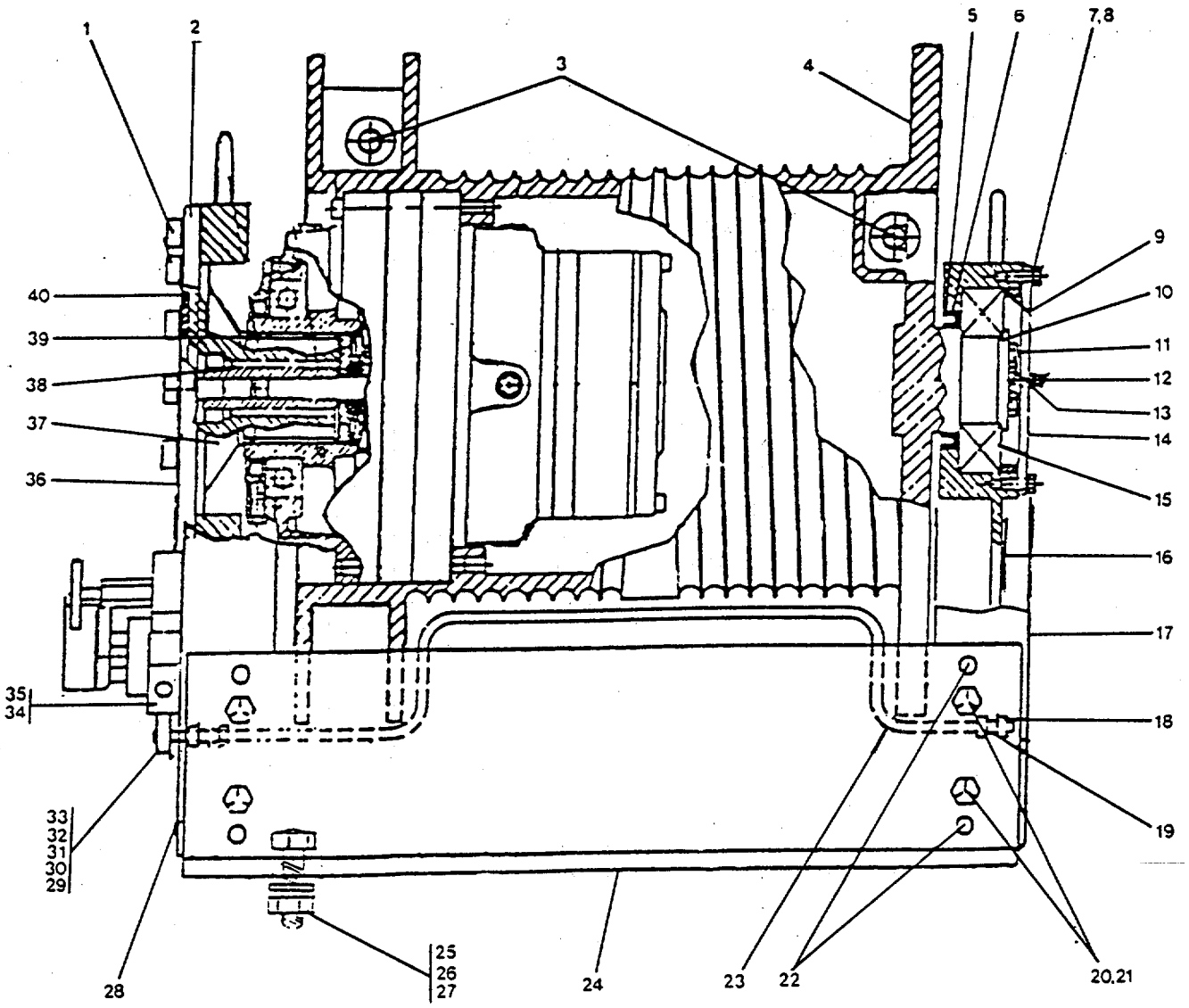


FIGURE 4-10. Winch Assembly Component Detail.

(5) From upright (28) remove round head screws (35), limit switch (34), spring (29), socket head capscrew (30), arm (31), socket head cap screw (32) plain nuts (33) and remove upright (28).

b. To remove gear reducer assembly from bow ramp winch drum (FIGURE 4-10) loosen socket head capscrews (8), remove headless straight pins (30) and remove socket head capscrews (8).

c. Remove gear reducer assembly from drum.

DISASSEMBLY

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

CAUTION

Cleanliness and care during repair is important. Before disassembly of any components, plug all ports and thoroughly was the outside of the assembly with cleaning solution to remove grit and dirt. When removing internal components, care must be taken so that sealing surfaces are not scratched or otherwise damaged. Inspect all packing grooves and mating surfaces for severe wear or other damage. Any metal parts showing severe wear should be replaced.

a. Place gear reducer assembly in a position to drain gear oil from housing, place a container under oil fill plugs (1,2,11 and 43, FIGURE 4-9), remove plugs one at a time and drain oil from gear reducer assembly.

b. Remove socket head capscrews (43), carrier seal (35), preformed packing (33), seal (41), carrier bearing (42) and housing, (32) from gear reducer assembly. Discard packing and seal.

c. Remove preformed packing (31), carrier bearing (38), bushing (37), retainer ring (39) and bushing (36). Discard packing.

(1) Remove third stage carrier planet subassembly (40) consisting of plant gear shafts (44), headless straight pins (3), planet gears (4), bearing spacers (5), thrust bearings (9) and planet pin bearings (6).

NOTE

Third stage carrier planet subassembly is replaced as a single unit. Further disassembly is not required.

(2) Remove third stage ring gear (29) and preformed packing (7) from gear reducer assembly. Discard packing.

d. From opposite end of gear reducer assembly, remove socket head capscrews (20), headless straight pin (26), and cover plate (23) with thrust washer. Remove and discard preformed packing (21).

CAUTION

Use care when removing cover plate from gear reducer assembly so thrust washer will not be scored or damaged.

e. Remove first stage ring gear (19), carrier and gear assembly (22), ring spacer (17), and preformed packing (16).

f. Remove carrier and gear assembly (18), second stage ring gear (15), second stage pinion gear (24), and third stage to second stage housing (12).

g. From housing (12) remove headless straight pin (27), third stage pinion gear (14), thrust bearing (13), bearing (28), spacer (10), and input shaft (25).

REPAIR

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

a. Wash all parts with cleaning solvent, inspect all metal mating surfaces, packing grooves and gears for nicks, burrs, scratches, scoring or other damage.

b. Inspect bearing and shafts for excessive wear. Wear is excess if over 5.0% of total area is missing.

NOTE

Damage or accumulated hours of operation on a component justify replacement.

c. Dry all metal parts with compressed air and replace all packing and seals.

ASSEMBLY

a. Coat all packing with lubricating oil and seals with lubricating grease prior to as sembly.

b. Into housing (12), install input shaft (25), spacer (10), bearing (28), thrust bearing (13), third stage pinion gear (14) and headless straight pin (27).

c. Onto housing assembly (12), install second stage pinion gear (24), second stage ring gear (15) and carrier and gear assembly (18).

d. Install on carrier and gear assembly (18), preformed packing (16), ring spacer (17), carrier and gear assembly (22), and first stage ring gear (19).

e. On ring gear (19), install preformed packing (21), cover plate (23) with thrust washer, headless straight pin (26), and socket head capscrews (20).

f. At opposite end of gear reducer assembly, install preformed packing (7), third stage ring gear (29) and third stage carrier planet subassembly (40) consisting of planet gear shaft (44), headless straight pin (3), planet gear (4), bearing spacer (5), thrust bearing (9) and pin planet bearing (6).

g. Install bushing (36), retainer ring (39), bushing (37), carrier bearing (38), and preformed packing (31).

h. Install housing (32), carrier bearing (42), seal (41), preformed packing (33), carrier seal (25), and socket head capscrews (43).

i. Install threaded plugs (11), threaded plug (2) and all but one threaded plug of (34). Fill gear box with lubricating oil and install threaded plug (1) and last threaded plug (34).

REPLACEMENT

a. Prior to installing gear reducer into winch drum, ensure drum cavity is clean and free of grit and dirt. Clean mating surfaces of drum and gear reducer to ensure tight fit.

b. Set gear reducer assembly into drum cavity and install headless straight pins (30) and socket head capscrews (8), and secure capscrews in rotation to properly seat gear reducer.

c. Align and set upright (28); install preformed packing (39), coupling (38), adapter (40), drum shaft (37), and socket head capscrews (36), and secure capscrews in rotation until snug.

d. Install headless straight pins (2) and socket head capscrews (1), and secure in rotation unti l snug.

e. Install limit switch assembly plain hex nuts (33), socket head capscrew (32), arm (31), socket head capscrew (30), spring (29), limit switch (34), and round head capscrews (35).

4-18. Repair Bow Ramp Winch. (FIGURE 4-10)

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

INITIAL SETUP

Tools

Tool kit, General mechanic's, 5180-00-69975273
Torque wrench (30-300 ft-lb), 5120-01-125-5190

Materials/Parts

Winch assembly P/N C13612
Annular ball bearing P/N 51455
Sensitive switch P/N 53122
Switch actuator arm P/N 13616
Seal P/N 51463
Preformed packing P/N 52322
Lockwire P/N 51465
Cleaning solvent, Item 5, Appendix C
Compressed air
Lubricating oil, Item 9, Appendix C
Lubricating grease, Item 7, Appendix C

Equipment Setup

Refer to the following paragraphs in this maintenance manual.
Hydraulic hand pump removed. Para. 2-23.
Emergency handcrank removed. Para. 4-9.
Hydraulic motor removed. Para. 2-24.
Hydraulic failsafe brake removed. Para. 2-25.
Hydraulic winch system removed. Para. 4-12.
Gear reducer removed. Para. 4-17.

WARNING

COMPRESSED AIR HAZARD. High pressure compressed air tanks, piping system and air operated devices can cause injury to eyes and exposed areas of skin due to escaping air pressure.

REMOVAL

Complete all tasks in the Equipment Condition and the bow ramp winch will be removed.

DISASSEMBLY

a. Prior to disassembly of winch, position winch drum (4) on blocks or use a lifting device with wire rope slings around drum to maintain alignment during disassembly.

b. From each side of winch frame remove dowel (22), socket head capscrews (20), lockwashers (21), and remove each side frame (24).

c. From ends of winch under drum remove set collars (19), bushings (18), and bail (23).

d. Remove hexhead capscrews (7), lockwashers (8), and end cover (14) with lubrication fitting (12).

e. Remove bearing spacer (9), lockwire (13), hexhead capscrews (18), shaft retainer (10), bearing (15); remove outboard upright (17) from drum (4) and remove seal (6) and seal sleeves (5) from upright (17) with identification plate.

f. To remove inboard end of winch assembly to include gear reducer assembly see paragraph 4-17.

g. Winch drum (4) is now free standing, remove cable anchors (3).

REPAIR

WARNING

The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

a. Wash all metal parts with cleaning solvent and inspect all metal mating surfaces and packing grooves for scratches, nicks, scoring or other damage.

b. Inspect bearings and shafts for excessive wear or other damage, inspect cable anchors for severe wear or other damage.

WARNING

High pressure compressed air tanks, piping systems and air operated devices possess potential for serious injury to eyes and exposed areas of skin due to escaping air pressure.

c. Dry all components with compressed air.

ASSEMBLY

a. Prior to reassembly of winch assembly coat all packing with lubricating oil and seals with lubricating grease. Coat threads of all screws with locktite (see lubrication chart LO 55-1905-223-12).

b. Install cable anchors (3) into winch drum (4). Install inboard end of winch assembly including gear reducer, see paragraph 4-17.

c. At outboard of winch assembly install upright (17) with identification plate seal slee ves (5), seal (6), bearing (15), shaft retainer (10), hex head capscrews (11) and secure in rotation until snug.

d. On capscrews (11) install lockwire (13), bearing spacer (9); install end cover (14) with lubrication fitting (12), lockwashers (8), hexhead cap screws (7) and secure in rotation until snug.

e. Install bail (23) with bushing (18) and set collars (19); set side frames (24) and install dowels (22), lockwashers (21), and socket head capscrews (20).

REPLACEMENT

Bow ramp winch is replaced in accordance with procedures in the Equipment Conditions.

4-19. Repair Bow Ramp Lifting Assembly.

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

INITIAL SETUP

Tools

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

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."

Materials/Parts

Shackle (2) P/N M877AG
Stud chain (2 ea) P/N 21.63.61-4
Wire rope P/N 21.69.64-2
Wire rope P/N 21.69.64-1
Warning tags, Item 1, Appendix C.

REMOVAL

WARNING

- **o** Ensure that all personnel are clear of the winch wire ropes, sheaves, chains, chain stoppers, wildcats, ramp, and ramp hinges before operating the bow ramp assembly to raise or lower ramp. A failing wire rope or stud chain can cause serious injury or death. Notify operations personnel prior to starting system.

- **o** With bow ramp in raised position, ensure that both chain stopper and both ramp locking assemblies are in locked position before removal of bow ramp shackle, turnbuckle, wire rope or stud chain. Failure to do so may cause bow ramp to lower endangering personnel and vessel. Change out only one side at a time.

a. Remove bow ramp shackles.

(1) With bow ramp in raised position ensure that both bow ramp locking assemblies (3, FIGURE 4-11) and both chain stoppers (1) are in locked position.

WARNING

Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, replacing electrical or mechanical components tag "Out of Service - Do Not Operate" and disconnect the power supply to the three control panels and the electrical motor in the hydraulic power pack assembly.

(2) Refer to TM 55-1905-223-10 and shutdown bow ramp assembly.

NOTE

Port and starboard components must be changed out at the same time.

(3) Position chain stopper (1) of appropriate stud chain (4) in the unlocked position.

NOTE

With equipment in this condition it is possible to remove both the stud chain and the shackle.

(4) Relieve tension on stud chain (4) by loosening turnbuckle locknuts (8); adjust the turnbuckle (9) outward until enough slack is given to remove turnbuckle jaw pin (10) or stud chain shackle (6).

(5) Remove shackle pins (5) from shackle (6) and ramp lifting pad (2). Turn shackle to allow clearance of stud chain link (4) and remove.

b. Remove stud chain. To remove stud chains (4), remove turnbuckle jaw pin (10) and remove stud chain from wildcat assembly.

c. Remove wire rope.

(1) Secure bow ramp to a suitable deck fitting using a lifting sling of at least 35-ton capacity with opposite end attached to one or both bow ramp shackles (6).

NOTE

Port and starboard wire rope must be removed at the same time.

(2) To remove wire rope (12) starboard side and port side remove turnbuckle jaw pin (10) from closed socket (11).

(3) Refer to TM 55-1905-223-10 and start up bow ramp assembly.

(4) Operate bow ramp winch and unwind both wire ropes forming separate coils on deck to prevent snarls or kinks.

(5) Refer to TM 55-1905-223-10 and shutdown bow ramp winch assembly.

(6) Remove ends of wire rope (12) from winch assembly cable anchors (3, FIGURE 4-10).

(7) Pull wire rope slowly from bow ramp sheave assemblies and wire rap glands into a coil on deck to prevent snarls or kinks.

REPAIR

Repair of the bow ramp lifting assembly is accomplished by repair of the subassemblies. Maintenance procedures for these subassemblies are contained in Chapter 4, following.

REPLACEMENT

a. Install bow ramp turnbuckle.

(1) Attach turnbuckle to chain link (4, FIGURE 4-11).

(2) Insert shackle pin (5) and secure.

b. Install stud chain.

(1) Remove deck fitting lifting device.

(2) To install stud chain (4), lay chain on deck and stretch out full length removing any kinks in chain. Feed bow ramp end of chain through and over wildcat sheeve assembly and secure to lifting pod (2).

(3) Refer to TM 55-1905-223-10 and restore the bow ramp assembly to normal operation.

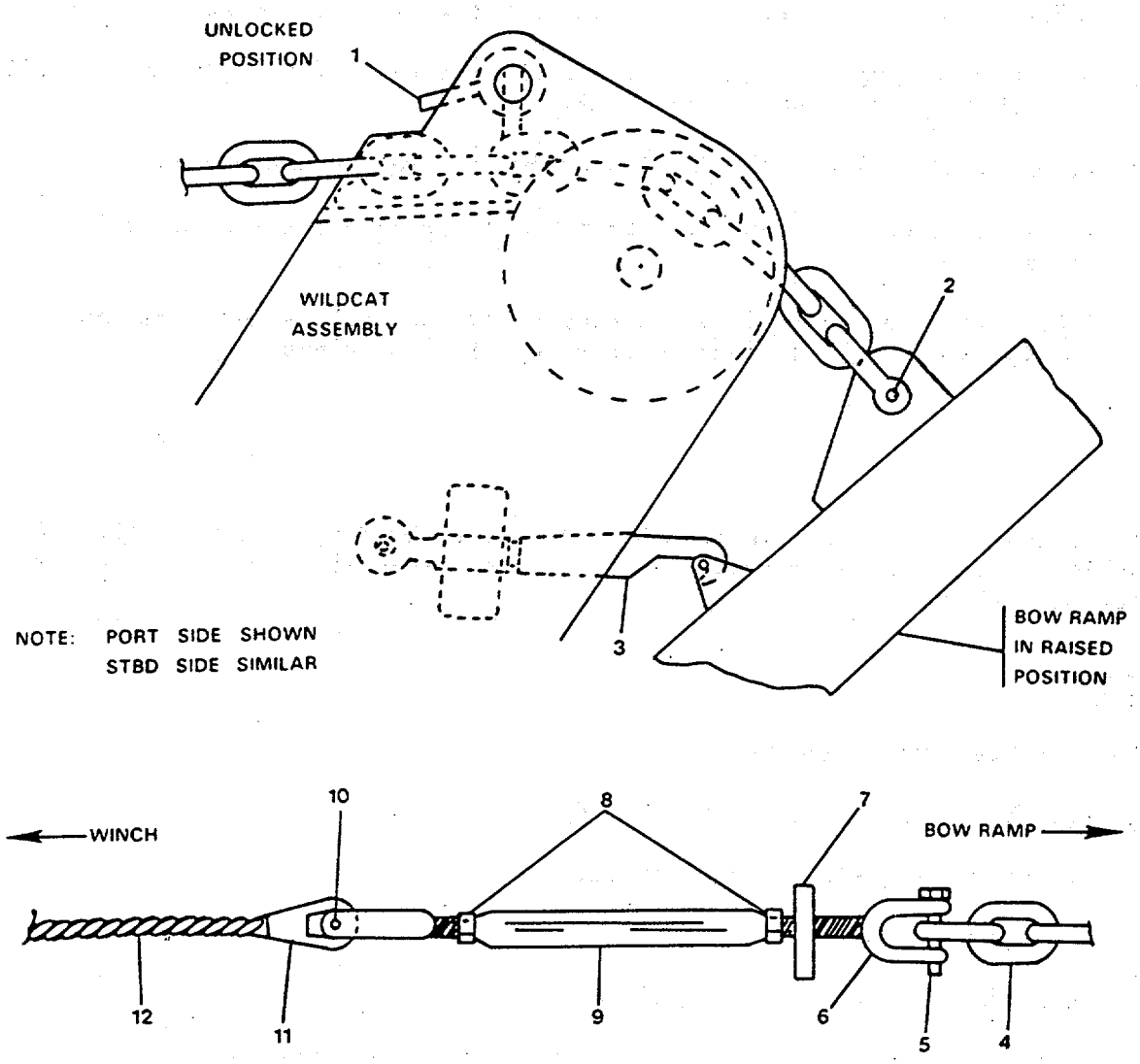


FIGURE 4-11. Bow Ramp Lifting Assembly.

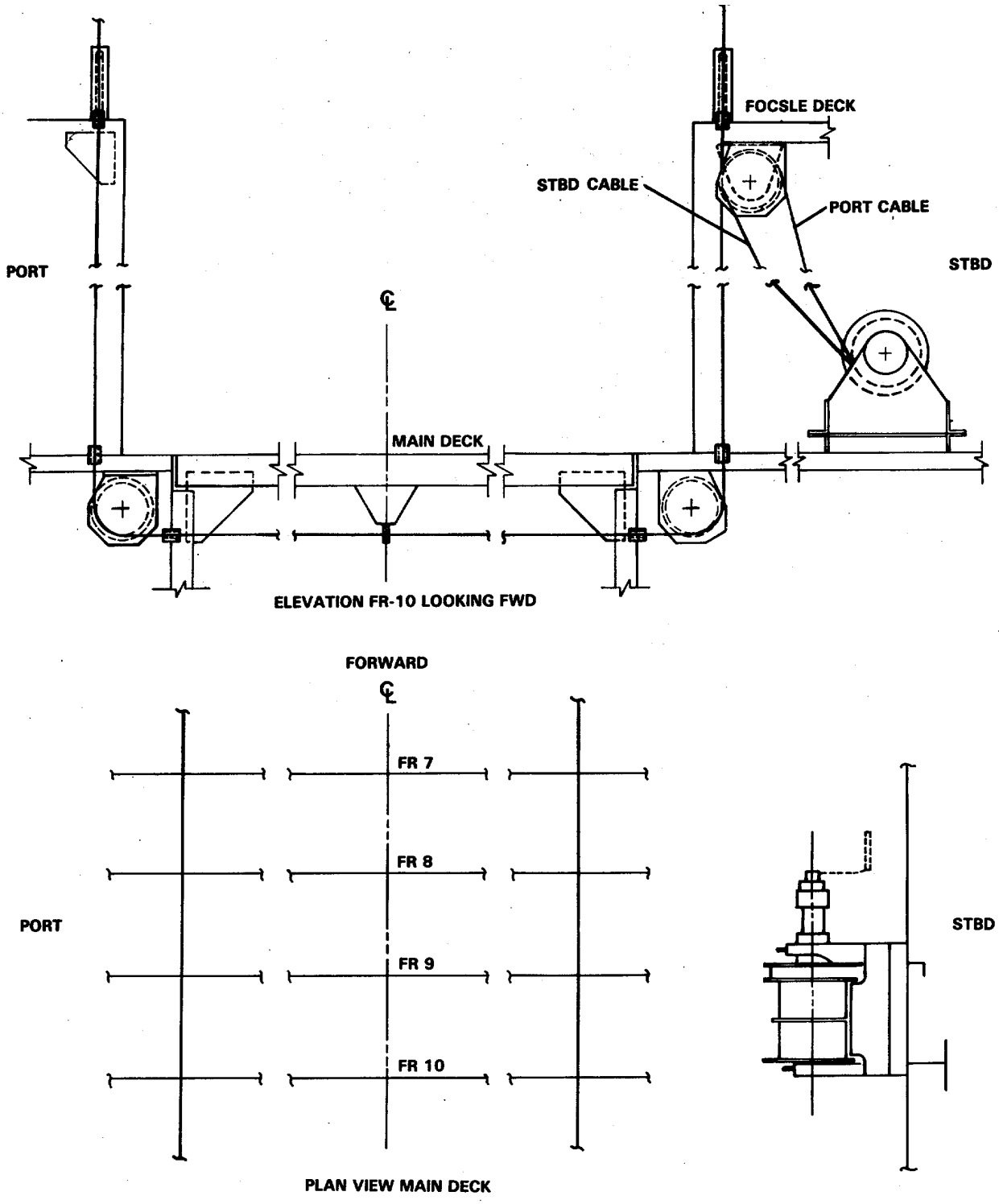


FIGURE 4-12. Rigging Arrangement.

c. Install wire rope.

NOTE

Install port and starboard wire ropes at the same time.

(1) To install wire rope (12), lay wire rope on deck in a coil or roll off of a reel to prevent snarls or kinks.

(2) Feed winch end of wire rope through sheeve assemblies and main deck to the winch drum using FIGURE 4-12 as a guide. Install end of wire rope into winch cable anchors (3, FIGURE 4-10) and secure to desired fit.

(3) Operate winch slowly until wire ropes (12, FIGURE 4-11) are installed on winch drum using caution to ensure that coils feed evenly and do not kink or snarl.

(4) Stop winch so enough slack remains in wire rope to install turnbuckle (9, FIGURE 4-11). Insert closed socket (11) end into turnbuckle jaw and install turnbuckle pin (10).

(5) Operate winch and take up slack in wire rope adjust turnbuckle (9) until desired tension is reached. Secure turnbuckle locking nuts (8).

(6) Remove lifting device used to secure bow ramp and restore system to normal operation, TM 55-1905-223-10.

4-20. Replace/Repair Pulley Sheave Assembly. (FIGURE 4-13)

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

INITIAL SETUP

Tools

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

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."

Materials/Parts

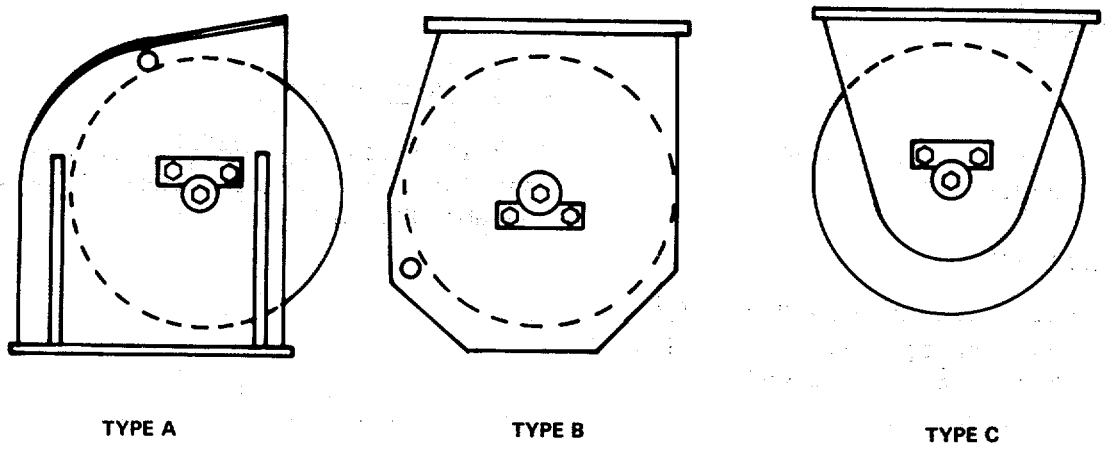
Pulley sheave assembly P/N 21-69067
Lubricating grease, Item 7, Appendix C
Warning tags, Item 1, Appendix C

REMOVAL

WARNING

- Ensure that all personnel are clear of the winch wire ropes, sheaves, chains, chain stoppers, wildcats, ramp, and ramp hinges before operating the bow ramp assembly to raise or lower ramp. A failing wire rope or stud chain can cause serious injury or death. Notify operations personnel prior to starting system.

- Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, or replacing electrical or mechanical components tag "Out of Service - Do Not Operate" and disconnect the power supply to the three control panels and the electrical motor in the hydraulic power pack assembly.



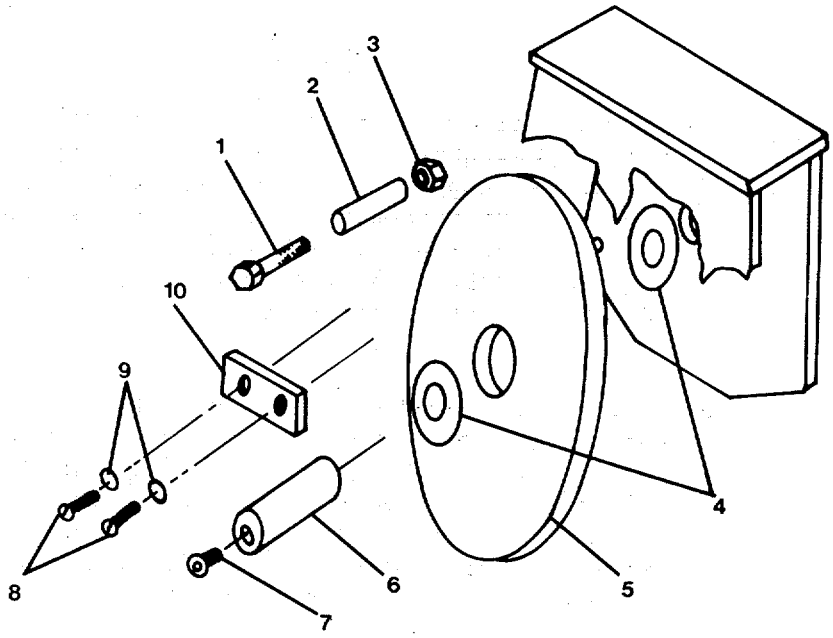


FIGURE 4-13. Pulley Sheave Assembly.

WARNING

With bow ramp in raised position, ensure that both chain stopper and both ramp locking assemblies are in locked position before removal of bow ramp shackle, turnbuckle, wire rope or stud chain. Failure to do so may cause bow ramp to lower endangering personnel and vessel.

a. Refer to TM 55-1905-223-10 and start up bow ramp assembly.

b. Operate winch and provide slack to wire ropes to relieve tension across sheave assembly. Refer to TM 55-1905-223-10 and shut down system.

CAUTION

As a safety precaution secure bow ramp to a suitable deck fitting using a lifting device with opposite end attached to one or both bow ramp shackles.

c. Take slack wire rope from appropriate sheave assembly and tie back to allow easy access; for type A & B assemblies only, first loosen and remove self-locking hexnut (3), machine bolt (1), and sleeve tube (2).

d. Remove machine bolt (8), lockwasher (9), and locking plate (10) from side of sheave assembly.

e. On opposite side of assembly, use a small drift punch and remove sheave pin (6) with grease fitting (7).

NOTE

Support sleeve in foundation assembly until pin is removed.

f. Remove brass washers (4) and sheave (5) from foundation.

REPAIR

Repair of the pulley sheave assembly is replacement of the assembly.

REPLACEMENT

a. To install sheave assembly, insert sheave (5) and brass washers (4) into sheave foundation assembly. Align washer and sheave pin holes with those in foundation and install sheave pin (6) with grease fitting (7).

b. Insert locking plate (10) into pin (6) slot and align with foundation bolt holes. Install lockwasher (9) and machine bolts (8).

c. For type A & B assemblies only, follow steps a and b above. Remove ties from wire rope and align on sheave; then, install sleeve tube (2), machine bolt (1), and self-locking nut (3). Grease new assembly.

d. Refer to TM 55-1905-223-10 and start up bow ramp assembly. Operate winch and take up wire rope slack and restore system to normal.

e. Remove any lifting or other devices used to hold bow ramp as a safety precaution.

4-21. Repair of Wildcat Foundation Assembly.

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

INITIAL SETUP

Tools

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

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."

Materials/Parts

Warning tags, Item 1, Appendix C.

REMOVAL

Removal of the assembly is accomplished by removal of the chain stopper assembly, wildcat sheave, and locking assembly, described in the actions to follow.

REPAIR

Repair of the assembly is accomplished by repair of the chain stopper assembly, wildcat sheave, and locking assembly described in the actions to follow.

REPLACEMENT

Replacement of the assembly is accomplished by replacement of the chain stopper assembly, wildcat sheave, and locking assembly, described in the actions to follow.

4-22. Repair of Chain Stopper Assembly. (FIGURE 4-14).

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

INITIAL SETUP

Tools

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

Materials/Parts

Chain stopper assembly P/N 21 69.61-12
Lubricating grease, Item 7, Appendix C
Warning tags, Item 1, Appendix C

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."

WARNING

- Ensure that all personnel are clear of the winch wire ropes, sheaves, chains, chain stoppers, wildcats, ramp, and ramp hinges before operating the bow ramp assembly to raise or lower ramp. A failing wire rope or stud chain can cause serious injury or death. Notify operations personnel prior to starting system.

- Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, or replacing electrical or mechanical components tag "Out of Service - Do Not Operate" and disconnect the power supply to the three control panels and the electrical motor in the hydraulic power pack assembly.

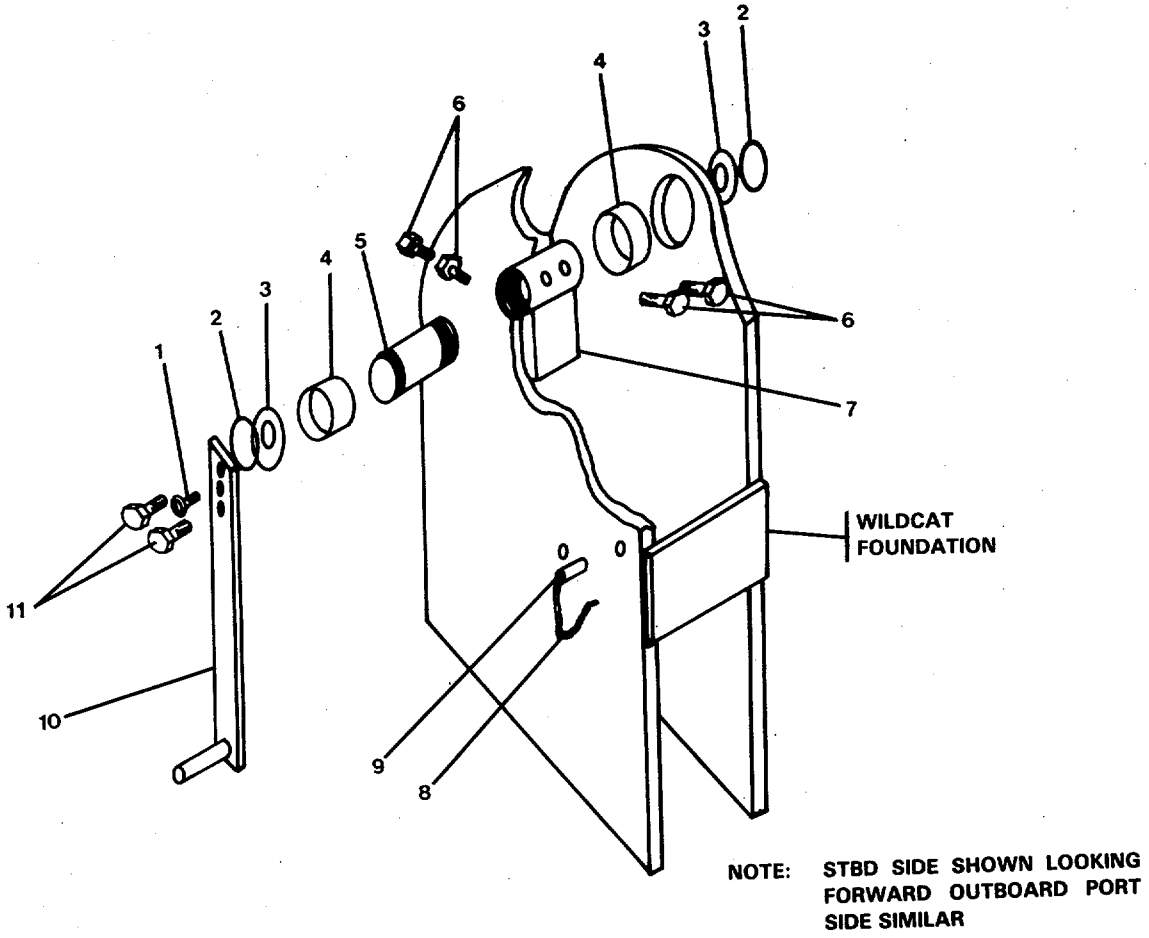


FIGURE 4-14. Chain Stopper Assembly.

WARNING

With bow ramp in raised position, ensure that both chain stopper and both ramp locking assemblies are in locked position before removal of bow ramp shackle, turnbuckle, wire rope or stud chain. Failure to do so may cause bow ramp to lower, endangering personnel and vessel.

a. Refer to TM 55-1905-223-10 and shut down the bow ramp assembly.

b. Reposition appropriate chain stopper to unlock position, remove hexhead capscrews (11) and handle (10) from chain stopper assembly.

c. Remove hexhead capscrews (6) from tongue assembly (7). Remove retaining rings (2) and flat washer (3) from tongue axle (5).

d. Using a small drift punch, tap outboard end of tongue axle (5). Remove axle with grease fitting (1) and tongue assembly (7) from wildcat foundation.

e. Using a small drift punch, tap and remove inboard and outboard tongue axle bushing (4) from tongue axle holes in wildcat foundation.

f. If securing pins (9) or single jack chains (8) are bent, damaged or broken, remove and replace.

REPAIR

Repair of this assembly is by replacement.

REPLACEMENT

a. To install chain stopper assembly, insert inboard and outboard tongue axle bushings (4) into axle holes in wildcat foundation.

b. Insert tongue assembly (7) into wildcat foundation and align with tongue axle holes; then, install tongue axle (5) and grease fitting (1) into wildcat foundation.

c. Align screw holes in tongue assembly (7) with screw holes in tongue axle (5) and install hexhead capscrews (6).

d. Install flat washers (3) over tongue axle and install retaining rings (2). Install handle (10) and hexhead capscrews (11) on inboard end of tongue axle.

e. Install securing pin (9) and single jack chain (8) as required.

f. Position chain stopper in locked position, then refer to TM 55-1905-223-10 and restore bow ramp assembly to normal.

4-23. Repair Wildcat Sheave. (FIGURE 4-15).

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

INITIAL SETUP

Tools

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

Materials/Parts

Wildcat sheave assembly P/N 21.69.61.4
Lubricating grease, Item 7, Appendix C
Warning tags, Item 1, Appendix C

Equipment Condition

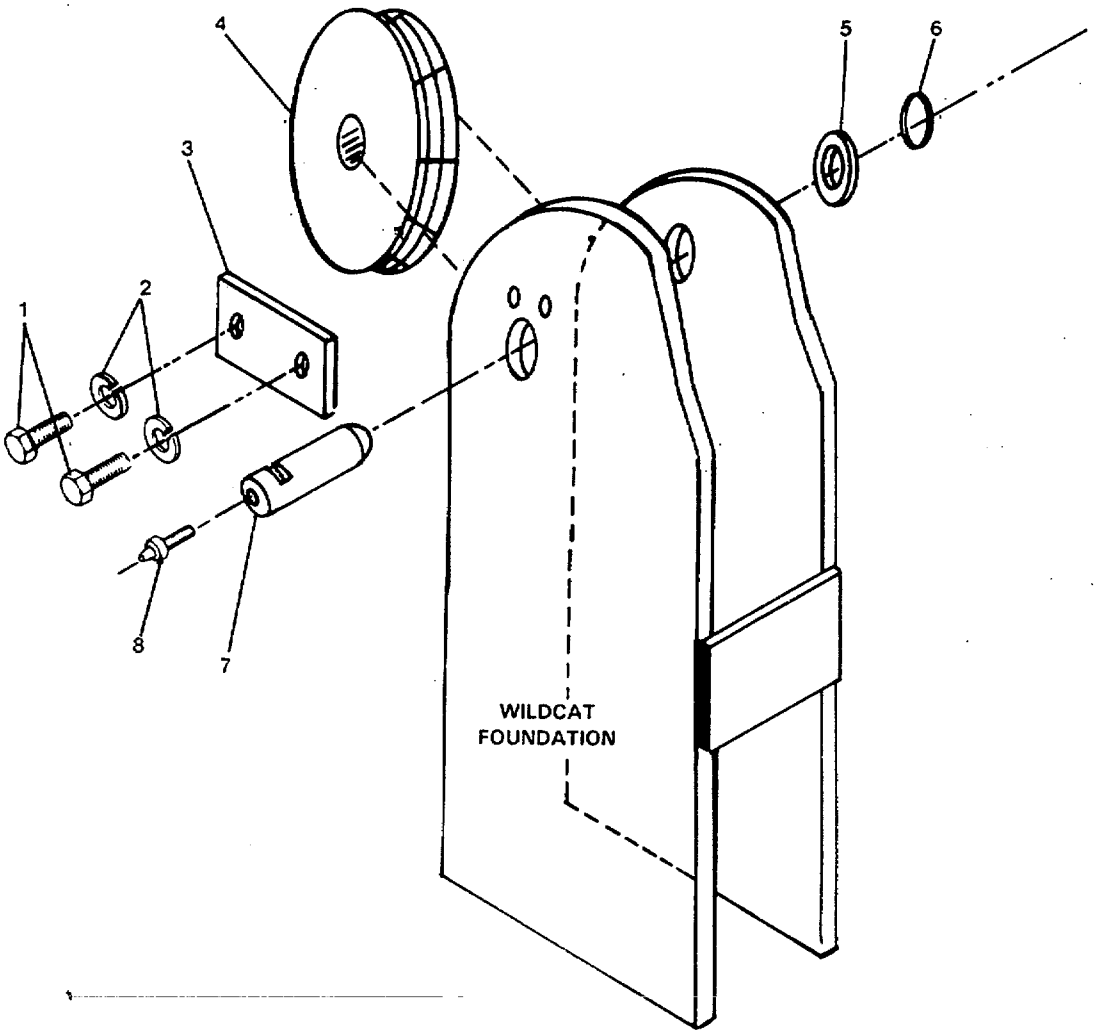
TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."

REMOVAL

WARNING

- Ensure that all personnel are clear of the winch wire ropes, sheaves, chains, chain stoppers, wildcats, ramp and ramp hinges before operating the bow ramp subsystem to raise or lower ramp. A failing wire rope or stud chain can cause serious injury or death. Notify operations personnel prior to starting system.

- Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, replacing electrical or mechanical components tag "Out of Service - Do Not Operate" and disconnect the power supply to the three control panels and the electrical motor in the hydraulic power pack assembly.



NOTE: STBD SIDE SHOWN LOOKING FORWARD OUTBOARD PORT SIDE SIMILAR

FIGURE 4-15. Wildcat Sheave.

WARNING

With bow ramp in raised position, ensure that both chain stopper and both ramp locking assemblies are in locked position before removal of bow ramp shackle, turnbuckle, wire rope or stud chain. Failure to do so may cause bow ramp to lower endangering personnel and vessel.

a. Refer to (4, FIGURE 4-11) and remove bow ramp end of stud chain from across wildcat sheave assembly.

b. Remove hex head capscrews (1, FIGURE 4-15) and lockwashers (2) from locking plate (3). Remove locking plate.

c. On outboard end of pin (7), remove retaining snap-on ring (6) and flat washer (5).

d. Support sheave (4) to relieve weight on pin (7) and tap pin including grease fitting (8) through wildcat foundation and remove.

e. Remove sheave (4) from wildcat foundation.

REPAIR

Repair of this assembly is by replacement.

INSTALLATION

a. Insert sheave (4) into wildcat foundation and align with pin holes and insert pin (7).

b. Install new grease fitting (8) as required. Install flat washer (5) and retaining ring (6) on outboard end of pin.

c. Install locking plate (3) and hex head capscrews (1) with lockwashers (2). Grease new wildcat sheave assembly.

d. Refer to (4, FIGURE 4-11) and replace bow ramp end of stud chain laying across wildcat sheave assembly.

4-24. Repair Locking Assembly. (FIGURE 4-16).

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

INITIAL SETUP

Tools

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

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."

Materials/Parts

Locking assembly P/N 21-69065
Lubricating grease, Item 7, Appendix C.
Warning tags, Item 1, Appendix C.

REMOVAL

WARNING

- **o** Ensure that all personnel are clear of the winch wire ropes, sheaves, chains, chain stoppers, wildcats, ramp, and ramp hinges before operating the bow ramp assembly to raise or lower ramp. A failing wire rope or stud chain can cause serious injury or death. Notify operations personnel prior to starting system.

- o Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, replacing electrical or mechanical components tag "Out of Service - Do Not Operate" and disconnect the power supply to the three control panels and the electrical motor in the hydraulic power pack assembly.

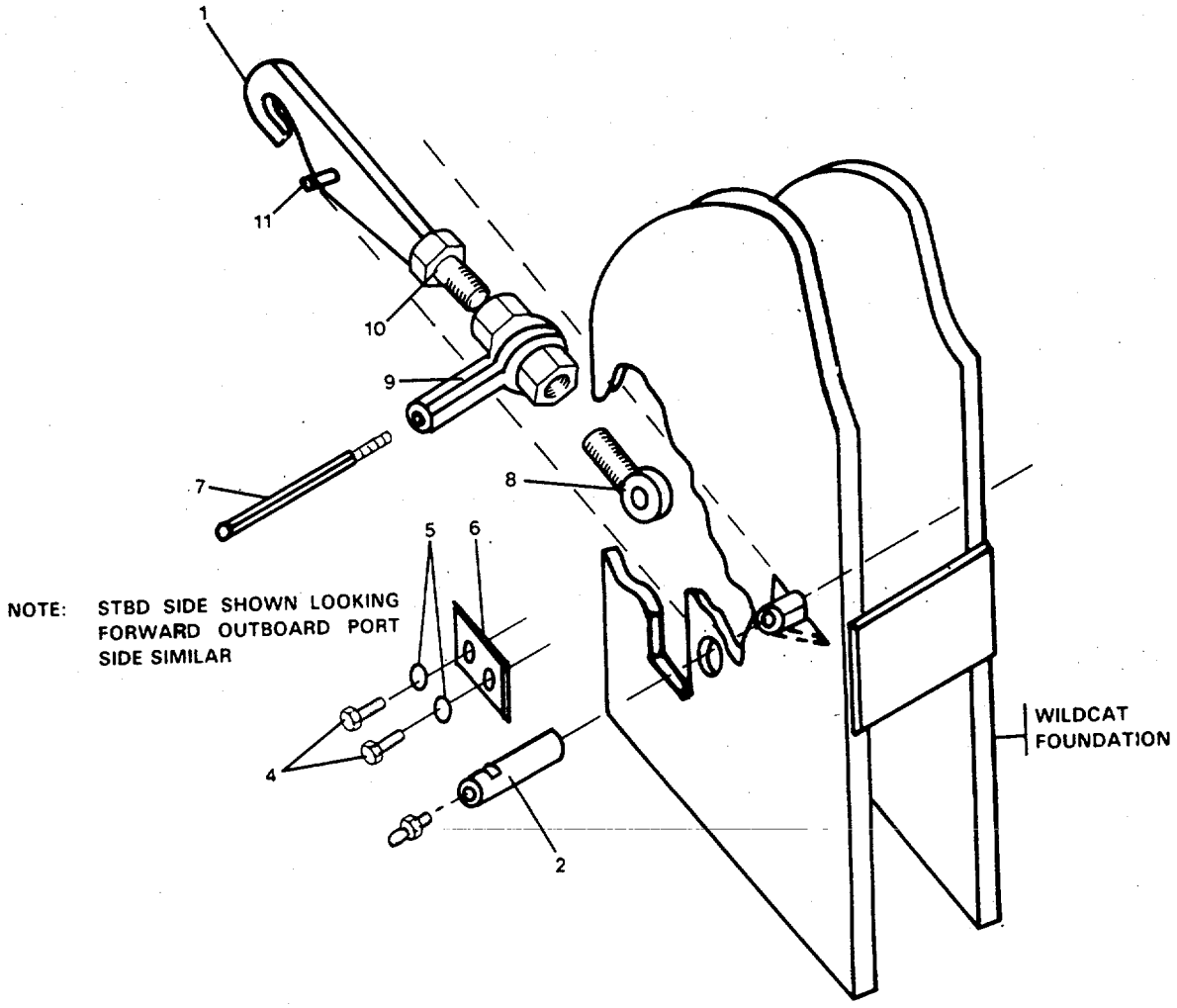


FIGURE 4-16. Locking Assembly.

WARNING

With bow ramp in raised position, ensure that both chain stopper and both ramp locking assemblies are in locked position before removal of bow ramp shackle, turnbuckle, wire rope or stud chain. Failure to do so may cause bow ramp to lower endangering personnel and vessel.

a. To remove bow ramp locking assembly, refer to TM 55-1905-223-10 and shut down bow ramp assembly.

b. Changing out one ramp locking assembly at a time, slack tension on hook(1) until assembly will move up and down freely.

c. Remove locking plate machine bolts (4) with lockwashers (5), and remove locking plate (6) from pin (2).

d. Remove handle (7) from barrel (9), remove pin (2) and lubrication fitting (3) by tapping from inboard side of foundation.

e. Lift and turn locking assembly to allow clearance of wildcat foundation and remove.

f. For further disassembly, remove hook assembly (1) consisting of threaded stud (10) and pin (11) from barrel (9)

g. Remove eyebolt (8) from opposite end of barrel (9).

REPAIR

Repair of this assembly is by replacement.

REPLACEMENT

a. For replacement of locking assembly, grease threads and install eyebolt (8) into barrel (9), install hook assembly (1) consisting of threaded stud (10) and pin (11).

b. Turn locking assembly and lower into place between wildcat foundation plates, aligning eyebolt end (8) into pin (2) foundation holes and barrel (9) extension to access in outboard foundation plate.

c. Install pin (2) with lubrication fitting (3), insert locking plate (6) into pin slot, align bolt holes, and install machine bolts (4) with lockwashers (5).

d. Install handle (7) into barrel (9) and grease pin (2).

e. Position locking assembly over bow ramp pin assembly and adjust into lock position.

f. Refer to TH 55-1905-223-10 and restore bow ramp assembly to normal.

4-25. Repair Bow Ramp Hinge Assembly. (FIGURE 4-17)

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

INITIAL SETUP

Tools

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

Materials/Parts

Bow ramp hinge assembly P/N 21-69072
Lubricating grease, Item 7, Appendix C
Warning tags, Item 1, Appendix C
Supports for ramp, Item 13, Appendix C

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."
Vessel must be dry-docked to perform this task.

REMOVAL

WARNING

- Ensure that all personnel are clear of the winch wire ropes, sheaves, chains, chain stoppers, wildcats, ramp and ramp hinges before operating the bow ramp assembly to raise or lower ramp. A failing wire rope or stud chain can cause serious injury or death. Notify operations personnel prior to starting system.

- Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, replacing electrical or mechanical components tag "Out of Service - Do Not Operate" and disconnect the power supply to the three control panels and the electrical motor in the hydraulic power pack assembly.

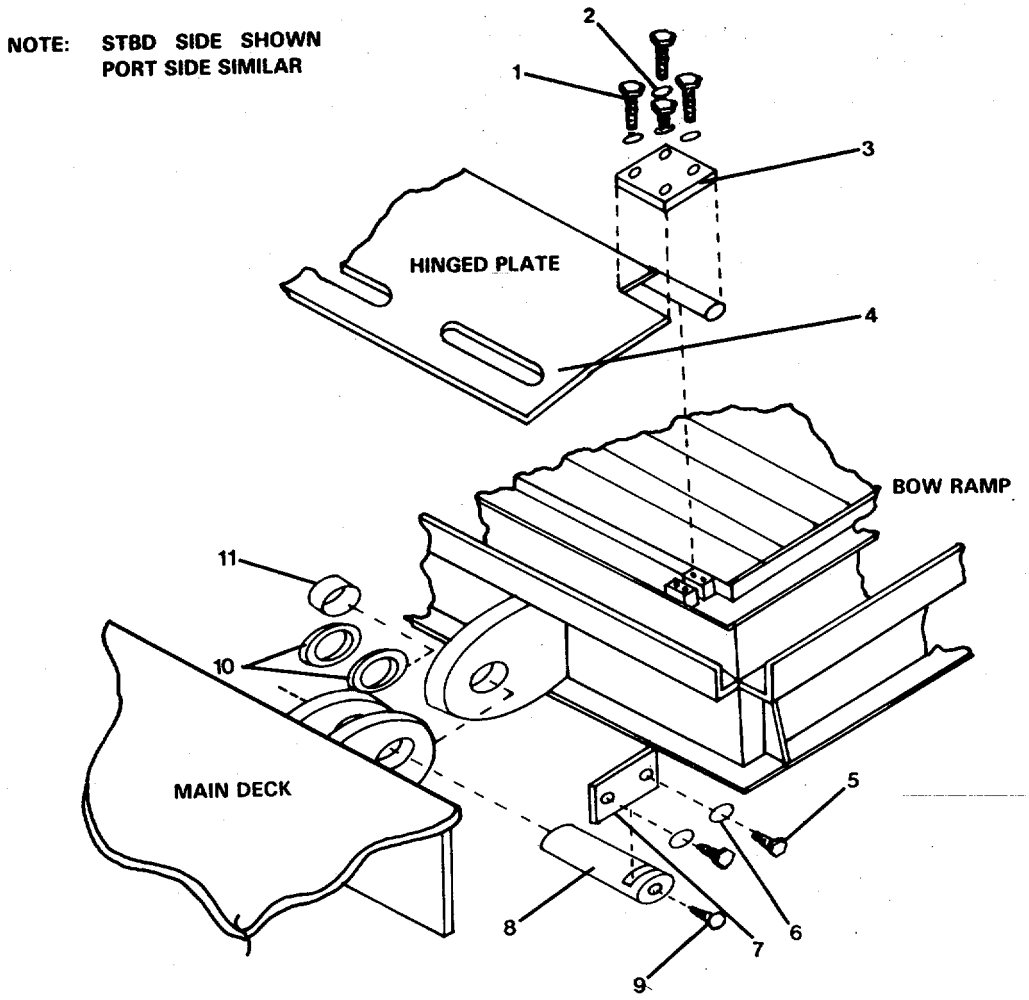


FIGURE 4-17. Bow Ramp Hinge Assembly.

CAUTION

Bow ramp hinge assemblies are a weight bearing surface. Before removal of any components provide the service of a crane or use a lifting device to relieve weight from main hinge pins.

a. Place supports in position so bow ramp can/be lowered onto them.

b. Refer to TM 55-1905-223-10 and start up bow ramp assembly. Lower bow ramp down on supports to relieve weight on hinge assemblies.

c. Remove hex head machine bolts (1) and washer s (2) from hinged plate hinge covers (3), remove hinge covers (3) from each outboard hinged plate (4) and remove hinged plates' exposing main hinge assemblies.

d. Remove hex head capscrews (5) with lockwasher (6) from locking plate (7) and remove locking plate.

e. Using a drift punch tap out and remove hinge pin (8) with lubrication fitting (9) and remove brass washers (10).

f. Using crane or lifting device, raise hinge end of bow ramp enough to clear pin hole in male hinge plate from female hinge plate. Use a drift punch to remove bushing (11).

REPAIR

Repair to main hinge assembly is by replacement.

REPLACEMENT

a. With hinge end of bow ramp still in raised position, install bushings (11) in male hinge plate pin hole. Lower bow ramp and align male and female hinge plate pin holes.

b. Insert brass washers (10) aligning with pin holes and insert hinge pin (8) with lubrication fitting (9).

c. Insert locking plate (7) into pin slot. Align and install hex head cap screws (5) with lo ckwashers (6). Lubricate hinge pin assembly.

d. Install outboard hinged plates (4) and set hinge covers (3). Install hex head machine bolts (1) with washers (2).

e. Refer to TM 55-1905-223-10 and start up bow ramp assembly. Raise ramp up off supports.

f. Operate winch and raise bow ramp to full up position. Set both bow ramp chain stoppers and both ramp locking assemblies in lock position and restore system to normal operation.

4-26. Repair Bow Ramp Sealing. (FIGURE 4-18)

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

INITIAL SETUP

Tools

Tool kit, general mechanic's,
51880-00-699-5273

Materials/Parts

Rubber strip (44 ft) P/N MGN 10.00.08
Rubber strip (2) P/N MGNMM02A(MK4)
Adhesive P/N 3880
Thinner P/N 493
Cleaning solvent, (Item 5, Appendix C)
Compressed air
Scraping tool, Item 14, Appendix C

Equipment Condition

TM 55-1905-223-10, bow ramp assembly shut down and tagged "Out of Service - Do Not Operate."

WARNING

- **Compressed Air Hazards**. High pressure compressed air tanks, piping systems, and air operated devices possess potential for serious injury to eyes and exposed areas of skin due to escaping air pressure.

- Ensure that all personnel are clear of the winch wire ropes, sheaves, chains, chain stoppers, wildcats, ramp, and ramp hinges before operating the bow ramp assembly to raise or lower ramp. A failing wire rope or stud chain can cause serious injury or death. Notify operations personnel prior to starting system.

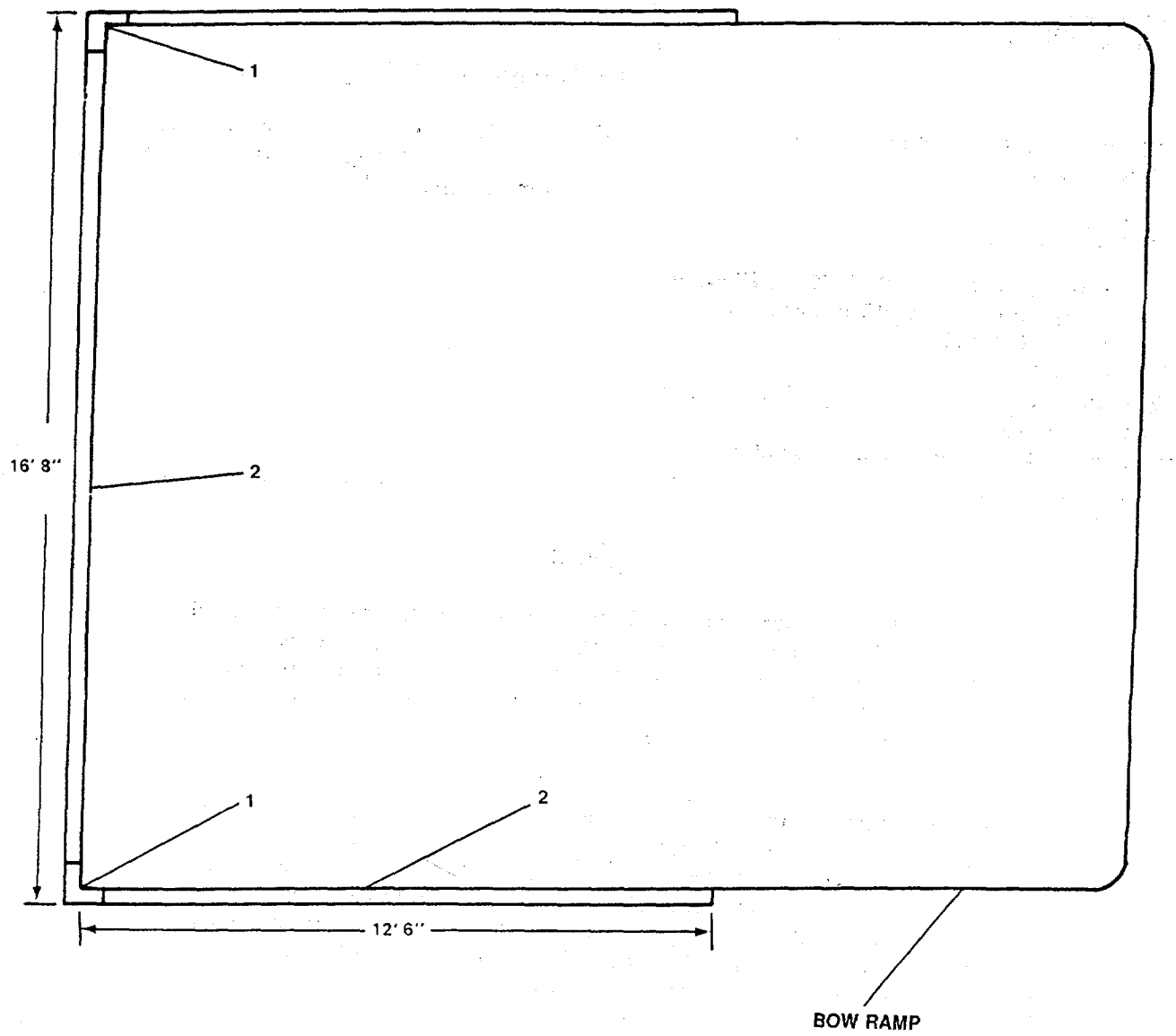


FIGURE 4-18. Bow Ramp Sealing.

WARNING

- Electrical components contain high voltages that can cause severe injury or death. Before servicing, adjusting, or replacing electrical or mechanical components tag "Out of Service - Do Not Operate" and disconnect the power supply to the three control panels and the electrical motor in the hydraulic power pack assembly.
- The fumes from cleaning solvents are dangerous. Use solvents in open air or well ventilated space. Wear proper eye protection and rubber gloves.

REMOVAL

a. Reference TM 55-1905-223-10. Start up bow ramp assembly, lower bow ramp to full down position. Shutdown, secure and tag "Out of Service - Do Not Operate."

b. Using a hand scraping tool or mechanical tool, remove rubber strips (1, 2) from bow ramp. Clean seal c hannel to a near white finish to ensure good contact surface.

c. Wipe out liner seating areas with cleaning solvent and blow clean with compressed air.

REPAIR

Repair of bow ramp sealing is by replacement.

REPLACEMENT

WARNING

Adhesives can contain chemical components that will irritate skin or eyes. Wear proper eye protection and rubber gloves while handling.

a. Into cleaned liner seating area, apply proper mixture of adhesive and thinner.

b. Install rubber strips (1, 2).

c. Refer TM 55-1905-223-10 and start up bow ramp assembly. Operate winch and raise ramp to full up position.

d. Check seating of rubber strip liners to ensure a good seal and restore system to normal operation.

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

4-27. 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. Disassembly, and repacking of equipment for shipment or short term storage, are covered in Chapter 2, Section VI.

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 43-0144	Painting of Vessels
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 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 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

*Supersedes 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 repair 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 O (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.

B-2 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 exact 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 desired 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 functioning 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[1] including fault location/troubleshooting[2], removal/installation, and disassembly/assembly[3] procedures, and maintenance actions[4] 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 in 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. Rebuild 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 this 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 alloci6n 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

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[1]Service - Inspect, test, service, adjust, align, calibrate, and/or replace.

[2]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).

[3]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).

[4]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 I - 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 I - 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 BOW RAMP ASSEMBLY

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
10	BOW RAMP ASSEMBLY	INSPECT	4.0					1	
		SERVICE	4.0					1	
		ALIGN		2.0				3	A
		ADJUST		1.0				1	
		REPLACE				48.0		1-6	A, B, C, D, E, F, G,H,I
		REPAIR	1.0	4.0		75.0		1-6	A, B, C, D, E, F, G,H,I
		OVERHAUL						*	K
1001	HYDRAULIC POWER PACK ASSEMBLY	INSPECT	2.0					1	
		SERVICE	4.0					1	
		REPLACE				7.0		1-5	
		REPAIR	1.0	2.0		42.0		1-6	B, D, F
100101	MOTOR, ELECTRIC	INSPECT	1.0					1	
		SERVICE	1.0					1	
		ALIGN		2.0				3	A
		REPLACE		2.0				1,3	A
		REPAIR				8.0		1,2, 3	B
100102	PISTON PUMP ASSEMBLY	INSPECT	1.0					1	
		SERVICE	1.0					1	
		ALIGN		1.0				1,3	A
		REPLACE		2.0				1	A, F
		REPAIR				12.0		1,3	B, F
100103	CONTROL VALVE, DIRECTIONAL	INSPECT	0.5					1	
		REPLACE		2.0				1-3	F
		REPAIR				12.0		1,4	B
100104	VALVE, MODULAR RELIEF/ CROSSPORT RELIEF	INSPECT	1.0					1	
		REPLACE		1.0				1,2	
		REPAIR				3.0		1,2	

Section II. MAINTENANCE ALLOCATION CHART FOR BOW RAMP ASSEMBLY (Cont)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5) TOOLS AND EOUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
10010401	VALVE, MODULAR RELIEF	INSPECT	1.0					1	
		REPLACE		1.0				1	B
10010402	VALVE, CROSSPORT RELIEF	INSPECT	1.0					1	
		REPLACE		1.0				1,2	
		REPAIR		3.0				1,2	
1002	MANIFOLD, HYDRAULIC SYSTEM ACCESSORIES	INSPECT	1.0					1	
		REPLACE		3.0				1	F, I
		REPAIR			3.0			1	F, I
1003	WINCH ASSEMBLY, HYDRAULIC	INSPECT	1.0					1	
		SERVICE	1.0					1	
		REPLACE				40.0		1,5	B, F, D
		REPAIR	0.5			40.0		1,5	B, F, D, H
100301	HAND PUMP, HYDRAULIC	INSPECT	1.0					1	
		REPLACE		1.0				1	F
		REPAIR				1.0		1	B, F
100302	HANDCRANK, EMERGENCY	INSPECT	1.0					1	
		REPLACE	0.5					1	H
		REPAIR				8.0		1	
100303	MOTOR, HYDRAULIC	INSPECT	1.0					1	
		REPLACE		2.0				1,3	B, F
		REPAIR				12.0		1,5	B
100304	BRAKE, FAILSAFE, HYDRAULIC	INSPECT	1.0					1	
		REPLACE		4.0				1	B, F, G
		REPAIR				12.0		1,5	B, E, G

Section II. MAINTENANCE ALLOCATION CHART FOR BOW RAMP ASSEMBLY (Cont)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5) TOOLS AND EOUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
100305	GEAR REDUCER ASSEMBLY	INSPECT	1.0					1	
		SERVICE	2.0					1	
		REPLACE				56.0		1,5	B, C
		REPAIR				36.0		1,5	B, C
10030501	PLANET, CARRIER	REPLACE				10.0		1,5	C, D, J
		REPAIR				36.0		1,5	C
100306	WINCH, BOW RAMP	INSPECT	2.0					1	
		SERVICE	2.0					1	
		ADJUST		1.0					B, C
		REPLACE				56.0		1,5	B, C
		REPAIR				56.0		1,5	D
1004	BOW RAMP ASSEMBLY, LIFTING	INSPECT	4.0					1	
		SERVICE	4.0					1	
		REPLACE				136.0		1,6	
		REPAIR	1.0	0.5		78.0		1,6	
100401	SHEAVE, PULLEY ASSEMBLY	INSPECT	2.0					1	
		SERVICE	2.0					1	
		REPLACE				2.0		1	
		REPAIR				4.0		1	
100402	WILDCAT FOUNDATION ASSEMBLY	INSPECT	2.0					1	
		SERVICE	2.0					1	
		REPLACE				8.0		1,6	
		REPAIR				16.0		1,6	
10040201	CHAIN STOPPER ASSEMBLY	INSPECT	2.0					1	
		SERVICE	2.0					1	
		REPLACE				4.0		1	
		REPAIR				8.0		1	

Section II. MAINTENANCE ALLOCATION CHART FOR BOW RAMP ASSEMBLY (Cont)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5) TOOLS AND EOUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
10040202	WILDCAT SHEAVE	INSPECT	1.0					1	
		SERVICE	1.0					1	
		REPLACE				8.0		1	
		REPAIR				6.0		1	
10040203	LOCKING ASSEMBLY	INSPECT	1.0					1	
		SERVICE	1.0					1	
		REPLACE				8.0		1	B
		REPAIR				8.0		1	B
100403	BOW RAMP HINGE ASSEMBLY	INSPECT	2.0					1	
		SERVICE	2.0					1	
		REPLACE				40.0		1,6	
		REPAIR				40.0		1,6	
100404	BOW RAMP, SEALING	INSPECT	2.0					1	
		SERVICE	2.0					1	
		REPLACE				8.0		1	
		REPAIR				8.0		1	
100405	TURNBUCKLE ASSEMBLY	INSPECT	1.0					1	
		SERVICE	1.0					1	
		REPLACE	1.0					1	
		REPAIR		1.0				1	

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS FOR BOW RAMP ASSEMBLY

TOOL OR TEST EQUIP-MENT REF CODE	MAINTE-NANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	C,O,F,H,	Tool Kit, General Mechanics	5180-00-699-5273	(50980) SC-5180-90-CL-N05
2	C,O	Tool Kit, Electricians	5180-00-391-1087	(80064) 9000S6202-73125ALT2
3	C,O,H	Tool Kit, Measuring, Machinist	5280-00-278-9919	(50980) SC-5280-95-CL-A01-HR
4	H	Torque Wrench (30-300 inch - pounds)	5120-01-092-3278	
5	H	Torque Wrench (30-300 foot - pounds)	5120-01-125-5190	
6	O,H	Lifting Sling	3940-01-183-9412	(15434) 3375958

Section IV. REMARKS
FOR
BOW RAMP ASSEMBLY

REFERENCE CODE	REMARKS
A	UPON REMOVAL, REPLACEMENT OF THE ELECTRIC MOTOR, LOVEJOY COUPLING, OR THE HYDRAULIC PUMP, THE ALIGNMENT MUST BE CHECKED.
B	THIS ITEM IS A CANDIDATE FOR DIRECT EXCHANGE WITH THE VENDOR.
C	GEAR REDUCER IS PART OF WINCH (INTERNAL) BUT IS ALSO A SEPARATE REPAIRABLE ITEM. FOR MAJOR REPAIR, REMOVE THE GEAR REDUCER FROM THE WINCH. SUPPORT THE WINCH DRUM WITH A LIFTING DEVICE AND / OR BLOCK SUPPORTS. REPAIR THE WINCH BY THE SAME PROCEDURE. ALL INTERNAL PARTS OF THE GEAR REDUCER SHOULD BE REPLACED IN SETS AND ORDERED BY PART NUMBER AND PREFIX OF STAGE.
D	IDENTIFICATION PLATE TO BE STAMPED I.A.W. DWG NO. C-13612 (BEEBE INTERNATIONAL INC.).
E	TO REMOVE PISTON FROM POWER PLATE, INTRODUCE LOW PRESSURE AIR (15 PSI) INTO THE HYDRAULIC INLET. MAKE SURE PISTON IS DIRECTED AWAY FROM OPERATOR.
F	DURING REPLACE / REPAIR OF HYDRAULIC SYSTEMS, ALL OPENINGS SHOULD BE CAPPED / PLUGGED TO PREVENT FOREIGN MATTER OR CONTAMINATION FROM ENTERING THE SYSTEM.
G	PC #28 IS A SHIPPING PLUG, AND IS TO BE USED FOR PROTECTION OF FAILSAFE BRAKE HYDRAULIC PORT DURING SHIPMENT, OR REMOVAL FROM SYSTEM.
H	THE EMERGENCY HANDCRANK IS TO BE INSTALLED ON THE OUTER END OF THE HYDRAULIC MOTOR FOR EMERGENCY USE ONLY AND IS TO BE REMOVED PRIOR TO NORMAL OPERATION OF THE WINCH SYSTEM.
I	REPAIR IS BY REPLACEMENT OF THE VALVES OF THE MANIFOLD ASSEMBLY.
J	REPAIR OF THIS ITEM IS BY REPLACEMENT.
K	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.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	O	2835-00-015-0246	Warning tags	EA
2	O	9150-00-067-3950	Hydraulic fluid	GL
3	O	5365-00-597-1360	Shim stock	EA
4	O	8030-00-145-0039	Anti-corrosion compound	GL
5	O	6850-01-078-9117	Cleaning solvent	BT
6	O	5330-00-641-1193	Gasket material	SH
7	O	9150-00-663-9795	Grease	LB
8	H	5350-00-186-8858	Emery cloth	PG
9	H	9150-00-111-3199	Lubricating oil	CN
10	H	5120-00-255-4458	Burnishing tool	EA
11	C	7420-00-160-4550	Utility pail	EA
12	C	4020-00-240-2164	Cotton cord	CL
13	H		Ramp support timbers	
14	H	5110-00-240-3094	Scraping tool	EA
15	H	2009-13	Hydraulic press	EA
16	O	9150-00-240-2251	GO 90 oil	CN

APPENDIX D

TORQUE VALUES

D-1. **Scope**. SAE capscrews are graded according to the strength of the capscrew. They are marked on the head so the correct strength and torque value are known. The tables in this appendix will list the capscrew markings with correct torque values as well as values for pipe plugs and metric bolts.

CAUTION

When replacing capscrews, always use a capscrew of the same measurement and strength as the capscrew being replaced. Using incorrect capscrews can result in equipment damage. Bolts threaded into aluminum require much less torque.

NOTE

Always use torque values listed in the tables when specific torque values are unknown. The torque values listed in the tables are based on the use of lubricated threads.

Table D-1. Capscrew Markings and Torque Values

Capacity Body Size		SAE Grade #5 Cast Iron or Steel			SAE Grade #6 or #7 Cast Iron or Steel			SAE Grade #8 Cast Iron or Steel		
		Torque			Torque			Torque		
Inches	Thread	ft-lb	kgm	N·m	ft-lb	kgm	N·m	ft-lb	kgm	N·m
1/4	-20	8	1.1064	10.8465	10	1.3630	13.5582	12	1.6596	16.2698
	-28	10	1.3830	13.5582				14	1.9362	18.9815
5/16	-18	17	2.3511	23.0489	19	2.6277	25.7605	24	3.3192	32.5396
	-24	19	2.6277	25.7605				27	3.7341	36.6071
3/8	-16	31	4.2873	42.0304	34	4.7022	46.0978	44	6.0852	59.6560
	-24	35	4.8405	47.4536				49	6.7767	66.4351
7/16	-14	49	6.7767	66.4351	55	7.6065	74.5700	70	9.6810	94.9073
	-20	55	7.6065	74.5700				78	10.7874	105.7538
1/2	-13	75	10.3725	101.6863	85	11.7555	115.2445	105	14.5215	142.3609
	-20	85	11.7555	115.2445				120	16.5860	162.6960
9/16	-12	110	15.2130	149.1380	120	16.5960	162.6960	155	21.4365	210.1490
	-18	120	16.5960	162.6960				170	23.5110	230.4860
5/8	-11	150	20.7450	203.3700	167	23.0961	226.4186	210	29.0430	284.7180
	-18	170	23.5110	230.4860				240	33.1920	325.3920
3/4	-10	270	37.3410	366.0660	280	38.7240	379.6240	375	51.8625	508.4250
	-16	295	40.7985	399.9610				420	58.0860	568.4360
7/8	- 9	395	54.6285	535.5410	440	60.8520	596.5520	605	83.6715	820.2590
	-14	435	60.1605	589.7730				675	93.3525	915.1650
1.0	- 8	590	81.5970	799.9220	660	91.2780	894.8280	910	125.8530	1233.7780
	-14	660	91.2780	849.8280				990	136.9170	1342.2420

Table D-1. Capscrew Markings and Torque Values - CONT

Capscrew Head Markings				
	and	 	OR	 

Table D-2. Pipe Plug Torque Values

Size			In Aluminum Components		In Cast Iron or Steel Components	
Thread	Actual Thread od		Torque		Torque	
in	mm	(in)	N•m	(ft-lb)	N•m	(ft-lb)
1/16	8.1	(0.32)	5	(45 in-lb)	15	(10)
1/8	10.4	(0.41)	15	(10)	20	(15)
1/4	13.7	(0.54)	20	(15)	25	(20)
3/8	17.3	(0.68)	25	(20)	35	(25)
1/2	21.6	(0.85)	35	(25)	55	(40)
3/4	26.7	(1.05)	45	(35)	75	(55)
1	33.5	(1.32)	60	(45)	95	(70)
1-1/4	42.2	(1.66)	75	(55)	115	(85)
1-1/2	48.3	(1.90)	85	(65)	135	(100)

Table D-3. Metric bolt Torque Values

Thread for general purposes	Cast Iron or Steel Head Mark 4		Cast Iron or Steel Head Mark 7	
	Torque		Torque	
(size x pitch (mm))	ft-lb	(N•m)	ft-lb	(N•m)
6 x 1.0	2.2 to 2.9	(3.0 to 3.9)	3.6 to 5.8	(4.9 to 7.8)
8 x 1.25	5.8 to 8.7	(7.9 to 12)	9.4 to 14	(13 to 19)
10 x 1.25	12 to 17	(16 to 23)	20 to 29	(27 to 39)
12 x 1.25	21 to 32	(29 to 43)	35 to 53	(47 to 72)
14 x 1.5	35 to 52	(48 to 70)	57 to 85	(77 to 110)
16 x 1.5	51 to 77	(67 to 100)	90 to 120	(130 to 160)
18 x 1.5	74 to 110	(100 to 150)	130 to 170	(180 to 230)
20 x 1.5	110 to 140	(150 to 190)	190 to 240	(160 to 320)
22 x 1.5	150 to 190	(200 to 260)	250 to 320	(340 to 430)
24 x 1.5	190 to 240	(260 to 320)	310 to 410	(420 to 550)

GLOSSARY

amps	Amperes
C	Degrees of temperature, Centigrade scale.
F	Degrees of temperature, Fahrenheit scale.
ft-lb	foot-pound
gpm	Gallons per minute
hp	Horsepower
id	'Inside diameter
in	inch
Locking assembly	Ratchet Operated Ramp Dogs
NSN	National stock number
od	Outside diameter
oz	ounce
psig	Pounds per square inch gauge
P/N	Part number
psi	pounds per square inch
rpm	Revolutions per minute

ALPHABETICAL INDEX

ALPHABETICAL INDEX -CONT

ALPHABETICAL INDEX - CONT

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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 decigram = .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 milliters = .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

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
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