TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE MANUAL

LIGHTER, AMPHIBIOUS (LARC-LX);

SELF-PROPELLED; DIESEL; STEEL;

60 TON; 61 FT;

DESIGN 2303; HULLS 5 THROUGH 60

NSN 1930-00-392-2981

This copy is a reprint which includes current pages from Changes

This manual supersedes TM 55-1930-203-20, 21 January 1970, including all changes.

HEADQUARTERS, DEPARTMENT OF THE ARMY

23 MAY 1980

CHANGE

NO. 5

HEADQUARTERS
DEPARTMENTS OF THE ARMY
WASHINGTON, D.C., 16 JULY 1992

Organizational Maintenance Manual

LIGHTER, AMPHIBIOUS (LARC-LX), SELF-PROPELLED, DIESEL,
STEEL, 60 TON, 61 FT, DESIGN 2303, HULLS 5 THROUGH 60
NSN 1930-00-392-2981

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Organizational Maintenance Manual

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SELF-PROPELLED; DIESEL; STEEL;
60 TON; 61 FT;
DESIGN 2303;,:HULLS 5 THROUGH 60
NSN 1930-00-392-2981

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iii and iv	iii and iv
1-1 and 1-2	1-1 and 1-2
1-5 and 1-6	1-5 and 1-6
1-9 and 1-10	1-9 and 1-10
2-1 through 2-4	2-1 through 2-4
2-9 and 2-10	2-9 and 2-10
2-15 and 2-16	2-15 and 2-16
2-21 and 2-22	2-21 and 2-22
2-33 through 2-36	2-33 through 2-36
2-41 and 2-42	2-41 and 2-42
2-47 through 2-52	2-47 through 2-52
2-55 and 2-56	2-55 and 2-56
2-81 through 2-86	2-81 through 2-86
2-91 and 2-92	2-91 and 2-92
2-97 and 2-98	2-97 and 2-98
2-107 and 2-108	2-107 and 2-108
---	2-108.1 through 2-108.5/108.6
2-109 and 2-110	2-109 and 2-110
2-127 through 2-130	2-127 through 2-130
2-185 and 2-186	2-185 and 2-186
2-235 and 2-236	2-235 and 2-236
2-253 through 2-256	2-253 through 2-256
2-303 through 2-306	2-303 through 2-306
2-319 through 2-323/324	2-319 through 2-330
A-1/A-2	A-1/A-2
B-3 through B-8	B-3 through B-8
B-11 through B-16	B-11 through B-16.1/16.2
C-1 and C-2	C-1 and C-2
-----	D-1/D-2
-----	FO-3 through FO-8

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URGENT

CHANGE NO. 1

HEADQUARTERS
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Organizational Maintenance Manual

LIGHTER, AMPHIBIOUS (LARC-LX); SELF-PROPELLED DIESEL;
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SAFETY PRECAUTIONS

RADIATION HAZARD

This equipment contains the following radioactive items:

Name	Location on Equipment
ARBITRARY SCALE METER (Battery/Generator)	Located on Operator's Control Panel

Instructions for safe handling, maintenance, storage, and disposition of these items are contained in TB 43-0141.

CLEANING SOLVENTS

Wear goggles, rubber gloves, and a rubber apron when mixing or diluting sulphuric acid, Specification MIL-M-10578, Type I. Sulphuric acid or metal conditioner and rust remover may cause serious acid burns if spilled or splashed on the hands or other parts of the body. Do not pour water into sulphuric acid or metal conditioner and rust remover. If water is poured into the mixture, it may splatter and cause acid burns. Provide adequate ventilation when handling sulphuric acid, metal conditioner, and rust remover since a poisonous gas may form. The gas is a dangerous fire and explosive hazard.

Use care to avoid sodium chromate and any solution containing this chemical from contacting the skin. Some individuals are extremely sensitive to these chemicals.

Dry cleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 °F - 138 °F (38 °C - 59 °C).

RAMP MAINTENANCE

Ramp hinge pins must be replaced one at a time, allowing the three remaining pins to support the ramp. Removal of two or more hinge pins at one time may result in weight of the ramp shearing the remaining pins which would damage the ramp and possibly cause injury or death to maintenance personnel. On hulls 19 through 60, remove lubrication fittings (3, 14 and 17).

LAUNCHING

During launching of the LARC, the boat carrying the LARC crew shall remain clear of the impact area by at least 300 feet (92 m) since there is danger of capsizing or being swamped. Make sure the impact area is clear of debris and other craft. In the event the LARC should start to sink due to unseen damage, all efforts must be made to save the vessel without endangering the crew. The tug and boat shall stand by for rescue purposes until the LARC is operating under its own power.

COMPRESSED AIR

Before attempting to remove any compressed air system lines or components, relieve air pressure from system. Failure to do so may result in injury pr death to maintenance personnel.

Do not remove the pressure cap from the expansion tank when the engine is operating. Remove the pressure cap only when the engine is secured and then carefully to prevent personnel injury from scalding.

SCREW, ROPE FOULED

Before removing rope from jackshafts, engines will be stopped. If engines are running and marine gear is accidentally shifted, injury may occur to personnel removing rope from jackshaft.

STARTING ENGINE

Before starting the engines, ensure that no one is in the machinery wells. When starting on and, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting. sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

Do NOT go under craft or near propellers' while engines are running.

ELECTRICAL

Before working on any electrical equipment, make sure the circuits as been deenergized and the cables have been disconnected from the

DANGER OF EXPLOSION

When refueling, shut down the electrical system of the LARC. Observe the no smoking rule. Do not permit anyone to operate tools or equipment which may produce sparks near the refueling operation. Sparks or fire may ignite the diesel fuel and produce an explosion.

Fuel oil and other petroleum products are highly volatile in extreme heat. To minimize the possibility of explosion, wipe up all spills at once, see that fuel lines and valves are not leaking and pump bilges regularly.

Prior to cutting or welding on the ramp, remove drain plugs on both sides of the ramp and check if ramp interior is primer coated. If primer coated, flush thoroughly with steam, carbon dioxide, or water. Do not reinstall drain plugs until the cutting and/or welding operation is completed. Failure to take this precaution may result in explosion of accumulated primer vapors.

WELDING

When cutting with a torch, or when welding, always station fire watches, ready. with fire extinguishers, in the vicinity on both sides-of the plate that is being cut or welded.

HYDRAULIC

Before disconnecting a line in the hydraulic system, bleed the pressure from that portion of the line. Failure to do so may result in injury or possible death to maintenance personnel.

DANGEROUS FUMES

When working inside the hydraulic oil supply tank, a portable type circulating blower should be used to pre- vent vapor accumulation. For extended work periods inside the tank, an air line tube respirator should be worn. Station an observer outside tank in case worker is overcome by fumes.

BURNS

Acids can cause serious burns or blindness. Avoid contact with eyes, skin, or clothing. Do not breathe vapors. Wear rubber gloves, goggles, and a rubber apron when handling them. When diluting acids, do not add water to acid; the acid must be added to the mixture slowly and with constant mixing. In case of contact with acid, flush the affected area with plenty of water and obtain medical aid immediately.

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Washington, D.C., 23 May 1980

ORGANIZATIONAL MAINTENANCE MANUAL

LIGHTER, AMPHIBIOUS (LARC-LX); SELF-PROPELLED DIESEL;

STEEL; 60 TON; 61 FT; DESIGN 2303; HULLS 5 THROUGH 60

NSN 1930-00-392-2981

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedure, please let us know. Mail you letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support Command ATTN: AMSTR-MCTS, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished directly to you.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

LIST OF ILLUSTRATIONS (Continued)

LIST OF TABLES

CHAPTER 1

INTRODUCTION

SECTION I. GENERAL

1-1. SCOPE.

These instructions are for the use of personnel responsible for organizational maintenance of the amphibious lighter (LARC-LX), shown in figure 1-1.

1-2. MAINTENANCE FORMS AND RECORDS.

a. The maintenance forms and records required to maintain this equipment include DA Form 2402 (Exchange Tag), DA Form 2404 (Equipment Inspection and Maintenance Worksheet) and DD Form 314 (Preventive Maintenance Schedule and Record).

b. Any additional forms that are required are listed and explained. in DAPAM738-750,The Army Maintenance Management System (TAMMS).

1-3. ADMINISTRATIVE STORAGE.

a. General. Detailed instructions for the preparation of the amphibious lighter (hereafter called the LARC) for limited storage are outlined within this paragraph. Preservation will be accomplished in sequence that will not require the operation of previously preserved components.

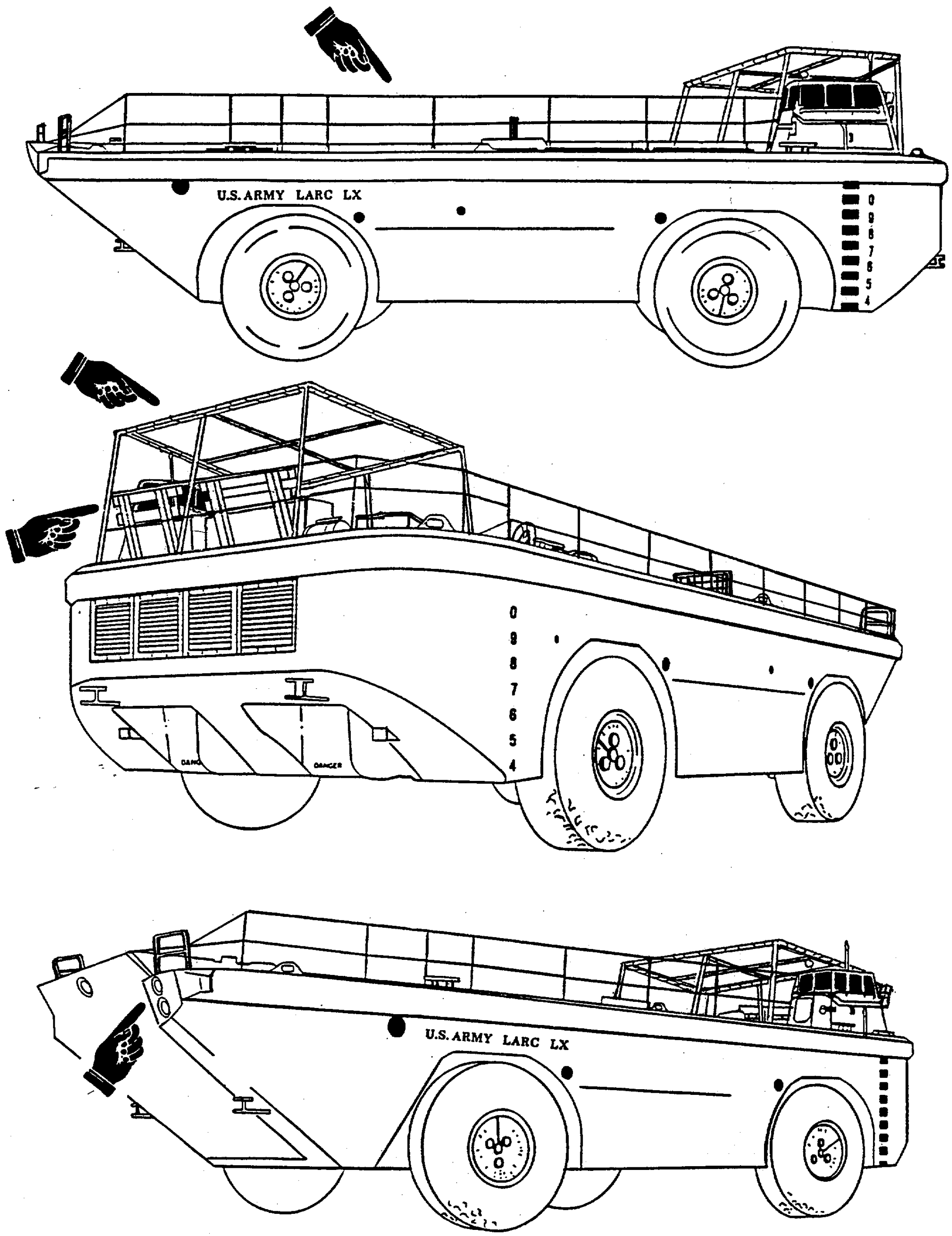
b. Inspection. The LARC will be inspected for any unusual conditions such as damage, rusting, accumulation of water, and pilferage. Inspection of the individual components and assemblies will be outlined on the "Preventive Maintenance Service" in this manual.

c. Cleaning and Drying. All contamination shall be removed by an approved method. Approved methods of cleaning, drying, types of preservatives, and methods of application are described in TM 38-230-2.

d. Painting. Paint all surfaces where the paint has been removed or damaged. Refer to TB 43-0144 for detailed cleaning and painting instructions.

e. Preservation and Depreservation Guide. DA Form 3256 (Preservation and Depreservation Guide for Marine Equipment).

(1) A properly annotated depreservation guide will, be completed concurrently with preservation for each item of mechanical equipment. Any peculiar requirements will be outlined in the blank



TS 1930-203-20/1-1

Figure 1-1. Amphibious Lighter (LARC - LX).

spaces on the form. The completed depreservation guide will be placed with the equipment in a waterproof envelope marked "Depreservation Guide" and fastened in a conspicuous location on or near the operator's controls.

(2) Prior to plaqing the LARC in operation or to the extent necessary for inspection, depreservation of the item shall be performed as outlined in the depreservation guide.

f. Cooling System. Fill cooling system with proper solution.

g. Lubrication System. Check level of lubricant.

h. Sealing of Openings. Openings that will permit the direct entry of water into the interior of engine, starting motor, generator, electrical enclosures and so on, shall be sealed with pressure- sensitive tape conforming to Specification PPP-T-60, Type III, Class 1.

i. Fuel Tank. Drain fuel tanks.

j. Air Cleaner. Clean and seal all openings that permit the direct entry of water. Use pressure-sensitive tape conforming to Specification PPP-T-60, Type III, Class 1.

k. Marine and Land Drive System, Drive Shafts, and Transmissions. Fill to operating level with the lubricant specified in the lubrication order.

l. Hydraulic System. The hydraulic system will be filled to capacity with the type and grade of lubricant specified in the lubrication order.

m. Exterior Surfaces. Coat exposed machined ferrous metal surfaces with type P-6 preservative conforming to Specification MIL-C-11796, Class 3. If preservative is not available, cup grease may be used.

n. Marking. Marking shall conform to MIL-STD-129.

o. Batteries and Cables. Batteries shall be filled, fully charged and secured in the battery compartment. Cables shall be disconnected, vent holes sealed and all terminals wrapped and secured with Type III, Class 1, pressure-sensitive tape conforming to Specification PPP-T-60.

p. Disassembly, Disassembled Parts and Basic Issue Items.

(1) Disassembly shall be limited to the removal of parts and projecting components that tend to increase the overall profile of the LARC and that which is subject to pilferage.

(2) If possible, disassembled items shall be packed with the publications. Otherwise, items will be packed in a suitable container and secured to the LARC to prevent loss or pilferage.

NOTE

If packing is required to provide adequate protection against damage during shipment, refer to TM 38-230-2 for guidance in crate fabrication.

q. Storage. Every effort should be made to provide covered storage for the LARC. If this is impossible, select a firm, level, well-drained storage location, protected from prevailing winds. Position the LARC on heavy planking. Provide the LARC with. maximum protection from the elements.

r. Inspection and Maintenance of Equipment in Storage. Every 90 days, the LARC will be inspected as outlined in table 2-2 (Preventive Maintenance Checks and Services), and operated long enough to assure complete lubrication of bearings. After each inspection period, the LARC shall be represerved.

1-4. DESTRUCTION OF ARMY-MATERL TO PREVENT ENEMY USE.

a. Mechanical Destruction. Using axes, picks mattocks, sledges, or any other heavy implements, damage all vital elements such as engine block and manifolds, fuel pumps, transmission housings, hydraulic and lubrication pump, radio equipment, fuel tanks, lines and filters, radiator, keel cooler, crossover pipes, starting motor, alternator batteries, junction box, instrument panel and control console, hull and tires.

b. Demolition by Misuse.

(1) Operate engine at full throttle.

(2) Drain transfer transmission and forward-reverse transmission while in operation.

(3) Pour sand, sugar, salt or dirt in fuel tanks, crankcase and radiator.

(4) Drain engine oil and run engine until it ceases.

(5) Pour sand, sugar, glass and dirt into the hydraulic reservoir and operate steering system and bilge pumps.

(6) Shift transmission rapidly from one position to another with engine at full throttle.

c. Demolition by Explosives. Place as many of the following charges as the situation permits, and detonate.

(1) One 1/2 pound (226 g) charge on the right side of the engine, left side of the engine and the top of each engine.

(2) Four 1/2 pound (226 g) charges (two on each side) on the forward-reverse transmission.

(3) Two 1/2 pound (226 g) charges on each side of gathering boxes.

(4) Two 1/2 pound (226 g) charges on1 each side of the miter boxes and one 1/2 pound (226 g) charge on each end of the differential transmission.

(5) One 1/4 pound (113 g) charge on the instrument panel.

(6) One 1/4 pound (113 g) charge on the control console.

(7) Two 1/2 pound ('226 g) charges on the surface of each wheel.

d. Weapon Fire. Fire on the vessel with the heaviest weapons available.

e. Scattering and Concealment. Remove all easily detachable parts such as filters, water, oil and fuel lines, batteries, alternator, belts, control panel, float tank, solenoids, valves and wiring. Scatter or bury them.

f. Burning. Break fuel lines at engine and puncture the fuel tanks and auxiliary tank. Saturate deck, cockpit, transfer transmission, and engine with gasoline, fuel oil, kerosene or other combustible material and ignite.

g. Submersion. Remove bilge drain plugs and puncture hull. Remove radiator cap, oil fill caps, oil fill plug and fuel tank caps. Open all drain valves on engine, transmission and hydraulic system. Drive vessel into deepest water available.

1-5. REPORTING EQUIPMENT I-PROVEMENT RECOMMENDATIONS (EIR)

EIR's will be prepared using Standard Form SF 368, (Quality Deficiency Report.) Instructions for preparing EIR's are provided in DA PAM 738-750, The Army Maintenance Management System (TAMMS). EIR's should be mailed directly to Commander, U.S. Army Troop Support Command, ATTN: AMSTR-QX , 4300 Goodfellow Blvd., St. Louis, MO 63120-1798.. A reply will be furnished to you.

SECTION II. DESCRIPTION AND DATA

1-6. DESCRIPTION.

a. General. The LARC is a four-wheel, diesel engine, amphibious lighter used for transporting large loads of cargo and troops between seagoing vessels and the beach or inland transfer points.

b. Land Operation. In land operation, each wheel is independently driven by one of the four engines. Wheel drive power is transmitted from the flywheel end of the engines through the respective torque converters, transmissions, miter boxes, and wheel columns to the planetary gears in the wheels.

c. Marine Operation. In marine operation, the port propeller may be driven by either or both port engines and the starboard propeller by either or both starboard engines. Power for marine drive is taken from the end of the engines opposite to the flywheel ends. Power from the engines is transmitted through fluid couplings and gathering boxes to their corresponding marine gear. A shaft extends aft from each marine gear through the hull to drive the propellers.

d. Electrical System. The electrical system is a 24 volt dc system powered by two 12 volt batteries connected in series. The batteries are charged by two battery charging alternators mounted on the gathering boxes. The electrical system is used primarily for LARC lighting.

e Hull and Cab Access Openings. There are numerous compartments within the LARC, some of which are watertight. These compartments house the mechanical, electrical, air pressure, and hydraulic components necessary for operation. Seventy-six access covers (fig. 1-2) provide maintenance personnel access to all work areas in the corresponding compartments.

f. Hydraulic Systems.

(1) Hydraulic oil pressure for operation of the winch, steering cylinders, steering alignment cylinders, ramp, cargo well pumps, bilge pumps, and radiator fans is supplied by eight double hydraulic pumps. The double hydraulic pumps, driven by the marine gear, supply hydraulic fluid at the required operating pressure.

(2) Hydraulic oil pressure for an independent system for hydraulic starting and wheel alignment is provided by a pump driven by Engine No. 3. The pump charges accumulators. A hand pump is provided if system is not pressurized and engines cannot be air started. Oil pressure operates a hydraulic starter motor and wheel alignment cylinders.

g. Compressed Air System. The compressed air system is supplied by two air compressors. One compressor is driven by each marine gear. The compressed air is stored in two air tanks located on the port and starboard sides under the cargo well deck. The compressed air system serves as a control system for the throttles, cargo well pumps, ramps, transmissions, marine gears, and radiator fans. The system supplies air for operation of the air horn, airbrakes, engine starting motors, and windshield wiper. The system also supplies air for inflation of the ramp seal and tires.

h. Steering System. The front and rear wheels of the LARC can be steered independently to make it more maneuverable on land. In marine operation, the LARC is steered by two rudders.

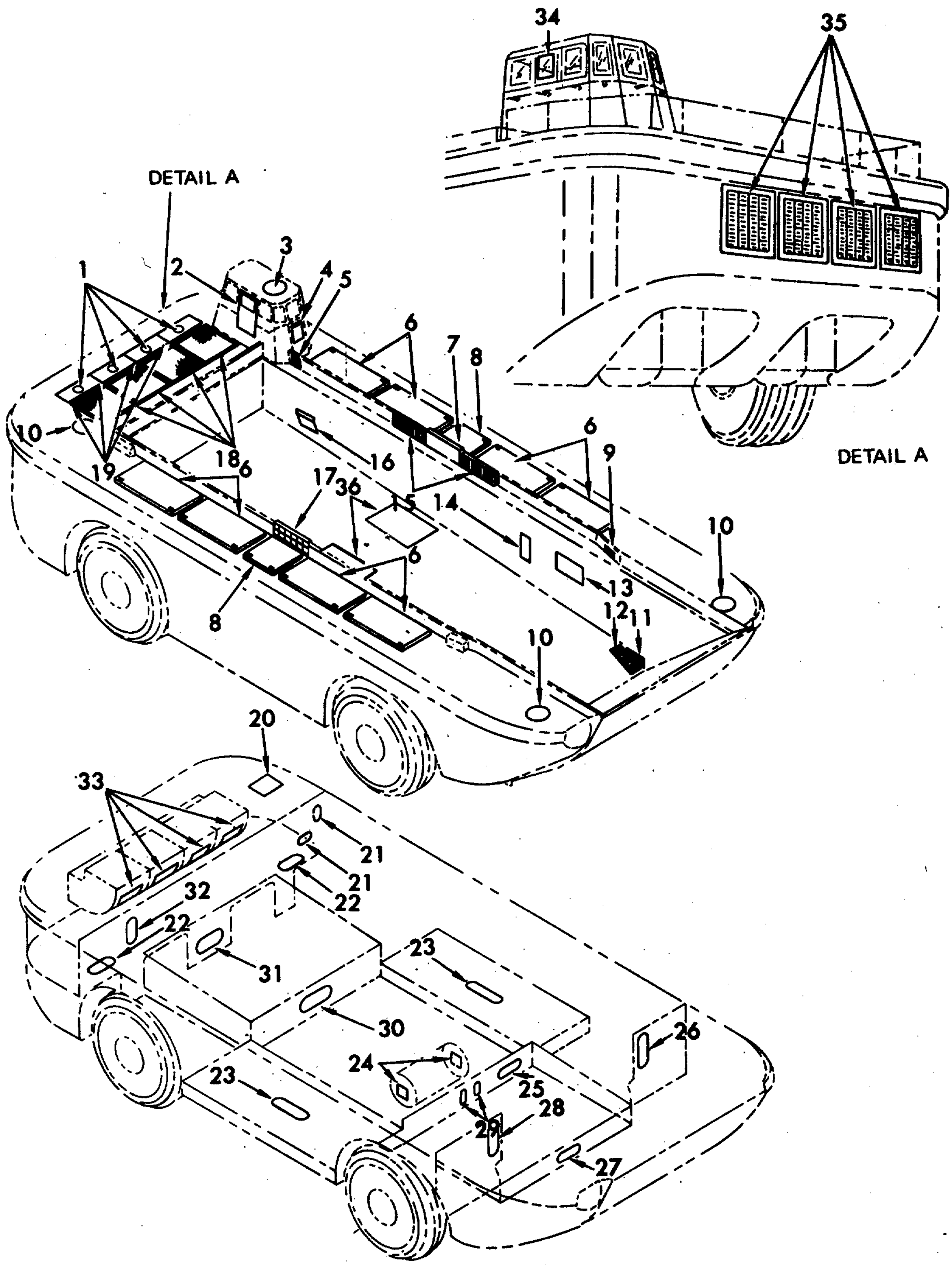


Figure 1-2. Hull and Cab Access Covers.

Legend for figure 1-2:

1. Radiator petcock access cover
2. Starboard cab door
3. Cab shuttle cover
4. Cab forward access cover
5. Aft engine vent louver
6. Large machinery hatch cover
7. Gage board access cover
8. Machinery room hatch cover
9. Forward engine vent louver
10. Deck scuttle cover
11. Cargo well.pump bulkhead gratin,g
12. Cargo well pump deck grating
13. Forward miter box access cover
14. Hydraulic line access cover
15. Center engine vent louver
16. Aft miter box access cover
17. Gage boards
18. Radiator deck fan grating
19. Radiator access cover
20. Cab crew seat (port aft stowage area access opening)
21. Bulkhead No. 14 port access cover
22. Aft storage area deck access cover
23. Lower machinery area deck access cover
24. Hydraulic tank access cover
25. Bulkhead No. 6 port access cover
26. Bulkhead No. 3 port access cover
27. Bulkhead No. 3 center access cover
28. Bulkhead No. 3 starboard access cover
29. Bulkhead No. 6 center access cover
30. Bulkhead No. 11 access cover
31. Bulkhead No. 14 center access cover
32. Bulkhead No. 14 starboard access cover
33. Radiator duct access cover
34. Port cab door
35. Stern louver
36. Marine gear access cover

1-7. TABULATED DATA.

a. Identification. The LARC has six major identification plates. The information contained on the plates is listed below.

(1) Engine Option Equipment Plate. Stamped on this plate is the model number, unit serial number, engine rating, and all options and accessories installed on the unit. The basic engine model number and serial number are stamped on the blower side of the cylinder block at the upper right-hand corner.

NOTE

The model number, unit serial number and engine rating were stamped on a nameplate attached to the flywheel housing on early units.

(2) Gathering Box Nameplate. Attached to the gathering box housing neat the generator.

(3) Marine Gear Nameplate. Installed on the marine gear upper housing at the control valve.

NOTE

Hulls 19 thru 24 have Transval Electronics Corp. nameplates on the marine gears. These marine gear units are the same units installed on hulls 5 thru 18 and hulls 25 thru 60 with nameplates of Western Gear Corp.

(4) Torque Converter Nameplate. Installed on the left side of converter housing.

(5) Miter Box Nameplate. Installed on miter box bevel cover.

(6) Builder Nameplate. Installed on port wall of cab.

b. Electrical System.

Batteries:	
Type	6 TN
Volts	12
Military Standard	MS3500 -3
Alternator:	
Volts	24
Military standard	BLHAA3025P
Circuit Breakers:	
Amperage	15
Military Standard	MS39062-1
Amperage	20
Military Standard	MS39062-2
Incandescent Lamp (High Beam Indicator	
	Single contact bayonet
	candelabra
Volts	2 8
Candle Power	3
Military Standard	MS15570-1251
Number of Units	1
Incandescent Lamp (Cab Dome Light):	
Bulb Shape	G6
Base	Single contact bayonet
Volts	24
Candle Power	6
Military Standard	MS15570-623
Incandescent Lamp (Cab Dome Light):	
Bulb Shape	S8
Base	Single contact bayonet
Volts	34
Candle Power	15
Ordnance Number	453701
Incandescent Lamp (Warning Light):	
Type	T -3-1/4
Base	Single contact miniature bayonet
Volts	28
Military Standard	MS25231-313

Incandescent Lamp (Searchlight):
- Volts 24
- Candle Power 150
- Military Standard MS15585-4

Incandescent Lamp (Spotlight):
- Manufacturer .... General Electric Co.
- Volts 24
- Manufacturer No. (Hulls 5-48) 1692
- Manufacturer No. (Hulls 49-60) 4318

Tachometer Generator:
- Manufacturer .... General Electric Co.
- Mode1 .... 2CM9ABX6

c. Generator Drivebelt Adjustment.

Belt- Deflection .... 7/8 in. (22 mm)

d. Hull Components.

Ramp Cable:
- size .... 5/8 in. (15 .9 mm) diameter
- Number of Strands 6
- Number of Wires per Strand 19
- Core .... Fiber

Bilge Pump:
- Manufacturer .... Deming
- Size .... 3 in. (762 mm)
- Manufacturer No. 4707FIG4305-31N

Cargo Well Pump:
- Manufacturer .... Byron Jackson Pumps
- Size .... 12 in. (304.8 mm)
- Type 76D
- Manufacturer No. 265916

e. Cargo Well Pump Oil Sight Valve Adjustment. Adjust drip-lubricator meter to 3 to 5 drops per minute.

f. Hydraulic System.

Multiple Unit Valve (Port):
- Manufacturer .... Vickers, Inc.
- Model........ CM2-06RTDDL10

Multiple Unit Valve (Starboard):
- Manufacturer .... Vickers, Inc.
- Model CM2-06RTTDDL10

g. Engine.

Rotation .... Right-Hand
Idle Speed .... 550 rpm
Governed Speed .... 2100 rpm
Water Pump (Engine Model 6080RA):
- Manufacturer .... Detroit Diesel Engine
- Manufacturer No 5113108

Water Pump (Engine Model 6081RC):
- Manufacturer .... Detroit Diesel Engine
- Manufacturer No 5113109

Air Cleaner:
- Manufacturer .... Detroit Diesel Engine
- Diameter .... 10 in. (254 mm)
- Manufacturer No 5183248

Primary Fuel Filter:
- Manufacturer .... AC Spark Plug
- Manufacturer No. (Hulls 5-18) 5182041
- Manufacturer No. (Hulls 19-60) 5575568
- Element .... Type T-553

Secondary Fuel Filter:
- Manufacturer .... AC Spark Plug
- Type (Hulls 5-18) 141
- Type (Hulls 19-24) T-67
- Type (Hulls 25-60) T-65
- Element (Hulls 5-18) .... Type TP-512
- Element (Hulls 19-24) .... Type T-552
- Element (Hulls 25-60) TP540X

Bypass Oil Filter:
- Manufacturer .... AC Spark Plug
- Type S-2
- Element .... Type P-117

Full Flow Oil Filter:
- Manufacturer .... AC Spark Plug
- Type PM13
- Manufacturer No.:
  - Engine Model 6080RA 5194287
  - Engine Model 6081RC 5194288
- Element .... Type PF-132

h. Engine Adjustment.

Engine Exhaust Valve Clearance .... 0.009 in. (0.2286 .mm) hot, 0.012 in. (0.3028 mm) cold
Fuel Injector Setting .... 1.460 in. (37.08 mm)
Governor Setting .... 0.170 in. (4.318 mm)

i. Fuel System.

Fuel System Filter:
- Manufacturer .... Marvel Engineering
- Model SLD-3/4-8
- Type .... Pressure
- Element .... Model SLD-3/4-8 PT6100

j. Land Drive System.

Transmission-Torque Converter Oil Filter:
- Manufacturer .... Nugent
- Size .... IS
- Fig. No. 1116PY

Gathering Box Oil Pump:
Manufacturer .... Viking Pump, Div. of Houdialle Industries, Inc.
Model GV7 85
Tires:
Manufacturer .... Firestone Tire and Rubber Co.
Size .... 36.00 x 41
Ply 4
Tread .... Non-skid
Type .... Tubeless
Weight .... 3325 lb (1508 kg) each
Flexible Coupling (Torque Converter-to-Transmission):
Manufacturer .... Philadelphia Gear Works
Manufacturer Dwg .... C684071 REV C
Flexible Coupling (Transmission-to-Miter Box):
Manufacturer .... Philadelphia Gear Works
Manufacturer Dwg .... C684036 REV B

k. Marine Drive System.

Oil Sediment Strainer:
Manufacturer .... Marvel Engineering
Model SLB-1/4-20
Flexible Coupling (Gathering Box to Marine Gear):
Manufacturer .... Philadelphia Gear Works
Manufacturer Dwg .... C684037 REV G
Flexible Coupling (Engine and Gathering Box to Fluid Coupling):
Manufacturer .... Philadelphia Gear Works
Manufacturer Dwg .... D684072A REV B

l. Compressed Air System.

Governor:
Manufacturer .... Westinghouse Airbrake Co.
Type NS-16
Air Starting Lubricator:
Manufacturer .... Norgren
Model 30-41-8L
Air Starting Air Filter:
Manufacturer .... Norgren
Model 30 AE8
Main Air Supply Filter:
Manufacturer .... Westinghouse Airbrake Co.
Type .... E
Strainer Assembly .... Mfr. No. 502904
Safety Relief Valve (Tire Air Line):
Manufacturer .... Westinghouse Airbrake Co.
Size .... 1/2 in. (12.7 mm) ~
Range .... 35-75 psi (2.5—5.3 kg/sq cm)
Type E-1

Safety Relief Valve (Air Tanks}:
Manufacturer . ... Westinghouse Airbrake Co.
Size .... 1/4 in.6. 14 mm
Range .... 130-175 psi (7.2-12.3 kg/sq cm).
Type .... FA
Relay Air Valves (Tire Inflation-Deflation Air Lines):
Manufacturer .... Westinghouse Airbrake Co.
Type A-1-B
Air Cylinder (Cargo Well Pump and Ramp Cylinder Air Lines):
Manufacturer .... Westinghouse Airbrake Co.
Type .... ABO
Air Cylinder (Radiator Fan Air Lines):
Manufacturer .... Westinghouse Airbrake Co.
Manufacturer No. 523159
Air Cylinder (Transmission Shifting Air Lines):
Manufacturer .... Westinghouse Airbrake Co.
Manufacturer No. 192758
Relay Air Valves (Brake Air Lines):
Manufacturer .... Westinghouse Airbrake Co.
Type C-2
Relay Air Valves (Transmission and Throttle Air LinesL:
Manufacturer .... Westinghouse Airbrake Co.
Type H-5
Shuttle Valves (Air Supply, Fan Throttle, Transmission, and Engine Starting Air Lines):
Manufacturer .... Westinghouse Airbrake Co.
Size .... 1/1 in. (6.4 mm)
Manufacturer No. P54350-2
Hand Throttle Control Valves:
Manufacturer .... Westinghouse Airbrake Co.
Part No. 50494-11
Range .... 10-60 psi (0.7-4 .2 kg/sq cm)
Type H-2-FX
Transmission Shifting Control Valve:
Manufacturer .... Westinghouse Airbrake Co.
Part No. 58455-2
Type 5-P-1B
Pilot Air Valves (Cargo Well Pump, Engine Cutout and Transmission Shifting, Ramp Cylinder, and Tire Inflation-Deflation):
Manufacturer .... Westinghouse Airbrake Co.
Type 2-HA-2
Pilot Air Valve (Air Horn and Engine Starting):
Manufacturer .... Westinghouse Airbrake Co.
Part No. 54692-2
Type 2-BA-1
Marine Shifting and Throttle Control Valves:
Manufacturer .... Westinghouse Airbrake Co.
Type HD-2-FM
Plug Valves:
Manufacturer .... Crane Co.
Size .... 1/2 in, (12.7 mm)
Manufacturer No. 639

Ramp Seal Air Reducing Valve:
Manufacturer .... Westinghouse Airbrake Co.
Type N-1
Range .... 5-60 psi (0.4-4.2 kg/sq cm)
Quick Opening Valve:
Manufacturer .... Crane Co.
Manufacturer No. 12 1/2
Size .... 1/2 in . (12.7 mm)
Quick Release Valves:
Manufacturer .... Westinghouse Airbrake Co.
Manufacturer No. P52935-3
Foot Control Valves (Brakes and Throttle Air Lines):
Manufacturer .... Westinghouse Airbrake Co.
Range .... 0-150 psi (0-10.6 kg/sq cm)
Type H-1
Actuator Positioner:
Manufacturer .... Manufacturer Airbrake Co.
Type AB-1
Windshield Wiper Motor:
Manufacturer .... Trico Products
Sweep .... 60 degrees
Model .... FPSC 60J
Air Horn:
Manufacturer .... Westinghouse Airbrake Co.
Type DD-5
Wiper Control Regulating Valve:
Manufacturer .... Trico Products
Manufacturer No. 75470-5C

m. Compressed Air System Adjustments.

Air Lubricator Adjustment .... Adjust to 60 drops per minute into sight feed dome.
Air Tank Safety Relief Valve Adjustment .... Adjust to 165 psi (11.6 kg/sq cm).
Tire Air Line Safety Relief Valve Adjustment .... Adjust to 70 psi (4.9 kg/sq cm).
Air Reducing Valve Adjustment .... Adjust to 15 psi (1.1 kg/sq cm).
Air Compressor Governor Adjustment .... Adjust compressor governor to cut in at 135 psi (9.5 kg/sq cm); adjust compressor governor to cut out at 155 psi (10.9 kg/sq cm).

n. Steering System.

Marine Steering Cable:
Size .... 7/16 in . (11.1 mm) diameter

Number of Strands 6
Number wires Per Strand 19
Core..Fiber

o. Cooling System.

Oil Coolers (Gathering Box and Marine Gear):
Manufacturer (Hulls 5-24) ....Kewanee Ross
Model 301-2BFC
Manufacturer (Hulls 25-60) ....Yates American
Model FB-1-3250-2
Type ....Single pass

p. Gages and Instruments.

Air Gage (Main and Tire):
Manufacturer ....United States Gauge Div. of Ametec, Inc.
Range ....0-200 psi (0-14.1 ka/sq cm)
Manufacturer No. 644
Air Pressure Gage (Ramp Seal):
Manufacturer ....Enterprise Div. Of General Metals Corp.
Range..0-60 psi (0-4.2 kg/sq cm)
Manufacturer No. B3365
Water Temperature Gage (Engine):
Manufacturer ....Dresser Industries, Inc.
Type (Hulls 5-48) 6170TW
Type (Hulls 49-60) 6142TW
Range..20 degrees F to 200 degrees F (-7 degrees C to +93 degrees C)
Tube Length (Hulls 5-48)...15 ft (4.6 m)
Tube Length (Hulls 49-60)...18 ft (5.5 m)
Oil Temperature Gage (Engine and Transmission):
Manufacturer ....Dresser Industries, Inc.
Type (Hulls 5-48) 6170TW
Type (Hulls 49-60) 6142TW
Range..100 degrees F to 300 degrees F (38 degrees C to 149 degrees C)
Tube Length (Hulls 5-48)...12 ft (3.7 m)
Tube Length (Hulls 49-60)...18 ft (5.5 m)
Oil Temperature Gage (Gathering Box and Marine Gear):
Manufacturer ....Dresser Industries, Inc.
Type (Hulls 5-48) 6170TW
Type (Hulls 49-60) 6142TW
Range..20 degrees F to 220 degrees F (-7 degrees C to +104 degrees C)
Tube Length (Hulls 5-48) ....12 ft (3.7 m)
Tube Length (Hulls 49-60) ....18 ft C5.5 m)

Oil Pressure Gage (Engine):
- Engine .... Dresser Industries, Inc.
- Mfr . No. .... 1776 LARC
- Range .... 0-100 psi (0-7.0 kg/sq cm)

Oil Pressure Gage (Gathering Box):
- Manufacturer .... Dresser Industries, Inc.
- Mfr . No .... 1774 LARC
- Range .... 0-60 psi (0-4.2 kg/sq cm)

Oil Pressure Gage (Transmission and Marine Gear):
- Manufacturer .... Dresser Industries, Inc.
- Mfr . No. .... 1777 LARC
- Range .... 0-300 psi (0-21.1 kg/cm2)

Hydraulic Pressure Gage (Steering):
- Manufacturer .... Instrument and Gauge Div. of Electric Autolite Co.
- Model 12882-A
- Range .... 0-2,000 psi (0-140 kg/cm2)

Sight Level Gage (Hydraulic Oil Tank):
- Manufacturer .... Vickers, Inc.
- Model G-L1
- Range .... High-Low

Quantity Gage (Fuel):
- Manufacturer .... Liquidometer
- Type .... D6 -209
- Range .... 0-300 gal . (0-1135-1)

q. Winch.

Winch Cable:
- Diameter .... 5/8 in. (15 .9 mm)
- Number of Strands 6
- Number of Wires per Strand 19
- Length .... 380 ft (116 m)
- Core .... Fiber

r. Miscellaneous Hull Components.

Life Line:
- Diameter .... 5/16 in. (7.9 mm)
- Number of Strands 6
- Number of Wires per Strand 19
- Type .... Plastic-covered

Cab Ventilating Fan:
- Manufacturer .... The Gabriel Co.
- Mfr. No. 9 5-24E
- Volts .... 24 dc
- Type .... Swivel Base

1-8. DIFFERENCES IN MODELS.

Fundamentally, there is little difference between hulls 5 through 18 and hulls 19 through 60. There are approximately 35 minor structural differences, most of which are of no concern to organizational maintenance personnel. However, organizational maintenance personnel should be aware of the differences listed in table 1-1.

Table 1-1. Differences In Models

ITEM	HULLS 5 THROUGH 18	HULLS 19 THROUGH 60
Ramp Seal	Single-lip rubber seal	Double-lip rubber seal
Cargo Well Pump Motors	Model M2B-40-FL- S15	Model MF-2008-30-38-21(special)
Torque Converters	Model TC-654	Model TC-554
Air Starting Motors	Model A31RH-6, size 9BM	Model B21RH-6, size 10BM
Propeller Shafts and Fairwater Caps	Right-hand threads (port) Left-hand threads(stbd)	Left-hand threads (port and stbd)
Propeller	Three-blade	Four-blade

CHAPTER 2
MAINTENANCE INSTRUCTIONS

SECTION I. SERVICE UPON RECEIPT OF MATERIAL

2-1. GENERAL

a. When a LARC is shipped to a new area, it may be received new from the builder or new or used from storage. The LARC may arrive being towed, under its own power, or aboard a LSD, LST, or cargo vessel.

b. All LARC's arriving at their destination should be in operational condition. However, certain inspections and maintenance services must be performed before they are considered ready for use.

2-2. INSPECTING AND SERVICING.

a. General. When the LARC has been shipped on a cargo vessel or LST, there are several inspections and services that must be performed prior to unloading. There are two procedures for unloading: hoisting with the use of a 100 ton (90.7 metric ton) crane or bow launching over the side.

b. Prehoist or Prelaunch Inspection and Servicing. When the LARC is to be bow-launched, the following inspection and services shall be performed prior to installation of impact protection material.

(1) Ensure that fire extinguishers are aboard and charged.

CAUTION

If LARC is to be bow-launched, secure fire extinguishers with additional lines to ensure they will not break loose on impact.

(2) Inspect hull and exterior components for broken parts. Inspect entire LARC for loose tools or waste that may foul equipment and moving parts. Stow and secure gear; remove waste and correct any deficiencies.

(3) Check oil level in engines, transmissions, miter boxes, gathering boxes, marine gears, and air compressors. Add necessary oil (see current lubrication order).

(4) Fill hydraulic supply tanks with hydraulic fluids; fill fuel tank with fuel oil.

(5) Check to make sure that radiator compartments and keel coolers are free of debris. Check that coolant level in each expansion tank is two inches (51 mm) below filler neck.

(6) Open globe valve at bottom of each air supply tank and drain condensation. Close globe valves. Open globe valves above each air supply and check main air pressure gage for a minimum of 45 psi (3.16 kg/cm^2).

NOTE

The air starting motors require a minimum of 45 psi (3.16 kg/cm^2) to start the diesel engines in warm weather and between 75 psi (.5.27 kg/cm^2) and 100 psi (7.03 kg/cm^2) in cold weather.

(7) If air pressure is below 45 psi (3.16 kg/cm^2) and the engine cannot be started, it will be necessary to get air from another source such as a portable air compressor, another LARC, or from tire pressure. The auxiliary air connection may be used to change the LARC system from an external source of air pressure.

(8) After air pressure is built up between 135-155 psi (9.5-10.9,kg/cm^2), shut engines down.

(9) Check air lines for leaks. Check hydraulic lines for leaks or evidence of leakage. If leaks are found, notify direct support maintenance.

(10) Inspect tires for deep cuts or gouges. If tires are damaged, notify direct support maintenance personnel.

(11) Check operation of tire inflation system. Inflate or deflate tires to desired operating pressure.

NOTE

If the beach terrain or contour is unknown, depress and turn the tire inflation valve in each wheel. This will permit tire inflation or deflation from the cab if necessary.

(12) Inspect fuel pumps for leaks. If fuel pump leaks at mounting flange, tighten bolts to proper torque value.

(13) Inspect bilge pumps and cargo well pumps for broken housing. If any deficiencies are found, notify direct support maintenance personnel.

(14) Inspect battery charging alternators for security of mounting. Tighten all-loose bolts to proper torque value.

(15) Inspect alternator drivebelt for loose or broken condition. If loose or broken, adjust or replace alternator drivebelt as required.

(16) Ensure ramp, hoist cables, and ramp cylinders are free from obstructions. Ensure ramp is locked.

(17) Ensure engine emergency shutoff levers are in the down (or run) position.

(18) Ensure all bilge drain valves operate properly. Close bilge drain valves tightly.

(19) Remove tape from battery cable ends and install battery cables on battery. Service batteries.

(20) Inspect all exposed lines for lubrication oil, grease, coolant, and fuel oil leaks.

(21) Shut off fuel supply valve and fuel return valves to fuel tanks. Close and secure all doors, scuttle covers and hatches.

c. Hoisting. Install lifting slings on the lifting eyes located in the cargo well (fig. 2-1). Each LARC is equipped with lifting slings. A 100 ton (90.7 metric ton) crane is required to lift the LARC from a cargo vessel or LST.

d. Launching. When a 100 ton (90.7 metric ton) crane is not available to remove the LARC from the cargo vessel or LST, it may be bow-launched. Before bow-launching the LARC, ensure that impact protection has been installed.

WARNING

Make sure the impact area is clear of debris or other craft prior to launching the LARC.

e. Boarding and Landing.

(1) When unloading the LARC, a boat shall be standing by to place the crew and maintenance personnel aboard after the LARC has come to rest in the water.

WARNING

During launching, the boat carrying the LARC crew and maintenance personnel shall remain clear of the impact area a minimum of 300 feet (92 meters), as there is danger of capsizing or being swamped.

(2) When the LARC floats calmly and appears to be seaworthy, the boat carrying the crew and maintenance personnel can approach the LARC.

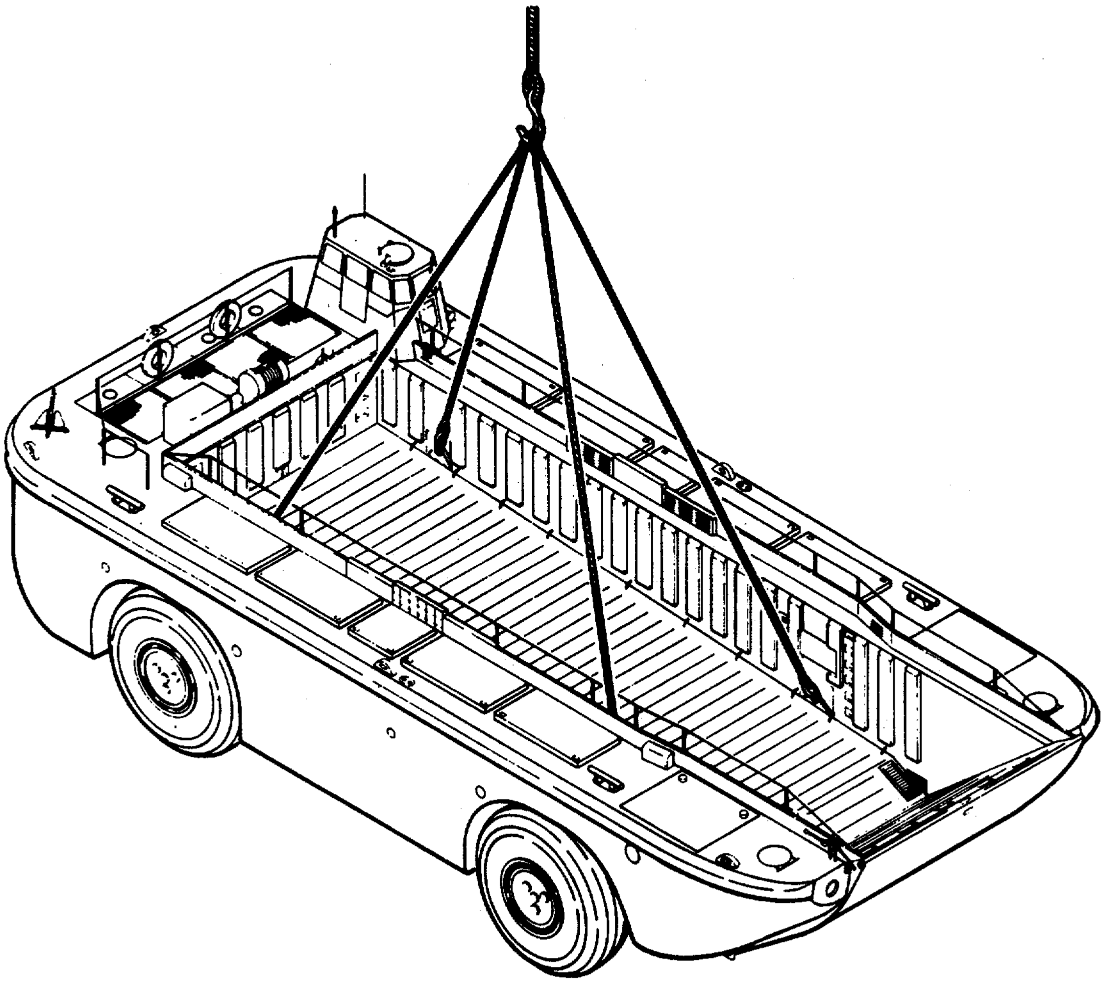


Figure 2-1. Hoisting the LARC.

(3) If the LARC is in no obvious danger of sinking, crew-members and maintenance personnel shall climb aboard using access ladder on port side.

WARNING

The boat and cargo vessel shall stand by for rescue purposes until the LARC is under way on its own power.

(4) Check bilge area for water leakage. Ensure bilge drain valves are tightly closed.

NOTE

During launching, the impact protection material will be shattered by the impact, leaving only the reinforcement and fittings to be removed. When conditions permit, reinforcement and fittings should be removed immediately after the launching. The sliding ways can be released either at the beach or immediately after the LARC has come to a standstill in the water.

(5) Remove all reinforcement lumber and securing lines. Remove lifting slings from crane and lifting eyes in cargo well.

(6) Open fuel supply and return valves. Start engines and bilge pumps to remove any water that may have entered after unloading.

2-3. UNLOADING OF EQUIPMENT FROM AN LSD.

a. General. When the LARC has been shipped on an LSD, there are several inspections and services that must be performed prior to unloading.

b. Prelaunch Inspection and Servicing.

NOTE

The following inspection and services shall be performed prior to flooding of the LSD landing well.

(1) Perform daily preventive maintenance checks and services listed in table 2-2.

(2) Ensure all bilge drain valves are closed securely.

(3) Inspect internal structure and components for broken or bent condition that may impair operation. Repair, replace or report damaged parts to direct support before launching.

(4) Ensure hydraulic oil tank is filled to proper level.

(5) Open globe valve in air supply lines at air tanks.

(6) Install battery cables if required and service batteries.

(7) Ensure that engine emergency stop levers are in the down (or run) position.

(8) Ensure cooling system is filled with proper coolant.

(9) Momentarily check operation of each cargo well pump. Correct or report any deficiencies.

(10) Start engines as follows:

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting an land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

NOTE

Ensure emergency shutoff lever is in the down (or run) position before attempting to start an engine.

(a) Place the master switch to the ON position and advance appropriate hand throttle to one-quarter open.

(b) Press the starter button for not more than 30 seconds. When the engine starts, release the starter button and set the throttle to obtain 600 rpm. Check to see that each engine runs smoothly. Run engines until air pressure builds up to 135-155 psi (9.5-10.9 kg/cm^2).

(11) Secure engines as follows:

(a) Run engines at idle for three to five minutes before securing. This allows the lubricating oil and coolant to carry the heat away from the engines.

(b) Push engine cutout valve levers all the way forward to the OFF position.

(c) After the engines have stopped, return the engine cutout valve levers to the RUN (vertical) position.

(12) Check all exposed piping and hoses for evidence of leaks. Repair as necessary.

(13) Adjust tires to desired operation pressure.

(14) If beach terrain or contour is unknown, depress and turn the tire inflation valve in each wheel. This will permit tire inflation or deflation from the cab if necessary while landing.

(15) Remove lines securing LARC to the Landing Ship Deck (LSD) well deck.

c. Launching. With the crew aboard and the LSD well flooded, start engines. en LSD tailgate is opened, proceed to open sea.

2-4. TOWED SHIPMENT.

a. General. Under favorable conditions, the LARC may be towed in protected waters such as sheltered bays, sounds, coastal waters, canals, lakes, rivers, and estuaries. Towing shall be done under the direction of a competent tug master.

CAUTION

Towing requires exercising extreme caution and sound judgment in regulating the speed of towing and the length of the towing lines.

(1) Parking brakes shall be set to prevent wheels from windmilling during towing.

NOTE

To prevent wheels from windmilling during towing, use brake pedal as a parking brake by placing the dog of the brake pedal locking device over the toe end of brake pedal when it is fully applied.

(2) Steering levers in cab shall be locked with wheels in a straight ahead position.

(3) One engine on each side of the LARC shall be kept operational while under tow to provide power for the bilge and cargo well pumps in case water is shipped.

b. Boarding and Landing.

(1) As the tug boat approaches with the LARC in tow, a boat should be standing by with the crew and maintenance personnel ready to board.

WARNING

The tug and boat shall stand by for rescue purposes until the LARC is operating under its own power.

(2) After boarding the LARC by the access ladder on the port side, disconnect the towing connections. Ensure marine gear is in neutral.

CAUTION

Do not shift gears upon boarding until the clamp is remove from the jackshafts.

(3) Shut engines down and remove rope wrapped around jackshafts.

WARNING

Be certain engines are stopped prior to removing clamp from jackshafts. If engines are running and marine gear is accidentally shifted, injury may occur to personnel removing clamp from jackshaft.

(4) Inspect entire LARC for loose tools or waste that may foul equipment and moving parts. Stow and secure loose gear.

(5) Ensure fire extinguishers are on board and are fully charged.

(6) Check air pressure gage for indication between 135 and 155 psi (9.5 and 10.9 kg/cm^2).

(7) Inspect all fuel lines for leaks. If fuel lines are leaking, tighten fittings.

(8) Ensure emergency engine stop levers are in the down (or run) position. Start engines and check steering response.

SECTION II. MOVEMENT TO A NEW WORKSITE

2-5. DISMANTLING FOR MOVEMENT.

The overall height of the LARC can be reduced approximately 4 feet (1.2 meters) by removing the cab top and canopy. Should removal of the cab top and canopy become necessary, request assistance from direct support maintenance personnel. If further height reduction is necessary to pass under an obstacle, the tires can be partially deflated.

2-6. REINSTALLATION AFTER MOVEMENT.

If the cab top has been removed during the movement to a new worksite, request the assistance of direct support maintenance personnel in reinstalling the cab top.

SECTION III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

2-7. TOOLS AND EQUIPMENT.

The special tools required to perform organizational maintenance are listed in table 2-1 and are illustrated in the section when the use of the tools is required.

2-8. SPECIAL TOOLS AND EQUIPMENT.

Any special tools in addition to those listed in table 2-1 that organizational maintenance personnel require will be listed in TM 55-1930-203-20P.

2-9. MAINTENANCE REPAIR PARTS.

Repair parts and equipment are listed and illustrated in the repair parts and special tools list covering organizational maintenance for this equipment (see TM 55-1930-203-20P).

Table 2-1. Special Tools

Item	Part No.	References Fig.	References Para.	Use
Gage, Injector Timing	J1853	2-55	2-80	Timing fuel injectors.
Gage, Governor Gap Tool	J5407	2-57	2-81	Adjusting governor gap.

SECTION IV. LUBRICATION INSTRUCTIONS

2-10. GENERAL.

General lubrication instructions for the LARC are contained in L.O. 55-1930-203-12. The following paragraphs contain lubrication instructions which are supplemental to and not specifically covered in the lubrication order.

2-11. TAILED LUBRICATION INFORMATION.

a. Care of Lubricants. All lubricants will be kept in a closed container and stored in a clean, dry place, away from extreme heat. Care will be taken to keep dirt, dust, water, or other foreign matter from contaminating the lubricants.

CAUTION

Do not use contaminated lubricants. Contaminated lubricants are harmful to equipment.

b. Points of Application. Points of application are illustrated in the lubrication order. Inspect equipment before servicing, since it is possible that various accessories may have been replaced with interchangeable units having different lubrication points or sealed bearings.

NOTE

On the lubrication order, a broken arrow shaft indicates lubrication points are located on both sides of the equipment.

c. Cleaning. By using an approved cleaning solvent, oil or hardened lubricant may be removed easily. Wipe fitting and surrounding surfaces before and after lubricant is applied.

d. Unusual Conditions. When operating under extreme conditions, such as high or low temperatures, prolonged high speeds or continued operation in sand or dust, change lubrication intervals to provide adequate lubrication.

e. Correct Grade of Lubrication. Whenever the forecast data indicates that air temperature will be consistently in the next higher or lower temperature range than that indicated on the KEY portion of the lubrication order, change to the applicable grade of lubricant.

2-12. SELF-CONTAINED LUBRICATION SYSTEM.

The marine gears, miter boxes, transmission-torque converters, gathering boxes, and column and wheel drives have lubricating oil systems that are self-contained. Each element that is lubricated is provided with a drain fitting at one or more of its lowest points.

SECTION V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-13. GENERAL.

To ensure that the LARC is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed in table 2-2. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued.

a. Before you operate. Always keep in mind the CAUTIONS and WARNINGS.. Perform your BEFORE (B) PMCS.

b. While you operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your DURING (D) PMCS.

c. After you operate. Be sure to perform your AFTER (A) PMCS.

d. If your equipment fails to operate. Troubleshoot with .proper equipment. Report any deficiencies using the proper forms, see TM 38-750.

2-14. PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Table 2-2 lists the preventive maintenance checks and services to be performed by organizational maintenance personnel.

Table 2-2. Organizational Preventive Maintenance Checks and Services

Legend

B - Before
D - During
A - After
W - Weekly
M - Monthly
Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
										STERN AND STARBOARD AREA	
1	•		•						Propeller shaft	Check propeller shafts for binding by turning propeller by hand. Report any discrepancy to direct support maintenance personnel.	
2	•		•						Propeller bushing	Lubricate propeller strut and stern tube bearing bushings. Refer to L. O. 55-1930-203-12	
3	•		•						Wheel column and drive	Check wheel column and wheel drive oil level; fill as required.	
4	•		•						Wheel column support bearings	Lubricate wheel column support bearings. Refer to L.O. 55-1930-203-12.	
5	•		•						Wheel spindle grease retainer	Fill wheel spindle grease retainer assemblies. Refer to L.O. 55-1930-203-12.	
6	•		•						Wheel columns	Check for water in wheel columns after each water operation. If a large amount of water is present, notify direct support maintenance personnel.	
7				•					Rudders	Inspect rudders for cracked, gouged or bent condition. Report any discrepancy to direct support maintenance.	
8				•					Propellers	Inspect propellers for cracked, gouged or bent condition. Report any discrepancy to direct support maintenance.	
9				•					Fairwater cap lockbolt	Check that fairwater cap lockbolt is properly lock-wired to fairweather cap	
10				•					Propeller struts	Inspect for cracked, broken or bent propeller struts. Report any discrepancy to direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services-Cont

Legend

B - Before
D - During
A - After
W - Weekly
M - Monthly
Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
										STERN AND STARBOARD AREA - Cont	
11					•				Wheel seals	Lubricate wheel seals. Refer to L.O. 55-1930-203-12.	
12					•				Cooling system coils	Inspect cooling system cooling coils for leakage or ruptures. Report any discrepancy to direct support maintenance.	
13					•				Hull plating	Inspect hull plating for rust and cracks. Clean rusted areas and spot paint as necessary. Inspect corrosion preventive anodes for deterioration. Report any discrepancy, breaks or serious hull dents to direct support rnaintenance.	
14						•			Fenders	Inspect for loose or deteriorated molded rubber fenders. Report any discrepancy to direct support maintenance.	
15						•			Wheel column oil	Drain and replace oil in wheel column and drive. Refer to L.O. 55-1930-203-12.	
16						•			Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	
										BOW AND PORT AREA	
1	•		•						Ramp hinge pins	Lubricate ramp hinge pins. Refer to L.O. 5 5-19 30-203-12.	
2	•		•						Wheel column and drive	Check wheel column and wheel drive oil level; fill as required.	

Table 2-2. Organizational Preventive Maintenance Checks and Services-Cont

Legend

B - Before | A - After | M - Monthly | S - Semiannually
D - During | W - Weekly | Q - Quarterly | A - Annually

ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
										BOW AND PORT AREA - Cont	
3	•		•						Wheel column support bearings	Lubricate wheel column support bearings. Refer to L.O. 55-1930-203-12.	
4	•		•						Wheel spindle grease retainer	Fill wheel spindle grease retainer assemblies.	
5	•		•						Wheel columns	Check for water in wheel columns after each water operation. If a large amount of water is present, notify direct support maintenance.	
6				•					Headlights	Inspect for cracked or broken headlights.	
7					•				Wheel seals	Lubricate wheel seals. Refer to L.O. 55-1930-203-12.	
8					•				Cooling system coils	Inspect cooling system cooling coils for leakage or ruptures. Report any discrepancy to direct support maintenance personnel.	
9					•				Hull Plating	Inspect hull plating for rust and cracks. Clean rusted areas and spot paint as necessary. Inspect corrosion preventive anodes for deterioration. Report any discrepancy, breaks or serious hull dents to direct support maintenance.	
10						•			Fenders	Inspect for loose or deteriorated molded rubber fenders. Report any discrepancy to direct support maintenance.	
11						•			Wheel column and drive	Drain and replace oil in wheel column and drive. Refer to L.O. 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services

Legend

B - Before
D - During
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W - Weekly
M - Monthly
Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
										BOW AND PORT AREA - Cont	
12					•				Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	
										BOTTOM AREA	
1					•				Hull plating	Inspect hull plating for rust and cracks. Clean rusted areas and spot paint as necessary. Inspect corrosion preventive anodes for deterioration. Report any discrepancy, breaks or serious hull dents to direct support maintenance.	
										PORT UPPER' MACHINERY AREA	
1	•		•						Engine fuel filters	Drain sediment and water from fuel filters.	
2	•		•						Gathering box	Check gathering box oil level and add oil as necessary. Refer to L.O. 55-1930- 203-12.	
3	•		•						Transmission	Check transmission oil level and add oil as necessary. Refer to L.O. 55-1930- 203-12.	
4	•		•						Miter box	Check miter box oil levels and add oil as necessary. Refer to L.O. 55-1930-203- 12.	
4.1	•		•						Switch, compressed Air Drain	Drain water from air supply tank by pressing switch and actuating solenoid drain valve.	
5				•					Air cleaner	Check engine air cleaner oil levels and add oil as necessary. Refer to L.O. 55-1930-203-12.	
6				•					Air gages	Inspect for bent, cracked or broken air gages in air starting motor air lines. Report any discrepancy to direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services

Legend

B - Before
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A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
										PORT UPPER MACHINERY AREA - Cont	
7				•					Air starting motor filters	Drain moisture and dirt from air starting motor filters.	
8				•					Filter element and bowl	Remove and clean air starting motor filter element and bowl.	
9				•					Motor lubricator	Check air starting motor lubricator oil levels and add oil as necessary. Refer to L.O. 55-1930-203-12.	
10				•					Lubricator	Check air starting motor lubricator operation and if necessary adjust rate of oil flow into the sight-feed dome to one drop per second by rotating oil feed adjusting screw either clockwise (decrease flow rate) or counterclockwise (increase flow rate).	
11				•					Bilge pump hoses	Inspect bilge pump discharge hoses and lines for leaks, crimps and ruptures. If discharge lines are damaged, notify direct support maintenance.	
12				•					Cargo well pump lines	Inspect cargo well pump oil lines for leaks, crimps and ruptures. Notify direct support maintenance of any damage.	
13				•					Hydraulic system lines	Inspect hydraulic system drain, supply, fill and vent lines for leaks, crimps and ruptures. If hydraulic tubing is damaged, notify direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services

Legend

B - Before　　A - After　　M - Monthly　　S - Semiannually
D - During　　W - Weekly　　Q - Quarterly　　A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
										PORT UPPER MACHINERY AREA - Cont	
14				•					Fuel system lines	Inspect fuel system tubing and hoses for leaks, crimps and ruptures. Notify direct support maintenance of any damage.	
15				•					Air system lines	Inspect compressed air system piping and tubing for leaks, crimps and ruptures. Report any discrepancy to direct support maintenance.	
16				•					Cooling system lines	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. If hoses, tubing or piping are damaged, notify direct support maintenance.	
17				•					Air cleaner	Check air compressor air cleaner oil level by removing cover and element. Refer to L.O. 55-1930-203-12.	
18				•					Engine accessories	Inspect engine mounted accessories and linkage for loose and broken connections and mountings.	
19				•					Marine drive couplings	Inspect marine drive system fluid couplings for leaks. If necessary, tighten or replace fill plug and plug gasket. Report further leakage to direct support maintenance.	
20				•					Fluid coupling	Check fluid coupling oil level. Refer to L. O. 55-1930-203-12.	
21				•					Linkage	Oil can lubricate engine emergency stop and throttle linkage. Refer to L. O. 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services

Legend

B - Before D - During A - After W - Weekly M - Monthly Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
										PORT UPPER MACHINERY AREA - Cont	
22				•					Positioners	Lubricate engine throttle actuator positioners. Refer to L.O. 55-1930-203-12.	
23				•					Couplings	Lubricate flexible couplings. Refer to L.O. 55-1930-203-12.	
24				•					Bearings	Lubricate upper and lower steering column bearings, upper and lower jackshaft bearings, cab steering bearing and steering rod bearings. Refer to L. O. 55-1930-203-12.	
25				•					Steering joints	Oil can lubricate steering lever, follow-up ball joints, bellcrank stud bearings and valve stem end shackles. Refer to L. O. 55-1930-203-12.	
26				•					Piston rods	Oil can lubricate ramp cylinder,- piston rods, transmission shift cylinder piston rods and the cargo well pump cylinder piston rod using OE oil.	
27				•					Control valves	Lubricate all control valves.	
28				•					Rust	Inspect for rust and corrosion. Clean rusted areas and spot paint as necessary. Report any breaks or serious dents to direct support maintenance.	
29					•				Crankcase	Drain and refill engine crankcase; replace both full flow and bypass oil filter elements. Refer to L. O. 55-1930-203-12 and para 2-71.	

Table 2-2. Organizational Preventive Maintenance Checks and Services

Legend

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ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
										PORT UPPER MACHINERY AREA - Cont	
30					•				Air inlet housing	Check air inlet housing for cracks. Report any discrepancy to direct support maintenance.	
31					•				Oil sediment strainer	Remove engine oil filler cap on drive gear hub support, and inspect sediment strainer and oil fill tube for obstructions and security.	
32					•				Engine mounting cushion	Inspect engine mounting cushion for deterioration and ensure mounting is secure. Report any discrepancy to direct support maintenance.	
33					•				V-belt	Inspect generator drivebelt for frayed, cracked or greasy condition. Report defective belt to direct support maintenance.	
34					•				V-belt	Adjust generator belt tension (para 2-22).	
35					•				Fire extinguisher	Inspect fire extinguisher for broken seal and obstruction of nozzle.	
36					•				Air compressor air cleaner	Clean and service the air compressor air cleaner. Refer to L. O. 55-1930-203-12 and para 2-103.	
37					•				Handwheels	Lubricate bilge drain valve handwheels. Refer to L.O. 55-1930-203-12.	
38					•				Air breathers	Check miter and gathering box air breathers for obstruction. Replace defective breathers.	

Table 2-2. Organizational Preventive Maintenance Checks and Services

Legend

B - Before A - After M - Monthly S - Semiannually
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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
										PORT UPPER MACHINERY AREA - Cont	
39					•				Bilge drain valve shaft	Lubricate bilge drain valve shaft Refer to L. O. 55-1930-203-12.	
40					•				Bilge drain valves	Check bilge drain valves for ease of operation. If binding condition exists, disconnect flexible shaft at handwheel and check for binding again. If binding still exists, replace defective valve.	
41					•				Engine filter elements	Replace engine primary and secondary fuel filter elements (para 2-65).	
42						•			Gathering box	Drain and refill gathering box. Refer to L.O. 55-1930-203-12.	
43						•			Transmission oil strainers	Remove and clean transmission oil strainers. Refer to L.O. 55-1930-203-12 and para 2-93.	
44						•			Miter box oil	Drain and replace oil in miter boxes (para 2-91).	
45						•			Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	
46							•		Fire extinguisher	Check fire extinguisher. If weight is less than that specified on nameplate, replace fire extinguisher.	
47							•		Engine	Tune engines in accordance with procedures outlined in paras 2-78 through 2-84.	
48							•		Cooling systems	Clean cooling systems and treat for winter or summer operation as applicable (para 2-124).	

Table 2-2. Organizational Preventive Maintenance Checks and Services

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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
										PORT UPPER MACHINERY AREA - Cont	
49								•	Fluid coupling	Drain and replace lubricant in fluid coupling. Refer to L.O. 55-1930-203-12.	
										PORT LOWER MACHINERY AREA	
1				•					Bilge pump lines	Inspect bilge pump discharge hose and lines for leaks, crimps and ruptures. If discharge lines are damaged, notify direct support maintenance.	
2				•					Cargo well pump lines	Inspect cargo well pump oil lines for for leaks, crimps and ruptures. Report any damage to direct support maintenance.	
3				•					Hydraulic lines	Inspect hydraulic system drain, supply, fill and vent lines for leaks crimps and ruptures. If hydraulic tubing is damaged, notify direct support maintenance.	
4				•					Air system lines	Inspect compressed air system, piping, and tubing for leaks, crimps and ruptures. Report any discrepancy to direct support maintenance.	
5				•					Cooling system lines	Inspect cooling system hoses, tubing, and piping for leaks, crimps and ruptures. If hoses, tubing or piping are damaged notify direct support maintenance.	
6				•					Flexible coupling	Lubricate angle drive shaft flexible coupling. Refer to L.O. 55-1930-203-12.	
7				•					Propeller drive shaft bearing	Lubricate marine gear propeller drive shaft bearing seal. Refer to L. O. 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services

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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
										PORT LOWER MACHINERY AREA - Cont	
8					•				Air box drain	Inspect engine air box drain tube to ensure that drain tube is not crimped, re-stricted, and is secured properly. Replace a crimped or otherwise damaged rain tube.	
9					•				Rust	Inspect for rust and corrosion Clean rusted areas and spot paint as necessary. Report any breaks or serious dents to direct support maintenance.	
9.1					•				Hydraulic oil reservoir	Inspect dip stick for level of fluid. Fill as required. Refer to L. O. 55-1930-203-12.	
10						•			Transmission filter elements	Replace transmission oil filter elements (para 2-93).	
11						•			Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	
12							•		Heat exchangers	Clean heat exchangers (para 2-124).	
13							•		Hydraulic start System Oil Filter Elements	Replace hydraulic oil filter elements (para 2-65-b)	
										CENTER PORT WATERTIGHT BILGE AREA	
1					•				Access cover	Remove area access cover and inspect seal for deterioration, hardening or cracking.	
2					•				Bilge shaft	Lubricate bilge drain valve shaft with GAA grease. Refer to L.O. 55-1930-203-12.	
3					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	

Table 2-2. Organizational Preventive Maintenance Checks and Services

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ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
										PORT BILGE MACHINERY AREA	
1	•		•						Propeller shaft glands	Inspect propeller shaft stern tube packing glands for evidence of leakage after each water operation.	
2	•		•						Marine gear	Check marine gear oil level. Refer to L.O. 55-1930-203-12.	
3	•		•						Air compressor	Check air compressor oil level. Refer to L. O. 55-1930-203-12.	
4	•		•						Propeller bushings	Lubricate propeller stern tube bearing bushings. Refer to L. O. 55-1930-203-12.	
5				•					Bilge pump lines	Inspect bilge pump discharge hose and lines for leaks, crimps and ruptures. If discharge lines are damaged, notify direct support maintenance.	
6				•					Cargo well pump lines	Inspect cargo well pump oil lines for leaks, crimps and ruptures. Report any damage to direct support maintenance.	
7				•					Hydraulic system lines	Inspect hydraulic system drain, supply, fill and vent lines for leaks, crimps and ruptures. If hydraulic tubing is damaged, notify direct support maintenance.	
8				•					Compressed air lines	Inspect compressed air system piping and tubing for leaks, crimps and ruptures. Report any discrepancy to direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services

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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting. Equipment is Not Ready/Available If:
										PORT BILGE MACHINERY AREA - Cont	
9				•					Cooling system lines	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. It hoses, tubing or piping are damaged notify direct support maintenance.	
10				•					Takeoff shaft bearings	'Lubricate marine gear input and power takeoff shaft bearings. Refer to L. O. 55-1930-203-12. Remove and clean marine gear oil sediment strainer (para 2-100).	
11					•				Rust	Inspect for rust and corrosion. Clean rusted areas and spot paint as necessary. Report any breaks or serious dents to direct support maintenance.	
12					•				Air compressor	Drain and replace air compressor oil (para 2-104).	
13						•			Flexible coupling	Inspect air compressor to marine gear flexible coupling for loose or deteriorated inserts. Replace damaged inserts. Report loose or broken flexible coupling to direct support maintenance.	
14						•			Marine gear	Drain and replace marine gear oil (para 2-100).	
15						•			Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any dis- crepancy to direct support rnaintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before	A - After	M - Monthly	S - Semiannually
D - During	W - Weekly	Q - Quarterly	A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									PORT BILGE MACHINERY AREA - Cont		
16								•	Tank interior	Close port air supply system globe valve and open air supply tank drain valve. Remove tank inspection plugs and, using a light, inspect tank interior for rust and corrosion. Report any discrepancy to direct support maintenance.	
									BULKHEAD TO WATERTIGHT BILGE AREA		
					•				Access cover	Remove area access cover and inspect seal for deterioration, hardening or cracking.	
2					•				Bilge drain valve shaft	Lubricate bilge drain valve shaft with GAA grease.	
3					•				Limber holes	Inspect limber holes for obstructions.	
4					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot-paint as necessary.	
5						•			Access cover	Remove access cover and inspect hydraulic of tank for corrosion or leakage. Clean rusted areas and spot-paint as necessary.	
6							•		Gaskets	Inspect gaskets around access opening for deterioration, hardening, or cracking.	
7							•		Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before
D - During
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ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
									BULKHEAD 3-TO-2 WATERTIGHT BILGE AREA		
1							•		Access cover	Remove area access cover and inspect seal for deterioration, hardening or cracking.	
2							•		Limber holes	Inspect limber holes for obstructions.	
3							•		**Rust**	Inspect for signs of rust and corrosion. Clean rusted areas and spot-paint as necessary.	
									PORT CARGO WELL PUMP AREA (WING COMPARTMENT)		
1	•		•						Cargo well pump oil tank	Check cargo well pump oil tank level and add OE10 oil as required.	
2				•					Ramp cable or broken strands.	Inspect ramp cable for frayed Coat cable with OE30 oil and lubricate sheaves with GAA grease.	
3				•					Hydraulic cylinder	Inspect ramp hydraulic cylinder for leaks at piston rod or for ruptures. Report any discrepancy to direct support maintenance.	
4				•					Fuel system tubing	Inspect for crimped, leaking or ruptured fuel system tubing and hoses. Report damaged components to direct support maintenance.	
5				•					Hydraulic system lines	Inspect for crimped, leaking or ruptured hydraulic system lines. Report any discrepancy to direct support maintenance.	
6				•					Ramp cylinder piston rod	Oil can lubricate ramp cylinder pulsation rod. Refer to L.O. 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

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ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
									PORT CARGO WELL PUMP AREA (WING COMPARTMENT) - Cont		
7				•					Motor shaft bearing	On hulls 5 through 18, equipped with Vickers Model M2B-40-FL-S15 cargo well pump motor, lubricate motor shaft bearing with GAA grease.	
8					•				Scuttle cover	Inspect compartment scuttie cover for defects. Report any discrepancy to direct support maintenance.	
9					•				Cover gasket	Inspect cover gasket for breakage, deterioration or looseness. If loose, glue to cover using 3M rubber cement (item 14, App D). If broken or deteriorated, strip gasket from cover, clean seat and install new gasket using 3M rubber cement (item 14, App D).	
10					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot-paint as necessary.	
11					•				Drain valve handwheel	Lubricate bilge drain valve handwheel. Refer to L. O. 55-1930-203-12.	
12					•				Bilge drain valves	Check bilge drain valves for ease of operation. If binding condition exists, disconnect flexible shaft at handwheel, and check for binding again. If binding still exists, replace defective valve.	
13					•				Ramp cable	Coat ramp cable with oil. Refer to L. O. 55-1930-203-12.	

2-27

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before | A - After | M - Monthly | S - Semiannually
D - During | W - Weekly | Q - Quarterly | A - Annually

ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
									PORT CARGO WELL PUMP AREA (WING COMPARTMENT) - Cont		
14	.					•			Filter element	Remove and clean fuel system fluid pressure filter element (para 2-87).	
15						•			Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	
									PORT CARGO WELL DRAIN AREA		
1									Bilge drain valve	Lubricate bilge drain valve shaft with GAA grease. Refer to L.O. 55-1930-203-12.	
2					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot-paint as necessary.	
									STARBOARD CARGO WELL PUMP AREA		
1	•	•							Cargo well pump oil tank	Check cargo well pump oil tank level and add OE10 oil as required. Refer to L. O. 55-1930-203-12.	
2			•						Ramp cable	Inspect ramp cable for frayed or broken strands. Coat cable with OE30 oil and lubricate sheaves with GAA grease. Refer to L. **O.** 55-1930-203-12.	
3			•						Hydraulic cylinder	Inspect ramp hydraulic cylinder for leaks at piston rod or for ruptures. Report any discrepancy to direct support maintenance.	
4			•						Fuel lines	Inspect for crimped, leaking or ruptured fuel system tubing and hoses. Report damaged components to direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD CARGO WELL PUMP AREA - Cont		
5				•					Hydraulic lines	Inspect for crimped, leaking ruptured hydraulic system lines. Report any discrepancy to direct support maintenance.	
6				•					Air system lines	inspect for crimped, leaking or ruptured compressed air system lines and tubing. Report any discrepancy to direct support maintenance.	
7				•					Ramp cylinder piston rod	Oil can lubricate ramp cylinder piston rod using OE oil. Refer to L. O. 55-1930-203-12.	
8				•					Motor shaft	On hulls 5 through 18, equipped with Vickers Model M2B-40-FL-S15 cargo well pump motor, lubricate motor shaft bearing with GAA grease. Refer to L. O. 55-1930-203-12.	
9					•				Scuttle cover	Inspect compartment scuttle cover for defects. Report any discrepancy to direct support maintenance.	
10					•				Cover gasket	Inspect cover gasket for breakage, deterioration or looseness. If loose, glue to cover using 3M rubber cement (item 14, App D). If broken or deteriorated, strip gasket from cover, clean seat and install new gasket using 3M rubber cement (item 14, App D).	
11					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot-paint as necessary.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD CARGO WELL PUMP AREA - Cont		
12					•				Handwheel	Lubricate bilge drain valve handwheel. Refer to L. O. 55-1930-203-12.	
13									Bilge drain valves	Check bilge drain valves for ease of operation. binding condition exists, disconnect flexible shaft at handwheel and check for binding again. If binding still exists, replace defective valve.	
14					•				Ramp cable	Coat ramp cable with oil. Refer to L.O. 55-1930-203-12.	
15						•			Fuel filter elements	Remove and clean fuel system pressure filter elements (para 2-87).	
16									Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	
									STARBOARD CARGO WELL DRAIN AREA		
1					•				Valve shaft	Lubricate bilge drain valve shaft with GAA grease.	
2					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot-paint as necessary.	
									STARBOARD UPPER MACHINERY AREA		
1	•	•							Fuel filters	Drain sediment and water from engine fuel filters.	
2	•	•							Gathering box	Check gathering box oil level and add oil as necessary. Refer to L. O, 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
D - During W - Weekly Q - Quarterly A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD CARGO WELL PUMP AREA - Cont		
3	•	•							Transmission	Check transmission oil level and add oil as necessary. Refer to L.O. 55-1930-203-12.	
4	•	•							Miter box	Check meter box oil levels and add oil as necessary. Refer to L.O. 55-1930-203-12.	
5			•						Air cleaner	Check engine air cleaner oil levels and add oil as necessary. Refer to L. O. 55-1930-203-12.	
6			•						Air gages	Inspect for bent, cracked or broken air gages in air starting motor air lines. Report any discrepancy to direct support maintenance.	
7			•						Motor filters	Drain moisture and dirt from air starting motor filters. Remove and clean air starting motor filter element and bowl.	
8			•						Motor lubricator	Check air starting motor lubricator oil levels and add oil as necessary. Refer to L.O. 55-1930-203-12.	
9			•						Motor lubricator	Check air starting motor lubri cator operation and if necessary adjust rate of oil flow into the sight-feed dome to one drop per second by rotating oil feed adjusting screw either clockwise (decrease flow rate) or counter-clockwise (increase flow rate).	
10			•						Accessories	Inspect engine mounted accessories and linkage for loose and broken connections and mountings.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
D - During W - Weekly Q - Quarterly A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD CARGO WELL PUMP AREA - Cont		
11				•					Fluid couplings	Inspect main drive system fluid couplings for leaks. E necessary, tighten or replace fill plug and plug gasket. Report further leakage to direct support maintenance.	
12				•					Fluid couplings	Check fluid coupling oil level. Refer to L. O. 55-1930-203-12.	
13				•					Steering cable	Inspect marine steering cable for broken strands and fraying. If necessary replace cable portions (para 2-122).	
14				•					Steering cable	Lubricate marine steering cable with OE30 oil. Refer to L.O. 55-1930-203-12. Inspect bilge pump discharge hose and lines for leaks, crimps and ruptures. E discharge lines are damaged, notify direct support maintenance.	
15				•					Oil lines	Inspect cargo well pump oil lines for leaks, crimps and ruptures. Report darnaged lines to direct support rnaintenance.	
16				•					Hydraulic lines	Inspect hydraulic system drain, supply, fill and vent lines for leaks, crimps and ruptures. If hydraulic tubing is damaged, notify direct support maintenance.	
17				•					Fuel lines	Inspect fuel system tubing and hoses for leaks, crimps and ruptures. Report damaged lines to direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before　　A - After　　M - Monthly　　S - Semiannually
D - During　　W - Weekly　　Q - Quarterly　　A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD UPPER MACHINERY AREA - Cont		
18				•					Air system lines	Inspect compressed air system piping and tubing for leaks, crimps and ruptures. Report any discrepancy to direct support rnaintenance.	
19				•					Cooling hoses	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. If hoses, tubing or piping are damaged notify direct support rnaintenance.	
20				•					Air cleaner	Check air compressor air cleaner oil level by removing cover and element. Refer to L.O. 55-1930-203-12.	
21				•					Positioners	Lubricate engine throttle actuator positioners. Refer to L.O. 55-1930-203-12.	
22				•					Throttle linkage	Oil can lubricate engine emergency stop and throttle linkage. Refer to L. O. 55-1930-203-12.	
23				•					Flexible coupling	Lubricate flexible couplings. Refer to L. O. 55-1930-203-12.	
24				•					Piston rods	Oil can lubricate ramp cylinders piston rods, transmission shift cylinders piston rods and the cargo well pump cylinder piston rod using OE oil. Refer to L.O. 55-1930-203-12.	
25				•					Control valves	Lubricate all control valves.	
26				•					Batteries	Check fluid level in batteries. Add distilled 'water, (item 5, App D) as required until level reaches bottom of cell covers.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before   A - After   M - Monthly   S - Semiannually
D - During   W - Weekly   Q - Quarterly   A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD UPPER MACHINERY AREA - Cont		
27					•				Rust	Inspect for rust and corrosion. Clean rusted areas and spot-paint as necessary. Report any breaks or serious dents to direct support rnaintenance.	
28					•				Crankcase	Drain and refill engine crankcase, replace both full flow and bypass oil filter elements Refer to L. O. 55-1930-203-12 and para 2-71.	
29	e				•				Air inlet housing	Check air inlet housing for cracks. Report any discrepancy to direct support maintenance.	
30	e				•				Sediment strainer	Remove engine oil filter cap on drive gear hub support, and inspect sediment strainer and oil fill tube for obstructions and security.	
31					•				Engine mounting cushion	Inspect engine mounting cushion for deterioration and ensure mounting is secure. Report any discrepancy to direct support maintenance.	
32					•				Battery charging alternator	Remove three capscrews, flat washers, lockwashers and nuts securing battery charging alternator and cover. Remove regulator from housing and check conditions of brushes and commutator. If brushes are not oil soaked or cracked and rotor contacting surfaces are smooth, they may be reused, otherwise report to direct support maintenance.	
33					•				Alternator belt	Inspect alternator drivebelt for frayed, cracked or greasy condition. Report defective belt to direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before | A - After | M - Monthly | S - Semiannually
D - During | W - Weekly | Q - Quarterly | A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD UPPER MACHINERY AREA - Cont		
34					•				Alternator belt	Adjust alternator belt tension. (para 2-22)	
35					•				Fire extinguisher	Inspect fire extinguisher for broken seal and obstruction of nozzle.	
36					•				Air cleaner	Clean and service the air compressor air cleaner. Refer to L.O. 55-1930-203-12 and para 2-103.	
37					•				Drain valve handwheel	Lubricate bilge drain valve handwheel and shaft. Refer to L.O. 55-1930-203-12.	
38					•				Drain valves	Check bilge drain valves for ease of operation. If binding condition exists, disconnect flexible shaft at handwheel, and check for binding again. If binding still exists, replace flexible shaft.	
39					•				Miter and gathering boxes	Check miter and gathering box air breathers for obstruction. Replace defective breathers.	
40						•			Engine fuel filters	Replace engine primary and secondary fuel filter elements (para 2-65).	
41						•			Gathering box	Drain and refill gathering box. Refer to L. O. 55-1930-203-12.	
42						•			Batteries	Inspect batteries for loose or broken terminals.	
43						•			Battery cables	Inspect battery cables for deteriorated insulation.	
44						•			Transmission oil strainers	Remove and clean transmission oil strainers. Refer to L.O. 55-1930-203-12 and para 2-93.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
D - During W - Weekly Q - Quarterly A - Annually

ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
									STARBOARD UPPER MACHINERY AREA - Cont		
45						•			Miter box	Drain and replace oil in miter boxes (para 2-91).	
46						•			Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	
47							•		Fire extinguisher	Check fire extinguisher. T weight is less than that specified on nameplate, replace fire extinguisher.	
48							•		Engines	Tune engines in accordance with procedures outlined in paras 2-78 through 2-84.	
49							•		Cooling system	Clean cooling systems and treat for winter or summer operation (para 2-124).	
50								•	Fluid coupling	Drain and replace lubricant in fluid coupling. Refer to L.O. 55-1930-203-12.	
									STARBOARD LOWER MACHINERY AREA		
1				•					Bilge pump lines	Inspect bilge pump discharge hose and lines for leaks, crimps and ruptures. E discharge lines are damaged, notify direct support maintenance.	
2				•					Well pump oil lines	Inspect cargo well pump oil lines for leaks, crimps and ruptures. Report damaged lines to direct support maintenance.	
3				•					Hydraulic lines	Inspect hydraulic system drain, supply, fill and vent lines for leaks, crimps and ruptures. If hydraulic tubing is damaged, notify direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
D - During W - Weekly Q - Quarterly A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD LOWER MACHINERY AREA - Cont		
4				•					Air. system lines	Inspect compressed air system piping and tubing for leaks, crimp and ruptures. Report any discrepancy to direct support maintenance.	
5				•					Cooling lines	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. If hoses, tubing or piping are damaged notify direct support maintenance.	
6				•					Flexible coupling	Lubricate angle drive shaft coupling. Refer to L. O. 55-1930-203-12.	
7				•					Propeller shaft bearing seal	Lubricate marine gear propeller drive shaft bearing seal with GAA grease. Refer to L. O. 55-1930-203-12.	
8					•				Air box drain tube	Inspect engine air box drain tube to ensure that drain tube is not crimped, restricted, and is secured properly. Replace a crimped or otherwise damaged drain tube.	
9					•				Rust	Inspect for rust and corrosion.' Clean rusted areas and spot paint as necessary. Report any breaks or serious dents to direct support rnaintenance.	
10						•			Oil filter elements	Replace transmission oil filter elements (para	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
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ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
									STARBOARD LOWER MACHINERY AREA - Cont		
11						•			Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	
12							•		Heat exchangers	Clean heat exchangers (pra 2-124).	
									CENTER STARBOARD WATERTIGHT BILGE AREA		
1					•				Access cover	Remove area access cover and inspect seal for deterioration, hardening or cracking.	
2					•				Drain valve shaft	Lubricate bilge drive valve shift with GAA grease; Refer to L. O. 55-1930203-12.	
3					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot-paint as necessary.	
									STARBOARD BILGE MACHINERY AREA		
1	•	•							Packing glands	Inspect propeller shaft stern tube packing glands for evidence of leakage after each water operation.	
2	•	•							Marine gear	Check marine gear oil level. Refer to L. O. 55-1930-203-12.	
3	•	•							Air compressor	Check air compressor oil level. Refer to L. O. 55-1930-203-12.	
4	•	•							Bushings	Lubricate propeller stern tube bearing bushings. Refer to L.O. 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before
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A - After
W - Weekly
M - Monthly
Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD BILGE MACHINERY AREA - Cont		
5				•					Takeoff shaft bearings	Lubricate marine gear input and power takeoff shaft bearings. Refer to L. O. 55-1930-203-12.	
6				•					Flexible coupling	Inspect air compressor to marine gear flexible coupling for loose or deteriorated inserts. Replace damaged inserts. Report loose or broken flexible coupling to direct support maintenance.	
7				•					Oil lines	Inspect cargo well pump oil lines for leaks, crimps and ruptures. Report damaged lines to direct support rnaintenance.	
8				•					Hydraulic system lines	Inspect hydraulic system drain, supply, fill and vent lines for leaks, crimps and ruptures. It hydraulic tubing is damaged, notify direct support rnaintenance.	
9				•					Air system lines	Inspect compressed air system piping and tubing for leaks, crimps and ruptures. Report any discrepancy to direct, support maintenance.	
10				•					Cooling system lines	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. If hoses, tubing or piping are damaged notify direct support maintenance.	
11				•					Bilge pump lines	Inspect bilge pump discharge hose and lines for leaks, crimps and ruptures. If discharge lines are damaged, notify direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
D - During W - Weekly Q - Quarterly A - Annually

ITEM NO.	INTERVAL								Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
	B	D	A	W	M	Q	S	A			
									STARBOARD BILGE MACHINERY AREA - Cont		
12				•					Hydraulic oil tank	Check hydraulic oil tank level at sight gage and add the correct OE oil as required. Refer to L. O., 55-1930-203-12.	
13					•				Rust	Inspect for rust and corrosion. Clean rusted areas and spot paint as necessary. Report any breaks or serious dents to direct support maintenance.	
14					•				Air compressor	Drain and replace air compressor oil (para 2-104).	
15	.				•				Drain valve shaft	Lubricate bilge drain valve shaft with GAA grease.	
16					•				Bilge pump	Lubricate bilge pump. Refer to L.O. 55-1930-203-12.	
17					•				Bilge pump strainers	Inspect bilge pump strainers for bent, broken, or clogged condition. If a strainer is damaged or clogged, remove attaching screws and clean or replace strainer.	
18					•				Hydraulic oil tank	Inspect for leakage around hydraulic oil tank access cover. Report any discrepancy to direct support maintenance.	
19						•			Oil strainer	Remove and clean marine gear oil sediment strainer (para 2-100).	
20						•			Marine gear oil.	Drain and replace oil in marine gear (para 2-100).	
21						•			Electrical wiring	Inspect electrical wiring for frayed or deteriorated insulation. Report any discrepancy to direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before | A - After | M - Monthly | S - Semiannually
D - During | W - Weekly | Q - Quarterly | A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									STARBOARD BILGE MACHINERY AREA - Cont		
22								•	Tank interior	Close port air supply system globe valve and open air supply tank drain valve. Remove tank inspection plugs and, using a light, inspect tank interior for rust and corrosion. Report any discrepancy to direct support maintenance.	
23								•	Hydraulic oil filters	Refer LARC to direct support maintenance personnel for cleaning of hydraulic oil tank filters.	
									AFT STARBOARD STORAGE AREA		
1				•					Bilge pump lines	Inspect bilge pump discharge hose and lines. for leaks, crimps and ruptures. If discharge lines are damaged, notify direct support maintenance.	
1.1	•		•						Portable Toilet	Inspect that waste holding tank is empty before operation, empty after. Open and close holding tank valve with lid closed before operations to vent any pressure buildup. Fill fresh water tank; in winter, add 4 quarts toilet anti-freeze.	
2				•					Cargo well pump lines	Inspect cargo well pump oil lines to leaks, crimps and ruptures. Report darnaged lines to direct support maintenance.	
3				•					Cooling system lines	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. If hoses, tubing or piping are darnaged, notify direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									AFT STARBOARD STORAGE AREA - Cont		
4				•					Steering cable	Inspect marine steering cable for broken strands and fraying. If necessary re-place cable portions (para 2-122).	
5				•					Steering cable	Lubricate marine steering cable with OE30 oil. Refer t L.O. 55-1930-203-12.	
6						•			Scuttle cover	Inspect scuttle cover and seal for damage. If necessary, replace seal. If cover is damaged, notify direct support maintenance.	
7						•			Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	
8						•			Hanrdwheels	Lubricate bilge drain valve handwheels. Refer to L.O. 55-1930-203-12.	
9						•			Drain valves	Check bilge drain valves for ease of operation. If binding condition exists, disconnect flexible shaft at handwheel, and check for binding again. If binding still exists, re-place drain valve.	
10						•			Steering cable sheave	Lubricate marine steering cable sheave with GAA grease. Refer to L. **O.** 55-1930-203-12.	
									AFT STARBOARD WATERTIGHT BILGE AREA		
1	.					•			Access cover	Remove area access cover and inspect seal for de-terioration, hardening or cracking.	
2						•			Drain valve shaft	Lubricate right drain valve shaft with GAA grease. Refer to L. O. 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									AFT STARBOARD WATER BILGE AREA - Cont		
3					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	
4							•		Rust	Inspect for rust and corrosion. Clean rusted areas and spot paint as necessary. Report any breaks or serious dents to direct support maintenance.	
									MARINE STEERING AREA		
1	•		•						Bushings	Lubricate rudder stock bushings. Refer to L. O. 55-1930-203-12.	
2	•		•						Bearing bushings	Lubricate propeller shaft strut bearing bushings. Refer to L. O. 55-1930-203-12.	
3	.			•					Steering cable	Inspect marine steering cable for broken strands and fraying. If necessary, replace cable portions (para 2-122).	
4				•					Steering cable	Lubricate marine steering cable with OE30 oil. Refer to L.O. 55-1930-203-12.	
5				•					Radiator tank	Inspect lower radiator tank for signs of coolant leakage. Report any discrepancy to direct support maintenance.	
6				•					Bilge pump hoses	Inspect bilge pump discharge hoses and lines for leaks, crimps and ruptures. If discharge lines are damaged, notify direct support maintenance.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

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B - Before
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A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									MARINE STEERING AREA - Cont		
7				•					Cargo well pump lines	Inspect cargo well pump oil lines for leaks, crimps and ruptures. Report damaged lines to direct support maintenance.	
8				•						drain, supply, fill and vent lines for leaks, crimps and ruptures. If hydraulic tubing is darnaged, notify direct support rnaintenance.	
9				•					Air system lines	Inspect compressed air system piping and tubing for leaks, crimps and ruptures. Report any discrepancy to direct support rnaintenance.	
10				•					Cooling lines	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. If hoses, tubing or piping are damaged notify direct support maintenance.	
11					•				Rust	Inspect for rust and corrosion. Clean rusted areas and spot paint as necessary. Report any breaks or serious dents to direct support maintenance.	
12					•				Valve handwheel	Lubricate bilge drain valve handwheels. Refer to L. O. 55-1930-203-12.	
13					•				Drain valves	Check bilge drain valves for ease of operation. If binding condition exists, disconnect flexible shaft at handwheel, and check for binding again. To binding still exists, replace flexible shaft.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									FAN AND FORWARD RADIATOR AREA		
1							•		Gaskets	Remove radiator: duct access covers and inspect cover gaskets for hardening, cracking or deterioration.	
2							•		Fan motor	Remove radiator duct access covers and inspect fan motor for leaks around hydraulic lines and connections. Report any discrepancy to direct support maintenance.	
									AFT BILGE AREA		
1				•					Bilge pump lines	Inspect bilge pump discharge hoses and lines for leaks, crimps and ruptures. If discharge lines are darnaged, notify direct support maintenance.	
2				•					Cargo well pump lines	Inspect cargo well pump oil lines for leaks, crimps, and ruptures. Report darnaged lines to direct support maintenance.	
3				•					Hydraulic lines	Inspect hydraulic system drain, supply, fill and vent lines for leaks, crimps and ruptures. If hydraulic tubing is darnaged, notify direct support maintenance.	
4				•					Cooling lines	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. If hoses, tubing or piping are damaged, notify direct support maintenance.	
5					•				Strainers	Inspect bilge pump strainers for bent, broken, or clogged condition. E a strainer is damaged or clogged, remove attaching screws and clean or replace strainer.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									AFT BILGE AREA - Cont		
6					•				Drain valve shaft	Lubricate bilge drain valve shaft with GAA grease. Refer to L. . 55-1930-203-12.	
7					•				Limber holes	Inspect limber holes for obstructions.	
8					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	
									BULIKHEAD 14-TO-6 WATERTIGHT BILGE AREAS		
1						•			Cover seal	Remove access cover and inspect cover seal for hardening, cracking or deterioration.	
2						•			Limber holes	Inspect limber holes for obstructions.	
									BULKHEAD 14-TO-11 WATERTIGHT BILGE AREAS		
1						•			Hydraulic lines	Inspect hydraulic system drain, supply, fill and vent lines for leaks, crimps and ruptures. hydraulic tubing is damaged, notify direct support maintenance.	
2						•			Air system	Inspect compressed air system piping and tubing for leaks, crimps and ruptures. Report any discrepancy to direct support maintenance.	
3						•			Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before | A - After | M - Monthly | S - Semiannually
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ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									AFT PORT STORAGE AREA - Cont		
1				•					Hydraulic system	Inspect hydraulic system drain, supply, fill and vent lines for leaks, crimps and ruptures. If hydraulic tubing is damaged, notify direct support maintenance.	
2				•					Air system	Inspect compressed air system piping and tubing for leaks, crimps and ruptures. Report any discrepancy to direct support maintenance.	
3				•					Cooling system	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. If hoses, tubing or piping are damaged, notify direct support maintenance.	
4				•					Steering column	Lubricate steering column bearings and jackshaft bear-ings. Refer to L.O. 55-1930-203-12.	
5				•					Air filter	Drain moisture and foreign matter from main air supply filter (para 2-107).	
6					•				Handwheels	Lubricate bilge drain valve handwheels. Refer to L.O. 55-1930-203-12.	
7					•				Drain valves	Check bilge drain valves for ease of operation. If binding condition exists, disconnect flexible shaft at handwheel, and check for binding again. If binding still exists, re-place flexible shaft.	
8					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
D - During W - Weekly Q - Quarterly A - Annually

ITEM NO.	B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									AFT PORT STORAGE AREA - Cont		
9					•				Air filter	Clean main air supply filter chamber and element (para 2-107).	
9.1					•				Air Dryer	Inspect air dryer sight glass. Replace Filter when fluid visible in glass (para 2 -10 7. 1)	
10					•				Seal	Remove area access cover and inspect seal for deterioration, hardening or cracking.	
11					•				Valve shaft	Lubricate bilge drain valve shaft with GAA grease. Refer to L.O. 55-1930-203-12.	
									INTERIOR CAB AREA		
1				•					Hydraulic system	Inspect hydraulic system drain, supply, fill and vent lines for leaks, crimps and ruptures. I hydraulic tubing is damaged, notify direct support maintenance.	
2				•					Air system	Inspect compressed air system piping and tubing for leaks, crimps and ruptures. Report any discrepancy to direct support maintenance.	
3				•					Cooling system	Inspect cooling system hoses, tubing and piping for leaks, crimps and ruptures. It hoses, tubing or piping are damaged, notify direct support maintenance.	
4				•					Hatch rails	Oil can lubricate sliding batch rails and dog latches on hulls 5 through 18. Refer to L. O. 55-1930-203-12.	
5				•					Scuttle cover	Oil can lubricate scuttle cover hinges and latch on hulls 19 through 60. Refer to L. O. 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before | A - After | M - Monthly | S - Semiannually
D - During | W - Weekly | Q - Quarterly | A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									INTERIOR CAB AREA - Cont		
6				•					Pivot shaft	Oil can lubricate pivot shaft of tire inflation pilot air valve control lever. Refer to L.O. 55-1930-203-12.	
7				•					Fan motor	Oil can lubricate radiator fan motor controls. Refer to L.O. 55-1930-203-12.	
8				•					Pivot shaft	Oil can lubricate pivot shaft of cargo well pump pilot air valves control lever. Refer to L. O. 55-1930-203-12.	
9				•					Steering lock	Oil can lubricate steering lever lock. Refer to L.O. 55-1930-203-12.	
10				•					Steering bearing	Lubricate steering column bearing.	
11				•					Lever locks	Oil can lubricate lever locks on engine cutout control valves. Refer to L. O. 55-1930-203-12.	
12				•					Window latch	Oil can lubricate window latch. Refer to L. O. 55-1930-203-12.	
13				•					Seat controls	Oil can lubricate operator seat controls. Refer to L.O. 55-1930-203-12. Inspect upholstery and springs for damage. Report any discrepancy to direct support maintenance.	
14				•					Pivot shaft	Oil can lubricate pivot shaft of hand throttle control valves control lever. Refer to L. O. 55-1930-203-12.	
15				•					Foot control valves	Oil can lubricate foot control valves. Refer to L. **O.** 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before A - After M - Monthly S - Semiannually
D - During W - Weekly Q - Quarterly A - Annually

ITEM NO.	B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									INTERIOR CAB AREA - Cont		
16				•					Pivot shaft	**Oil** can lubricate pivot shaft of transmission shifting control valves control lever. Refer to L. O. 55-1930-203-12.	
17					•				Scuttle cover	On hulls 19 through 60, inspect scuttle cover and seal for damage. If necessary, replace seal. It cover is damaged, notify direct support rnaintenance.	
18					•				Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	
19					•				Fire extinguisher	Inspect fire extinguisher for broken seal and obstruction of nozzle.	t
20						•			Fire extinguisher	Check fire extinguisher. If weight is less than that specified on nameplate, replace fire extinguisher.	
									DECKS, CARGO WELL AND RAMP AREA		
1	•		•						Winch cable	Clean winch cable and coat with used crankcase o**il.**	
2	•		•						Winch gearcase	Check level of oil in winch gearcase. Refer to L.O. 55-1930-203-12.	
3				•					Ramp latches	Oil can lubricate ramp latches, ramp control valves and cable eyes. Refer to L. O. 55-1930-203-12.	
4				•					Hinges and latches	Oil can lubricate upper machinery compartment hinges and latches. Refer to L.O. 55-1930-203-12.	
5				•					Hinges	Oil can lubricate cab window and door hinges. Refer to L.O. 55-1930-203-12.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before
D - During
A - After
W - Weekly
M - Monthly
Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									DECKS, CARGO WELL AND RAMP AREA - Cont		
6				•					Searchlight shaft	Oil can lubricate searchlight shaft. Refer to L. O. 55- 1930-203-12.	
7				•					Winch controls	Oil can lubricate winch controls. Refer to L. O. 55-1930-203-12. It winch has not been used. coat outer cable come with used crankcase oil.	
8				•					Radiator fan motor	Apply GAA grease, refer to L.O. 55-1930-203-12, to center of radiator fan motor shaft to prevent water gentling into motor bearing area.	
9				•					Ramp seal	Check ramp seal for leakage (**para** 2-46).	
9.1				•					Ramp seal protector	Check Ramp seal protector for free movement. Apply GAA grease, Refer to L.O. 55-1930-203-12.	I
10				•					Scuttle covers	Oil can lubricate the scuttle covers, hinges and dog bolts. Refer to L.O. 55-1930-203-12.	
11					•				Access covers	Inspect machinery compartment hatch access covers and seals for cracks, chips or looseness. Replace defective seals. Remove any rust from gasket seats with a wire brush.	
12					•				Rust	Inspect cab exterior for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	
13					•				**Rust**	Inspect decks, cargo well and ramp for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before
D - During
A - After
W - Weekly
M - Monthly
Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									DECKS, CARGO WELL AND RAMP AREA - Cont		
14					•				Scuttle cover	Inspect scuttle cover and seal for damage. If necessary, replace seal. If cover is damaged, notify direct support maintenance.	
15					•				Winch cable	Unwind entire winch cable and coat with used crank-case oil.	
16						•			Winch cable	Unwind entire winch cable and clean cable using a brush, soak cable with PL (Special) lubricating oil. Wipe off excess oil and coat cable with CW lubricating oil. Prior to rewinding cable, coat winch drum with CW lubricating oil.	
									RADIATOR UPPER MOUNT AREA		
1						•			Access cover seal	Remove area access cover an inspect seal for deteriora-tion, hardening or cracking.	
2						•			Radiator hose	Remove access covers and check radiator hose for deterioration, security and leakage. E hose is loose, tighten hose clamps. Re-port defective hose to direct support rnaintenance.	
3						•			Radiator	Remove four radiator access covers and inspect top of radiators for leaks. NT radiators are leaking, re-port darnaged radiator to direct support maintenance personnel. Install radiator access plate.	
4						•			Rust	Inspect for signs of rust and corrosion. Clean rusted areas and spot paint as necessary.	

Table 2-2. Organizational Preventive Maintenance Checks and Services -Cont

Legend

B - Before　A - After　M - Monthly　S - Semiannually
D - During　W - Weekly　Q - Quarterly　A - Annually

ITEM NO.	INTERVAL B	D	A	W	M	Q	S	A	Item To Be Inspected	Procedures	For Readiness Reporting Equipment is Not Ready/Available If:
									AFT RADIATOR AREA		
1							•		Rust	Remove stern louvers and inspect for sign of rust and corrosion. Clean rusted areas and spot paint as necessary.	
2							•		Radiator	Inspect radiator for leakage, rust and corrosion. Report any discrepancy to direct support maintenance.	

SECTION VI, TROUBLESHOOTING

2-15. GENERAL.

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the LARC 'and its components. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests, inspections, or corrective actions. If you experience a malfunction which is not listed or is not remedied by listed corrective actions, notify you supervisor.

2-16. ORGANIZATIONAL MAINTENANCE TROUBLESHOOTING.

Refer to table 2-3 for-troubleshooting which is allocated to organizational maintenance.

NOTE

Before using the troubleshooting table, ensure that all applicable operating checks have been performed.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM

1. LOW BATTERY VOLTAGE.

Step 1. Check for low electrolyte solution.
Refill electrolyte (para 2-24).

Step 2. Check for defective battery.
Replace defective battery (para 2-24).

2. ALTERNATOR VOLTAGE OUTPUT FAILS.,

Step 1. Check for broken drivebelt.
Refer broken drivebelt to direct support maintenance.

Step 2. Check for loose mounting bolts and/or incorrect belt tension.
Adjust belt tension (para 2-22).

3. ALTERNATOR OUTPUT HIGH, LOW OR ERRATIC.

Step 1. Check drivebelt for correct tension.
Adjust drivebelt (para 2-22).

Step 2. Check for dry or defective battery.
Refill or replace battery (para 2-24).

Step 3. Check for poor electrical connections to include battery ground.
Ensure that all connections between alternator and battery are secure and free of corrosion.

4. ALTERNATOR NOISY.

Check for loose mounting bolts or drive pulley.
Adjust drivebelt tension and tighten pulley and bolts (para 2-22).

Table 2-3. Troubleshooting - Cont

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - Cont

5. ALTERNATOR OVERHEATS.

Check for overloaded electrical system.
Turn off all unnecessary electrical equipment until battery is fully charged.

6. TACHOMETER INOPERATIVE.

Check for loose connection or defective wiring.
Tighten all tachometer electrical connections. If wiring is defective, notify direct support maintenance.

7. LIGHTS WILL NOT ILLUMINATE.

Step 1. Check for loose battery cable connection.
Clean connection and tighten as required.

Step 2. Check for defective bulb.
Replace bulb.

Step 3. Check for discharged or defective battery.
Recharge or replace battery (para 2-24).

Step 4. Check for open or defective master switch control circuit breaker.
Close the circuit breaker. If this does not correct the trouble, replace circuit breaker.

Step 5. Check for open or defective master switch.
Close master switch. If this does not correct the trouble, notify direct support maintenance.

8. HEADLIGHTS INOPERATIVE (HIGH BEAM, LOW BEAM OR BOTH).

Step 1. Check for defective lamp.
Replace defective lamp (para 2-30).

Table 2-3. Troubleshooting - Cont

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - Cont

Step 2. Check for defective headlights and navigation lights circuit breaker.
Replace circuit breaker.

9. HIGH BEAM INDICATOR INOPERATIVE.

Step 1. Check for defective bulb.
Replace bulb.

Step 2. Check for defective headlights and navigation lights circuit breaker.
Replace circuit breaker.

10. TEMPERATURE, PRESSURE, OR FLUID LEVEL LIGHT INOPERATIVE.

Step 1. Check for defective bulb.
Replace bulb.

Step 2. Check for defective sending unit.
Replace sending unit.

Step 3. Check for defective circuit breaker.
Replace circuit breaker.

11. CIRCUIT BREAKER WILL NOT CLOSE.

Step 1. Check for defective circuit breaker.
Replace circuit breaker.

Step 2. Check for short circuit in wiring.
Inspect circuit breaker wiring, if defective, notify direct support maintenance.

Table 2-3. Troubleshooting - Cont

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

HULL AND COMPONENTS

1. RAMP WILL NOT FULLY CLOSE.

Step 1. Check for obstruction between ramp and ramp seal.
Remove obstruction. Ensure seal is not damaged.

Step 2. Inspect cable harness for proper adjustment.
Adjust cable harness (para 2-45).

2. BILGE DRAIN VALVES LEAKING.

Step 1. Check for dirt or obstruction in valve.
Clean valve (para 2-42).

Step 2. Check for defective valve disk.
Repair or replace defective valve disk (para 2-42).

Step 3. Check for defective bilge drain valve.
Replace bilge drain valve.

Step 4. Check flexible shaft for binding.
Lubricate shaft with GAA grease.

3. BILGE PUMP OPERATING - BUT NOT DRAWING WATER.

Step 1. Check for clogged strainer.
Remove attaching screws and clean strainer.

Step 2. Obstruction in discharge line.
Clean discharge line and port. If obstruction cannot be removed without disassembly, notify direct support maintenance.

Step 3. Check for ruptured discharge hose.
Loosen hose clamp and replace hose.

Table 2-3. Troubleshooting - Cont

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

HYDRAULIC SUPPLY SYSTEM

NO HYDRAULIC OIL SUPPLY FROM HYDRAULIC OIL TANK TO HYDRAULIC PUMPS.

Check gate valves between tank and pumps closed.
Open gate valves.

RAMP HYDRAULIC SYSTEM

RAMP RAISES SLOWLY.

Ramp cylinder vent clogged.
Clean or replace vent as necessary.

DIESEL ENGINE

1. ENGINE WILL NOT START.

Step 1. Fuel shutoff valve closed.
Open fuel shutoff valve.

Step 2. Emergency stop lever pulled up.
Place lever in the down (or run) position.

Step 3. Check for insufficient fuel.
Fill fuel tanks.

Step 4. Check for improper engine adjustment.
a. Adjust governor (para 2-73).
b. Adjust exhaust valve (cold) (para 2-79).
c. Adjust exhaust valve (hot) (para 2-79).
d. Time fuel injectors (para 2-80).
e. Adjust governor gap (para 2-81).
f. Position injector rack control lever (para 2-82).
g. Adjust maximum no-load engine speed (para 2-83).
h. Adjust idle speed and buffer screw (para 2-84).

Table 2-3. Troubleshooting - Cont

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

DIESEL ENGINE - Cont

2. ENGINE HARD TO START.

Step 1. Check for proper grade of oil.
Drain crankcase and fill with proper grade of oil. Refer to L.O. 55-1930-203-12.

Step 2. Check for insufficient fuel.
Fill fuel tanks.

Step 3. Improper engine adjustments.
Adjust governor (para 2-73).

3. ENGINE VIBRATES EXCESSIVELY OR RUNS UNEVENLY.

Check for improper engine adjustment.
Adjust governor (para 2-73).

4. ENGINE LACKS POWER.

Step 1. Check for incorrect exhaust valve clearance.
a. Adjust exhaust valve (cold) (para 2-79).
b. Adjust exhaust valve (hot) (para 2-79).

Step 2. Inspect for leaks in fuel system.
Check fuel lines, filters and pumps for leaks. Replace defective lines and service filters. Refer a defective pump to direct support maintenance.

Step 3. Check for insufficient air supply.
Clean any dirt and obstructions from air cleaner. Check exhaust back pressure. If pressure is excessive, ensure that breather tube is not clogged.

Table 2-3. Troubleshooting - Cont

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

DIESEL ENGINE - Cont

Step 4. Check for insufficient fuel.
Fill fuel tanks. Check that fuel shutoff valves are open and that filters are clean. Check that fuel lines are unobstructed.

Step 5. Check for improper governor adjustment.
Adjust governor (para 2-73).

Step 6. Check for incorrect fuel injector timing.
Time fuel injectors (para 2-80).

Step 7 Check for incorrect fuel injector control settings.
Set fuel injector control (para 2-75).

5. ENGINE DETONATES.

Step 1. Check for incorrect fuel injector timing.
Time fuel injectors (para 2-80).

Step 2. Check for excessive oil in air cleaner.
Ensure that oil is at the oil level mark.

Step 3. Check for improper fuel injector control settings.
Set fuel injector control (para 2-75).

6. ENGINE STOPS.

Step 1. Check for insufficient or no fuel.
Fill fuel tanks, clean filters and open shutoff valves. Check fuel system and lines for dirt and obstructions.

Step 2. Governor surges.
Inspect governor for defects (para 2-73).

7. EXCESSIVE CRANKCASE PRESSURE.

Check for restricted breather on rocker cover.
Remove and clean breather tube (para 2-60).

Table 2-3. Troubleshooting - Cont

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

DIESEL ENGINE - Cont

8. ENGINE OIL PRESSURE.

<u>Step 1.</u> Check for low oil level or incorrect grade of oil.
Add oil to crankcase. Refer to L. O. 55-1930-203-12.

<u>Step 2.</u> Check for oil cooler bypass valve or full flow oil filter malfunction.
Remove and clean bypass valve (para 2-71).

9. HIGH ENGINE OIL CONSUMPTION.

<u>Step 1.</u> Check for external oil leaks.
Replace gaskets and defective components that are organizational responsibility or notify direct support maintenance.

<u>Step 2.</u> Check for restricted breather on rocker cover,
Remove and clean breather tube (para 2-60).

10. ENGINE SPEED DOES NOT RETARD WHEN FOOT THROTTLE IS RELEASED.

<u>Step 1.</u> Check injector control tube for binding.
Determine cause of binding and report defects to direct support maintenance.

<u>Step 2.</u> Check to see if fuel rod is uncoupled from injector control tube or if control tube is bent.
Recouple fuel rod or report defects to direct support maintenance.

11. EXCESSIVE GRAY OR BLACK EXHAUST SMOKE (TEMP. 165°F (74°C) M.

<u>Step 1.</u> Check for improper grade of fuel oil.
Drain system and refill with proper grade of fuel oil.

<u>Step 2.</u> Check for clogged air cleaner.
Clean the air cleaner (para 2-61).

Table 2-3. Troubleshooting - Cont

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

DIESEL ENGINE - Cont

Step 3. Check to see if emergency stop lever is completely down.
Push lever down to RUN position.

Step 4. Check for incorrect fuel injector timing.
Time fuel injector (para 2-80).

12. EXCESSIVE BLUE EXHAUST SMOKE (TEMP. 165°F (74°C) MIN).

Check for high oil level in air cleaner.
Ensure that oil in lower housing is at proper level.

13. EXCESSIVE WHITE EXHAUST SMOKE (TEMP. 165°F (740C) MIN).

Check for improper grade of fuel oil.
Drain system and refill with proper grade of fuel oil.

14. LOSS OF POWER FROM TORQUE CONVERTER.

Step 1. Check for low oil level.
Add oil to proper level. Refer to L. O. 55-1930-203-12.

Step 2. Check that seal drain line is above transmission oil level.
Place seal drain line below transmission oil level in transmission sump. The seal drain line must be at least 3 1/2 inches (89 mm) or more below the centerline of the torque converter at every point in the line.

Step 3. Check for foaming oil.
Ensure that seal drain line is below transmission of level in transmission sump. The seal drain line must be at least 3 1/2 inches (89 mm) or more below the centerline of the torque converter at every point in the line.

Table 2-3. Troubleshooting - Cont

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

DIESEL ENGINE - Cont

Step 4. Check engine flywheel housing drain hole for oil leak.
Clean or replace restricted seal drain line. Ensure that seal drain line is below transmission oil level in transmission sump. The seal drain line must be at least 3 1/2 inches (89 mm) or more below the centerline of the torque converter at every point in the line.

Step 5. Check for one or both stators in torque converter locked.
Refer to paragraph 2-77.

Step 6. Check to see if seal drain line is clogged.
Clean or replace restricted line. Ensure that seal drain line is below oil level in transmission sump. The seal drain line must be at least 3 1/2 inches (89 mm) or more below the centerline of the torque converter at every point in the line.

FUEL SYSTEM

NO FUEL OR INSUFFICIENT FUEL.

Step 1. Check fuel supply.
Fill fuel tanks.

Step 2. Check for closed fuel shutoff valve.
Open fuel shutoff valve.

Step 3. Check for restricted primary fuel strainer or secondary fuel filter.
Clean and service fuel filters (para 2-65).

Step 4. Check for restricted fluid pressure filter.
Clean and service filter (para 2-87).

Step 5. Check for obstructed fuel flow.
Disconnect and clean all fuel lines.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

LAND DRIVE SYSTEM

1. LOW TRANSMISSION OIL PRESSURE AND/OR HIGH TORQUE CONVERTER-TRANSMISSION OIL TEMPERATURE.

Step 1. Check for low oil level.
Add oil. Refer to L. O. 55-1930-203-12.

Step 2. Check for high oil level.
Drain oil to proper level. If level stays high, disconnect seal drain line and remove any obstructions.

Step 3. Check for clogged transmission breather.
Clean the breather (para 2-93).

Step 4. Check for clogged transmission strainer.
Clean the strainer (para 2-93)..

Step 5. Check for clogged transmission oil filter.
Clean the filter (para 2-93).

Step 6. Check for foaming oil.
Ensure that seal drain line is below oil level in transmission sump. The seal drain line must be at least 3 1/2 inches (89 mm) or more below the centerline of the torque converter at every point in the line. Check for air leak at oil pump inlet. Replace leaking line or fitting.

Step 7. Check for one or both stators in torque converter locked. Refer to para 2-77.

2. OIL LEAKING FROM ENGINE FLYWHEEL HOUSING DRAIN HOLE.

Restricted torque converter seal drain line.
Clean or replace restricted line. Ensure that seal drain line is below oil level in transmission sump. The seal drain line must be at, least 3 1/2 inches (89 mm) or more below the centerline of the torque converter at every point in the line.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

LAND DRIVE SYSTEM - Cont

3. NOISY OR VIBRATING FLEXIBLE COUPLING (LAND DRIVE).

Step 1. Check for worn-out transmission flexible coupling.
Repair or replace flexible coupling (para 2-92).

Step 2. Check for worn-out miter box flexible coupling.
Repair or replace flexible coupling (para 2-92).

4. GREASE LEAKING FROM FLEXIBLE COUPLING (LAND DRIVE).

Step 1. Check for defective seals in transmission flexible coupling.
Replace defective seals (para 2-92).

Step 2. Check for defective seals in miter box flexible coupling.
Replace defective seals (para 2-92).

5. ERRATIC OR REDUCED BRAKING FORCE.

Step 1. Check for worn-out brake lining.
Refer worn brake lining to direct support maintenance (para 2-91).

Step 2. Check for air leak at airbrake inlet.
Soap test inlet reducer; if leaking, notify direct support maintenance.

Step 3. Check for air leak at expander tube nozzle.
Notify direct support maintenance.

6. NOISY OR VIBRATING MILLER BOX.

Step 1. Check for low oil level.
Add oil to miter box. Refer to L. O. 55-1930-203-12.

Step 2. Check for oil leakage around input shaft into column and wheel drive. If, after servicing miter box, oil level in miter box decreases and oil level in column and wheel drive increases, notify direct support maintenance.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

LAND DRIVE SYSTEM - Cont

7. NOISY OR VIBRATING WHEEL.

Check for low oil level in column and wheel drive.

NOTE
Oil fill hole in wheel must be level with center of wheel to fill.

Add oil. Refer to L. O. 55-1930-203-12.

MARINE DRIVE SYSTEM

1. LOSS OF OR SLUGGISH SHAFT MOTION BETWEEN GATHERING BOX AND FLUID COUPLING.

Step 1. Check fluid coupling for leaking around filler gasket.
Replace defective gasket.

Step 2. Check for low oil level in fluid coupling.

NOTE

To fill, opening must be approximately 50 degrees from the vertical position to allow necessary air space.

Check for evidence of high temperature operation.
Add oil to fluid coupling. Refer to L. O. 55-1930-203-12.

2. SHAFT BETWEEN GATHERING BOX AND MARINE GEAR VIBRATES EXCESSIVELY.

Step 1. Check for worn out flexible coupling.
Replace damaged coupling (para 2-99).

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

MARINE DRIVE SYSTEM - Cont

Step 2. Check for worn-out thrust button in flexible coupling.
Replace damaged button (para 2-99).

3. GREASE LEAKING FROM FLEXIBLE COUPLING AROUND SHAFT BETWEEN GATHERING BOX AND MARINE GEAR.

Check for defective seal in flexible coupling.
Replace defective seal (para 2-99).

4. GATHERING BOX OIL PRESSURE GAGE ERRATIC OR INOPERATIVE.

Check to see if oil line to pressure gage is restricted.
Clean oil line (para 2-98).

5. LOW GATHERING BOX OIL PRESSURE.

Step 1. Check for low oil level.
Add oil to gathering box. Refer to L. O. 55-1930-203-12.

Step 2. Check for leaking oil line.
tighten or replace oil line.

6. HIGH GATHERING BOX OPERATING TEMPERATURE.

Step 1. Check for low gathering box oil pressure.
Tighten or replace oil line as necessary. Add oil to gathering box. Refer to L.O. 55-1930-203-12.

Step 2. Check for restricted oil line.
Remove and clean line or replace as necessary.

7. LOW MARINE GEAR OIL PRESSURE.

Step 1. Check for low oil level.
Add 2190 TEP lubricating oil to marine gear, operate engine for two minutes, check oil level and bring to full mark.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

MARINE DRIVE SYSTEM - Cont

Step 2. Check for clogged oil filter.
Clean oil filter (para 2-100).

Step 3. Check for leaking oil line.
Tighten or replace line.

8. HIGH MARINE GEAR OPERATING TEMPERATURE.

Step 1. Check for low oil level.
Add 2190 TEP lubricating oil to marine gear, operate engine for two minutes, check oil level and bring to full mark.

Step 2. Check for clogged oil filter.
Clean oil filter (para 2-100).

Step 3. Check for leaking oil line
Tighten or replace line.

Step 4. Check for restricted oil line.
Remove and clean or replace oil line as necessary.

9. TIGHTENING PACKING GLAND WILL NOT STOP WATER LEAKING AROUND PROPELLER SHAFT.

Check for worn out -packing.
Replace packing (para 2-101).

10. MARINE GEAR WILL NOT SHIFT (OIL PRESSURE NORMAL).

Step 1. Check for restricted oil line from oil pump to control valve on marine gear or from control valve to marine gear.
Remove and clean or replace restricted oil lines as required.

Step 2. Check for ruptured or crimped air line between marine gear shifting and throttle control valve and marine gear logan valve.
Replace defective portion of line and notify direct support maintenance.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COMPRESSED AIR SYSTEM

1. ENGINE FAILS TO TURN OVER.

Check for low air supply.
Use emergency air supply from tires.

2. FOOT THROTTLE DEPRESSED WITH NO ENGINE RESPONSE.

Step 1. Check for uncoupled throttle linkage between throttle control shaft lever and governor.
Reinstall throttle linkage (para 2-74).

Step 2. Check for broken governor throttle shaft.
Replace throttle shaft (para 2-74).

Step 3. Check for uncoupled throttle linkage between throttle control shaft 9 lever and actuator positioner.
Reconnect throttle linkage (para 2-74).

Step 4. Check for broken actuator positioner rod assembly.
Replace actuator positioner rod (para 2-74).

Step 5. Check for loss of air pressure to actuator positioner.
Inspect compressed air system to determine cause of pressure loss. Report to direct support maintenance.

3. COMPRESSED AIR SYSTEM WILL NOT ATTAIN 155 PSI (10.90 kg/sq cm).

Step 1. Check that air compressor governor is properly adjusted.
Adjust governor (para 2-106).

Step 2. Check safety relief valve for proper adjustment.
Adjust relief valve (para 2-105).

Step 3. Check for defective safety relief valve in air supply tank.
Replace defective valve.(para 2-105).

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COMPRESSED AIR SYSTEM - Cont

Step 4. Check for leaking air line.
Tighten leaking air line. Notify direct support maintenance.

4. INSUFFICIENT AIR SUPPLY.

Step 1. Check for ruptured air line.
Notify direct support maintenance.

Step 2. Check that air compressor governor is properly adjusted.
Adjust governor (para 2-106).

Step 3. Check for defective air compressor governor.
Notify direct support maintenance.

5. AIR COMPRESSOR GOVERNOR WILL NOT CUT OUT AIR COMPRESSORS AT 255 PSI (10. 90 kg/sq cm).

Step 1. Check that air compressor governor is properly adjusted.
Adjust governor (para 2-106).

Step 2. Check for defective air compressor governor.
Notify direct support maintenance.

Step 3. Check safety relief valve for proper adjustment.
Adjust relief valve (para 2-105).

Step 4. Check for defective safety relief valve in air supply tank.
Replace relief valve (para 2-105).

6. AIR COMPRESSOR RUNS WITH EXCESSIVE NOISE AND VIBRATION.

Check for low oil level.
Add oil to air compressor. Refer to L.O0. 55-1930-203-12.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COMPRESSED AIR SYSTEM - Cont

7. ALL ENGINES FAIL TO ACCELERATE WHEN USING FOOT THROTTLE.

Check for ruptured or crimped air line between foot control valve and shuttle valve.

Report condition to direct support maintenance.

8. ONE ENGINE FAILS TO ACCELERATE WHEN USING FOOT THROTTLE.

Step 1. Check for crimped air line between shuttle valve and actuator positioner.
Notify direct support maintenance.

Step 2. Check for uncoupled throttle linkage between throttle control shaft lever and governor.
Reconnect throttle linkage (para 2-74).

Step 3. Check for broken governor throttle shaft.
Replace throttle shaft (para 2-74).

Step 4. Check for uncoupled throttle linkage between throttle control shaft lever and actuator positioner.
Reconnect throttle linkage (para 2-74).

Step 5. Check for broken actuator positioner rod assembly.
Replace actuator positioner rod (para 2-74).

9. ONE ENGINE FAILS TO ACCELERATE WHEN USING HAND THROTTLE.

Step 1. Check for ruptured or crimped air line between throttle control valve and actuator postioner.
Notify direct support maintenance.

Step 2. Check for uncoupled throttle linkage between throttle control shaft lever and governor.
Reconnect throttle linkage (para 2-74).

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COMPRESSED AIR SYSTEM - Cont

Step 3. Check for broken governor throttle shaft.
Replace throttle shaft (para 2-74).

Step 4. Check for uncoupled throttle linkage between throttle control shaft lever and actuator positioner.
Reconnect throttle linkage (para 2-74).

Step 5. Check for broken actuator positioner rod assembly.
Replace actuator positioner rod (para 2-74).

10. PORT OR STARBOARD ENGINES FAIL TO ACCELERATE WHEN USING MARINE THROTTLE.

Step 1. Check for ruptured or crimped air line between marine gearshaft and throttle control valve.
Notify direct support maintenance.

Step 2. Check for uncoupled throttle linkage between throttle control shaft lever and governor.
Reconnect throttle linkage (para 2-74).

Step 3. Check for broken governor throttle shaft.
Replace throttle shaft (para 2, 74).

Step 4. Check for uncoupled throttle linkage between throttle control shaft lever and actuator positioner.
Reconnect throttle linkage (para 2-74).

Step 5. Check for broken actuator positioner rod assembly.
Replace actuator positioner rod (para 2-74).

11. AIRBRAKE WILL NOT OPERATE.

Step 1. Check for ruptured air line.
Notify, direct support maintenance.

Step 2. Check to see if air compressor governor is properly adjusted.
Adjust governor (para 2-106).

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COMPRESSED AIR SYSTEM - Cont

Step 3. Check for defective air compressor governor.
Notify direct support maintenance.

Step 4. Check to see if globe valves at aft miter boxes are closed (for aft brakes only)'.
Open globe valves.

Step 5. Check for ruptured or crimped brake air lines.
Notify direct support maintenance.

12. ONE ENGINE CUTOUT SYSTEM INOPERATIVE.

Check for ruptured or crimped air line between cutout pilot air valve and actuator positioner.
Notify direct support maintenance.

13. TRANSMISSION FAILS TO SHIFT TO NEUTRAL WHEN ENGINE CUTOUT PILOT AIR VALVE IS MOVED FORWARD OR BACKWARD WITH TRANSMISSION IN FIRST OR REVERSE GEAR.

Check for ruptured or crimped air line between cutout pilot air valve and transmission shifting air control cylinder.
Notify direct support maintenance.

14. TRANSMISSION(S) WILL NOT SHIFT (LAND DRIVE).

Check for broken or uncoupled linkage between transmission shifting control cylinder and transmission.
Couple linkage, or notify direct support maintenance.

15. TRANSMISSION SHIFTING CONTROL CYLINDER WILL NOT SHIFT TRANSMISSION TO OR FROM NEUTRAL POSITION.

Check for ruptured or crimped air line between ports 1, 3 or 5 of transmission control valve and transmission shifting control cylinder.
Notify direct support maintenance.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COMPRESSED AIR SYSTEM - Cont

16. TRANSMISSION SHIFTING CONTROL CYLINDER WILL NOT SHIFT TRANSMISSION TO OR FROM SECOND POSITION.

Check for ruptured or crimped air line between ports 1, 2, 4 or 5 of transmission control valve and transmission shifting control cylinder.

Notify direct support maintenance.

17. TRANSMISSION SHIFTING CONTROL CYLINDER WILL NOT SHIFT TRANSMISSION FROM REVERSE POSITION.

Check for ruptured or crimped air lines between ports 3 or 5 of transmission control valve and transmission shifting control cylinder.

Notify direct support maintenance.

18. TRANSMISSION SHIFTING CONTROL CYLINDER WILL NOT SHIFT TRANSMISSION FROM FIRST POSITION.

Check for ruptured or crimped air lines between ports 1, 2 or 5 of transmission control valve and transmission shifting control cylinder.

Notify direct support maintenance.

19. TRANSMISSION SHIFTING CONTROL CYLINDER WILL NOT SHIFT TRANSMISSION FROM THIRD POSITION.

Check for ruptured or crimped air lines between ports 1 and 2 of transmission control valve and transmission shifting control cylinder.

Notify direct support maintenance.

20. RAMP SEAL WILL NOT INFLATE.

Check for closed plug valve below ramp latch lever on starboard side.

Open plug valve.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COMPRESSED AIR SYSTEM - Cont

21. RAMP SEAL WILL NOT DEFLATE.

Check if trip lever for quick opening exhaust valve is rusted closed.
Remove rust and lubricate levers (refer to L. O. 55-1930-203-12).

22. RAMP WILL NOT RAISE OR LOWER.

Step 1. Check for ruptured or crimped air line between pilot air valve and double-acting cylinder.
Notify direct support maintenance.

Step 2. Check for disconnected double-acting air cylinder linkage.
Connect double-acting air cylinder linkage.

23. CARGO WELL PUMP INOPERATIVE.

Step 1. Check for ruptured or crimped air line between pilot air valve and double-acting air cylinder.
Notify direct support rnaintenance.

Step 2. Check for disconnected double-acting air cylinder linkage.
Connect double-acting air cylinder linkage.

24. AIR STARTING MOTOR FAILS TO OPERATE.

Step 1. Check for insufficient air pressure.
Use emergency or external air supply, such as a portable air compressor, another LARC, or from tire pressure.

Step 2. Check for clogged air starting filter or ruptured filter bowl.
Clean filter (para 2-108).

25. TIRES FAIL TO INFLATE.

Step 1. Check for ruptured or crimped air line in tire inflation-deflation system.
Notify direct support rnaintenance.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COMPRESSED AIR SYSTEM - Cont

Step 2. Check that safety relief valve is properly adjusted.
Adjust relief valve (para 2-114).

Step 3. Check for defective safety relief valve.
Replace defective valve (para 2-114).

26. TIRES FAIL TO DEFLATE.

Step 1. Check for ruptured or crimped air line between pilot air valve and deflation relay air valve.
Notify direct support maintenance.

Step 2. Check for closed globe valves at miter box.
Open globe valves.

Step 3. Check for closed tire inflation valves.
Depress and lock tire inflation valves in deflate position.

27. TIRES INFLATE ABOVE 70 PSI (4. 92 kg/sq cm).

Step 1. Check that safety relief valve is properly adjusted.
Adjust relief valve. (para 2-114).

Step 2. Check for defective safety relief valve.
Replace defective relief valve (para 2-114).

28. RADIATOR FANS FAIL TO SHUT OFF WHEN SHIFTING INTO MARINE DRIVE.

Check for ruptured or crimped air line between marine gear control valve and single-acting cylinder.
Notify direct support maintenance.

29. AIR HORN INOPERATIVE.

Step 1. Check air horn for defects or out of adjustment.

a. Inspect air horns for dents and breakages. If defective, notify direct support maintenance.
b. Depress pushbutton in cab to ensure air horns are in harmony.
c. Adjust air horns (para 2-119).

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COMPRESSED AIR SYSTEM - Cont

Step 2. Check for ruptured or crimped air line between air horn and air horn control valve.
Notify direct support maintenance.

30. WINDSHIELD WIPER INOPERATIVE.

Check for ruptured windshield wiper hose.
Notify direct support maintenance.

STEERING SYSTEM

1. WHEELS DO NOT STEER TO DESIRED POSITION.

Step 1. Check if steering follow-up is out of adjustment as follows: Align wheels. When hydraulic steering pressure will not drop off at the correct wheel angle, adjust.
Adjust steering (para 2-121).

Step 2. Check if steering follow-up is broken, bent or uncoupled.
Determine extent of damage and notify direct support maintenance.

2. MARINE-STEERING NOT TRUE.

Step 1. Check steering cable for improper adjustment.
Adjust steering cable (para 2-122).

Step 2. Check for obstructed rudder.
Remove obstruction.

Step 3. Check for improperly adjusted crossrod.
Adjust crossrod (para 2-122).

Step 4. Check for hydraulic system malfunction by removing access covers 30 and 31 and inspecting forward steering hydraulic components for leaks and breakage.
Notify direct support maintenance of any leaks or damage. Install access covers.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

STEERING SYSTEM - Cont

3. MARINE STEERING INOPERATIVE.

Step 1. Check for broken steering cable.
Replace cable (wire ropes) (para 2-122).

Step 2. Check for hydraulic system malfunction by removing access covers 30 and 31 and inspecting forward steering hydraulic components for leaks and breakage.
Notify direct support maintenance of any leaks or damage.
Install access covers.

4. FORWARD OR AFT STEERING SYSTEM INOPERATIVE.

Check for mechanical steering linkage malfunction.
Lubricate or adjust as required.

a. Lubricate steering linkage bearings grease fittings with GAA grease, and lubricate valve stem end shackle and bellcrank stud bearing with OE oil as necessary.
b. Adjust steering linkage (para 2-121).

COOLING SYSTEM

1. ABNORMAL ENGINE COOLANT TEMPERATURES.

Step 1. Check for scale or deposits in cooling system.
Clean and refill cooling system (para 2-124).

Step 2. Check for defective pressure cap on expansion tank by removing radiator petcock access covers and inspecting cap.

WARNING

Do not remove the pressure cap from the expansion tank when the engine is operating. Remove the pressure cap only when the engine is secured and then carefully to prevent personnel injury from scalding.

Replace pressure cap, if necessary.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COOLING SYSTEM - Cont

Step 3. Check for clogged radiator openings. Remove four radiator duct access covers, louvers and grills.
Clean foreign matter from air chambers and radiator core and blow out with compressed air. Replace radiator access covers, louvers and grills.

2. ENGINE COOLANT LOSS.

Step 1. Check for leaking radiator or hoses.
Notify direct support maintenance of leaky radiator.

Step 2. Remove radiator petcock access covers and check for open or leaking drainplug.
Close drainplug or replace (para 2-124).

Step 3. Check for defective pressure cap on expansion tank by removing radiator petcock access covers and inspecting cap.

WARNING

Do not remove the pressure cap from the expansion tank when the engine is operating. Remove the pressure cap only when the engine is secured. Remove carefully to prevent injury from scalding.

Replace pressure cap if necessary.

GAGES AND INSTRUMENTS

MARINE GEAR OIL PRESSURE GAGE ERRATIC OR INOPERATIVE (LOW PRESSURE WARNING LIGHT DOES NOT GLOW).

Check if oil line to pressure gage is restricted.
Remove and clean or replace oil line.

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

WINCH EQUIPMENT

1. WINCH BRAKE INOPERATIVE.

Step 1. Brake not adjusted, properly.
Adjust brake (para 2-135).

Step 2. Check for defective winch brake control stand components.

a. Using figure 2-118 as a guide replace defective winch brake control components.
b. Adjust brake (para 2-135).

2. WINCH WILL NOT RUN IN ONE DIRECTION.

Check to see if shift control is engaging gears.
Using figure 2-119 as a guide, replace defective shift control components.

3. WINCH SPEED CONTROL ERRATIC OR INOPERATIVE.

Check for defective speed control assembly.
Replace defective speed control assembly (para 2-137).

Table 2-3. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

HYDRAULIC START AND WHEEL ALIGNMENT SYSTEM

1. HYDRAULIC STARTER WILL NOT OPERATE

Step 1. Check pressure gage
Pressurize using hand pump.

Step 2. Check Accumulator for closed Ball Valves
Open ball valves.

Step 3. Check hydraulic fluid level in Reservoir.
Fill as required.

Step 4. Check System for Leaks,
Repair as needed.

2. WHEELS WILL NOT ALIGN

Step 1. Check pressure gage
Pressurize using hand pump.

Step 2. Check Accumulator for closed Ball Valves
Open ball valves.

Step 3. Check hydraulic fluid level in Reservoir.
Fill as required.

Step 4. Check System for Leaks.
Repair as needed.

SECTION VII. RADIO INTERFERENCE SUPPRESSION

2-17. GENERAL METHODS USED TO OBTAIN PROPER SUPPRESSION.

Essentially, suppression is attained by providing a low resistance path to ground for stray currents. The methods used include shielding ignition and high-frequency wires, grounding the frame with bonding straps, and using capacitors and resistors.

2-18. REPLACEMENT OF SUPPRESSION COMPONENTS.

When replacing suppression components, replacement parts must be identical in resistance and capacitance to the defective ones being replaced.

2-19. TESTING OF RADIO INTERFERENCE SUPPRESSION COMPONENTS.

a. Test capacitors for opens, leaks, or shorts using a capacitor tester if available. If no capacitor tester is available, a multimeter may be used. To use multimeter, proceed as follows:

(1) Place multimeter selector switch in OHMS position.

(2) Place RANGE switch on highest range.

(3) Disconnect one end of the capacitor being measured. Measure the resistance.

(4) For a good capacitor, the needle should swing to the right and gradually return to the left.

(5) For a shorted capacitor, the needle should swing to the right to zero on the meter scale.

(6) A resistance reading on the meter is an indication of a leaky capacitor.

(7) An open capacitor is indicated when the needle on the meter remains to the extreme left side.

b. If no test equipment is available, locate the faulty capacitor by trial and error.

SECTION VIII. MAINTENANCE OF ELECTRICAL SYSTEM

2-20. GENERAL.

a. The LARC is equipped with one main electrical system, and four tachometer electrical systems. The main electrical-system (fig. 2-2) supplies 24 vdc to operate the lights, radio, .heater blower, and cab fans. The main system consists of-battery charging * alternators, voltage regulators, batteries, master relay, circuit breakers, light assemblies, switches, and the necessary-electrical wiring. The voltage regulators are integral-.-with the. .alternators. Two.12 volt batteries connected in series supply the main electrical system.

b. When battery voltage drops below 2.4 volts with engines operating, the voltage regulators permit the battery charging alternators to recharge the batteries and maintain the electrical supply at 24 volts. The master switch operates the master relay which controls the flow of current to the various main-electrical system components. All main electrical circuits are protected by circuit breakers and are controlled by a switch.

c. The four tachometer electrical systems are used to indicate revolutions per minute (rpm) of the engines. Each tachometer electrical system consists of a tachometer generator, a unit of a dual tachometer, and the necessary wiring. Electrical output from the tachometer generator drives corresponding tachometer units.

2-21. RELAYS AND SWITCHES.

a. Remove master control relay cover, position master power control switch (located on instrument panel), and check to see if master control relay is energized. If relay does not close, report this condition to direct support maintenance.

b. Inspect all manually operated switches for breakage or other damage. Check connectors, plugs and receptacles for tightness and/or signs of corrosion. Report any discrepancies to direct support maintenance .

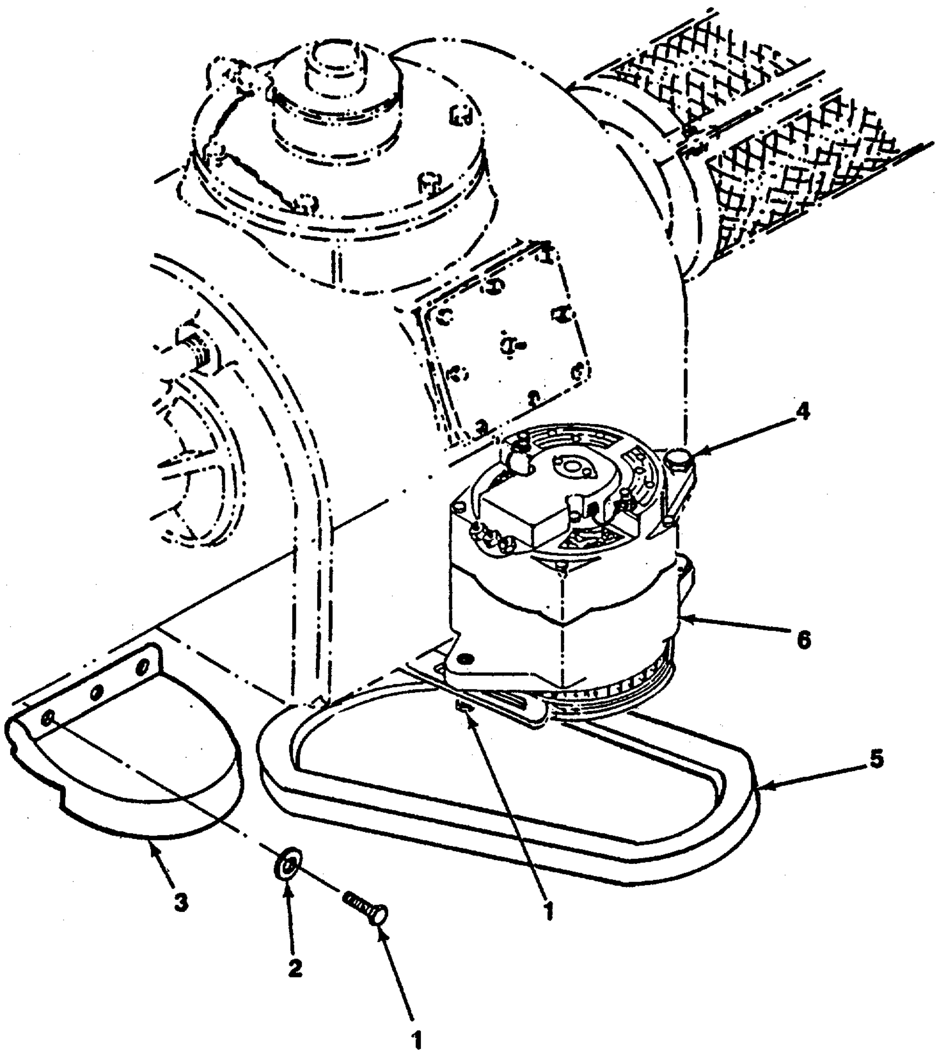
Figure 2-2 is now FO-1 and FO-2 located in back of manual.

2-22. BATTERY CHARGING ALTERNATOR DRIVEBELT.

a. General. Two internally shielded battery charging alternators supply electrical energy to recharge two series-connected, 12 volt batteries. One battery charging alternator is mounted on each gathering box and is driven by a V-belt from the output shaft of the gathering box.

b. Inspection.

(1) Inspect drivebelt (5, fig. 2-3) for frayed and/or cracked places.



1. Capscrew
2. Lockwasher
3. Cover
4. Mounting bolts
5. Drivebelt
6. Alternator

Figure 2-3. Battery Charging Drive Belt Adjustment.

(2) Report any defects to direct support maintenance.

c. Belt Adjustment. If drivebelt deflection is more or less than 7/8 to 1 inch (22 to 25 mm), adjust as follows:

(2) Report any defects to direct support maintenance.

c. Belt Adjustment. If drivebelt deflection is more or less than 7/8 to 1 inch (22 to 25 mm), adjust as follows:

(1) Loosen capscrew (1, Fig. 2-3) on end of adjusting bracket and loosen alternator mounting bolts (4).

(2) Insert a wooden pry bar between the gathering box and the battery charging alternator (6). Pull upward against the alternator housing until drivebelt tension is sufficient, allowing 7/8 to 1 inch (22 to 25 mm) deflection.

(3) Hold alternator at this position and tighten capscrew (1) to correct torque value; tighten alternator mounting bolts (4).

PARAGRAPH 2-23 DELETED

2-24. BATTERIES AND BATTERY CABLES.

NOTE

The 6TN and 6TL batteries can be mixed or matched. However, maintenance-free batteries cannot be mixed or matched with military batteries. The 6TN and/or the 6TL batteries will perform properly in hot weather as long as electrolyte levels are carefully monitored. If the electrolyte expands and causes the level to rise, some fluid must be removed. If the level becomes too low due to evaporation, distilled water may be used to obtain the proper level. A good grade of drinking water (excluding mineral waters) may be used if distilled water is not available.

Electrolyte (NSNs 68io 00 249-9354 and 6810l843-1640) have a specific gravity of 1.280 and should be used in these batteries. Do NOT adjust the electrolyte in wet batteries to a lower specific gravity.

a. General. When fully charged, two series-connected 12 volt lead-acid storage batteries supply the main electrical system with 24 volts dc. The batteries are located in the starboard upper machinery area, aft of engine No. 1.

b. Inspection and Service.

(1) Inspect batteries for cracks and cleanliness. Replace if cracked. Remove corrosion accumulations with a 20% solution of sodium bicarbonate (item 15, App. D) in water. Flush thoroughly with fresh water. Dry with low pressure, dry compressed air.

(2) Ensure terminal posts and terminals on cables are clean and free of corrosion. Ensure all battery cable connections are securely tightened on battery posts. Ensure proper fluid level.

CAUTION

Use only distilled water when filling batteries. Under no circumstances will contaminated water be added to the battery electrolyte solution.

(3) Fill all cells having a low level with distilled water (item 5, App. C). Water added to battery cells should just reach the bottom of the cell covers.

WARNING

Wear goggles rubber gloves, and a rubber apron when mixing or diluting sulphuric acid, Specification MIL-M-10578, Type I. Sulphuric acid or metal conditioner and .rust remover may cause serious acid burns if spilled or splashed on the hands or other parts of the body. Do not pour water into sulphuric acid or metal conditioner and rust remover. If water is poured into the mixture, it may splatter and cause acid burns. Provide adequate ventilation when handling sulphric acid, metal conditioner, and rust remover since a poisonous gas may form. The gas is a dangerous fire and explosive hazard.

c. Testing.

(1) Remove battery filler caps.

(2) Test each cell using a battery hydrometer, and record each cell reading.

(3) Hold the hydrometer in a vertical position with just enough electrolyte drawn in so that the float moves freely. To avoid incorrect readings, the float should not touch the sides, top, or bottom of the barrel.

(4) Position the hydrometer so that the surface of the liquid is level with the eyes;. then read the mark on the hydrometer scale at this level.

NOTE

Specific gravity reading should be 1.250 to 1.300 (1.200 to 1.225 for batteries used in tropical climates). If the specific gravity reading is below 1.250 (1.200 for batteries used in tropical climates), the battery requires recharging. If recharging does not bring the specific gravity reading up to its minimum value (1.250 or 1.200), replace battery.

(5) Refer to TM 9-6140-200-12 for information on maintaining lead-acid storage batteries.

d. Battery Removal.

(1) Loosen battery cable terminal clamp nuts and remove battery cables.

(2) Remove nuts from the holddown clips securing battery and remove bracket.

(3) Lift battery vertically out of battery frame.

e. Battery Installation.

(1) Position battery in battery frame.

(2) Position bracket and holddown clips; secure with nuts.

(3) Connect battery cables and tighten battery cable terminal clamp nuts.

2-25. NAVIGATION LIGHTS

a. General. The navigation lights consist of bow light, two running lights, and a range anchor light. The bow light is mounted on top of the cab at the forward inboard corner. The running lights are mounted one on each side of the bulwark at the bow. The range anchor light is mounted on a 20 inch (50.8 cm) staff on top of the cab at the aft inboard corner. The navigation lights are controlled by a switch (NAV LIGHTS) on the instrument panel in the cab.

b. Bow and Running Light Lamp Service.

(1) Loosen screw (1, fig. 2-4) securing cover (2).

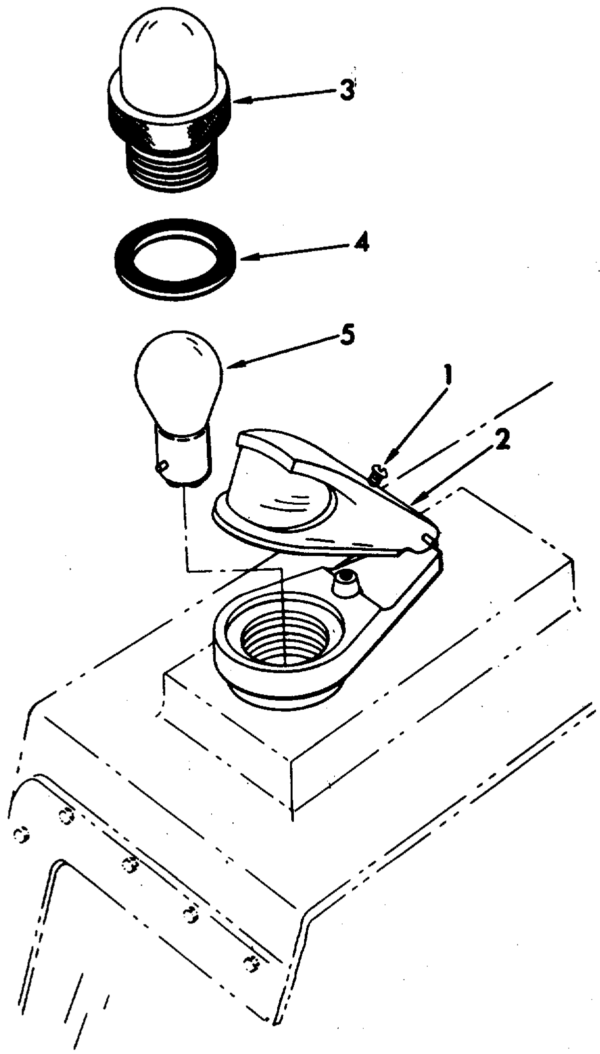
(2) Lift cover and unscrew lens (3) from base of light and remove gasket (4). Inspect gasket; replace if required.

(3) Remove lamp (5) by depressing and rotating to free bayonet base lock. Replace defective lamp.

(4) Depress lamp (5) in socket and rotate to lock.

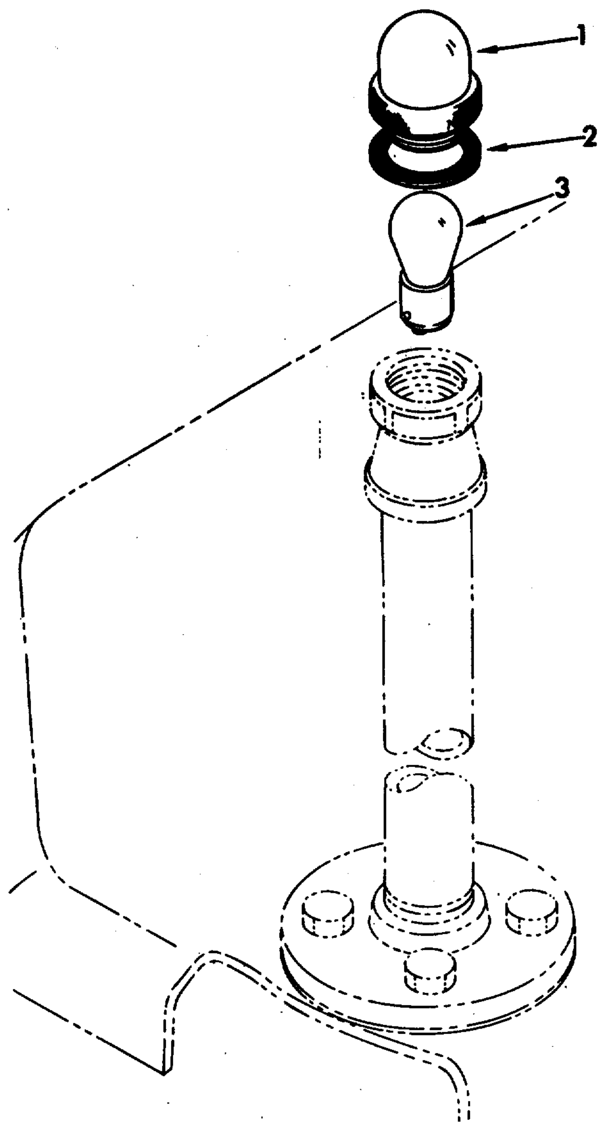
(5) Install gasket (4) and lens (3).

(6) Position cover (2) and secure with screws (1).



1. Screw
2. Cover
3. Lens
4. Gasket
5. Lamp

Figure 2-4. Bow and Rowing Light Replacement.



1. Lens
2. gasket
3. Lamp

Figure 2-5. Range Anchor Light Lamp Replacement.

c. Range Anchor Light Lamp Service.

NOTE
All broken or malformed gaskets shall be replaced with new gaskets.

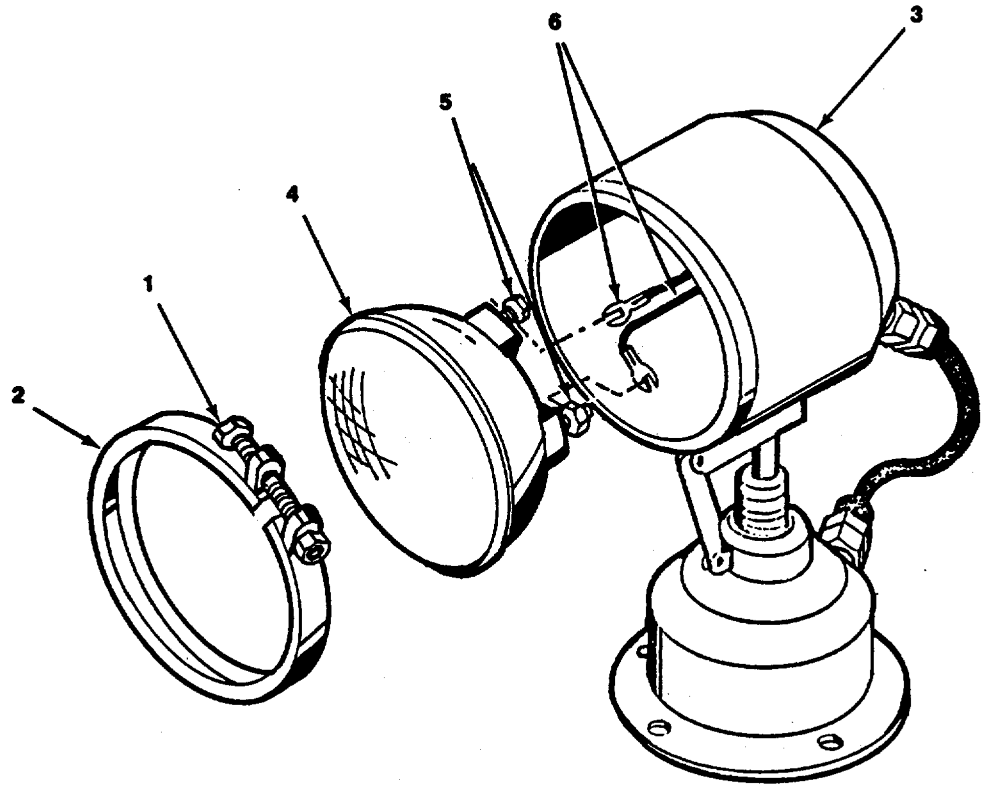
(1) Unscrew lens (1, fig. 2-5) from base of light and remove gasket (2). Inspect gasket, replace if necessary.

(2) Remove lamp (3) by depressing and rotating to free bayonet base lock. Replace defective lamp.

(3) Depress lamp (3) in socket and rotate to lock.

(4) Install gasket (2) and lens (1).

2-26. SERVICE SEARCHLIGHT.



1. *Screw*
2. *Retaining rim*
3. *Housing*
4. *Light bulb*
5. *Nut*
6. *Wire*

Figure 2-6. Searchlight Lamp Replacement.

a. Remove.

(1) Loosen screw (1) on rim (2) and remove rim from searchlight housing (3).

(2) Pull light bulb (4) from searchlight housing (3), loosen nuts (5), and disconnect wires (6) freeing bulb (4).

b. Install.

(1) Connect wires (6) to new light bulb (4) using nuts (5) and insert bulb (4) into searchlight housing (3).

(2) Install rim (2) on searchlight housing (3) and tighten screw (1) securing light bulb (4) in housing.

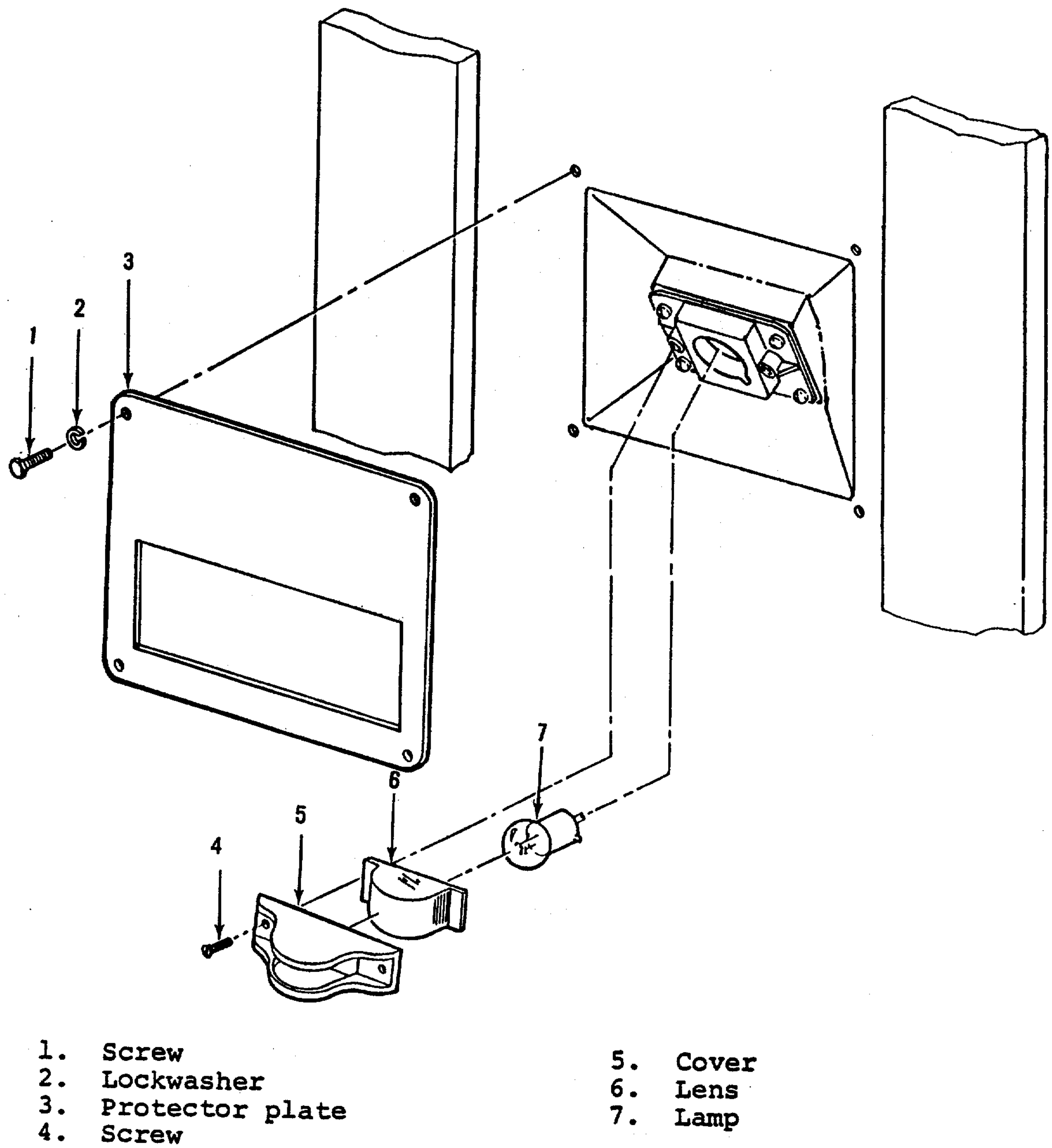


Figure 2-7. Cargo Well Light Lamp Replacement.

2-27. CARGO WELL LIGHTS.

a. General. Four cargo well lights are for illumination of the cargo well area. There are two lights located on the port bulkhead and two on the starboard bulkhead of the cargo well. The lights are controlled by two switches (PORT CARGO LIGHTS and STBD CARGO LIGHTS) on the circuit breaker panel.

b. Service.

(1) Remove four screws (1, fig. 2-7), lockwashers (2) and protector plate (3).

(2) Remove two screws (4) attaching cover to light base and remove cover (5) and lens (6).

(3) Remove lamp (7) by depressing and rotating to free lock base. Replace defective lamp.

(4) Depress lamp (7) in socket and rotate to lock.

(5) Install lens (6). Position cover (5) and secure with .two screws (4) .

(6) Position protector plate (3) and install lockwashers (2) and four screws (1).

2-28. COMPARTMENT LIGHTS.

a. General. The compartment lights are for illuminating the machinery areas and wing compartments. The compartment lights consist of four lights in each upper machinery area, two lights in each lower machinery area, two lights in each bilge machinery area, and one light in each forward and aft wing compartment. The upper and lower machinery area lights and the bilge machinery area light are controlled by two switches rnounted on a bracket beneath the main deck at the center machinery hatches. The wing compartment lights are controlled by a switch on each light fixture.

NOTE

Two types of compartment lights are used on the LARC. Both are serviced in the same manner.

b. Compartment Light Service.

(1) Remove securing ring C1, fig. 2-8).

(2) Remove slipring (2), packing (3), globe (41, and nonmetallic washer (6). Remove la'p C5). by depressing and rotating to free bayonet base lock. Replace defective lamp.

(3) Depress lamp (5) in socket and rotate to lock.

(4) Install nonmetallic washer (6), globe (4), packing (3) and slipring (2).

(5) Install securing ring (1).

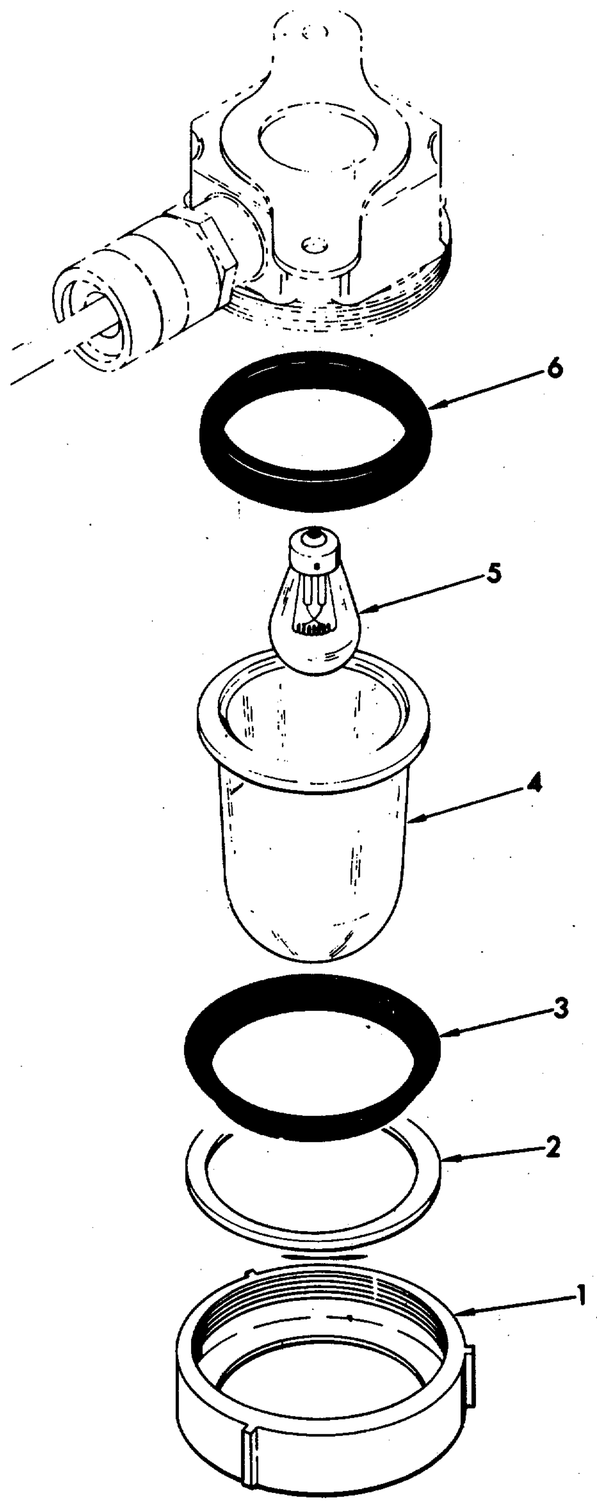


Figure 2-8. Compartment light lamp Replacement.

Legend for figure 2-8:

1. Securing ring
2. Slipring
3. Packing
4. Globe
5. Lamp
6. Washer, nonmetallic

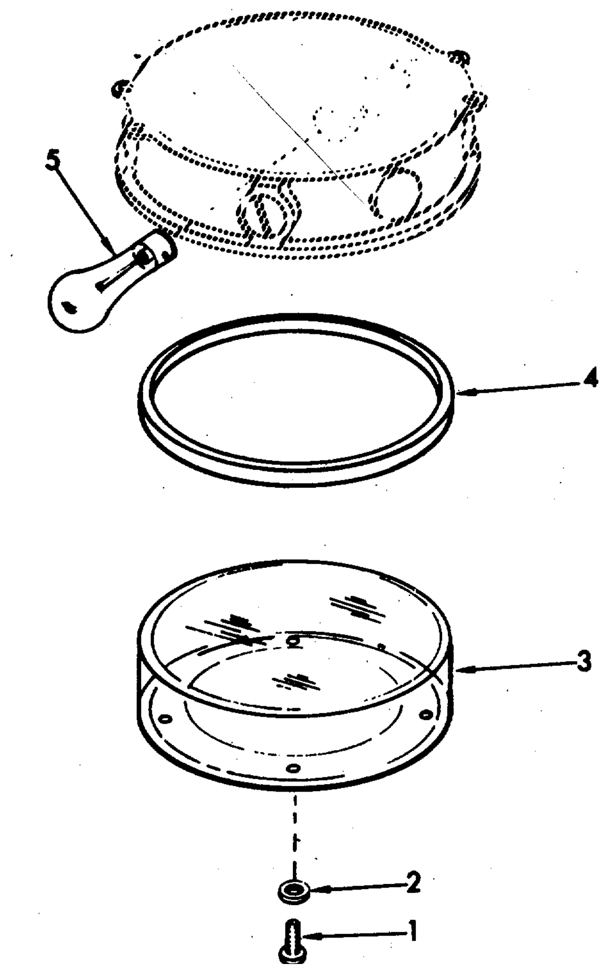
c. Machinery Compartment Light Service.

(1) Remove four screws (1, fig. 2-9), packing (2), lens (3), and packing (4).

(2) Remove lamp (5) by depressing and rotating to free bayonet base lock. Replace defective lamp.

(3) Depress lamp (5) in socket and rotate to lock.

(4) Install packing (4), lens (3), packing (2) and four screws (1).

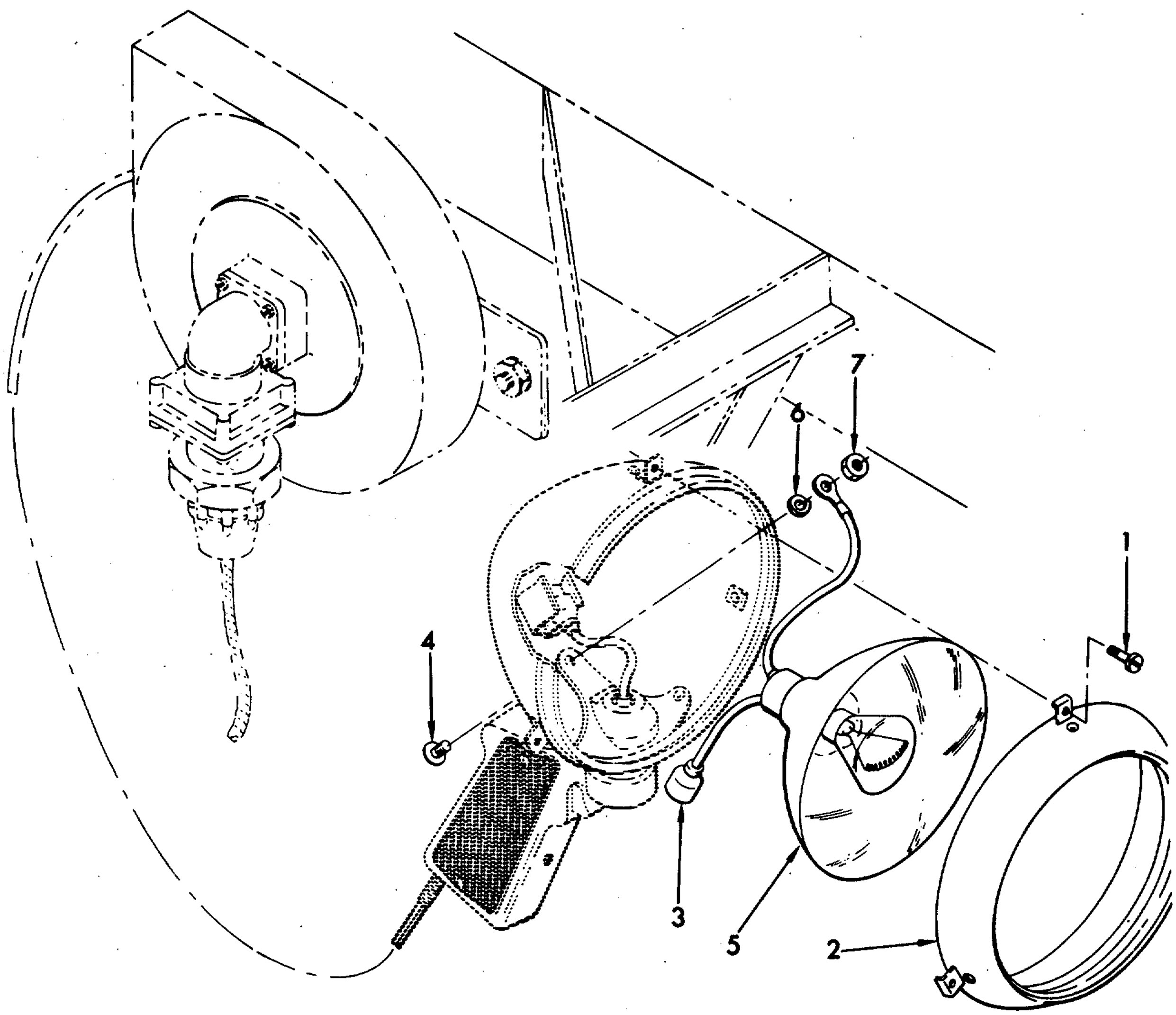


1. Screw
2. Packing
3. Lens
4. Packing
5. Lamp

Figure 2-9. Machinery Compartment Light Lamp Replacement.

2-29. SPOT AND TROUBLE LIGHTS.

a. General. The spot and trouble lights are used as trouble lights forward and aft. The LARC is equipped with two spot and trouble lights, one in the cab and one in the forward starboard wing compartment. Each light has a 24 volt, sealed beam lamp mounted on a pistol-grip handle attached to a cable with a self-winding reel. Each A J light is controlled by a trigger switch in the pistol-grip handle.



1. Screw
2. Door assembly
3. Plug
4. Screw
5. Lamp
6. Lockwasher
7. Nut

Figure 2-10. Spot and Trouble Light Lamp Replacement.

b. Service.

(1) Remove door assembly (2, fig. 2-10) from spot and trouble light by removing three screws (1).

(2) Slide lamp (5) out and remove screw (4), nut (7), and lockwasher (6) to disconnect ground lead.

(3) Disconnect lamp lead plug (3). Replace defective lamp (5) -

(4) Connect lamp lead plug (3).

(5) Position ground lead and secure with nut (7), lockwasher (6) and screw (4).

(6) Slide lamp (5) into position and install door assembly (2) with three screws (1).

2-30. HEADLIGHTS.

a. General. The LARC is equipped with four headlights. There are two types of headlights used, as illustrated in figures 2-11 and 2-12. The lamps for the headlights are sealed beam with three leads. The headlights can be switched from high beam to low beam with three leads. The headlights can be switched from high beam to low beam by means of a dimmer switch located on the floor of the cab. The headlights are controlled by a switch (HEADLIGHTS) on the cab instrument panel.

b. Service (Old Type).

(1) Remove door assembly (2, fig. 2-11) from headlight body by removing three screws (1). Remove gasket (3).

(2) Remove retaining ring (5) by removing three screws (4).

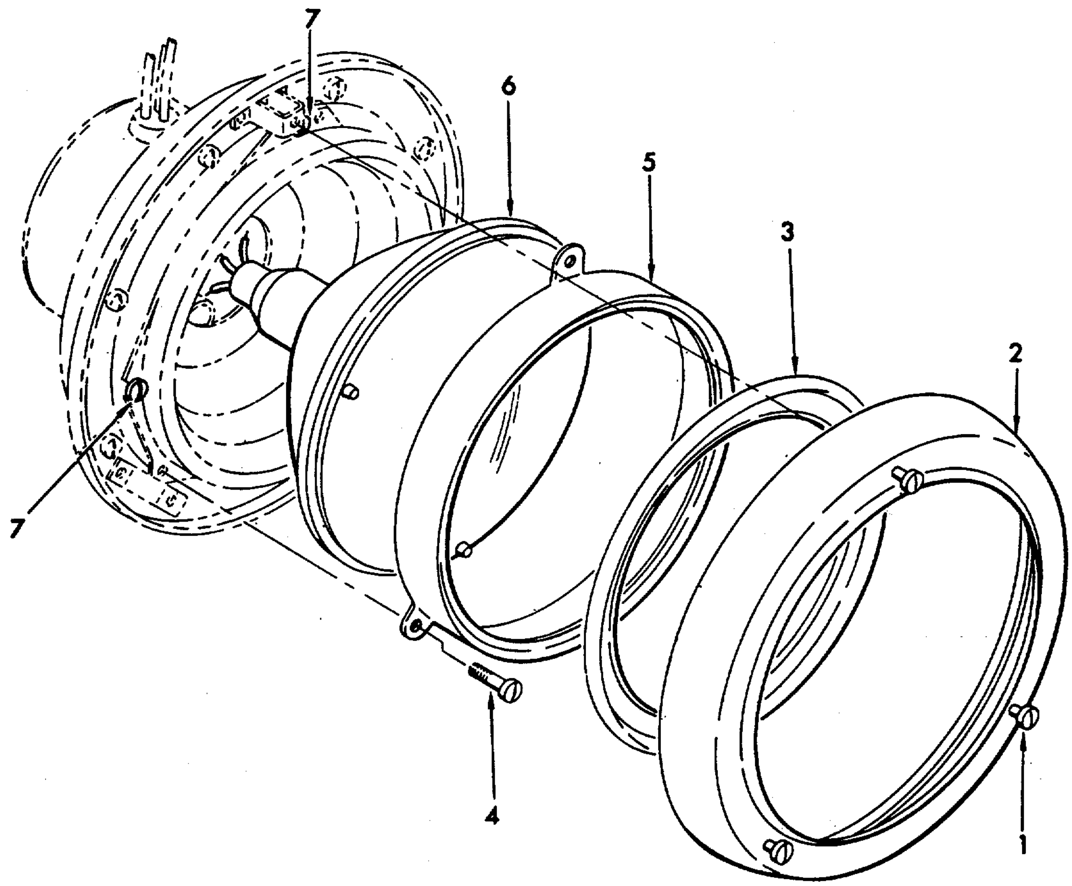
(3) Slide lamp (6) out and remove ground lead. Disconnect lamp lead plugs. Replace defective lamp:

(4) Connect lamp lead plug and attach ground lead.

(5) install lamp (6).

(6) Position retaining ring (5) and secure with three screws (4).

(7) Install gasket (3) and door assembly (21; secure with three screws (1).



1. Screw
2. Door assembly
3. Gasket
4. Screw
5. Retaining ring
6. Lamp
7. Adjusting screw

Figure *2-11. Headlight Lamp Replacement (Old Type).*

c. Service (New Type).

(1) Remove retaining ring (2, fig. 2-12) by removing six screws (1).

(2) Remove lens (3) and gasket (4). Remove retaining ring (6) by removing three screws (5).

(3) Slide lamp (7) out and remove screws that attach the ground lead. Replace defective lamp.

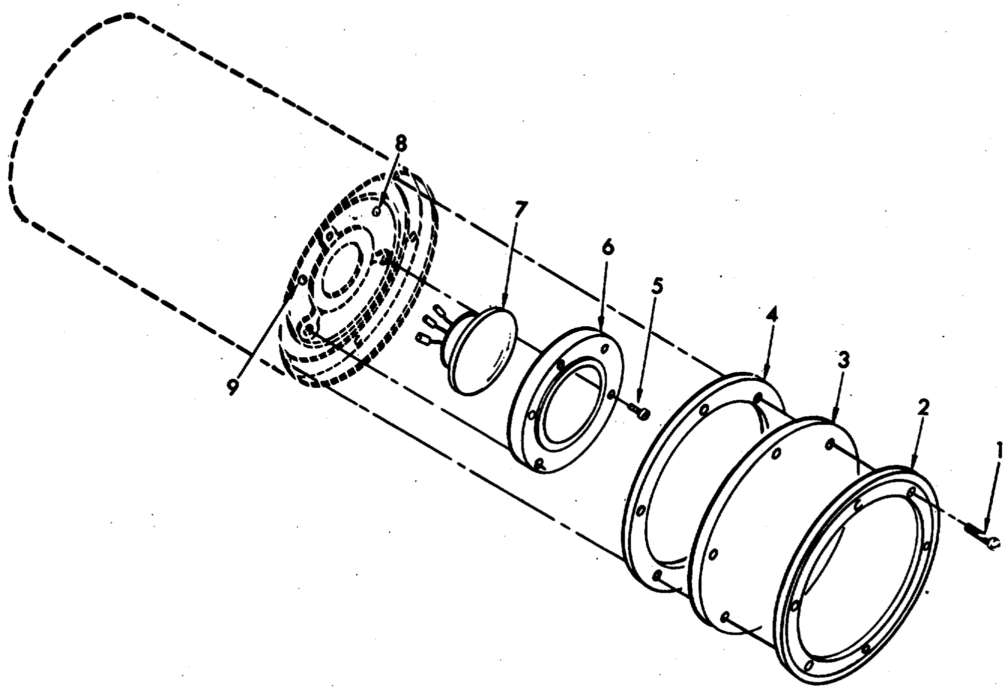
(4) Attach ground lead and install screws.

(5) Install lamp (7).

(6) Install retaining ring (6) and three screws (5).

(7) Install gasket (4) and lens (3).

(8) Position retaining ring (2) and secure with six screws (5).



1. Screw
2. Retaining ring
3. Lens
4. Gasket
5. Screw
6. Retaining ring
7. Lamp
8. Adjusting screw (vertical
9. Adjusting screw (horizontal)

Figure 2-12. Headlight Lamp Replacement (New Type).

d. Adjustment (Old Type).

(1) Remove door assembly (2, fig. 2-11).

(2) Adjust headlights by turning adjusting screws (7) in or out to vary the angle of the lamp. Install door assembly.

e. Adjustment (New Type).

(1) Remove screws (1, fig. 2-12), retaining ring (2), lens (3) and gasket (4).

(2) Adjust headlights by turning adjusting screws (8 and 9) in or out to vary the angle of the lamp. Install ring, lens, and gasket.

2-31. MASTER WARNING LIGHT.

a. General. The master warning light (fig. 2-13) is located on the left side of the instrument panel in the cab. The master warning light will illuminate when any of the port or starboard warning lights located on the cab bulkheads illuminate.

b. Service.

(1) Remove retaining ring (2, fig. 2-13) from light base by removing two screws (1).

(2) Remove lens (3) and gasket (4).

(3) Remove lamp (5) by depressing and rotating to free bayonet base lock. Replace defective lamp.

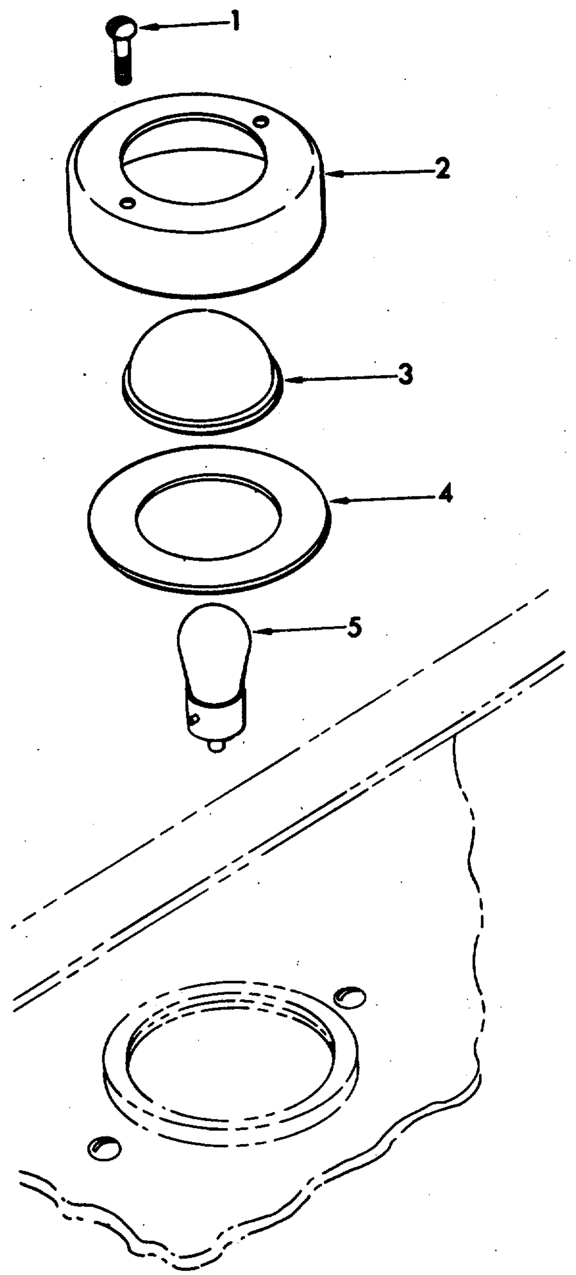
(4) Depress lamp (5) in socket and rotate to lock.

(5) Install gasket (4) and lens (3).

(6) Position retaining ring (2) and secure with two screws (1) .

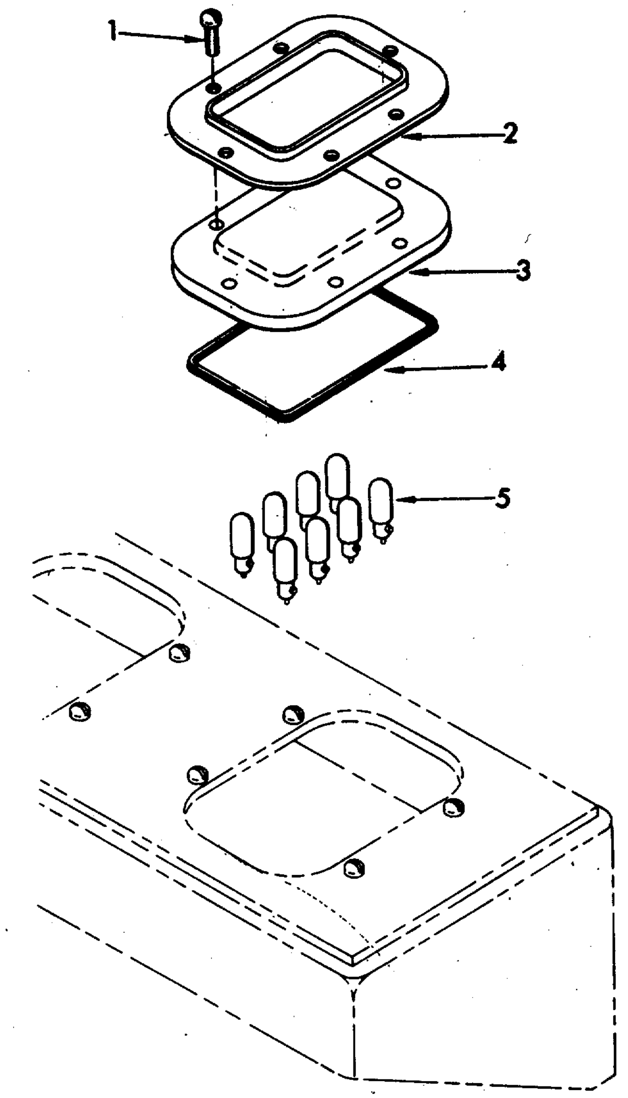
2-32. WARNING LIGHTS.

a. General. The warning lights (fig. 2-14) are located in the cab, one on the port and one on the starboard bulkheads. Each warning light consists of eight individual lamps grouped together. One or more lights will light if a malfunction occurs. The lights indicate low converter oil pressure, high transmission oil temperature, high engine water temperature, low engine oil pressure, high gathering box oil temperature, low marine gear oil pressure, high marine gear oil temperature, and low hydraulic oil level.



1. Screw
2. Retaining ring
3. Lens
4. Gasket
5. Lamp

Figure 2-13. Master Warning Light Lamp Replacement.



1. Screw
2. Frame
3. Lens
4. Seal
5. Lamp

Figure 2-14. Warning Lights Lamp Replacement.

b. Service.

(1) Remove frame C2, fig. 2-14) from warning light base by removing six screws (1).

(2) Remove lens (3) and seal (4).

(3) Remove lamps (5) by depressing and rotating to free bayonet base lock. Replace defective lamp.

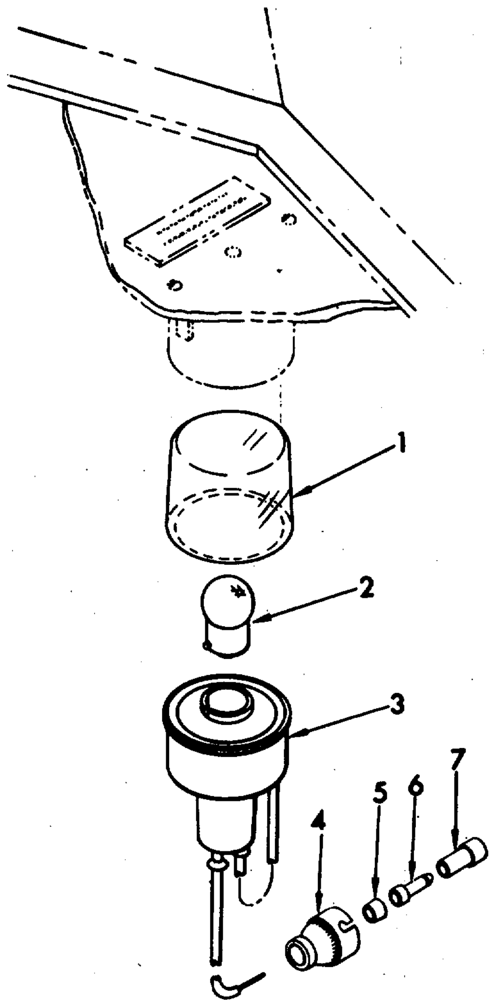
(4) Depress lamp (5) in socket and rotate to lock.

(5) Install seal (4) and lens (3).

(6) Position frame (2) and secure with six screws C1).

2-33. HIGH-BEAM INDICATOR LIGHT.

a. General. The high-beam indicator light (fig. 2-15) is located on the instrument panel and lights when the headlights are on high beam.



1. Lens
2. Lamp
3. Cover assembly
4. Shell
5. Bushing
6. Terminal
7. Grommet

Figure 2-15. High Beam Indicator Light Lamp Replacement.

b. Removal.

(1) Remove cover assembly (3, fig. 2-15) by depressing and rotating. Slide cover assembly from body assembly. Hold lens firmly.

(2) Remove lens (1).

(3) Remove lamp (2) by depressing and rotating to free bayonet base lock.

c. Disassembly.

(1) Slide shell (4, fig. 2-15) and bushing (5) up wire.

(2) Remove grommet (7).

(3) Heat terminal (6) with soldering iron and remove terminal.

(4) Remove bushing (5) and shell (4).

(5) Repair or replace any damaged parts.

d. Reassembly.

(1) Clean wire and tin wire with rosin core solder (item 12, App. C).

(2) Slide shell (4, fig. 2-15) and bushing (5). onto wire.

(3) Place terminal (6) on wire and solder.

(4) Install grommet (7) and reassemble bushing (5) and shell (4).

e. Installation.

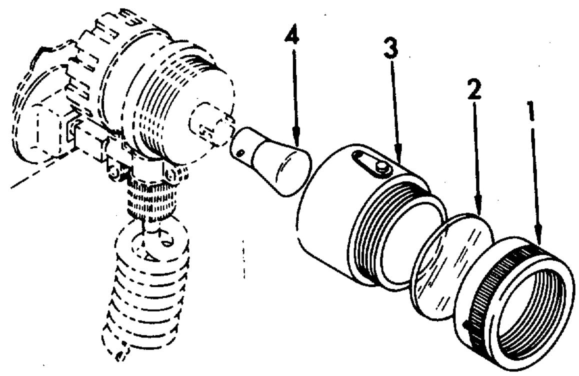
(1) Depress lamp (2, fig. 2-15) into cover assembly (3) and rotate to lock.

(2) Install lens (1).

(3) Install cover assembly (3) into body assembly.

2-34. INSTRUMENT PANEL LIGHTS.

a. General. Two instrument panel ultraviolet lights are mounted on the forward cab top of each side. The instrument panel lights (fig. 2-16) are for illumination of the instrument dials during night operation. Each light is controlled by a rheostat at the rear of the light.



TS 1930-203-20/2-16

1. Retaining ring
2. Lens
3. Lens cover
4. Lamp

Figure 2-16. Instrument Panel Light Lamp Replacement.

b. Service.

(1) Remove lens cover (3, fig. 2-16) and remove lamp (4) by depressing and rotating to free bayonet base lock.

(2) Remove retaining ring (1) and lens (2).. Replace defective lamp.

(3) Install lens (2) and retaining lamp ring (1) on lens cover (3) .

(4) Depress lamp (4) in socket and rotate-to lock.

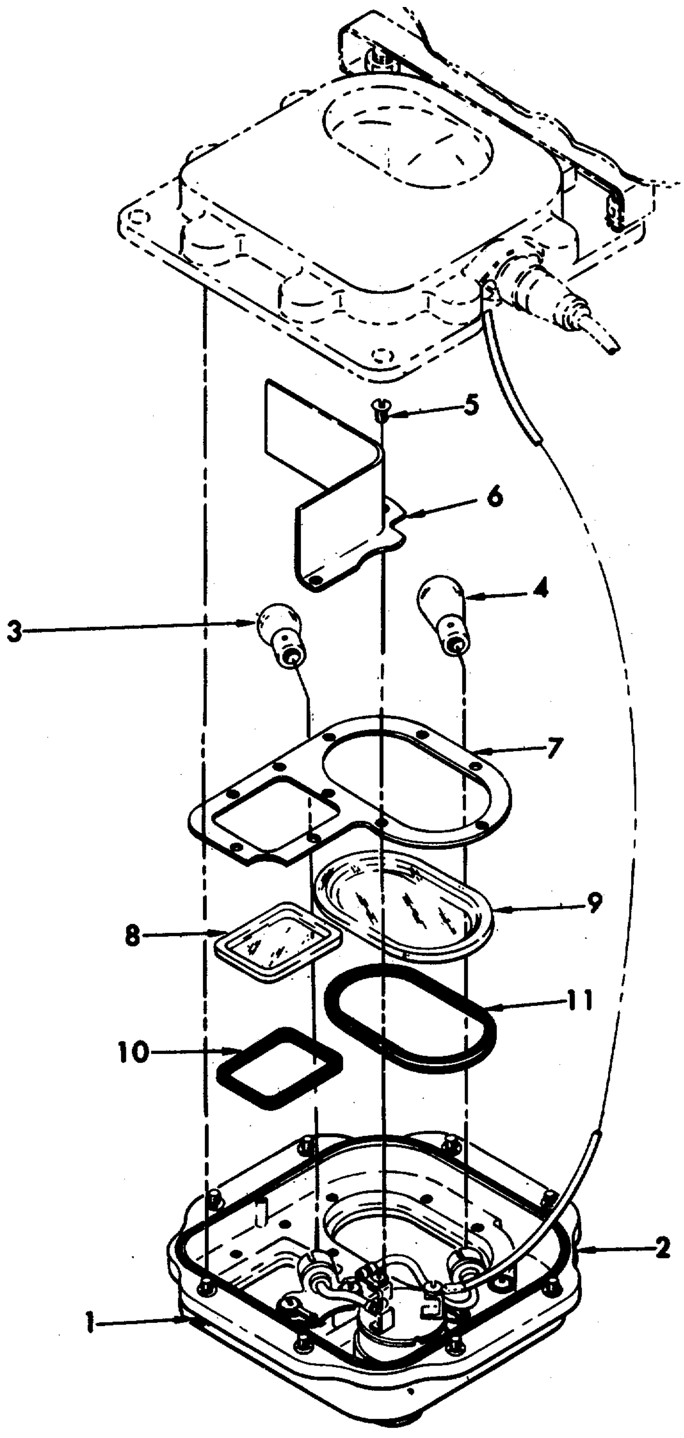
(5) Install lens cover (3).

2-35. CAB DOME LIGHT.

a. General. The dome light is located inside the cab and is mounted on a bracket to the cab top. The dome light contains a red and a white light and is controlled by a switch located on the dome light door assembly.

b. Service.

(1) Remove door assembly (2, fig. 2-17) by loosening eight screws (1).



TS 1930-203-20/2-17

1. Screw
2. Door assembly
3. Lamp
4. Lamp
5. Screw
6. Partiton
7. Plate
8. Lens
9. Lens
10. Gasket
11. Seal

Figure 2-17. Cab Dome Light Lamp Replacement.

(2) Remove lamps (3 and 4) by depressing and rotating to free bayonet base lock.

(3) Remove lenses (8 and 9) by removing partition retaining screws (5) partition (6)., and retaining plate (7).

(4) Remove gasket (10) and seal (11). Replace defective lamp.

(5) Install gasket (10) and seal (11), lenses (8 and 9), retaining plate (7) and partition (6) and secure with screws (5).

(6) Depress lamps (3 and 4) in socket and rotate to lock.

(7) Install door assembly (2) and secure with eight screws (1).

2-36. CIRCUIT BREAKER PANEL.

a. General. The circuit breaker panel (fig. 2-18) contains six 15 ampere and four 20 ampere circuit breakers, all of the thermal and self-resetting type. The circuit breaker panel also contains six toggle switches for controlling the port and standboard cargo light, ventilation fans, heater, searchlight, and radio.

b. Inspection.

(1) Remove four screws (1, fig. 2-18) from top of circuit breaker panel (2) and unhinge circuit breaker panel. Inspect circuit breakers for damage. Replace any damaged circuit breakers.

(2) Inspect switches for damage. Replace any damaged switches.

c. Switch and Circuit Breaker Removal.

(1) Place master control switch on instrument panel to OFF position. Unhinge panel.

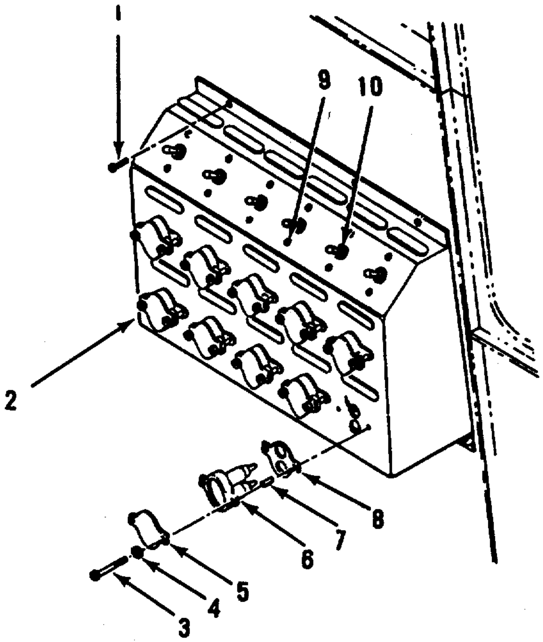
(2) Disconnect and tag wiring at appropriate switch (10, fig. 2-18) or circuit breaker.

(3) Remove two screws (9) and unscrew nut securing each switch to circuit breaker panel. Replace switch.

(4) Remove plate (5), spacers (7), circuit breaker (6), and gasket (8) from circuit breaker panel by removing two screws (3) and two flat washers (4).

d. Switch and Circuit Breaker Installation.

(1) Install gasket (8, fig. 2-18), circuit breaker C6), spacers (7) and plate (5). Secure with two flat washers (4) and two screws (3).



TS 1930-203-20/2-18

1. Screw
2. Circuit breaker panel
3. Screw
4. Washer, flat
5. Plate
6. Circuit Breaker
7. Spacer
8. Gasket
9. Screw
10. Switch

Figure 2-18. Circuit Breaker Panel.

(2) Connect wiring at appropriate switch or circuit breaker.

(3) Position circuit breaker panel (2) and secure with four screws (1).

2-37. ELECTRICAL TACHOMETER GENERATOR.

a. General. The tachometer generators are used to produce electrical current to drive the dual tachometer. A tachometer generator is mounted on each engine and is driven by the camshaft. As speed of the engine increases or decreases, the output of the tachometer generator varies proportionally.

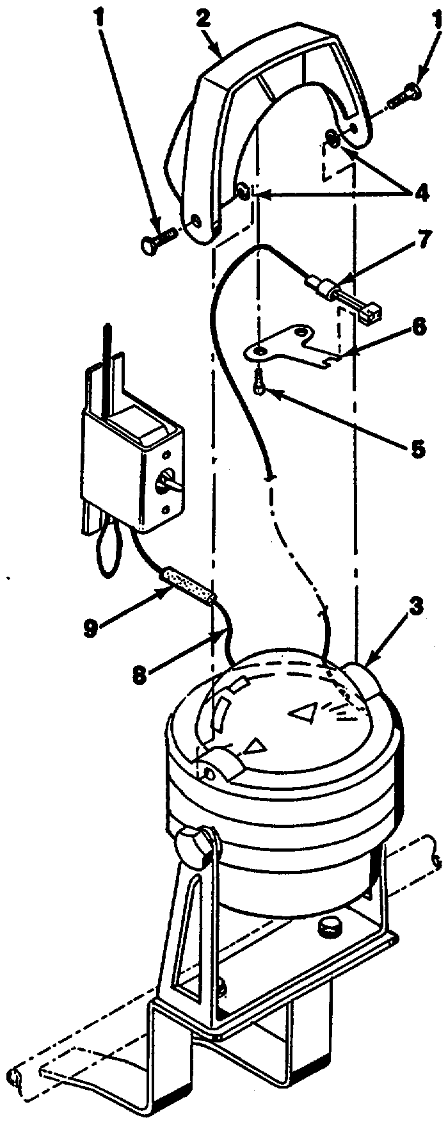
b. Inspection.

(1) Ensure screws attaching tachometer generators are tightened to correct torque value.

(2) Inspect cable connection at generators for security. Tighten loose connections.

(3) Inspect tachometer generator for cleanliness and damage. Clean as necessary. Report any damage to direct or support maintenance.

2-37.1. COMPASS.



1. Setscrew
2. Sunshade
3. Compass housing
4. Washer
5. Screw
6. Bracket
7. Light assembly
8. Light assembly wire
9. Resistor

Figure 2-18.1. Compass

a. Service Compass.

(1) Remove setscrews (1) and lift sunshade (2) from compass housing (3). Retain washers (4).

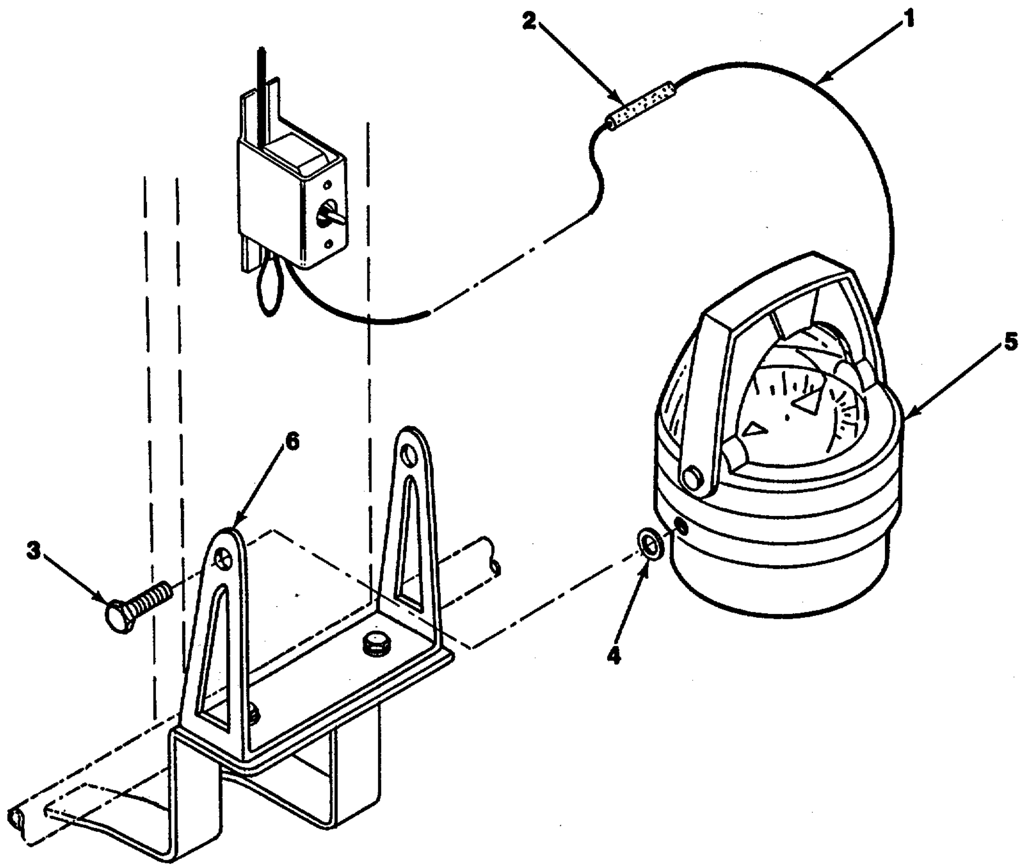
(2) Remove screws (5) and bracket (6) freeing light assembly (7).

(3) Cut light assembly wire (8) at connection to resistor (9) and remove light assembly (7) by pulling wire (8) from compass housing (3).

(4) Thread light assembly wire (8) through compass housing (3).

(5) Secure light assembly (7) using bracket (6) and screws (5).

(6) Attach sunshade (2) to compass housing (3) using washers (4) and setscrews (1).



1.	Light assembly wire	4.	Washer
2.	Resistor	5.	Compass
3.	Screw	6.	Bracket

Figure 2-18.2. Compass Replacement

b. Remove Compass.

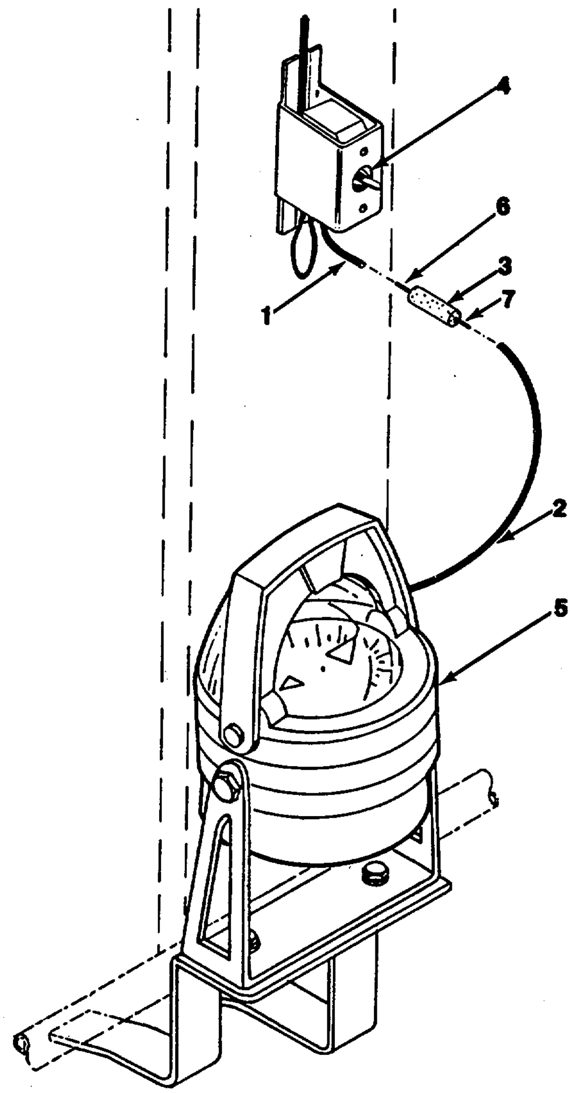
(1) Cut light assembly wire (1) at connection to resistor (2).

(2) Remove screws (3) and washers (4) and then remove compass (5) from mounting bracket (6).

c. Install Compass.

(1) Align compass (5) in bracket (6) and secure using washers (4) and screws (3).

(2) Splice wire (1) to resistor (2) and solder. Wrap connection to insulate.



1. Wire
2. Light assembly wire
3. Resistor
4. Toggle switch
5. Compass
6. Resistor lead
7. Resistor lead

Figure 2-18.3. Replace Compass Resistor.

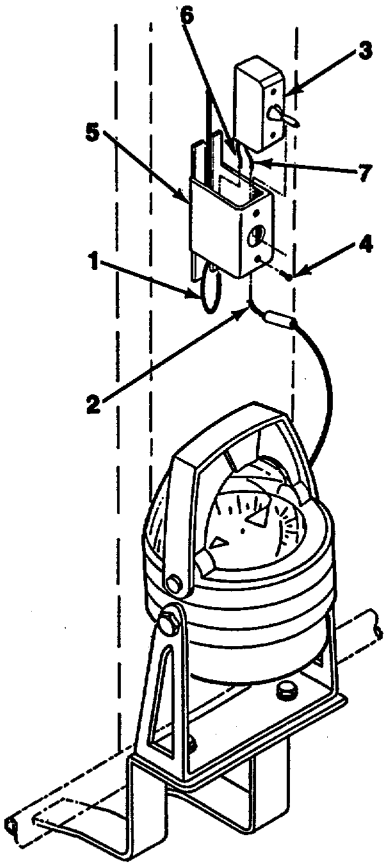
d. Remove Compass Resistor.

(1) Cut wires (1, fig. 2-18.3) and light assembly wire (2) close to resistor (3).

e. Install Compass Resistor.

(1) Strip ends of wires (1) and (2) in preparation for connecting new resistor (3) into wire from toggle switch (4) to compass (5).

(2) Connect resistor leads (6) and (7) to wires (1) and (2). Splice wires and then solder. Insulate connections by wrapping with tape.



1. Wire
2. Light assembly wire
3. Toggle switch
4. Screw
5. Bracket
6. Lead
7. Lead

Figure 2-18.4. Replace Compass Switch.

f. Remove compass switch.

(1) Cut wires (1, fig. 2-18.4) and light assembly wire (2) close to toggle switch (3).

(2) Remove screws (4) and remove switch (3) from bracket (5).

g. Install-compass switch.

(1) Strip ends of wires (1) and (2) in preparation for connecting replacement switch into circuit.

(2) Connect wires (1) and (2) to leads (6) and (7) on new tog%1e switch (3).

NOTE

Connect wires using solderless connectors when available. When solderless connectors are not available splice the wires and then solder. Wrap wire connections with tape or use heat shrink tubing to insulate.

(3) Place switch (3) in bracket (5) and secure using screws (4).

SECTION IX. MAINTENANCE OF HULL AND COMPONENTS

2-38. GENERAL.

Basically, the LARC is constructed of a steel frame with a welded steel skin. However, for this structure to be serviceable, numerous hull components are required. These components consist of compartment scuttle covers, hatch cover braces, hatch covers, towing lugs and shackles, cargo well dunnage, bilge drain valves, bilge pumps, cargo well pumps, ramps, cab, cab hatch or scuttle cover, and operator' s seat.

2-39. GENERAL INSPECTION AND SERVICE OF HULL.

a. Inspect the hull and all bulkheads for signs of rust, dents, or breaks. Clean rusted areas and spot-paint as necessary.

b. Remove access cover gaskets by removing attaching bolts.

c. Inspect access cover gasket seat for rust. Clean any rust or foreign particles from gasket seat with a wire brush.

d. Inspect access cover gaskets for deterioration or hardening and cracking. Replace unserviceable gaskets.

e. Install access covers and gaskets.

f. Ensure bolts securing access covers are tightened to correct torque values.

g. Inspect molded rubber fenders for deep gouges, cuts, and deterioration.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

h. Clean bilge pumps with drycleaning solvent (item 6, App. C) and inspect for broken housing. If pump is damaged, notify direct support maintenance.

i. Ensure bolts attaching bilge pumps are tightened to correct torque value.

j. Inspect bilge pump strainers for bent, broken, or clogged condition. If a strainer is damaged or clogged, remove attaching screws and clean or replace strainer.

k. Inspect bilge pump discharge hoses, lines, and clamps for corrosion or breaks. If discharge lines are damaged, notify direct support maintenance.

l. Inspect cargo well pump oil lines for leaking, bent, or broken condition. Tighten leaking fittings. If an oil line is damaged, report damage to direct support maintenance.

2-40. COMPARTMENT SCUTTLES.

a. General. There are three deck scuttle openings on the main deck (fig. 2-1. A scuttle opening is provided for each forward wing compartment and for the aft starboard storage area. Each scuttle opening is equipped with a scuttle cover that can be sealed by dog bolts mounted on the scuttle cover mounting ring. A rubber gasket is installed on each scuttle cover, making the scuttle opening watertight when closed.

b. Inspection and Service.

(1) Inspect cover for breakage. If broken, notify direct support maintenance.

(2) Inspect dog bolt and wingnut (14, fig. 2-19) for broken or bent condition. Replace damaged dog bolt and wingnut.

(3) Inspect cover gasket. If damaged, replace.

(4) Oil scuttle hinges and dog bolts. Remove paint, grease, or rust spots from gasket.

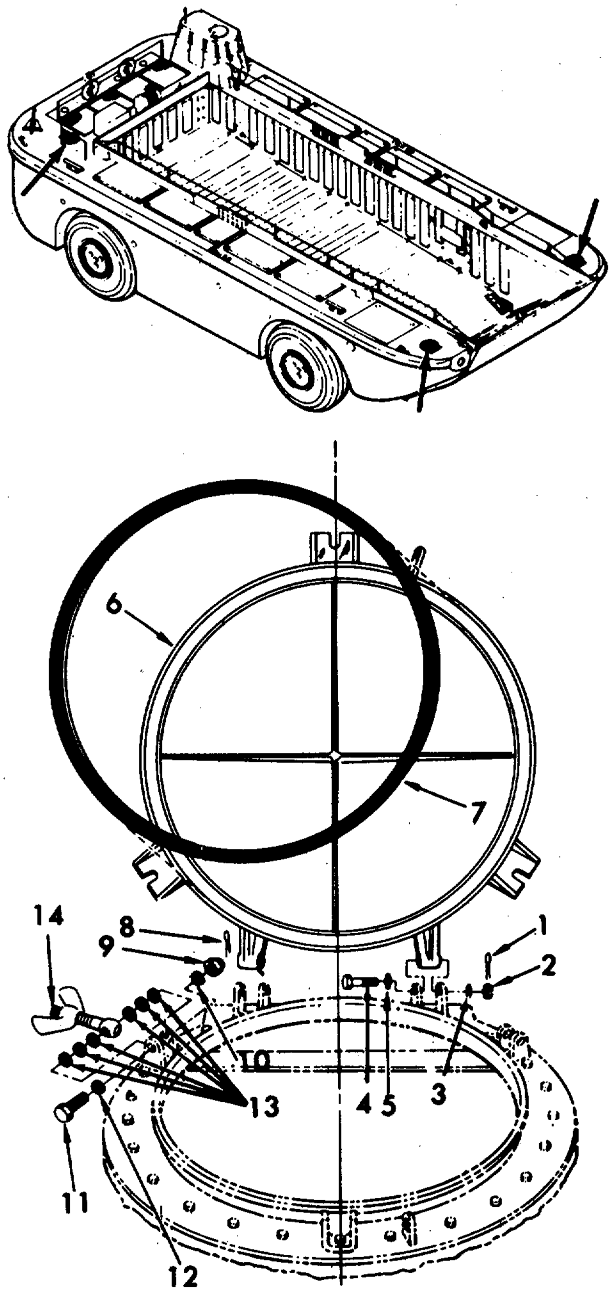
c. Removal.

(1) Loosen dog bolt and wingnut (14, fig. 2-19).

(2) Remove two cotter pins (1), nuts (2), flat washers (3), bolts (4), and flat washers (5). Remove covet (6).

(3) Remove cotter pin (8), nut (9), flat washer (10).

(4) Remove bolt (11), flat washer (12), six flat washers (13) and remove dog bolt and wingnut (14).



TS 1930-203-20/2-19

1.	Cotter pin	8.	Cotter pin
2.	Nut	9.	Nut
3.	Washer, flat	10.	Washer, flat
4.	Bolt	11.	Bolt
5.	Washer	12.	Washer, flat
6.	Scuttle	13.	Washer, flat
7.	Gasket	14.	Dog bolt and wingnut

Figure 2-19. Compartment Scuttle Cover, Removal and Installation.

d. Installation.

(1) Start bolt (11, fig. 2-19) and washer (12) through hinge.

(2) Place three flat washers (13), dog bolt and wingnut (14), and three flat washers (13) on bolt (11).

(3) Place washer (10) and nut (9) on other end of bolt. Tighten nut and insert cotter pin C8).

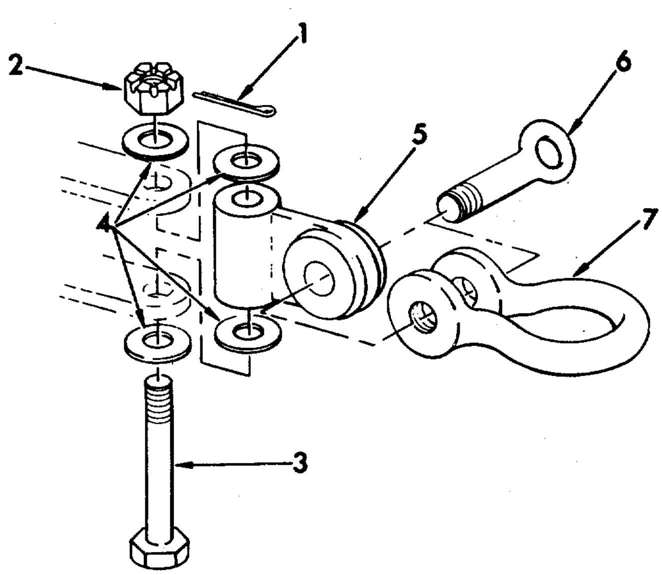
(4) Place cover (6) in hinge.

(5) Place bolt C4) and flat washer C5) through hinge.

(6) Place flat washer (3) and nut (2) on other end of bolt. Tighten nut and insert cotter pin (1).

2-41. TOWING LUG AND SHACKLE.

a. General. The towing lugs and shackles (fig. 2-20) are used for securing towing lines. Each swivel-type steel lug is capable of withstanding 100,000 pounds C45,360 kg) normal pull. Provisions are made for stowing the towing lugs and shackles in the aft starboard area.



1. Cotter pin
2. Nut
3. Bolt
4. Washer, flat
5. Shackle
6. Shackle pin
7. Towing lug

Figure 2-20. Towing Lug and Shackle, Removal and Installation.

b. Inspection.

(1) Inspect towing lug (7, fig. 2-20) and shackle (5) for rust. Remove rust with a wire brush and spot paint as necessary.

(2) Check if towing lug and shackle is bent or broken. Replace defective part.

c. Removal.

(1) Remove cotter pin (1, fig. 2-20), nut (2)., bolt (3), and four flat washers (4).

(2) Remove shackle (5) with towing lug (7) attached.

(3) Remove shackle pin (6) to separate shackle and towing lug.

d. Installation.

(1) Position towing lug (7, fig. 2-20) on shackle (5) and install shackle pin (6).

(2) Position shackle with two flat washers (4) between brackets. Install bolt (3), with flatwashers (4), nut (2) and cotter pin (1).

2-42. BILGE DRAIN VALVES.

a. General. There are 11 bilge drain valves (fig. 2-21) located at different points in the bilge area. These valves provide a means of draining water from the bilge areas while the LARC is on land. The valves are operated by handwheels connected to the valves by flexible shafts.

b. Inspection and Service.

(1) Lubricate flexible shaft with GAA grease.

(2) Open and close bilge drain valve to check for ease of operation. If a binding condition exists, disconnect flexible shaft at handwheel (7, fig. 2-21) and check for binding again. If binding still exists, replace flexible shaft.

Legend for figure 2-21:

1. Nut
2. Washer, flat
3. Handwheel
4. Nut
5. Lockwasher
6. Nut
7. Handwheel
8. U-bolt
9. Nut
10. Packing
11. Nut
12. Bolt
13. Valve body
14. Disk holder
15. Disk
16. Disk retainer
17. Screw
18. Screen

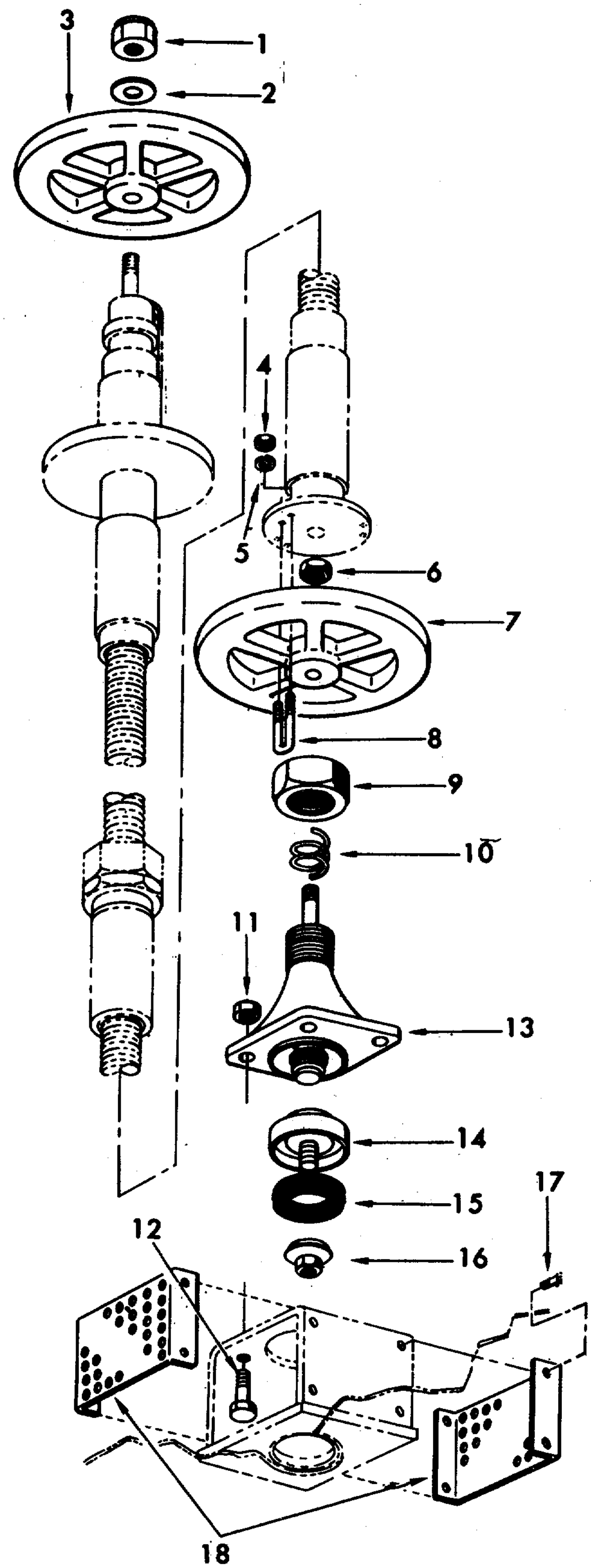


Figure 2-21. Bilge Drain Valve, Exploded View.

(3) Inspect upper handwheel (3) for damage. If damaged, replace .

c. Removal.

(1) Remove nut (1, fig. 2-21), flat washer (2), and remove handwheel (3).

(2) Remove six nuts (4), six lockwashers (5), three U-bolts (8), and remove flexible shaft.

(3) Remove nut (6) and remove handwheel (7).

(4) Remove eight screws (17) and remove screen (18).

(5) Remove four nuts (11) and four screws (12) and valve.

(6) Disassemble valve by removing nut (9), packing (10), disk retainer (16), disk (15), and disk holder (14).

d. Cleaning, Inspection, and Repair.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean all metal parts with drycleaning solvent (item 6, App. C). Dry with low-pressure compressed air.

(2) Replace entire drain valve if valve stem or body is bent or broken. Replace or repair any other damaged part as necessary.

e. Installation.

(1) Install disk (15, fig. 2-21), disk retainer (16) and disk holder (14) on valve (13).

(2) Install packing (10) and nut (9).

(3) Install valve (13), four nuts (11) and four screws (12).

(4) Position screen (18) and install eight screws (17).

(5) Install handwheel (7) and nut (6).

(6) Position flexible shaft, install three U-bolts (8), six lockwashers (5) and six nuts.(4).

(7) Install handwheel (3), flat washer (2} and nut (1).

2-43. RAMP.

a. General. The ramp is used to facilitate loading and unloading cargo. The ramp is opened and closed by means of two hydraulically operated ramp cylinders and cable harnesses. These cylinders are located in the forward port and starboard wing compartment. The ramp is secured at the bottom with four hinge pins. Drainplugs are provided in both sides of the ramp to drain water that may accumulate in the compartments within the ramp. A rubber seal, installed around the cargo well ramp opening, inflates when the ramp is fully closed and latched and seals the ramp to the hull. The ramp is secured in the closed-position by two ramp latches.

b. Inspection and Service.

(1) Lubricate ramp hinge pins with GLA grease.

(2) Examine ramp hinge for evidence of bent or distorted hinge pins. Notify direct support maintenance of any damaged hinge pins.

(3) Lower ramp and remove ramp drainplugs. Drain water from ramp compartments and inspect drainplugs for stripped threads. Replace any damaged drainplugs.

2-44. RAMP LATCH.

a. General. There are two hand-operated ramp latches (fig. 2-22) located one on each side of the cargo well at the bow. These latches are used to secure the ramp in the raised position. The ramp latch on the starboard side also actuates the ramp seal inflation valve.

b. Inspection and Service.

(1) Examine ramp latch for broken or bent parts. If ramp latch is damaged, replace defective parts.

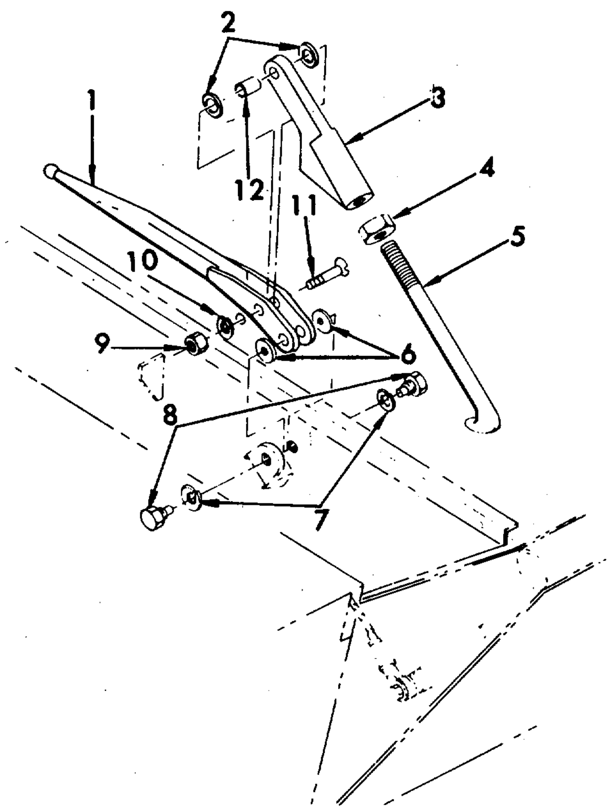
(2) Oil all working parts of the ramp latch (see lubrication order).

(3) With ramp raised, latched, and seal inflated, examine lever (1, fig. 2-22) for slack movement. Any slack movement indicates adjustment is necessary.

c. Adjustment.

(1) Unlatch ramp and loosen nut (4, fig. 2-22) on hook (5). Turn hook clockwise to reduce length of hook and counterclockwise to increase length of hook.

(2) Adjust hook (5) to proper position and tighten nut (4) securely.



TS 1930-203-20/2-22

1. Lever
2. Washer, flat
3. Hook mount
4. Nut
5. Hook
6. Washer, flat
7. Lockwasher
8. Bolt
9. Nut
10. Lockwasher
11. Screw
12. Bushing

Figure 2-22. Ramp Latch, Exploded View.

d. Removal.

(1) Remove two bolts 1(8, fig. 2-22) and lockwashers (7) and remove ramp latch and two flat washers (6).

e. Disassembly.

(1) Loosen nut (4, fig. 2-22); unscrew and remove hook (5).

(2) Remove nut (9), lockwasher (10), screws (11), two flat washers (2), and bushing (12) to separate hook mount (3) and lever (1).

f. Cleaning, Inspection and Repair.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flashpoint of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean all parts with drycleaning solvent, (item 6, App. C) and dry with compressed air. Spot paint as necessary.

(2) Examine bolts (8), screw (11), and nut (9) for stripped threads. Examine lever (1), hook mount (3), and hook (5) for damage. Replace all damaged parts.

g. Reassembly. Position hook mount (3, fig. 2-22), bushing (12) and two flat washers (2) between lever (1). Install screw C11), lockwasher (10) and nut (9).

(2) Install hook (5) and nut (4). Adjust as necessary.

h. Installation. Position ramp latch, install washers (6 and 7, fig. 2-22) and bolts (8).

2-45. RAMP CABLE HARNESSES.

a. General. The ramp cable harnesses (fig. 2-23), located in the forward port and starboard wing compartments, multiply the movement of the hydraulic ramp cylinders for raising or lowering the ramp. Each cable harness is equipped with an adjustment bridle for removing slack from the wire rope.

b. Inspection and Service.

(1) Lubricate blocks, sheaves, and wire rope with GAA grease.

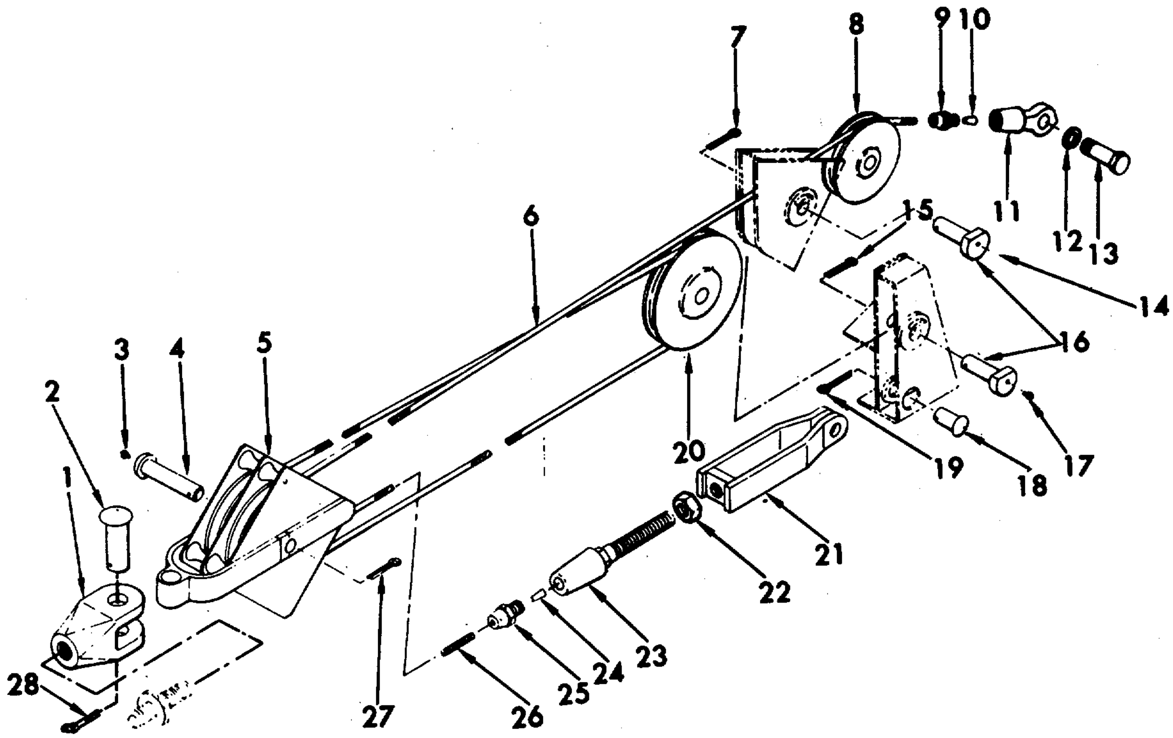
(2) Inspect wire rope (6, fig. 2-23) for frayed or broken strands. If damaged, replace rope.

(3) Inspect sheaves (8 and 20) and double blocks (5) for breakage. Replace damaged sheaves or blocks.

(4) Inspect wire rope bridles, sockets, sleeves, and eye end fittings for breakage. Replace damaged parts.

c. Adjustment. If either or both sides of the ramp will not fully close when raised, adjust ramp cable harness as follows:

(1) Lower ramp to obtain slack in cable harness.



TS 1930-203-20/2-23

1. Clevis
2. Clevis pin
3. Fitting
4. Pin
5. Double block
6. Wire rope
7. Cotter pin
8. Sheave
9. Sleeve
10. Plug
11. Eye end fitting
12. Washer, flat
13. Bolt
14. Fitting
15. Cotter pin
16. Sheave pin
17. Fitting
18. Pin
19. Cotter pin
20. Sheave
21. Adjustment bridle
22. Locknut
23. Socket
24. Plug
25. Sleeve
26. Wire rope
27. Cotter pin
28. Cotter pin

Figure 2-23. Ramp Cable Harness, Removal and Installation.

(2) Disconnect adjustment bridle (21, fig. 2-23) from sheave mount be removing cotter pin (19) and pin (18).

(3) Rotate adjustment bridle clockwise to remove slack from cable. Tighten locknut (22).

(4) After adjustment is complete, position adjustment bridle on sheave mounting and replace pin and cotter pin.

d. Removal.

(1) Lower ramp to obtain slack in the cable harness.

(2) Remove cotter pin (19, fig. 2-23), pin (18), adjustment bridle (21), socket (23), plug (24), and sleeve (25).

(3) Remove bolt (13), flat washer (12), eye end fitting (11), plug (10), and sleeve (9)). Pull wire rope out.

WARNING

On hulls 19 through 60, remove lubrication fittings (3, 14, and 17).

(4) Remove cotter pins (7 and 15) inserted through sheave pins (16).

(5) Remove sheave pins (16) and remove sheaves (8 and 20). Remove cotter pin (28) inserted through clevis pin (2).

(6) Remove clevis pin (2) and remove double block (5).

(7) Remove cotter pin (27) inserted through pin (4) in double block (5). Remove pin (4) and sheaves from double block.

(8) Replace any defective part required to repair ramp cable harness.

e. Installation.

(1) Install pin (4, fig. 2-23) in double block (5) insert cotter pin (27).

(2) Position end of double block between clevis (1), install clevis pin (2) and cotter pin (28).

(3) Install sheaves (8 and 20), sheave pins (16) and cotter pins (7 and 15).

NOTE

On hulls 19 through 60, install lubrication fittings (3, 14, and 17).

(4) Install wire rope in sleeve (9), install plug (10), eye end fitting (11), flat washer (12) and bolts (13).

(5) Install sleeve (25), plug (24), socket (23), nut (22) and adjustment bridle (21). Position adjustment bridle and install pin (18) and cotter pin (19).

2-46. RAMP SEAL.

a. General. An inflatable rubber seal installed around the ramp opening in the cargo well to seal the ramp to the cargo well. When the ramp is fully closed and latched, the seal is inflated to 15 psi (1.05 kg/cm2).

b. Inspection.

(1) Inspect ramp seal for deep cuts or gouges. Check to see if seal has pulled away from seal retainers. If seal has cuts, gouges, or evidence of chafing, notify direct support maintenance.

(2) Check ramp seal for leakage as follows:

(a) With ramp up and seal inflated, close ramp seal plug valve located just below ramp latch lever. Tie or tape exhaust quick-opening valve, located forward on the starboard bulwark, in closed position.

(b) Unlatch and lower ramp. Check ramp seal with a soapy water solution. If seal leaks, notify direct support maintenance.

(c) Raise and latch ramp; remove line or tape from deflation quick-opening valve and open ramp seal plug valve.

2-47. CAB.

a. General. The cab, located on the aft port side, houses the instruments and controls necessary for the operator to control the LARC. Seats are provided in the cab for the operator-and two crew members. On hulls 5 through 18, a sliding hatch cover is located on top of the cab to cover the hatch opening. On hulls 19 through 60, a scuttle cover is provided on the top of the cab.

b. Inspection and Service.

(1) Inspect cab hull for dents or rust. Remove rust and spot-paint as necessary. If cab-hull is damaged by dents, notify direct support maintenance.

(2) Inspect window glass for cracked or clouded condition. If defective, notify direct support maintenance.

(3) Inspect door for broken, deteriorated, or loose seal. If seal is damaged, replace. If seal is loose, glue seal to door frame with rubber cement (item 13, App. C).

(4) Inspect sponge rubber padding around hatch opening on hulls 5 through 18. If padding is damaged, replace. If padding is loose, glue to hatch opening with rubber cement (item 13, App. C).

(5) Inspect hatch latch on hulls 5 through 18 for operation. If latch does not work properly, repair latch.

(6) Inspect sliding hatch on hulls 5 through 18 for freedom of movement. If hatch is damaged, notify direct support maintenance. Remove rust and spot-paint as necessary. Lubricate hatch (see lubrication order).

(7) Inspect operator's seat upholstery and springs for damage. Report any damage to direct support maintenance. Clean operator's seat backrest and seat cushion with mild soap and water. Apply leather preservative (item 10, App. C). Lubricate seat (see lubrication order).

c. Door Seal Removal.

(1) Use a smooth-bladed tool to remove seal from door frame. Peel door seal completely away from door frame.

(2) lean all remaining pieces of door seal and adhesive from door frame with wire brush.

d. Door Seal Installation.

(1) Notch seal material at door corners to provide a smooth fit. Apply a coat of rubber cement (item 13, App. C) to door frame.

(2) Place new seal to door frame. Work seal in place by hand pressure to obtain an even fit.

e. Rubber Padding Removal (Hulls 5 through 18).

(1) Strip sponge rubber padding from hatch opening.

(2) Remove all traces of old padding and cement from hatch opening with wire brush.

f. Rubber Padding Installation (Hulls 5 through 18).

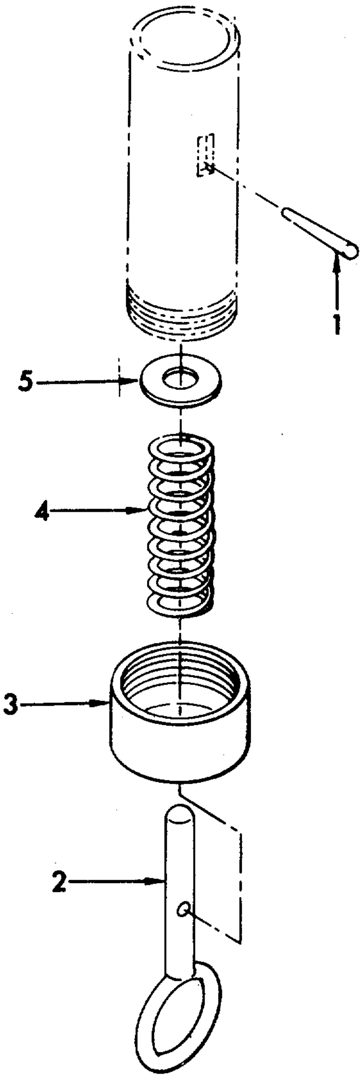
(1) Apply a coat of rubber cement (item 13, App. C) to hatch opening.

(2) Position new sponge rubber padding and allow to dry.

g. Hatch Latch Removal (Hulls 5 through 18).

(1) Remove pin (1, fig. 2-24).

(2) Unscrew cap (3) and remove pin and ring (2), spring (4), and flat washer (5).



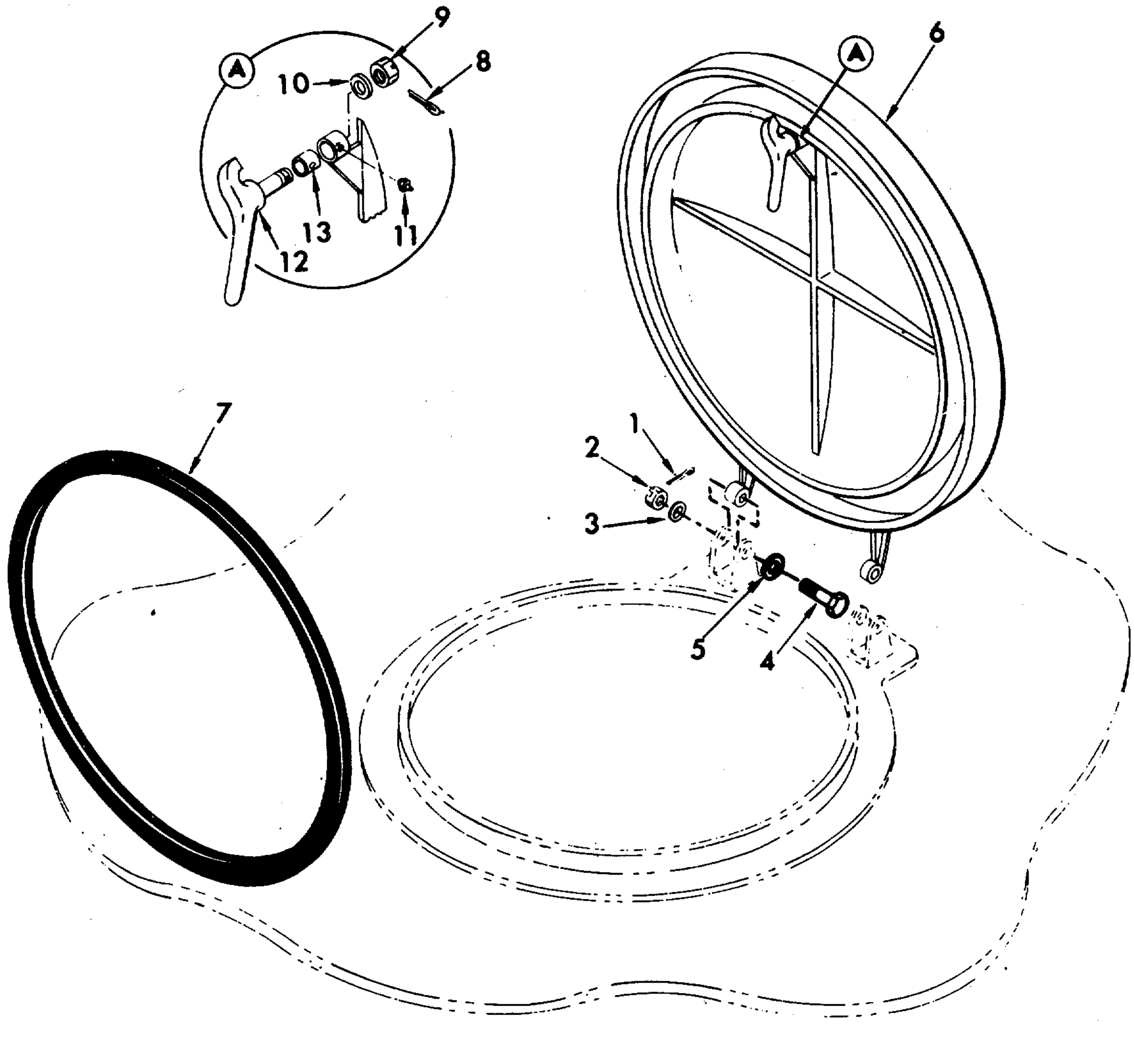
TS 1930-203-20-2-24

1. Pin
2. Pin and ring
3. Cap
4. Spring
5. Washer, flat

Figure 2-24. Sliding Hatch Latch, Removal and Installation.

2-48. CAB SCUTTLE COVER.

a. General. On hulls 19 through 60, the opening in the top of the cab is sealed with a scuttle cover (6, fig. 2-25). A dog handle is installed on the bottom side of the scuttle cover to lock the cover in the closed position.



1. Cotter pin
2. Nut
3. Washer, flat
4. Bolt
5. Washer, flat
6. Scuttle cover
7. Gasket
8. Cotter pin
9. Nut
10. Washer, flat
11. Fitting
12. Dog handle
13. Bushing

Figure 2-25. Cab Scuttle Cover, Removal and Installation..

b. Inspection and Service.

(1) Inspect cover for any damage. Replace a damaged cover.

(2) Lubricate cover hinges and dog handle.

(3) Check condition of scuttle cover gasket. If gasket is damaged, replace. Cement new gasket in place using rubber cement (item 13, App. C).

c. Removal.

(1) Remove cotter pin (1, fig. 2-25), nut (2), flat washer (3), bolt (4), and flat washer (5). Remove cover.

(2) Remove dog handle (12) by removing cotter pin (8), nut (9), flat washer (10), and bushing (13).

d. Installation.

(1) Attach dog handle (12, fig. 2-25) to cover and secure with flat washer (10), nut (9), and cotter pin (8).

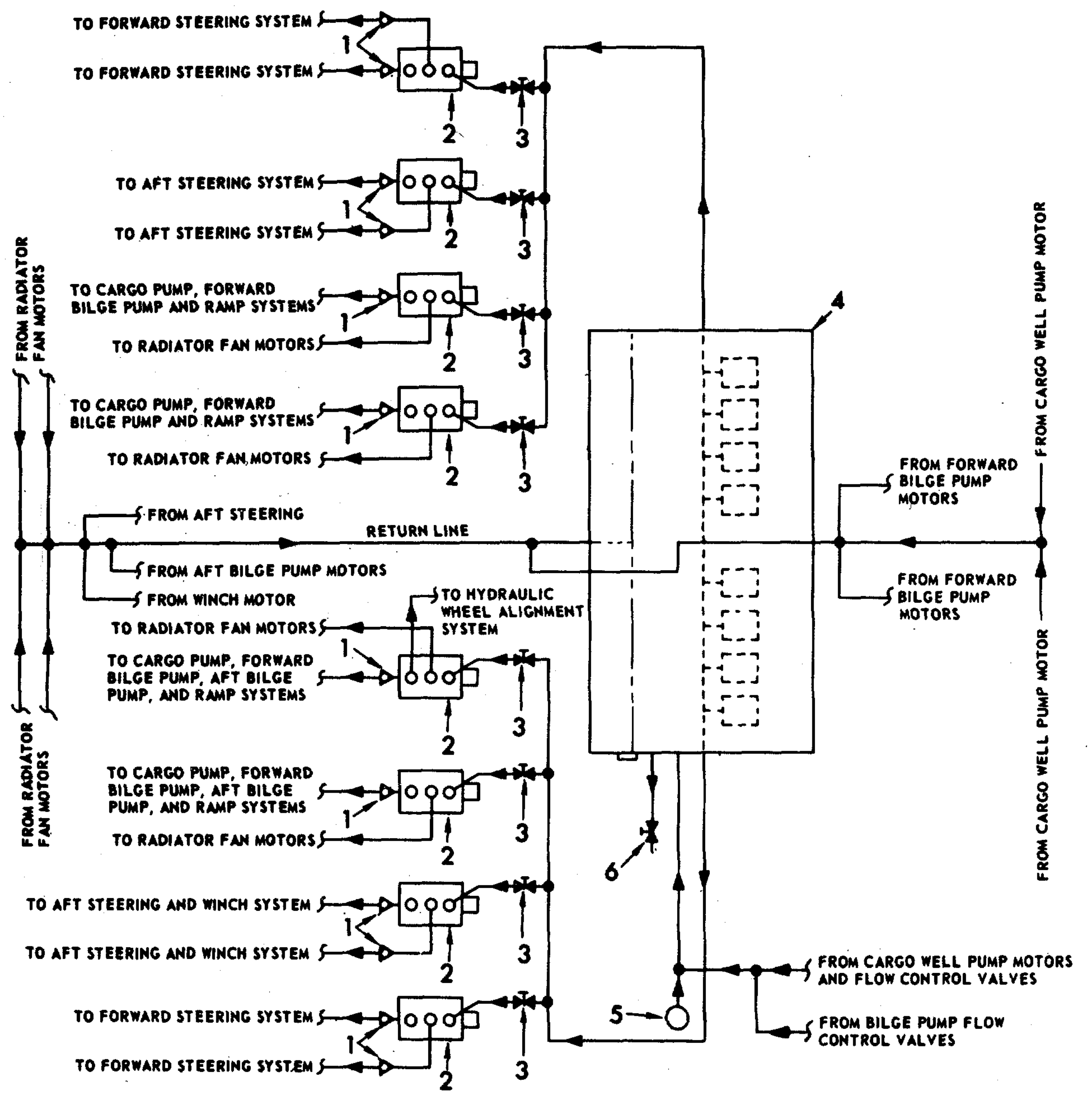
SECTION X. MAINTENANCE OF HYDRAULIC SYSTEM

2-49. GENERAL.

The hydraulic system consists of a hydraulic supply system interconnected to seven hydraulic working systems. The hydraulic working systems are the ramp cargo well pump, bilge pump, wheel alignment forward steering, aft steering, winch, and radiator fan.

2-50. HYDRAULIC SUPPLY SYSTEM.

a. General. The hydraulic supply system (fig. 2-26) consists of a 300 gallon (1136 1) hydraulic fluid tank, nine gate-valves, .eight hydraulic double pump units, 12 check valves, a filler cap, and necessary lines and fittings to interconnect the system. Hydraulic fluid is pumped from the 300 gallon (1136 1) hydraulic fluid tank by the eight double pumps, driven by the marine gear assemblies. Four pumps are mounted on the front end of each marine gear assembly. These pumps develop 16 separate hydraulic fluid supplies. Two hydraulic fluid supplies developed by port pumps furnish fluid to the port multiple unit valve assembly. Two hydraulic fluid supplies developed by starboard pumps furnish fluid to the starboard multiple unit valve assembly. One of the supplies for the starboard multiple unit valve assembly also furnishes hydraulic fluid to the wheel alignment hydraulic system. Four hydraulic supplies developed by port and starboard pumps furnish the aft steering and winch hydraulic system. Four hydraulic fluid supplies developed by port and starboard pumps furnish the four radiator-fan hydraulic system.



TS 1930-203-20/2-26

1. Check valve
2. Double pump unitq
3. Gate valve
4. Hydraulic fluid tank
5. Filler cap
6. Gate valve

Figure 2-26. Ramp Hydraulic System Diagram.

Hydraulic supplies for the multiple unit valve assemblies and hydraulic steering systems are equipped with check valves. The check valves prevent hydraulic fluid pressure from unloading back through either pump if a pump should become inoperative. Eight gate valves between the hydraulic supply tank and the hydraulic double pump units provide a means of securing the hydraulic tank when removing components. The hydraulic supply tank located amidships is filled through a filler cap which is located amidships on port deck. A gate valve located adjacent to the supply tank on the starboard side is for draining the hydraulic fluid from the supply tank.

b. Inspection and Service.

(1) Inspect gate valves for leakage at valve stem. Replace valve stem packing by removing packing nut and putting in new packing.

(2) Ensure gate valves in pump supply lines are open.

CAUTION

Gate valves in supply lines should be closed only when it becomes necessary to isolate a supply line or double pump unit for maintenance purposes. A closed gate valve may cause damage to corresponding double pump unit when equipment is in operation.

(3) Inspect hydraulic fluid tank drain line and Supply lines for leaks or other damage.

(4) Inspect hydraulic fill and vent line for leaks or other damage. Tighten hose clamps or replace if damaged. Notify direct support maintenance if tubing is damaged.

(5) Inspect hydraulic supply systems lines for security of mounting. Notify direct support maintenance of any loose or defective straps and hangers.

(6) Remove access covers and inspect hydraulic return line and center portion of hydraulic fluid tank for leaks.

(7) Place a container under supply tank, drain line and remove pipe plug located under LARC.

(8) Open hydraulic fluid tank gate valve (6, fig. 2-26) and drain fluid from tank.

(9) Remove access cover from each end of hydraulic fluid tank (4). Inspect supply tank switch and hose clamps for corrosion. Inspect switch hose and cover gaskets. Notify direct support maintenance of any damage.

(10) Refill supply tank with oil (see lubrication order).

(11) Inspect the double pump units (2) for leaks or other damage. Notify direct support maintenance of any damage.

2-51. RAMP HYDRAULIC SYSTEM.

a. General. The ramp hydraulic system (fig. 2-27) consists of a unit control valve within each multiple unit valve assembly, check valves, fluid flow restructures, ramp cylinders, and the necessary lines and fittings to interconnect the system. The system, controlled by the air system, is used to raise and lower the ramp. There are two independent hydraulic fluid supplies, one on each side of the LARC. The hydraulic fluid supplies are used only to raise the ramp. Arrangement of the ramp hydraulic system lines enable either unit control valve to supply hydraulic fluid to both ramp cylinders. Each control valve is actuated by an air cylinder connected to the valve spool. Both air cylinders are individually controlled by respective air valves located on the main deck aft of the ramp latches. The unit control valves have three positions: RAISE, NEUTRAL, and LOWER. The NEUTRAL position stops the flow of hydraulic fluid to or from the ramp cylinders. The RAISE position allows the hydraulic fluid supply to enter the system. The check valves parallel the fluid flow restructure in their respective supply line allowing the hydraulic fluid supply to flow at full volume to the cylinders. The hydraulic fluid supply actuates the cylinders and raises the ramp by the multiplying action of connecting cable harnesses. The LOWER position allows hydraulic fluid in the ramp cylinders to flow back to the hydraulic fluid tank. Hydraulic fluid returning to the tank is blocked by the applicable check valve and flows through the fluid flow restructure which is in parallel. The fluid flow restructure controls the rate of ramp descent by restricting hydraulic fluid flow back to the hydraulic fluid tank.

b. Inspection and Service.

(1) Inspect multiple unit valves (1 and 5, fig. 2-27) for breaks, leaks or other damage. Notify direct support maintenance of any damage.

(2) Inspect hydraulic system lines for breaks, leaks, or other damage. Report any damage to direct support maintenance.

WARNING

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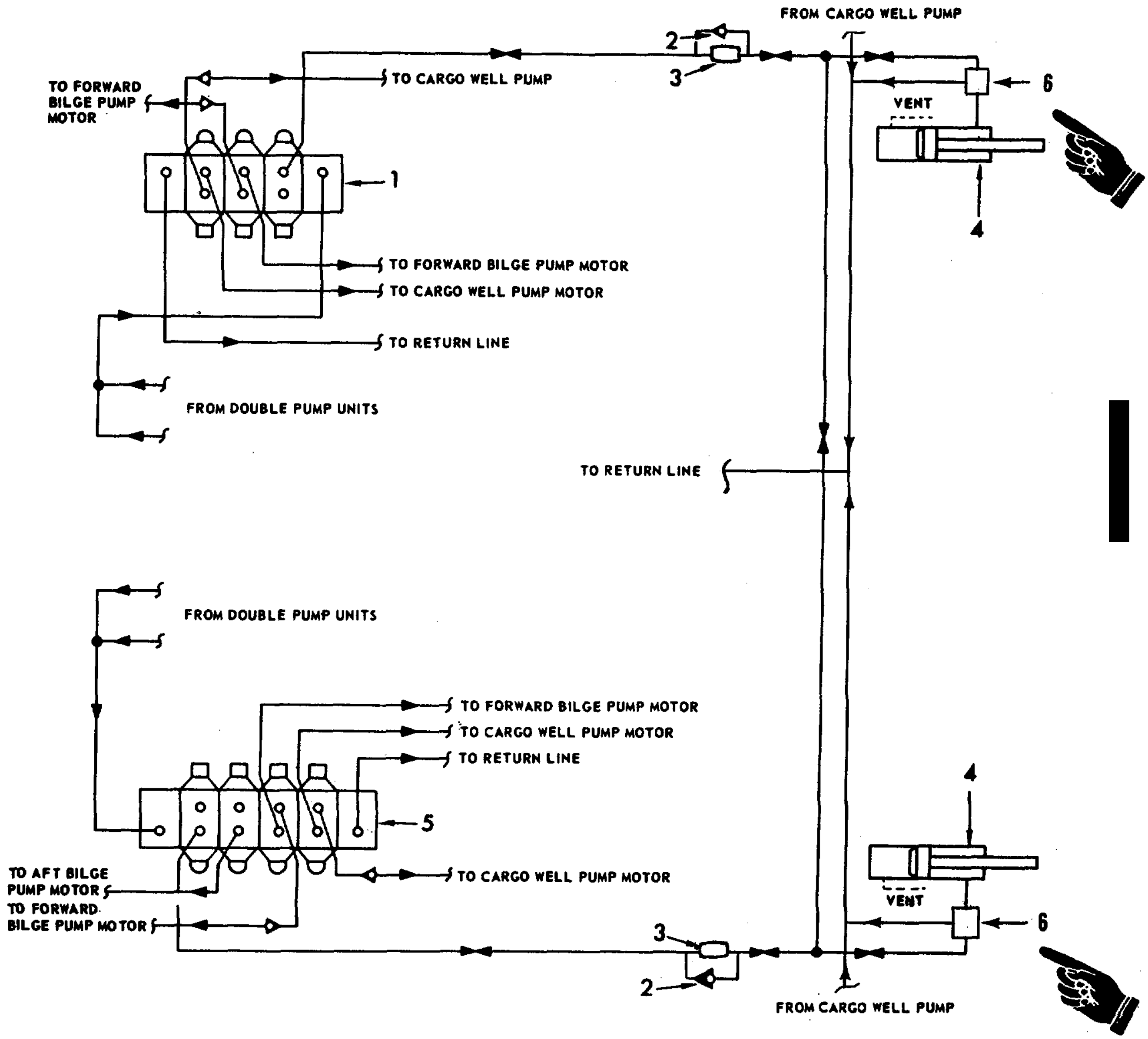


TS 1930-203-20/2-27

1. Port multiple unit valve
2. Check valve
3. Fluid flow restrictor
4. Ramp cylinder
5. Starboard multiple unit valve
6. Pressure relief valve

Figure 2-27. Ramp Hydraulic System Diagram.

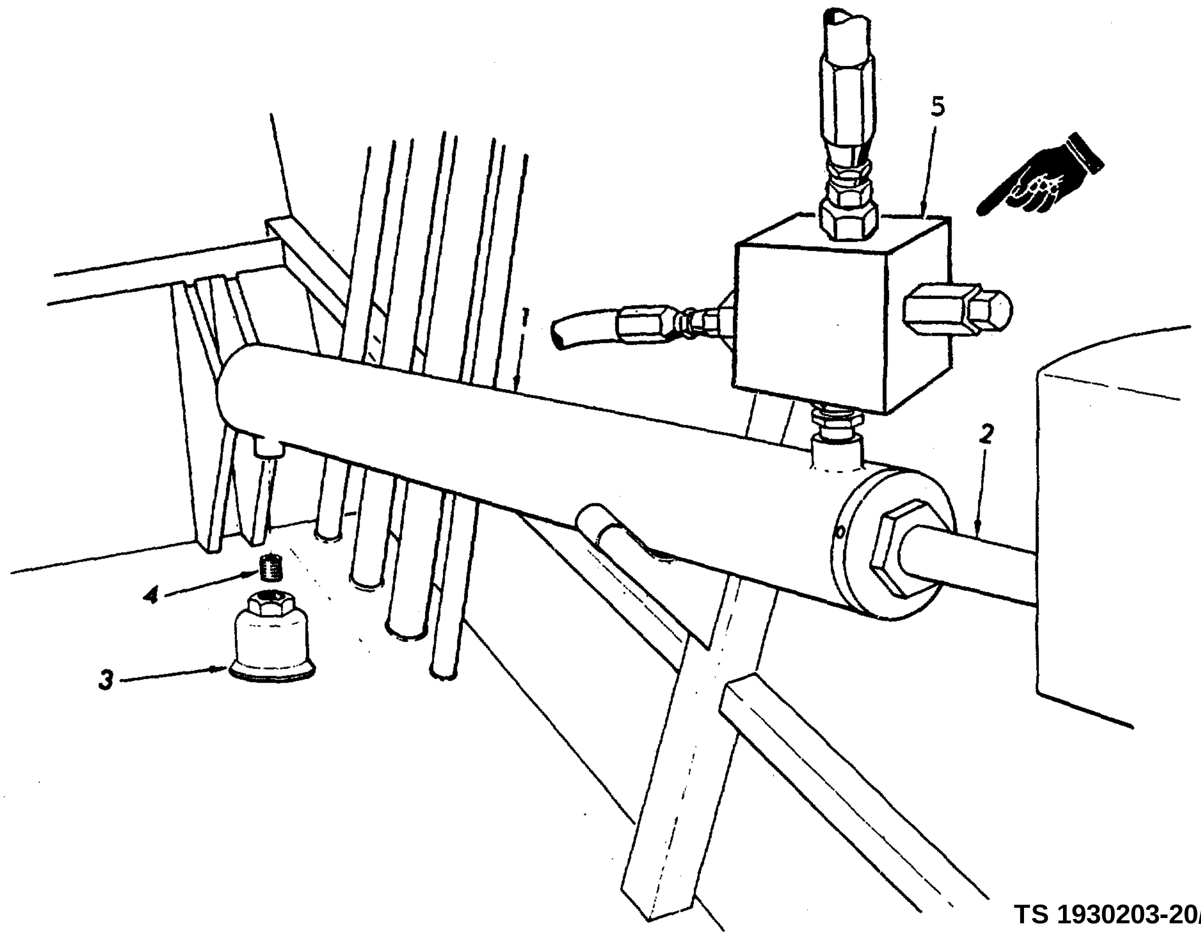
(3) Clean multiple unit valves with drycleaning solvent (item 6, App. C). Lubricate valves (See lubrication order).

(4) Inspect ramp cylinders (fig. 2-28) for leakage at piston rod (2). Inspect cylinder body (1) for dents or other damage. Report any defects to direct support maintenance personnel.

(5) Clean body with kerosene (item 9, App. C) or similar cleaning agent. Lubricate piston rod (2) with OE10 oil.

(6) Inspect vent (3) and nipple (4) for damage or leaks.

(7) Inspect relief valve (5) for damage, or leaks.



1. Cylinder body
2. Piston rod
3. Vent
4. Nipple
5. Relief valve

Figure 2-28. Ramp Cylinder Inspection.

2-52. CARGO WELL PUMP HYDRAULIC SYSTEM.

a. General.

(1) The cargo well pump hydraulic system (fig. 2-29) is made up of two independent hydraulic systems, one on each side of the LARC. Each system contains a unit control valve within a multiple unit valve assembly, check valves, a flow control and relief valve, a hydraulic motor, and necessary lines and fittings to interconnect the system.

(2) The primary purpose of each cargo well pump hydraulic system is to operate its corresponding cargo well pump. Both systems are equipped with an emergency crossover line which enables either system to operate the opposite hydraulic motor. The system is controlled by port and starboard unit control valves. These valves are actuated by air cylinders which are connected to the valve spools.

(3) The air cylinders are individually controlled by air valves located in the cab. Each unit control valve has three positions: NORMAL, NEUTRAL, and EMERGENCY. The NEUTRAL position isolates the cargo well pump hydraulic systems from the hydraulic supply system. The NORMAL position allows hydraulic fluid to flow to its corresponding hydraulic motor. The EMERGENCY position enables either unit control valve to direct hydraulic fluid to the hydraulic motor in the opposite system. Check valves are installed in the normal and emergency lines of each system. Arrangement of the check valves stops the flow of hydraulic fluid back to the opposite unit control valve when either system is operating.

(4) Hydraulic fluid flowing to the hydraulic motors is regulated to 1, 000 psi (70.4 kg/cm2) by flow control and relief valves. These valves route excess hydraulic fluid to lines that return to the supply system. Hydraulic fluid from the pump motors flows through return lines back to the supply system.

b. Inspection and Service.

(1) Inspect flow control and relief valves (3, fig. 2-29), cargo well pump lines, and cargo well pump motors for leaks or other damage. Report any deficiencies to direct support maintenance personnel.

(2) Lubricate cargo well pump hydraulic motors installed in hulls 5 through 18.

WARNING

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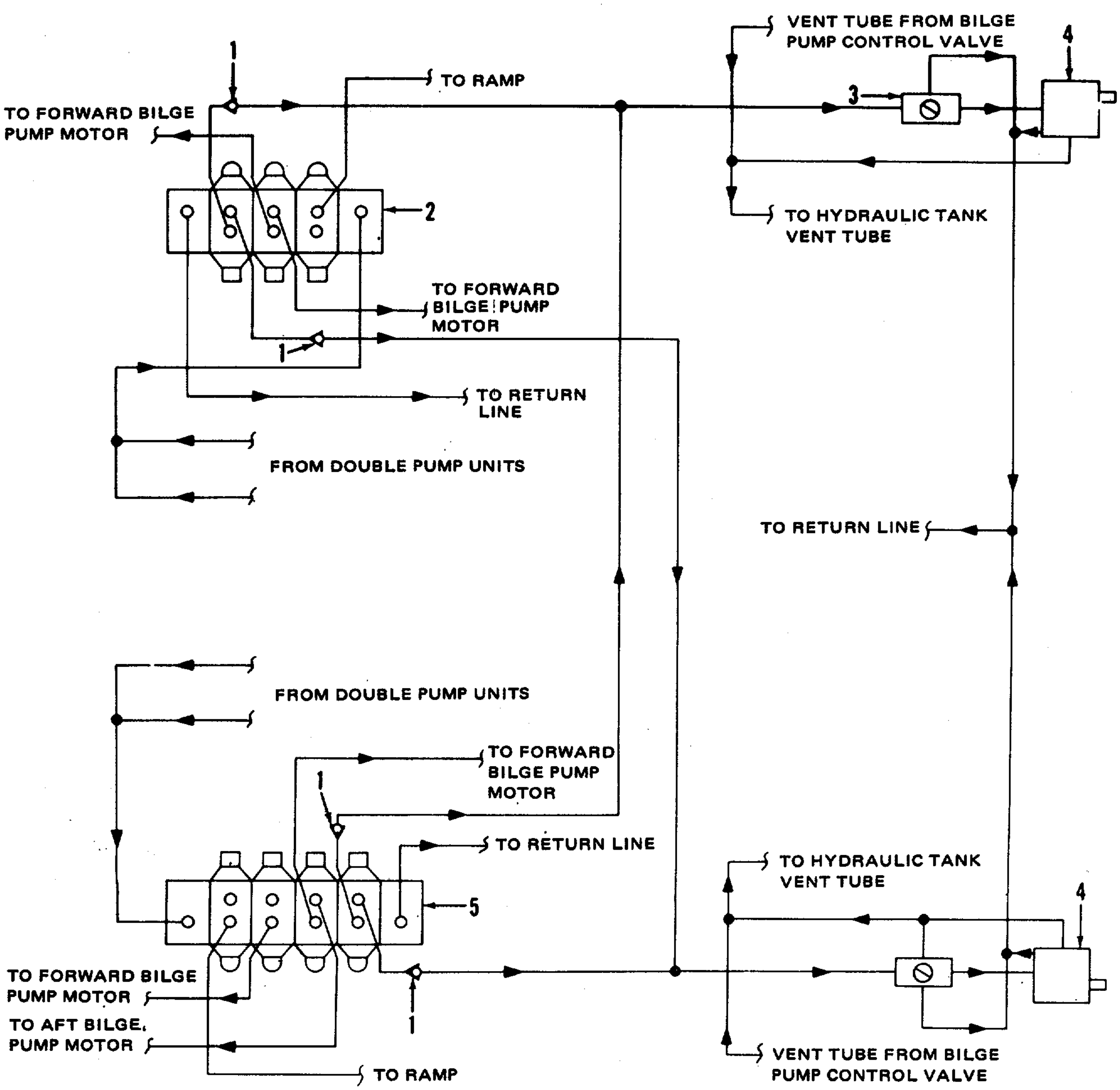
(3) Clean multiple unit valves (2 and 5) with drycleaning solvent (item 6, App. C). Lubricate valves (see lubrication order).



TS 1930-203-20/2-29

1. Check valve
2. Point multiple unit valve
3. Flow control and relief valve
4. Cargo well pump motor
5. Starboard multiple unit valve

Figure 2-29. Cargo Well Pump Hydraulic System Diagram.

2-53. BILGE PUMP HYDRAULIC SYSTEM.

a. General.

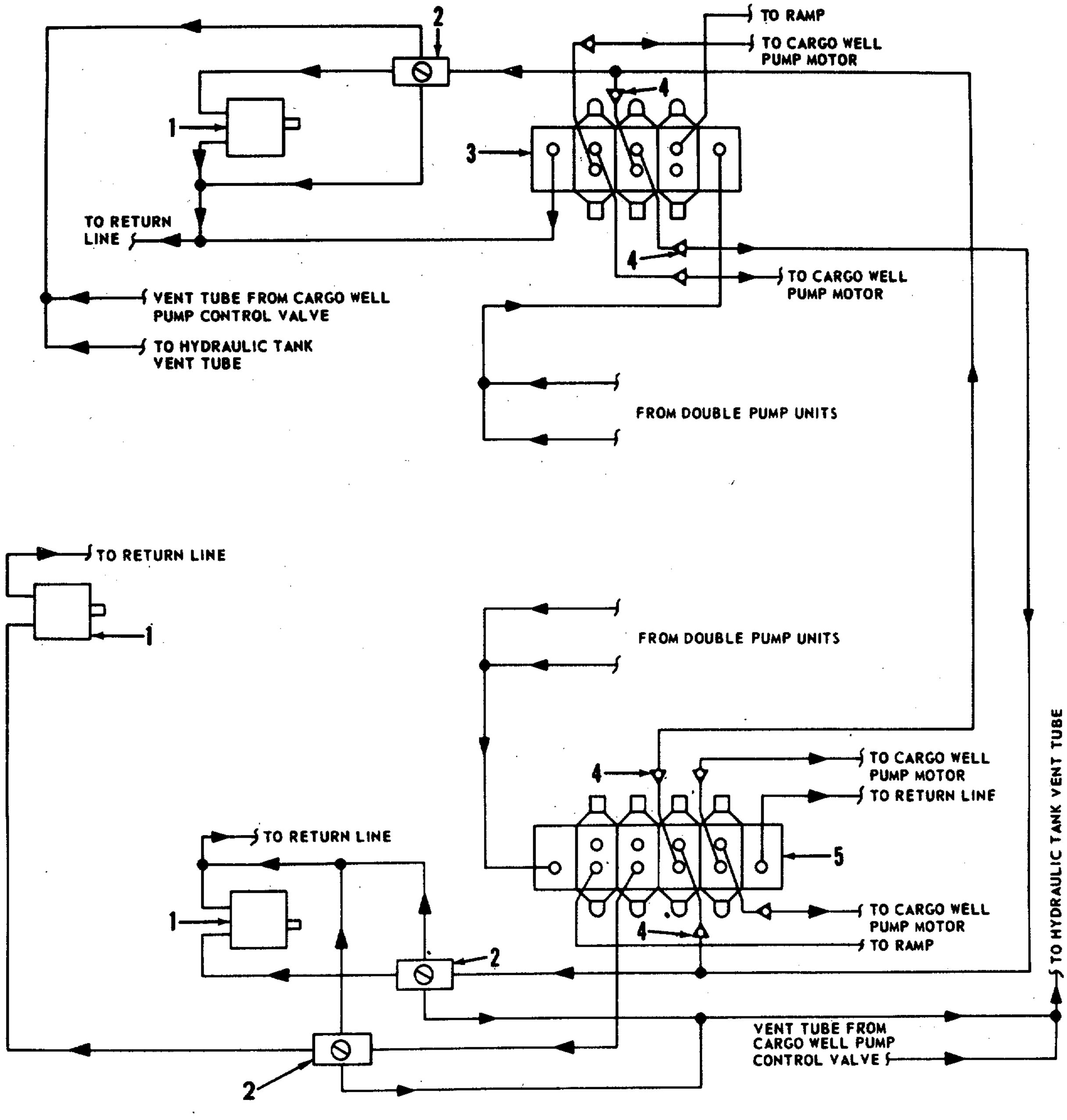
(1) The bilge pump hydraulic system (fig. 2-30) is used to pump water from the bilge area. The system consists of unit control valves within the port and starboard multiple unit valves, flow control and relief valves, check valves, hydraulic motors, and necessary lines and fittings to interconnect the system. The bilge pump hydraulic system is basically three independent hydraulic systems. One system is located on the port side for the port bilge pump. The other systems are located on the starboard side for the starboard and aft bilge pump.

(2) The purpose of the port and starboard bilge pump hydraulic systems is to supply hydraulic fluid under pressure to their corresponding port, starboard, and aft bilge pump hydraulic motors. The systems for port and starboard bilge pumps are equipped with a crossover line which enables either system to operate the opposite bilge pump hydraulic motor. The hydraulic fluid supply for the port bilge pump hydraulic system is supplied by hydraulic double pump units mounted on the starboard marine gear. The hydraulic fluid supply for the starboard and aft bilge pump hydraulic systems are supplied by double pump units mounted on the starboard marine gear.

(3) The port and starboard bilge pump hydraulic systems are manually controlled by three-position (NORMAL OPERATION, NEUTRAL and EMERGENCY OPERATION) unit control valves. The aft bilge pump hydraulic system is manually controlled by a two-position (NORMAL OPERATION AND NEUTRAL) unit control valve. The NEUTRAL position stops the flow of hydraulic fluid to the system. The NORMAL OPERATION position allows hydraulic fluid to flow to the bilge pump motors. The EMERGENCY OPERATION position for the port and starboard bilge pump system enables either system to supply hydraulic fluid to the opposite pump motor. The check valves installed in the port and starboard bilge pump hydraulic system are to prevent the flow of hydraulic fluid to the unit control valve in the opposite system. The flow control and relief valves installed in the bilge pump supply lines regulate hydraulic fluid pressure to the pump motors and route excess hydraulic fluid back to the hydraulic fluid tank. The flow control and relief valves are set at 550 psi (38.7 kg/cm2).

b. Inspection and Service.

(1) Inspect flow control and relief valves (2, fig. 2-30), bilge pump lines, and bilge pump motors (1) for leaks or other damage. Report any deficiencies to direct support maintenance.



TS 1930-203-20/2-30

1. Bilge pump hydraulic motor
2. Flow control and relief valves
3. Part multiple unit valve
4. Check valve
5. Starboard multiple unit valve

Figure 2-30. Bike Pump Hydraulic System Diagram.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame' or excessive heat.' Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C). (2) Clean multiple unit valves (3 and 5) with drycleaning solvent (item 6, App. C). Lubricate valves (see lubrication order).

(2) Clean multiple unit valves (3 and 5) with drycleaning solvent (item 6, App. C). Lubricate valves (see lubrication order).

2-54. Forward Steering Hydraulic System.

a. General.

(1) The forward steering hydraulic system (fig. 2-31) is used for steering the front wheels of the LARC. The system consists of a control valve, a relief valve, needle valves, a pressure gage, steering cylinders, and the necessary lines and fittings to interconnect the system.

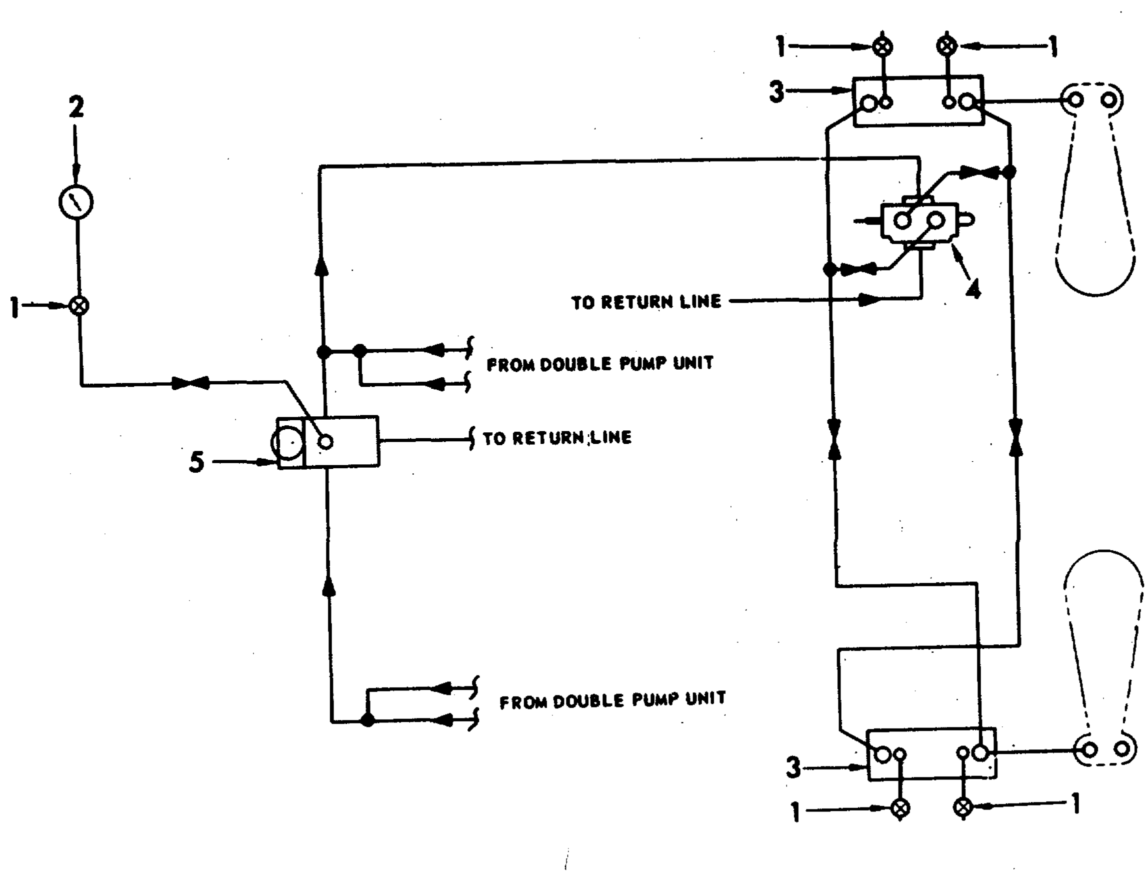
(2) Hydraulic fluid for the forward steering system is supplied by a double pump unit mounted on each marine gear. Hydraulic fluid from the double pump units flows to the relief valve located in the bulkhead 11 to 6 watertight bilge area. The relief valve maintains operating pressure at 300 psi (91.5 kg/cm2) by venting excess hydraulic fluid back to the hydraulic fluid tank. Fluid flows from the relief valve to the control valve located in the port upper machinery area. The control valve is operated by the mechanical steering linkage.

(3) When the control valve spool is moved off center, hydraulic fluid charges one side of the steering cylinder and the other side is vented back to the hydraulic fluid tank. When the steering cylinders move the wheels to the desired position, the control valve spool will center and stop the flow of hydraulic fluid to and from the steering cylinders. The hydraulic fluid supply will flow through the control valve and back to the hydraulic fluid tank when the valve spool is centered. The needle valves located on the steering cylinders are used for bleeding air from the steering cylinders. A needle valve is also located under the cab instrument panel to secure hydraulic fluid to the steering pressure gage.

b. Inspection and Service.

(1) Inspect control valve (4, fig. 2-31) and-steering cylinders (3) for leaks or other damage. Notify direct support maintenance of any leaks or other damage.

(2) Remove access covers to gain access to bulkhead 11 to 6 watertight bilge area and inspect relief valve (5) for leaks or other damage. Inspect forward steering hydraulic system lines for leaks, breaks, and security of mount. Report any defect to direct support maintenance.



1. Needle valve
2. Steering pressure gage
3. Steering cylinder
4. Control valve
5. Relief valve

Figure 2-31. Forward Steering System Hydraulic System Diagram.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(3) Clean all metal surfaces of steering cylinders (3) with a clean cloth moistened in drycleaning solvent (item 6, App. C).

c. Adjustment of Cushion Screw.

(1) Drive LARC into water deep enough for all four wheels to clear bottom.

(2) Secure engine on side where cushion screw adjustment check will be performed.

(3) Enter upper machinery area above steering cylinder to be checked. Have corresponding wheels turned sharply in one direction and then the other, listening for sound of a slap as cylinder piston bottoms in both directions.

(4) If cylinder does not bottom, cushion screw may be closed.

(5) If slap is heard or cylinder does not bottom, hold cushion screw (2, fig. 2-32) securely with a screwdriver and loosen jaunt (1) several turns.

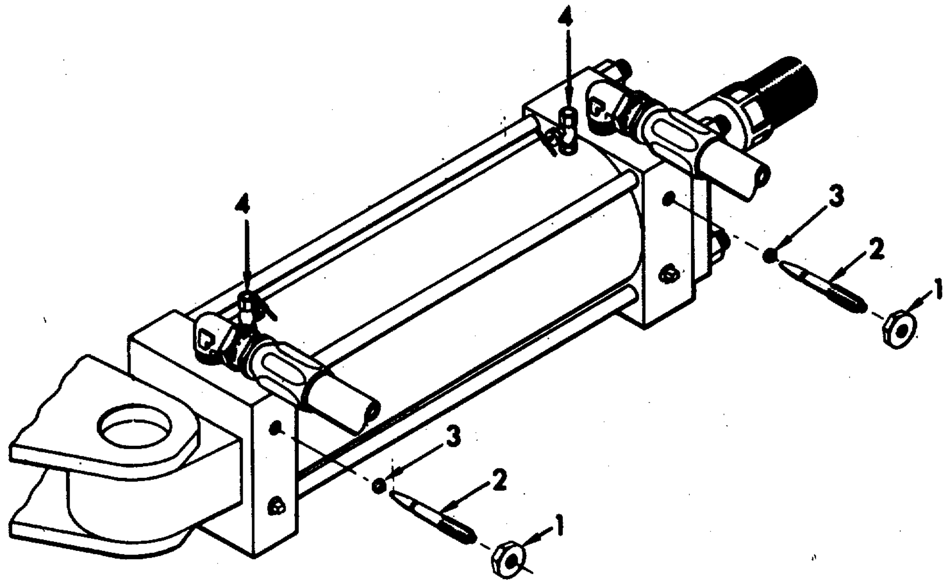
(6) Turn cushion screw (2) in or out one turn.

(7) Turn wheels sharply in both directions and observe last two or three inches (51 to 76 mm) of piston rod travel for a quiet, cushioned bottoming.

(8) Repeat steps (6) and (7) above, counting numbers of turns, until steering piston bottoms slowly and quietly. Hold cushion screw (2) with screwdriver and tighten jaunt (1).

NOTE

After adjusting cushion screw several turns and cylinder piston still does not bottom quietly, ball check valve may be stuck open. Return cushion screw to original position and notify direct support maintenance.



TS 1930-203-20/2-32

1. Jamnut
2. Cushion screw
3. Preformed packing
4. Needle valve

Figure 2-32. Steering Cylinder Cushion Screw, Adjustment.

d. Cushion Screw Removal.

(1) Secure engines and bleed hydraulic pressure from steering cylinder by turning applicable steering lever in the cab sharply in both directions.

(2) Open needle valves (4, fig. 2-32) to ensure pressure has been bled off. Loosen jaunt (1).

NOTE

When removing cushion screw, count the number of turns required for removal Cushion screw must be reinstalled in the same position.

(3) Remove cushion screw (2). Remove jaunt (1) and preformed packing (3).

e. Cushion Screw Installation.

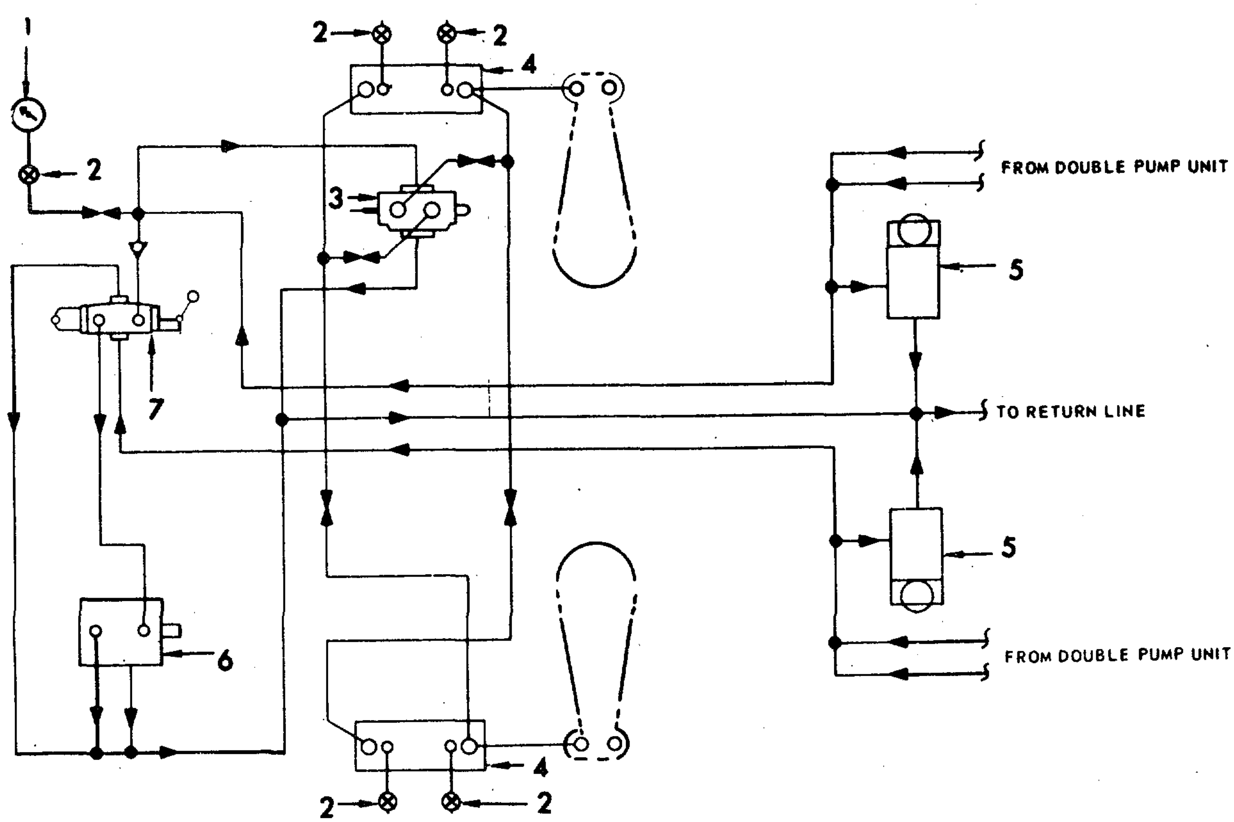
(1) Install preformed packing (3, fig. 2-32) into housing. Install cushion screw (21 and turn correct number of turns.

(2) Install jaunt (1). Hold cushion screw securely with a screwdriver and tighten jaunt. Close needle valves C4).

2-55. AFT STEERING-AND WINCH HYDRAULIC SYSTEM.

a. General.

(1) The aft steering and winch hydraulic system (fig. 2-33) is used for steering the aft wheels and operating the winch. The system consists of control valves, relief valves, .needle valves, a check valve, a pressure gage, steering cylinders, a hydraulic motor, and the necessary lines and fittings to interconnect the system.



1. Gage
2. Needle valve
3. Steering control valve
4. Steering cylinder
5. Relief valve
6. Winch motor
7. Winch control valve

Figure 2-33. Aft Steering and Winch Hydraulic System Diagram.

(2) Hydraulic fluid for the aft steering system is supplied by a double pump unit mounted on each marine gear. Hydraulic fluid from the port double pump unit flows to the steering control valve through a relief valve in the port supply line. Hydraulic fluid from the starboard double pump unit flows to the same steering control valve through a relief valve, winch control valve, and check valve in the starboard supply line. The port and starboard supply line relief valves, located in the bulkhead 11 to 6 watertight bilge area, are set to maintain an operating pressure of 1300 psi (91. 5 kg/cm2). Each relief valve vents excess hydraulic fluid back to the hydraulic fluid tank.

(3) The steering control valve spool, when moved off center, routes hydraulic fluid to one side of the steering cylinders and vents the other side back to the hydraulic fluid tank. The steering control valve, located in the port upper machinery area, is actuated by the mechanical steering linkage. When the steering cylinders move the wheels to the desired position, the, steering control valve spool will center and stop the flow of hydraulic fluid to and from the steering cylinders. The hydraulic fluid supply will flow through the control valve and back to the hydraulic fluid tank when the valve spool is centered.

(4) The needle valves located on the steering cylinders are used for bleeding air from the steering cylinders. A needle valve is also located beneath the cab instrument panel to secure hydraulic fluid to the steering pressure gage.

(5) The starboard hydraulic fluid supply is also used to operate the winch. The winch control valve, located in the marine steering area, is spring-loaded for winch operation. The winch control valve is manually operated by a lever located between the winch and the cab on the main deck. When the winch control valve lever is placed in an inward positions, hydraulic fluid flows through the winch hydraulic motor back to the hydraulic fluid tank. The hydraulic motor is installed on the bottom of the winch in the marine steering area.

(6) A starboard engine must be operating before the winch will be operative. If it is necessary to steer the aft wheels during winch operation, port and starboard engine, s must be operating. Steering speed of the aft wheels will be reduced to half speed during winch operation due to starboard hydraulic fluid supply flowing through the winch motor. The check valve located between the port and starboard steering supply lines prevents the port hydraulic fluid supply from unloading through the winch control valve, during winch operation.

b. Inspection and Service.

(1) Inspect steering cylinders (4, fig. 2-33) for leaks or other damage. Report any leaks or other damage to direct support maintenance.

(2) Remove access covers and inspect control valves (3 and 7) and relief valves (5) for leaks or breaks. Inspect aft steering and winch hydraulic system lines for leaks, breaks, and security of mounting. Report any defects to direct support maintenance.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - , 138 degrees F (38 degrees C - 59 degrees C).

(3) Clean all metal surfaces of steering cylinders with a clean cloth moistened in drycleaning solvent (item 6, App. C).

(4) Should the cushion screw require adjustment or removal and installation, use the same procedure used for the forward steering hydraulic system (para 2-54c).

2-56. HYDRAULIC WHEEL ALIGNMENT SYSTEM.

a. General. The purpose of the hydraulic wheel alignment system (fig. 2-34) is to maintain wheel alignment. The hydraulic wheel alignment system consists of needle valves, check valves, fluid indicators, steering alignment cylinders, and the necessary lines and fittings to interconnect the system. The hydraulic fluid from one side of a hydraulic double pump unit, mounted on the starboard marine gear, flows to the needle valves in the supply lines. The hydraulic fluid supply is maintained at 65 psi (4.6 kg/cm2) and is used only when the steering alignment cylinders require realignment. The valves are opened only when realigning, the steering alignment cylinders. The needle valves mounted on the steering alignment cylinders are used to bleed the air from the cylinders when realigning the alignment cylinders.

b. Inspection and Service.

(1) Inspect needle valves (4, fig. 2-34) and steering alignment cylinders for leaks, breaks, or other damage. Report any defects to direct support maintenance.

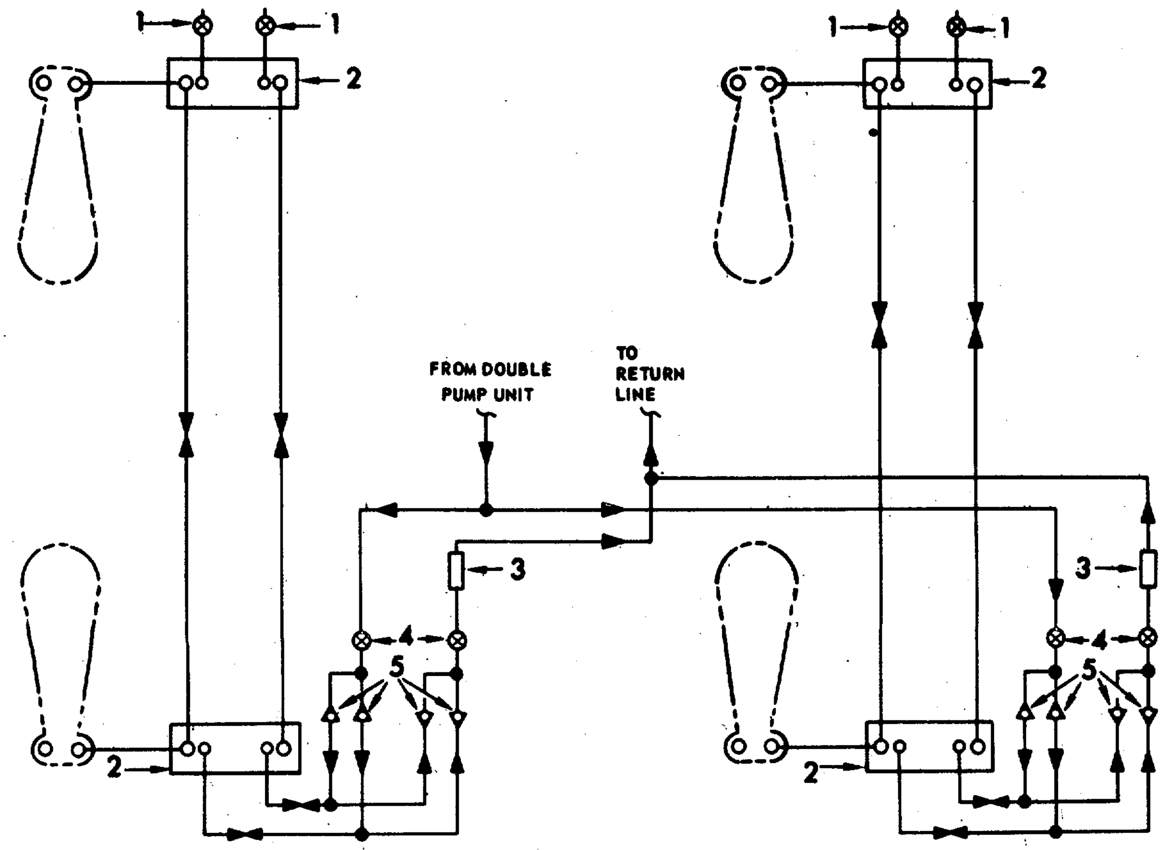
WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(2) Clean all metal surfaces of steering alignment cylinder (2, fig. 2-34) with a clean cloth moistened with drycleaning solvent (item 6, App. C).

(3) Check steering alignment as follows:

(a) Open needle valves in steering pressure gage lines.



TS 1930-203-20/2-34

1. Needle valve
2. Alignment cylinder
3. Liquid indicator
4. Needle valve
5. Check valve

Figure 2-34. Hydraulic Wheel Alignment System Diagram.

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(b) Start engines.

(c) Turn steering levers sharply in both directions observing on gage that pressure builds up and then drops off. If pressure does not drop off, steering is misaligned. Notify direct support maintenance.

CAUTION

Do not attempt to steer the LARC unless the vehicle is in motion. Turning the wheel while the LARC is motionless will cause damage to tires.

(d) Stop Engines.

2-57. FAN MOTOR HYDRAULIC SYSTEM.

a. General. The fan motor hydraulic system consists Of four independent hydraulic, systems. Two systems are located aft on each side of the LARC. The fan motor hydraulic systems (fig. 2-35) are -used to operate the radiator fans during land operation. .Each system consists of a control valve, relief valve, hydraulic motor and the necessary lines and fittings. The port fan motor hydraulic systems are independently supplied by double pump units mounted on the port marine gear, and the starboard systems are supplied by pumps mounted on the starboard marine gear. Each system has a control valve located in the cab and a relief valve located in the marine steering area. The relief valves are set to maintain an operating pressure of 1, 000 psi (70.4 kg/cm2). In the closed positions, the control valves allow actuate the relief valves. When actuated, the relief valves allow hydraulic fluid to flow through the fan motors back to the hydraulic fluid tank. The fan motor control valves will be automatically moved to the open by mechanically connected air cylinders when the marine gear is positioned in the forward or reverse position.

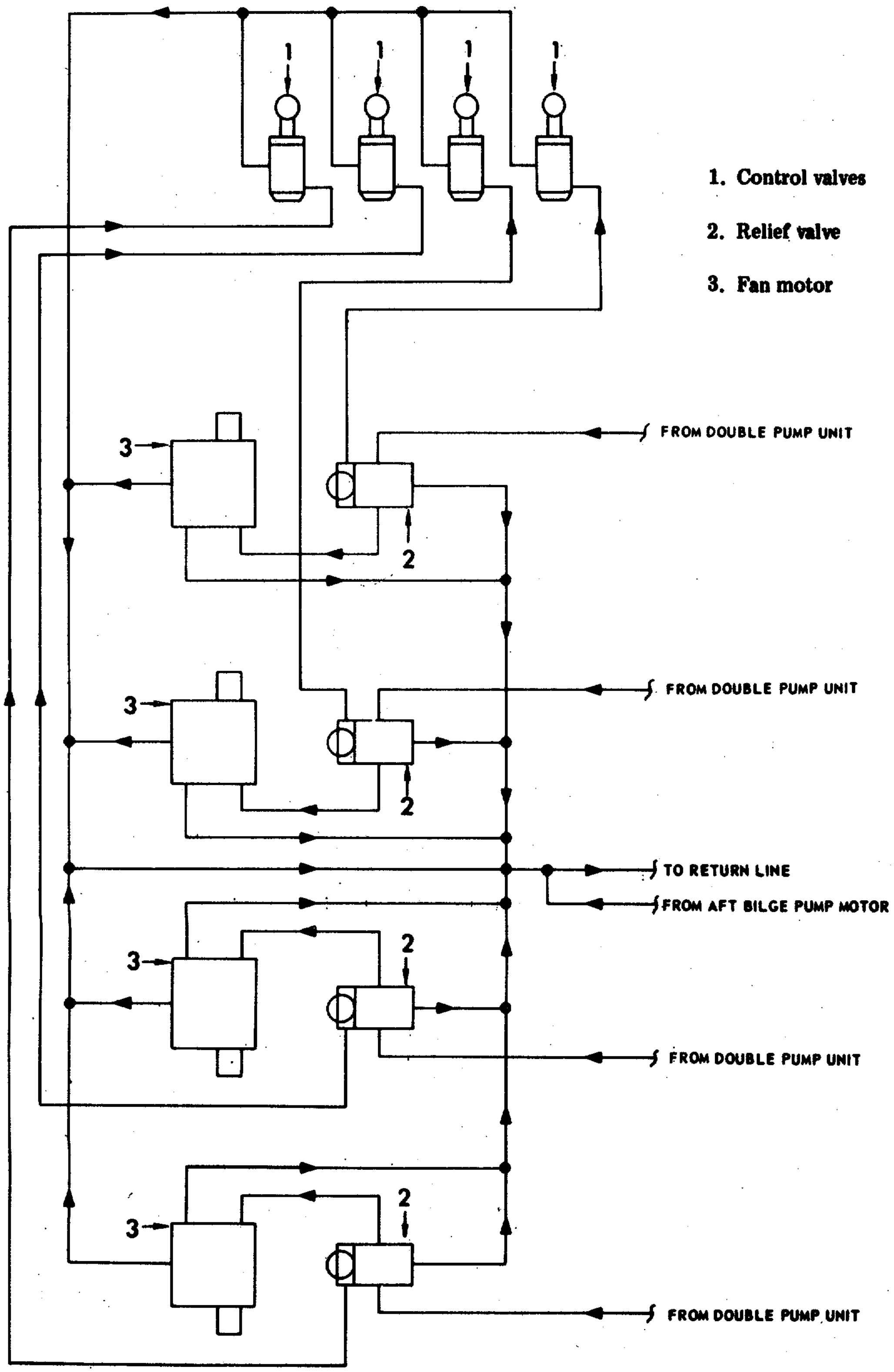


Figure 2-35. Fan Motor Hydraulic System Diagram.

b. Inspection.

(1) Inspect control valves (1, fig. 2-35) and relief valves (2) for leaks, breaks, or other damage. Report all defects to direct support maintenance.

(2) Remove radiator duct access cover and bulkhead No. 14 center access covers and inspect fan motors and fan motor hydraulic system lines for leaks, breaks, and security of mounting. Report any defects to direct support maintenance.

SECTION XI. MAINTENANCE OF DIESEL ENGINE

2-58. GENERAL.

Four series 71 Detroit diesel engines are used on the LARC. The engines are two cycle, six cylinder, in-line engines having a 165 continuous horsepower rating at 2100 rpm. Each engine (figs. 2-36 and 2-37) is equipped-with an air starting motor, a forced feed fuel injection system, a full pressure lubrication system, and a circulating fresh water cooling system. Engine speed is controlled by a limiting speed governor coupled to the engine fuel system to limit the flow of fuel oil for engine speed control.

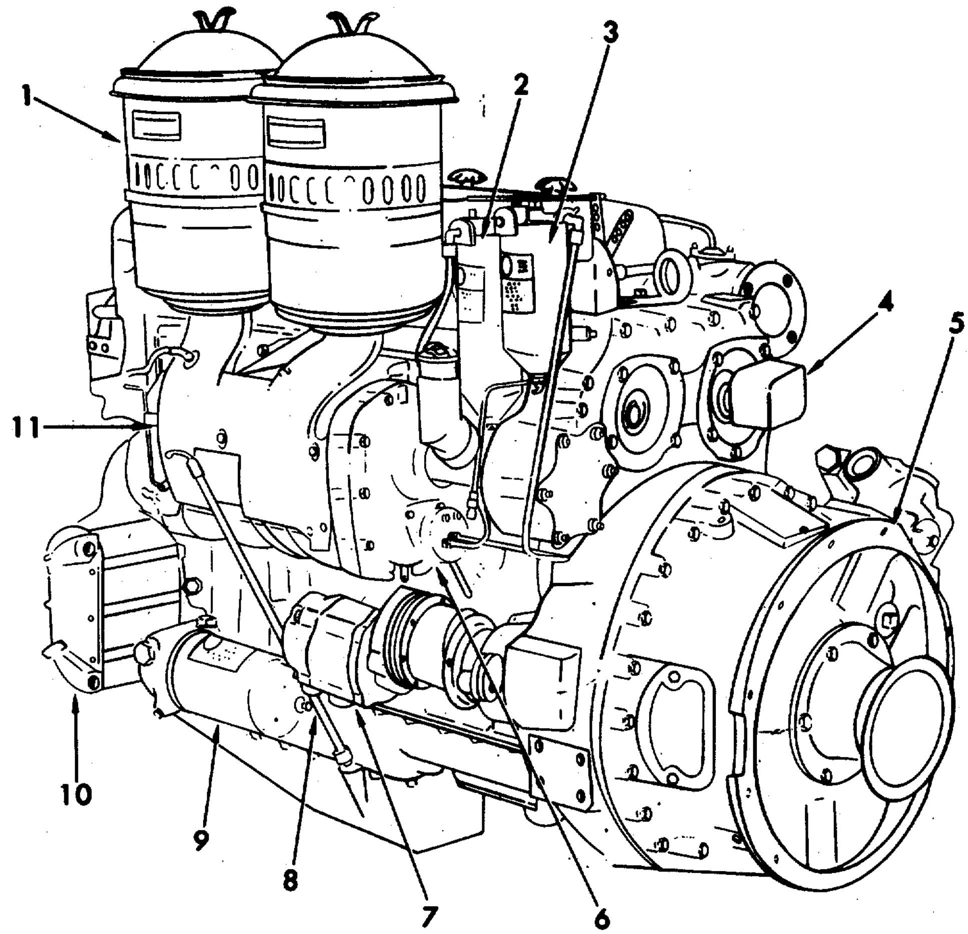
2-59. GENERAL ENGINE MAINTENANCE.

a. Ensure wingbolt securing air cleaner (1, fig. 2-36) to air inlet housing (11) is tight to prevent air cleaner from vibrating loose. Check oil level in air cleaners. Add oil as necessary (see lubrication order).

b. Inspect primary fuel strainer (3) and secondary fuel filter (2) for fuel oil leaks around inlet and outlet lines and connections. 'Tighten or replace fuel lines. Ensure draincocks on fuel filter and strainer are closed. Tighten or replace leaking draincocks. Inspect around base of fuel filter and strainer for leakage. Should leakage continue after tightening hardware, replacement of gasket between cover and shell will be required.

CAUTION

Always observe torque values when tightening all hardware on engine components. Failure to observe torque values will result in cracked or broken components and/or stripped or broken hardware.



TS 1930-203-20/2-36

1. Air cleaner
2. Fuel filter (secondary)
3. Fuel strainer (primary)
4. Tachometer drive
5. Torque converter
6. Fuel pump
7. Air starting motor
8. Oil level dipstick
9. Oil filter (full flow)
10. Oil cooler
11. Air inlet housing

Figure 2-36. Accessory Side of Engine.

c. Examine gear covers and tachometer drive (4) for oil leakage around mating areas. If required, tighten bolts securing tachometer drive gear covers to-correct torque value. Notify direct support maintenance if oil leakage between cylinder block and gear cover is found.

d. Inspect fuel pump (6) and fuel line on engine for damage, such as dents or excessive bendsthat would restrict fuel oil flow. Notify direct support maintenance if fuel pump needs replacing.

e. Inspect air lines on air starting motor (7) to ensure lines tight and free of air leaks. If air leakage is found, notify direct support maintenance.

f. Inspect oil filters for leaks at covers and tighten hardware securing cover to shell. Replace gasket between cover and shell if -normal tightening of attaching hardware fails to stop oil leak.

g. Inspect draincock on oil cooler (10) for leakage. Wipe any oil traces from around draincock so any leakage will be apparent. Replace a defective draincock.

h. Examine water pump mounting flange for coolant leaks and secure mounting. Tighten hardware attaching water pump or replace gasket between cylinder block and water pump to correct leaking condition. Inspect all water hoses and lines for wear and leaks.

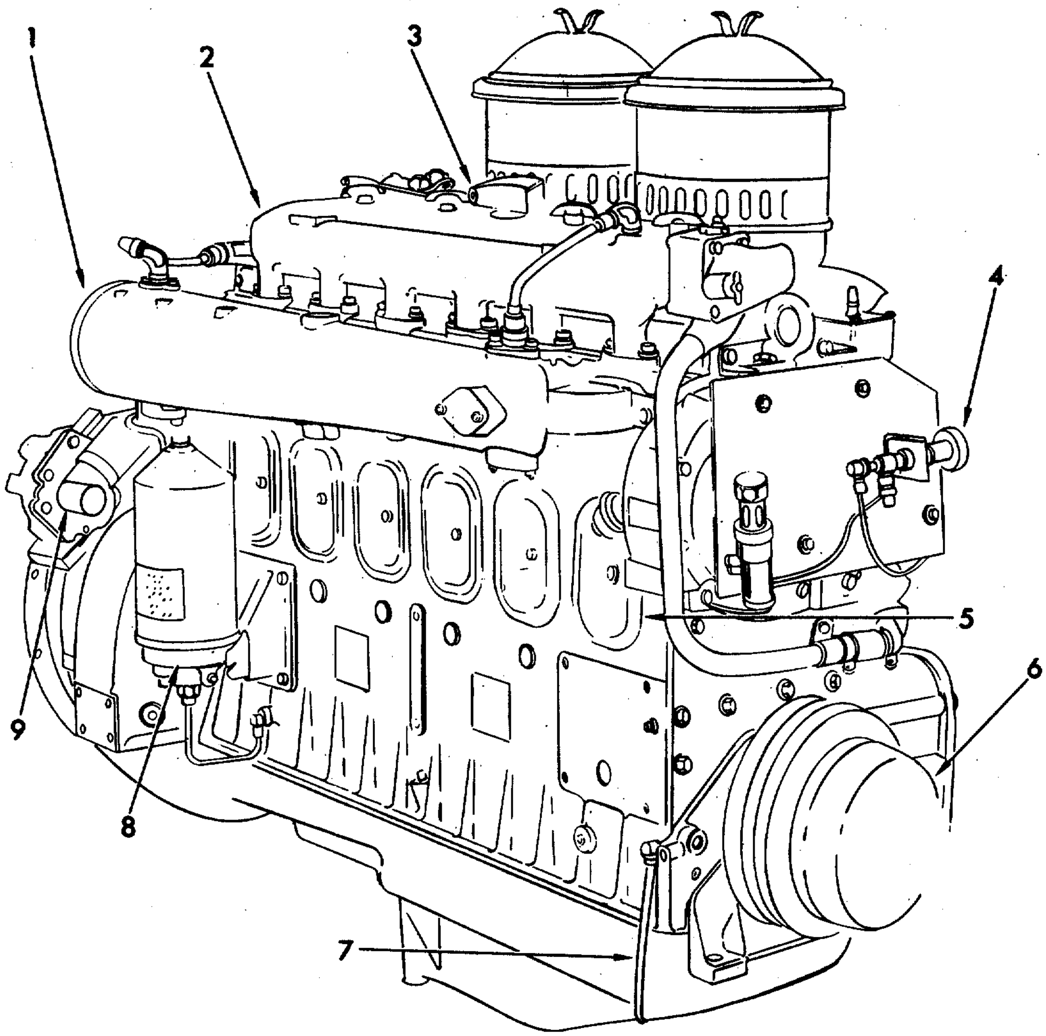
i. Inspect air inlet housing (11) and blower drive gear support assembly for cracks and secure mounting. Notify direct support maintenance of any defects discovered. Check oil line and connection on blower drive hub support for leaks. Tighten leaking oil line as required. Actuate emergency stop lever to ensure lever is in proper operating condition and does not bind when pulled up. Notify direct support maintenance of any defects found.

j. Remove oil filler cap on drive gear hub support and inspect sediment element strainer and oil filler tube for obstructions and security. Remove obstructions from oil filler screen. Lightly tap oil filler tube until tube is bottomed in opening of drive gear hub support.

CAUTION

When checking mounting nuts on the .exhaust manifold, do not exceed 20 to 25 foot-pounds (2.8 to 3.5 kg/m) torque or studs may break.

k. Inspect exhaust manifold for cracks in housing and signs of exhaust blow-by around exhaust pipe mating flange. Notify direct support maintenance of any defects. Inspect exhaust manifold drain hoses, draincocks, and water inlet and outlet tubes for leaks. Tighten draincocks and tubes as required to correct leakage.



TS 1930-203-20/2-2-37

1. Exhaust manifold
2. Water manifold
3. Breather tube
4. Fluid starting aid
5. Handhold cover
6. Power takeoff
7. Drain tube
8. Bypass oil filter
9. Oil charging pump

Figure 2-37. Manifold Side of Engine.

l. Inspect water manifold to cylinder head mating areas for water leaks. Ensure that water temperature sensing element and water temperature thermostatic switch electrical connections on water manifold are tight and free of corrosion.

m. Check oil level in engine with oil level dipstick (8). Ensure that oil level is at a safe operating level. Add oil to full mark (see lubrication order).

n. Inspect oil pan for leaks. Ensure that screws attaching oil pan are properly tightened to correct torque value. Notify direct support maintenance if oil pan leaks. Inspect oil temperature thermometer bulb in oil pan for leakage and security. Replace oil temperature thermometer bulb gasket if leaking.

o. Inspect oil pressure sending unit on manifold side of engine below the small end of the exhaust manifold for leaks. Replace if defective. Check that electrical connections are tight and free of corrosion.

2-60. ROCKER COVER ASSEMBLY.

a. General. The rocker cover assembly (fig. 2-38) completely encloses the valves, fuel injector rack, and fuel injectors at the top of the cylinder head. The top of the cylinder head is sealed against oil leakage by a rocker cover gasket (12) located in the flanged edge of the rocker cover assembly. A breather tube (4) is located on the top of the rocker cover assembly to vent fumes from the engine

b. Removal.

(1) Wipe rocker cover (6, fig. 2-38) clean before removal to prevent dust and dirt from entering valve mechanism.

(2) Loosen four thumbscrews (1) and lift rocker cover straight up from cylinder head.

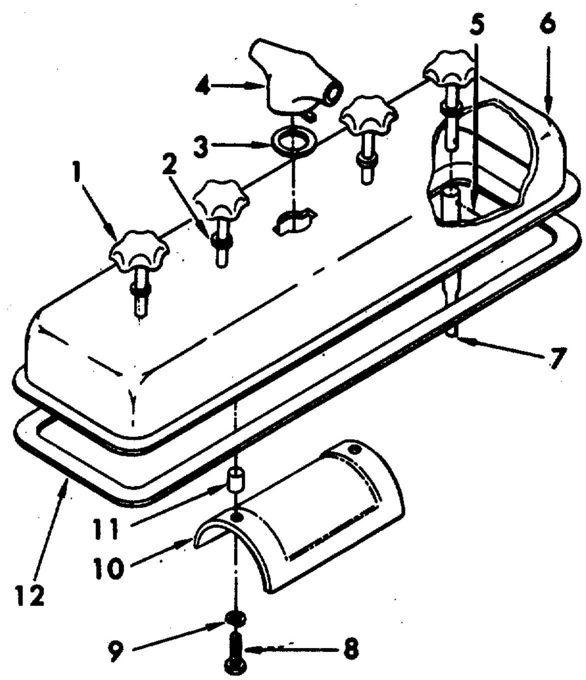
(3) Remove breather tube (4) and breather tube gasket (3) from rocker cover.

(4) Remove two bolts (8) and lockwasher (9) securing baffle (10) to rocker cover and remove baffle and two spacers (11).

c. Cleaning, Inspection, and Repair.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel -and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).



TS 1930-203-20/2-38

1.	Thumbscrew	7.	Extension stud
2.	Nonmetallic washer	8.	Bolt
3.	Breather tube gasket	9.	Lockwasher
4.	Breather tube	10.	Baffle
5.	Pin	11.	Spacer
6.	Rocker cover	12.	Rocker cover gasket

Figure 2-38. Rocker Cover Assembly, Removal and Installation.

(1) Rinse all parts of rocker cover assembly in drycleaning solvent (item 6, App. C) and dry parts with low pressure, dry compressed air.

(2) Clean breather tube.

(3) Inspect flanged edge of the rocker cover to ensure that all pieces of old gasket have been removed. Flanged edge should not be bent, allowing rocker cover gasket (12, fig. 2-38) to seat improperly between cylinder head and rocker cover. Replace rocker cover if bent or otherwise damaged.

(4) Inspect extension studs (7) and thumbscrews (1) for stripped threads. If threads are damaged, replace defective parts.

NOTE

It is not necessary to remove extension studs (7), pins (5), or thumbscrews (1) unless nonmetallic washers (2) require replacement.

(5) Ensure that nonmetallic washer (2) between rocker cover (6) and thumbscrew (1) is in serviceable condition. Replace nonmetallic washer if flattened or distorted, allowing leakage of oil around thumbscrew.

NOTE

Always use a new rocker cover gasket (12) between rocker cover and cylinder head when replacing rocker cover. A new breather tube gasket (3) also may be required to ensure an oil tight seal between breather tube (4) and rocker cover.

d. Installation.

(1) Install two spacers (11, fig. 2-38) and baffle (10) and secure with two screws (8) and lockwashers (9).

(2) Install breather tube (4) and gasket (3).

(3) Install gasket (12) and cover (6). Secure with washers (2) and thumbscrews (1).

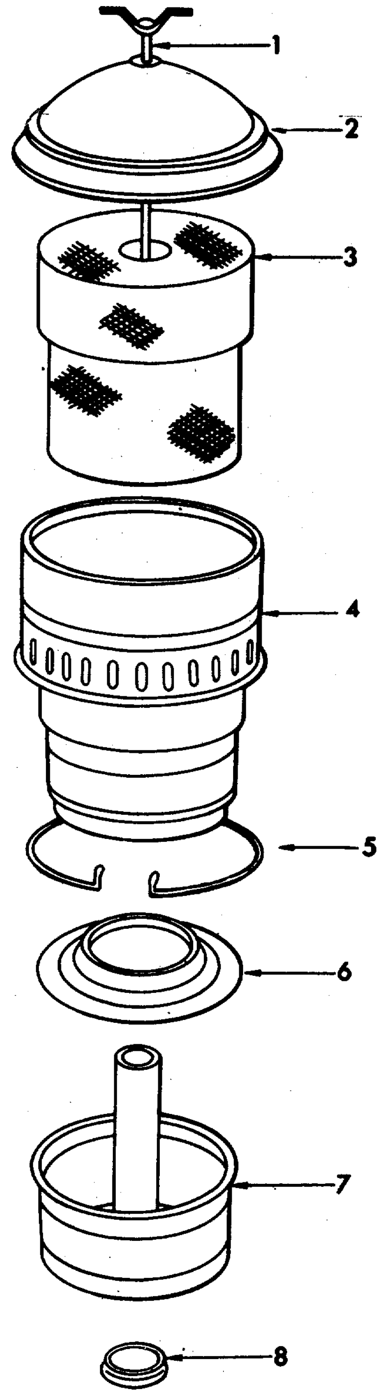
2-61. AIR CLEANER ASSEMBLY.

a. General. The air cleaner assembly (fig. 2-39) consists of a metal wool element supported inside the upper housing which is located over the oil bath in the lower housing. Air drawn through the air cleaner passes over the top of the oil where large particles of dirt and dust stick to the surface of the oil. The air stream then changes direction and flows upward through the metal wool element. As the air continues to pass through the air cleaner minute particles are filtered from the air by the metal wool element. A second change of air direction occurs when the air reaches the top of the air cleaner. The air is pulled by the incoming air down through the center tube of the air cleaner into the air inlet housing.

b. Removal. Remove wingbolt (1, fig. 2-39) and lift air cleaner assembly from air inlet housing.

NOTE

Hold the air cleaner assembly in its normal position when lifting from air inlet housing to prevent spilling oil from lower housing.



TS 1930-203-20/2-39

1. Wingbolt
2. Cover
3. Metal wool element
4. Upper housing
5. Snarping
6. Baffle
7. Lower housing
8. Preformed packed

Figure 2-39. Air Cleaner Assembly, Exploded View.

c. Disassembly.

(1) Remove cover (2, fig. 2-39) and lift metal wool element (3) from upper housing (4).

(2) Remove upper housing from lower housing (7}.

(3) Remove snapring (5) and baffle (6) from lower housing.

(4) Pour dirty oil from lower housing (7) and remove preformed packing (8) from bottom of lower housing.

d. Cleaning, Inspection and Repair.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Wash cover (2, fig. 2-39), upper housing (4), metal wool element (3), baffle (6), and lower housing (7) in a clean solution of drycleaning solvent (item 6, App. C). Wipe all parts with a clean, dry cloth.

(2) Examine all parts to ensure they are in a serviceable condition.

(3) Repair or replace unserviceable parts.

e. Reassembly.

(1) Install preformed packing (8, fig. 2-39) into lower housing (7) and fill lower housing to oil level mark. Ensure proper oil level.

(2) Install baffle (6) and snapring (5) on lower housing.

(3) Place upper housing (4) onto lower housing (7); place metal wool element (3) into upper housing.

f. Installation. Install assembled air cleaner onto air inlet housing, ensuring preformed packing is in proper between air inlet housing tube and the lower housing. Install cover (2, fig. 2-39) and tighten wingbolt (1).

2-62. AIR INLET HOUSING.

a. General. Air flowing to the engine from combustion and scavenging, is drawn downward through two air cleaners and into the air inlet housing by the blower assembly. As the air passes through the air cleaners and into the air inlet housing, it passes over two shutdown valves and through a screen before arriving at the blower assembly. When closed, the two shutdown valves block incoming air from entering the engine, thus preventing combustion. The shutdown valves are actuated by a hand lever mounted on the side of the air inlet housing which provides a means of stopping the engine from within the upper machinery area.

b. Inspection.

(1) Examine air inlet housing for damage, secure mounting and cracks. Report any defects to direct support maintenance.

(2) Tighten bolts securing air inlet housing to engine, observing torque values.

(3) Actuate emergency stop lever on side of air inlet housing several times to ensure shutdown valves are operating correctly. Should emergency stop lever stick or fail to close properly, notify direct support maintenance.

NOTE

A slight popping should be heard when emergency stop lever is pulled up rapidly. This popping noise is caused by the shutdown valves striking the air shutdown plate and .indicates shut- down valves are fully closed. The shut- down valves may also be inspected by removing the air cleaners and with the aid of a flashlight, looking down through the top of the air inlet housing.

2-63. FLUID STARTING AID.

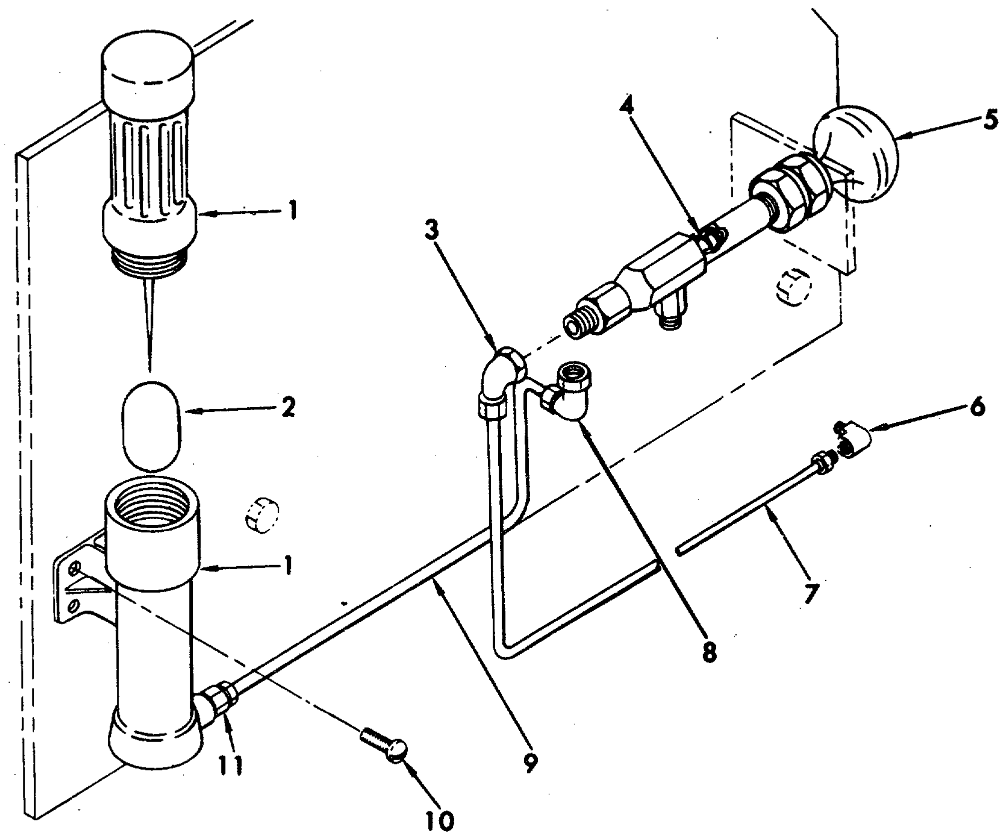
a. General. The fluid starting aid (fig. 2-40) is designed to inject a highly volatile fluid (ether) into the air inlet housing to assist in engine starting at low temperature. Basically, the fluid starting aid consists of a puncturing tool assembly, a pump assembly to transfer the ether to the air inlet housing, a spray nozzle to disperse the ether, and lines connecting the components.

b. Inspection.

(1) Ensure that all fittings are tight and tubes free of excessive bends. Tighten all loose fittings and replace all crimped or excessively bent tubing.

(2) Check pump assembly (5, fig. 2-40) as follows:

(a) Remove pump assembly to spray nozzle tube (7) at spray nozzle elbow (6) and place finger on end of tube.



TS 1930-203-20/2-40

1. Puncturing tool assy
2. Ether capsule
3. Elbow
4. Pump plunger seal
5. Pump assembly
6. Spray nozzle elbow
7. Tube
8. Elbow
9. Tube
10. Screw
11. Fitting

Figure 2-40. Fluid Starting Aid.

(b) Actuate pump assembly (5). Air pressure should push against finger if pump assembly is serviceable. If pump assembly will not force air through tube, proceed to disassembly.

c. <u>Disassembly.</u>

(1) Remove fitting (11, fig. 2-40), elbows (3, 6 and 8), and tubes (7 and 9).

(2) Unscrew large nut next to pump handle and remove pump assembly (5).

(3) Remove plunger and plunger seals (4) from pump assembly.

(4) Unscrew upper part of puncturing tool (1) from lower part and remove ether capsule (21)

(5) Remove screws (10) and lower part of puncturing tool (1).

(6) Repair or replace any defective parts.

d. Reassembly.

(1) Attach lower part of puncturing tool (1, fig. 2-40) to frame with screws (10).

(2) Install new seals (4) and plunger.

(3) Position pump assembly on frame, insert plunger and tighten large nut next to handle.

(4) Install elbows (3, 6, 8),-tubing (7, 9), and fitting (11). Ensure that fittings are tight.

(5) Drop new ether capsule (2) into bottom part of puncturing tool (1) and screw top part into place tightly so it does not leak.

2-64. FUEL PUMP ASSEMBLY.

a. General. The positive displacement gear type fuel pump (fig. 2-41) draws fuel oil from the fuel tanks. The fuel oil flows through a fluid pressure filter, located below the fuel tank, primary and secondary fuel filters mounted on the engine, and a fuel manifold to the fuel injectors for engine consumption. The fuel pump is mounted to the blower assembly and is driven off the end of the blower lower rotor. Excessive discharge pressure is relieved by a pressure relief valve built into the fuel pump body. A properly operating fuel pump will maintain a fuel pressure at the fuel inlet manifold of 40 psi (2.8 kg/cm^2) to 60 psi (4.2 kg/cm^2) at 1800 rpm engine speed.

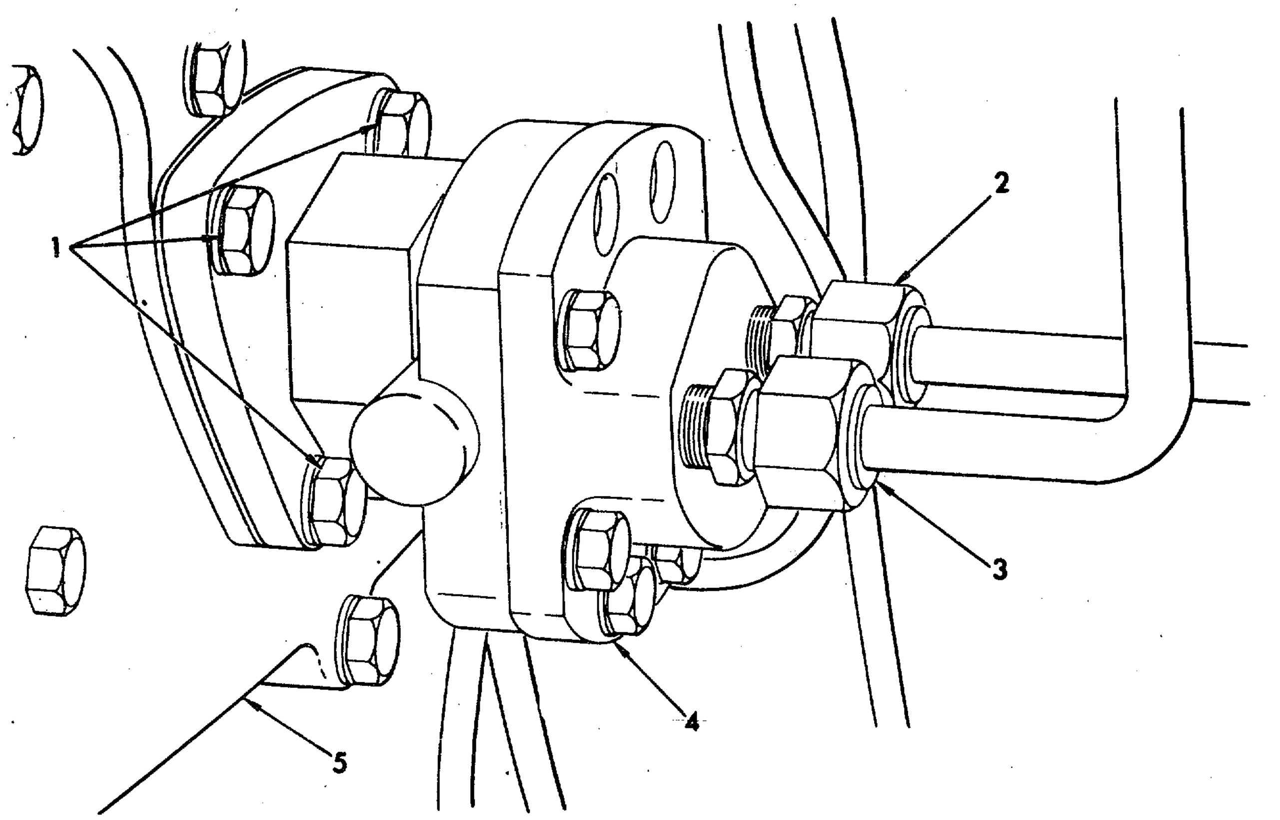
b. Inspection.

(1) Check inlet connection (2, fig. 2-41) and outlet connection (3) for fuel oil leaks. Tighten fuel line connections if leakage is evident.,

CAUTION

Excessive tightening of fuel oil line connections will result in twisted lines and stripped threads.

(2) Inspect fuel pump mounting flange or oil leaks. Observe torque values when tightening bolts and seal washers (1). If pump continues to leak, notify direct support maintenance.



TS 1930-203-20/2-41

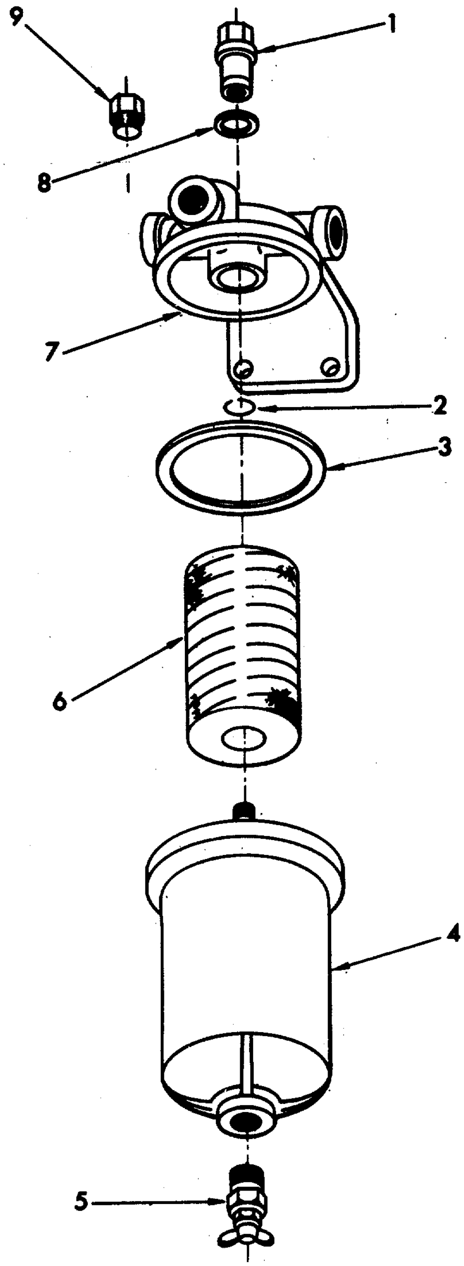
1. Bolt and seal washer
2. Inlet connection
3. Outlet connection
4. Fuel pump
5. Blower assembly

Figure 2-41. Fuel Pump Assembly.

2-65. FUEL STRAINER AND FUEL FILTER.

a. General.

(1) A fuel strainer (primary) (fig. 2-42) and a fuel filter (secondary) (fig. 2-43) are used to remove impurities from fuel. The fuel strainer is located between the fuel tank and the fuel pump. The fuel filter is installed between the fuel pump and the fuel inlet manifold.



TS 1930-203-20/2-42

1. Cover nut
2. Retaining ring
3. Gasket
4. Shell
5. Draincock
6. Filter element
7. Cover
8. Cover nut gasket
9. Plug, pipe

Figure 2-42. Primary Fuel Strainer, Service.

(2) The fuel strainer and fuel filter are similar in construction and consist essentially of a shell cover, and filtering element. The filtering element is positioned over the central stud, which is welded to the shell. The shell and element are attached to the cover by a nut or bolt that threads on or into the central stud. A shell gasket and cover bolt gasket seal the assembly against leakage.

(3) Since the fuel strainer (fig. 2-42) is located between the fuel tank and the fuel pump, it functions under suction. The fuel filter (fig. 2-43), is located between the fuel pump and the fuel inlet manifold in the cylinder head, operates under pressure. Fuel enters through the inlet passage in the cover and into the shell surrounding the filter element. Pressure of suction created by the pump causes the fuel to flow through the filter element where dirt particles are removed. Clean fuel flows to the interior of the filter element, up through the central passage in the cover and into the outlet passage, then to the fuel inlet manifold in the cylinder head.

b. Inspection and Service.

CAUTION

The wiring harness, starting, or other electrical equipment, must be shielded during filter change, since fuel oil can permanently damage the electrical insulation.

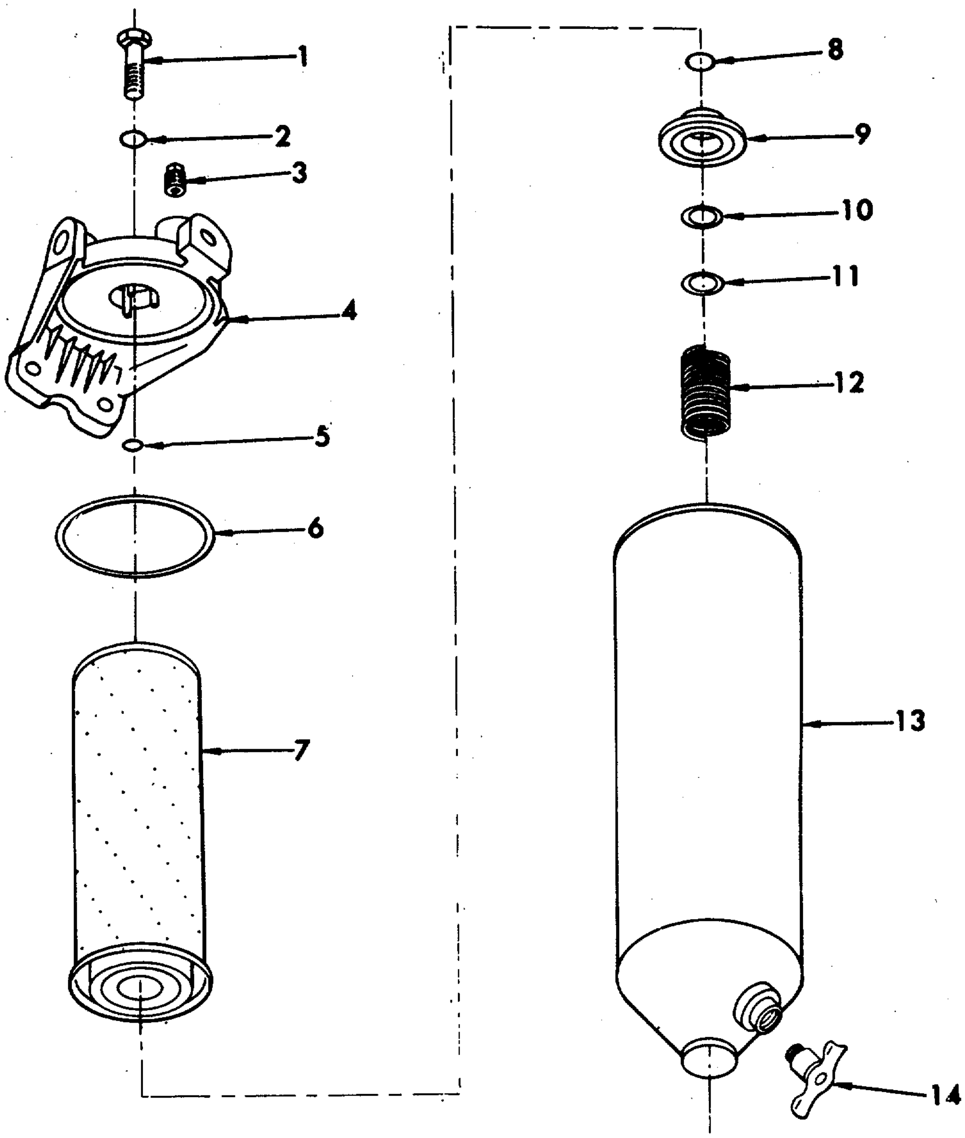
(1) With the engine shut down, place a container under the strainer or filter (fig. 2-42 or 2-43) and open the draincock. Loosen the cover nut or bolt just enough to allow the fuel oil to drain out freely.

(2) While supporting the shell, unscrew the cover nut or bolt and remove the shell and the element.

(3) Remove and discard the element, the shell gasket, and the cover nut gasket or bolt gasket.

(4) Wash the shell thoroughly with fuel oil and dry it with compressed air.

(5) Examine the element seat and retaining ring to ensure they have not slipped out of place. Check the spring by pressing on the element seat. When released, the seat must return against the retaining ring.



TS 1930-203-20/2-43

1. Bolt
2. Gasket
3. Plug, pipe
4. Cover
5. Retaining ring
6. Gasket
7. Filter element
8. Retainer
9. Element seat
10. Washer
11. Spring seat
12. Spring
13. Shell
14. Draincock

Figure 2-43. Secondary Fuel Filter, Service.

NOTE

The element seat, spring, washer and seal cannot be removed from the strainer shell. If necessary, the shell assembly must be replaced. However, components of the filter can be serviced. Examine the filter retainer (8, fig. 2-43) for hardening or cracking.

(7) Install a new gasket in the recess of the shell. Place the shell and element in position under cover. With a new gasket over the cover bolt, thread the bolt (or nut) into the stud.

(8) With the shell and gasket properly positioned, tighten the cover bolt or nut just enough to prevent fuel leakage. Remove filler plug in the cover and complete filling of shell with fuel.

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(9) Start the engine, run-to normal operating temperature and check fuel filter and strainer for leaks.

(10) Stop engines.

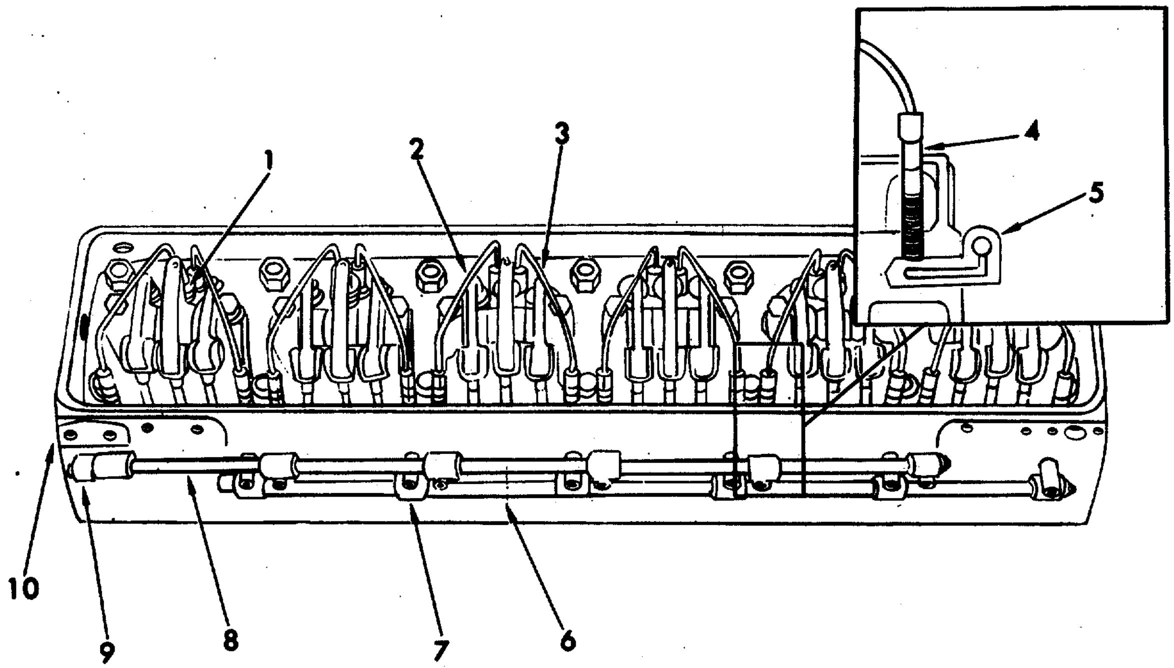
2-66. FUEL MANIFOLD.

a. General. The fuel injectors are supplied with oil by a fuel manifold, located on the air cleaner side of the cylinder head. The fuel manifold on some model cylinder heads are cast as an integral part of the cylinder head. Other engines with an earlier type cylinder head design have the fuel manifold mounted to the side of the cylinder head (fig. 2-44). This type of fuel manifold is secured to the cylinder head by threaded fuel connectors which extend down through, and set into, tapered seat openings in the T-connectors on the fuel manifold.

b. Inspection.

(1) Remove both air cleaners.

(2) Remove rocker cover and gasket.



TS 1930-203-20/2-44

1. Fuel injector
2. Fuel outlet pipe
3. Fuel inlet pipe
4. Fuel connector
5. Fuel manifold
6. Inlet fuel manifold
7. T-connector
8. Outlet fuel manifold
9. Restricted fitting
10. Cylinder head

Figure 2-44. Cylinder Head with External Fuel Manifold.

WARNING

Before starting engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(3) Start the engine, run to normal operating temperature and check fuel outlet pipes (2, fig. 2-44) and fuel inlet pipes (3) for fuel oil leaks. If leaks are evident, tighten pipe connections. If this does not stop leakage, notify direct support maintenance.

CAUTION

Excessive tightening of the fuel oil line connections will result in twisted lines and stripped threads.

(4) Check fuel manifold (5) for leaks. Report any leaks to direct support maintenance.

(5) Stop engines.

(6) Install rocker cover and air cleaners.

2-67. WATER PUMP.

a. General. The water pump assembly (fig. 2-45) draws coolant from the oil cooler and circulates the coolant through the engine cylinder block, cylinder head, water manifold, water cooled exhaust manifold, heat exchangers, radiators, and oil coolers. The water pump is mounted at the front of the blower housing and is driven by the blower lower rotor shaft. The drive end of the water pump shaft is supported by a double-row combination radial and thrust ball bearing, with the water pump shaft serving as the inner race of the bearing. A draincock is located in the bottom of the water pump to aid in draining the cooling system or cylinder block when required.

b. Inspection.

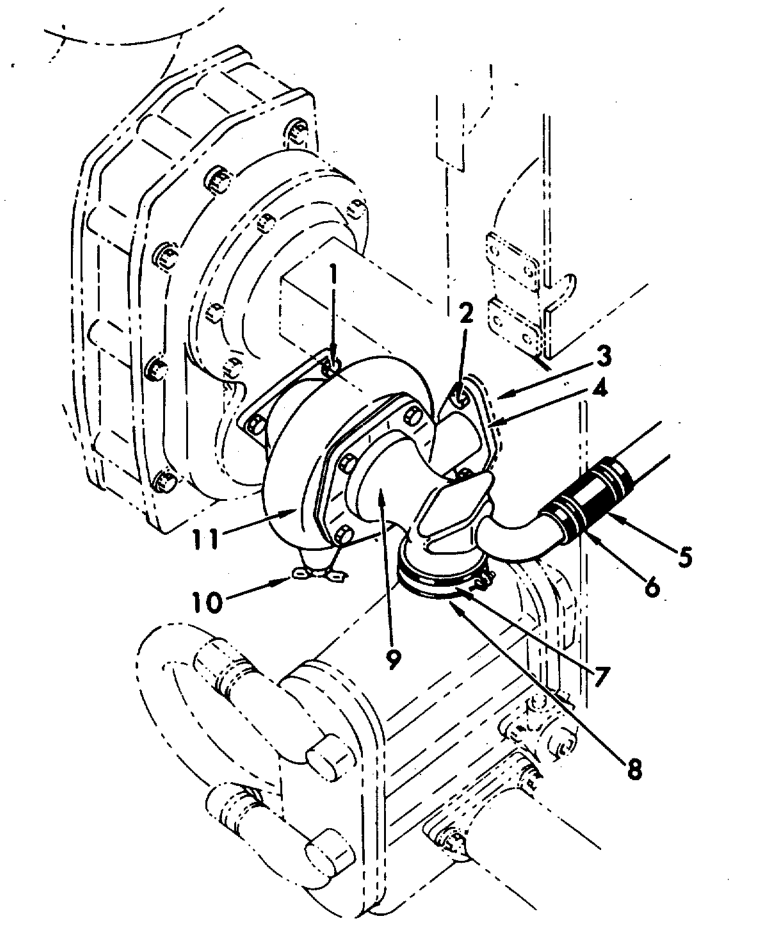
(1) Ensure that all hardware securing water pump is securely tightened. observe torque values when tightening hardware.

(2) Ensure that hose clamp (6, fig. 2-45) between water pump cover and water manifold is securely tightened and hose (5) is not leaking.

(3) Ensure that preformed packing (3) is free of leaks and bolts (2) are properly tightened. Replace packing if leakage is evident.

(4) Ensure that hose clamp (7) between water pump and oil cooler is securely tightened and that preformed packing (8) is not leaking.

(5) Inspect water pump housing for cracks. Notify direct support maintenance if cracks are found.



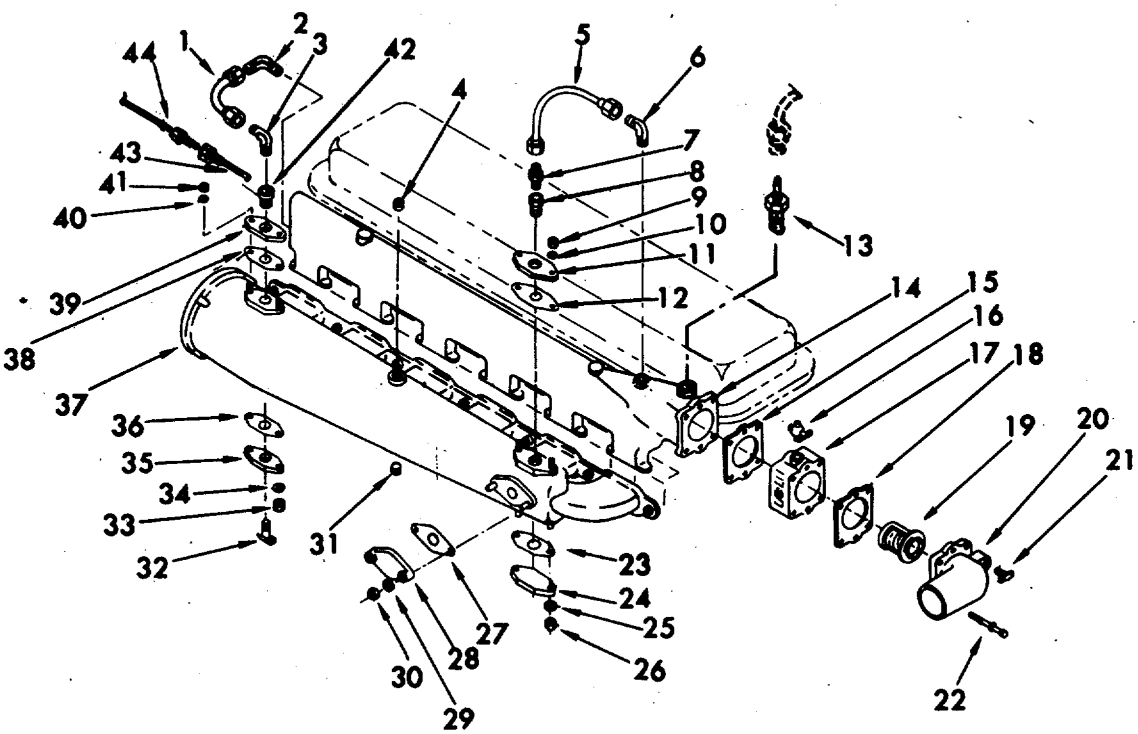
TS 1930-203-20/2-45

1. Bolt and seal assembly
2. Bolt
3. Preformed packing (outlet)
4. Outlet flange
5. Hose
6. Hose clamp
7. Hose clamp
8. Preformed packing (inlet)
9. Water pump cover
10. Draincock
11. Water pump

Figure 2-45. Water Pump Assembly.

2-68. WATER MANIFOLD.

a. General. Cooling water, leaving the cylinder head through openings directly over each exhaust port, enters the water manifold (14, fig. 2-46) which is attached to the cylinder head at each of six water openings. One end of the water manifold is connected to the expansion tank by a water hose and elbow assembly. The elbow assembly consists of a manifold elbow and a thermostat housing which contains a thermostat. The thermostat regulates the temperature of the engine coolant leaving the engine. An inlet tube and an outlet tube connects the water manifold to the water-cooled exhaust manifold, one located at each end of the water manifold. A water temperature gage sensing element is located at the end of the water manifold and is connected to a water temperature gage located on the gage board. A temperature



TS 1930-203-20/2-46

1. Inlet tube
2. Elbow
3. Elbow
4. Pipe plug
5. Outlet tube
6. Elbow
7. Coupling
8. Bushing
9. Nut
10. Lockwasher
11. Cover
12. Gasket
13. Water temperature thermostatic switch
14. Water manifold
15. Gasket
16. Draincock
17. Thermostat housing
18. Gasket
19. Thermostat
20. Manifold elbow
21. Draincock
22. Capscrew
23. Gasket
24. Cover
25. Lockwasher
26. Nut
27. Gasket
28. Cover
29. Lockwasher
30. Nut
31. Pipe plug
32. Draincock
33. Nut
34. Lockwasher
35. Cover
36. Gasket
37. Exhaust manifold
38. Gasket
39. Cover
40. Lockwasher
41. Nut
42. Bushing
43. Water temperature gage gage socket
44. Water temperature gage sensing element

Figure 2-46. 'Water and Exhaust Manifold Components.

thermostatic switch is located on the top of the water manifold, and is connected to the warning light in the cab. The water manifold may be drained of the engine coolant by opening a draincock located in the bottom of the exhaust manifold.

b. Inspection.

(1) Inspect all gasket areas between base of water manifold (14, fig. 2-46) and cylinder head for leaks. Notify direct support maintenance if coolant leakage is found.

(2) Inspect gaskets (15 and 18) for leaks at the thermostat housing (17).

(3) Ensure that electrical connections on water temperature thermostatic switch (13) are free of corrosion and are tight.

(4) Inspect inlet tube (1) and outlet tube (5) connections to ensure that connections are tight and not leaking. Tighten leaking connections as required.

(5) Ensure that draincocks (16 and 21) open and close easily and are free of leaks.

2-69. WATER-COOLED EXHAUST MANIFOLD.

a. General. The water-cooled exhaust manifold (37, fig. 2-46) is cast with an integral water jacket surrounding the exhaust chamber. The diameter of the exhaust chamber increases uniformly from one end to the other where it terminates in a flange to which the exhaust piping is connected. A portion of the engine coolant is bypassed from the water manifold into the large end of the water jacket surrounding the exhaust manifold and is discharged at the small end back into the water manifold. A draincock (32) is installed in the bottom of the exhaust manifold.

b. Inspection.

(1) Inspect hardware securing exhaust manifold (37, fig. 2-46) to ensure it is securely tightened.

(2) Open draincock (32) and drain a small amount of coolant from the exhaust manifold water jacket and tighten draincock. Draincock should open and close easily and should not leak.

(3) Inspect gasket between exhaust manifold (37) and cylinder head for signs of exhaust blow-by. Should signs of blow-by be evident, notify direct support maintenance.

(4) Inspect covers (11, 24, 28, 35, and 39) and gaskets (12, 23, 27, 36, and 38) for leakage. Tighten cover nuts if required. If leakage continues, replace defective gasket or cover.

2-70. MUFFLER AND EXHAUST PIPING.

a. General. The engine mufflers and exhaust piping are constructed of stainless steel and are completely enclosed with a fiberglass insulating material. The exhaust piping carries gasses from the engine through a muffler to exhaust ports in the bulkhead where the exhaust gasses are expelled overboard.

b. Inspection.

NOTE

Remove only the amount of insulation from the muffler and exhaust piping to facilitate an inspection of exhaust piping joints. If evidence of scorching or buming of insulation is found, removal of insulation from complete exhaust system is required for inspection.

(1) Inspect gasket (3, Fig. 2-47) at water-cooled exhaust manifold for leaks. Replace gasket if required.

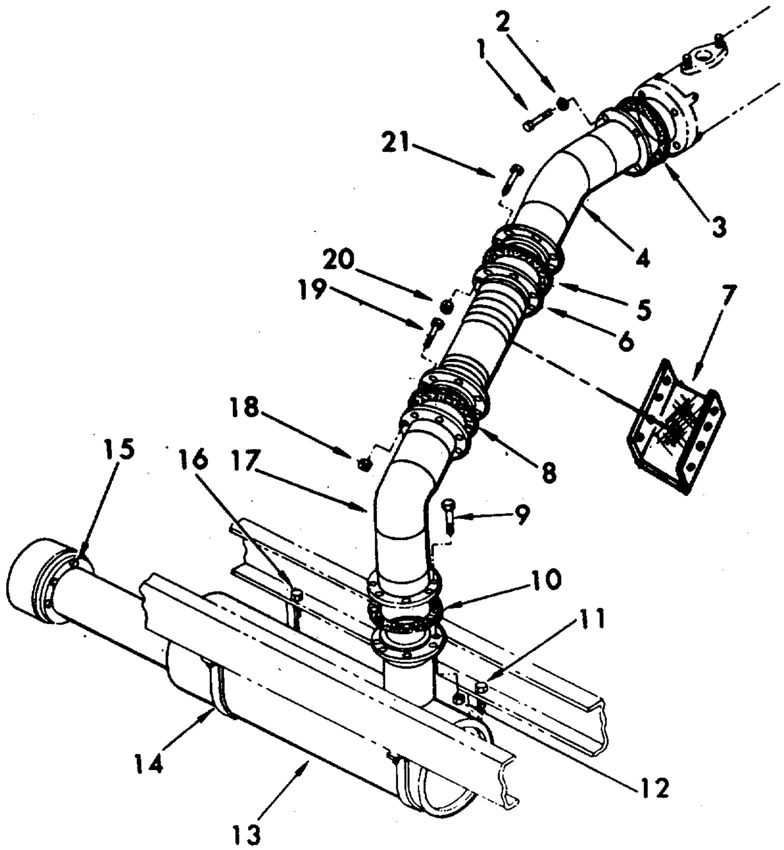
(2) Ensure that bolts (9, 19, and 21) and nuts (12, 18, and 20) are securely tightened.

(3) Inspect hanger straps (14) to ensure they hold muffler (13) securely to the framing. Tighten bolts and nuts (11, 16) securing hanger strap.

(4) Inspect all connections between muffler and exhaust manifold for gas-tight connections. Notify direct support maintenance of any damage.

(5) Inspect muffler connection to pipe and seal plate for gas tight connection. Ensure that capscrews (15) are tight.

(6) Inspect all insulation and insulating retaining straps to ensure that insulation has not come loose from exhaust piping (4 and 17), flexible hose (6), and muffler (13). Replace defective insulation as required. Notify direct support maintenance of defective hoses or muffler.



TS 1930-203-20/2-47

1. Capscrew
2. Lockwasher
3. Gasket
4. Exhaust piping
5. Gasket
6. Flexible hose
7. Blanket
8. Gasket
9. Bolt
10. Gasket
11. Bolt and nut
12. Nut
13. Muffler
14. Hanger strap
15. Capscrew
16. Bolt and nut
17. Exhaust piping
18. Nut
19. Bolt
20. Nut
21. Bolt

Figure 2-47. Muffler and Exhaust Piping.

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2-71. LUBRICATING OIL FILTERS.

a. General. Each diesel engine on the LARC is equipped with two types of oil filters, a full flow oil filter (fig. 2-48) and a bypass oil filter (fig. 2-49). The full flow oil filter is located on the accessory side of the engine. All oil supplied to the engine /first passes through the full flow oil filter. The full flow oil filter removes the larger foreign particles that may be present in the oil without restricting the normal flow of oil. When the engine is in operation, a portion of the lubricating oil is bled off the oil gallery and passes through the bypass oil filter. Eventually, all the oil passes through the bypass oil filter, thus filtering out minute foreign particles.

b. Inspection and Service.

(1) Inspect oil filters to ensure that oil leakage is not present. Replace gaskets between cover and shell if leakage is present.

(2) Inspect lines on bypass oil filter for security and excessive bends and crimping. Tighten or replace leaking oil lines.

(3) Inspect shells to determine if excessive torque has compressed shell around area where cover and shell mate. Replace defective shells.

c. Full Flow Oil Filter Element Removal.

(1) Remove cover nut (12, fig. 2-48) and gasket (13) and pull shell (14) from cover housing (19).

NOTE

When removing shell, catch oil trapped in filter in a container.

(2) Remove element (6), upper washer .(7), retainer (8), retainer packing (9), lower washer (10), and spring (41) from shell (14).

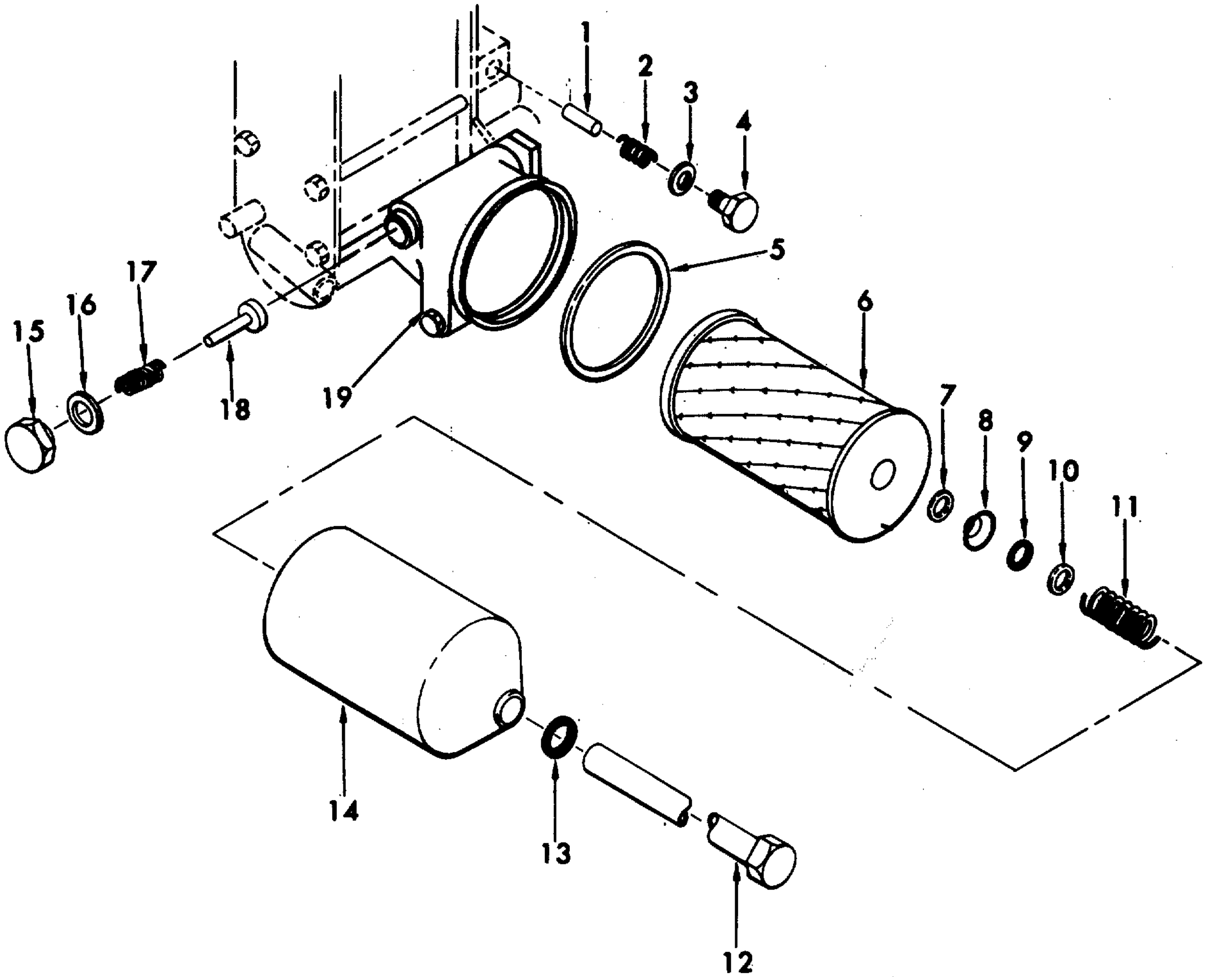
(3) Remove valve plug (4), gasket (3), spring (2), and oil cooler bypass plunger (1) from oil cooler adapter.

(4) Unscrew machine plug (15) and remove gasket (16), spring (17), and filter bypass valve (18) from cover. Remove gasket

(5) from cover housing (19).

d. Bypass Oil Filter Element Removal.

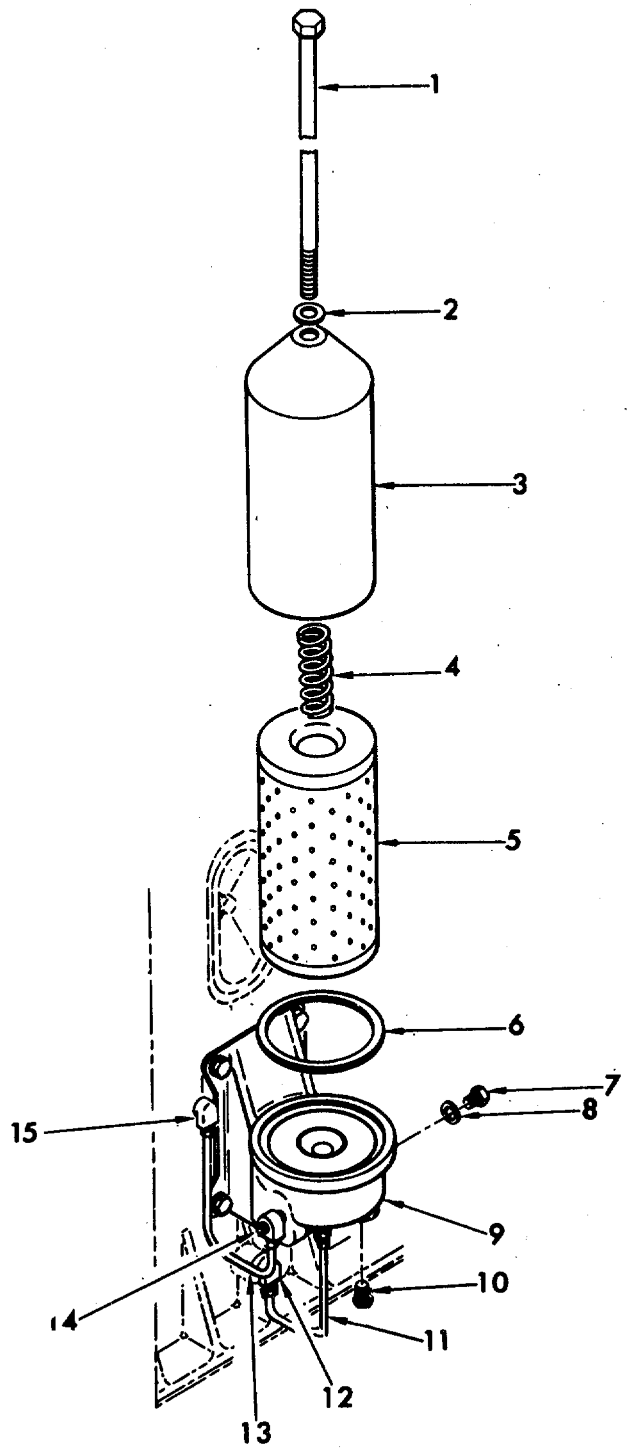
(1) Remove drainplug (10, fig. 2-49) from cover (9) and drain oil into a container.



TS 1930-203-20/2-48

1. Oil cooler bypass plunger
2. Spring
3. Gasket
4. Valve plug
5. Gasket
6. Element
7. Upper washer
8. Retainer
9. Retainer packing
10. Lower washer
11. Spring
12. Cover nut
13. Gasket
14. Shell
15. Machine plug
16. Gasket
17. Spring
18. Filter bypass valve
19. Cover housing

Figure 2-48. Full Flow Oil Filter Removal and Installation.



TS 1930-203-20/2-49

Figure 2-49. Bypass Oil Filter, Removal and Installation.

Legend for figure 2-49:

1. Center stud
2. Gasket
3. Shell
4. Spring
5. Element
6. Gasket
7. Plug
8. Gasket
9. Cover
10. Drainplug
11. Drain line
12. Elbow pipe
13. Pressure line
14. Elbow
15. Elbow

(2) Unscrew center stud (1) attaching shell (3) to cover and remove center stud, shell, spring (4)., and element (5) from cover; remove gasket (2).

(3) Remove plug (7), gasket (8) and gasket (6) from cover.

e. Cleaning.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean both types of oil filter parts thoroughly, except covers and elements, in drycleaning solvent (item 6, App. C). Wipe parts dry with a clean, lint-free cloth.

(2) Remove oil traces from covers with a clean cloth moistened in drycleaning solvent (item 6, App. C). Wipe covers dry using a clean, dry cloth.

(3) Remove all particles of old gaskets so new gasket. between shells and covers will seal properly.

f. Full Flow Oil Filter Element Installation.

NOTE

A light application of grease on filter element gasket will hold gasket in the recess of the cover.

(1) Install gasket (5, fig. 2-48) into cover housing (19). Install filter bypass valve (18), spring (17), gasket (16), and plug (15) into cover housing.

(2) Install oil cooler bypass plunger (1), spring (2), and gasket (3) into oil cooler adapter and secure with valve plug (4).

(3) Insert spring (11), lower washer (10), packing (9), retainer (8), upper washer (7), and element C6) into shell (14).

CAUTION

Excess torque when tightening cover nut can compress the filter shell inward, making it difficult or impossible to obtain a complete oil seal.

(4) Install shell (14) on cover housing (19) and secure using cover nut (12) and gasket (13).

g. Bypass Oil Filter Element Installation.

NOTE

A light application of grease on filter element gasket will hold gasket in recess of cover.

(1) Install gasket (6, fig. 2-49) into cover (9).

(2) Insert gasket (8) and replace plug (7) in cover (9).

(3) Install element (5) and spring (4) into shell (3). Place shell over cover (9).

CAUTION

Excess torque when tightening center stud can compress the filter shell inward, making it difficult or impossible to obtain a complete oil seal.

(4) Insert center stud (1) and gasket (2) into shell and tighten.

h. Testing.

(1) Check oil filters for leaks as follows:

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(a) Start engine and run to normal operating temperature.

(b) While watching oil filter(s) for leaks, run engine at fast idle for one minute. Increase speed until maximum oil pressure is attained and run for three minutes, then run engine at idle for one minute.

(2) Check engine oil level and add oil to bring oil level to FULL mark (see lubrication order).

2-72. AIR STARTING MOTOR.

a. General. The air starting motor (fig. 2-50) on each diesel engine receives starting air pressure from the air supply tanks. The air passes through a filter and lubricator before reaching the air starting motor. The motor requires approximately 45 psi (3.2 kg/cm2) to sufficiently turn the diesel engine to attain cranking speed. Two models are depicted.

b. Inspection.

(1) Inspect air starting motor housing for cracks. Tighten air line connections if necessary. Reportafly defects to direct support maintenance.

(2) Ensure that bolts securing starting motor are tightened securely.

(3) If required, lubricate either motor (see lubrication order).

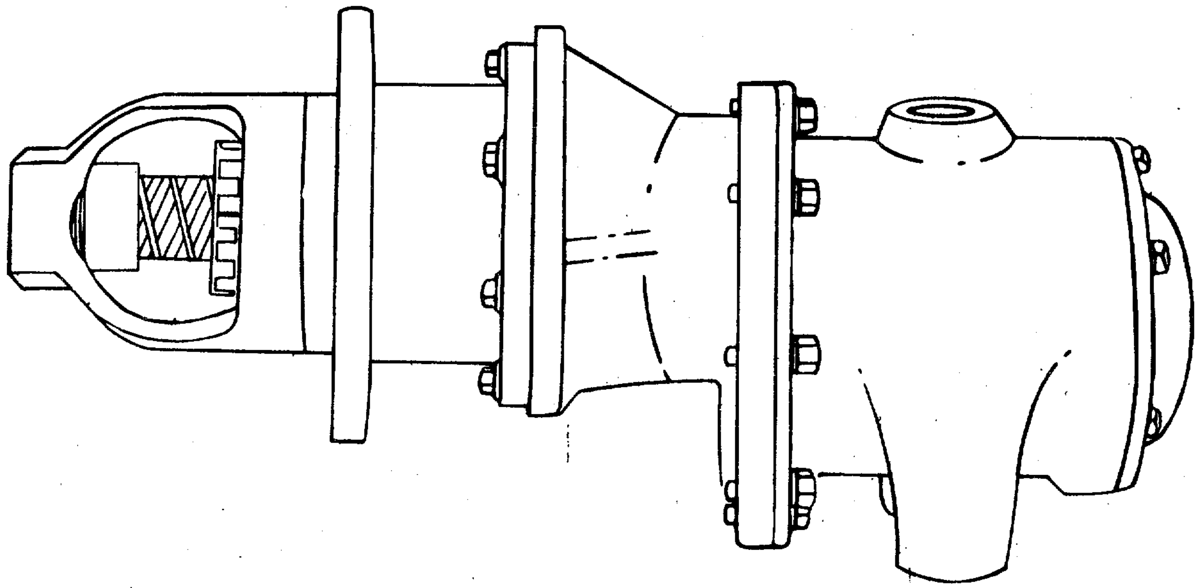
2-73. GOVERNOR.

a. General. A limiting speed governor (7, fig. 2-51) is mounted on the blower assembly and is driven by the upper rotor of the blower section. The governor controls engine idling speed and maximum operating speed through a fuel rod mechanically linked from the governor to the engine fuel injector control rack which regulates the amount of fuel injected in the cylinders. Engine speed is determined by the opposition of weights to a high and low speed spring. When centrifugal force of the weight balances out the tension on the high or low speed spring (depending on the speed range), the governor .stabilizes the engine speed for a given setting of the governor control lever..

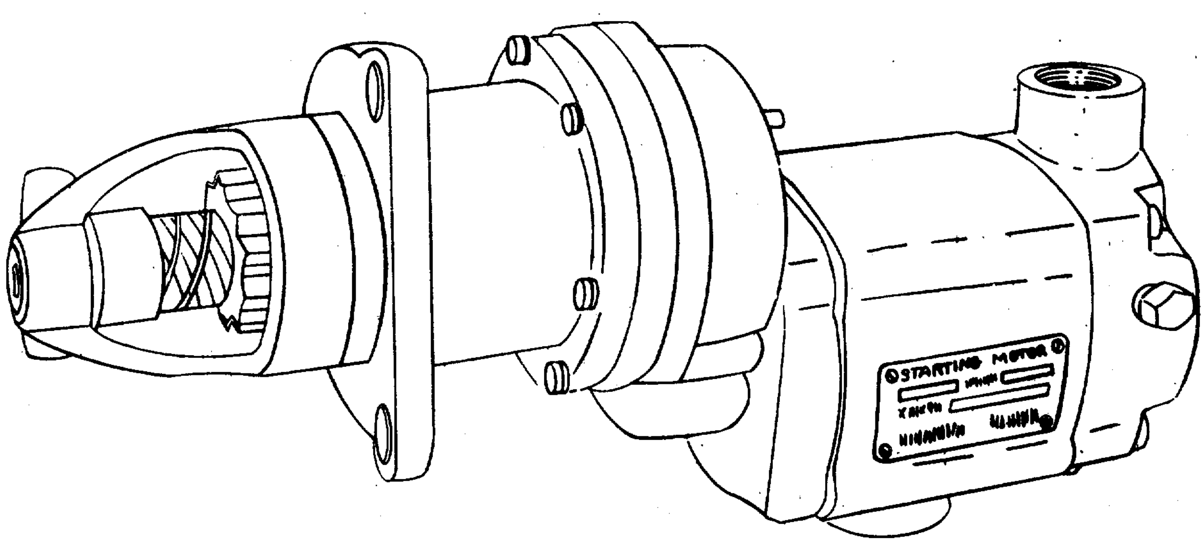
b. Inspection.

(1) Inspect governor assembly for cracks in housing. Ensure that mounting bolts are secure.

(2) Inspect oil line and fitting from governor hub to engine for leaks. Tighten or replace oil line to stop leaks.



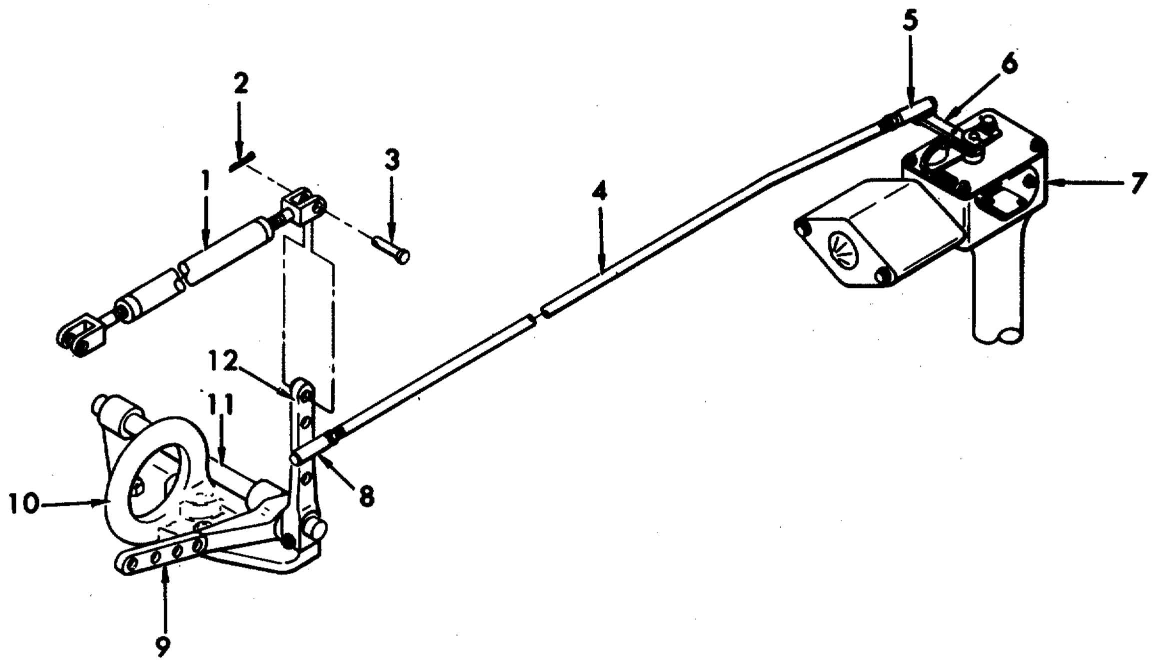
MODEL A31RH-6



MODEL B21RH-6

TS 1930-203-20/2-50

Figure 2-50. Air Starting Motor.



1. Rod assembly
2. Cotter pin
3. Straight pin
4. Governor-throttle shaft
5. Ball joint
6. Governor speed control lever
7. Governor
8. Ball joint
9. Control lever
10. Lifting eye
11. Throttle control shaft'
12. Control lever

Figure 2-51. Governor-Throttle Controls, Removal and Installation

(3) Ensure that cover plate adjacent to buffer screw adjustment is tight and oil leakage is not present. Replace cover plate gasket should oil leakage be present.

(4) Inspect governor speed control lever (6, fig. 2-51) for freedom of travel and binding; ensure that bolt attaching speed control lever to shaft is securely tightened. If speed control lever is binding, notify direct support maintenance.

2-74. GOVERNOR-THROTTLE CONTROL LINKAGE.

a. General. The engine governor-throttle control linkage (fig. 2-511 is a mechanical linkage between the actuator positioner and the governor. Engine speed is determined by the length of travel of the governor-throttle control linkage. As the control lever is moved by the rod assembly from actuator positioner, this movement is transmitted by the governor-throttle shaft to the governor speed control lever which directly determines engine speed.

b. Inspection.

(1) Ensure that cotter pin (2, fig. 2-51) and straight pin (3) is present and in good condition. Replace defective pins.

(2) Ensure control lever capscrews are tightened to correct torque value.

(3) Ensure linkage moves freely through entire range of travel. Ensure jamnuts are pulled up snug against ball joints (5 and 8).

NOTE

Never attempt to adjust engine speed by turning throttle linkage or by moving throttle control shaft to a different position on control lever.

c. Removal.

(1) Remove nuts securing ball joints (5 and 8, fig. 2-51) to governor speed control lever (6) and control lever (12) and remove ball joints together with governor-throttle shaft (4). Remove ball joints (5 and 8) from shaft.

NOTE

Count and record number of turns required to remove each ball joint from shaft to aid installation. If ball joints are not installed in same position, engine speed will be adversely affected.

(2) Remove cotter pin (2) and straight pin (3) attaching rod assembly (1) to control lever (12).

(3) Loosen capscrew in base of each control lever and tap both levers from throttle control shaft (11).

(4) Loosen setscrews in shaft collar and remove throttle control shaft (11) from engine.

(5) Replace defective control linkage.

d. Installation.

(1) Install throttle control shaft (11, fig. 2-51) onto engine. Tighten setscrew in shaft collar.

(2) Install both control levers (9 and 12) onto throttle control shaft (11). Tighten capscrew at base of control levers to correct torque value.

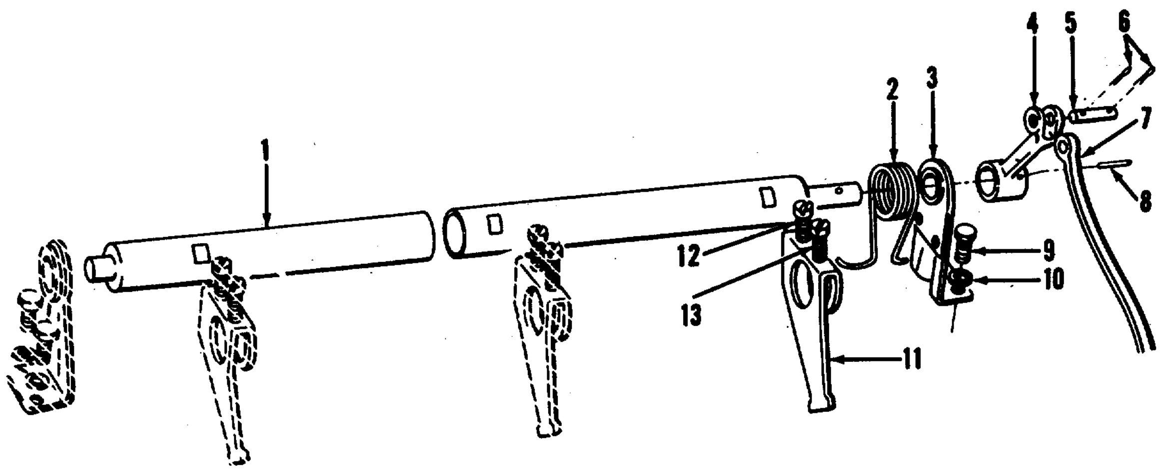
(3) Attach rod assembly (1) to control lever (12) and secure with straight pin (3) and cotter pin (2).

(4) Install ball joints (5 and 8) on governor-throttle shaft (4).

(5) Attach governor-throttle shaft (4) to control lever (12) and governor speed control lever (6) and install nuts securing ball joints (5 and 8).

2-75. FUEL INJECTOR CONTROLS.

a. General. Movement of the injector control tube-governor fuel rod (7, fig. 2-52), which is determined by governor speed, causes the injector control tube (1) to turn. This movement is transmitted to the injector control tube. The injector control tube levers are connected directly to the injector control rack. The injector control rack determines the amount of fuel oil injected into the combustion chamber by the fuel injectors.



1. Injector control tube
2. Spring
3. Injector control tube bracket
4. Injector control tube lever
5. Link pin
6. Cotter pin
7. Fuel rod
8. Straight pin
9. Bolt
10. Lockwasher
11. Injector rack control lever
12. Inner control lever adjusting screw
13. Outer control lever adjusting screw

Figure 2-52. Fuel Injector Controls.

b. Inspection.

(1) Wipe rocker cover with cleaning cloth to prevent dust and dirt from entering valve mechanism. Loosen thumbscrews and lift rocker cover straight up from cylinder head.

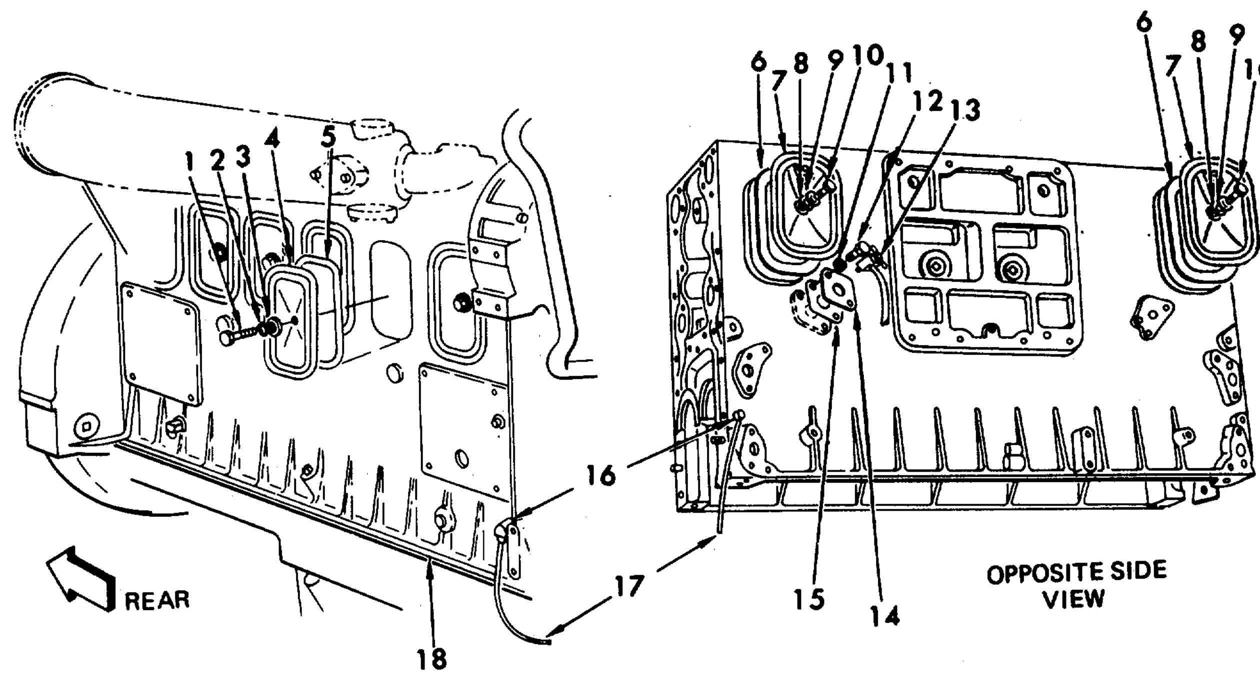
(2) Inspect inner control lever adjusting screw (12, fig. 2-52) and outer control lever adjusting screw (13) to ensure that threads are not stripped. Replace adjusting screws if threads are stripped.

(3) Ensure the injector rack control levers C11) fit properly in grooves in injector control tube (1) and cannot slip from grooves.

(4) Inspect all component parts carefully to ensure that parts are not cracked, broken, or otherwise defective. Report defects to direct support maintenance. Install rocker cover.

2-76. ENGINE BLOCK.

a. General. The engine block (fig. 2-53) is an integral iron casting forming the primary structural foundation of the engine. Water jackets within the engine block extend the full length of the cylinder bores and are divided into upper and lower sections interconnected by hollow struts. Coolant enters at the bottom of each water jacket and leaves the engine block through the cylinder head. An air box surrounds the water jacket and conducts air from the blower to all of the air inlet ports in the cylinder liners. Hand holes on the manifold side of the engine block permit access to the air box and inspection of the piston and compression rings.



TS 1930-203-20/2-53

1. Capscrew
2. Washer
3. Gasket (copper)
4. Handhold cover
5. Gasket
6. Gasket
7. Cover
8. Gasket (copper)
9. Washer
10. Capscrew
11. Lockwasher
12. Capscrew
13. Draincock
14. Water hole cover
15. Gasket
16. Elbow
17. Air box drain tube
18. Cylinder block

Figure 2-53. Engine Block Components, Removal and Installation.

b. Inspection.

(1) Ensure six capscrews (1, fig. 2-53) securing six hand- hold covers (4) are tight. Tighten capscrews to a torque of 30 to 35 ft-lb (4.1 to 4.8 m/kg).

(2) Inspect draincock (13) for leakage periodically. Replace leaking draincocks. Open draincock and allow a small portion of engine coolant to drain from engine block to check operation of draincock. Replace defective draincock.

(3) Inspect water hole cover gasket (15) for leakage. Replace all leaking water-hole cover gaskets. Tighten bolts securing water hole cover (14) to a torque of 13 to 17 ft-lb (1.8 to 2.4 m/kg).

(4) Inspect air box drain tubes (17) to ensure that drain tubes are not crimped, restricted, and are secured properly. Replace a crimped or damaged drain tube.

(5) Check air box drain tubes for operation as follows:

WARNING

Before starting engines, ensure that no one is in the machinery wells. When starting on land, station a man outside aft of the-LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(a) Start engine and run to normal operating temperature.

(b) With engine running at idle, place finger over air box drain tube (17) and check for air flow. If no air flow is noted, stop engine and proceed to step (6).

(6) Remove air box drain tubes from engine. Blow out drain lines with compressed air and replace.

c. Engine Block Components Removal.

(1) Remove capscrews (1, fig. 2-53), washers (2), and gaskets (3); remove handhold covers (4)and gaskets (5).

NOTE

Drain coolant when removing draincocks or water hole cover.

(2) Remove draincock (13) from water hole cover (14).

(3) Remove two capscrews (12) and lockwashers (11) securing water hole cover (14) and remove cover and gasket (15).

(4) Remove capscrews (10), washers (9), and gaskets (8) from covers (7) and remove covers and gaskets (6).

(5) Remove two air box drain tubes (17) and elbows (16) from engine.

d. Engine Block Components Installation.

(1) Attach two elbows (16, fig. 2-53) and air box drain tubes (17) to engine.

(2) Install gaskets (6), covers (7), and gaskets (8) and secure with washers (9) and capscrews (10).

(3) Install gasket (15) and water hole cover (14) and secure with two lockwashers (11) and capscrews (12). Install draincock (13).

(4) Refill cooling system with coolant.

(5) Install gaskets (5), hand hole covers (4), and gaskets (3) and secure with washers (2) and capscrews (1).

2-77. TORQUE CONVERTER.

a. General. Output load of the engine is automatically adjusted to the load command of the land drive system by means of the torque converter. The torque converter permits the engine to operate at its most effective output, and at the same time, protects the engine from shock loads, dragging, and stalling, thereby increasing service life of the engine assembly. Because torque is hydraulically and automatically multiplied by the torque converter, engine power is fitted to load requirements more efficiently.

b. Inspection.

(1) Examine oil charging pump on torque converter for leaks around mounting flange. Report leaks to direct support maintenance.

(2) Inspect hydraulic lines attached to oil charging pump for leaks. Report leaks to direct support maintenance.

(3) Inspect torque converter housing cover for oil leaks around gasket between mating surfaces. Tighten bolts securing housing cover.

c. Testing. If loss of power is apparent with engine functioning properly, torque converter stators may be locked. Check for locked stators as follows:

WARNING

Before starting the engines, ensure that no one is in the machinery well. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(1) Start engines..

(2) Shift transmission to first gear and apply brakes to keep LARC from moving.

(3) Run torque converter in this stalled condition until torque converter oil temperature reads 230 degrees F (110 degrees C).

CAUTION

Do not stall the torque converter longer than 30 seconds or allow torque converter oil temperature to exceed 250 degrees F (121 degrees C).

(4) Release brakes, shift transmission to neutral, and immediately check rate of torque converter temperature drop with maximum input rpm.

NOTE

Temperature should begin to drop after 15 seconds. A slow rate of temperature drop probably indicates one or both stators are locked. A rapid rate of temperature drop indicated normal stator operation.

(5) Stop engines.

(6) If check indicates torque converter stators are locked,notify direct support maintenance.

2-78. ENGINE TUNEUP.

Start engines and check all gage board tachometers for reading on idle and cutout speeds for each engine. Should any engine rpm show less than 550 rpm at idle speed, or above 2100 rpm at full throttle, stop engine and perform each of the following procedures in sequence.

2-79. EXHAUST VALVE ADJUSTMENT.

a. Cold Adjustment.

(1) Place governor speed control lever (6, fig. 2-51) in NO FUEL position.

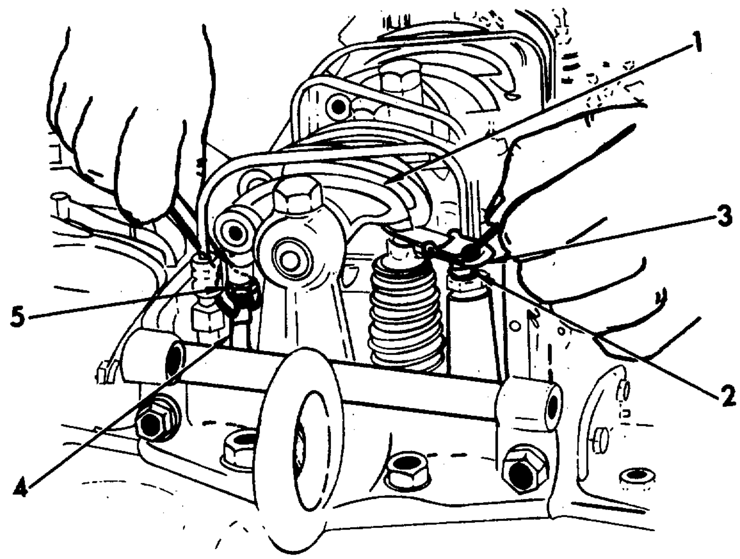
(2) Wipe rocker cover with cleaning cloth to prevent dust and dirt from entering valve mechanism. Loosen thumbscrews and lift rocker cover straight up from cylinder head.

(3) Rotate crankshaft by jacking over with strap or pipe wrench until fuel injector follower is fully depressed on cylinder to be adjusted.

(4) Loosen pushrod locknut (5, fig. 2-54).

(5) Place a 0.012 inch (0.3048 mm) feeler gage (3) between valve stem (2) and rocker arm (1). Adjust pushrod (4) to obtain a smooth pull on feeler.

(6) Remove feeler gage (3) between valve stem (2) and rocker arm (1). Hold pushrod (4) with 5/16 inch open-end wrench and tighten locknut (5) with a 1/2 inch open-end wrench.



TS 1930-203-20/2-54

1. Rocker arm
2. Valve stem
3. Feeler gage
4. Pushrod
5. Locknut

Figure 2-54. Exhaust Valve Adjustment.

(7) Recheck clearance between rocker arm C1) and valve stem (2). If adjustment is correct, a 0.011 inch (0.2794 mm) feeler will pass freely between end of valve stem and rocker arm and a 0.013 inch (0.3302 mm) will not pass through opening.

(8) Check and adjust remaining valves. Replace rocker cover. Reposition governor speed control lever to its original position.

b. Hot Adjustment.

(1) Wipe rocker cover with cleaning cloth to prevent dust and dirt from entering valve mechanism. Loosen thumbscrews and lift rocker cover straight up from cylinder head.

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(2) Start engine and run until normal operating temperature is established, then shut engine down.

(3) Place a 0.008 inch (0.2032 mm) feeler gage (3) between valve stem (2) and rocker arm (1). If valve clearance is sufficient, feeler gage will pass freely between valve stem and rocker arm (1), and a 0.010 inch (0.245 mm) gage will not.

(4) Remove feeler (3) between valve stem (2} and rocker arm (1).

(5) If adjustment is incorrect, follow the cold setting procedure using the 0.008 inch (0.2032 mm) and 0.010 inch (0.245 mm) feeler gage.

(6) Check remaining exhaust valves in same manner. Replace rocker cover.

2-80. FUEL INJECTOR TIMING.

a. General. To properly time the fuel injectors, the injector follower must be adjusted to a definite height in relation to the fuel injector body. All fuel injectors can be timed during one revolution of the crankshaft.

b. Timing Procedure.

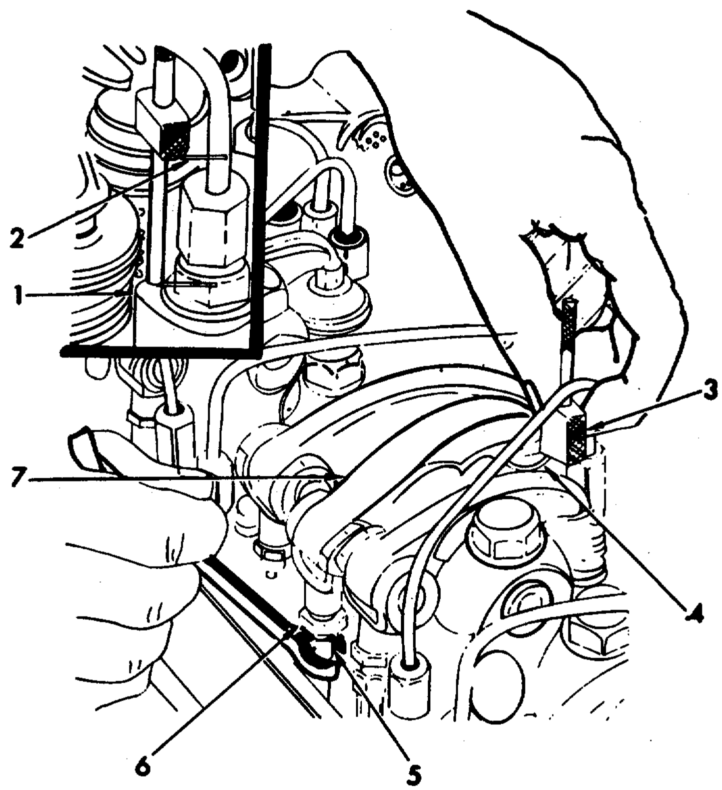
(1) Place governor speed control lever (6, fig. 2-51) in NO FUEL position.

(2) Wipe rocker cover with cleaning cloth to prevent dust and dirt from entering valve mechanism. Loosen thumbscrews and lift rocker cover straight up from cylinder head.

(3) Rotate crankshaft by jacking over with a strap wrench or pipe wrench until exhaust valves on particular cylinder to be timed are fully depressed (opened).

(4) Place small end of fuel injector timing gage (J1853) (3, fig. 2-55) in hole provided in top of injector body, with flat part of timing gage toward injector follower (4).

(5) Loosen locknut (6) and turn pushrod (5), using a 5/16 inch wrench, to adjust rocker arm (7) until extended part of timing gage (3) will just pass over top of injector follower (4).



TS 1930-203-20/2-55

1. Fuel injector
2. Timing dimension
3. Timing gage (J1853)
4. Injector follower
5. Pushrod
6. Locknut
7. Rocker arm

Figure 2-55. Fuel Injector Timing.

(6) Hold pushrod with 5/16 inch wrench to prevent turning and tighten locknut using a 1/2 inch wrench.

(7) Recheck clearance with timing gage to ensure that adjustment has not been altered. Time remaining fuel injectors.

(8) Return governor speed control lever (6, fig. 2-51) to it original position. Replace rocker cover.

2-81. GOVERNOR GAP ADJUSTMENT.

a. General. All engines of the LARC are normally controlled from a single foot throttle and any two engines on the same side of the LARC drive common shafts, therefore, the idle and overspeed setting of all engines must be set at approximately the same rpm. Because of individual governor variations, governor gap dimension may vary between engines. After completing each governor adjustment, ensure that idle and overspeed settings as indicated by the engine tachometers are the same for all engines.

b. Adjusting Procedures.

WARNING

Before starting the engines ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(1) Start engine requiring a new governor setting and bring to normal operating temperature.

(2) Turn idle speed adjusting screw to obtain 550 rpm as indicated on instrument board tachometer.

NOTE

Ensure that valves and fuel injector settings are correct before attempting to adjust governor gap.

(3) Run engines at idle for three to five minutes before stopping. This allows the lubricating oil and coolant to carry the heat away from the engines.

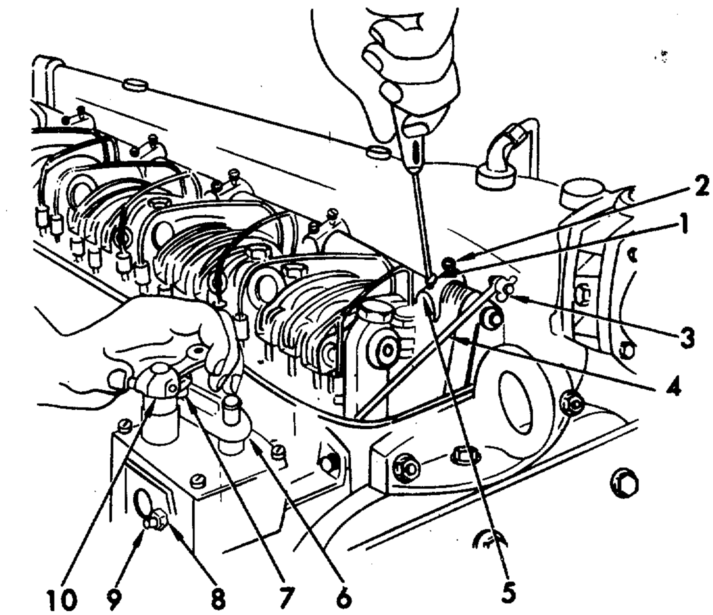
(4) Push engine cutout valve levers all the way forward to the OFF position.

(5) After the engines have stopped, return the engine cut- out valve levers to the RUN (vertical) position.

(6) Remove governor cover.

(7) Wipe rocker cover with cleaning cloth to prevent dust and dirt from entering valve mechanism. Loosen thumbscrews and lift rocker cover straight up from cylinder head.

(8) Remove fuel rod (4, fig. 2-56) between governor and injector control tube lever (3).



TS 1930-203-20/2-56

1. Inner control lever adjusting screw
2. Outer control lever adjusting
3. Injector control tube lever
4. Fuel rod
5. Injector rack control lever
6. Cam control
7. Stop lever
8. Locknut
9. Buffer screw
10. Governor speed control lever

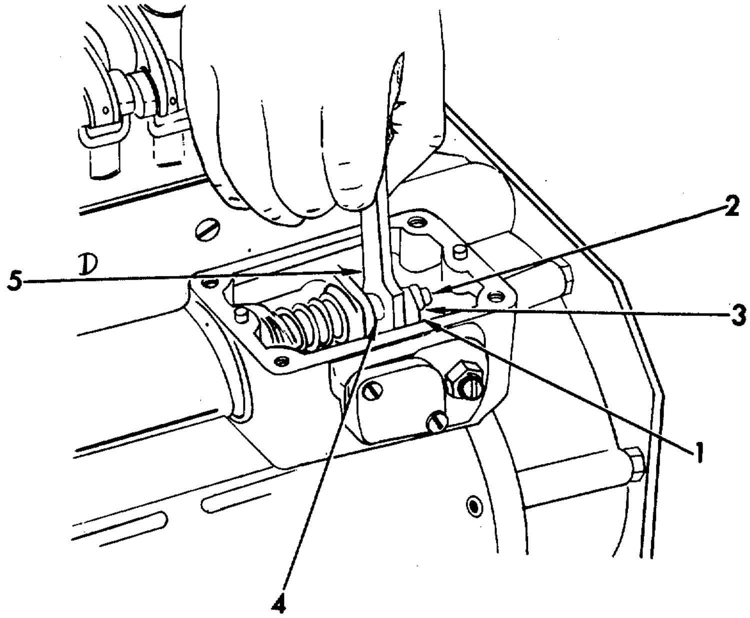
Figure 2-56. Injector Rack Control Lever Positioning.

(9) Using a 0.170 inch governor gap tool gage (J5407) (5, fig. 2-57) set the gap between the low speed spring cap (1) and high speed spring plunger (4).

(10) Loosen locknut (3) and turn gap adjusting screw (2) until a slight drag is felt on the governor gap tool gage.

(11) Hold gap adjusting screw (2) and tighten locknut (3). Recheck gap and readjust if necessary.

(12) Install fuel rod (4, fig. 2-56) between governor and injector control tube lever (3). Replace rocker cover.



TS 1930-203-20/2-57

1. Low speed spring cap
2. Gap adjusting screw
3. Locknut
4. High speed spring plunger
5. Governor cap tool gage (J5407)

Figure 2-57. Governor Gap Adjustment.

(13) Install governor cover and start engine. Advance throttle to full position.

(14) Check reading on instrument board tachometer. Tachometer reading should not exceed 2100 rpm. Stop engine.

2-82. INJECTOR RACK CONTROL LEVER POSITIONING.

a. General. When the injector rack control levers are positioned correctly, the speed control lever will be at maximum speed position; the governor low speed gap will be closed; the high speed spring plunger will be seated in the governor control housing, and the fuel injector racks will be in full fuel position. The No. 1 injector rack control lever should be adjusted first to establish a guide for the remaining injector rack control levers.

b. Adjustment.

NOTE

Exhaust valve adjustment, fuel injector timing and governor gap adjustment pro- cedures must be accomplished in sequence before making this adjustment.

(1) Disconnect linkage attached to governor speed control lever (10, fig. 2-56).

(2) Wipe rocker cover with cleaning cloth to prevent dust and dirt from entering-valve mechanism. Loosen thumbscrews and lift rocker cover straight up from cylinder head.

(3) Loosen idle speed adjusting screw locknut (5, fig. 2-58), and loosen idle speed adjusting screw'(4) until 1/2 inch (13 nm) of threads project from locknut when locknut is positioned against high speed spring plunger (6).

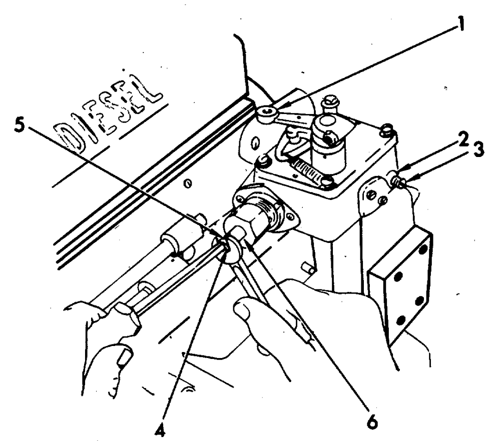


Figure 2-58. Engine Idling Speed Adjustment.

(4) Loosen buffer screw locknut (2) and back out bufferscrew (3) approximately 5/8 inch (16 mm).

(5) Loosen all inner control lever adjusting screws (1, fig. 2-56) and outer control lever adjusting screws (2). Ensure that all control levers are free on injector control tube.

(6) Move governor speed control lever (10) to maximum speed position and hold governor speed control lever in this position with light finger pressure.

(7) Turn inner control lever adjusting screw (1) and No. 1 injector rack control lever down until a slight movement of injector control tube is observed or an increase in effort is noted. This will place No. 1 injector rack in fuel position.

(8) Turn down outer control lever adjusting screw (2) until it bottoms lightly on injector control tube.

(9) Alternately tighten both inner control lever adjusting screws (1) and outer control lever adjusting screws (2) until they are secure.

(10) Ensure that governor speed control lever (10) is properly adjusted by holding the governor speed control lever in the maximum speed position and pressing down on the injector rack with a screwdriver, causing the injector rack to rotate. The setting is sufficiently tight if the injector rack returns to its original position. If the injector rack does not return to its original position, it is too loose. To correct, back off the outer control lever adjusting screw (2) slightly and tighten the inner control. lever adjusting screw (1) slightly. The setting is too tight if, when moving the governor speed control lever from the idle to the maximum speed position, the injector rack becomes tight before the governor speed control lever reaches the end of its travel (as determined by the stop under the governor cover). This will result in a step-up in effort required to move the governor speed control lever to the end of its travel. To correct this condition, slightly back off the inner control lever adjusting screw and tighten the outer control lever adjusting screw slightly.

(11) Manually hold No. 1 injector in full fuel position and turn down inner control lever adjusting screw C) of No. 2 injector until injector rack has moved into full fuel position and inner control lever adjusting screw is bottomed in injector control tube.

(12) Turn outer control lever adjusting screw (2) down until it bottoms lightly on injector control tube. Then, alternately tighten both inner and outer control lever adjusting screws (1 and 2) until tight.

(13) Recheck No. 1 injector rack to ensure that is has remained snug on ball end of injector rack control lever (5) while adjusting No. 2 injector. If rack of No. 1 injector has become loose, back off slightly on inner control lever adjusting screw (1) on No. 2 injector rack control lever. Tighten outer control lever adjusting screw (2).

NOTE

When the settings are correct, the injector racks of both injectors must be snug on the ball end of their respective rack control levers.

(14) Position remaining injector rack control levers (5).

(15) Reset idle speed adjusting screw (4, fig. 2-58) until it projects 3/8 inch (9.5 mm) beyond locknut (5); tighten the locknut.

(16) Replace rocker cover.

(17) Connect linkage to governor speed control lever (10,fig. 2-56).

2-83. MAXIMUM NO-LOAD ENGINE SPEED ADJUSTMENT.

a . General. Adjusting the engines to the maximum no-load engine speed will result in all engines operating at the same maximum rpm, and ensure that engine overspeeding will not result.

b. Adjustment.

NOTE

Exhaust valve adjustment, fuel injector timing, governor gap adjustment and injector rack control lever positioning procedures must be accomplished in sequence before making this adjustment.

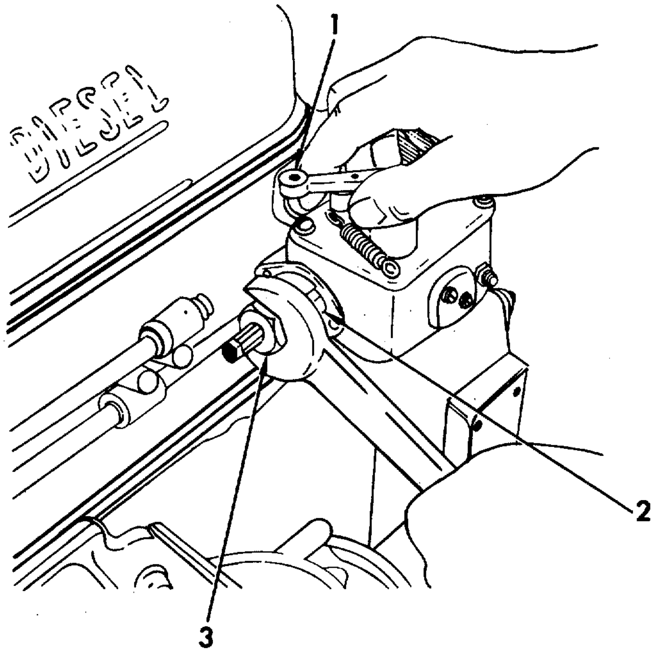
WARNING

Before starting, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(1) Start the engine and run until normal operating temperature is established.

(2) Remove governor cover, loosen spring retaining locknut (2, fig. 2-59) and back off high speed spring retainer (3) approximately five turns.

(3) Place governor speed control lever (1) in maximum speed position.



1. Governor speed control lever
2. Spring retaining locknut
3. High speed spring retainer

Figure 2-59. Maximum No-Load Speed Adjustment.

(4) Turn high speed spring retainer (3) until engine tachometer indicates engine is operating at 2100 rpm no-load speed.

(5} Hold high speed spring retainer (3) and tighten spring retaining locknut (2).

(6) Hold idle speed adjusting screw (4, fig. 2-58) and tighten locknut (5); recheck gap to ensure that clearance has not varied. Readjust as necessary.

(7) Install governor cover. Advance throttle to full position. C8) Check reading on instrument board tachoometer. Tachometer reading should not exceed 2100 rpm.

(9) Stop engines.

2-84. IDLE SPEED AND BUFFER SCREW ADJUSTMENT.

a. General. With the maximum no-load speed adjusted, the idle speed must be adjusted to indicated 550 rpm. The adjustment is made by a small screw which limits the travel of high speed spring plunger. If the idle speed screw will not adjust the engine speed precisely to 550 rpm, adjust the idle speed screw up to within 15 rpm of the desired 550 rpm. The engine speed may then be increased to 550 rpm by adjusting the buffer screw.

b Adjustment.

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and af t of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(1) Start engine and run to normal operating temperature.

(2) Unscrew buffer screw (3, fig. 2-58) by loosening locknut (2). Buffer screw (3) should be backed out sufficiently to avoid contact with differential lever within governor.

(3) Turn idle speed adjusting screw (4) until engine is operating at approximately 15 rpm below recommended idle speed of 550 rpm.

(4) Hold idle speed adjusting screw (4) and tighten locknut (5).

(5) Turn buffer screw (3) in until engine tachometer indicates 550 rpm.

NOTE

Do not increase engine speed more than 15 rpm with the buffer screw (3).

(6) Hold buffer screw (3) and tighten locknut (2).

(7) Stop engines.

SECTION XII.. MAINTENANCE OF FUEL SYSTEM

2-85. GENERAL.

The LARC is equipped with two independent. fuel systems (fig. 2-60). Each fuel system consists of a 300 gallon (1135 1) fuel tank, liquid level gage, fluid pressure filter, necessary valves, hoses, and tubing. Both systems have a supply line and a return line connecting the engines to the fuel tank. The plug valves in the supply and return lines are arranged so that the fuel tank on either engine may be isolated from the fuel system. The check valves in the supply lines prevent-fuel oil flow surging from the engine back to the fuel tank. A fluid pressure filter, installed in the supply lines, filters fuel oil going to the engines. Fuel oil used to cool the fuel injectors is returned to the fuel tanks through the return lines. Two crossover transfer lines, a supply and a return, are installed between the two fuel systems. Each crossover line is equipped with a normally closed plug valve which may be opened to allow either of the fuel systems to furnish fuel oil to the opposite engines. Fuel system components mounted on the engines are covered in the engine assembly portion of this manual.

2-86. FUEL TANK.

a. General. The fuel tanks are constructed of 12 gage steel and are located in the forward port and forward starboard sides of the main deck. Each fuel tank is equipped with a filler plug and vent. A vent valve fitted with a 4 to 6 ounce bronze spring is located on top of each fuel tank and is designed to open at a vacuum of O.5 to O.75 inch of water., Each fuel tank is also equipped with a liquid level gage mounted on the forward side. These gages are viewed from within cargo well pump compartments.

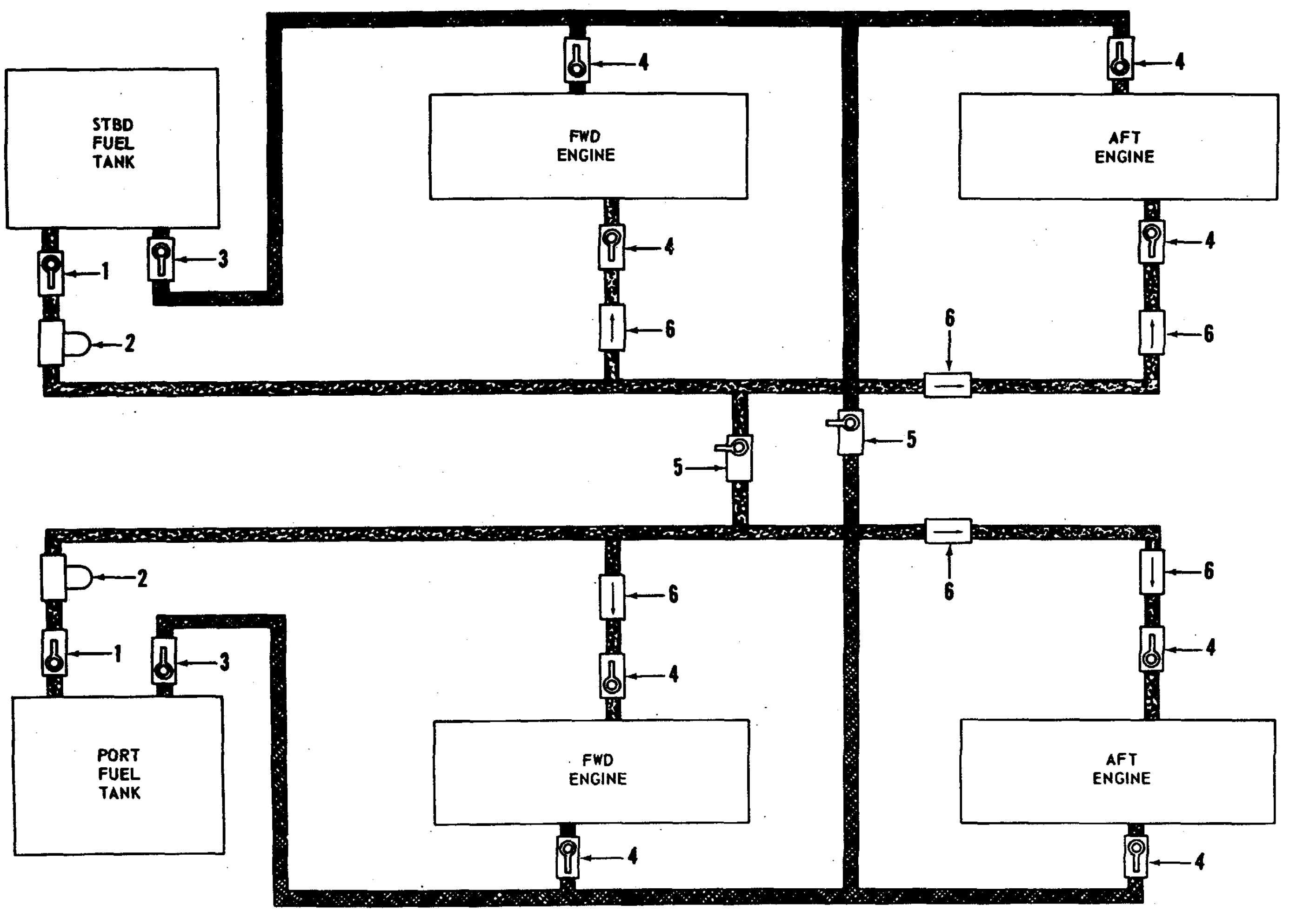
b. Inspection and Service.

(1) Examine fuel tanks for leaks or damage. Notify direct support maintenance if fuel tank is leaking.

(2) Inspect exterior of fuel tanks for signs of rust and cleanliness. Remove rust using a wire brush and spot.-paint as necessary.

(3) Examine filler and vent plugs for stripped threads. Replace plugs as required.

(4) Examine open end of vents for obstruction. Remove obstructions if present.



1. Plug valve
2. Fluid pressure filter
3. Plug valve
4. Plug valve
5. Plug valve
6. Check valve

Figure 2-60. Fuel System Schematic.

2-87. FLUID PRESSURE FILTER.

a. General. Foreign particles are removed for each fuel system by a fluid pressure filter. The fluid pressure filter (fig. 2-61) uses a permanent type wire mesh insert and has a flow capacity of 8 gpm (30.3 1pm).

b. Inspection.

(1) Examine mating surfaces and connections of a fluid pressure filter for leaks and replace as necessary.

(2) Clean all dust and dirt accumulation from exterior of fluid pressure filter with a clean, lint-free cloth.

(3) Examine exterior of fluid pressure filter for cracks, leaks, or dents. If damaged, notify direct support maintenance.

c. Removal.

(1) Close plug valve (1, fig. 2-60) in supply line at base of fuel tank.

(2) Open draincock (15, fig. 2-61) and drain any residual fuel.

(3) Loosen mounting bracket.

(4) Unscrew hand nut (1) and remove shell (14) as an assembly from filter assembly.

(5) Unscrew element assembly from casting head (3).

d. Disassembly.

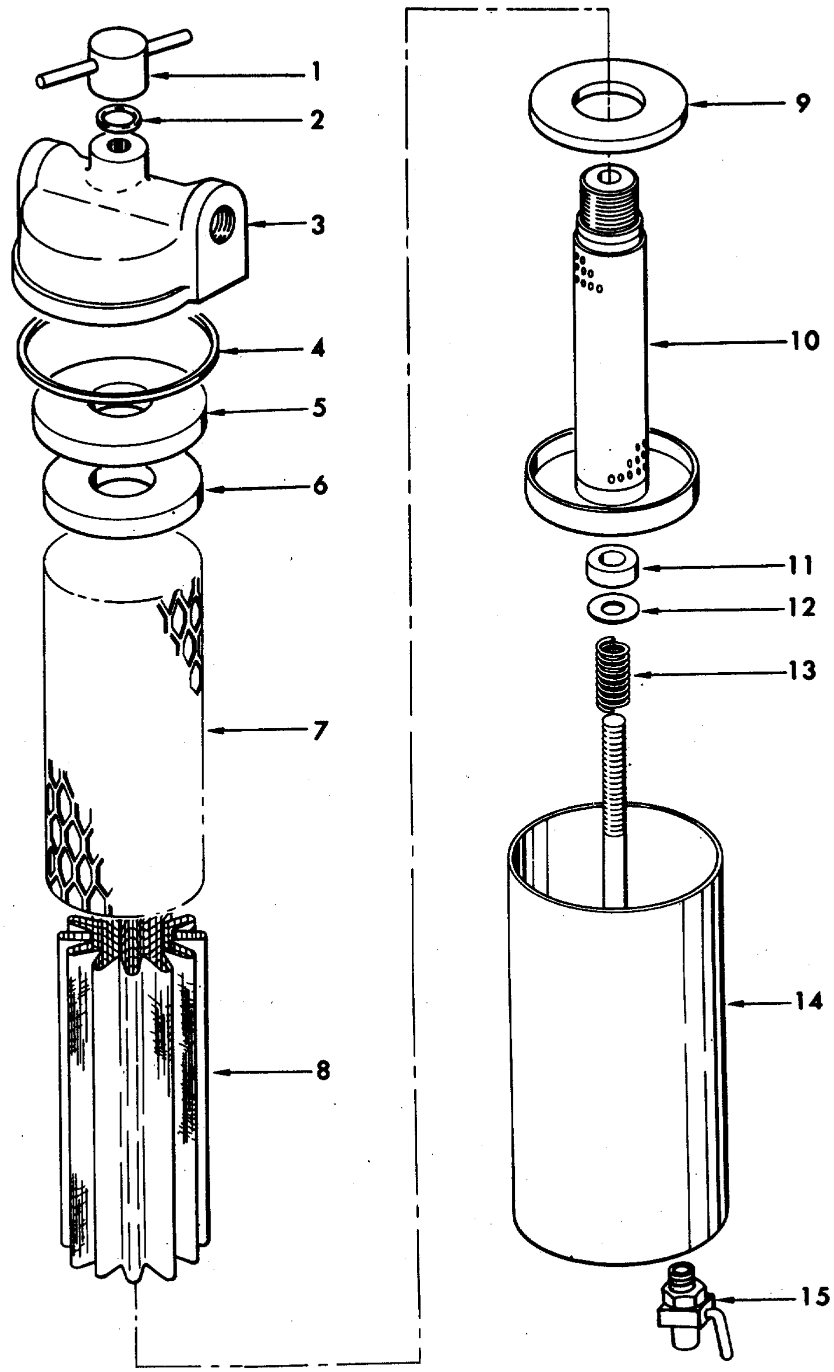
(1) Remove cover (5, fig. 2-61) and gasket (6).

(2) Remove wire housing (7) from around wire mesh insert, (8).

(3) Remove wire mesh insert (8) from center tube and base (10).

(4) Withdraw center tube and base (10), gasket (11), flat washer (12), and spring (13) from shell (14).

(5) Unscrew draincock (15).



TS 1930-203-20/2-81

Figure 2-61. Fluid Pressure Filter, Exploded View.

Legend for figure 2-61:

1. Nut
2. Packing, preformed
3. Casting head
4. Packing
5. Cover
6. Gasket
7. Wire housing
8. Insert
9. Gasket
10. Center tube and base
11. Gasket
12. Lockwasher
13. Spring
14. Shell
15. Draincock

e <u> Cleaning, Inspection,, and Repair</u>.

WARNING

Drycleaning so, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean all parts in drycleaning solvent (item 6, App. C).

(2) Shake off excess solvent or blow dry with low-pressure, dry compressed air not exceeding 10 psi (O.7 kg/cm2).

(3) Inspect spring (13, fig. 2-61) to ensure spring is not broken. Replace spring if defective.

(4) Inspect insert (8) for punctured or deteriorated condition. Replace if deteriorated or punctured.

(5) Inspect wire housing (7) for punctures. Report discrepancies to direct support maintenance.

f. <u>Reassembly.</u>

(1) Install spring (13, fig. 2-61), flat washer (12) and gasket-(11) into shell (14).

(2) Install gasket (9) and wire mesh insert (8) on center tube and base (10) and insert into shell (4).

(3) Install wire housing (7), gasket (6) and cover (5) into shell (14').

(4) Install and tighten draincock (15).

g. <u>Installation</u>.

(1) Install packing (4, fig. 2-61) into casting head (3).

(2) Install shell (14), packing (2), and nut (1).

(3) Position filter assembly on mounting bracket; secure bracket.

(4) Ensure draincock (15) is closed.

(5) Open plug valve (1, fig. 2-60) in supply line at base to fuel tank.

2-88. VALVES.

a. General. Two types of valves are used throughout the fuel system, a plug valve and a check valve. The manually operated plug valves are used to stop the flow of fuel oil. The check valves allow fuel oil to flow only in one direction.

b. Inspection.

(1) Examine plug valves (1, 3, 4, and 5, fig. 2-60) and check valve (6) for broken or bent condition. Replace damaged valves.

(2) Ensure that plug valves will open and close and do not stick or bind.

c. Removal.

NOTE

Crossover line and engine supply and return line plug valves (4 and 5, fig. 2-60) and check valve (6) may be removed without draining the fuel tanks. Close plug valves (1 and 3) at base of tank to retain fuel when other plug valves (4 and 5) and check valve (6) are to be removed.

(1) Remove plug valves (4 and 5) and check valve (6) located in the supply and return lines at the engines and the crossover lines.

(2) Drain fuel tanks by siphoning fuel oil-into a suitable container; remove plugvalves (1 and 3) located in the supply and return lines at the base of the fuel tanks.

(3) Remove unions from valves.

d. Installation.

(1) Install unions into valves.

(2) Install plug valves (1 and 3) in the supply and return lines at the base of fuel tanks.

(3) Install plug valves (4 and 5) and check valve (6) in the supply and return lines at the engines and crossover lines.

(4) Refill fuel tanks and check valves for leaks.

2-89. TUBING, HOSES, FITTINGS, AND PACKING.

a. General. Copper tubing is used throughout the fuel system along with wire braided hoses and brass fittings. Preformed packing are used where tubing passes through bulkheads.

b. Inspection.

(1) Examine tubing and hoses for leaking connections, crimping, and excessive bends. Tighten leaking connections and report damaged tubing and hoses to direct support maintenance.

(2) Examine fittings for stripped threads and leaks. Report damaged fittings to direct support maintenance.

(3) Examine preformed. packing for looseness or signs of leakage. Remove and replace loose or leaking preformed packing.

SECTION XIII. MAINTENANCE OF LAND DRIVE SYSTEM

2-90 GENERAL.

The LARC is equipped with a four wheel-drive system (fig. 2-62). Each wheel is independently driven by a diesel engine. The four diesel engines transmit mechanical energy from their flywheel ends through the respective torque converters, flexible couplings (4), transmissions (5), flexible couplings (6), miter boxes '(3)-, wheel column right angle drives, and wheel hub planetary gears to the wheels. The land drive system is controlled from the cab by a compressed air system which operates all four transmissions at the same time. All four wheels of the drive system are steerable. Airbrakes are located on the forward and aft sides of each miter box.

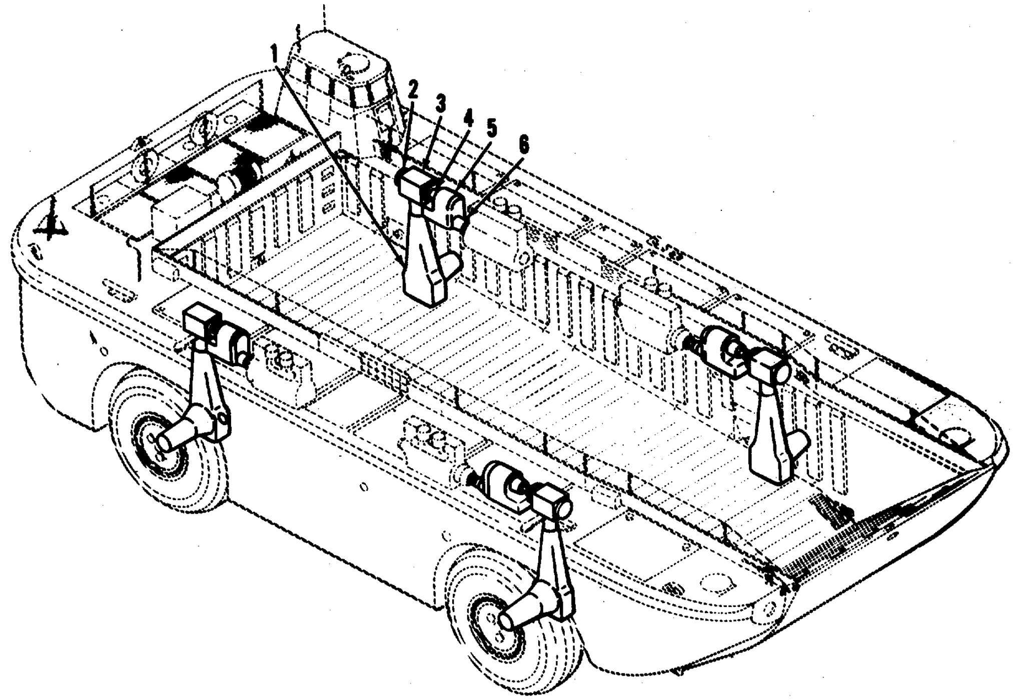
2-91. GENERAL MAINTENANCE.

a. Apply parking brakes and check airbrake (2, fig. 2-62) at miter box (3), to see if lining (fig. 2-63) is worn to bottom of notches machined across brake blocks. Release brakes. Notify direct support maintenance if lining is worn to bottom of notch.

b. Check if retractor springs are in place. Notify direct support maintenance if any springs are out of place, missing, or broken.

c. Inspect miter boxes for oil leaks. If leaking, notify direct support maintenance.

d. Check miter box oil level on fill plug-dipstick and fill to full mark (see lubrication order).



1.Wheel column
2. Airbrake
3. Miter box
4. Flexible
5. Transmission
6. Flexible

Figure 2-62. Land Drive System.

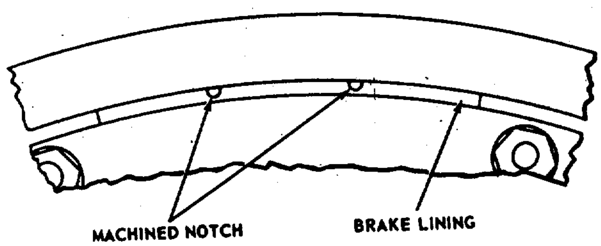


Figure 2-63. Brake Lining.

CAUTION

If a large-amount of oil is missing from the miter box or if the miter box is dry, notify direct support maintenance. The miter box oil seals may be allowed oil to leak into the wheel column.

e. Change oil in. miter box as follows:

(1) Remove miter box access covers from cargo well bulkhead.

(2) Place a suitable container under miter box and remove oil, drainplug.

(3) After oil has drained from miter box, remove container and replace oil drainplug.

(4) Install miter box access cover.

(5) Remove fill plug-dipstick and refill miter box to proper oil level (see lubrication order).

(6) Replace fill plug-dipstick.

f. Inspect miter box drainplug and fill plug-dipstick at each oil change .for stripped or malformed threads. If damaged, replace drainplug and fill plug-dipstick.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact.' Do not use near open flame, or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

9. Remove air breather from miter boxes and clean with drycleaning solvent (item 6, App. C). If air breathers are broken or clogged, replace air breathers.

h. Inspect column and wheel drive for oil leaks. Notify direct support maintenance of any leaks.

i. Check wheel column for trapped water.

CAUTION

If a large amount of water is present in the wheel column, notify direct support maintenance for inspection of wheel seals.

CAUTION

If oil level in wheel column exceeds recommended level after water has been drained, check miter box oil level. Miter box oil seal may be leaking.

j. Lubricate wheel column.

k. Inspect wheel column drainplug at each oil change for stripped or malformed threads. If damaged, replace drainplug.

WARNING

Drycleaning solvent ,Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

1. Remove air breather from wheel columns and clean with dry-cleaning solvent (item 6, App. C). If air breathers are broken or clogged, replace air breathers.

m. Clean wheel column lower pivot bearing lubrication fittings and lubricate. If lubrication fittings are broken or clogged, replace.

2-92. FLEXIBLE COUPLINGS.

a. General. Flexible couplings in the land drive system between the torque converter and miter boxes provide a means for correcting minor shaft misalignment. These flexible couplings consist of gear- toothed hubs mating with internal gears which permit small amount of play. This play allows the coupling to flex as it rotates, and prevents excessive stresses from occurring in the torque converters, transmissions, or miter boxes.

b. Inspection and Service.

(1) Lubricate Flexible coupling. If lubrication fitting threads are stripped or malformed, replace damaged lubrication fitting.

(2) Inspect flexible coupling for lubrication leaks. If flexible coupling leaks, notify direct support maintenance.

c. Torque Converter-Transmission Flexible Coupling Removal.

NOTE

Replacement of the torque converter- transmission flexible coupling may be performed only when authorized by the direct support technical service officer.

(1) Remove machinery guard (2, fig. 2-64) by removing bolts (1), nuts (4), and lockwashers (3).

(2) Remove bolt (13), nuts (5), and lockwashers (6) securing flexible coupling.

(3} Slide flanges (9) toward each other and remove flexible "coupling, adapter plates (7), and gaskets (8).

d. Torque Converter-Transmission Flexible Coupling Disassembly.

(1) Disconnect retaining rings (11, fig. 2-64) from flanges (9) and remove flanges (9), seals (10) and retaining rings (11).

(2) Remove seal plates (12) from hub (lb).

(3) Remove lubrication fitting (14) and relief fitting (15) from flanges (9).

e. Torque Converter-Transmission Flexible Coupling Cleaning, Inspection and Repair.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean all metal parts of the flexible coupling in drv-cleaning solvent (item 6, App. C).

(2) Inspect adapter plates (7, fig. 2-64) and retaining rings (11) for broken or warped condition. Replace any damaged part.

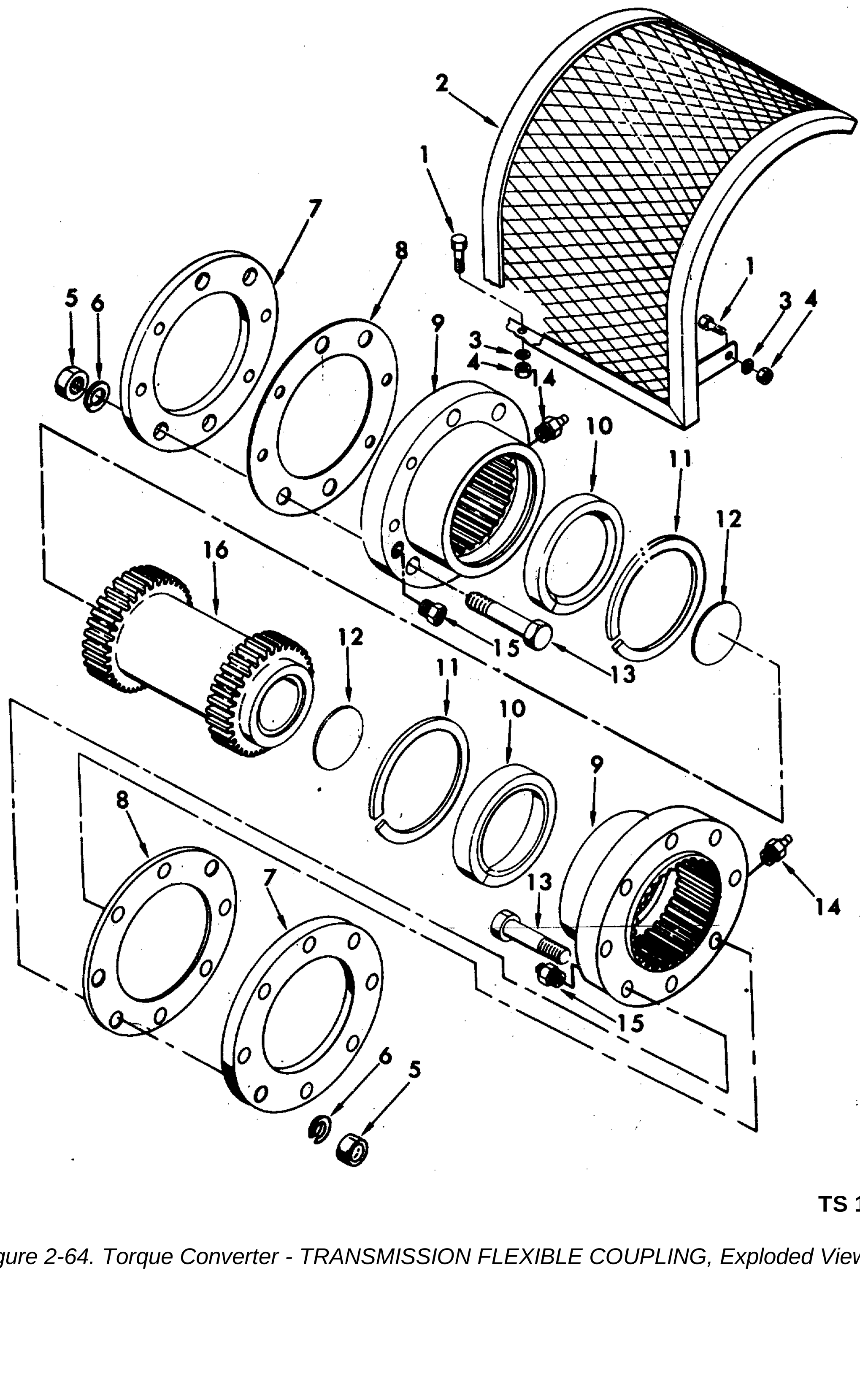
(3) Inspect hub (16) and flanges (9) for uneven wear or broken teeth. If hub or flanges are damaged, replace entire flexible coupling.

f. Torque Converter-Transmission Flexible Coupling Reassembly.

(1) Install lubrication fitting (14, fig. 2-64) and relief fitting (15) into flanges (9).

(2) Install new seal plates (12) in hub (16).

(3) Install flanges (9), seals (10) and retaining rings (10) on hub (16).



TS 1930-203-20/2-64

Figure 2-64. Torque Converter - TRANSMISSION FLEXIBLE COUPLING, Exploded View.

Legend for figure 2-64:

1.	Bolt	9.	Flange
2.	Machinery bolt	10.	Seal
3.	Lockwasher	11.	Retaining ring
4.	Nut	12.	Seal plate
5.	Nut	13.	Bolt
6.	Lockwasher	14.	Lubrication fitting
7.	Adapter plate	15.	Relief fitting
8.	Gasket	16.	Hub

g. Torque Converter-Transmission Flexible Coupling Installation.

NOTE

Pack flexible coupling with grease (see lubrication order).

(1) Slide flanges (9, fig, 2-64) toward each other and position flexible coupling assembly with adapter plates (7) and new gaskets (8). Secure with bolts (13), lockwashers (6), and nuts (5).

(2) Position machinery guard (2) and secure with bolts (1), lockwashers (3) and nuts (4).

h. Transmission-Miter Box Flexible Coupling Removal.

NOTE

Replacement of the transmission-miter box flexible coupling may be performed only when authorized by the direct support technical service officer.

(1) Remove valve handle (4, fig. 2-65) by removing valve nut (3).

(2) Remove machinery guard l2) by removing four bolts (1), nuts (6) and lockwashers.(5).

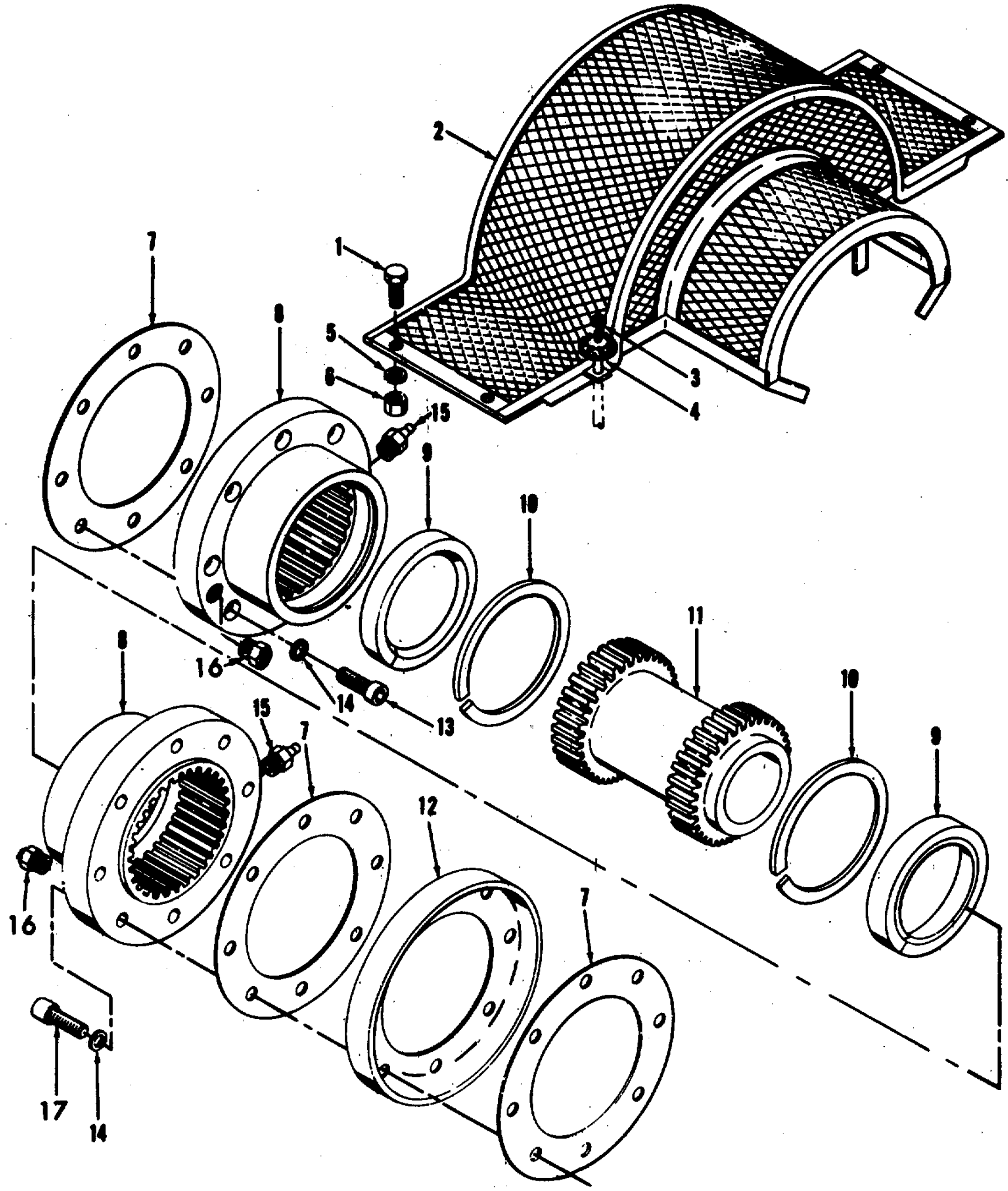
(3) Remove capscrews (13 and 17) and(lockwashers (14) from each end of flexible coupling.

(4) Slide flexible coupling flanges (8) toward each other and remove flexible coupling, gaskets (7), and closure ring (12).

i. Transmission-Miter Box Flexible Coupling Disassembly.

(1) Remove retaining rings (10, fig. 2-65) from flanges (8) at end of coupling and remove flanges, seals (9), and retaining rings.

(2) Remove lubrication fitting (15) and relief fitting *(16) from' flanges (8).



1. Bolt
2. Machinery guard
3. Nut
4. Value handle
5. Lockwasher
6. Nut
7. Gasket
8. Flange
9. Seal
10. Retaining
11. Hub
12. Closure ring
13 Capscrew
14. Lockwasher
15. Lubrication
16. Relief fitting
17. Capscrew

Figure 2-65. Transmission-Miter Box Flexible Coupling, Exploded View.

j. Transmission-Miter Box Flexible Coupling Cleaning, Inspection, and Repair.

WARNING

Drycleaning solvent, Specification, P-p-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean all metal parts in drycleaning solvent (item 6, App. C).

(2) Inspect closure ring (12, fig. 2-65) and retaining rings (10) for broken or warped condition. Replace any damaged part.

(3) Inspect hub (11) and flange (8) for uneven wear and broken teeth. If hub or flange is damaged replace entire flexible coupling.

k. Transmission-Miter Box Flexible Coupling Reassembly.

(1) Install lubrication fitting (15) and relief fitting (16, fig. 2-65) into flanges (8)'.

(2) Install new seals (9) on flanges (8) and install retaining rings (10).

1. . Transmission-Miter Box Flexible Coupling Installation.

NOTE

Pack flexible couplings with grease (see lubrication order)'.

(1) Slide flexible coupling flanges (8, fig. 2-65) toward' each other and position flexible couplings assembly with closure ring (12}. and new gaskets (7), placing gasket with smallest outside diameter on transmission shaft. Secure to miter box with 1 1/2 inch long capscrews (13) and lockwasher (14) and to transmission with 1 1/4 inch long capscrews (17) and lockwashers (14).

(2) Position machinery guard (2) and secure with four bolts (1), lockwashers (5) and nuts (6).

(3) Install valve handle (4) and valve nut (3).

(4)

2-93. TRANSMISSION.

a. General. The transmission is used in conjunction with the torque converter to provide three forward speeds and one reverse speed with automatically varying torque ratios in each speed. The' transmission can be shifted in all forward ranges at full power without causing damage to the unit. The transmission and torque converter have a common lubrication system. An oil filter and oil strainer are used in the transmission-torque converter oil system to remove impurities from the lubrication oil. The strainer is installed in the transmission and oil filter is installed in the oil line between the torque converter and the oil cooler.

b. Inspection and Service.

(1) Remove dirt and dust accumulations from transmission.

WARNING

Before starting engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(2) Start engines and bring transmission oil up to operating temperature. Check oil in transmission with oil level indicators (12, fig. 2-66) while engines are idling. Shut engines down. If oil level is below full mark on oil level indicator, remove breather cap (13) and add oil to full mark (see lubrication order).

(3) Change transmission oil (see lubrication order).

(4) Inspect oil drainplugs at each oil change for stripped or malformed threads. Replace damaged drainplugs.

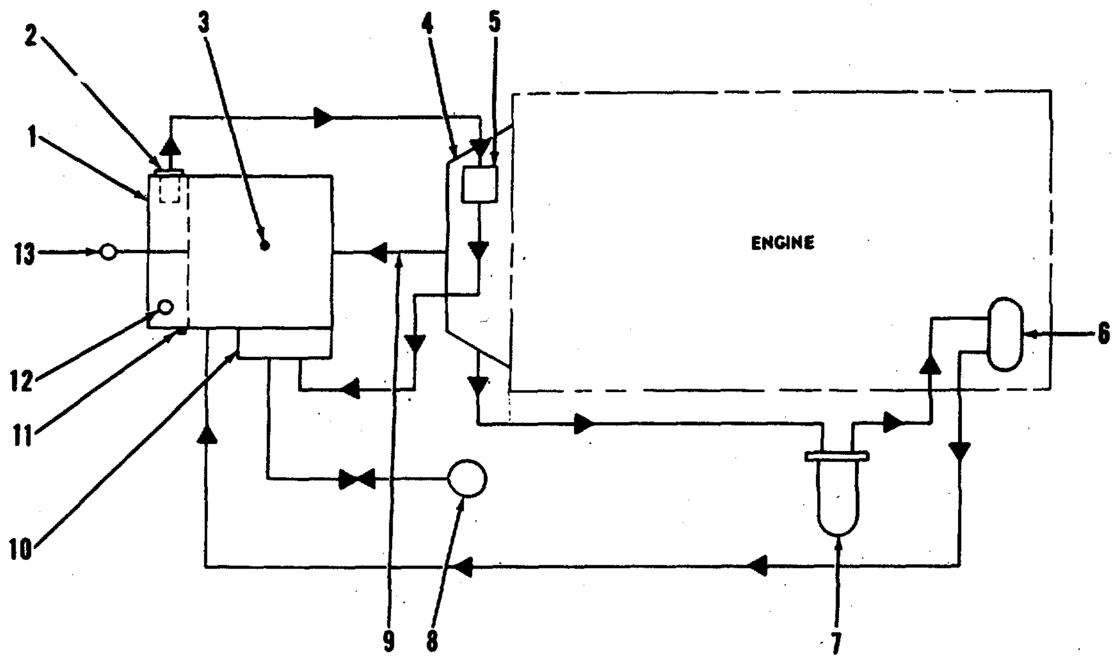
(5) Clean and inspect transmission oil strainer at every oil change.

(6) Check transmission mounting bolts for correct torque values.

WARNING

Drycleaning solvent, Specification, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(7) Inspect breather cap (13, fig. 2-66) for clogged or bent condition. Clean breather cap with drycleaning solvent (item 6, App. C). Replace damaged-breather cap.



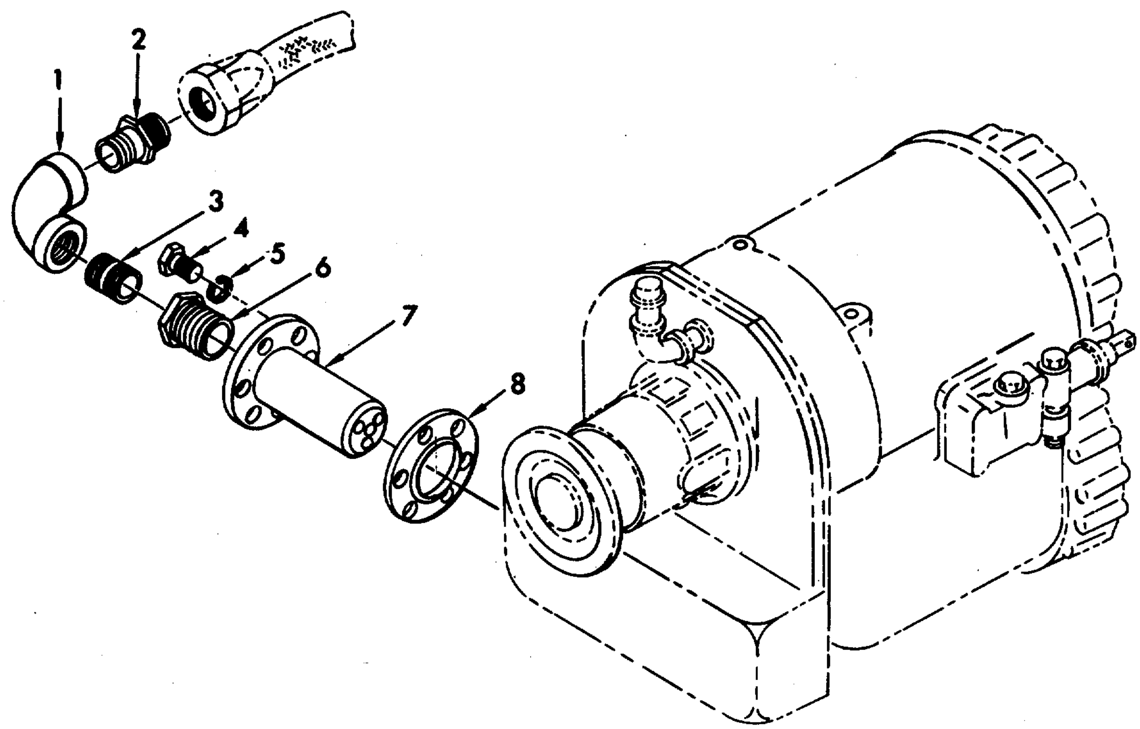
TS 1930-203-20/2-66

1. Transmission
2. Oil strainer
3. Pipe plug
4. Torque converter
5. Oil pump
6. Oil cooler
7. Oil filter
8. Pressure gage
9. Seal drain line
10. Selector valve
11. Pipe plug
12. Oil level indicator
13. Breather cap

Figure 2-66. Transmission - Torque Converter Oil Lines Locator Diagram.

(8) Inspect transmission oil lines for leaks, cracks, kinks, or deterioration. Drain transmission oil in a suitable container and repair or replace defective oil lines. Replace transmission oil.

(9) Inspect for leaks around oil strainer mounting gasket (8, fig. 2-67). If leakage is evident, tighten capscrews C4). If leakage continues after capscrews are tightened, drain transmission oil in a suitable container and replace defective gasket. Replace transmission oil.



TS 1930-203-20/2-67

1. Elbow
2. Adapter
3. Nipple
4. Capscrew
5. Lockwasher
6. Bushing, pipe
7. Oil strainer
8. Gasket

Figure 2-67. Transmission Oil Strainer, Exploded view.

CAUTION

The correct seal drain line routing between torque converter and transmission oil sump is critical. The seal drain line must be at least 3 1/2 inches (89 mm) or more below the centerline of the torque converter at every point in the line. There must never be any kinks or tight bends in the seal drain line. Improper arrangement of the seal drain line will result in excessive leakage past the torque converter pump hub seal or the output shaft dual oil shaft.

(10) Remove torque converter seal drain line (9, fig. 2-66) at every oil change. Inspect seal drain line for carbon deposits. Clean obstructed seal drain line and reinstall.

(11) Drain oil from oil filter in a suitable container and clean or change transmission oil filter element (3, fig. 2-68) at every oil change.

(12) Inspect transmission oil filter for signs of leaks at shell gasket (1). If oil filter leaks at shell gasket, tighten capscrews (2). If leakage continues after capscrews are tightened, replace defective gasket.

(13) Inspect filter shell (5) for dents or cracks. If damaged, notify direct support maintenance.

c. Transmission Oil Strainer Removal.

(1) Remove pipe plugs (3 and 11, fig. 2-66) and drain transmission oil into a suitable container.

(2) Remove flexible hose from adapter (2, fig. 2-67).

(3) Remove elbow (1), nipple (3), and bushing (6) from oil strainer (7).

(4) Remove six capscrews (4) and lockwashers; slip oil strainer (7) from transmission. Remove gasket (8).

d. Transmission Oil Strainer Cleaning, Inspection, and Repair.

(1) Inspect strainer for metal particles. If metal particles are present, notify direct support maintenance.

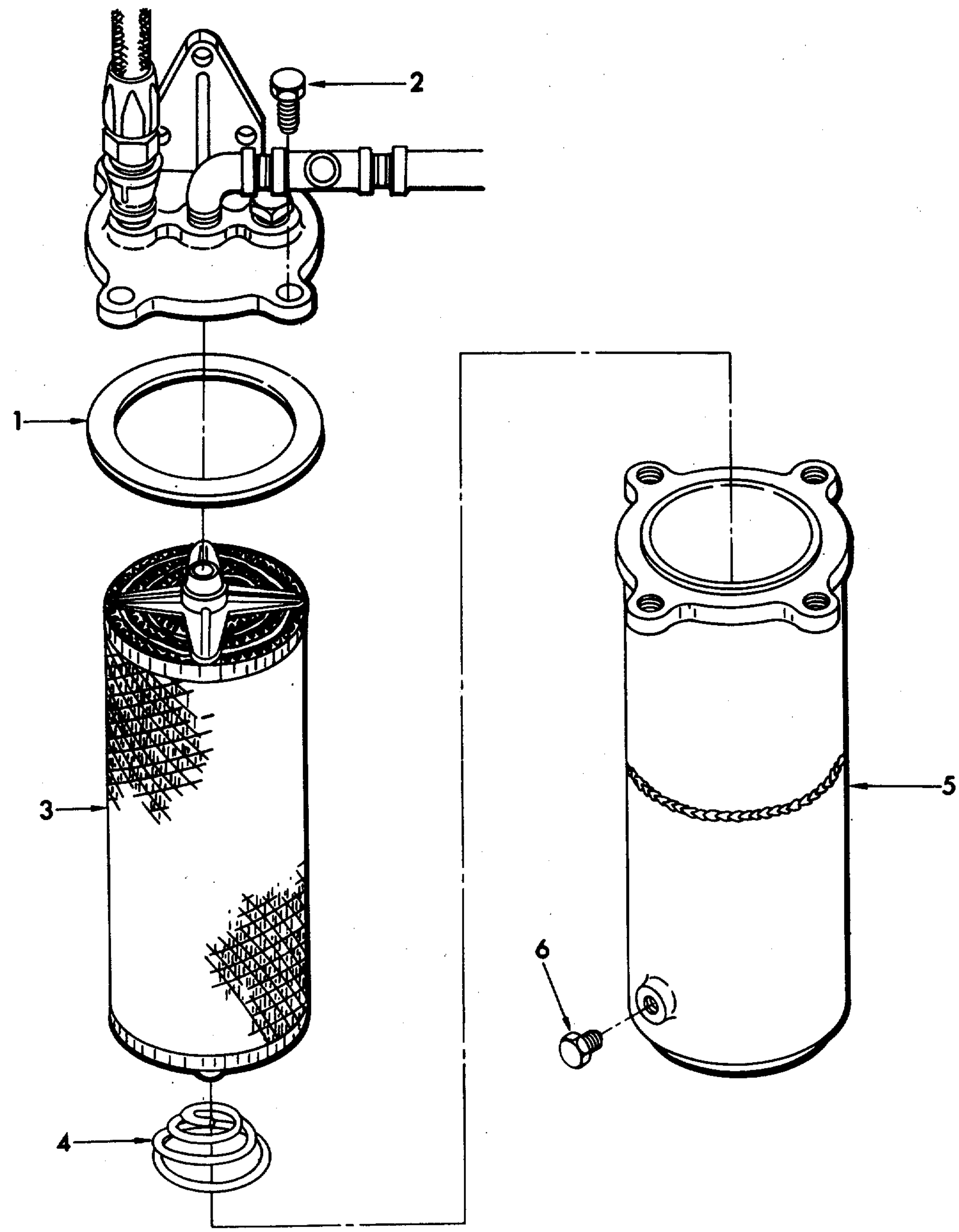
WARNING

Drycleaning solvent, Specification, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(2) Clean strainer assembly with drycleaning solvent (item 6, App. C) and a stiff bristle brush. Dry with low-pressure air (10 psi (0.7 kg/cm^2)).

(3) Inspect strainer for torn or clogged screen. Clean or replace as necessary.

(4) Inspect strainer gasket for broken or deteriorated condition. Replace defective gasket.



TS 1930-203-30/2-68

1.	Gasket	4.	Spring
2.	Capscrew	5.	Shell
3.	Element	6.	Drainplug

Figure 2-68. Transmission Oil Filter, Exploded View.

e. Transmission Oil Strainer Installation.

(1) Position gasket (8, fig. 2-67) on transmission. Install oil strainer (7) and secure with six lockwashers (5) and capscrews (4).

(2) Install bushing (6) into oil strainer (7), nipple (3) into bushing, and elbow (1) onto nipple.

(3) Install adapter (2) into elbow and attach flexible hose.

(4) Refill transmission with oil and install pipe plugs (3 and 11, fig. 2-66).

f. Transmission Oil Filter Element and Gasket Removal.

(1) Drain oil from transmission and oil filter in suitable container.

(2) Remove four capscrews (2, fig. 2-68) and remove shell (5) and gasket (1).

(3) Remove element (3) and spring (4).

g. Filter Element, Disassembly.

(1) Unroll element.

(2) Unscrew bag clamps until they touch the clamp pin.

(3) Turn clamp one-quarter turn.

(4) Remove bag and ring.

(5) Remove ring from bag.

h. Filter Element Cleaning, Inspection, and Repair.

(1) Clean filter spool with kerosene (item 9, App. C) or fuel oil (item 8, App. C).

(2) Check for tension on the bypass relief valve spring in the spool to ensure ball is resting against seat.

(3) Turn bag inside out and scrape with a wooden scraper to remove foreign particles, being careful not to damage the bag.

(4) Clean bag in kerosene or fuel oil.

(5) Inspect bag for holes or deterioration. Replace damaged bag.

(6) Turn bag right side out.

i. Filter Element, _Reassembly.

(1) Insert metal ring inside top of bag (2, fig. 2-69).

(2) Fold top of bag (3) inward over ring about 1/2 inch (13 mm), starting with the ends and then the sides.

(3) Turn bag clamps lengthwise (4) to receive gasket and to enter bag opening.

(4) Hold bag against gasket on spool and give a quarter turnto bag clamp handles. This brings them into position (5).

(5) Hold spool handles while turning bag clamp nuts to a handtight length position.

CAUTION

Avoid pinching bag between clamps and ring. Pinching will puncture the bag.

(6) Facing inlet end, place spool with bag on a clean flat surface and lay bag spacer mat (6) on bag making sure that they are flat and that left end of mat comes up close to spool.

(7) Roll the bag spacer mat with bag around spool in a clockwise direction. Roll bag seam on the outside so it can be seen when bag is rolled up (7).

(8) Insert element and spring into shell. Shake and turn backwards to loosen folds.

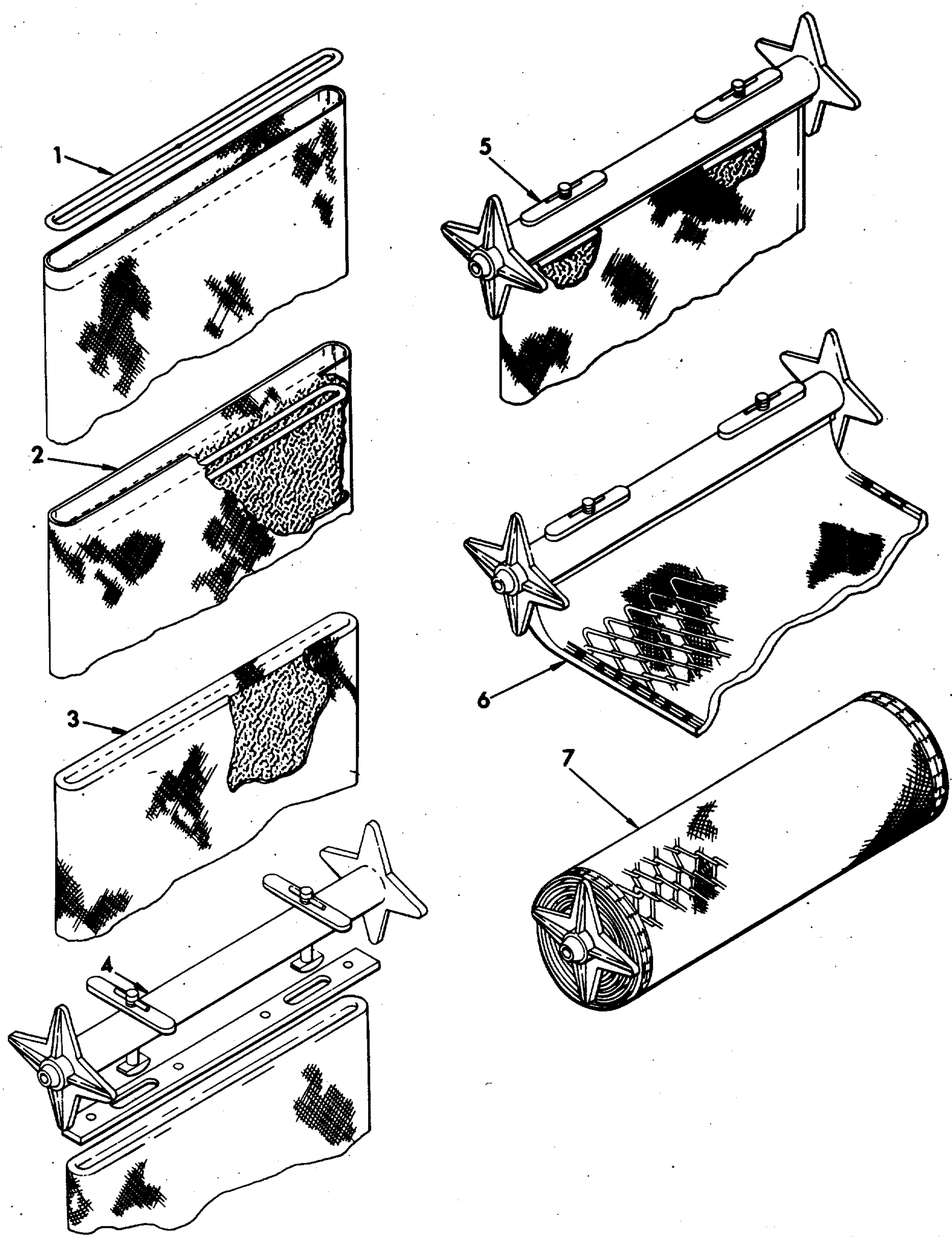
j. Transmission Oil Filter Element and Gasket Installation.

(1) Install shell (5, fig. 2-68), gasket (1) and four capscrews (2).

(2) Refill transmission with oil.

2-94. WHEELS AND TIRES.

a. General. The tires of the LARC are constructed of molded rubber with 48 ply nylon cording, size 36.00 x 41, with a 9 foot (2.8 m) outside diameter. The tires weigh 3325 pounds (1508 kg) each and are inflated or deflated from the cab. Minimum tire pressure is 35 psi (2.5 kg/cm^2) and maximum is 70 psi 14.9 kg/cm^2) with a normal /operating pressure of 50 psi (3.5 kg/cm^2). Each wheel contains planetary reduction gearing which is partially submerged in oil for lubrication purposes. A 50 ton (45.35 metric ton) hydraulic jack, used for tire removal, is stowed in the aft starboard stowage area of each LARC. This jack is used to shift the weight of the LARC to the opposite corner when it is necessary to change a tire.



TS 1930-203-20/2-69

Figure 2-69. Oil Filter Element.

Legend for figure 2-69:

1. Bag and ring
2. Ring in bag
3. Bag top folded over ring
4. Spool gasket
5. Bag attached to spool
6. Spacer mat on bag
7. Bag rolled on spool

b. Inspection and Service.

(1) Clean wheel seal lubrication fittings and lubricate. If lubrication fittings are broken or clogged, replace lubrication fittings.

(2) Inspect tires for cuts or leaks. Notify direct support maintenance of any damage or leaks.

NOTE

A tire cannot be deflated by the control valve unless the tire inflation check valve in the wheel is depressed and locked in position by turning. If the wheel valve is not depressed, air in that tire will be isolated.

(3) Inspect tire inflation valve for proper operation. There are three positions on the control lever: mid-position is neutral, the raised position inflates the tires, and the lowered the raised position inflates the tires, and the lowered position deflated the tires. A safety relief valve will not allow the tires to be inflated above 70 psi (4.9. kg/cm^2). If tire inflation valve does not operate properly, notify direct support maintenance.

(4) Inspect wheel drain and fill plug at each oil change for damaged threads. Replace defective plug.

2-95. COLUMN AND WHEEL SPINDLE GREASE RETAINER.

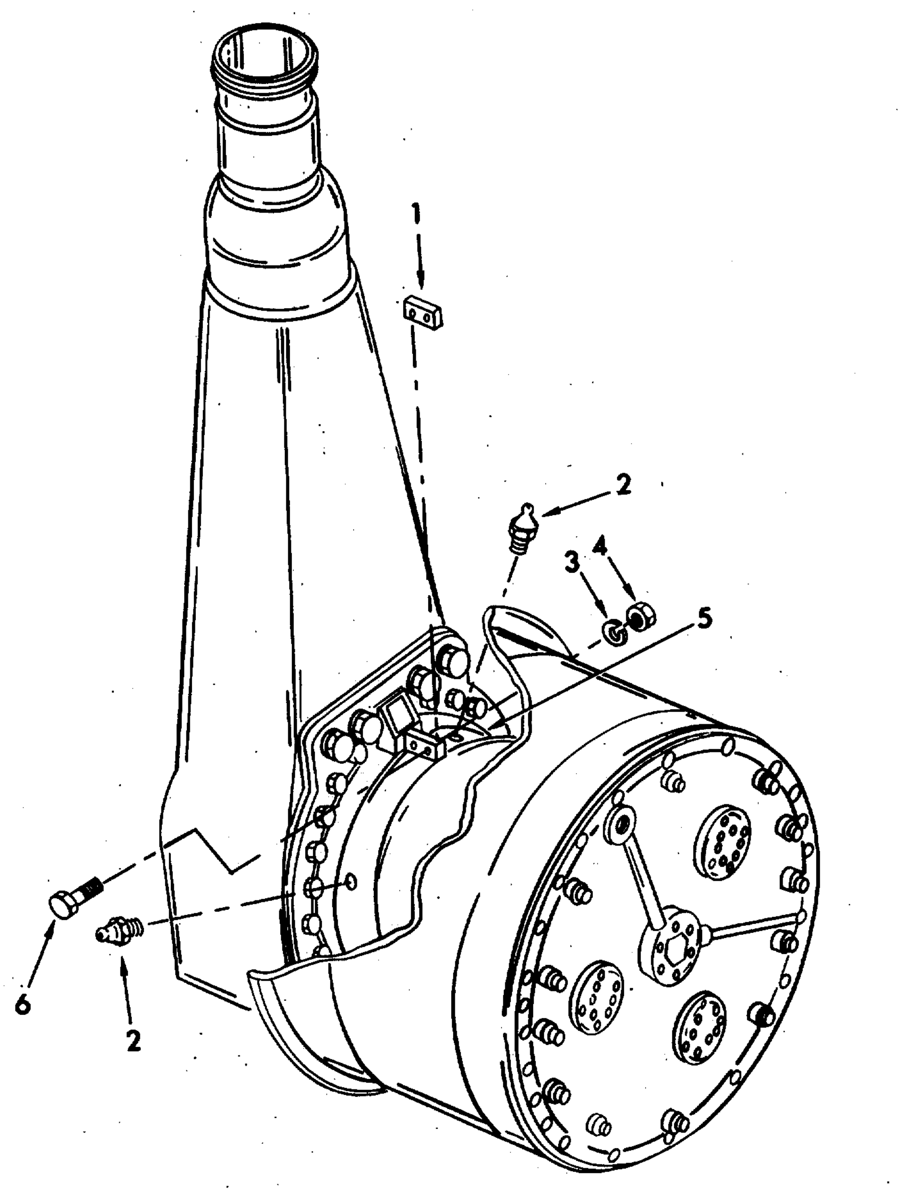
a. General. The grease retainer assemblies are constructed of 16 gage corrosion resistant steel. They are installed around each wheel spindle and butted tightly against the wheel hub to prevent water and sand from entering the column and wheel drive assembly and damaging the seals, bearings and gears.

NOTE

To be effective, the grease retainer assemblies must be kept filled with grease at all times.

b. Grease Retainer Assembly Removal.

(1) Remove four nuts (4, fig. 2-70), lockwashers (3) and capscrews (6).



TS 1930-203-20/2-70

1.	Gasket	4.	Nut, hexagon
2.	Fitting	5.	Retainer
3.	Lockwasher	6.	Capscrew

Figure 2-70. Column and Wheel Spindle Grease Retainer, Removal and Installation.

(2) Separate retainer halves (5) and remove from wheel spindle. Remove two gaskets (1) from ends of retainer.

(3) Remove lubrication fittings (2).

c. Grease Retainer Assembly Cleaning, Inspection and Repair.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid -repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees (38 degrees C - 59 degrees C).

(1) Clean all parts in drycleaning solvent (item 6, App. C). Dry with low pressure air (10 psi (0.7 kg/cm^2)).

(2) Inspect retainer halves (5, fig. 2-70) torn, broken or warped condition. Replace if defective.

(3) Inspect gaskets (1) for broken or deteriorated condition. Replace if defective.

(4) Examine lubrication fittings for stripped threads or clogged condition. Replace if defective.

d. Grease Retainer Assembly Installation.

NOTE

The grease retainer assembly must be butted tightly against the wheel hub to be effective.

(1) Install gaskets (1, fig. 2-70) between retainer halves.

(2) Install retainer halves (5) and secure with four capscrews (6), lockwashers (3), and nuts (4).

SECTION XIV. MAINTENANCE OF MARINE DRIVE SYSTEM

2-96. GENERAL.

The marine drive system (fig. 2-71) consists of two independent drive systems that are controlled separately. The marine drive system consists of flexible couplings, fluid couplings, gathering boxes, angle drive couplings, marine gears, intermediate shafts, stern tubes, struts, propeller shafts, stern tubes, struts, propeller shaft, and propellers, The marine drive system on the starboard side is basically the same as the port marine drive system. Due to opposite arrangement of the two systems, some of the components are left and right-hand equipment. Power for the marine drive systems is taken from forward and aft engines and directed through flexible and fluid couplings to corresponding gathering boxes. The gathering boxes direct the power down through angle drive couplings to the respective marine gear. Both angle drive couplings consist of a shaft with a flexible coupling on each end. The marine gears control the direction of rotation for the propellers and also serve as power sources for the hydraulic and compressed air systems. Each marine gear has an independent oil system which lubricates and supplies pressure for shifting of the gears. Both marine gears are controlled independently from the cab by the air pressure system. The marine gears direct power aft through the intermediate and propeller shafts to the propellers. The propeller shafts extend through the LARC hull at the stern tubes and are supported in each propeller tunnel by a propeller strut. Both the stern tubes and propeller struts are equipped with lubrication fittings.

2-97. GENERAL MAINTENANCE.

a. Remove top outboard half of fluid coupling machinery guard. Service and inspect as follows:

(1) Inspect fluid coupling (6, fig. 2-71) for leaks. If leaking at fill plug, tighten plug. If leakage continues after the plug has been tightened, replace plug gasket. If necessary, replace fill plug. If there is evidence of overheating or other leakage, notify direct support maintenance.

(2) Inspect fluid coupling fill plugs at each oil change for broken or malformed threads. Inspect gasket for broken or deteriorated condition. If fill plugs or gaskets are damaged, replace.

(3) Lubricate fluid couplings (see lubrication order).

b. Replace machinery guard.

c. Inspect flexible couplings between engines and gathering boxes for leakage. If a large amount of grease is leaking from flexible couplings, notify direct support maintenance.

d. Lubricate flexible couplings with GLA grease. If lubrication fitting threads are stripped or malformed, replace damaged fittings.

2-98. GATHERING BOX.

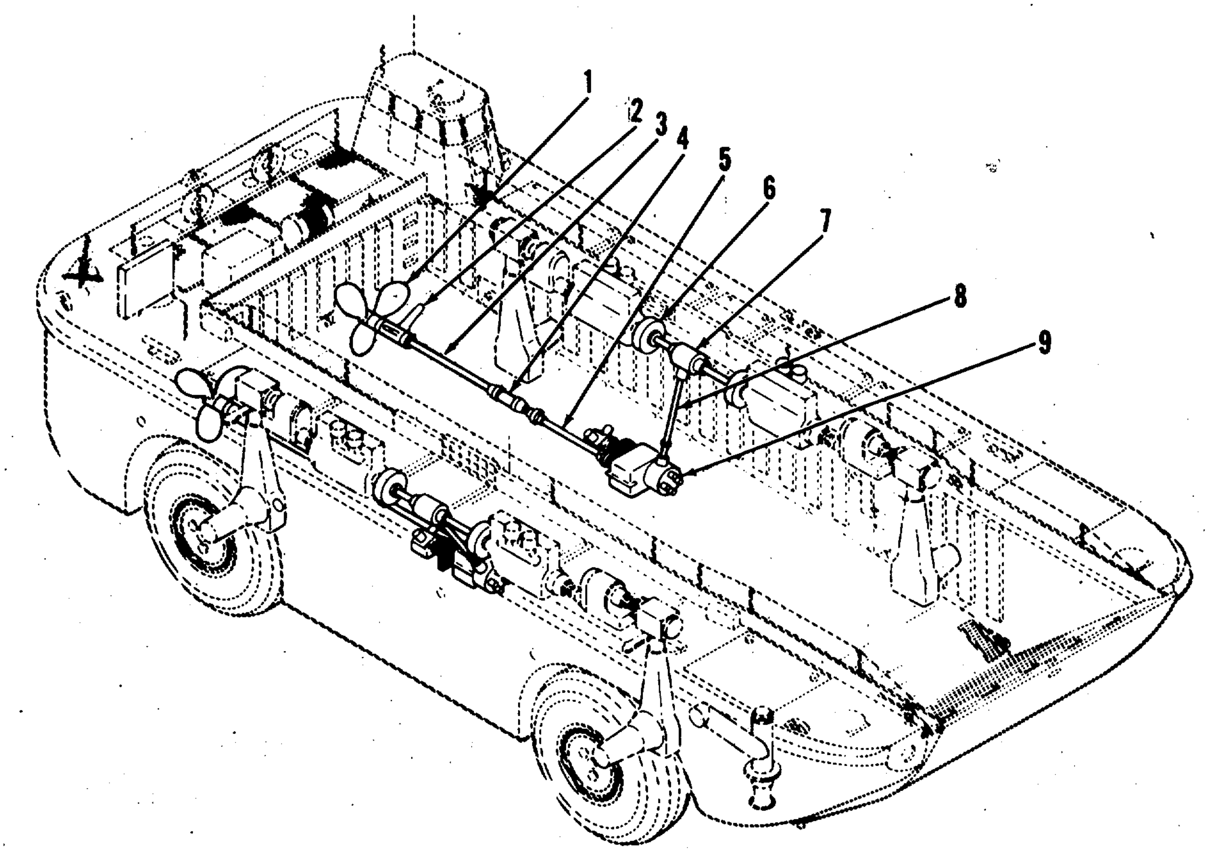
a. General. The gathering box is a bevel gear-type reducer having two input shafts and a single output shaft. Mechanical power from corresponding forward and aft gears is collected by the gathering box and delivered to the respective marine gear through an angle drive coupling.

b. Inspection and Service.

(1) Inspect all gathering box oil lines (fig. 2-72 and 2-73) as follows:

NOTE

Drain oil from gathering box into a suitable container prior to removing any part .of the gathering box oil lines.



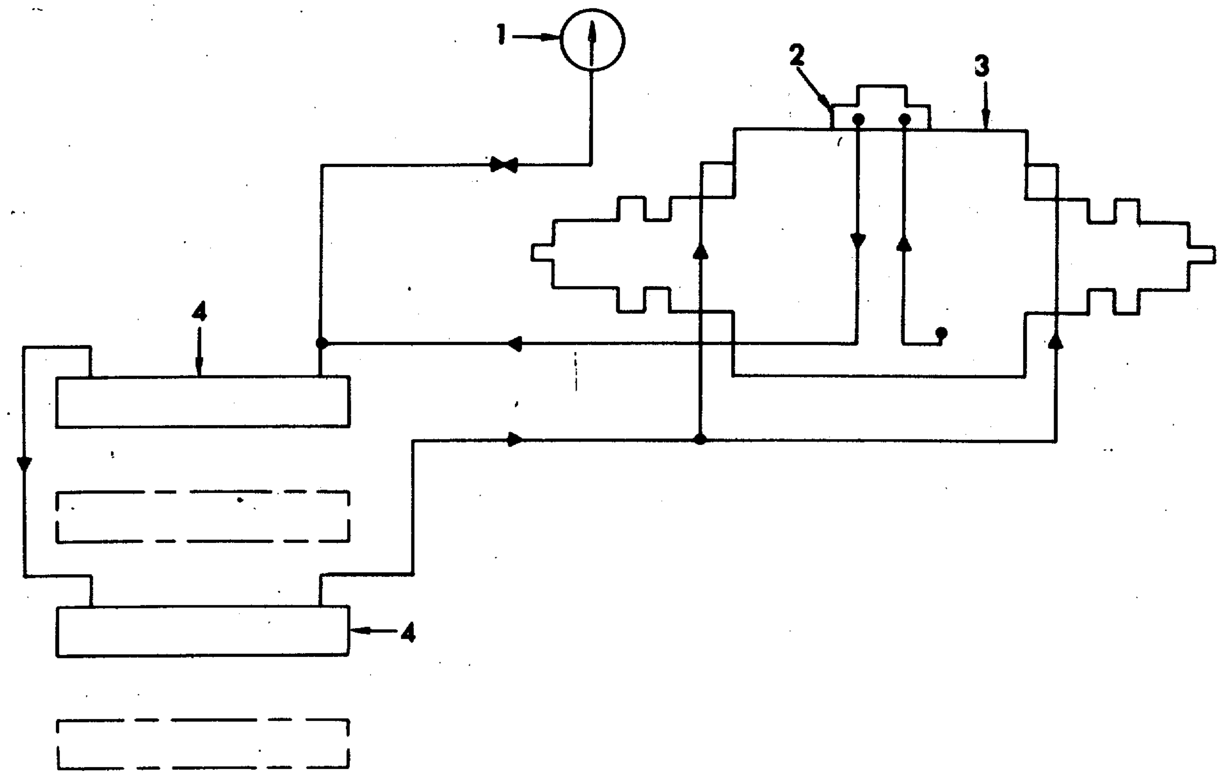
TS 1930-203-20/2-71

1. Propeller
2. Strut
3. Propeller shaft
4. Stern tube
5. Propeller intermediate shaft
6. Fluid coupling
7. Gathering box
8. Angle drive coupling
9. Marine gear

Figure 2-71. Marine Drive System.

(a) Inspect hoses for kinked, deteriorated, and leaking condition. Tighten leaky fittings and replace all damaged hoses. Remove and clean lines.

(b) Inspect all piping, tubing, and fittings for broken, bent, and leaking condition. Tighten leaky fittings and replace all damaged parts.



TS 1930-203-20/2-72

1. Oil pressure gage
2. Oil pump
3. Gathering box
4. Oil cooler

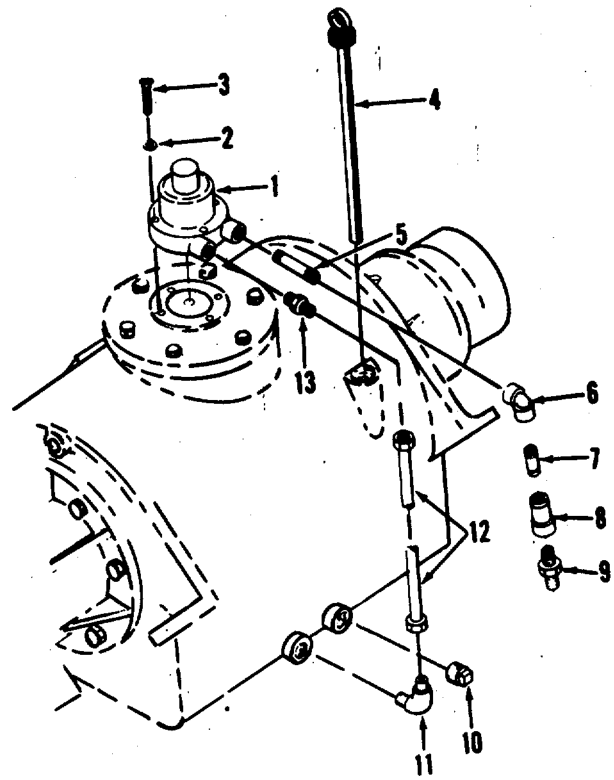
Figure 2-72. Gathering Box Oil Lines Flow Diagram.

(2) Inspect gathering boxes (7, fig. 2-71) for oil leaks. If gathering boxes leak, notify direct support maintenance.

(3) Check oil in gathering boxes by removing fill plug-dipsticks (4, fig. 2-73). Fill gathering boxes to full mark on fill plug-dipsticks with proper oil (see lubrication order).

(4) Change gathering box oil (see lubrication order).

(5) Inspect fill plug-dipsticks (4, fig. 2-73) and gathering box oil drainplug (10) at each oil change for broken and malformed threads. If fill plug-dipsticks and drainplugs are damaged, replace.



TS 1930-203-20/2-73

1.	Gathering box oil pump	8.	Bell reducer
2.	Lockwasher	9.	Adapter
3.	Capscrew	10.	Drainplug
4.	Oil dipstick	11.	Elbow
5.	Nipple	12.	Tube
6.	Elbow	13.	Adapter
7.	Nipple		

Figure 2-73. Gathering Box Oil Pump and Lines, Removal and Installation.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(6) Remove air breather from gathering boxes and clean with drycleaning solvent (item 6, App. D). If air breathers are broken or clogged, replace air breather.

2-99. GATHERING BOX-MARINE GFAR ANGLE DRIVE COUPLINGS.

a. General. The gathering box and marine gear are coupled together with an angle drive coupling. The coupling consists of a shaft with a flexible coupling on each end. The flexible coupling prevent stresses from occurring in either the gathering box or marine gear during operation of the marine drive system. A button and thrust plate are provided on the lower flexible coupling to take the shock of shaft end play.

b. Inspection and Service.

(1) Inspect flexible-couplings for leaks. If a large amount of grease is leaking from couplings, notify direct support maintenance.

(2) To lubricate flexible coupling, remove plug, force GLA grease through grease fitting until new grease appears at plug opening. Replace plug. If lubrication fitting threads are stripped or damaged, replace fittings.

c. Removal

NOTE

Replacement of the gathering box-marine gear angle drive coupling may be performed only when authorized by the direct support technical service officer.

(1) Remove all bolts (9, fig. 2-74) nuts (11), and lock-washers (10), and remove machinery guards (12 and 16).

(2) Remove capscrews (17) and lockwashers (18) from each flexible coupling flange (3).

(3) Slide flanges (3) back and remove marine gear drive shaft (8) with gaskets (1).

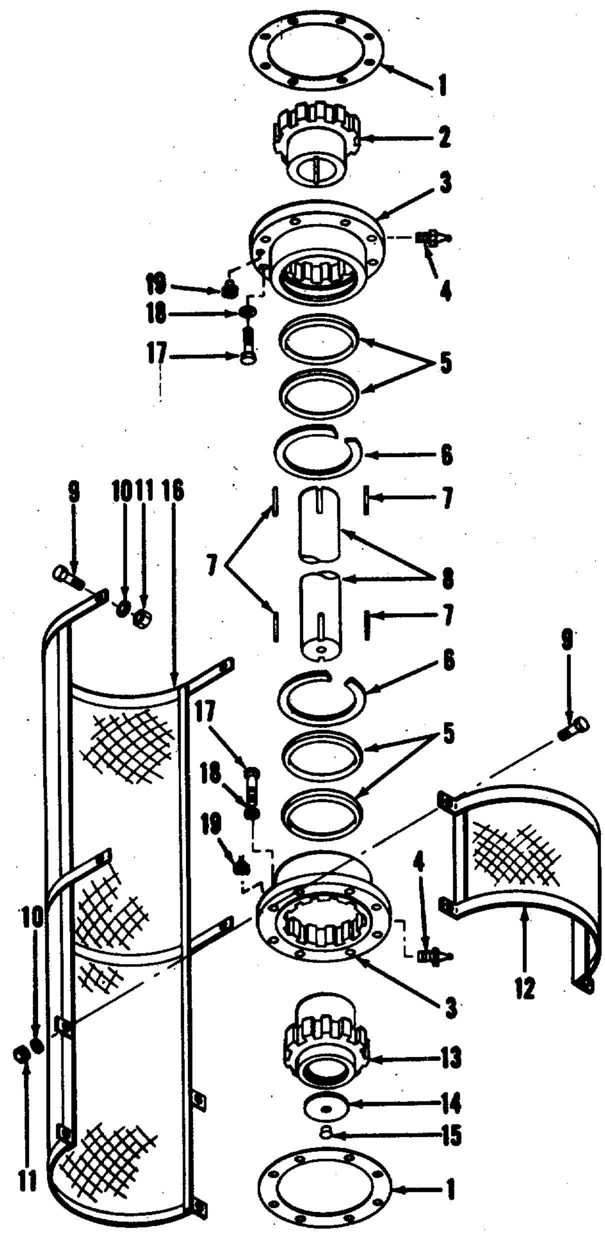
d. Disassembly.

(1) Remove shaft (8, fig. 2-74) and keys (7) from flexible coupling assemblies.

(2) Remove hub gears (2 and 13). Press button (15) and thrust plate (14) from lower hub gear (13).

(3) Remove retaining rings (6) and seals (5) from flanges (3).

(4) Remove lubrication fittings (49) and relief fittings (19) from flanges (3).



TS 1930-203-20/2-74

1. Gasket
2. Hub gear
3. Flange
4. Lubrication fitting
5. Seal
6. Retaining ring
7. Key
8. Shaft
9. Bolt
10. Lockwasher
11. Nut
12. Machinery guard
13. Hub gear
14. Thrust plate
15. Button
16. Machinery guard
17. Capscrew
18. Lockwasher
19. Relief fitting

Figure 2-74. Gathering Box - Marine Gear Angle Drive Coupling, Exploded View.

e. Cleaning, Inspection, and Repair.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean all metal parts in drycleaning solvent (item 6, App. C).

(2) Inspect retaining rings for cracked or warped condition. If damaged, replace retaining rings.

(3) Inspect each flange and gear hub for uneven wear and broken teeth. If flange and gear hub are damaged, replace angle drive coupling.

(4) Inspect button (15, fig. 2-74) and thrust plate (14) on lower coupling for broken or malformed condition. If damaged, replace button or thrust plate.

f. Reassembly.

(1) Install lubrication fittings (4, fig. 2-74) and relief fittings (19) into flanges (3).

(2) Install retaining rings (6) and new seals on flange (3).

(3) Press assembled thrust plate (14) and button (15) into lower hub gear (13). Install hub gears (2) and (13).

(4) Install keys (7) and shaft (8) into flexible coupling assembly.

g. Installation.

NOTE

Pack flexible couplings with grease (see lubrication order).

(1) Slide flanges (3, fig. 2-74) back and install marine gear drive shaft and new gaskets. Secure with capscrews (17) and lockwashers (18).

(2) Position machinery guards (12) and (16) and secure with lockwashers (10), nuts (11) and bolts (9).

2-100. MARINE GEAR.

a. General. The LARC is equipped with two marine gears located in the port and starboard lower machinery areas. Each marine gear receives mechanical power from the output shaft of the gathering box and relays the power to the propellers, air compressors, and hydraulic double pump units. Both marine gears are equipped with an oil filter, a dipstick, lubrication fittings, and drainplugs. Forward and reverse shifting of the marine gear is controlled by air pressure from the cab.

b. Inspection and Service.

(1) Inspect all marine gear oil lines (fig. 2-75) as follows:

NOTE

Drain oil from marine gear into a suitable container prior to removing any part of the marine gear oil lines.

(a) Inspect hose for kinked, deteriorated, or leaking condition. Tighten leaky fittings and report all damaged hose to direct support maintenance.

(b) Inspect all piping, tubing and fittings for broken, bent, or leaking condition. Tighten all leaky fittings and report all damaged parts to direct support maintenance.

(2) Inspect marine gear for leakage. If lubricant is leaking from marine gear, notify direct support maintenance.

(3) Check marine gear oil level with fill plug-dipstick. If level is low, fill marine gear to full mark on fill plug-dipstick (see lubrication order).

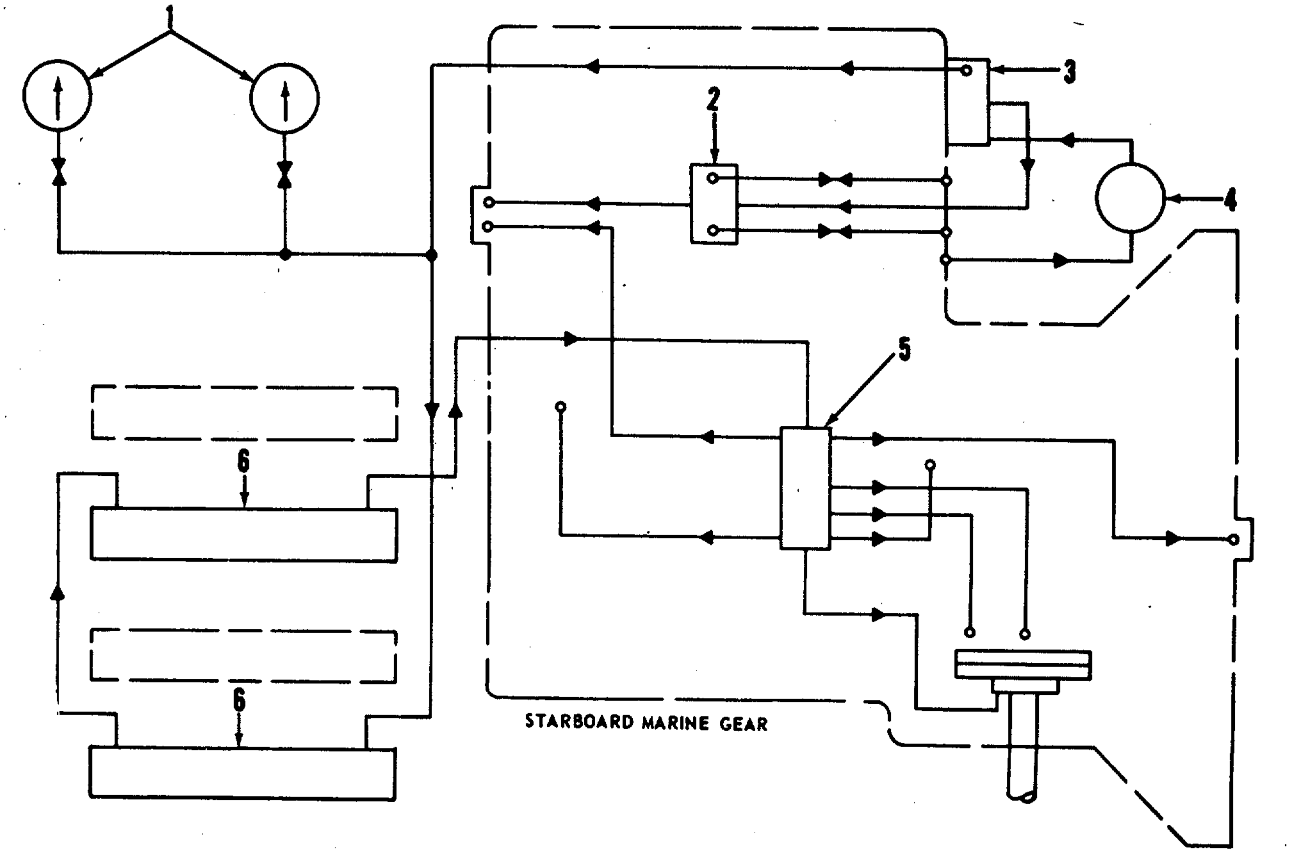
(4) Clean marine gear lubrication fittings and lubricate. If lubrication fittings-are broken or clogged, replace fittings.

(5) Examine marine gear oil sediment strainer (4) for leaks between head casting and shell. If any leaks are found, replace packing.

(6) Clean exterior of marine gear oil sediment strainer and inspect for cracks or dents. Report any damage to direct support maintenance.

(7) Every 500 hours, drain gear case. Clean and inspect marine gear oil sediment strainer element at each oil change. Refill gear case (see lubrication order).

(8) Inspect marine gear fill plug-dipstick and oil drain-plugs at each oil change for broken or malformed threads. If fill plug-dipstick and drainplugs are damaged, replace.



TS 1930-203-20/2-75

1. Oil pressure gage
2. Air control valve
3. Oil pump
4. Oil sediment strainer
5. Oil manifold
6. Oil cooler

Figure 2-75. Marine Gear Oil Lines Flow Diagram.

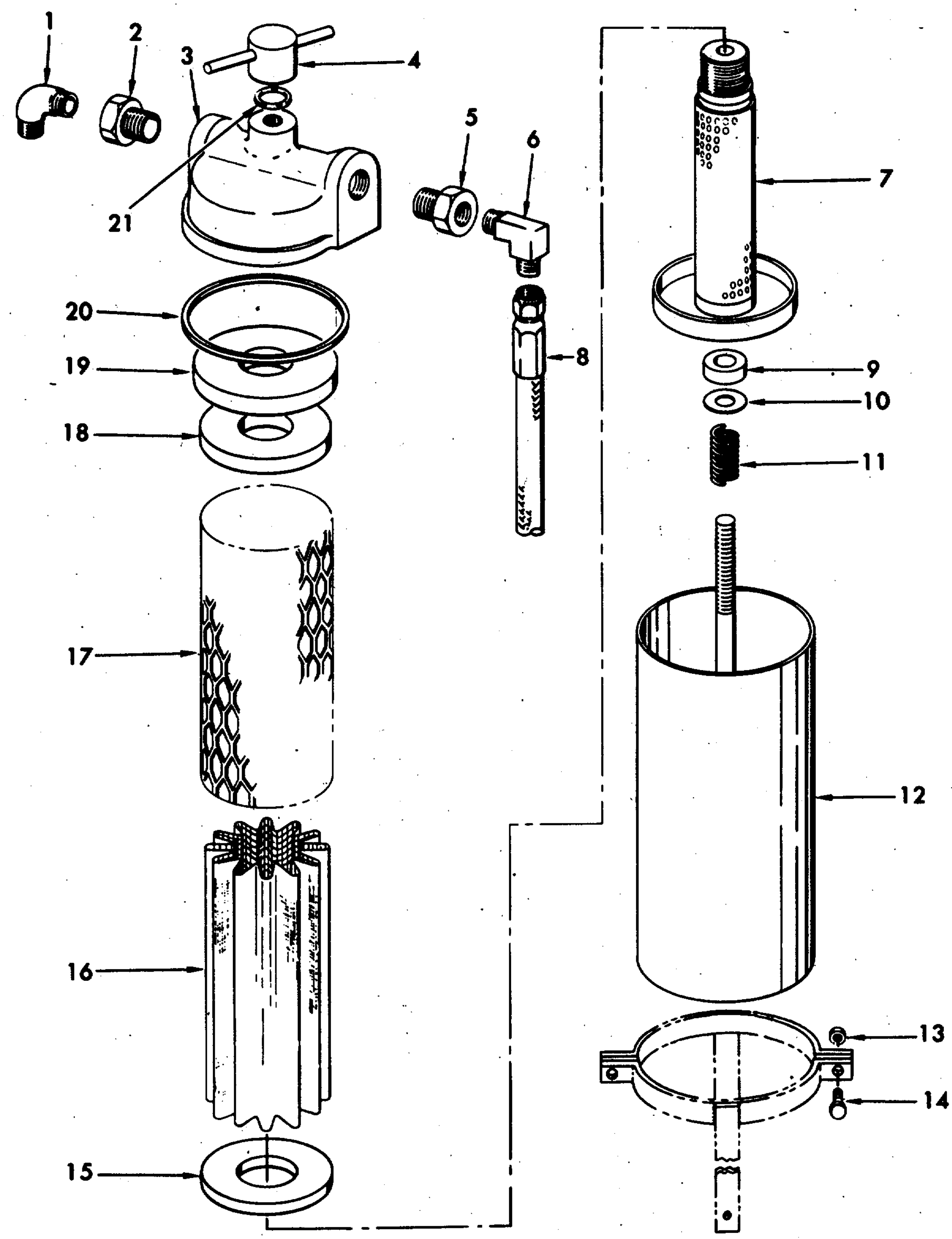
c. Sediment Strainer Element Removal.

(1) Drain oil from marine gear into suitable container.

(2) Remove two nuts (13, fig. 2-76) and bolts (14) from sediment strainer bracket assembly to disconnect oil sediment strainer.

(3) Remove hand nut (4), preformed packing (21), shell (12), and preformed packing (20) from head casting (3).

(4) Unscrew element from head casting (3).



TS 1930-203-20/2-76

Figure 2-76. Oil Sediment Strainer, Exploded View.

Legend for figure 2-76:

1. Elbow
2. Bushing
3. Head casting
4. Head nut
5. Bushing
6. Adapter
7. Center tube
8. Hose assembly
9. Gasket
10. Washer, flat
11. Spring
12. Shell
13. Nut
14. Bolt
15. Washer
16. Insert
17. Housing
18. Washer
19. Top cover
20. Preformed packing
21. Preformed packing

d. Sediment Strainer Element Disassembly.

(1) Remove top cover (19, fig. 2-76) and washer (18).

(2) Remove housing (171 from insert (16).

(3) Remove insert (16) and washer (15) from center tube (7).

e. Sediment Strainer Element Cleaning, Inspection, and Repair.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean all metal parts of element in drycleaning solvent (item 6, App. C). Shake excess solvent from insert (16, fig. 2-76) or blow dry from inside with low-pressure compressed air (10 psi (0.7 kg/cm^2)).

(2) Inspect washers (10, 15, and 18) for broken or malformed condition. Replace washers if damaged.

(3) Ensure center tube (7), flat washer (10), spring (11), housing (17) and top cover (19) are in serviceable condition. Report damaged parts to direct support maintenance.

f. Sediment Strainer Element Reassembly.

(1) Install washer (15, fig. 2-76) and insert (16) on center tube (7).

(2) Install housing (17) over insert.

(3) Install washer (18) and top cover (19).

g. Sediment Strainer Element Installation.

(1) Screw element into head casting (3, fig. 2-76).

NOTE

Replace all sediment strainer preformed packings.

(2) Install preformed packing (20), shell (12), preformed packing (21) and hand nut (4).

(3) Secure sediment strainer assembly in bracket assembly with two bolts (14) and nuts (13).

2-101. PROPELLERS AND PROPELLER SHAFTS.

a. General. The LARC is equipped with two 48 inch propellers. Both propellers have either three or four blades and are connected to the propeller shafts by fairwater caps. The propeller shafts are supported in the propeller tunnels by struts welded to the LARC hull. The propeller shafts enter the hull through stern tubes. The stern tubes are equipped with a packing gland and packing material which enable the propeller shaft to rotate without the entry of water. Bushings in both struts and stern tubes may be lubricated from the outside or inside of the LARC. The propeller shafts inside the hull are connected to corresponding marine gears by intermediate shafts and flexible couplings.

b. Inspection and Service.

(1) Inspect propellers for cracks, large nicks, gouges and bent blades. If propellers are damaged, notify direct support maintenance.

(2) Remove lockwire from bolt (1, fig. 2-77) and remove bolt from fairwater cap (2). Tighten fairwater cap with special spanner wrench. Replace bolt and lockwire.

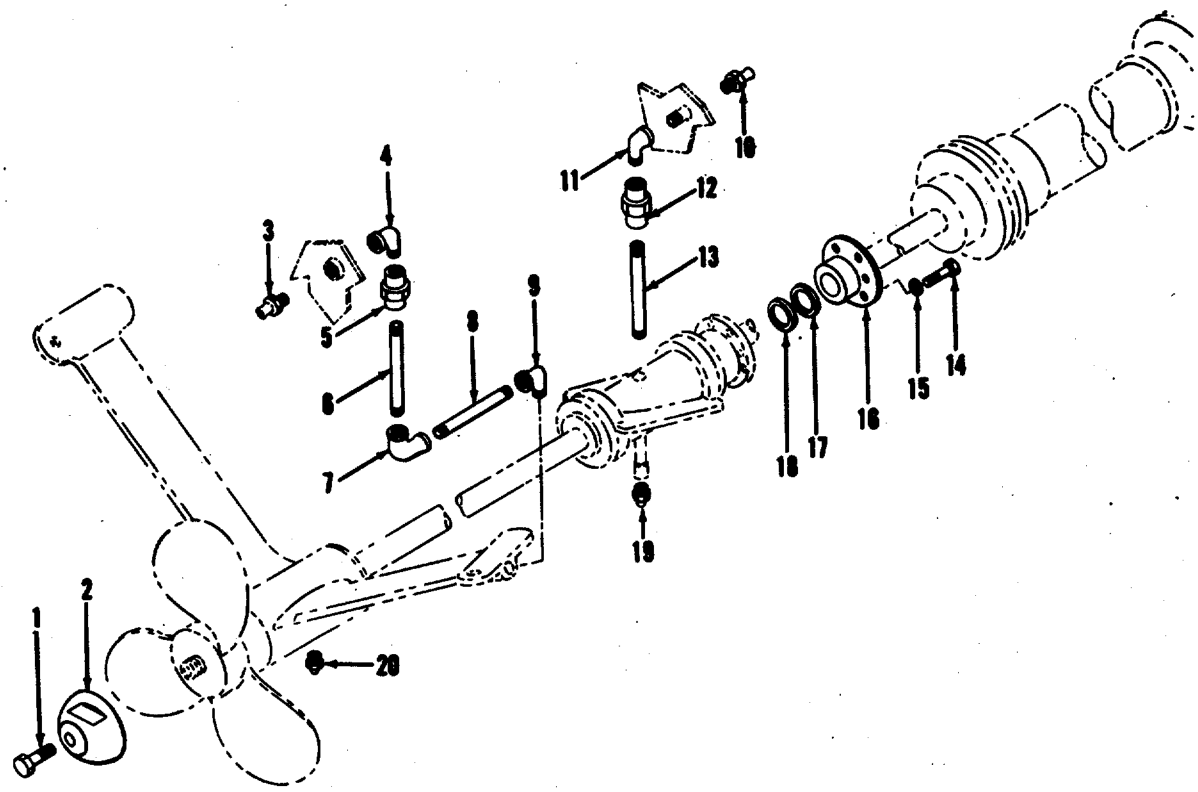
(3) Inspect fairwater caps for broken or malformed condition. If damaged, replace fairwater caps.

(4) Inspect propeller shafts for cracked or bent condition. If propeller shafts are damaged, notify direct support maintenance.

(5) Inspect propeller struts for broken or bent condition. If struts are damaged, notify direct support maintenance.

(6) Remove bulkhead No. £4 center access cover and inspect propeller strut and stern tube lubrication piping for breaks, bends, or leaking condition. Tighten leaking connections and report damaged piping to direct support maintenance. Install access cover.

(7) Clean propeller strut stern tube lubrication fittings and lubricate with GLA grease. If lubrication fittings are broken or clogged, replace lubrication fittings.



1. Bolt
2. Fairwater cap
3. Reducer
4. Elbow
5. Union
6. Pipe
7. -Elbow
8. Pipe
9. Elbow
10. Reducer
11. Elbow
12. Union
13. Pipe
14. Capscrew
15. Washer, flat
16. Packing gland
17. Packing retainer
18. Packing
19. Lubrication fitting
20. Lubrication fitting

Figure 2-77. Propeller Shaft Components, Removal and Installation.

CAUTION

Overtightening of the packing gland will cause propeller shaft to overheat. If propeller cannot be turned by hand when marine gear is in neutral, packing gland is too tight..

(8) Inspect packing gland (16, fig. 2-77) for evidence of water leakage. If packing gland leaks, tighten capscrews (14).

NOTE

If tightening of capscrew does not prevent entry of water, remove and replace packing (18).

c. Stern Tube Packing Removal.

(1) Remove four bronze capscrews (14, fig. 2-77) and flat washers (15).

(2) Slide packing gland (16) out and pull out packing retainer (17).

(3) Remove packing (18) from stuffing box.

d. Stern Tube Packing Installation.

(1) Install new packing (18, fig. 2-77).

(2) Slide packing retainer (17) and packing gland (16) into position.

(3) Replace four bronze capscrews (14) and flat washers (15).

CAUTION

Overtightening of the capscrews will result in overheating of the propeller shaft. If propellers cannot be turned by hand, capscrews are too tight.

(4) Tighten capscrews only enough to prevent entry of water.

e. Fairwater Cap Removal.

(1) Remove lockwire from locking bolt (1, fig. 2-77).

(2) Remove locking bolt (1) from fairwater cap (2)

NOTE

Hulls 5 through 18 were originally equipped with left- and right-hand threaded fairwater caps. Hulls 19 through 60 are equipped with left-hand threaded fairwater caps only.

(3) Position special spanner wrench on fairwater cap (2), tap lightly, and remove fairwater cap.

f. Fairwater Cap Installation.

(1) Using special spanner wrench, install fairwater cap (2, fig. 2-77).

(2) Install bolt (1) and lockwire.

SECTION XV. MAINTENANCE OF COMPRESSED AIR SYSTEM

2-102. GENERAL.

The compressed air system consists of an air supply system connected to an air starting control and supply system, airbrake control and supply system, transmission shifting control system, engine cutout control system, throttle control system, marine gear and radiator fan control system, tire inflation-deflation control and supply system, ramp seal control and supply system, cargo well pump control system, ramp control system, windshield wiper control and supply system, and the air horn control and supply system.

2-103. AIR SUPPLY SYSTEM.

a. General. Compressed air is supplied to the air supply system by two air compressors which are driven by the marine gears. Both air compressors draw air through their respective oil bath air filters located in the upper machinery areas between the aft engines and bulkheads. The compressed air is stored in two air supply tanks located below the cargo deck in the forward portion of the LARC. Each air compressor and air supply tank is connected so the air supply system will function properly with only one air compressor and air supply system will function properly with only' one air compressor and air supply tank in working order. Check valves are located in air lines between the air supply tanks to prevent back flow of air in the event of air compressor failure. Globe valves are located in the air supply lines from the air supply tanks for the purpose of shutting off air flow from the tanks. The air supply tanks are also connected to the air compressors via a shuttle valve and a governor which controls the output of the air compressors. The shuttle valve prevents back flow of air from one air supply tank to the other.

b. Inspection and Service.

(1) Remove cover and element from air compressor air filter body and ensure oil is at correct level. Add oil as required (see lubrication order).

(2) Replace cover and element on filter body.

(3) Change oil in air compressor air filter as follows:

(a) Remove cover and element from filter body.

(b) Drain oil from filter body.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 38 degrees F (38 degrees C - 59 degrees C).

(c) Wash element, cover, and filter body with drycleaning solvent (item 6, App. C).

(d) Dry element with low-pressure, dry compressed air not exceeding 10 psi (0.7 kg/cm2).

(e) Inspect cover and filter body for broken or bent condition. Replace air compressor air filter if damaged.

(f) Fill filter body with proper oil to correct oil level (see lubrication order).

(4) Inspect air compressor air filter and supply air piping, tubing, and fittings for ruptured or crimped conditions. Report discrepancies to direct support maintenance.

(5) Test all pressurized supply air piping and tubing connections for leakage with soapy water solution. If leakage is found, tighten connection and retest. If leakage is found after tightening, notify direct support maintenance.

(6) Remove all rust and scale from air piping with wire brush and spot-paint.

(7) Ensure clamps, brackets, hangers, and straps are securely mounted. Observe torque values when tightening attaching hardware.

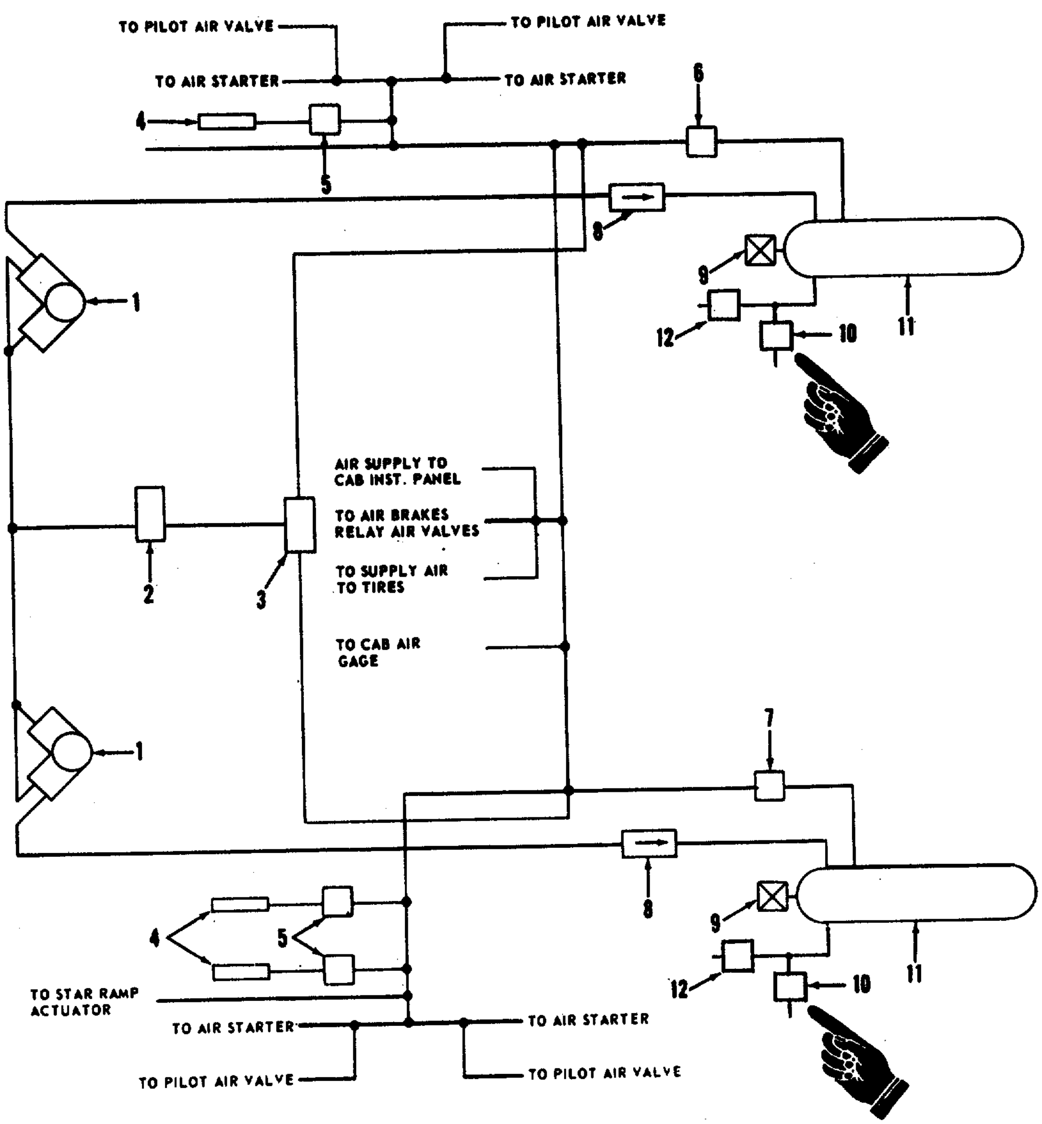
(8) Inspect clamps, brackets, hangers, and straps to ensure they are not broken. Report discrepancy to direct support maintenance.

(9) Inspect packing and grommets for looseness or deterioration. Report discrepancy to direct support maintenance.

(10) With air lines pressurized and globe valves closed, check valve stem at packing retaining nut for air leakage with a soapy water solution. If leakage is found, replace packing in stuffing box.

(11) Close globe valves (6 and 7, fig. 2-78) and service ,connection globe valves (5); observe for binding and stopping of air flow. Report discrepancy to direct support maintenance.

(12) Inspect globe valves (6 and 7), service connection globe valves (5), shuttle valve (3), and check valves (8) for cracks. Report discrepancy to direct support maintenance.



1.	Air compressor	7.	Starboard globe valve
2.	Air compressor governor	8.	Check valve
3.	Shuttle valve (or double check valve)	9.	Safety relief valve
4.	Service connection	10.	Drain valve
5.	Service connection globe valve	11.	Manual air supply tank
6.	Port globe valve	12.	Solenoid drain valve

Figure 2-78. Air Supply System Diagram.

c. Globe Valve Packing Removal.

(1) Open globe valve fully.

(2) Unscrew nut (1, fig. 2-79) from stem (5) and remove handwheel (2).

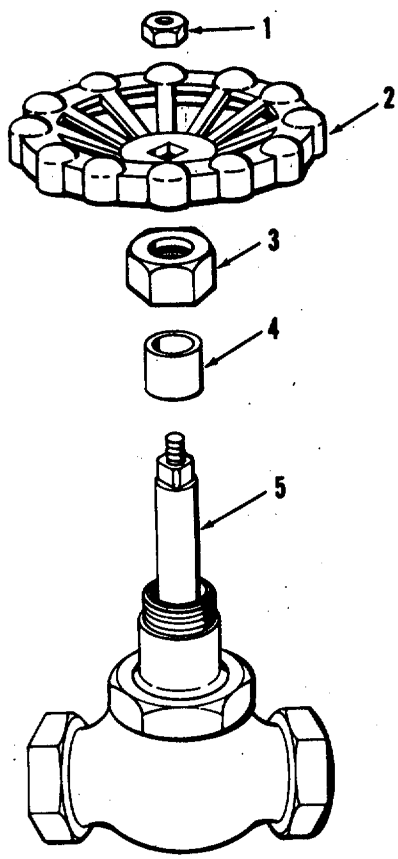
(3) Unscrew packing retaining nut (31 and remove packing

(4) from stuffing box.

d. Globe Valve Packing Installation.

(1) Install packing (4, fig. 2-79) and retaining nut (3) on stem (5).

(2) Install handwheel (2) and nut (1).



1. Nut
2. Handwheel
3. Packing retaining nut
4. Packing
5. Stern

Figure 2-79. Globe Valve, Disassembly and Reassembly.

2-104. AIR COMPRESSOR.

a. General. Two types of air compressors (Model 3YC and Model 3VC, are used on the LARC. The air compressors are two-stage compressors equipped with an air-cooled intercooler assembly. The compressors are driven through a flexible coupling connected between the marine gear and the compressor drive shaft. The compressors have two different size cylinders, a large low-pressure cylinder and a small high-pressure cylinder. Filtered air is compressed in the low pressure cylinder and is routed through the intercooler to the high pressure cylinder. On the Model 3YC air compressor, each cylinder head is equipped with three valves: a suction valve, a discharge valve, and an unloader valve. On the Model 3VC air compressor, each cylinder head is equipped with two valves: a combination suction unloader valve and a discharge valve. The suction valves open the discharge valves lose on the down stroke of the pistons, allowing air to flow into the cylinders. The suction valves close on the up stroke of the pistons and the discharge valves open, allowing the compressed air to flow from the cylinder. When air receiver pressure rises to cutout pressure, the air compressor governor applies air pressure to the compressor unloaders. The unloader values on the Model 3YC air compressor open the suction valves eliminating compression. On the Model 3VC air compressors, air goes to the unloader suction valve assemblies and the suction valves are opened eliminating compression.

b. Inspection and Service (Model 3YC),

(1) Inspect tubing and fittings (fig. 2-80) on air compressor for ruptured, crimped, and stripped threads. Report defective tubing and fittings to direct support maintenance.

(2) Change oil in air compressor as follows:

(a) Place a suitable container below drain pipe (4).

(b) Remove cap (5) and inspect cap and drain pipe for stripped threads. Replace cap and drain pipe if damaged.

(c) Reinstall cap on drain pipe.

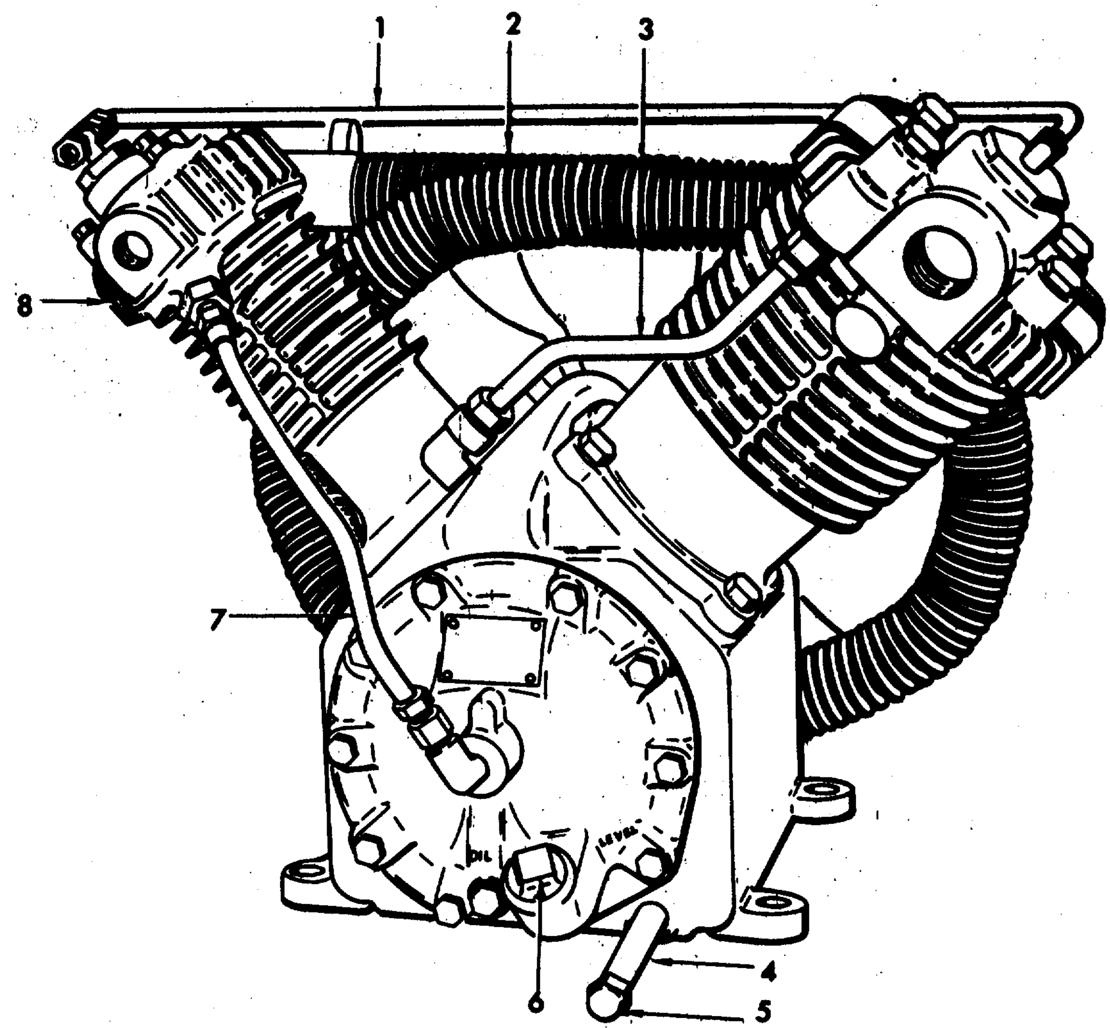
(d) Remove filler plug (6) and add oil to level mark (see lubrication order).

(e) Reinstall filler plug

(3) Examine flexible coupling inserts (3, fig. 2-81) for deterioration. Replace deteriorated inserts.

(4) Examine flexible coupling for slack or broken coupling. Report discrepancy to direct support maintenance.

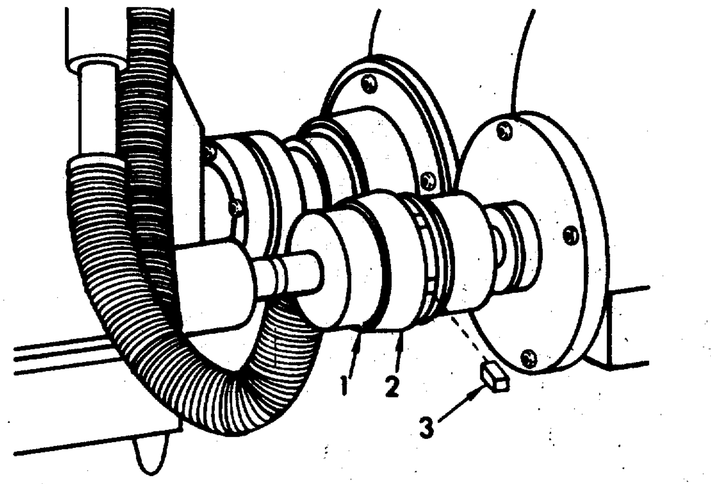
(5) Inspect air compressor cylinders and heads for cracks or leaks. Report damage to direct support maintenance.



TS 1930-203-20/2-80

1. Unloader tube
2. Intercooler
3. Vent tube
4. Drain pipe
5. Oil drain cap
6. Filler plug
7. Unloader tube
8. Valve body

Figure 2-80. Air Compressor, Model 3YC.



TS 1930-203-20/2-81

1. Retaining ring
2. Collar
3. Flexible coupling insert

Figure 2-81. Flexible Coupling Insert, Removal and Installation.

(6) Inspect intercooler (fig. 2-82) for crimping or rupture. Replace intercooler if defective.

(7) Start and engine and check air compressor for proper operation. Report any discrepancy to direct support maintenance.

WARNING

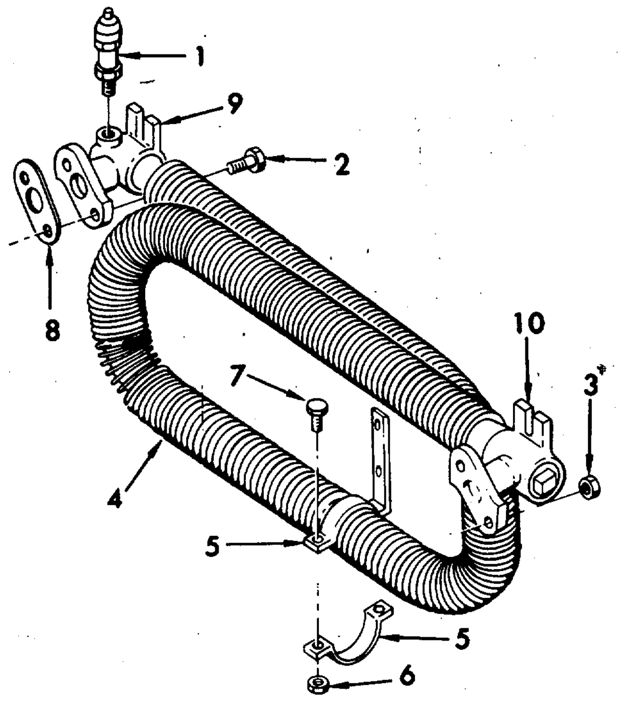
Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(8) Stop the engine.

c. <u>Intercooler Assembly (Model 3YC) Removal.</u>

(1) Remove two attaching bolts (7, fig. 2-82) and nuts (6) securing clamp (5) to intercooler (4).

(2) Remove four bolts (2) and nuts (3) from intercooler connections securing intercooler assembly to air compressor cylinder heads.



TS 1930-203-20/2-82

1. Safety valve
2. Bolt
3. Nut
4. Intercooler
5. Clamp
6. Nut
7. Bolt
8. Gasket
9. Flange
10. Flange

Figure 2-82. Intercooler Assembly, Model 3YC.

(3) Remove gaskets (8) and unscrew safety valve (1) from intercooler assembly.

d. Intercooler Assembly (Model 3YC) Cleaning and Inspection.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean all parts of intercooler assembly in drycleaning solvent (item 6, App. C), and dry with low-pressure, dry compressed air.

(2) Examine safety valve (1, rig. 2-82) for corrosion and stripped threads. Replace safety valve if defective.

e. Intercooler Assembly (Model 3YC) Installation.

(1) Install safety valve (1, fig. 2-82).

(2) Position new gaskets (8). Install flanges (9) and (10). Secure with four bolts (2) and nuts (3).

(3) Install clamp (5) and secure with two bolts (7) and nuts (6).

f. Flexible Coupling Insert (Model 3YC) Removal.

(1) Remove retaining ring (1, fig. 2-81) from groove and slide retaining-ring and collar (2) back.

(2) Remove flexible coupling inserts (3) from flexible coupling. Replace damaged inserts.

g. Flexible Coupling Insert (Model 3YC) Installation.

(1) Install inserts (3, fig. 2-81) into flexible coupling.

(2) Install collar (2) and retaining ring (1).

h. Inspection and Service (Model 3VC).

(1) Inspect tubing and fittings on air compressor for ruptured, crimped, and stripped threads. Replace defective tubing and fittings.

(2) Change oil in air compressor as follows:

(a) Place a suitable container below drain hole.

(b) Remove drainplug (5, fig. 2-83) and inspect drainplug for stripped threads. Replace plug if damaged.

(c) Reinstall drainplug.

(d) Remove filler plug (4) and add oil to lever mark (see lubrication order).

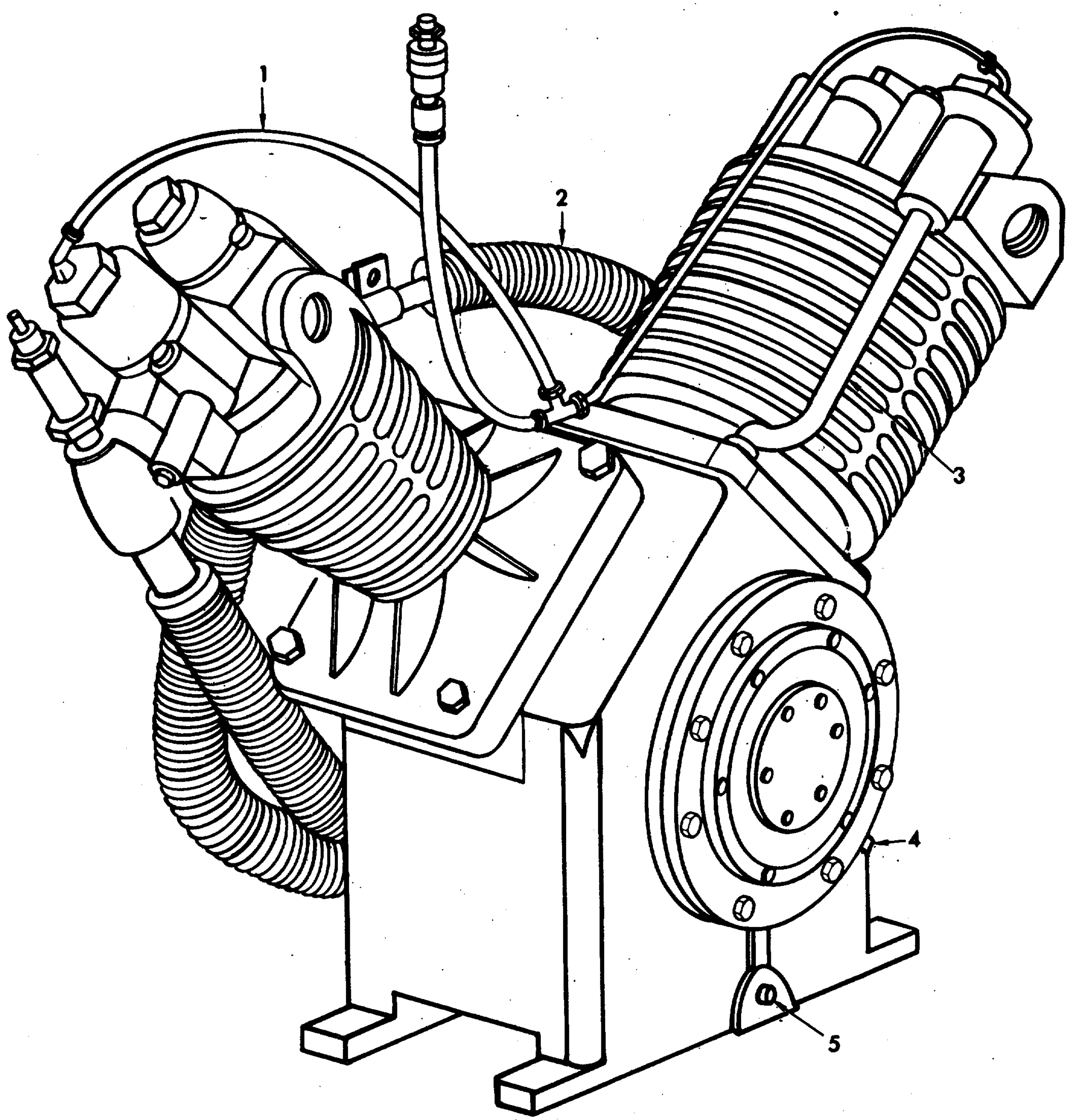
(e) Reinstall filler plug.

(3) Examine flexible coupling inserts (3, fig. 2-81) for deterioration. Replace deteriorated inserts.

(4) Examine flexible coupling for slack or broken coupling. Report discrepancy to direct support maintenance.

(5) Inspect air compressor cylinders and heads for cracks or leaks. Report damage to direct support maintenance.

(6) Inspect intercooler (fig. 2-84) for crimping or rupture. Replace intercooler if defective.



TS 1903-203-20/2-83

1. Unloader tube
2. Intercoller
3. Breather tube
4. Filler plug
5. Drainplug

Figure 2-83. Air Compressor, Model 3VC.

(7) Ensure hardware securing air compressor is present and tightened to correct torque values.

(8) Start an engine and check air compressor for proper operation. Report any discrepancy to direct support maintenance.

WARNING

Before starting the engines ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(9) Stop engines.

i. Intercooler Assembly (Model 3VC) Removal.

(1) Remove two capscrews (8, fig. 2-84) and nuts (5) securing clamp (7) to intercooler (9).

(2) Remove capscrews (13), flat washer (14), clamp (15), and spacer (16).

(3) Remove five capscrews (1 and 12) and lockwashers (2 and 11) from intercooler connections securing the intercooler assembly to air compressor heads.

(4) Remove gaskets (4 and 10) and unscrew safety valve (39) from intercooler.

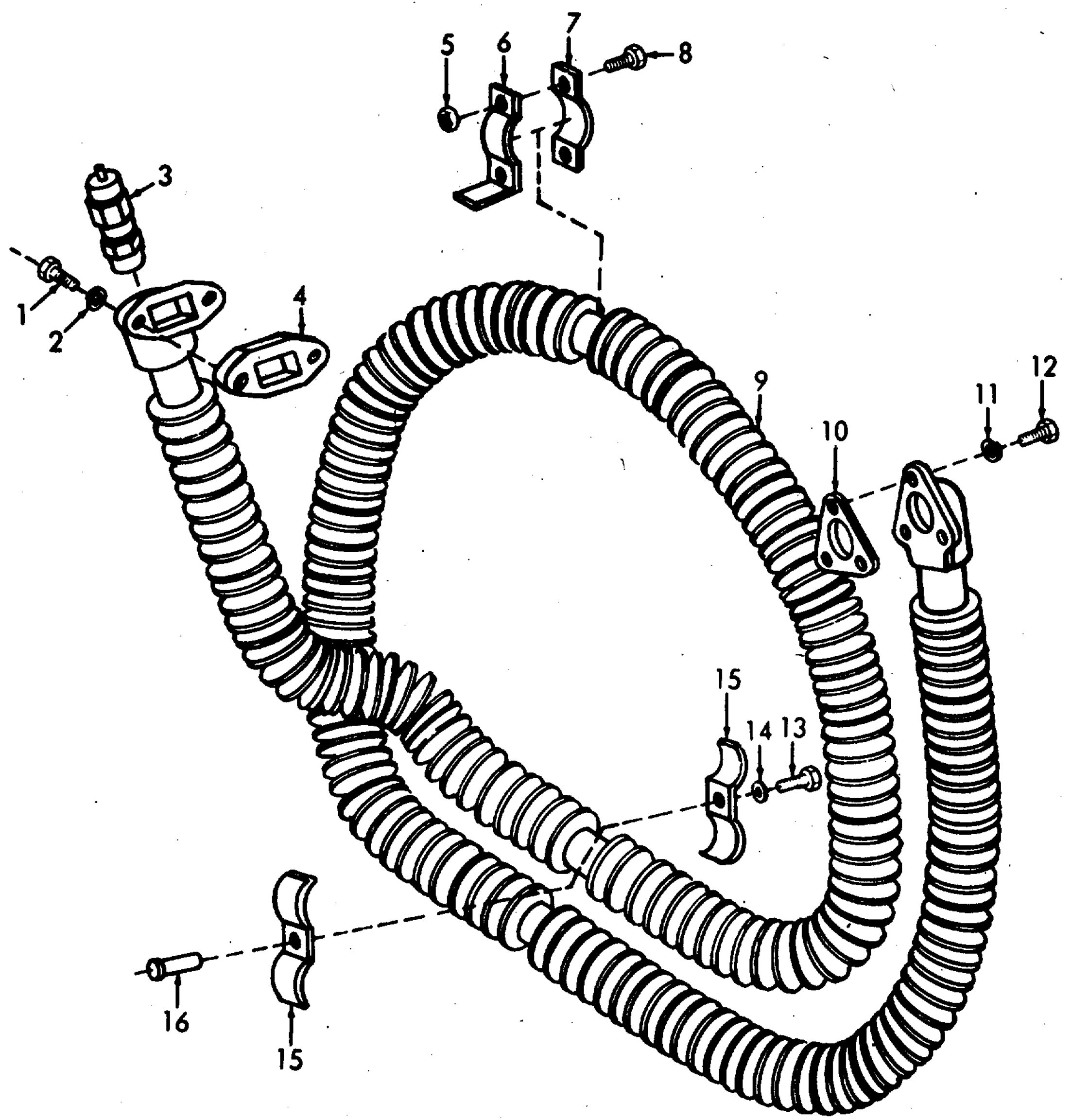
j. Intercooler Assembly (Model 3VC) Cleaning and Inspection.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean all parts of intercooler assembly in drycleaning solvent (item 6, App. C) and dry with low-pressure, dry compressed air.

(2) Examine safety valve (3, fig. 2-84) for corrosion and stripped threads. Replace safety valve if defective.



TS 1930-302-20/2-894

1. Capscrew
2. Lockwasher
3. Safety valve
4. Gasket
5. Nut
6. Bracket
7. Clamp
8. Screw
9. Intercooler
10. Gasket
11. Lockwasher
12. Capscrew
13. Capscrew
14. Washer, flat
15. Clamp
16. Spacer

Figure 2-84. Intercooler Assembly, Model 3VC.

k. Intercooler Assembly (Model 3VC) Installation.

(1) Install safety valve (3, fig. 2-84) into intercooler.

(2) Position new gaskets (4) and (10). Install five capscrews (1 and 12) and lockwashers (2 and 11).

(3) Install spacer (16), clamp (15), flat washer (14) and capscrew (13).

(4) Install clamp (7) and secure with two capscrews (8) and nuts (5).

l. Flexible Coupling Insert (Model 3VC) Removal.

(1) Remove retaining ring (1, fig. 2-81) from groove and slide retaining ring and collar (2) back.

(2) Remove flexible coupling inserts (3) from flexible coupling. Replace damaged inserts.

m. Flexible Coupling Insert (Model 3VC) Installation.

(1) Install inserts (3, fig. 2-81) into flexible coupling.

(2) Install collar (2) and retaining ring (1).

2-105. AIR SUPPLY TANKS AND VALVES.

a. General. The compressed air is stored in two air tanks located below the cargo deck in the forward portion of the LARC, one port and one starboard. The air tank has safety valve and drain valve. The air tanks are connected so that the air supply system will function properly with only one air compressor and air tank in working order. Check valves are located in airlines between the air tanks to prevent back flow of air in event of air compressor failure. Globe valves are located in the air tank supply lines for the purpose of shutting off air flow from the tanks if desired. The tanks are also connected to the air compressors via a shuttle valve and a governor which controls the output of the air compressors. The governor is set to cut in at 135 psi (9.5 kg/cm2) and cut out at 155 psi (10.9 kg/cm2). The shuttle valve prevents back flow of air from one air tank to the other.

b. Inspection and Service.

(1) Inspect safety relief valve (9, fig. 2-78) for leakage or cracks. Replace defective valve.

(2) Remove access panel in port side of bulkhead and inspect air supply tanks (11) on both sides of bulkhead for leakage or cracks. Report discrepancy to direct support maintenance. Reinstall access panel.

(3) Remove all rust and scale from exterior of air tanks using a wire brush and spot-paint the repaired areas.

(4) Open drain valves (10) and drain all water accumulation from air supply tanks.

(5) Close globe valves (6 and 7) and open drain valves (10) in air supply tank, remove inspection plugs from air supply tank and using a light, examine interior for rust. Report rust to direct support maintenance.

WARNING

Before attempting to remove any compressed air system lines or components, relieve pressure from system. Failure to do so may result in injury or death to maintenance personnel.

(6) Remove safety relief valve and check with an external air source for proper adjustment of 165 psi (11.6 kg/cm2) release pressure.

(7) Adjustment of safety relief valve is as follows:

(a) Loosen locknut on safety relief valve.

(b) Turn regulating nut clockwise to increase and counterclockwise to decrease release pressure.

(c) Tighten locknut when 165 psi (11.6 kg/a2) releasepressure is achieved.

(8) With air lines pressurized and globe valves closed check valve stem at packing retaining nut for leakage with a soapy solution. If leakage is found, replace packing in stuffing box as follows :

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59- degrees C).

(a) Wash element, cover and filter body with drycleaning solvent (item 6, App. C).

(b) Dry element with low-pressure, dry compressed air not to exceed 10 psi (0.7 kg/cm2).

(9) Inspect globe valves for binding or breakage. Report discrepancy to direct support maintenance.

c. Safety Relief Valve Removal.

(1) Close globe valves (6 and 7, fig. 2-78) located in air lines above air supply tanks and open drain valve (10) in air supply tank (11) to vent compressed air.

(2) Unscrew safety relief valve (9) from air supply tank.

WARNING

Before attempting to remove any compressed air system lines or components, relieve pressure from system. Failure to do so will result in injury or death to maintenance personnel.

d. Safety Relief Valve Installation.

(1) Install safety relief valve (9, fig. 2-78) into air supply tank (11).

(2) Close drain valve (10) in air supply tank and open globe valves (6) and (7) located in air lines above air supply tank.

2-106. AIR COMPRESSOR GOVERNOR.

a. General. The compressed air system is regulated for a maximum pressure of 155 psi (10.9 kg/cm2) and a minimum pressure of 135 psi (9.5 kg/cm2) by an air compressor governor mounted on the port marine gear inboard bulkhead. The air compressor governor controls the operating capacities of the air compressors by applying pressure to the unloader valves in the cylinder heads of the air compressor when air pressure in the compressed air system exceeds 155 psi (10.9 kg/cm2). When air pressure drops below 135 psi (9.5 kg/cm2), pressure is no longer applied to the unloader valve, allowing the air compressor suction valve to open.

b. Inspection and Service.

(1) Inspect compressor governor for cracks. Report discrepancy to direct support maintenance.

(2) Ensure two locknuts (2, fig. 2-85) are secureon governor adjusting stem.

(3) Ensure governor (3) is securely mounted to bracket.

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(1) Start one or more engines and check air compressor governor operation as follows:

(a) Observe air pressure gage in cab for proper cut-in pressure (135 psi (9.5 kg/cm2)) and cutout pressure (155 psi (10.9 kg/cm2)) of the governor.

(b) Adjust governor as necessary.

(2) Stop engines.

c. Adjustment. Adjust cut-in and cutout pressures as follows:

(1) Loosen locknuts (2, fig. 2-85), one at a time, on governor adjusting stems.

(2) Turn adjusting screws (1) counterclockwise if cut-in and cutout pressures are too high.

(3) Turn adjusting screws (1) clockwise if cut-in and cutout pressures are too low.

(4) Tighten locknuts (2) when proper adjustment of cut-in pressure (135 psi (9.5 kg/cm)) and cutout pressure (155 psi (10.9 kg/cm2)) is obtained.

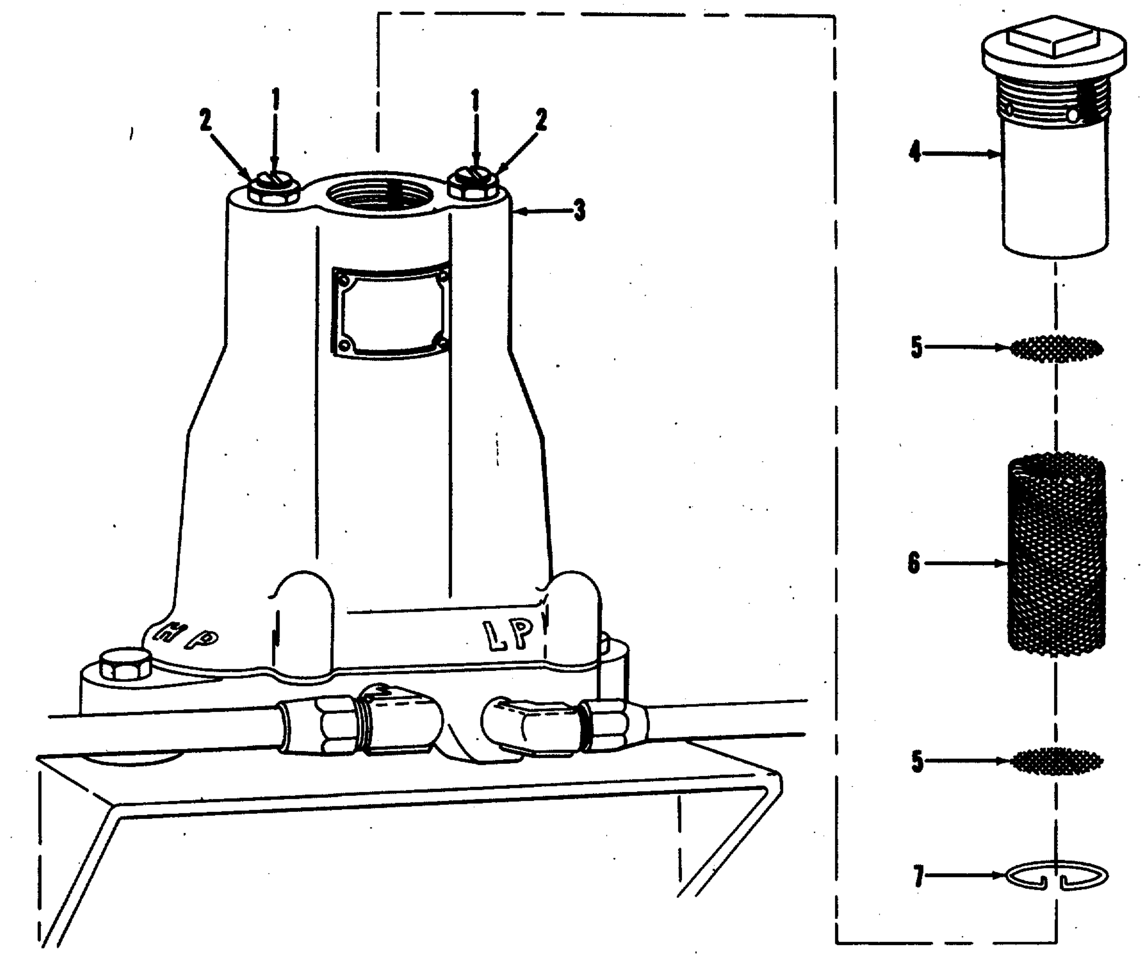
d. Sediment Strainer Removal.

WARNING

Before attempting to remove any compressed air system lines or components, relieve pressure from system. Failure to do so may result in injury or death to maintenance personnel.

(1) Open drain valves (10, fig. 2-78) on base of air tanks and vent compressed air system.

(2) Unscrew and remove sediment strainer from governor body.



1. Adjusting screw
2. Locknut
3. Governor body
4. Sediment strainer housing
5. Strainer plate
6. Strainer
7. Retaining ring

Figure 2-85. Air Compressor Governor Strainer, Exploded View.

e. Sediment Strainer Disassembly.

(1) Remove *retaining* ring (7, fig. 2-85) from sediment strainer housing (4).

(2) Remove strainer (6) and two strainer plates (5) from sediment strainer housing (4).

f. Sediment Strainer Cleaning and Inspection.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Clean strainer (6, fig. 2-85), strainer plates (5), and sediment strainer housing (4) in drycleaning solvent (item 6, App. C).

(2) Dry strainer (6) with low-pressure air not exceeding 10 psi (0.7 kg/cm^2).

(3) Replace strainer if ruptured or cannot be cleaned properly.

(4) Inspect sediment strainer housing (4) for ruptured condition. Report discrepancy to direct support maintenance.

g. Sediment Strainer Reassembly.

(1) Install two strainer plates (5, fig. 2-851 and strainer (6) into sediment strainer housing (4).

(2) Install retaining ring (7) into sediment strainer housing (4).

h. Sediment Strainer Installation.

(1) Install sediment strainer housing (4, fig. 2-85) into governor body.

(2) Close valves (10, fig. 2-79) on base of air tanks.

2-107. MAIN AIR SUPPLY FILTER.

a. General. The main air supply filter is located below the cab deck in the port aft storage compartment area below the service brake foot valve. The main air supply filter purifies the compressed air from the supply tank and serves to prevent water and foreign matter from entering the cab air control valves.

b. Inspection and Service.

(1) Inspect main air supply filter for air leakage. If leaking, tighten capscrews securing dirt chamber and line flanges to correct torque value. If leaking continues, report discrepancy to direct support maintenance.

(2) Drain air supply filter as follows:

(a) Close globe valves (6 and 7, fig. 2-78) located in air lines above air supply tanks and open service connecting globe valves (5) to vent air supply lines.

(b) Drain water and foreign matter accumulations from main air supply filter by removing drainplug (9, fig. 2-86).

(c) Inspect drainplug (9) for stripped or malformed threads. Replace defective drainplug.

(d) Replace drainplug (9) in base of main air supply filter.

(e) Close service connection globe valves (5, fig. 2-78) and open globe valves (6 and 7).

(3) Ensure attaching hardware securing main air supply filter is tightened to correct torque value.

c. Filter Element Removal.

WARNING

Before attempting to remove any compressed air system lines or components, relieve pressure from system. Failure to do so will result in injury or death to maintenance personnel.

(1) Close globe valves (6 and 7, fig. 2-78) located in air lines above air supply tanks and open service globe valves (5) to vent compressed air from lines.

(2) Remove two capscrews (8, fig. 2-86) and remove dirt chamber (7), gasket (6), element support (5), and element (4) from filter body (3).

d. Filter Element Cleaning, Inspection, and Repair.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(1) Rinse all parts in a clean solution of drycleaning solvent (item 6, App. C). Wipe all parts dry using a clean, lintfree cloth.

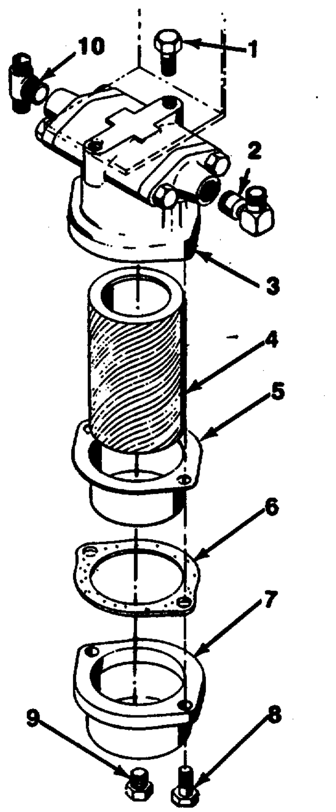


Figure *2-86. Main Air Supply Filter, Disassembly and Rassembly.*

TS 1930-203-20/2-86

1.	Capscrew	6.	Gasket
2.	Elbow	7.	Dirt chamber
3.	Filter body	8.	Capscrew
4.	Element	9.	Drainplug
5.	Element support	10.	Tee

(2) Blow filter element dry using compressed air not exceeding 10 psi (0.7 kg/cm2).

(3) Inspect element for deterioration of curled hair and felt mesh. Replace element if curled hair and felt mesh are deteriorated.

e. Filter Element Installation.

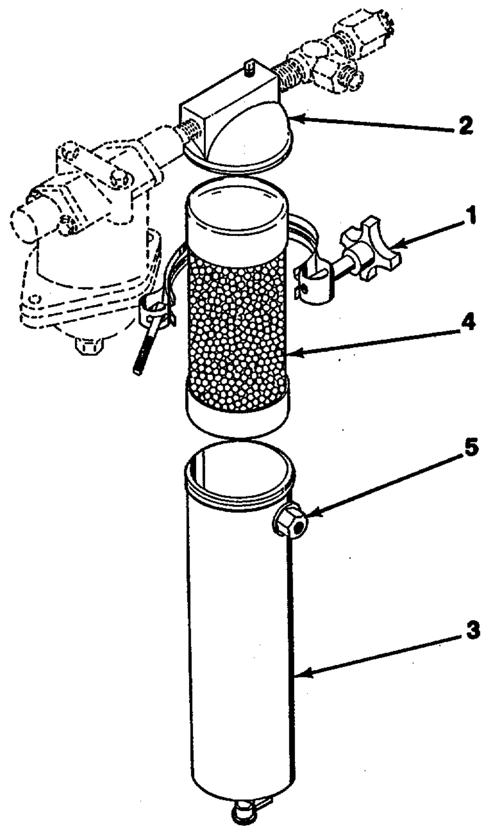
(1) Position gasket (6, fig. 2-86) on dirt chamber (7).

(2) Install element support (5) and insert element (4) into support.

(3) Install element assembly into filter body (3) and secure with two capscrews (8).

(4) Close service connection globe valves (5, fig. 2-78) and open globe valves (6) and (7) located in air lines above air supply tank.

2-107.1 SERVICE AIR DRYER



1. Strap clamp
2. Top
3. Housing
4. Cartridge
5. Sight window

Figure 2-86.1. Air Dryer.

a. Disassemble.

(1) Bleed air pressure off from compressed air system.

(2) Open strap clamp (1) and remove.

(3) Separate top (2) and housing (3) of air dryer.

(4) Remove cartridge (4) and replace.

b. Assemble.

(1) Insert replacement cartridge (4) into air dryer housing (3).

(2) Mate housing (3) to top (2) and securetogether using clamp (1). Ensure that sight window (5) is facing out, away from bulkhead.

2-108. AIR STARTING CONTROL AND SUPPLY SYSTEM.

a. General. The air starting control and supply system (fig. 2-87) is four individual air systems which supply compressed air to operate the air starters. Each individual systems consisting of two air starting pilot air valves, shuttle valve (or double check valve), quick-release valve, relay air valve, air starting filter, air starting gage, plug valve, and lubricator. When the starting button of the air starting pilot air valve is pressed, air actuates the relay air valve which will allow compressed air to flow to the air starter. All air flowing to the air starter is filtered through the air starter filter and is lubricated by the lubricator. The plug valve may be closed, stopping air flow to the air starter and allowing the air starting gage to be observed without the air starter being operated.

b. Inspection and Service.

(1) Inspect air starting valves for breakage. If damaged, notify direct support maintenance.

(2) Inspect air starting piping and tubing for rupture or crimping. Report discrepancy to direct support maintenance.

(3) Inspect air starting filter (7, fig. 2-87) for air leakage. Replace packings C2 or 4, fig. 2-88) if leakage is found.

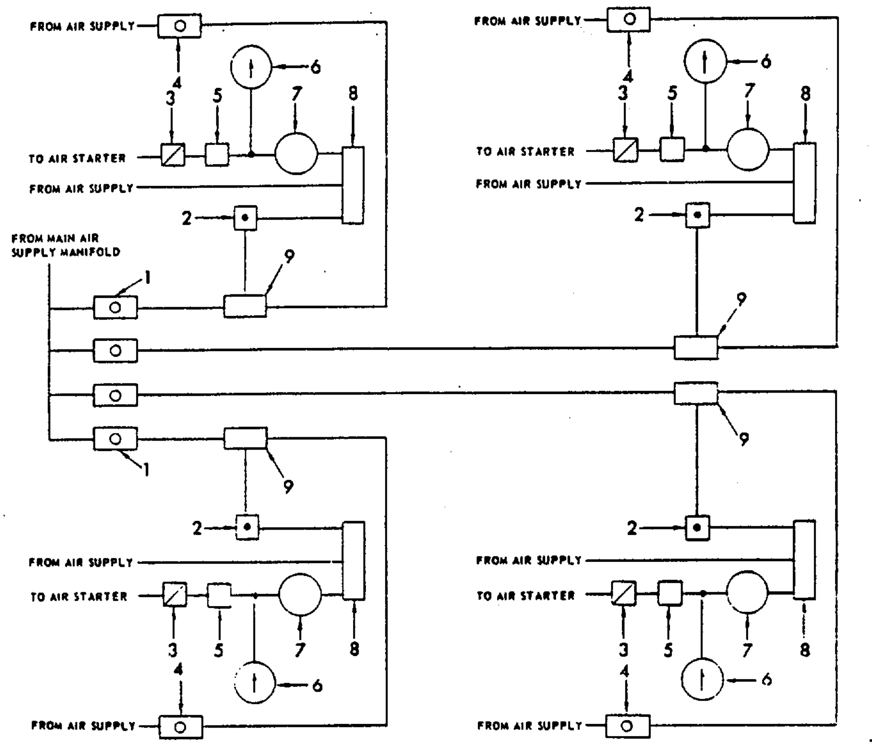


Figure 2-87. Air Starting Control and Supply Systems Diagram.

Legend for figure 2-87:

1. Air starting pilot air valve
2. Quick release valve
3. Lubricator
4. Air starting pilot valve
5. Plug valve
6. Air starting gage
7. Air starting filter
8. Relay air valve
9. Shuttle valve (or double check valve).

(4) Inspect air starting filter (7, fig. 2-87) and lubricator (3) for breakage. Report discrepancy to direct support maintenance.

(5) Inspect air starting lubricator (fig. 2-89) for air leakage. Replace gaskets (2, 6, 7, or 13) or O-ring packing (3) if leakage is found.

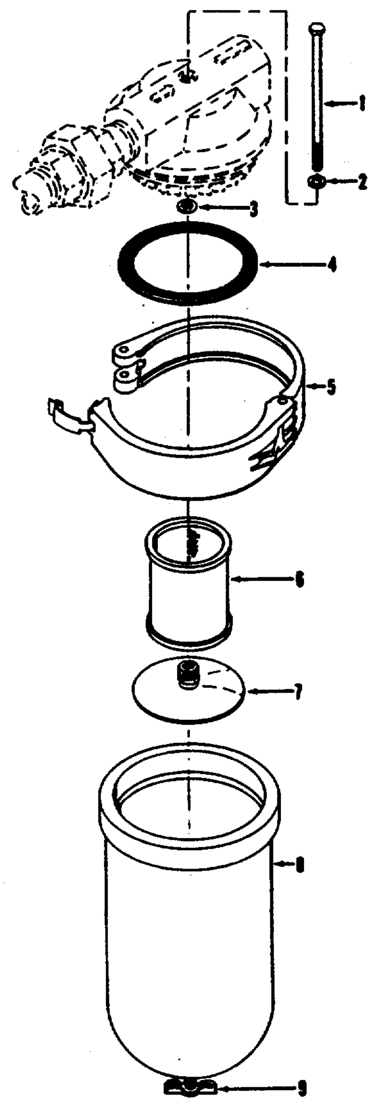


Figure 2-88. Air Starting Filter, Disassembly and Reassembly.

Legend for figure 2-88:

1. Filter screw
2. Packing
3. Retaining ring
4. Packing
5. Clampring
6. Filter element
7. Baffle
8. Filter bowl
9. Draincock

(6) Refill lubricator with oil (see lubrication order).

(7) Open draincock (9, fig. 2-88) on the bottom of the air filter bowl (8), drain moisture and dirt from bowl, and close draincock.

c. Adjustment.

(1) To check lubricator adjustment, activate the air starter on an engine observing lubricator for one drop per second into the sight-feed dome (1, fig. 2-89).

(2) Adjust the rate of oil flow to one drop per second into the sight-feed dome.

(3) Using a 3/32 inch Allen wrench inserted in to the oil feed adjusting screw (4), increase the rate of oil flow to the sight-feed dome by rotating the oil feed adjusting screw counterclockwise, or decrease the rate of oil flow to the sight-feed dome by rotating the oil feed adjusting screws clockwise. Proper adjustment of one drop per second into sight-feed dome will allow one drop every 20 seconds into air starting line.

d. Filter Element and Packing Removal.

(1) Unlatch clamp-ring (5, fig. 2-88) to remove filter bowl (8) and packing (4).

(2) Unscrew baffle (7) to remove filter element (6).

(3) Remove retaining ring (3) and push filter screw (1) and packing (2) out of filter body.

e. Filter Element and Packing Cleaning and Inspection.

(1) Rinse the filter bowl only with a petroleum solvent; wipe filter bowl dry using a clean, lint-free cloth.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

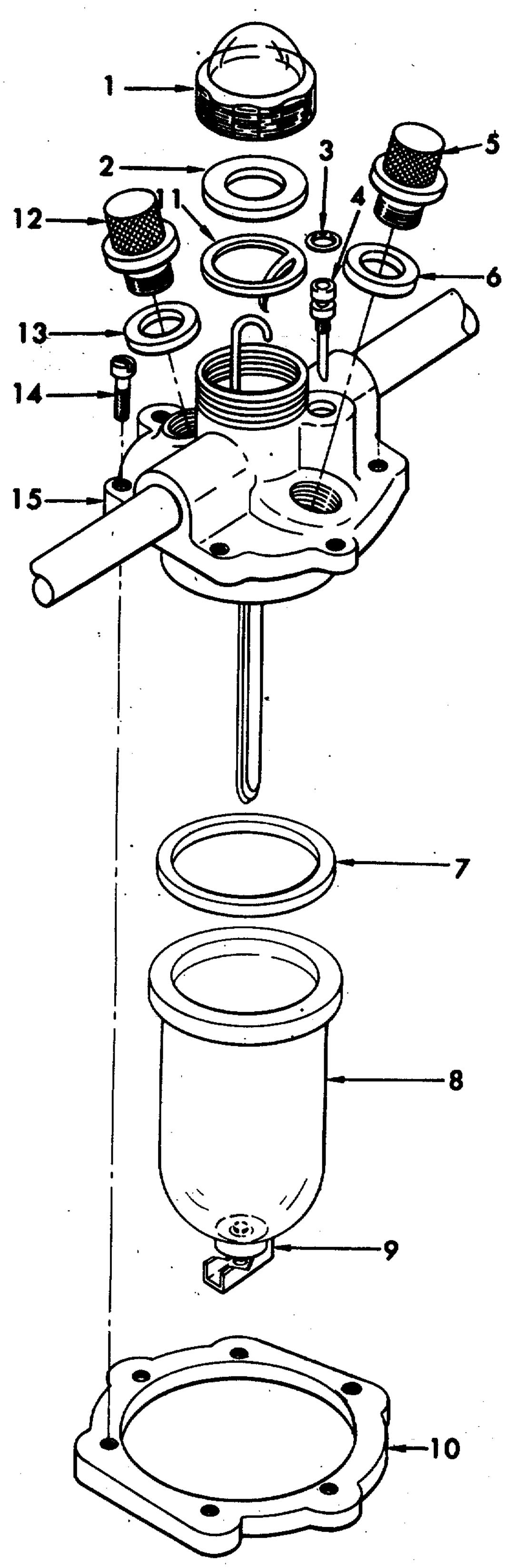


Figure 2-89. Air Starting Lubricator, Disassembly and Reassemby.

Legend for figure 2-89:

1. Sight-feed dome
2. Gasket
3. O-ring packing
4. Screw
5. Filler plug
6. Gasket
7. Gasket
8. Lubricator bowl
9. Draincock
10. Clamp ring
11. Lockwasher
12. Filler plug
13. Gasket
14. Screw
15. Body

(2) Clean baffle (7, fig. 2-88) and filter element (6) in drycleaning solvent (item 6, App. C). Blow baffle and filter element dry using dry, compressed air not exceeding 10 psi (0.7 kg/cm=).

(3) Inspect filter element (6) for broken, warped condition. Report discrepancy to direct support maintenance.

(4) Inspect packings (2 and 4) for broken or deteriorated condition. Replace defective packing.

f. Filter Element and Packing Installation.

(1) Install packing (2, fig. 2-88) on filter screw (1) and insert into filter body. Install retaining ring (3).

(2) Position- filter element (6) and install baffle (7).

(3) Position packing (4) and filter bowl (8) and secure with clamp ring (5).

g. Lubricator Gaskets Removal.

(1) Unscrew filler plugs (5 and 12, fig. 2-89) and remove gaskets (6 and 13).

(2) Unscrew sight-feed dome (1) and remove gasket (2).

(3) Remove six screws (14), clamp-ring (10), lubricator bowl (8) and gasket (7).

h. Lubricator Gaskets Installation.

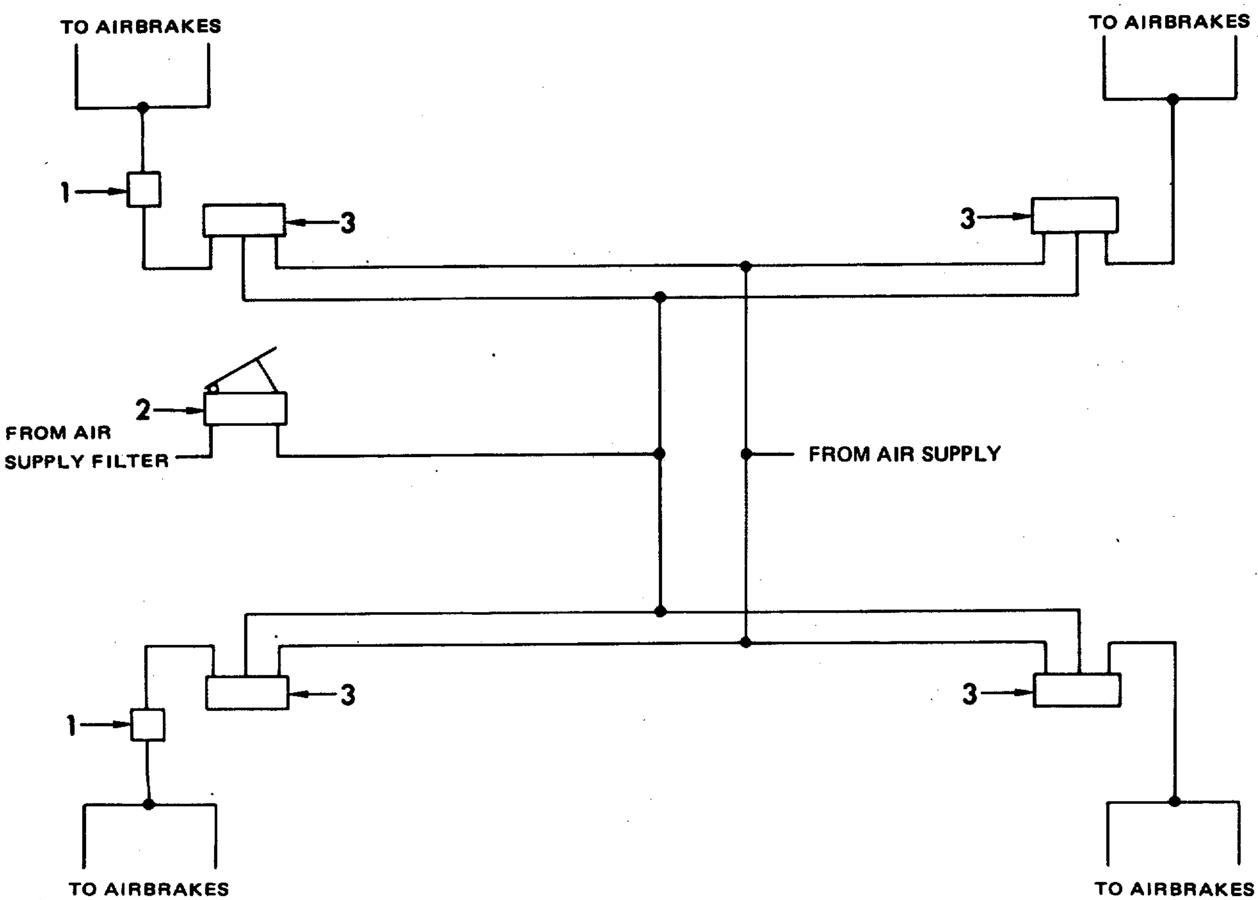
(1) Position gasket (7, fig. 2-89) and install lubricator bowl (9), clampring (10) and screws (14).

(2) Install gaskets (2) a sight-feed dome (1).

(3) Install gaskets (6 and 13) and filler plugs (5 and 12).

2-109. AIRBRAKE CONTROL AND SUPPLY SYSTEM.

a. General. The airbrake control and supply system (fig. 2-90) supplies air pressure to the airbrakes which restrain the horizontal miter box shafts. The airbrake control and supply system consists of a foot control valve located in the cab, two relay air valves mounted on the inboard bulkhead of each upper machinery compartment, and a globe valve mounted next to the aft port and starboard miter boxes. When the brake pedal of the foot control valve is pressed, air activates the relay air valve which allows air from the air supply tanks to flow to the brakes. When the brake pedal is released, all air is vented to the atmosphere from the air lines and airbrakes. The globe valves in the airbrake control system are provided so air may be isolated in the aft airbrakes for parking or maintenance.



TS 1930-200/240

1. Globe valve
2. Foot control valve
3. Relay air valve

Figure 2-90. Air Brake Control and Supply System Diagram.

b. Inspection and Service.

(1) Examine foot control valve (2, fig. 2-90) and relay air valves (3) for breakage. Report discrepancy to direct support maintenance.

(2) Check air lines for loose connections with a soapy water solution. Tighten all loose connections.

(3) Inspect air lines and fittings for ruptured or crimped condition. Report discrepancy to direct support maintenance.

(4) Using an oil can filled with OE30 oil, lubricate plunger of foot control valve.

(5) With air lines pressurized and globe valves closed, check valve stems at packing retaining nut for air leakage with a soapy water solution. If leakage is found, replace packing in stuffing box.

(6) Operate foot control valve and listen to operation of each relay air valve. Report discrepancy to direct support maintenance.

(7) Examine globe valves (1, fig. 2-90) for breakage. Report discrepancy to direct support maintenance.

c. Adjustment. Check foot control valve for proper delivery pressure adjustment as follows:

WARNING

Before starting the engines ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(1) Start engines and place LARC in motion.

(2) Slowly apply foot control valve and observe braking action of LARC.

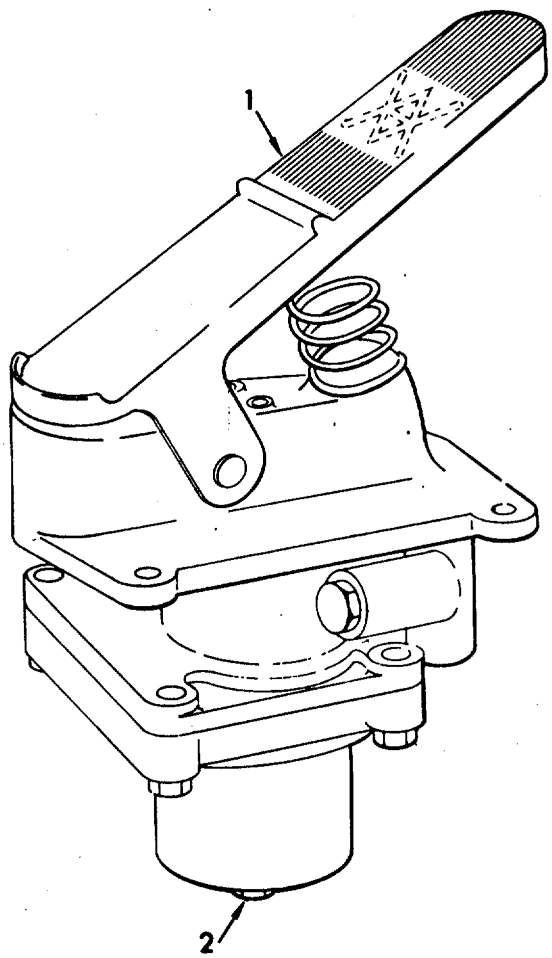
(3) If brakes do not lock all wheels at desired pedal position, adjust delivery pressure as follows:

(a) Increase delivery pressure by turning adjusting screw (2, fig. 2-91) clockwise.

(b) Decrease delivery pressure by turning adjusting screw counterclockwise.

(4) Place LARC in motion and repeat adjustment procedure.

(5) If foot control valve is properly adjusted, stop engines.



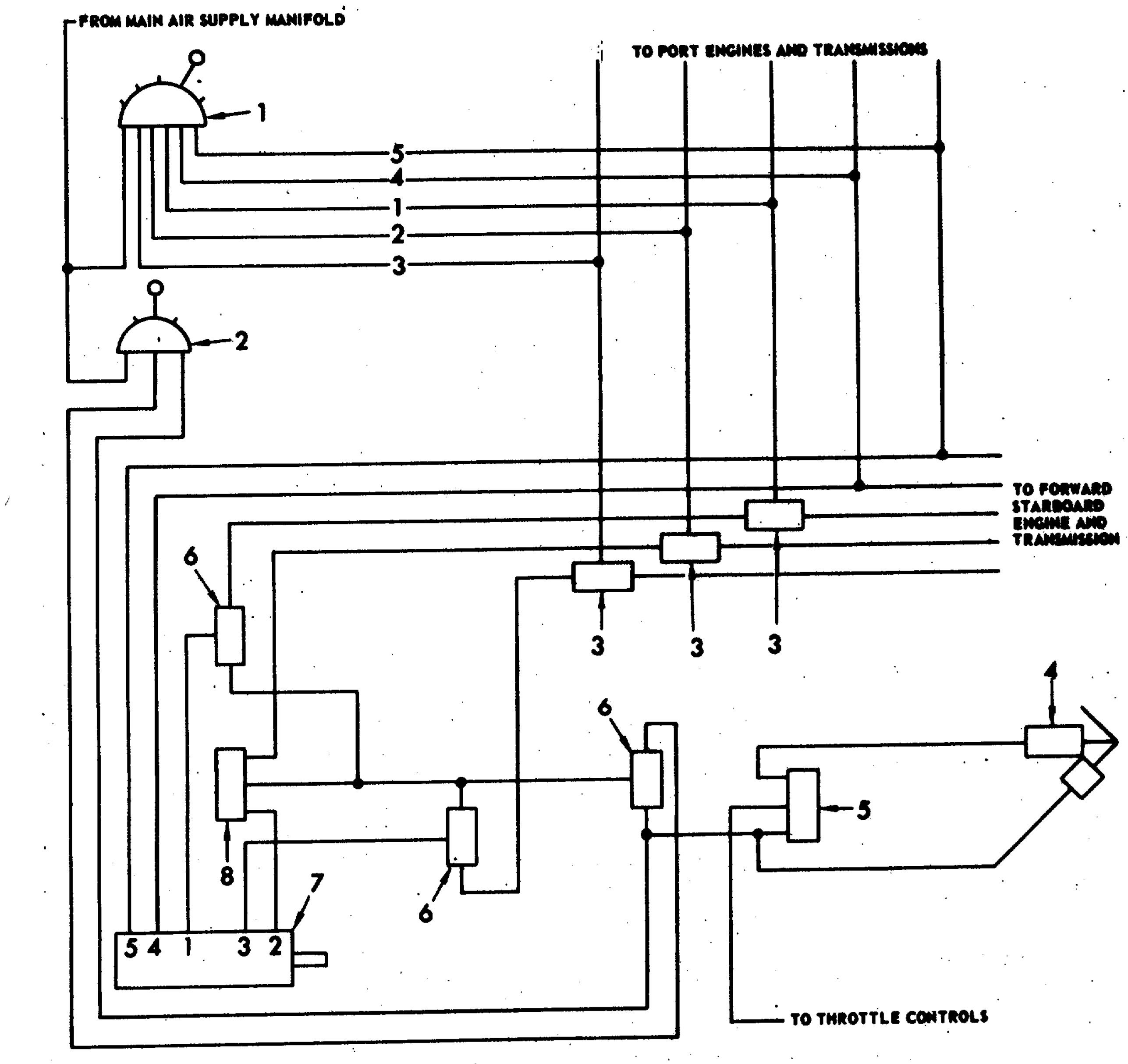
1. Foot control valve
2. Adjusting screw

Figure 2-91. Foot Control Valve; Adjustment

(6) Examine globe valves (1, fig. 2-90) for breakage. Report discrepancy to direct support maintenance.

2-110. TRANSMISSION SHIFTING CONTROL SYSTEM.

a. General. The transmission shifting control system (fig. 2-92) consists of a transmission control valve (fig. 2-93), six quick-release valves, eight shuttle valves or double check valves, four relay air valves, and four transmission shifting control cylinders. The transmission shifting control cylinders located on the side of each transmission, shift the transmission to the position corresponding to that of the transmission control valves. The control valve, located on the port bulkhead of the cab, is so constructed that it applies air pressure at two or more ports of each transmission shifting control cylinder simultaneously. Port one, two, and three air lines are equipped with quick release valves for the purpose of speeding up venting of air lines to the atmosphere during shifting for one gear to the other. Hulls 5 through 18 were originally equipped with quick-release valves (fig. 2-94) which differ from those installed in hulls 19 through-60. Shuttle valves or double check valves in ports one and three air lines and relay air valve in port two air line enable the transmission shifting control cylinder to be operated by the engine cutout system. All double check valves requiring replacement shall be replaced with shuttle valves. The shuttle valves serve the same purpose as double check valves.

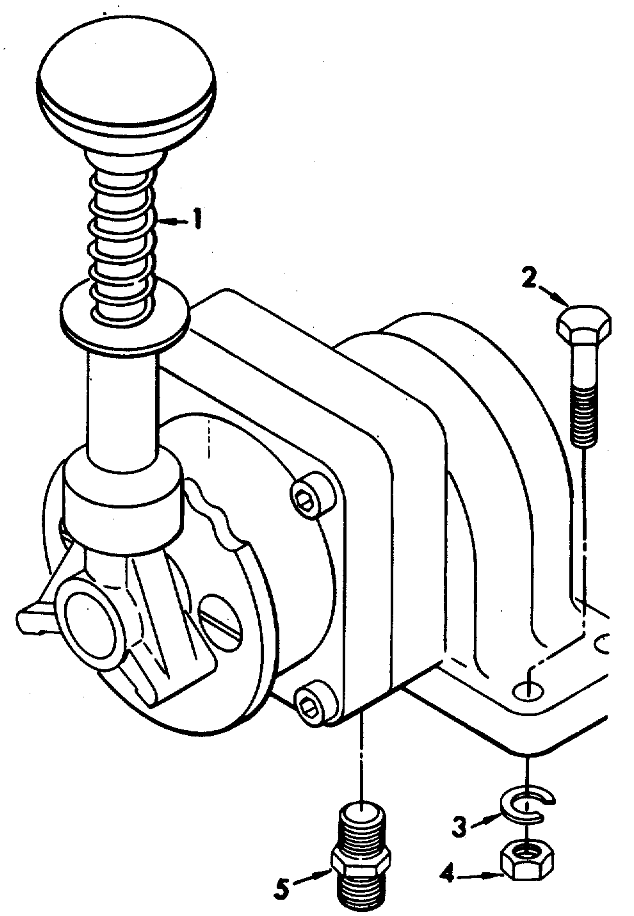


TS 1930-203-20/2-02

Figure 2-92. Transmission Shifting Control and Engine Cutout Systems Diagram.

Legend for figure 2-92:

1. Transmission control valve
2. Pilot air valve
3. Quick-release valve
4. Actuator positioner
5. Relay air valve
6. Shuttle valve (or double check valve)
7. Transmission shifting control cylinder
8. Relay air valve



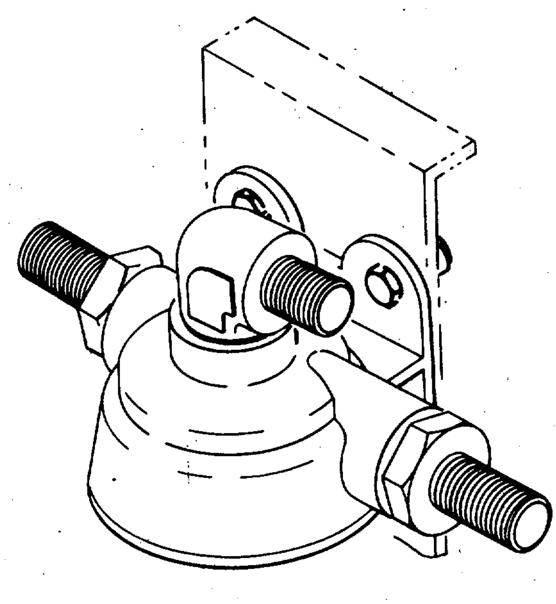
TS 1930-203-20/2-93

1. Control valve
2. Bolt
3. Lockwasher
4. Nut
5. Coupling

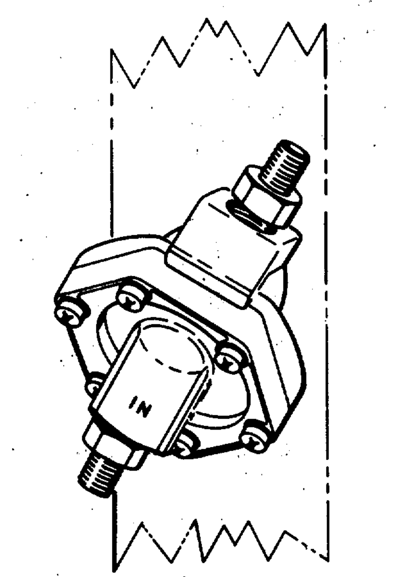
Figure 2-93. Transmission Control Valve.

b. Inspection and Service.

(1) Check air hoses connected to each transmission shifting control cylinder for loose connections or ruptured condition with a soapy water solution. Tighten all loose connections and replace all ruptured hoses.



HULLS 5 THROUGH 18



HULLS 19 THROUGH 60

TS 1930-203-20/2-94

Figure 2-94. Quick Release Valves.

(2) Check transmission shift control system by shifting transmission control valve through all ranges, observing operation of each transmission shifting control cylinder. Report discrepancy to direct support maintenance.

(3) Inspect transmission control valve, transmission shifting control cylinders-, and quick-release valves for breakage. Report discrepancy to direct support maintenance.

(4) Ensure transmission control valve, transmission shifting control cylinders, and relay air valves attaching hardware are tightened to correct torque values.

(5) Lubricate the pivot shaft of the transmission control valves control lever and lubricate piston rods of transmission shifting control cylinders (see lubrication order).

(6) Check all air tubing for loose connections with a soapy water solution. Tighten loose connections.

(7) Test all air tubing and fittings for ruptures with a soapy water solution. Report discrepancy to direct support maintenance.

(8) Inspect double check valves or shuttle valves for breakage. Report discrepancy to direct support maintenance.

2-111. ENGINE CUTOUT CONTROL SYSTEMS.

a. General. The four engine cutout control systems (fig. 2-92) are used to secure the four engines and to shift the four transmissions to neutral. Each system consists of a pilot air valve (2), located in the cab, two relay air valves (5 and 8), and three shuttle valves (or double check valves) (6). When the pilot air valve lever is moved forward of the neutral positions, air flows to the throttle relay air valve (5), the small cylinder of the actuator positioner (4), and a shuttle valve (6). The throttle relay air valve (5) blocks the air supply line to the large cylinder of actuator positioner (4) and vents the large cylinder to the atmosphere. The small cylinder of the actuator positioner (4) moves the control rod to the NO FUEL position and shuts off the engine. Air from the shuttle valve (6) flows to the relay air valve (8) and to the shuttle valves (6} that are in port one and port three airlines. The transmission relay air valve blocks port two air supply line and vents port two or the transmission shifting control cylinder to the atmosphere. Air flowing through shuttle valves (6) that are in port one and port three air lines is routed to ports one and three of the transmission shifting control cylinder (7). If the transmission is in first or reverse gear, the transmission shifting control cylinder (7) shifts the transmission to neutral. When the control lever is moved aft of the neutral position, air flows through the opposite side of the shuttle valve (6) and shifts the transmission to neutral in the same manner.

b. Inspection and Service.

(1) Inspect engine cutout pilot air valves (2, fig. 2-92) for leaks and breakage. Report discrepancy to direct support maintenance.

(2) Ensure attaching hardware that secures engine cutout pilot air valve (2) is tightened to correct torque value.

(3) Operate each engine cutout pilot air valve (2) and observe components being actuated. Report discrepancy to direct support maintenance.

(4) Test all air lines for loose connection with a soapy water solution. Tighten all loose connections.

(5) Inspect air tubing and fittings for crimped or ruptured condition. Report defective tubing and fittings to direct support maintenance.

(6) Lubricate valve control lever pilot shaft.

2-112. THROTTLE CONTROL SYSTEM.

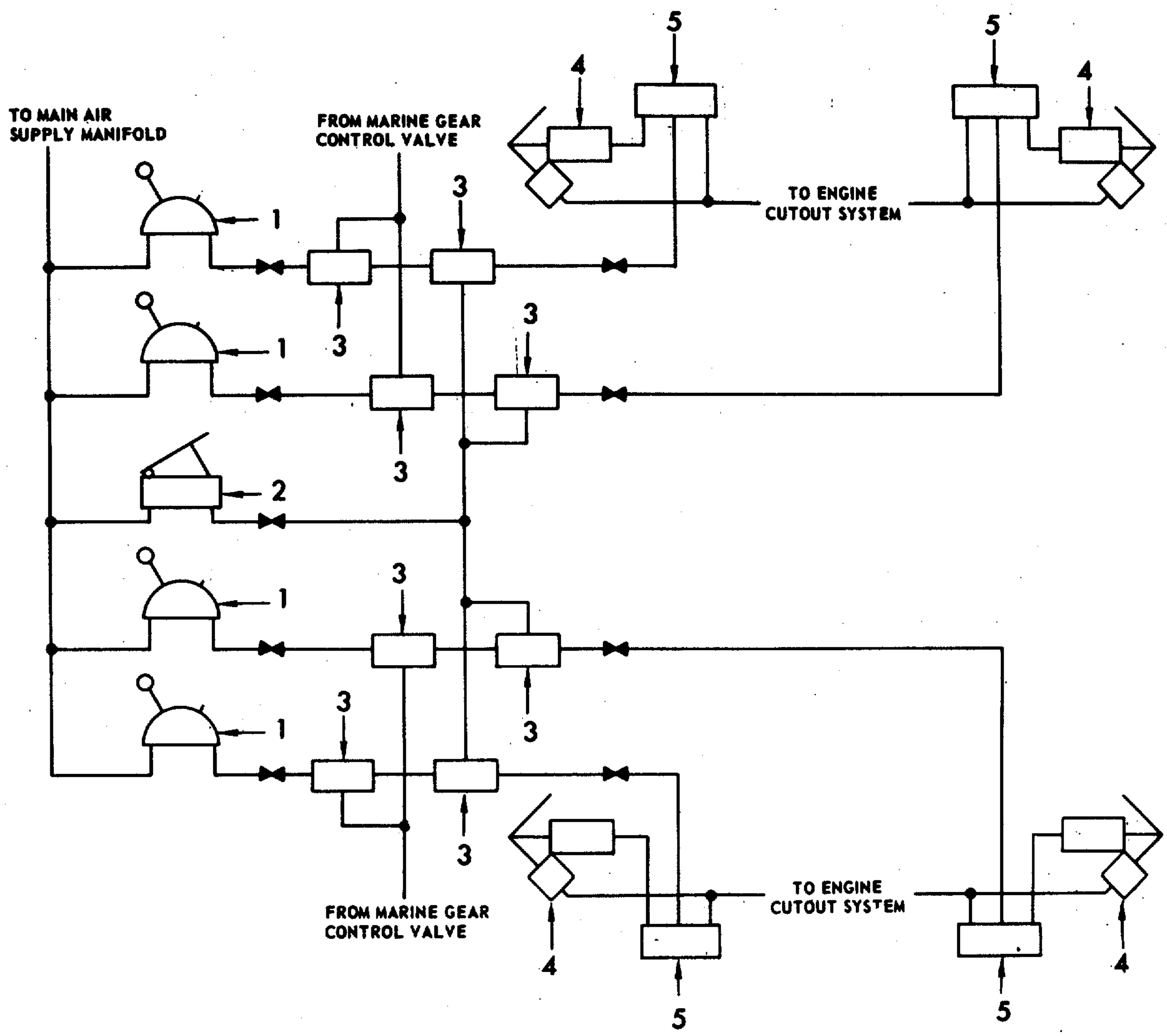
a. General. The throttle control system (fig. 2-95) is an air pressure system for controlling the speed of all four engines. The system consists of four hand throttle control valves, a foot control valve, four relay air valves, eight double check valves or shuttle valves, and four actuator positioners. Movement of each throttle control valve causes the corresponding actuator positioner control rod to move proportionally. The actuator positioners, mounted on the torque converters, control the speed of the engines by varying the position of the engine governor throttle control shafts. All engines may be operated simultaneously by the foot control valve which is connected to the throttle control air line with a double check valve. Double check valves are used to connect the marine gear control system to the throttle control system. All double check valve requiring replacement shall be replaced with shuttle valves. The shuttle valves serve the same purpose as double check valves. The relay air valves are used in throttle controls stem so that the engine cutout control system will operate.

b. Inspection and Service.

(1) Check air hoses attached to actuator positioner for loose connections or ruptures with a soapy water solution. Tighten all loose connections and replace all ruptured or defective hoses.

(2) Check operation of all control valves and observe action of actuator positioner. Report any discrepancies to direct support maintenance.

(3) Examine the hand throttle control valves (1, fig. 2-95), foot control valve (2), shuttle valves (or double check valves) (32, relay air valves (5), and actuator positioner (4) for breakage. Report any discrepancies to direct support maintenance.



TS 1930-203-20/2-95

1. Hand throttle control valve
2. Foot control valve
3. Shuttle valve (or double check valve)
4. Actuator positioner
5. Relay air valve

Figure 2-95. Throttle Control System Diagram.

(4) Lubricate pivot shaft on levers of hand throttle control valve and lubricate actuator positioners linkage (see lubrication order).

(5) Check air tubing for loose connections and ruptures with a soapy water solution. Tighten all loose connections, observing proper torque values. Report leaking connections and all ruptures to direct support maintenance.

(6) Inspect shuttle valves or double check valves for breakage. Report discrepancies to direct support maintenance.

c. Hand Throttle Control Valve Adjustment.

(1) Check that all linkages are correctly connected. Place all hand throttle control valves in the idle position. Start engines and check tachometer for correct indication of 550 rpm.

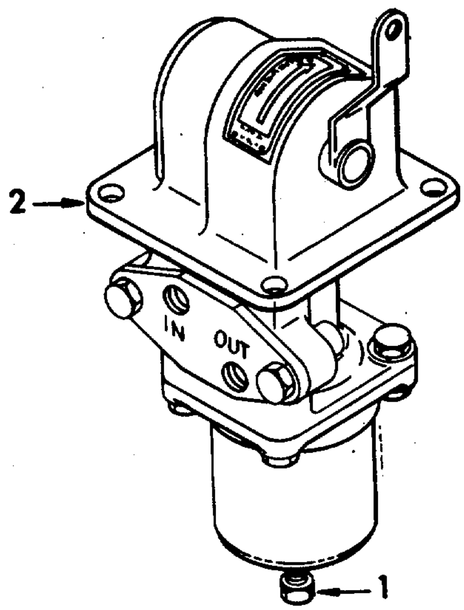
(2) Turn adjusting screw (1, fig. 2-96) on base of hand throttle control valve clockwise to increase delivery pressure and engine rpm.

(3) Turn adjusting screw (1) counterclockwise to decrease delivery pressure and engine rpm.

(4) Observe tachometers for proper idle speed (550 rpm) of engines.

(5) If engines fail to idle at 550 rpm, disconnect actuator positioner rod assembly and observe engine tachometers. Tachometers should indicate 550 rpm. If engines still fail to idle at 550 rpm, comply with paragraph 2-81.

(6) Reconnect linkage. Engines failing to idle at 550 rpm require adjustment of corresponding hand throttle control valves. Adjust delivery pressure of throttle control valves per step (2) or C3) above.



TS 1930-203-20/2-96

1. Adjusting screw
2. Hand throttle control valve

Figure 2-96. Hand Throttle Control Valve, Adjustment.

d. Foot Control Valve Adjustment.

WARNING

Before starting the engine, ensure that no one is in the machinery well. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(1) Start engine and place foot control valve in the maximum rpm position.

(2) Observe the tachometers on the instrument panel for maximum engine rpm (2100 + or - 50 rpm).

(3) Adjust foot control valve delivery pressure if all engines fail to reach maximum rpm as follows:

(a) Turn adjusting screw (2, fig. 2-91) on base of foot control valve clockwise to increase delivery pressure and engine rpm.

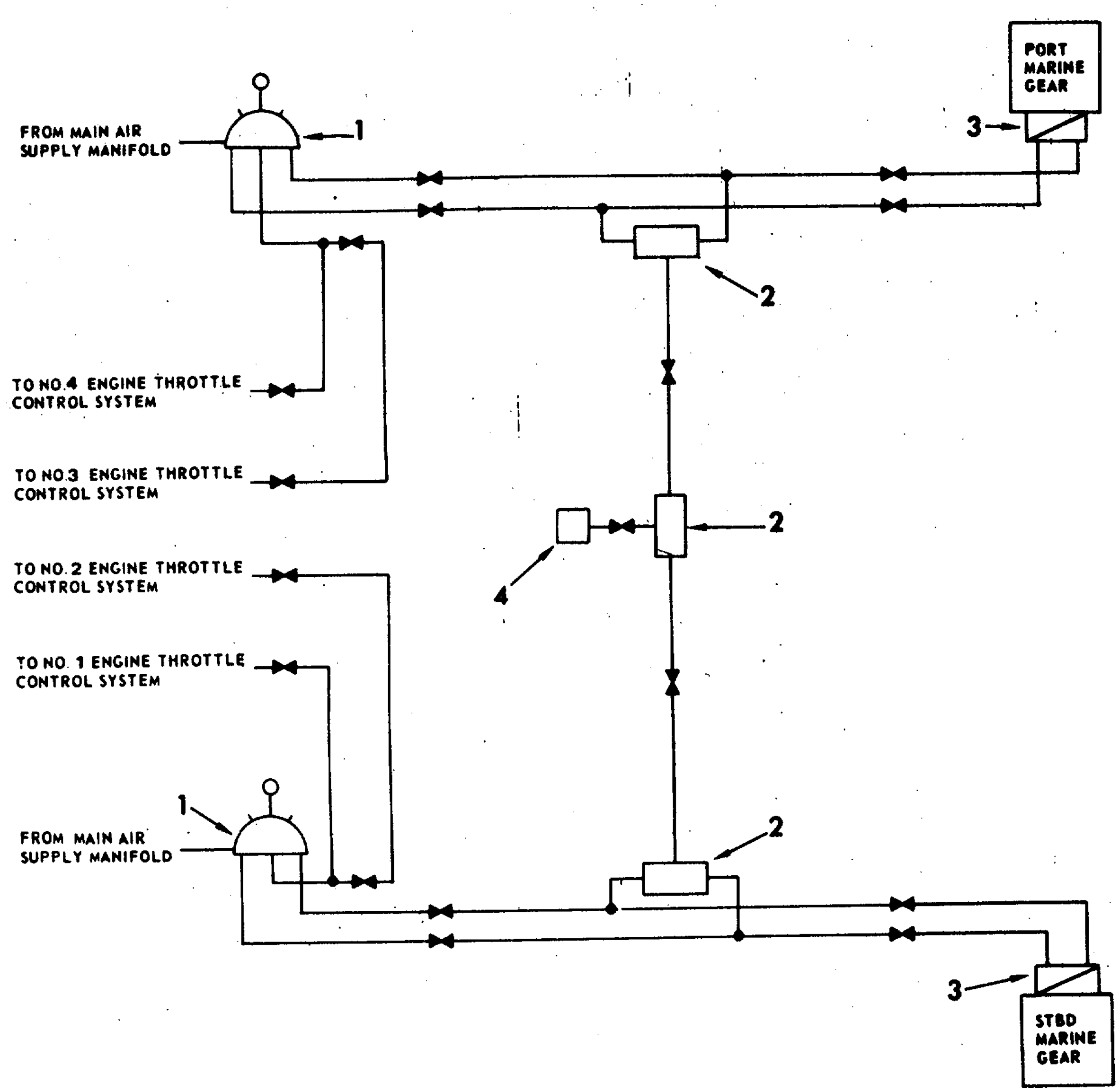
(b) Turn adjusting screw (2) counterclockwise to decrease delivery pressure engine rpm.

(c} Observe tachometers for maximum engine rpm (2100 + or - 50 rpm).

(4) Stop engines.

2-113. MARINE GEAR AND RADIATOR FAN CONTROL SYSTEM.

a. General. The marine gear and radiator fan control system (fig. 2-97) shifts the marine gear from neutral to forward or reverse and shuts off the radiator fan motors during marine operation. The marine gear and radiator fan control system consists of a port and starboard marine gear shifting and throttle control valve located on the instrument panel, three shuttle valves (or double check valves) located below the radiator fan controls in the cab, a single-acting cylinder located below the radiator fan controls and a logan valve located on the marine gear. Moving the control lever of the marine gear shifting and throttle control valve from NEUTRAL to FORWARD or REVERSE activates the corresponding marine gear Logan valve which shifts the marine gear to forward or reverse. After marine gear engagement in reverse or forward; continued movement of the control lever will increase engine speed for idle to full speed, with full speed being reached at the end of the control lever travel. Moving the control lever to NEUTRAL decreases engine speed to idle. The control lever can be placed and left in any position within the shifting and speed portion of its travel. The marine gear shifting and throttle control valves are connected by shuttle valves (or double check valves) to a single-acting cylinder which automatically moves the radiator fan controls to shut off the radiator fan motors when a marine gear shifting and throttle control valve is. placed in any position other then NEUTRAL.



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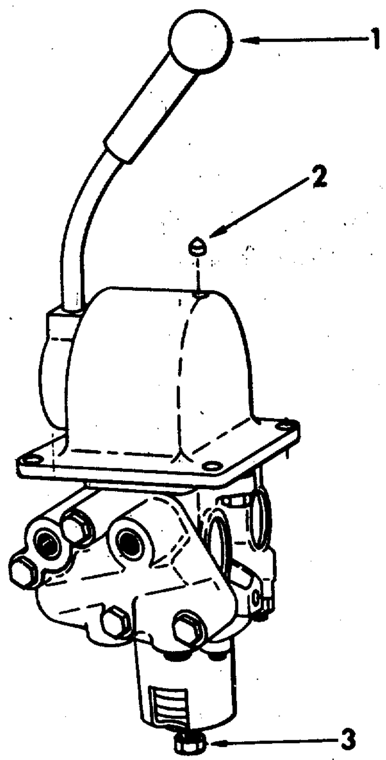
1. Marine gear shifting and throttle control valve
2. Shuttle valve (or double check valve)
3. Logan valve
4. Single-acting cylinder

Figure 2-97. Marine Gear and Radiator Fan Control System Diagram.

b. Inspection and Service.

(1) Examine oilers (2, fig. 2-98) in control valves to ensure oilers are-clean and not clogged. Clean or replace oilers.



TS 1930-203-20/2-96

1. Control valve
2. Oiler
3. Adjusting screw

Figure 2-98. Marine Gear Shifting and Throttle Control Valve.

(2) Examine marine gear shifting and throttle control valves (1, fig. 2-97), shuttle valves (or double check valves) (2), and single-acting cylinder (4) for cracks. Report any discrepancy to support maintenance.

(3) Ensure attaching hardware of marine gear control valves and single-acting cylinder are present and tightened to correct torque value.

(4) Check all air tubing for loose connections with a soapy water solution. Tighten all loose connections.

(5) Inspect all air tubing and fittings for ruptured or crimped condition. Report any discrepancies to direct support maintenance.

(6) Activate marine control valves and observe action of single-acting cylinders. Report any discrepancies to direct support maintenance.

c. Adjustment.

(1) Check marine gear shifting and throttle control valves delivery pressure adjustment as follows:

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear, before proceeding.

(a) Start port engines.

(b) Place the MASTER SWITCH to the ON position and advance appropriate hand throttle to one-quarter open.

(c) Press the starter button for not more than 30 seconds. When the engine starts, release the starter button and place control lever of port marine gear control valve in maximum forward position observing port tachometer for maximum (2100) rpm; place control lever in neutral.

(2) Repeat this procedure for starboard engines.

(3) Should port or starboard engines fail to reach maximum rpm, adjust corresponding marine gear control valves delivery pressure as follows:

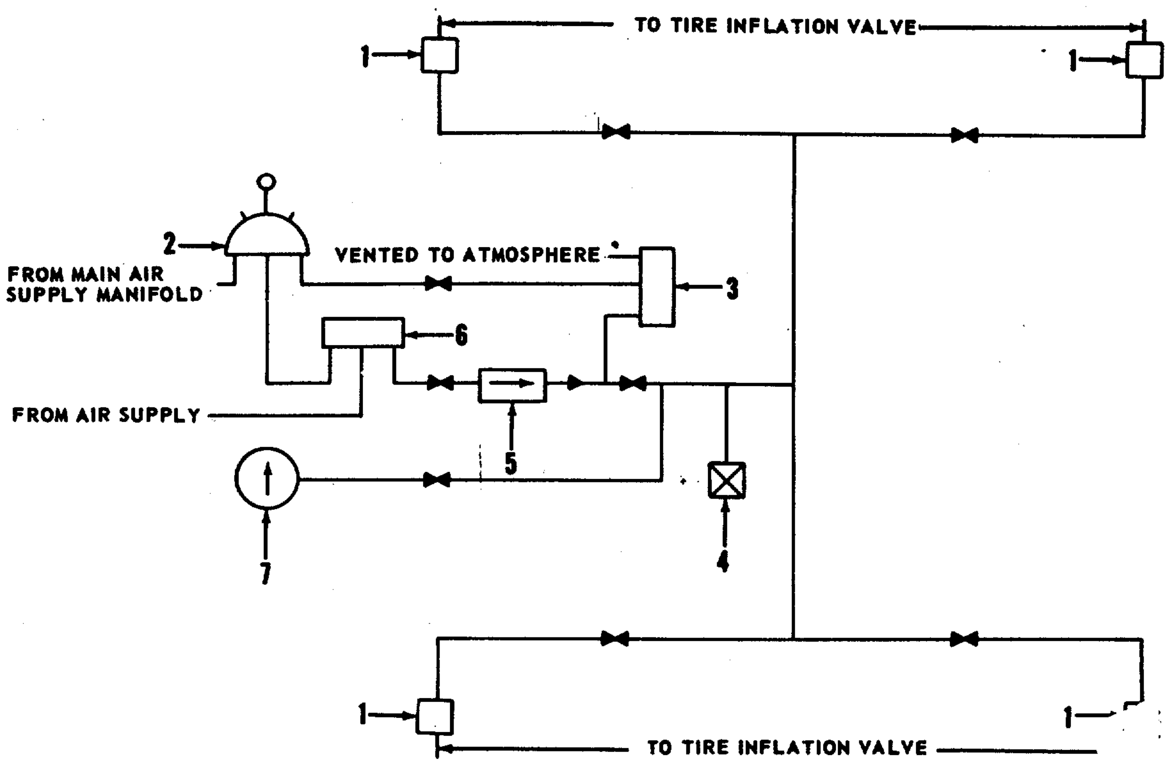
(a) Turn adjusting screw (3, fig. 2-98) on base of control valve clockwise to increase delivery pressure and engine rpm.

(b) Observe tachometer for proper (2100) rpm.

(4) Stop engines.

2-114. TIRE INFLATION-DEFLATION CONTROL AND SUPPLY SYSTEM.

a. General. The tire inflation-deflation control and supply system (fig. 2-99) supplies air pressure to inflate all tires. The system consists of a pilot air valve, two relay air valves, a check valve, a safety relief valve, and four angle globe valves. There are three positions of the pilot air valve mounted on the right side of the instrument panel; neutral, inflate, and deflate. When the control lever of the control valve is placed in the inflate position, the inflation relay air valve will operate and allow air to flow to the tires. A safety relief valve will not allow the tires to be inflated above 70 psi (4.9 kg/cm2). Moving the control lever of the control valve to deflate will operate the deflation relay air valve and allow compressed air in the lines into vent to the atmosphere. A tire cannot be deflated by the pilot air valves unless the inflation valve in the wheel is depressed and locked in the deflate position (fig. 2-100). The air line to each tire has a manually operated angle globe valve to isolate a tire during maintenance to the wheel or system.



1. Angle globe valve
2. Pilot air valve
3. Deflation relay air valve
4. Safety, relief valve
5. Check valve
6. Inflation relay air valve
7. Tire gage

Figure 2-99. Tire Inflation - Deflation Control and Supply System Diagram.

b. Inspection.

(1) Inspect valves (1, 2, 3, 5, and 6, fig. 2-99) for breakage. Report discrepancies to direct support maintenance.

(2) Open a tire inflation valve and check operation of the pilot air valve (2) and relay air valves (3 and 6) by deflating and inflating 5 psi (0.35 kg/cm2). Close tire inflation valve and report any discrepancies to direct support maintenance.

(3) With air lines pressurized and angle globe valves closed, check valve stems at packing retaining nut for air leakage with a soapy water solution. If leakage is found, replace packing in stuffing box.

(4) Check air lines for loose connections and ruptures with a soapy water solution. Tighten all loose connections to proper torque value.

(5) Inspect air lines and fittings for ruptured or crimped conditions. Report discrepencies to direct support maintenance.

c. Safety Relief Valve Adjustment.

(1) Close all angle globe valves (1, fig. 2-99) and while observing the tire gage (7), slowly inflate the air lines to 70 psi (4.9 kg/cm2) with the pilot air valve (2). If safety relief valve (4) does not open at 70 psi (4.9 kg/cm2), adjust as follows:

(a} Loosen capnut to allow room for regulating nut to be moved.

(b) Turn regulating nut clockwise to increase release pressure or counterclockwise to decrease release pressure.

(c) Set safety relief valve to release 70 psi (4.9 kg/cm2).

NOTE

If safety relief valve will not release or take adjustment, replacement is required.

(d) Tighten capnut when proper adjustment is achieved.

(2) Open all angle globe valves.

d. Globe Valve Packing Removal.

(1) Open globe valve fully.

(2) Unscrew nut (1, fig. 2-79) from stem (5) and remove handwheel (2).

(3) Unscrew packing retaining nut (3) and remove packing (4) from stuffing box.

e. Globe Valve Packing Installation.

(1) Install packing (4, fig. 2-79) and retaining nut (3) on. stem (5).

(2) Install handwheel (2) and nut (1).

f. Safety Relief Valve Removal.

(1) Close tire inflation valves in the wheels (fig. 2-100).

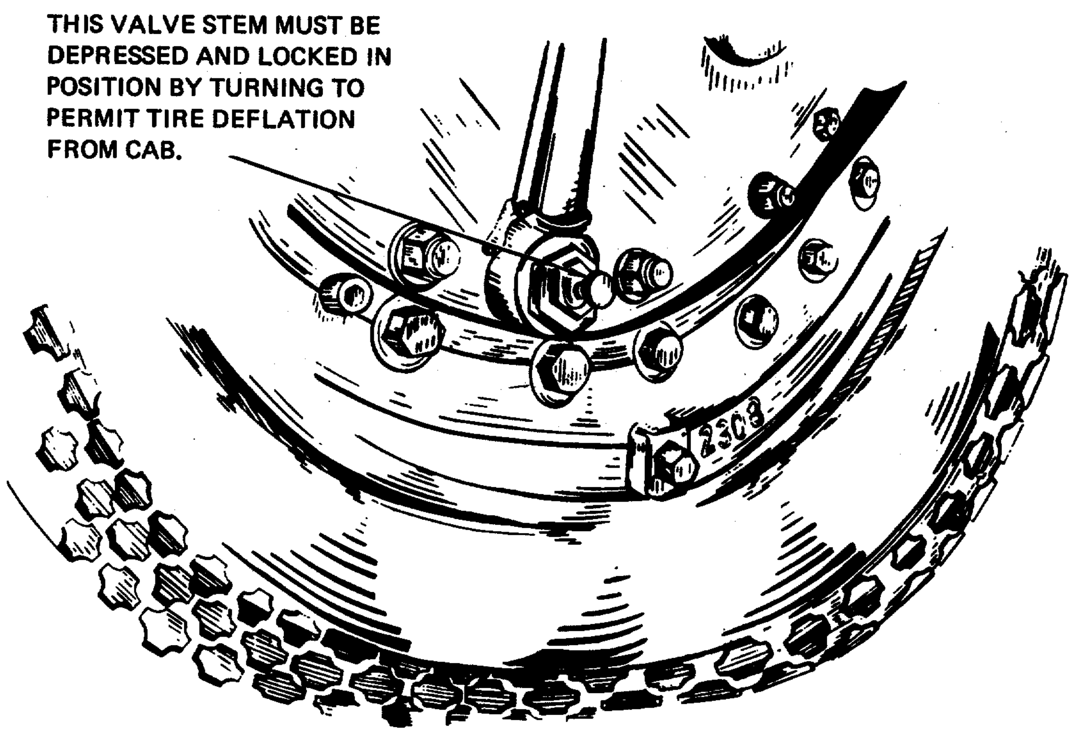


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Figure 2-100. Tire Inflation Check Valve.

(2) Position pilot air valve (2, fig. 2-99) to deflate.

WARNING

Before attempting to remove any compressed air systems lines or components, relieve pressure from system. Failure to do so may result in injury or death to maintenance personnel.

(3) Unscrew safety-relief valve.

g. Safety Relief Valve Installation.

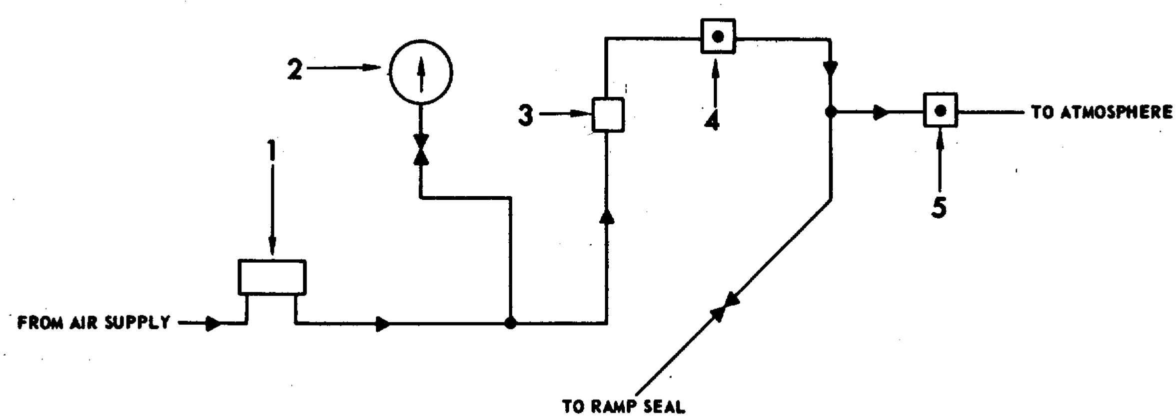
(1) Install safety relief valve.

(2) Position pilot air valve (2, fig. 2-99) to inflate.

(3) Open tire inflation valves.

2-115. RAMP SEAL CONTROL AND SUPPLY SYSTEM.

a. General. The ramp seal control and supply system (fig. 2-101) is used to inflate or deflate the ramp seal. The system consists of a reducing valve, two quick-opening valves, and a plug valve. During the ramp raising procedure when the ramp is almost closed, a trip lever is moved by the ramp and allows the deflation quick-opening valve to close. When the ramp is completely closed and latched, the starboard ramp latch lever holds the inflation quick-opening valve in its open position to inflate the ramp seal with a maximum air pressure of 15 psi (1.05 kg/sq cm). Air pressure delivered to the ramp seal is indicated on an air gage located on the starboard forward just aft and below the starboard ramp latch. When unlatching the ramp, the starboard ramp latch allows the quick-opening valve at the ramp latch to close, shutting off air pressure to the ramp seal. Downward movement of the ramp allows the trip lever to open the quick-opening valve and exhaust air within the ramp seal to the atmosphere.



TS 1930-203-20/2-101

1. Reducing valve
2. Ramp seal gage
3. Plug valve
4. Inflation quick-opening valve
5. Deflation quick-opening valve

Figure 2-101. Ramp Seal Control and Supply System Diagram.

b. Inspection and Service.

(1) Inspect all valves within the ramp seal inflation-deflation system for leaks and breakage. Report any discrepancy to direct support maintenance.

(2) Check all air lines for loose connections with a soapy water solution. Tighten loose connections to correct torque value.

(3) Inspect air lines and fittings for a crimped or ruptured condition. Report defective air lines and fittings to direct support maintenance.

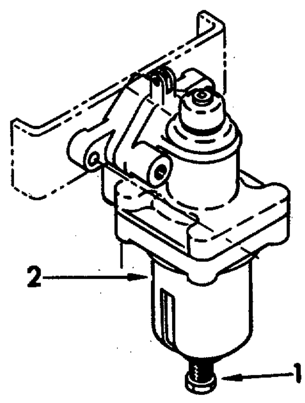
(4) Lubricate all working parts of the deflation quick-opening valve trip lever (see lubrication order).

(5) Check air to ensure air pressure does not exceed 15 psi C1.05 kg/cm) with ramp raised and seal inflated. Should the air gage pressure exceed 15 psi (1.05 kg/sq cm), adjust the-reducing valve 1, fig. 2-101).

c. Adjustment.

(1) Turn adjusting bolt (1, fig. 2-102) on base of reducing valve counterclockwise until adjusting screws turns freely.

(2) Turn adjusting bolt (1) slowly clockwise until air gage registers 15 psi (1.05 kg/cm2).



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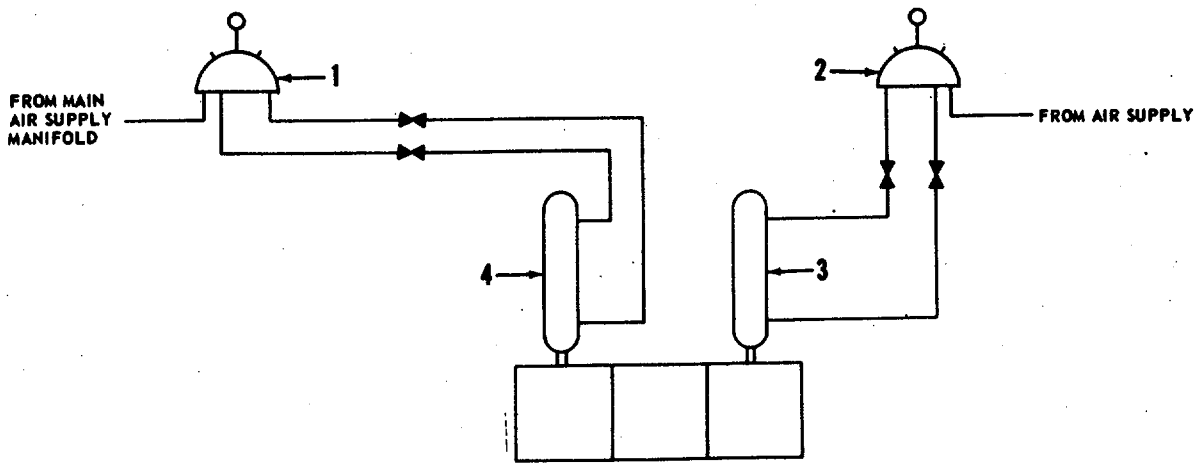
1. Adjusting bolt
2. Reducing valve

Figure 2-102. Reducing Valve Adjustment.

2-116. CARGO WELL PUMP CONTROL SYSTEM.

a. General. The cargo well pump control system (fig. 2-103) consists of two pilot valves located in the cab and two double-acting air cylinders located amidship in the upper machinery areas directly above the multiple unit valves. The pilot air valves are three-position valves. Moving the control lever from neutral to normal operation or emergency operation will apply air pressure to the double-acting air cylinder which actuates the corresponding section of the multiple unit valve which supplies hydraulic fluid to the cargo well pump.



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1. Cargo well pump control pilot air valve
2. Ramp control pilot air valve
3. Ramp control double acting air cylinder
4. Cargo well pump control double

Figure 2-103. Cargo Well Pump and Ramp Control Systems Diagram.

b. Inspection and Service.

(1) Ensure hardware attaching pilot air valve is tightened to correct torque value.

(2) Inspect air valves for air leaks and breakage. Report any discrepancy to direct support maintenance.

(3) Check all air lines for loose connections with a soapy water solution. Tighten all loose connections.

(4) Inspect air tubing and fittings for crimped or ruptured condition. Report defective tubing and fittings to direct support maintenance.

(5) Inspect double-acting air cylinders for air leaks and breakage. Report any discrepancy to direct support maintenance.

(6) Inspect capscrew attaching locking clamps for security. Observe torque value limits.

(7) Lubricate each valve control lever pilot shaft and double-acting air cylinder piston rod.

2-117. RAMP CONTROL SYSTEM.

a. General. The cargo well and ramp control system (fig. 2-103) consists of two pilot air valves located on the port and starboard forward main deck just aft of the ramp latch and two double-acting air cylinders located amidship in the upper machinery areas directly above the multiple unit machinery valves. The pilot air valves are three-position valves. Moving the control lever from neutral to lower or raise position will apply air pressure to the double-acting air cylinder, which actuates the corresponding section of the multiple Unlit valve.

b. Inspection.

(1) Inspect all valves within the cargo well and ramp control system for leaks and breakage. Report any discrepancy to direct support maintenance.

(2) Check all air lines for loose connections with a soapy water solution. Tighten loose connections to correct torque value.

(3) Inspect air lines and fittings for a crimped or ruptured condition. Report defective air lines and fittings to direct support maintenance.

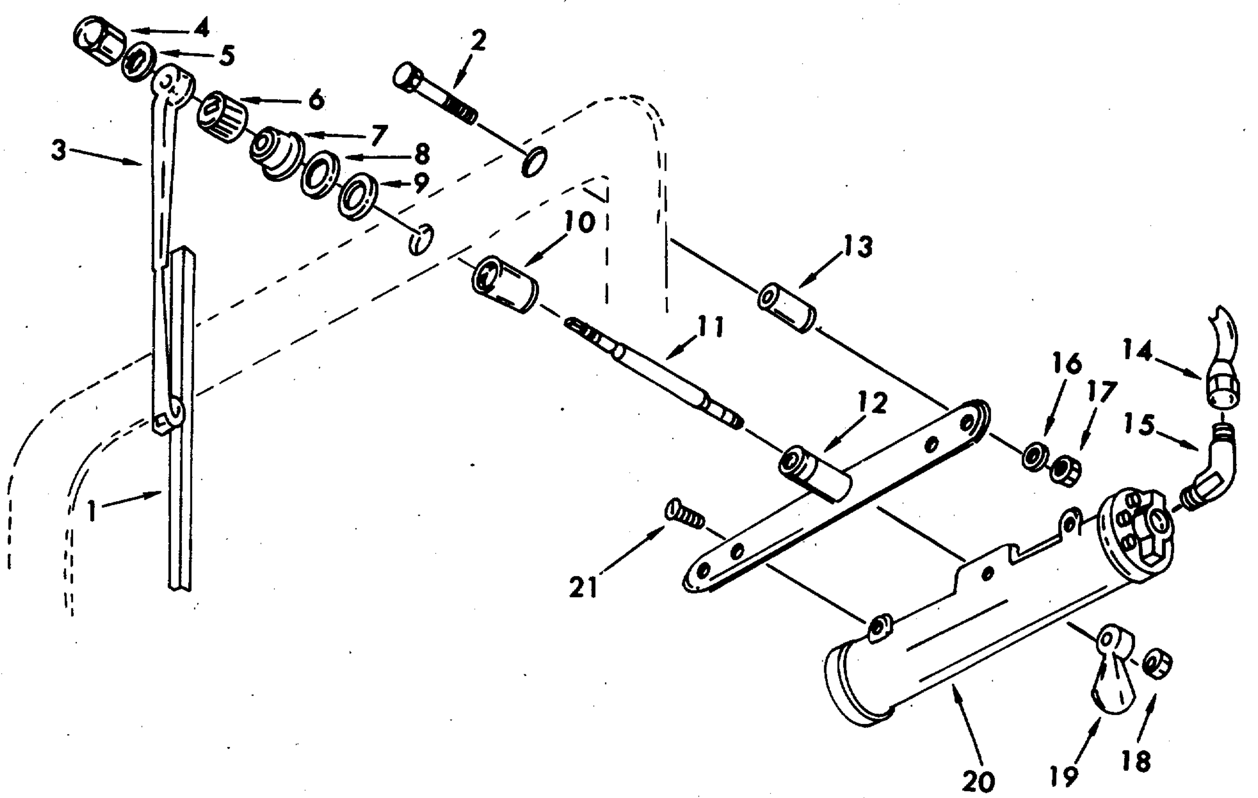
2-118. WINDSHIELD WIPER CONTROL AND SUPPLY SYSTEM.

a. General. The windshield wiper control and supply system supplies air pressure for operation of the windshield wiper motor. The windshield wiper system (fig. 2-104) consists of a regulating control valve, a windshield wiper motor, and windshield wiper arm and blade assembly. Windshield wiper speed is determined by the rotation of a regulating control valve located on the extreme lower starboard side of the instrument panel. Rotating the control knob clockwise increases wiper speed and counterclockwise decreases or stops wiper movement. The windshield wiper drive motor is located above the center and at the top of the window directly in front of the operator.

b. Inspection.

(1) Inspect air hose for broken or deteriorated condition. Replace defective air hose.

(2) Inspect windshield wiper mot6r and regulating control valve for breakage. Report defects to direct support maintenance.



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1.	Blade	12.	Plate
2.	Bolt	13.	Spacer
3.	Arm	14.	Hose
4.	Nut	15.	Elbow
5.	Washer	16.	Washer
6.	Adapter	17.	Nut
7.	Shield	18.	Nut
8.	Washer	19.	Handle
9.	Gasket	20.	Motor
10.	Spacer	21.	Screw
11.	Shaft		

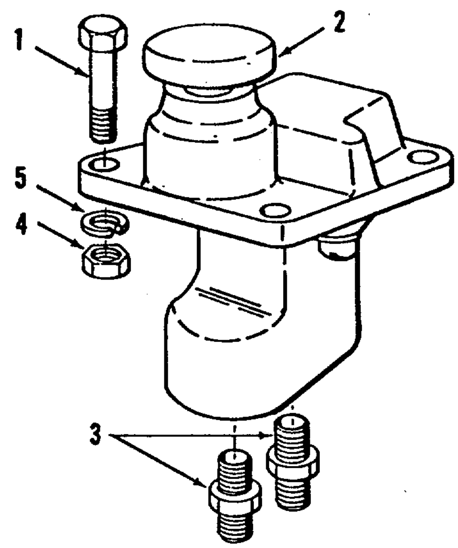
Figure 2-104. Windshield Wiper Assembly.

(3) Check operation of windshield wiper motor and control valve by operating windshield wiper in slow and fast ranges. Report any discrepancy to direct support maintenance.

(4) Ensure all attaching hardware is' tightened to correct torque values.

2-119. AIR HORN CONTROL AND SUPPLY SYSTEM.

a. General. The air horn control and supply system supplies air pressure for operation of the LARC air horns. The air horns are located on the aft port side opposite the cab compartment. They are operated by a pushbutton pilot air valve (2, fig. 2-105) located on the left lower edge of the instrument panel beneath the steering arms.



1. Bolt
2. Pilot air valve
3. Coupling
4. Nut
5. Lockwasher

TS 1930-203-20/2-105

Figure 2-105. Air Horn Pilot Valve.

b. Inspection.

(1) Ensure that air horn and pilot air valve attaching hardware are present and tightened to correct torque value.

(2) Inspect air horn air lines for bent, ruptured, or leaking condition. Report all discrepancies to direct support maintenance.

(3) Depress pushbutton in cab to ensure air hornsare in harmony.

(4) Check air tubing for loose connections with a soapy water solution. Tighten all loose connections to correct torque value.

(5) Inspect air tubing and fittings for ruptured or crimped condition. Report any discrepancy to direct support maintenance.

(6) Inspect air horns for dents and breakage. Report any discrepancy to direct support maintenance.

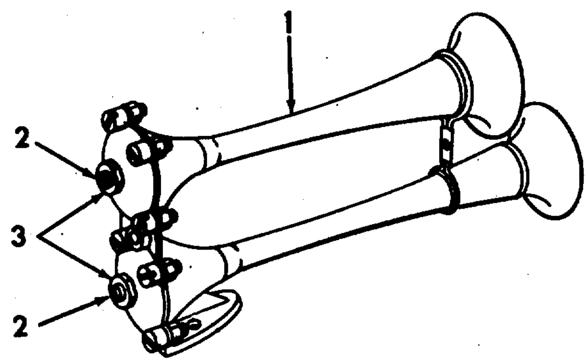
(7) Inspect pilot air valve for breakage. Report any discrepancy to direct support maintenance.

c. <u>Adjustment.</u>

(1) Loosen jamnut (.3, fig. 2-106) on adjusting screw (2) in back plate of air horn (1).

(2) Turn adjusting screw (2) until tone of air horns are at desired loudness and are in harmony.

(3) Hold adjusting screw (2) securely and tightenjamnut (3) -



TS 1930-203-20/2-108

1. Air horn
2. Adjusting screw
3. Jamnut

Figure 2-106. Air Horn Adjustment.

SECTION XVI. MAINTENANCE OF STEERING SYSTEM

2-120. GENERAL.

The steering system of the LARC has two steering levers located in the cab. The port lever controls the forward wheels and the starboard lever controls the aft wheels. Marine steering operates in conjunction with the forward wheels.

2-121. LAND STEERING.

a. General. The forward and aft wheels can be steered independently for land operation. Basically, land steering is accomplished by the hydraulic system. However, each hydraulic steering control valve is mechanically controlled from the cab. The mechanical steering linkage consists of steering columns, jackshafts, steering rods, bell cranks, and follow-up rods. The forward and aft steering controls in the cab operate their respective hydraulic control valves through jackshafts, steering rods, and bell cranks. The follow-up rods, attached to the port wheel columns, center corresponding hydraulic control valves when wheels turn to the desired direction.

b. Inspection and Service

(1) Check hand grips (1, fig. 2-107) for loose, broken, or deteriorated condition. If hand grips are damaged, remove grips and clean pipes. Apply adhesive (item 1, App. D) to new hand grips and install hand grips. If hand grips are loose, replace adhesive.

(2) Ensure screw (3) is securely tightened.

(3) Inspect jackshafts, steering rods, bell cranks, and follow-up rods for broken or bend condition. If damaged, notify direct support maintenance.

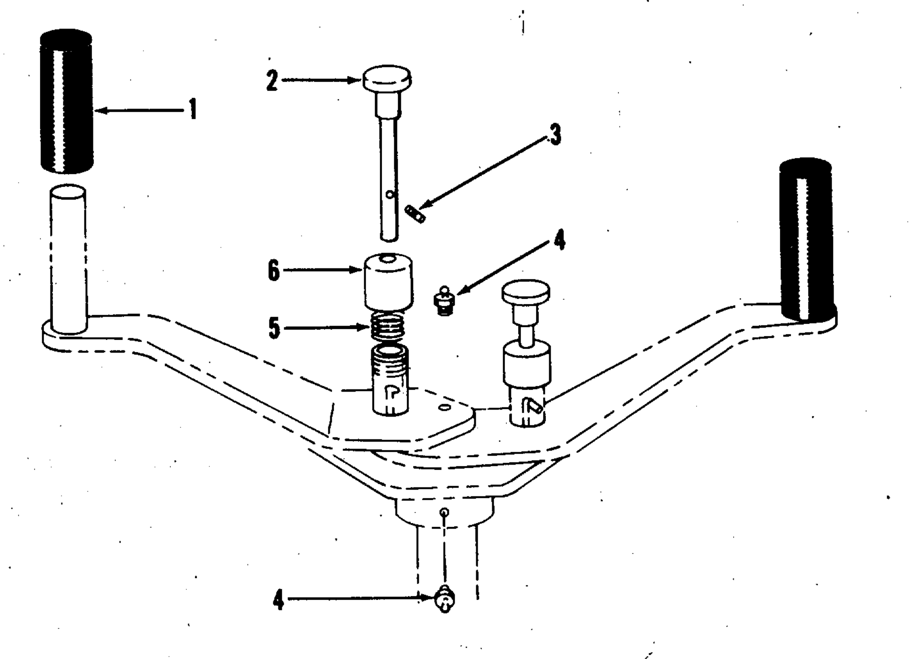
(4) Clean steering linkage lubrication fittings and lubricate. If lubrication fittings are broken or clogged, replace.

(5) When aligning the wheels and when hydraulic steering pressure will not drop off at the correct wheel angle, adjust steering follow-up.

c. Adjustment.

NOTE

The following procedures pertain to the forward steering. The aft steering procedures are identical.



TS 1930-203-20/2-107

1.	Hand grip	4.	Lubrication fitting
2.	Pin	5.	Spring
3.	Screw	6.	Cap

Figure 2-107. Steering Controls, Removal and Installation.

NOTE

Bulkhead No. 14 access cover must be removed to gain access to aft steering follow-up-stops.

(1) Loosen jamnuts (2, fig. 2-108) on forward steering several turns and back off steering stop (3 and 5).

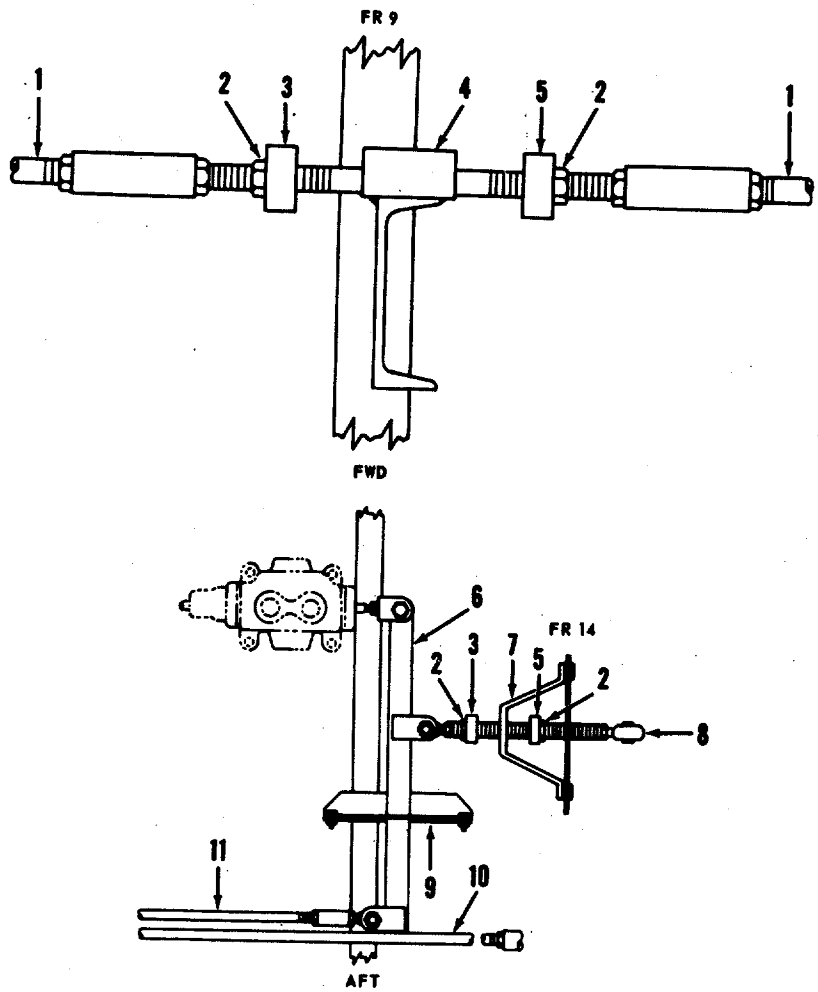
(2) Push left steering lever forward and hold.

(3) After port forward steering cylinder is fully extended, screw aft steering stop (5) until stop strides steering limit block (4).

(4) Continue screwing aft steering stop (5) until steering pressure gage in cab indicates pressure drop.

(5) Lock aft stop (5) with jamnut (2).

(6) Pull left steering lever aft and hold.



TS 1930-203-20/2-108

1. Steering rod
2. Jamnut
3. Forward steering pump
4. Steering limit block
5. Aft steering stop
6. Differential arm
7. Steering limit block
8. Clevis connection to jackshaft
9. Differential arm guide
10. Front wheel steering rod
11. Rear wheel follow-up rod

Figure 2-108. Steering Follow - up, Adjustment.

(7) After port forward steering cylinder is fully retracted, screw forward steering stop (3) until stop strikes steering limit block.

(8) Continue screwing forward steering stop (3) until steering hydraulic pressure gage in the cab indicated pressure drop.

(9) Lock forward steering stop (3)with jamnut (2).

NOTE

If port front wheel steering cylinder will not travel full stroke in both directions after the steering stops (3 and 5, fig. 2-108) have been backed off, the starboard front wheel is misaligned.

d. Locking Pin and Spring Removal.

(1) Loosen cap (6, fig. 2-107) holding spring (5).

(2) Remove screw (3) and pin (2).

(3) Remove cap (6) and remove spring C5).

e. Locking Pin and Spring Installation.

(1) Install spring (5, fig. 2-107) and cap (6).

(2) Install pin (2) and screw (3).

(3) Tighten cap (6) holding spring (5).

2-122. MARINE STEERING.

a. General. When water based, the LARC is steered by two rudders located aft of the propellers. The starboard rudder is equipped with a quadrant and the port rudder with a tiller arm. The quadrant and tiller arm are linked together with a crossrod assembly for simultaneous operation of rudders. The rudders are steered with the forward wheels by a wire rope connected between the quadrant and starboard wheel column steering lever. Sheaves are provided at the various bends and turns of the wire rope to ensure smooth operation.

b. Inspection and Service.

(1) Inspect tiller arm (10, fig 2-109) and quadrant (16) for broken and malformed condition. If damaged, notify direct support maintenance.

(2) Inspect rudders (1, fig. 2-110) for cracked, chipped, or warped condition. Notify direct support maintenance personnel if rudders are damaged.

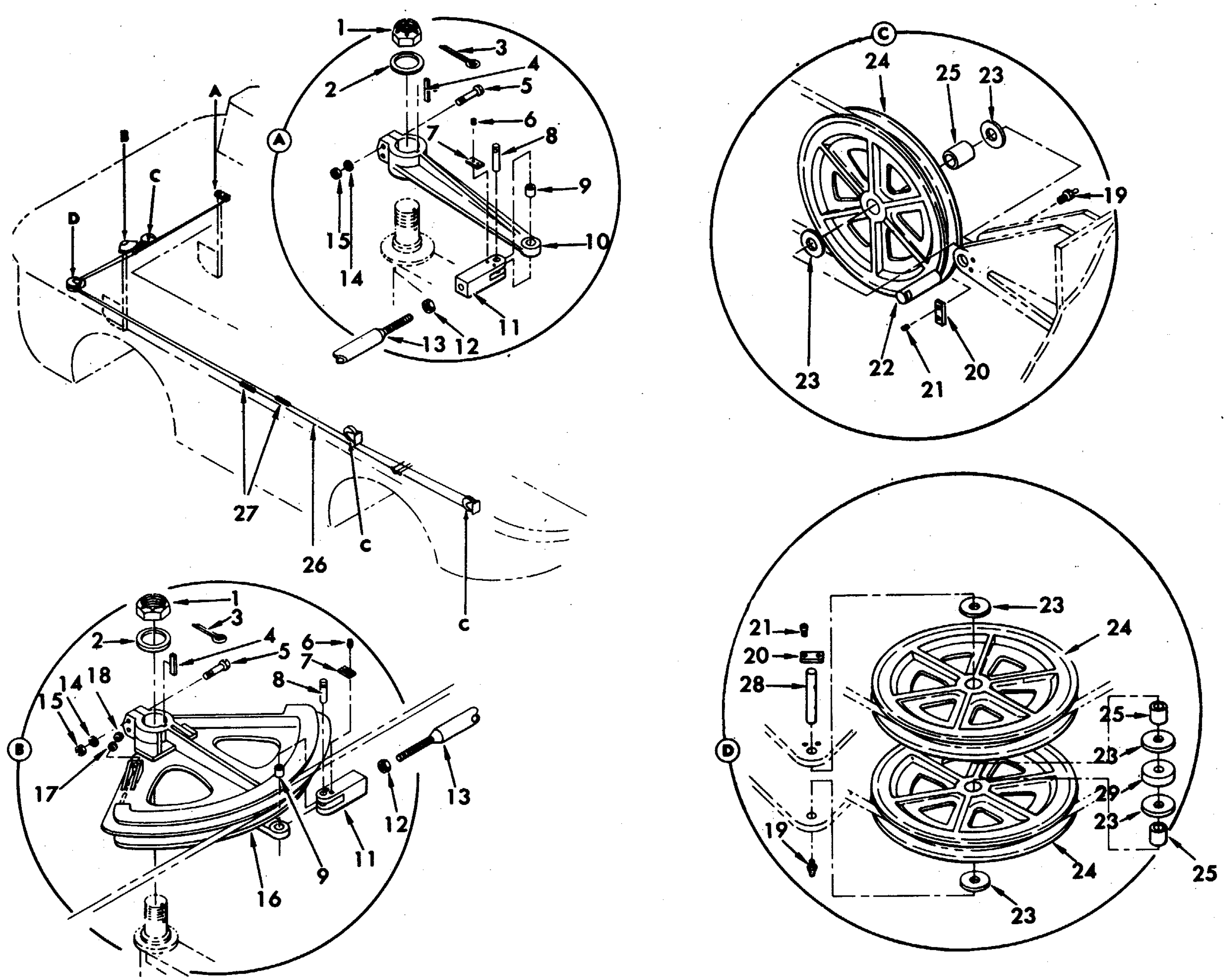


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Figure 2-109. Marine Steering, Exploded View.

Legend for figure 2-109:

1.	Nut	16.	Quadrant
2.	Washer, flat	17.	Washer, flat
3.	Cotter pin	18.	Nut
4.	Key	19.	Lubrication fitting
5.	Bolt	20.	Key plate
6.	Capscrew	21.	Capscrew
7.	Key plate	22.	Pin
8.	Pin	23.	Spacer
9.	Bushing	24.	Pulley
10.	Tiller arm	25.	Bushing
11.	Clevis	26.	Wire rope
12.	Jamnut	27.	Turnbuckles
13.	Crossrod	28.	Pin
14.	Washer, flat	29.	Spacer
15.	Nut		

(3) Clean rudder bushing and sleeve lubrication fittings (5) and lubricate with GAA grease. If lubrication fittings are broken or clogged, replace.

(4) Inspect wire rope (26, fig. 2-109) for broken strands or fraying at tie points and sheaves. Report damage to direct support maintenance.

(5) Inspect turnbuckles (27) for breakage. Report damage to direct support maintenance.

(6) Inspect pulleys (24) for cracks and breakage. Report damage to direct support maintenance.

(7) Ensure capscrews (21) attaching key plate (20) are tightened securely.

(8) Clean sheave pin lubrication fittings (19) and lubricate with GAA grease. If lubrication fittings are broken or clogged, replace.

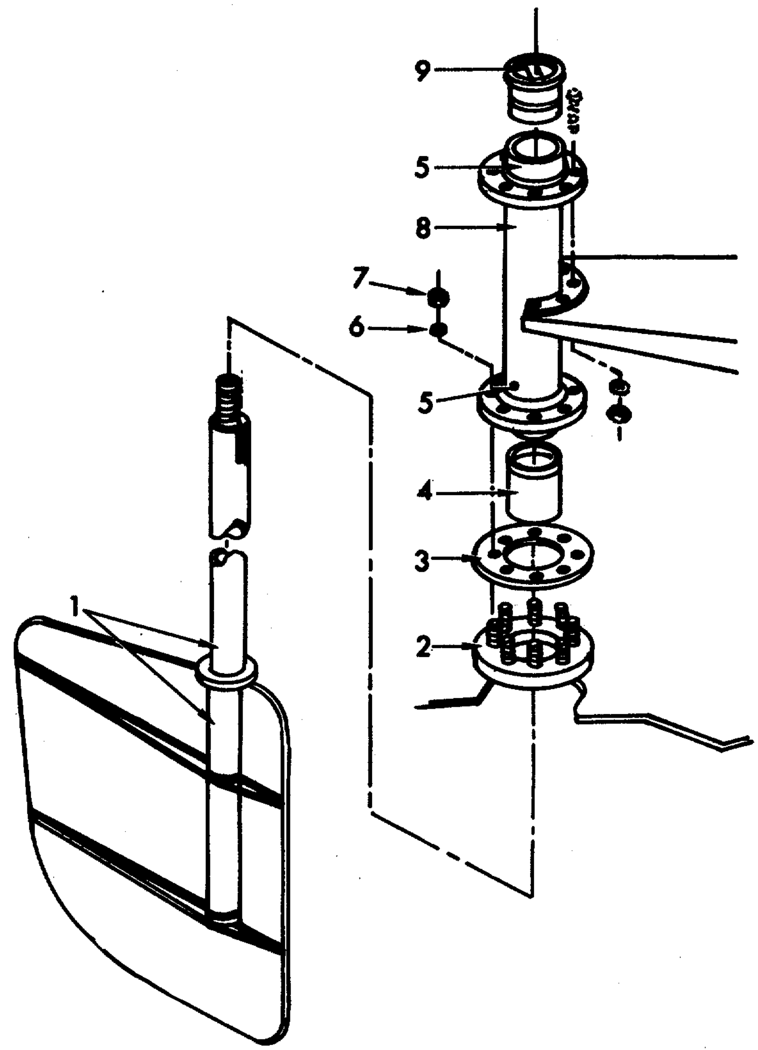
(9) Inspect crossrod (13) and clevis (11) for broken or bent condition. If damaged, notify direct support maintenance.

(10) Inspect sleeves (8, fig. 2-110) and sockets (5) for breakage. Report damage to direct support maintenance.

c. Crossrod Assembly Adjustment.

(1) Remove capscrews (6, fig. 2-109), key plate (7), and pin (8) at either end of crossrod assembly.

(2) Loosen jamnut (12) and back jamnut off several turns.



TS 1930-203-20/2-110

Legend for figure 2-110:

1. Rudder
2. Stud, sleeve mounting plate
3. Gasket
4. Sleeve bearing
5. Lubrication fitting
6. Washer, flat
7. Nut
8. Sleeve assy
9. Bearing

Figure 2-110. Rudder and Sleeve, Exploded View.

(3) Support crossrod assembly and align rudder assemblies parallel to each other.

(4) Screw clevis (11) in or out until crossrod assembly is at correct length; secure clevis withjamnut (12).

(5) Replace crossrod assembly and install pin (8), key plate (7), andcapscrew (6).

SECTION XVII. MAINTENANCE OF COOLING SYSTEM

2-123. GENERAL.

The LARC cooling system (fig. 2-111) consists of four independent fresh water cooling systems with a total capacity of 210 gallons (795 1). Each of the four systems operate 7 psi (0.49 kg/sq cm) pressure when the system is operating at normal temperature. The cooling systems function independently of each other so that failure of any one engine or cooling system will not affect the operation of the remaining cooling system.

a. Land Operation. The coolant in the cooling system is cooled during land operation by the radiators and hydraulically operated fans. Air enters the fan and forward radiator areas through gratings covering the radiator fans and is blown through the radiator openings to cool the coolant within the radiator cores. Air passing through the radiator core openings is then expelled overboard through the aft radiator areas.

b. Water Operation. During marine operation, the radiator fans are automatically shut off when the marine transmission is shifted from neutral. Cooling is accomplished by cooling coils located in the aft wheel wells which are submerged in the water in which the LARC is operating. Cooling heat is transferred to the outside water by radiation as the coolant flows through the cooling coils.

2-124. COOLING SYSTEM MAINTENANCE.

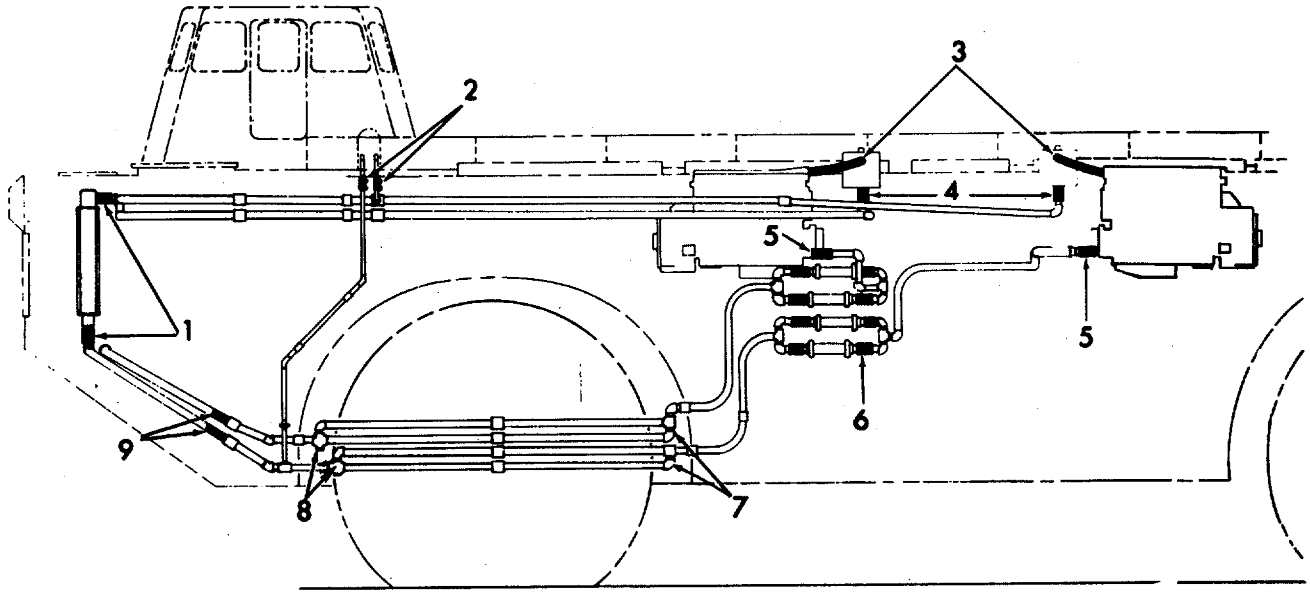
a. Inspection and Service.

(1) Inspect expansion tanks for leakage. If there is a hole or crack in an expansion tank, report damage to direct support maintenance.

(2) Ensure that hardware securing the expansion tanks is tightened to correct torque value.

WARNING

Do not remove the pressure cap from the expansion tank when the engine is operating. Remove the pressure cap only when the engine is secured and then carefully to prevent personnel injury from scalding.



TS 1930-203-20/2-111

1. Radiator hose
2. Cab heater hose
3. Expansion tank inlet hose
4. Expansion tank outlet hose
5. Engine inlet hose
6. Oil cooler hose
7. Cooling coils
8. Pipe plugs
9. Cooling coil inlet hose

Figure 2-111. Engine Cooling System.

(3) Remove pressure caps and inspect filler neck seats to ensure that seats are clean and free of dents. Remove all foreign matter from filler neck seat and replace pressure cap. If filler neck is dented, report damage to direct support maintenance.

(4) Ensure that pressure cap will relieve coolant pressure exceeding 7 psi (0.49 kg/cm.). If pressure cap does not function properly, replace.

(5) Inspect the oil coolers for leakage and insure attaching hardware is tightened to correct torque values. Notify direct support maintenance if oil cooler is leaking.

(6) Drain cooling system and clean and inspectzincs for serviceable condition as follows:

NOTE

When draining the cooling system of antifreeze, the antifreeze should be drained into a suitable container for reuse.

(a) Remove radiator petcock access covers and open air vent petcocks in top of radiators.

(b) Remove drainplugs on aft end of all four cooling coils and drain coolant.

(c) Replace drainplugs after cooling systems have fully drained.

(d) Remove zincs from oil coolers. Clean zincs and inspect for serviceable condition. If a large portion of a zinc is eaten away, replace. Installzincs in oil coolers.

(e) Close air vent petcocks in top of radiators.

(f) Remove pressure caps on expansion tanks.

CAUTION

Whenever water is added to a hot engine, it must be done slowly to avoid cooling which may cause distortion and possible cracking of engine castings.

(g) Fill cooling systems with appropriate coolant to two inches (51 mm) below filler neck and replace the pressure caps.

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(h) Start engines and check cooling system for leaks.

(i) Run engines until normal operating temperatures are reached.

(j) Open air vent petcocks to vent air trapped in top of radiators.

(k) Close air vent petcocks and replace covers.

(l) Stop engines.

WARNING

Do not remove pressure cap from the expansion tank when the engine is operating. Remove the pressure cap only when the engine is secured and then carefully to prevent personnel injury from scalding.

(m) Remove pressure caps.

(n) If required, add coolant to bring coolant level to two inches (51 mm) below filler neck.

(o) Replace pressure caps on expansion tanks.

(7) Ensure that cooling coil drainplugs are tightened securely and are free of leaks. If leakage continues after a plug is tightened, drain applicable cooling system and replace plug.

CAUTION

Do not paint cooling coils (7, fig. 2-111).

(8) Inspect cooling coils for leaking, ruptured, or bent tubing. Report damaged cooling coils to direct support maintenance.

(9) Ensure that hardware attaching clams to cooling coils is present and securely tightened to prevent cooling coils from vibrating loose.

(10) Remove four radiator duct access covers, louvers, and grilles and inspect radiator cores for corrosion and leakage. Report all discrepancies to direct support maintenance.

(11) Clean foreign matter from air chambers and radiator core and blow out with compressed air. Replace radiator duct louvers, access covers, and grilles.

(12) Remove four radiators access covers and inspect top of radiators for leaks. If radiators are leaking, report damaged radiator to direct support maintenance. Install radiator access covers.

WARNING

Drycleaning solvent, Specification P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F - 138 degrees F (38 degrees C - 59 degrees C).

(13) Remove four radiator fan gratings installed on the main deck and clean fanblades with a clean cloth slightly dampened in drycleaning solvent (item 6, App. C). Wipe each blade dry with a clean, dry cloth.

(14) Inspect each blade for cracks, chips, and nicks. Report all discrepancies to direct support maintenance.'

(15) Clean fan motor lubrication fittings and lubricate. If lubrication fittings are broken or clogged, replace. Reinstall radiator fan grilles.

(16) Remove access covers giving access to cooling system piping, hoses, and fittings and inspect all hoses C2, 3, 4, 5, 6 and 9, fig. 2-111) for deterioration, security, and leakage. If a hose is loose, tighten hose clamps. If a hose is defective, drain applicable cooling system and replace hose.

(a) Inspect cooling system tubing, piping, and fittings for dents, security, and leaking joints. Report defective tubing, piping, and fittings to direct support maintenance.

CAUTION

Do not paint cooling coils (7, fig. 2-111).

(b) Clean rust and corrosion from outer surface of allpipings and fittings. Spot-paint as required and reinstall all removed access covers.

b. <u>Cooling System Draining Procedures</u>.

NOTE

Should the cooling system require draining of antifreeze, the antifreeze should be drained into a suitable container for reuse.

(1) Remove radiator petcock access covers and open air vent petcocks in top of radiators.

(2) Remove drainplugs on aft-end of all four cooling coils and drain coolant.

(3) Replace drainplugs after cooling systems have fully drained.

(4) Close air vent petcocks and replace covers on radiator access plates.

c. Cooling System Filling Procedures.

CAUTION

Whenever water is added to a hot engine it must be done slowly to avoid rapid cooling which may cause distortion and possible cracking of engine castings.

(1) Ensure that drainplugs on cooling coils are secure.

(2) Remove covers on radiator access plates and ensure that air vent petcocks in top of radiator are closed.

(3) Remove pressure caps on expansion tanks.

(4) Fill cooling systems with appropriate coolant to two inches (51 mm) below filler neck and replace the pressure caps.

WARNING

Before starting the engines, ensure that no one is in the machinery wells. When starting on land, station a man outside and aft of the LARC to make sure no one is in the propeller tunnels. Before starting, sound the horn as a signal that the engines are about to be started. Allow at least 30 seconds for personnel to get clear before proceeding.

(5) Run engines until normal operating temperatures are reached.

(6) Open air vent petcocks to vent air trapped in top of radiators.

(7) Close air vent petcocks and replace covers.

WARNING

Do not remove pressure cap from the expansion tank when the engine is operating. Remove the pressure cap only when the engine is secured and then carefully to prevent injury from scalding.

(8) Stop-engines and remove pressure caps.

(9) If required, add coolant to bring coolant level to two inches (51 mm) below filler neck.

(10) Replace pressure caps on expansion tanks.

d. Cooling System Cleaning Procedures

NOTE

The following instructions are for one engine cooling system. Since the systems are independent, they must be serviced separately.

(1) Drain coolant from system.

CAUTION

Whenever water is added to a hot engine, it must be done slowly to avoid rapid cooling which may cause distortion and possible cracking of engine castings.

(2) Dissolve 21 pounds (9.5 kg) of oxalic acid (item 11, App. C) in approximately 20 gallons (76 l) of water. Pour solution into cooling system.

(3) Fill cooling systems with clean water to two inches (51 mm) below filler neck and replace the pressure caps.

(4) At normal operating temperature, run engine at a fast idle for not less than 30 minutes.

(5) Open air vent petcocks to vent air trapped in top of radiators.

(6) Close air vent petcocks.

(7) Run engines at idle for three to five minutes before securing. This allows the lubricating oil and coolant to carry the heat away from the engines. Stop engines.

(8) Open air vent petcocks in top of radiators.

(9) Remove drainplugs on aft end of all four cooling coils and drain coolant.

(10) Replace drainplugs after cooling systems have fully drained.

(11) Close air vents petcocks in top of radiators.

WARNING

Do not remove pressure cap from the expansion tank when the engine is operating. Remove the pressure cap 6nly when the engine is secured and then carefully to prevent personnel injury from scalding.

(12) Remove pressure caps on expansion tanks.

CAUTION

Whenever water is added to a hot engine, it must be done slowly to avoid rapid cooling which may cause distortion and possible cracking of engine castings.

(13) Dissolve 4 1/2 pounds (2 kg) of neutralizer borax (item 3, App. C) in approximately 5 gallons (19 1) of water. Pour solution into cooling system.

(14) Fill cooling systems with clean water to two inches (51 mm) below filler neck and replace the pressure caps.

(15) At normal operating temperature, run engine at a fast idle for not less than 5 minutes.

(16) Open air vent petcocks to vent air trapped in top of radiators.

(17) Close air vent petcocks.

(18) Run engines at idle for three to five minutes before securing. This allows the lubricating oil and coolant to carry the heat away from the engines. Stop engines.

(19) Open air vent petcocks in top of radiators.

(20) Remove drainplugs on aft end of all four cooling coils and drain coolant.

(21) Replace drainplugs after cooling systems have fully drained.

(22) Close air vent petcocks in top of radiators.

WARNING

Do not remove pressure cap from the expansion tank when the engine is operating. Remove the pressure cap only when the engine is secured and then carefully to prevent personnel injury from scalding.

(23) Remove pressure caps on expansion tanks.

CAUTION

Whenever water is added to a hot engine it must be done slowly to avoid rapid cooling which may cause distortion and possible cracking of engine castings.

(24) Fill cooling systems with clean water to two inches (51 mm) below filler neck and replace the pressure caps.

(25) At normal operating temperature run engine at fast idle for not less than five minutes.

(26) open air vent petcocks to vent air trapped in top of radiators.

(27) Close air vent petcocks.

(28) Run engines at idle for three to five minutes before securing. This allows the lubricating oil and coolant to carry the heat away from the engines. Stop engines.

(29) Open air vent petcocks in top of radiator.

(30) Remove drainplugs on aft end of all four cooling coils and drain coolant.

(31) Replace drainplugs after cooling system have fully drained.

(32) Close air vent petcocks and replace covers on radiator access plates.

(33) Replace pressure cap on expansion tanks.

(34) Treat cooling system for summer or winter operations as applicable.

e. Cooling System Summer Treatment.

NOTE

The following instructions are for one engine cooling system. Since the systems are independent, they must be serviced separately. The cooling system must also be in a thoroughly clean condition prior to treatment.

CAUTION

Whenever water is added to a hot engine, it must be done slowly to avoid rapid cooling which may cause distortion and possible cracking of engine castings.

(1) Ensure that drainplugs on cooling coils are secure.

(2) Remove covers on radiator access plates and ensure that air vent petcocks in top of radiators are closed.

(3) Remove pressure caps on expansion tanks.

(4) Fill cooling system to approximately one-third capacity (not more than 20 gallons (76 1)) with clean water.

(5) Dissolve 16 pounds (7.25 kg) of corrosion inhibitor compound (item 4, App. D) in approximately 20 gallons (76 1) of water. Pour solution into cooling system.

WARNING

Use care to avoid sodium chromate and any solution containing this chemical from contacting skin. Some individuals are extremely sensitive to these chemicals.

(6) Dissolve 6 1/2 pounds (2.94 kg) of sodium chromate (item 16, ,App. C) in approximately 10 gallons (38 1) of water. Pour solution into cooling system.

(7) Fill cooling system with clean water to two inches (51 mm) below filler neck and replace pressure cap.

(8) At normal operating temperature, run engine at fast idle for not less than 5 minutes to thoroughly mix solutions.

(9) Open air vent petcocks to vent air trapped on top of radiators.

(10) Close air vent petcocks and replace covers.

(11) Run engines at idle for three to five minutes before securing. This allows the lubricating oil and coolant to carry the heat away from the engines. Stop engines.

WARNING

Do not remove pressure cap from the expansion tank when the engine is operating. Remove the pressure cap only when the engine is secured and then carefully to prevent personnel injury from scalding.

(12) Remove pressure caps.

(13) If required, add coolant to bring coolant level to two inches (51 mm) below filler neck.

(14) Replace pressure caps on expansion tanks.

f. Cooling System Winter Treatment (Temperatures below 32 degrees F (0 degrees C)).

NOTE

The following instructions are for one engine cooling system. Since the systems are independent, they must be serviced separately. The cooling system must be in a thoroughly clean condition prior to

(1) Inspect complete cooling system and correct any existing deficiencies.

(2) Ensure that drainplugs on cooling coils are secure.

(3) Remove covers on radiator access plates and ensure that air vent petcocks in top of radiators are closed.

(4) Remove pressure caps on expansion tanks.

(5) Prepare mixture of ethylene glycol inhibited antifreeze, (item 7, App. C) and water to protect cooling systems to a temperature at least 10 degrees F (-12 degrees C) below lowest expected temperature.

NOTE

At temperatures below -55 degrees F (-51 degrees C), arctic antifreeze compound (item 2, App. C) will be used full strength. This solution will protect the cooling systems to -90 degrees F (-68 degrees C).

(6) Fill cooling systems with appropriate coolant to two inches (51 mm) below filler neck and replace pressure caps.

(7) Start engines and run engines until normal operating temperatures are reached.

(8) Open air vent petcocks to vent air trapped in top of radiators.

(9) Close air vent petcocks and replace covers.

(10) Run engines at idle for three to five minutes before securing. This allows the lubricating oil and coolant to carry the heat away from the engines. Stop engines.

WARNING

Do not remove pressure cap from the expansion tank when the engine is operating. Remove the pressure cap only when the engine is secured and then carefully to prevent personnel injury from scalding.

(11) Remove pressure caps.

(12) Check mixture with an accurate hydrometer.

(13) Add coolant, if required, to bring coolant level to two inches (51 mm) below filler neck.

(14) Replace pressure caps on expansion tanks.

(15) Fasten tags on or near expansion tank pressure caps indicating type and amount of antifreeze used and level of protection.

NOTE

When operating at below freezing temperatures, coolant should be checked weekly for proper strength. Use an accurate hydrometer to check that specific gravity conforms to specifications of table 2-4.

SECTION XVIII. MAINTENANCE OF GAGES AND INSTRUMENTS

2-125. GENERAL.

There are basically six types of instruments installed on the LARC. Gages indicate the various systems temperatures, quantities, and pressures. A tachometer indicates engine rpm.

2-126. TEMPERATURE GAGES.

a. <u>General.</u> The temperature gages located on the gage boards are provided for the engines, transmissions, marine gears, and gathering boxes. Each engine has two temperature gages, one for water with a range from 20 degrees to 220 degrees F (-7 degrees to 104 degrees C) and the other oil with a range from 100 degrees to 300 degrees F (38 degrees to 149 degrees C). The transmission temperature gages indicate oil temperatures ranging from 100 degrees to 300 degrees E (38 degrees to 149 degrees C). Each gage is controlled by a, temperature sensing bulb installed in its related equipment. The gages are connected to the bulbs by capillary tubes.

Table 2-4. Military Antifreeze Materials

Lowest expected ambient temp. °F (°C)	Pints of inhibited glycol per gal. Of Coolant[1]	Compound, Antifreeze Arctic[2]	Ethylene glycol Coolant solution specific gravity at 68°F (20°C)
+20 (-7)	1 1/2 ------	Issued full strength and ready	1. 022
+10 (-12)	2 -----------	mixed for 0 to -65° F (-18°C	1.036
0 (-18)	2 ¾--------	to -54°C) temperatures for	1. 047
-10 (-23)	3 ¼--------	both initial installation and	1. 055
-20 (-29)	3 1/2 ------	replenishment of losses.	1.062
-30 (-34)	4 -----------		1.067
-40 (-40)	4 ¼--------		1.073
-50 (-46)	Arctic anti-	DO NOT DILUTE WITH WATER	
-60 (-51)	freeze pre-	OR ANY OTHER SUBSTANCES	
	ferred		

[1]Maximum protection is obtained at 60% by volume (4. 8 pints of ethylene glycol per gallon of solution).

[2]Military Specification MIL-C-11755 arctic type, nonvolatile antifreeze compound is intended for use in the cooling system of liquid-cooled internal combustion engines. It is used for protection against freezing primarily in arctic regions where the ambient temperature remains for extended period close to -40°F (-40°C) or drops as low as -90°F (-68°C).

[3]Use an accurate hydrometer. To test hydrometer, use 1 part ethylene glycol antifreeze to 2 parts water. This should produce a hydrometer reading of 0°F (-18°C).

NOTE

Fasten a tag near the radiator filler cap indicating the type antifreeze.

b. Inspection.

(1) Inspect temperature gages (6, 7, 8, 9, 10, 11, 12, and 13, fig. 2-112) for defects. Notify direct support maintenance of defective gages.

(2) Inspect capillary tubing for broken or crimped condition. Notify direct support maintenance if capillary tubing is damaged.

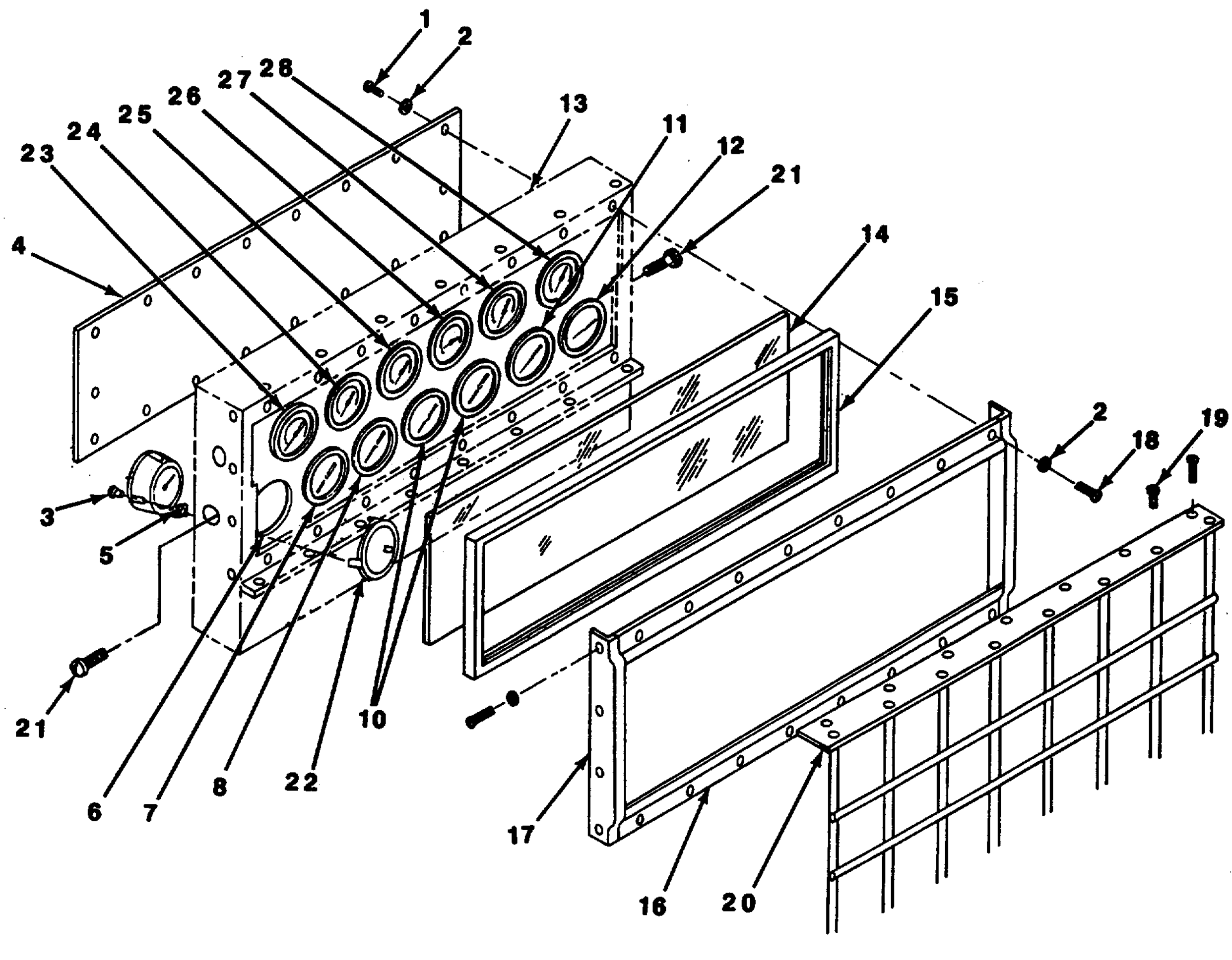


Figure 2-112. Gage Board.

Legend for figure 2-112:

1. capscrew
2. Lockwasher
3. Screw
4. Cover
5. Spacer
6. Engine water temperature gage
7. Engine oil temperature gage
8. Torque converter oil temperature gage
9. Marine gear oil temperature gage
10. Torque converter oil temperature gage
11. Engine oil temperature gage
12. Engine water temperature gage
13. Panel
14. Glass
15. Gasket
16. Frame
17. Frame
18. Screw
19. Screw
20. Guard
21. Vent
22. Mounting ring
23. Engine oil pressure gage
24. Transmission oil pressure gage
25. Gathering box oil pressure gage
26. Gathering box oil pressure gage
27. Transmission oil pressure gage
28. Engine oil pressure gage

2-127. OIL PRESSURE GAGES.

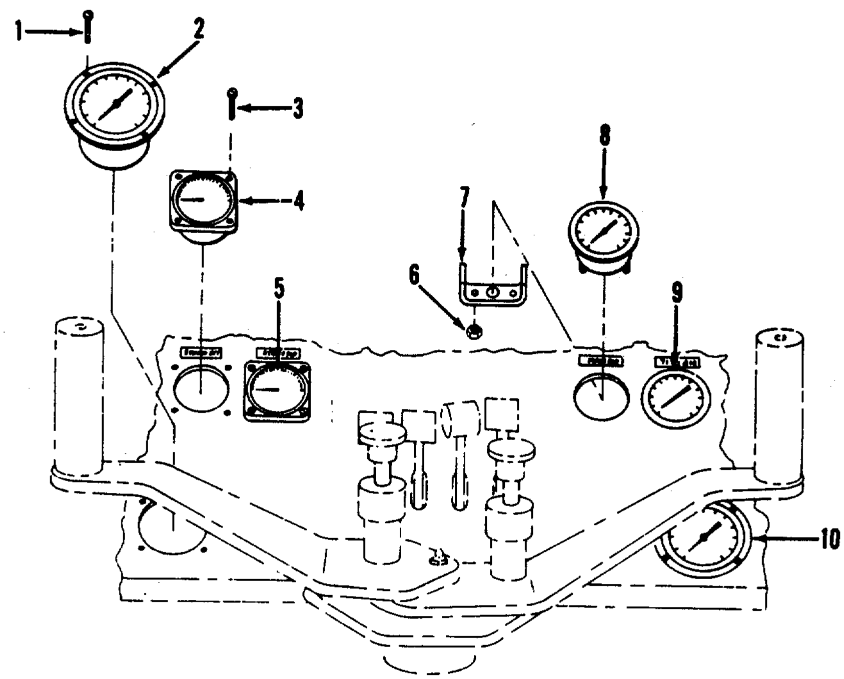
a. General. Oil pressure gages for the engines, transmissions, and gathering boxes are located on the gage boards. Each marine gear has two oil pressure gages, one located on corresponding gage board and one on the cab instrument panel. The engine oil pressure gages range for 0 to 100 psi (0 to 7.0 kg/cm^2). The transmission oil pressure gages range from 0 to 300 psi (0 to 21.1 kg/cm^2). The gathering box oil pressure gages range from 0 to 60 psi (0 to 4.2 kg/cm^2). The marine gear oil pressure gages range for 0 to 300 psi (0 to 21.1 kg/cm^2).

b. Inspection. Inspect oil pressure gages (23, 24, 25, 26, 27 and 28, fig. 2-112) and (2 and 10, fig. 2-113) for defects. Notify direct support maintenance of defective gages.

2-128. STEERING PRESSURE GAGE.

a. General. Two steering pressure gages are located on the cab instrument panel. One steering pressure gage is installed in the forward hydraulic steering system, and the other gage is installed in the aft hydraulic steering system. The steering pressure gages, used when aligning the wheels, are calibrated from 0 to 2000 psi (0 to 141 kg/cm2).

b. Inspection. Inspect steering pressure gages (4 and 5, fig. 2-113) for defects. Notify direct support maintenance if defects are discovered.



TS 1920-203-20/2-113

1. Screw
2. Marine gear oil pressure
3. Screw
4. Aft steering pressure gage
5. Forward steering pressure gage
6. Nut
7. U-Clamp
8. Main air pressure gage
9. Tire air pressure gage
10. Marine gear oil pressure gage

Figure 2-113. *Instrument Panel Gages.*

2-129. MAIN AIR AND TIRE AIR PRESSURE GAGES.

a. General. The main air and tire air pressure gages are located on the cab instrument panel. The main air pressure gage indicates the air pressure available in the main air system and is calibrated from 0 to 200 psi (0 to 14.1 kg/cm^2). The tire air pressure gage indicates the air pressure in the tire inflation system, including the air in the tires, and is calibrated from 0 to 200 psi (0 to 14.1 kg/cm^2).

b. Inspection. Inspect main air and tire air pressure gages (8 and 9, fig. 2-113) for defects. Notify direct support maintenance if defects are discovered.

2-130. FUEL QUANTITY GAGES.

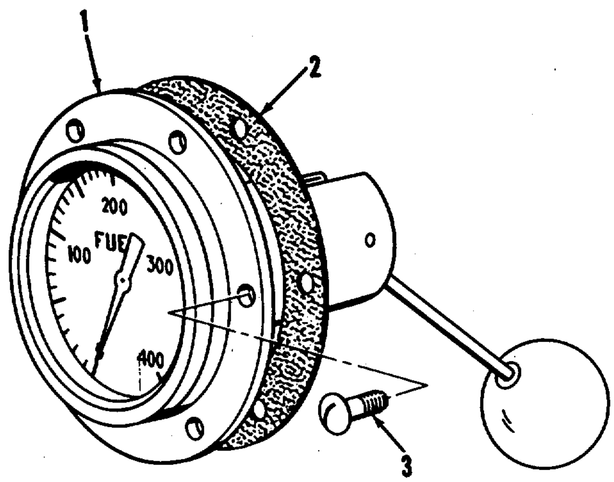
a. General. The LARC has two fuel quantity gages, one located in the forward side of each fuel tank. The fuel quantity gages are float-type gages calibrated for 0 to 300 gallons (0 to 1136 1).

b. Inspection.

(1) Inspect fuel quantity gage (1, fig. 2-114} for defects. Notify direct support maintenance if defects are discovered.

(2) Inspect fuel quantity gage C1) for broken or bent indicator and for dial markings which cannot be read immediately. Notify direct support maintenance if fuel quantity gages are damaged.

(3) Inspect fuel quantity gage gasket (2) for leakage. If gasket leaks, tighten machine screws (3). If leakage continues, notify direct support maintenance.



TS 1930-203-20/2-114

1. Fuel quantity gage
2. Gasket
3. Screw

Figure 2-114. Fuel Quantity Gage.

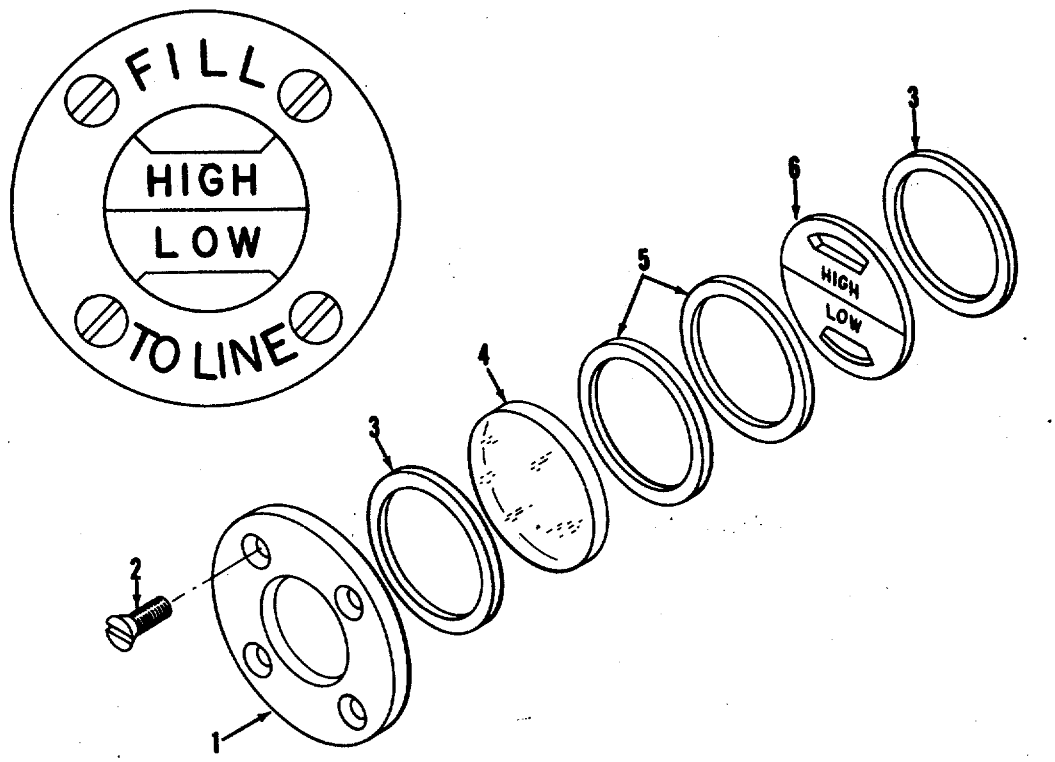
2-131. SIGHT LEVEL QUANTITY GAGE.

a. General. The sight level quantity gage is a nonmechanical gage located in the upper starboard side of the hydraulic fluid tank. The sight level quantity gage is marked HIGH and LOW on either side of a horizontal line. Hydraulic fluid should be maintained at the horizontal line of the sight level quantity gage.

b. Inspection.

(1) Inspect sight level quantity gage for defects (4, fig. 2-115). Notify direct support maintenance if defective.

(2) Inspect sight level quantity gage for leakage. If gaskets (3 and 5) leak, tighten screws (2). If leakage continues, notify direct support maintenance.



TS 1930-203-20/2-115

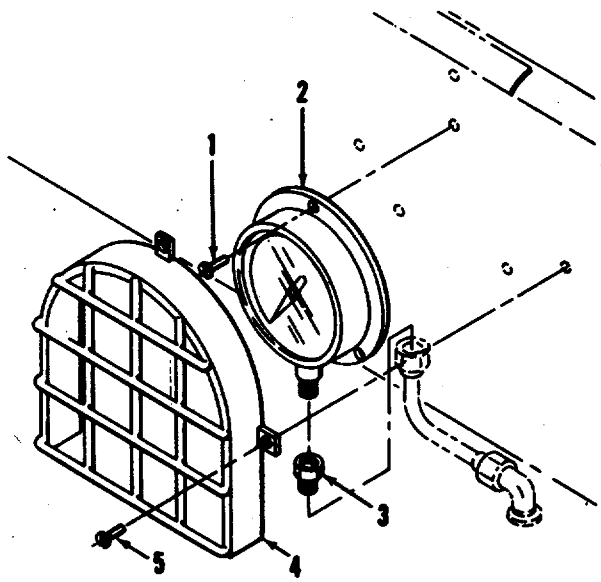
1. Cover
2. Screw
3. Gasket
4. Glass
5. Gasket
6. Plate

Figure 2-115. Sight Level Quantity Gage.

2-132. RAMP SEAL AIR PRESSURE GAGE.

a. General. A ramp seal air pressure gage is located on the outboard side of the starboard bulwark immediately aft of the ramp latch handle. The ramp seal air pressure gage indicates the air pressure in the ramp seal and is calibrated from 0 to 60 psi (0 to 4.2 kg/cm2).

b. Inspection. Inspect ramp seal air pressure gage (2, fig. 2-116) for defects. Notify direct support maintenance if defective.



TS 1930-203-20/2-116

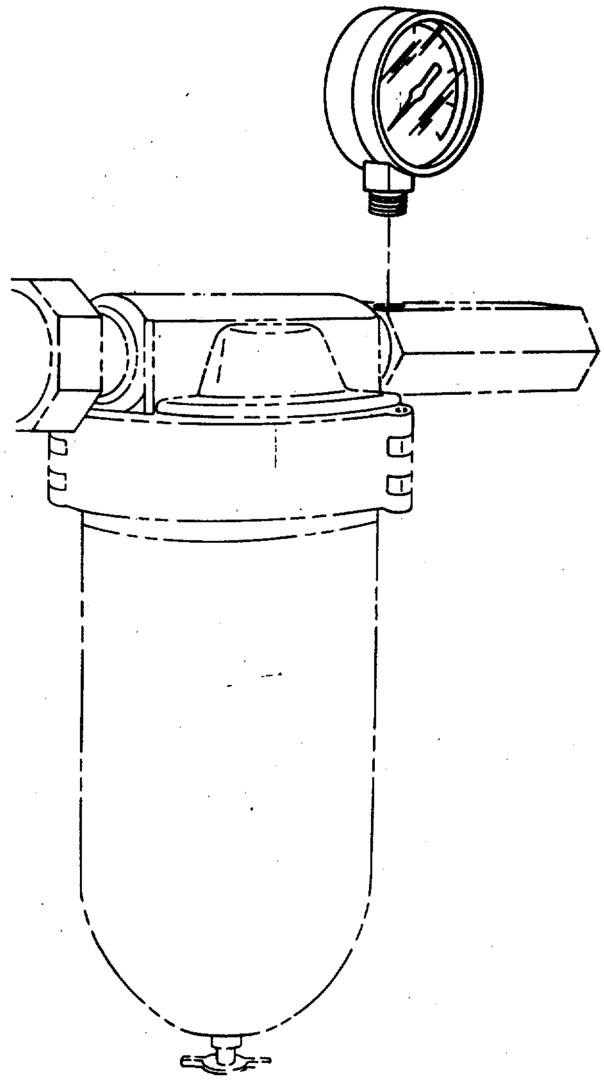
1. Screw
2. Gage
3. Adapter
4. Guard
5. Screw

Figure 2-116. Ramp Seal Air Pressure Gage.

2-133. STARTING AIR PRESSURE GAGE.

a. General. A starting air pressure gage is located in each air starting line between the air filter and air lubricator. The four starting air pressure gages indicate the air pressure in the air starting system and are calibrated from O to 160 psi (O to 11.2 kg/cm2).

b. Inspection. Inspect starting air pressure gages (fig. 2-117) for defects. Notify direct support maintenance if defective.



TS 1930-203-20/2-117

Figure 2-117. Starting Air Pressure Gage.

SECTION XIX. MAINTENANCE OF WINCH EQUIPMENT

2-134. GENERAL.

The LARC is equipped with hydraulic winch equipment located on the main deck aft of the cargo well. The winch equipment consists of a control stand, speed control linkage, hydraulic motor, and winch assembly. The winch assembly, controlled by the speed control linkage and control stand, is used to aid in loading and unloading cargo or to lower and raise the anchor. The winch assembly has a 23,000 pound (10,433 kg) pull and is equipped with a 5/8 inch (15.9 mm) wire rope, 380 feet (91.4 meters) long. The wire rope is underwound on the cable drum for greater pulling power. The hydraulic motor is mounted on the bottom of winch assembly and is located in the marine steering area.

2-135. GENERAL MAINTENANCE.

a. Inspect wire rope (4, fig. 2-118) for kinks and broken strands along its entire length. Report damage to direct support maintenance.

b. Inspect cable guard (15) for loose, bent, or broken condition. Tighten if loose or report damage to direct support maintenance.

c. Inspect winch assembly gaskets (3, 9, and 20) for oil leakage. If there is evidence of oil leakage at gaskets, tighten respective capscrews. If leakage continues, drain oil from winch assembly and remove covers (1 and 10). Replace defective gaskets and reinstall covers. Replace oil in winch assembly (see lubrication order).

d. Inspect pipe plugs (13, 14, and 19) at each oil change for stripped and malformed threads. Replace defective pipe plugs.

e. Check oil level in winch assembly. If necessary add oil (see lubrication order).

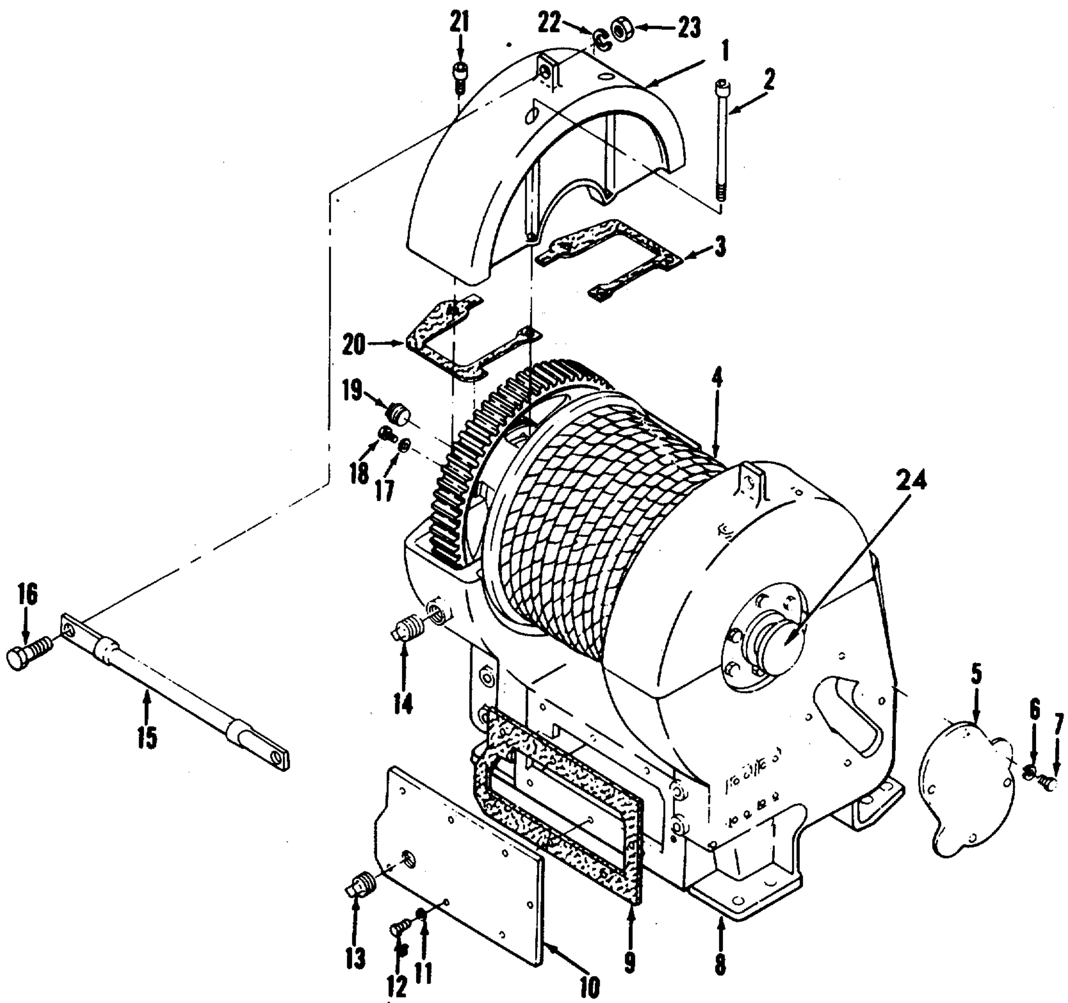
f. Change oil in winch assembly (see lubrication order).

g. Attach anchor to winch assembly wire rope. Place shift lever (10, fig. 2-119) in neutral and release brake lever (9).

h. Pull out free spooling control (24, fig. 2-118) and allow cable drum to free spool. Drop anchor over stern of LARC and apply brake before anchor contacts ground. If brake does not stop and restrain the cable drum, adjust the brake as follows:

(1) Remove brake cover (3, fig. 2-120) by removing four capscrews (1) and lockwashers (2).

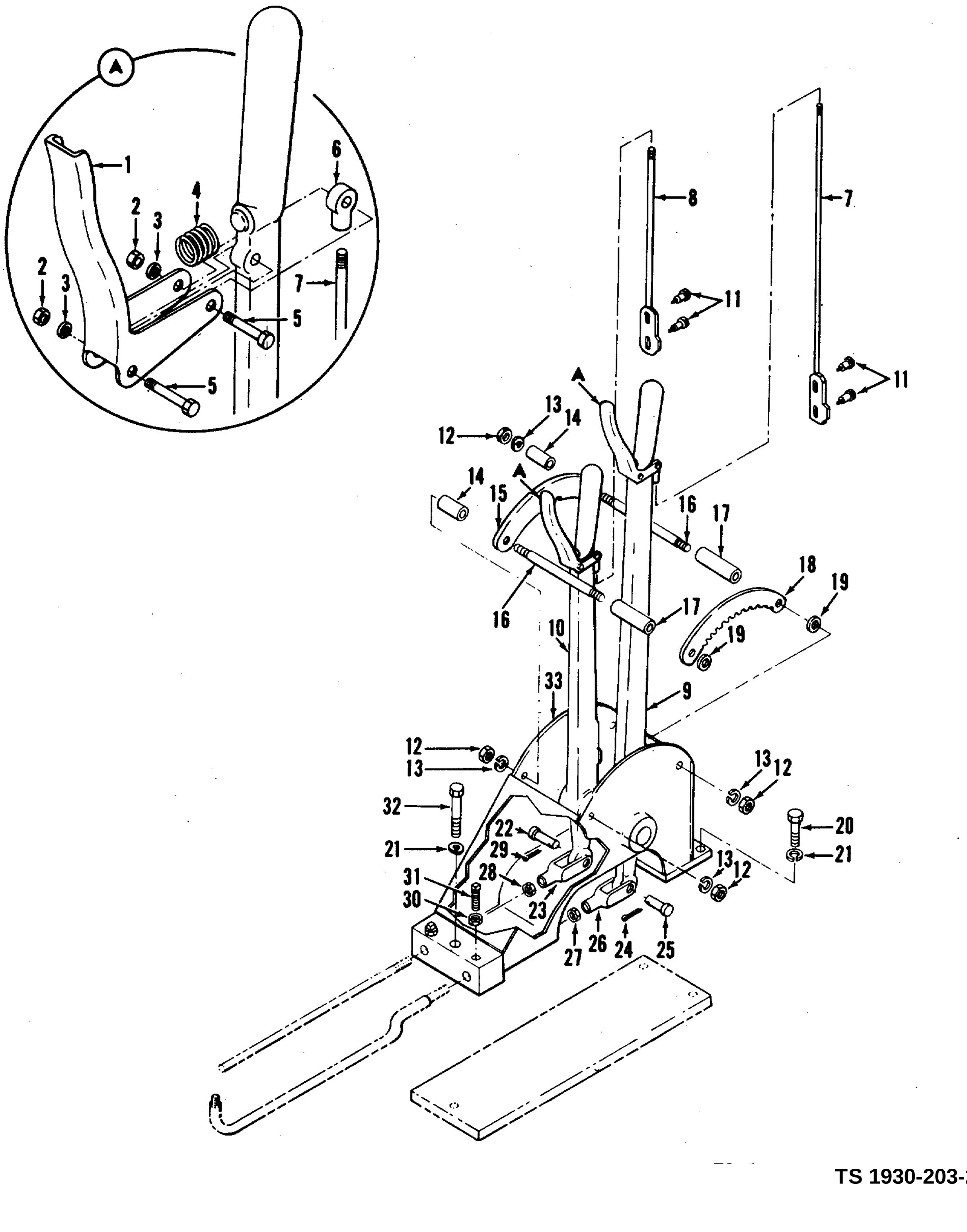
(2) Loosen locknut (9) and jamnut (8); turn brake adjusting bolt (5) clockwise until cable drum can be turned freely by hand.



TS 1930-203-20/2-118

1.	Cover	13.	Pipe plug
2.	Capscrew	14.	Pipe plug
3.	Gasket	15.	Cable guard
4.	Wire rope	16.	Bolt
5.	Brake cover	17.	Lockwasher
6.	Lockwasher	18.	Capscrew
7.	Capscrew	19.	Pipe plug
8.	Winch housing	20.	Gasket
9.	Gasket	21.	Capscrew
10.	Cover	22.	Lockwasher
11.	Lockwasher	23.	Nut
12.	Capscrew	24.	Free spooling control

Figure 2-118. Cargo Winch Assembly.

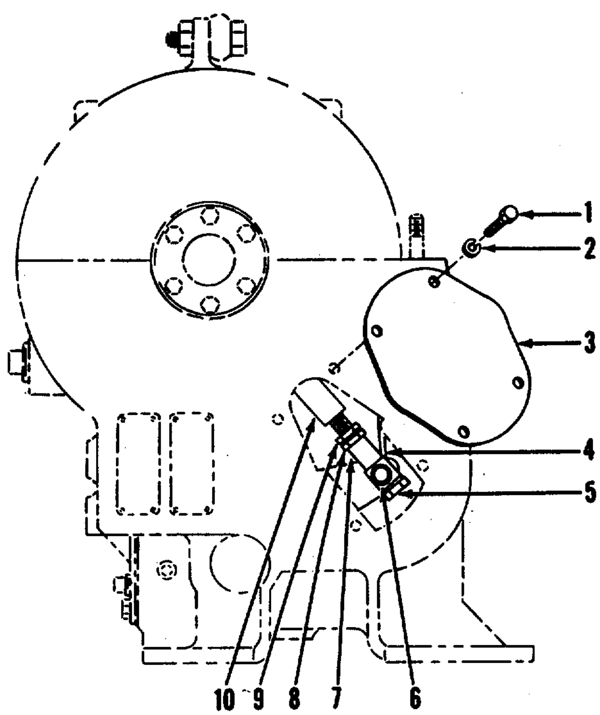


TS 1930-203-20/2-119

Figure 2-119. Control Stand, Disassembly and Reassembly.

Legend for figure 2-119:

1. Grip latch
2. Nut
3. Washer
4. Spring
5. Screw
6. Rod end
7. Pawl and rod
8. Pawl and rod
9. Brake lever
10. Shift lever
11. Screw
12. Nut
13. Lockwasher
14. Spacer
15. Sector
16. Stud
17. Spacer
18. Ratchet
19. Spacer
20. Capscrew
21. Lockwasher
22. Yoke pin
23. Yoke
24. Cotter pin
25. Yoke pin
26. Yoke
27. Jamnut
28. Jamnut
29. Cotter pin
30. Jamnut
31. Setscrew
32. Capscrew
33. Control stand



TS 1930-203-20/2-120

1. Capscrew
2. Lockwasher
3. Brake cover
4. Brake hand
5. Bolt, brake adjusting
6. Pin, brake adjusting
7. Spacer
8. Jamnut
9. Locknut
10. Brake adjusting link

Figure 2-120. Winch Bracket.

(3) Tighten brake band (4) by turning brake adjusting bolt (5) counterclockwise until a slight drag is felt on cable drum.

(4) Tighten jamnut (8) and locknut (9).

(5) Replace brake cover (3).

NOTE

The amount of drag on the cable drum can be varied by adjustment of the winch brake to meet different working conditions.

2-136. WINCH CONTROL STAND.

a. General. The winch control stand (fig. 2-119) is located in the port side of the LARC adjacent to the winch. The control stand is equipped with two levers (shift and brake) which are linked to their respective components within the winch assembly. The long lever is the winch brake lever and the short lever is the three position shift lever (neutral, forward, and reverse).

b. Inspection and Service.

(1) Inspect for broken or bent levers (9 and 10, fig. 2-119) and damaged contr6l stand (33). If levers or control stand are damaged, repair damaged parts.

(2) Inspect grip latches (1), pawl and-rods (7 and 8), sector (15), and ratchet (18) for broken or bent condition. Replace parts if damaged.

c. Control Stand Components Removal.

(1) Remove pawl screws (11, fig. 2-119) and remove pawl and rods (7 and 8) from rod ends (6).

(2) Remove screws (5), nuts (2), and washers (3) and remove rod end (6) and grip latch (1) with spring (4).

(3) Remove spacers (14, 17, and 19), sector (15), and ratchet (18) by removing nuts (12), lockwashers (13) and stud (16).

NOTE

Notches are not required in the shift lever sector (15) for forward or reverse positions because detents in winch assembly shift fork hold the shifter in place.

d. Control Stand Components Installation.

(1) Install stud (16, fig. 2-119), ratchet (18), sector (15) and spacers (14, 17 and 19). Secure with lockwashers (13) and nuts (12).

(2) Install spring (4), grip latch (1) and rod end (6) and secure with washers (3), nuts (2) and screws (5).

(3) Install pawl and rod (7 and 8) into rod ends C6) and secure with pawl screws (11).

2-137. SPEED CONTROL LINKAGE.

a. General. The speed control linkage (fig. 2-121) is a manually controlled linkage for the winch hydraulic control valve. The linkage primarily consists of a handle, connecting bars, shaft, stuffing box, and clevis. The speed control linkage is located on the port side of the main deck, adjacent to the control stand.

b. Inspection and Service.

(1) Inspect speed control handle, connecting bars, and shaft for bent or broken condition. Replace handle, connecting bars, and shaft if bent or broken.

(2) Check speed control shaft for binding. If binding, lubricate shaft surface with a few drops of OE10 oil.

(3) Ensure all attaching hardware is present and in good operating condition.

c. Removal.

(1) Remove speed control handle (1) by removing cotter pin (19) and clevis pin (2).

(2) Loosen jamnut (6) and unscrew stuffing box nut (17).

(3) Remove cotter pin (11) and clevis pin (14); remove shaft (18) and stuffing box nut (17).

(4) Remove jamnut (6) and packing rings (4) from stuffing box (7).

(5) Remove stuffing box (7) and gasket (8) by removing bolts (5), nuts (10), and lockwashers (9).

(6) Loosen jamnut (13) and remove clevis (12).

(7) Remove jamnut (13).

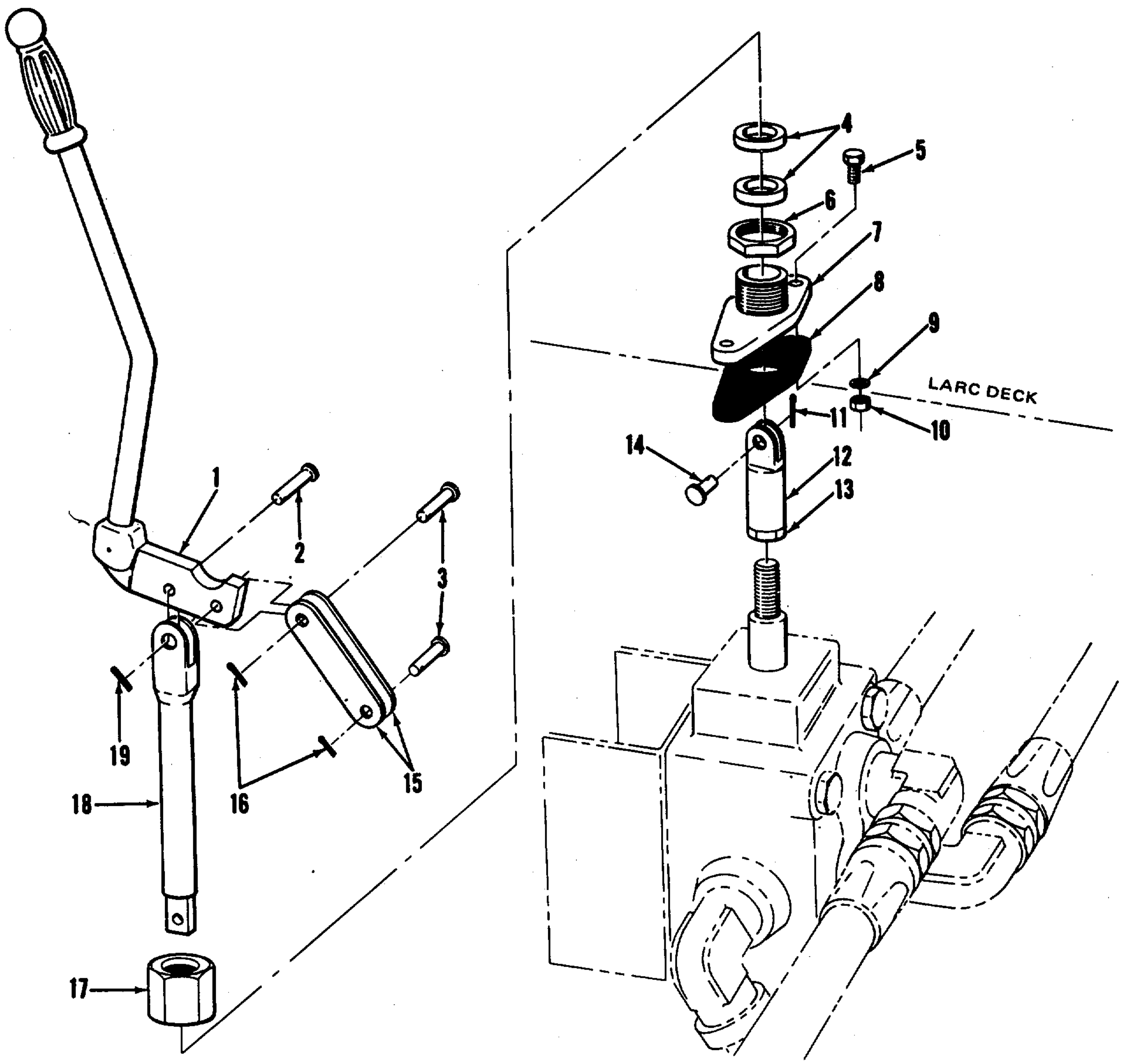
d. Installation.

(1) Install jamnut (13, fig. 2-121).

(2) Install clevis (12) and tighten jamnut (13).

(3) Install gasket (8) and stuffing box (7); secure with bolts (5), lockwashers (9) and nuts (10).

(4) Install jamnut (6) and packing rings (4).



TS 1930-203-20/2-121

1. Handle
2. Clevis pin
3. Clevis pin
4. Packing rings
5. Bolt
6. Jamnut
7. Stuffing box
8. Gasket
9. Lockwasher
10. Nut
11. Cotter pin
12. Clevis
13. Jamnut
14. Clevis pin
15. Connecting bar
16. Cotter pin
17. Nut, stuffing box
18. Shaft
19. Cotter pin

Figure 2-121. Speed Control Linkage, Disassembly and Reassembly.

(5) Install stuffing box (17) and jamnut (6).

(6) Tighten stuffing box (17) and jamnut (61.

(7) Install speed control handle (1) and secure with clevis pin (2) and cotter pin (19).

(8) Install connecting bars (15), clevis pins (3) and cotter pins (16).

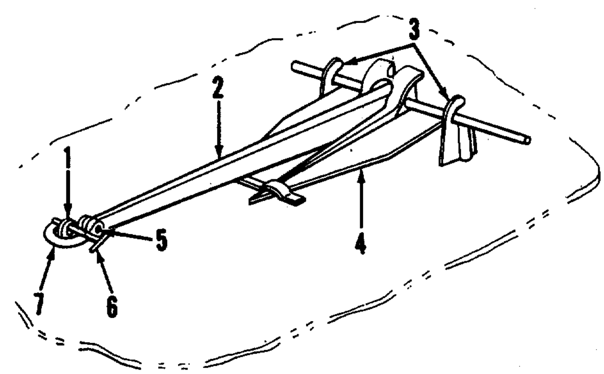
SECTION XX. MAINTENANCE OF MISCELLANEOUS HULL ACCESSORIES

2-138. GENERAL.

This section contains maintenance instruction for the miscellaneous hull accessories on the LARC. The components of this section consist of an anchor, ventilating fans, heater, and lifelines.

2-139. ANCHOR.

a. General. The LARC is equipped with a 150 pound (68 kg) anchor (fig. 2-122) which, when attached to the winch cable, may be lowered overboard to prevent the LARC from drifting. The anchor can be handled by one man and is raised and lowered by the cargo winch.



1. Eye, deck mounting
2. Shank
3. Stowage bracket
4. Fluke
5. Shackle pin
6. Toggle pin
7. Connecting shackle

Figure 2-122. Anchor Stowage.

b. Inspection and Service.

(1) Inspect anchor for rust. Wire-brush all rust and scale from anchor and spot-paint as required.

(2) Inspect connecting shackle (7, fig. 2-122) for breakage. Replace defective connecting shackle.

(3) Inspect shackle pin (5) and toggle pin (6) for breakage. Replace defective parts.

c. Anchor Removal.

(1) Remove toggle pin (6, ,fig. 2-122) from mounting eye (1).

(2) Remove anchor from mounting pads.

d. Anchor Installation.

(1) Position anchor (fig. 2-122) on mounting pads.

(2) Install toggle pin (6) into mounting eye (1).

2-140. VENTILATING FANS.

a. General. Two ventilating fans are located on both sides of the cab ceiling above the instrument panel to circulate air in the cab. The base is adjustable to permit change in airflow direction.

b. Inspection and Service.

(1) Inspect fan guard and fan blades for broken or warped condition. Report all discrepancies to direct support maintenance.

(2) Lubricate fans.

(3) Ensure fan guard, fan blade, and ventilating fans are securely mounted. Observe torque values when tightening attaching hardware.

2-141. HEATER.

a. General. The LARC cab is equipped with a hot water heater for windshield defrosting and for heating the cab. The heater has two hoses connecting the heater and defrosting units together. The heater fan is operated by a left-hand rotation, 24 volt dc, 1/30 hp motor. The heater controls may be used to vary the amount of air flow or hot water circulation through the heater. The hot water that circulates through the heater flows from the aft port engine cooling system.

b. Inspection and Service.

(1) Inspect defroster outlet for accumulations of dirt or foreign matter. Remove all dirt and foreign matter from defroster outlet.

(2) Inspect defroster hoses for heat deterioration and breakage. Remove and replace defective defroster hoses.

(3) Operate heater fan motor. Report failure to operate to direct support maintenance.

c. Defroster Hose Removal.

(1) Loosen defroster hose clamps for defroster hose.

(2) Slide defroster hose from heater and defroster unit.

d. Defroster Hose Installation.

(1) Install defroster hose in heater and defroster unit.

(2) Tighten defroster hose clamps.

2-142. LIFELINES AND SAFETY RAIL.

a. General. The lifelines are plastic-covered wire rope installed inboard on both sides of cargo well, outboard across the stern, and along port and starboard sides of the LARC. The lifelines are installed on the LARC as a safety precaution to prevent the crew from falling overboard or into the cargo well. The safety rails are made of pipe located at the port and starboard forward scuttles.

b. Inspection and Service.

(1) Inspect the lifelines for slackness, deteriorated plastic covering, frayed wire, and cuts. Replace defective wire rope.

(2) Inspect the stern stanchions (1, fig. 2-123) and bulwark stanchions (2) for rust. Wire-brush all rust from stanchions and spot-paint as required.

(3) Inspect stanchions (1, 2, and 3) for broken or bent condition. Replace defective stanchions.

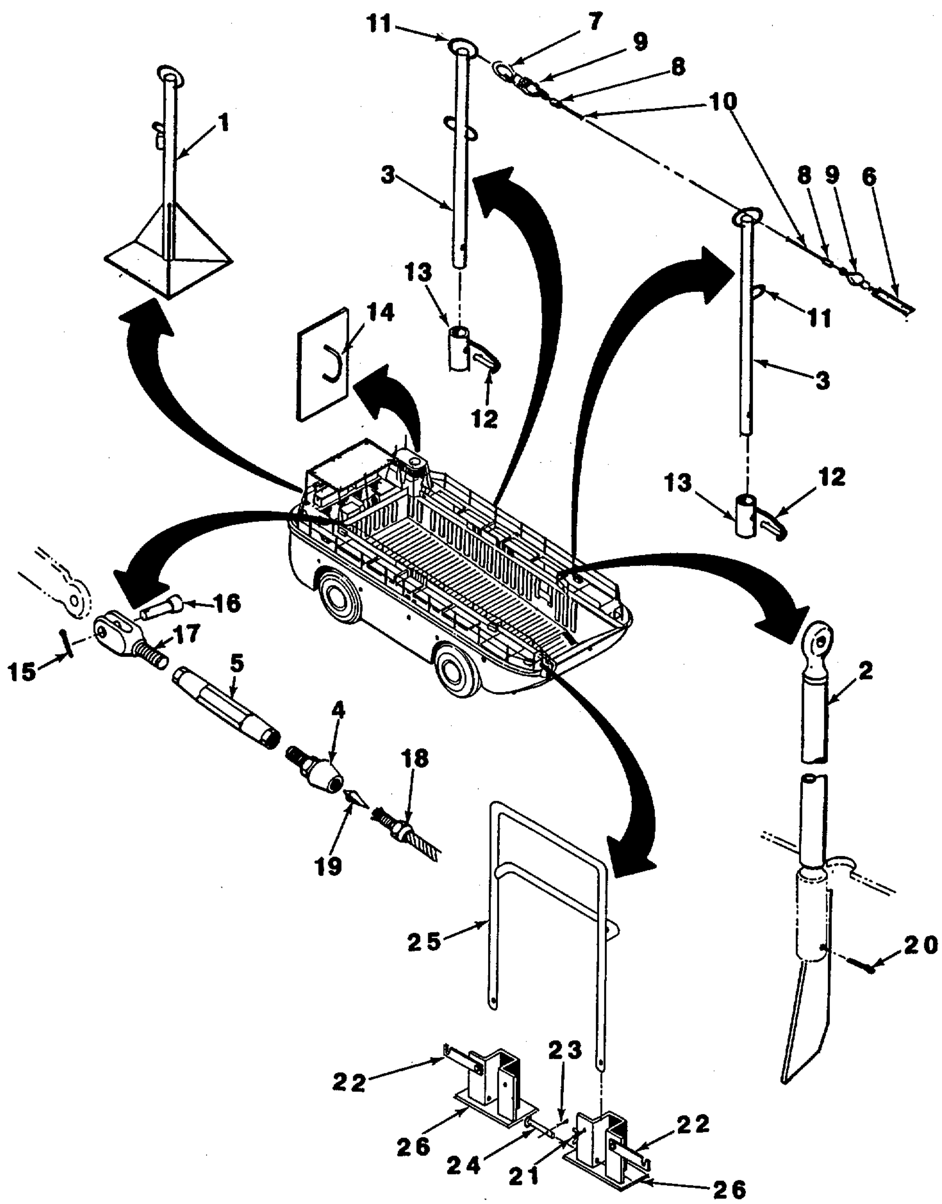
(4) Inspect sockets (4), turnbuckles (5) and (6), swivel boat snaps (7), wire rope clamps (8) and thimbles (9) for breakage or stripped threads. Replace defective components.

c. Port and Starboard Outboard Lifeline and Stanchion Removal.

(1) Loosen turnbuckle (6) to slacken lifeline (10).

(2) Unhook swiveled boat snap (7) and pull lifeline (10) through stanchion eyes (11).

(3) Remove toggle eye pin (12) and lift stanchion (3) free of stanchion socket,(13).



1.	Stanchion	14.	Eye
2.	Stanchion	15.	Cotter Pin
3.	Stanchion	16.	Pin
4.	Socket	17.	Clevis
5.	Turnbuckle	18.	Sleeve
6.	Turnbuckle	19.	Plug
7.	Snap	20.	Cotter Pin
8.	Clamp	21.	Butterfly Nut
9.	Thimble	22.	Retainer
10.	Lifeline	23.	Cotter Pin
11.	Stanchion Eye	24.	Shank Pin
12.	Toggle Pin	25.	Safety Rail
13.	Socket	26.	Bracket

Figure 2-123. Safety Rail, Lifeline and Stanchion, Removal and Installation.

d. Port and Starboard Outboard Lifeline and Stanchion Installation.

(1) Place stanchion (3) inside stanchion socket (13) and insert toggle eye pin (12) through holes in stanchion socket (13) and stanchion (3).

(2) Thread wire rope (10) through stanchion eyes (11).

CAUTION

Be careful not to break plastic covering on wire rope when threading through the stanchion eyes.

(3) Hook boat snaps (7) to eyes and tension wire rope safety rail using turnbuckle (6).

e. Stern Stanchions and/or Port and Starboard Outboard Stanchion Sockets Removal

(1) Remove lifeline (10) and port and starboard stanchions (3) (TM 55-1930-230-20).

(2) Grind existing stern stanchion (1) or stanchion socket welds (13) loose from deck or eye (14) from pilothouse.

f. Stern Stanchion and/or Outboard Stanchion Socket Installation.

(1) Align and weld stern stanchion (1)/stanchion socket (3), eye (14), and weld to deck/pilothouse. Refer to paragraph 11-3 for welding procedures.

(2) Install port/starboard stanchions (3) and lifelines (TM 55-1930-230-20).

CAUTION

Be careful not to break plastic covering on wire rope when threading through the stanchion eyes.

g. Port and Starboard Inboard Lifeline and Stanchion Removal

(1) Remove cotter pin (15, fig. 2-123) and pin (16) from clevis (17).

(2) Unscrew clevis from turnbuckle (5).

(3) Remove turnbuckle (5) from socket (4), unscrew socket from sleeve (18) and remove plug (19).

(4) Remove sleeve (18) and pull wire rope through stanchion eyes.

(5) Remove cotter pin (20) and remove stanchion (2).

h. Port and Starboard Inboard Lifeline and Stanchion Installation.

CAUTION

Be careful not to break plastic covering on wire rope when threading through the stanchion eyes.

(1) Install stanchion (2, fig. 2-123) and cotter pin (20).

(2) Thread wire rope through stanchion eyes and install sleeve (18).

(3) Install plug (19) and screw socket (4) on sleeve (18).

(4) Screw turnbuckle (5) to socket (4) and clevis (17).

(5) Position clevis and secure with pin (16) and cotter pin (15).

I. Bow Scuttle Safety Rail Removal.

(1) Loosen butterfly nuts (21) and rotate retainer (22) out of the way.

(2) Extract cotter pins (23) and pull shank pins (24) freeing safety rail (25).

(3) Grind bracket welds (26), away to remove bracket.

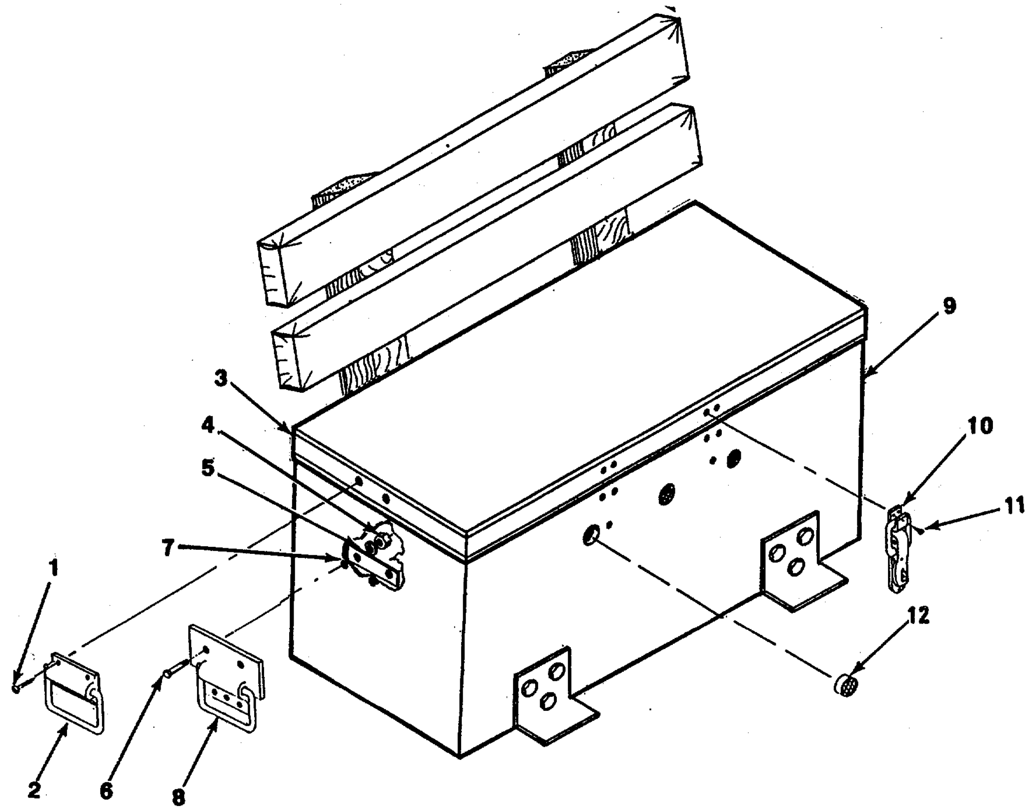
j. Bow Scuttle Safety Rail Installation.

(1) Weld brackets (26) in place on deck.

(2) Position safety rail (25) in brackets (26) and insert shank pins (24) through brackets (26) and safety rail (25). Insert cotter pins (23) in pins (24).

(3) Place safety rail (25) in erect position, close retainer (22) and secure by tightening butterfly nuts (21).

2-143. REPAIR SEAT.



1.	Screw	7.	Backing plate
2.	Handle	8.	Handle
3.	Seat lid	9.	Chest
4.	Nut	10.	Latch
5.	Lockwasher	11.	Screw
6.	Bolt	12.	Vent

Figure 2-124. Seat, Repair.

a. Removal - Seat Handle.

(1) Remove screws (1) and remove damaged handle (2).

b. Installation - Seat Handle.

(1) Install new handle (2) and secure to seat lid (3) using screws (1).

c. Removal - Chest Handle.

(1) Remove nuts (4), lockwashers (5), and bolts (6) freeing backing plate (7) and handle (8). (2) Remove handle (8) and backing plate (7).

d. Installation - Chest Handle.

(1) Install new chest handle (8) and backing plate (7) on side of chest (9), securing handle (8) and plate (7) to the chest (9) using bolts (6), lockwashers (5), and nuts (4).

e. Removal - Lid Latch.

(1) Open latch (10).

(2) Remove screws (11) and remove latch (10) from lid.

f. Installation - Lid Latch.

(1) Position new latch (10) on chest (9) and secure in place using screws (11).

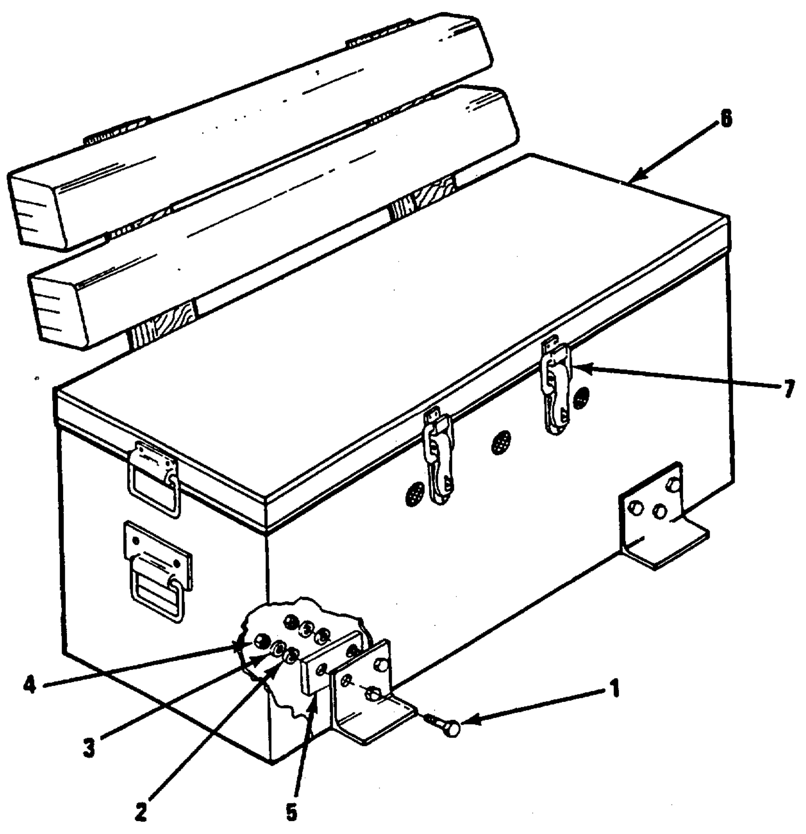
g. Removal - Vent.

(1) Remove vent (12).

h. Installation - Vent.

(1) Install vent (12) in hole in chest (9) side.

2-144. REPLACE SEAT.



1. Nut
2. Washer
3. Lockwasher
4. Bolt
5. Backing plate
6. Seat
7. Bracket

Figure 2-125. Seat, Replacement.

a. Removal - Seat.

(1) Remove nuts (1), washers (2), lockwashers (3), bolts (4), and backing plates (5) freeing seat (6) from brackets (7).

(2) Remove seat (6).

b. Fabrication

(1) Fabricate replacement seat in accordance with plans in Appendix E - Illustrated List of Manufactured Items.

c. Install - Seat.

(1) Position new seat (6) in brackets (7).

(2) Install bolts (4), backing plates (5), lockwashers (3), washers (2), and nuts (1).

2-145. REPLACE PORTABLE TOILET.

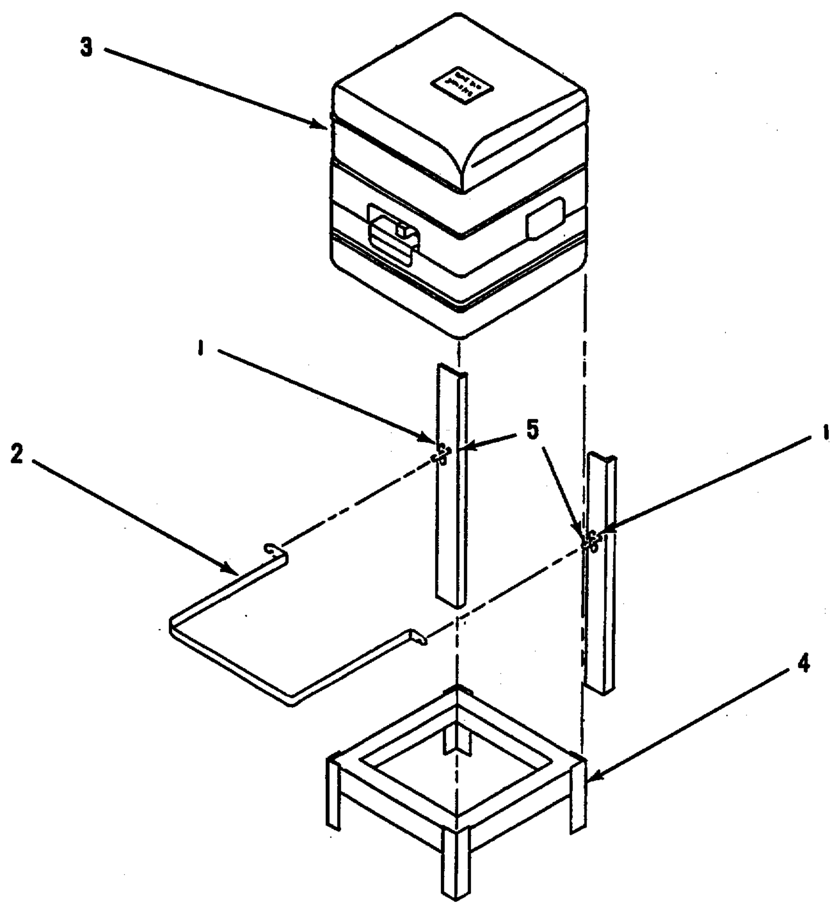


Figure 2-126. Portable Toilet, Replacement.

a. Remove.

(1) Loosen two wing nuts (1) and lift bracket (2) clear of portable toilet (3).

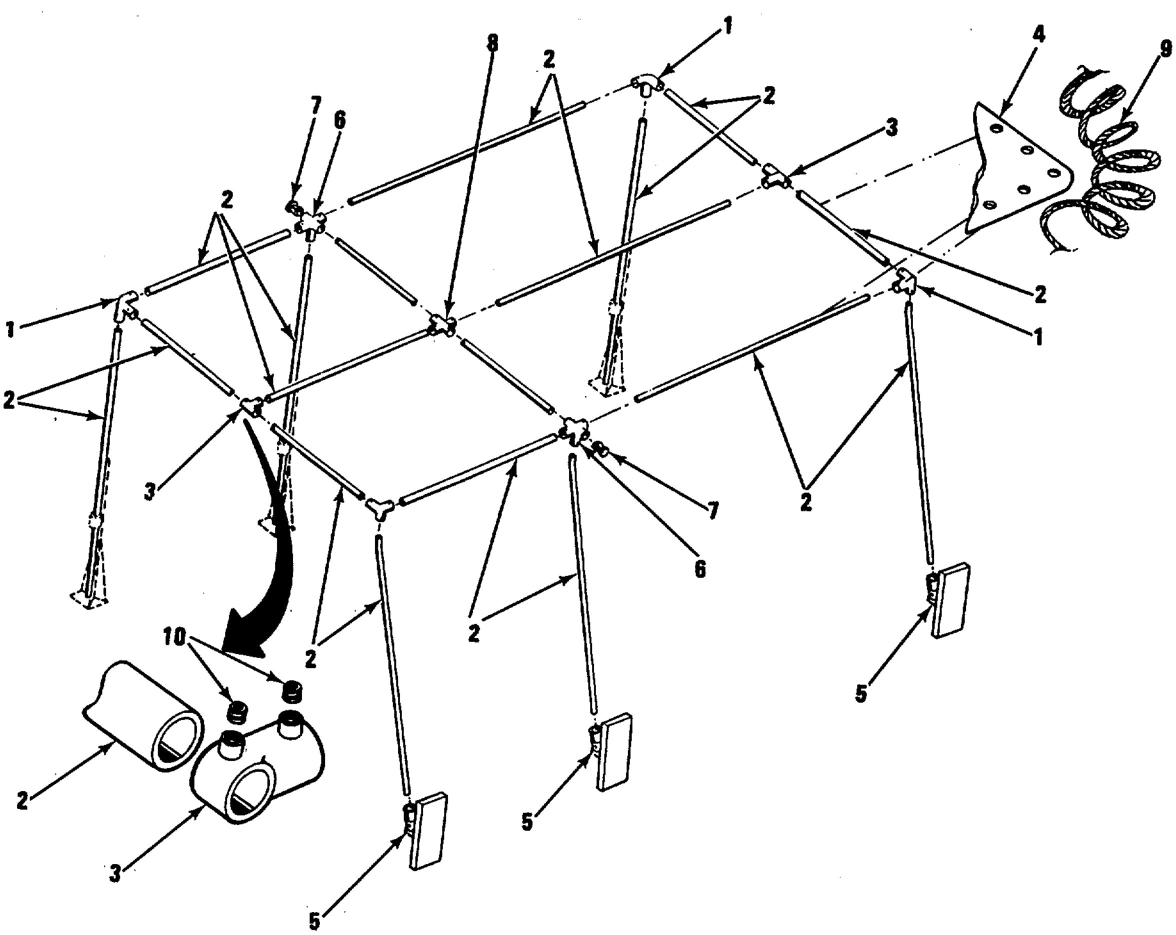
(2) Lift toilet (3) clear of foundation (4) and remove.

b. Install.

(1) Seat portable toilet (3) on foundation (4).

(2) Place bracket (2) around toilet (3) and over bolts (5). Tighten wing nuts (1) securing bracket (2) to bulkhead.

2-146. REPAIR/REPLACE CANOPY.



1. Side Outlet Elbow
2. Pipe, 1-1/4"
3. Single Socket Tee
4. Canopy Cover
5. Swivel Flange
6. Side Outlet Tee
7. Plug, Plastic
8. Two Socket Cross
9. Rope, ¼" Dia.
10. Screws

Figure 2-127. Canopy, Replacement and Repair.

a. Removal.

(1) Unlace rope (9) and remove or lay back canopy cover (4) as required to allow clear work area for repair of damaged canopy frame components.

(2) Ease set screws (10) in pipe fittings (11) unclamping pipe (2)

(3) Remove damage pipe and/or pipe fitting as required.

NOTE

Swivel flange fittings are welded to LARC-60 and will have to be cut off if damaged.

b. Fabrication.

(1) Replacement pipe is cut to specified length from 1-1/4" pipe.

(2) Replacement canopy cover is fabricated in accordance with drawing at Appendix E.

c. Installation.

(1) Insert pipes (2) into pipe fittings (11) and tighten set screws (10) to clamp pipes in fittings.

(2) Install canopy cover (4) over canopy frame and lash it to the frame using rope (9).

SECTION XXI. MAINTENANCE OF HYDRAULIC STARTER AND WHEEL ALIGNMENT SYSTEM

2-147. WHEEL ALIGNMENT SYSTEM.

a. General.

(1) In case of steering failure with the wheels in a turned position, this system will return the wheels to a straight ahead position. Once the wheels, have been returned to a straight ahead position, further steps will be at the direction of supervisory personnel. The procedural steps for using the system are also listed on an instructional plate/schematic diagram mounted on the inside of the port forward large machining hatch cover. There is a system for the front steering and a system for the aft steering.

(2) The wheel alignment system consists of a directional flow control valve, two cylinder shutoff valves, and one cylinder control valve. The position of the directional flow control valve directs hydraulic fluid flow to either the forward or aft end of the steering cylinder. The position of the directional flow control valve determines which way the wheels will turn when pressure is applied to the cylinder. The cylinder shutoff valves block the flow of hydraulic flitted to the steering cylinder when closed and allow it to flow when open. They must be closed unless the wheel alignment system is in use. The cylinder control valve allows hydraulic fluid to flow through the directional flow control valve and then to the steering cylinder.

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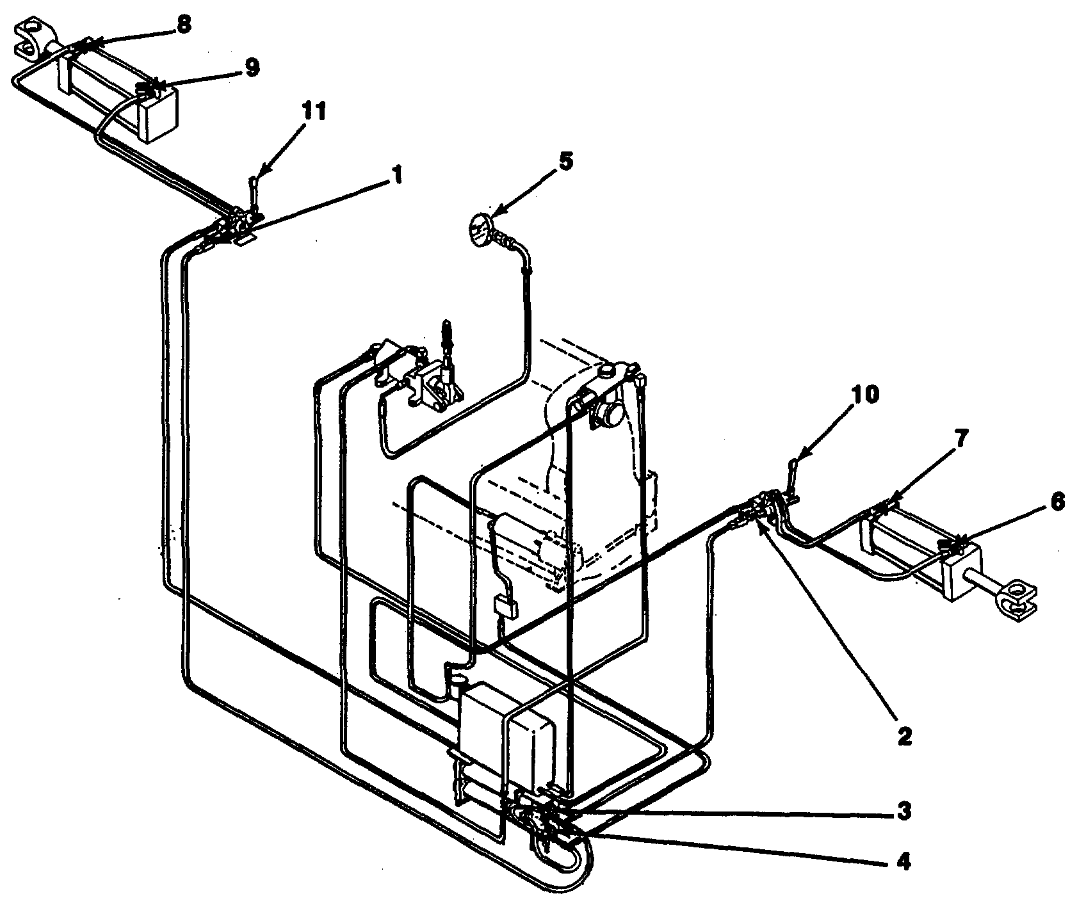


Figure 2-128. Wheel Alignment System.

Legend for figure 2-128:

1. Needle valve
2. Needle valve
3. Ball valve
4. Ball valve
5. Pressure gage
6. Needle valve
7. Needle valve
8. Needle valve
9. Needle valve
10. Spool valve lever
11. Spool valve lever

b. Operation. The wheel alignment system will be used only when directed by the crew chief. The following procedures will be followed in using the system.

(1) Close valves (1) and (2) if they are open.

(2) Do not move the steering levers.

(3) Open valves (3) and (4) if they are closed.

(4) Check the hand pump pressure gage (5) for pressure reading. If the reading is below 3000 psi use hand pump to raise pressure to 3000 psi.

(5) If the steering forward failed, open valves (6) and (7). If the steering aft failed, open valves (8) and (9).

(6) Move the spool valve lever (10) in direction wheels are to move when aligning forward wheels. Move spool valve lever (11) when aligning aft wheels.

NOTE

OPEN VALVE IN NEXT STEP SLOWLY OR SYSTEM PRESSURE WILL BE LOST.

(7) Slowly open needle valve (2) for alignment of forward wheels. Slowly open needle valve (1) for alignment of aft wheels. Check for correct movement of wheels as needle valve is opened.

(8) If wheels are not turning in correct direction close needle valve (1) or (2). Move spool valve lever (10) or (11) opposite position and repeat step 7.

(9) When wheels are straight close needle valve opened in step 7.

(10) Move spool valve lever (10) or (11) to center position.

(11) For steering forward failures, close valves (6) and (7). For steering aft failures, close valves (8) and (9).

(12) Proceed as directed by supervisor.

APPENDIX A

REFERENCES

A-1.	Demolition. TM 750-244-3	Procedures for Destruction of Material to Prevent Enemy use
A-2.	Fire Protection. TB 5-4200-200-10	Hand portable Fire Extinguishers Approved for Army Users
A-3.	Lubrication. C9100IL	Fuels, Lubricants, oils, and Waxes
	LO 55-1930-203-12	Lubrication Order: Lighter, Amphibious (LARC-LX); Self-Propelled; Diesel; Steel; 60 Ton; 61 Foot; design 2003; Hulls 5 through 60; NSN 1930-00-392-2981
A-4.	Maintenance.	
	TM 9-2610-200-20	Tires and Inner Tubes, Pnuematic, Care, Maintenance and Repair
	TM 9-6140-200-12	Operator and Organizational Maintenance For Lead-Acid Storage Batteries
	TM 38-230-2	Preservation, Packaging and Packing of Military Supplies and Equipment
	DA PAM 738-750	The Army Management Maintenance System (TAMMS)
	TB 43-0141	Instructions for Handling, Mainten-ance, Storage and Disposal of Radioactive Material
	TM 55-1900-202-12/1	Crafts, Floating, USAMEC: Preventive Maintenance
	TM 55-1930-203-10	Operator's Manual: Lighter, Amphibious (LARC-LX); Self-Propelled; Diesel; Steel; 60 Ton; 61 Foot; Design 2003; Hulls 5 through 60; NSN 1930-00-392-2981
	TM 55-1930-203-20P	Organizational Maintenance Repair Parts and Special Tools List
A-5.	Painting. TB 43-0144	Painting of Vessels
A-6.	Radio Interference Suppression. TM 11-483	Radio Interference Suppression
A-7.	Shipment and Storage. TB 740-97-4	Storage of Vessels

APPENDIX B

MAINTENANCE ALLOCATION CHART

SECTION I. INTRODUCTION

B-1. GENERAL.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance function upon the end item or component will be consistent with the assigned maintenance functions.

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

d. Section IV contains supplemental instructions on explanatory notes for a particular maintenance function.

B-2. MAINTENANCE FUNCTIONS.

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operation required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, 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 equipments 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. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remaching, or resurfacing) to 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 (services/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not. normally return an item to like new condition.

k. Rebuild. Consists of those services/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 materiel 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 equipments/components.

B-3. COLUMN ENTRIES USED IN THE MAC.

a. Column 1 - Group Number. Column 1 lists group numbers, the purpose of which is to identify 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 Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For a detailed explanation of these functions, see paragraph B-2).

d. Column 4 - Maintenance Level. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. .This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the member or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each level. The number of man-hours specified by 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, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designation for the various maintenance levels are as follows:

C--Operator or crew
O--Organization maintenance
F--Direct support maintenance
H--General support maintenance
D--Depot maintenance

e. Column 5 - Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

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

SECTION II. MAINTENANCE ALLOCATION CHART.

B-4. COLUMN ENTRIES USED IN TOOL AND TEST EQUIPMENT REQUIREMENTS.

a. Column 1 - Tool or Test Equipment Reference Code. The tool and test equipment reference code correlates with a maintenance function on the identified end item or component.

b. Column 2 - Maintenance Level. The lowest level 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/NATO Stock Number. The National or NATO stock number of the tool or test equipment.

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

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS.

B-5. EXPLANATION OF COLUMNS IN SECTION IV.

a. Reference Code. The code scheme recorded in column 6, Section II.

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

Section II - MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIP	(6) REMARKS
01	ELECTRICAL SYSTEM								
0101	Relays & Switches	Inspect		0.1					
		Repair			2.0				
		Replace			1.0				
		Adjust			0.5				
0102	Battery Charging Alternators. and Drivebelts								
	Belts	Inspect		0.1					
		Adjust		0.1					
		Replace			0.3				
	Alternators	Inspect			0.5				
	Replace				1.0				
	Alternator Pulley.	Replace		0.5					
0104	Battery & Battery Cables	Inspect		0.1					
		Service		0.1					
		Test		0.5					
		Replace		0.1					
0105	Navigation Lights	Inspect	0.1						
		Service		0.1					
		Repair			1.0				
		Replace			1.0				
0106	Searchlight	Inspect	0.1						
		Service	0.1						
		Replace	1.0						
0107	Cargo Well Lights	Inspect	0.1						
		Service		0.1					
		Replace			1.0				
0108	Compartment Lights	Inspect	0.1						
		Service		0.2					
		Repair			1.0				
0109	Spot & Trouble Lights	Inspect	0.1						
		Service		0.2					
		Repair			1.0				
0110	Headlights	Inspect	0.1						
		Service		0.1					
		Adjust		0.1					
		Repair			1.0				

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
01	ELECTRICAL SYSTEM - Cont								
0111	Master Warning Light	Inspect	0.1						
		Service		0.1					
		Repair			0.5				
0112	Warning Light	Inspect	0.1						
		Service		0.1					
		Repair			0.5				
0113	High Beam Indicator Light	Inspect	0.1						
		Replace		0.1					
		Repair		0.2					
0114	Instrument Panel Lights	Inspect	0.1						
		Service		0.2					
		Repair			0.2				
0115	Cab Dome Light	Inspect	0.1						
		Service		0.1					
		Repair			0.3				
0116	Circuit Breaker Panel	Inspect		0.1					
		Repair		0.3					
		Replace		0.1					
0117	Electrical Tachometer Generator	Replace		0.1					
		Inspect		0.1					
		Replace			0.5				
0118	Compass	Service		0.2					
		Replace		2.0					
0119	Resistor	Replace		0.1					
0120	Switch	Replace		0.5					
02	HULL & COMPONENTS								
0201	Hull	Inspect		1.0					
		Service		2.0					
		Repair				5.0			
		Replace				7.0			
0202	Compartment Scuttles	Inspect		0.2					
		Service		0.1					
		Repair			1.0				
		Replace		0.2					
0203	Machinery Hatch Cover Brace Assembly	Inspect			0.1				
		Service			1.0				
		Repair			1.0				
		Replace			0.5				

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
02	HULL & COMPONENTS - Cont								
0204	Machinery Hatch Covers	Inspect			0.1				
		Service			0.1				
		Repair			1.0				
		Replace			1.0				
0205	Towing Lug & Shackle	Inspect		0.1					
		Service		0.2					
		Repair		0.5					
		Replace							
0206	Bilge Drain Valves	Inspect		0.5					
		Replace		0.1					
		Repair		0.1					
		Replace		0.5					
0207	Ramp	Inspect		0.1					
		Service		0.2					
		Repair			3.0				
		Replace				3.0			
0208	Ramp Latch	Inspect		0.1					
		Service		0.1					
		Repair		0.5					
		Replace		0.5					
0209	Ramp Cable Harness	Adjust		1.0					
		Replace		4.0					
0210	Ramp Seal	Service	0.6						
		Inspect		0.5					
		Replace			8.0				
021001	Ramp Seal Protector	Inspect		0.5					
		Service			0.2				
		Replace			4.0				
0211	Cab	Inspect		0.3					
		Service		0.5					
		Repair		1.0					
		Replace			3.0				
0212	Cab Scuttle Cover	Inspect		0.1					
		Service		0.1					
		Replace		0.3					
0213	Hatch, Marine Gear Access	Inspect		0.1					
		Replace		1.0					
03	HYDRAULIC SUPPLY SYSTEM	Test			8.0				
0301	Hydraulic Fluid Tank	Inspect		1.0					
		Service		0.5					
		Repair			2.0				
		Replace			2.0				

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
03	HYDRAULIC SUPPLY SYSTEM-Cont								
0302	Hydraulic Pumps	Inspect		0.5					
		Repair			2.0				
		Replace			1.0				
		Overhaul				6.0			
0303	Valves	Inspect		0.3					
		Service		0.2					
		Repair			0.5				
		Replace			0.5				
0304	Lines	Inspect		0.5					
		Replace			1.0				
04	RAMP HYDRAULIC SYSTEM								
0401	Ramp Cylinder	Inspect		0.3					
		Service		0.2					
		Replace			2.0				
040101	Valve, Relief	Replace			0.5				
0402	Valves	Inspect		0.5					
		Service		0.2					
		Repair			2.0				
		Replace			2.0				
		Overhaul				4.0			
0403	Lines	Inspect		0.2					
		Replace			1.0				
05	CARGO WELL PUMP HYDRAULIC SYSTEM								
0501	Motors	Inspect		0.3					
		Service		0.2					
		Repair			2.0				
		Replace			1.0				
		Overhaul				3.0			
0502	Valves	Inspect		0.5					
		Replace			1.0				
0503	Lines	Inspect		0.2					
		Replace			1.0				
06	BILGE PUMP HYDRAULIC SYSTEM								
0601	Motors	Inspect		0.3					
		Repair			2.0				
		Replace			1.0				
		Overhaul				3.0			

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
06	BILGE PUMP HYDRAULIC SYSTEM - Cont								
0602	Valves	Inspect		0.5					
		Service		0.2					
		Repair			2.0				
		Replace			1.0				
0603	Lines	Inspect		0.2					
		Replace			1.0				
07	FORWARD STEERING HYDRAULIC SYSTEM								
0701	Cylinders	Inspect		0.2					
		Service		0.2					
		Adjust		0.2					
		Repair			1.0				
		Replace			2.0				
		Overhaul				3.0			
0702	Valves	Inspect		0.1					
		Repair			1.0				
		Replace			0.5				
08	AFT STEERING & WINCH HYDRAULIC SYSTEM								
0801	Cylinder	Inspect		0.1					
		Service		0.1					
		Repair		0.2	1.0				
		Replace			2.0				
		Overhaul				3.0			
0802	Valves	Inspect		0.1					
		Repair			1.0				
		Replace			0.5				
0803	Lines	Inspect		0.2					
		Replace			1.0				
09	HYDRAULIC WHEEL ALIGNMENT SYSTEM								
0901	Cylinder	Inspect		0.1					
		Service		0.1					
		Align						1.0	
		Adjust		0.1					
		Repair			1.0				
		Replace			2.0				
		Overhaul				3.0			

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
09	HYDRAULIC WHEEL ALIGNMENT SYSTEM - Cont								
0902	Valves	Inspect		0.1					
		Repair			1.0				
		Replace			0.5				
0903	Lines	Inspect		0.2					
		Replace			1.0				
10	FAN MOTOR HYDRAULIC SYSTEM								
1001	Valves	Inspect		0.1					
		Repair			1.0				
		Replace			0.5				
1002	Fan Motors	Inspect		0.1					
		Repair			1.0				
		Replace			0.5				
1003	Lines	Inspect		0.05					
		Replace			1.0				
11	DIESEL ENGINE								
1101	Rocker Cover Assembly	Inspect		0.3					
		Service		0.3					
		Replace		0.5					
		Repair		0.5					
1102	Air Cleaner Assembly	Inspect		0.1					
		Service		0.3					
		Replace		0.03					
		Repair		0.5					
1103	Air Inlet Housing	Inspect		0.1					
		Replace			1.0			26	
		Repair			2.0				
1104	Fluid Starting Aid	Inspect		0.5					
		Replace		0.5					
		Repair		0.5					
1105	Fuel Pump Assembly	Inspect		0.2					
		Replace			1.0			25	
		Repair			1.0				
1106	Fuel Filters	Inspect		0.05					
		Service		0.1					
		Replace		0.2					
		Repair		0.1					

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
11	DIESEL ENGINE - Cont								
1107	Fuel Manifold	Inspect		0.5					
		Replace			1.0				
		Repair			1.0				
1108	Water Pump	Inspect		0.05					
		Replace			1.0			28	
		Repair			2.0				
1109	Water Manifold	Inspect		0.1					
		Repair			0.5				
		Replace			0.5				
1110	Exhaust Manifold	Inspect		0.05					
		Repair			1.0				
		Replace			1.0				
1111	Muffler & Exhaust Piping	Inspect		0.05					
		Replace			1.0				
		Repair			1.0				
1112	Lubricating Oil Filters	Inspect		0.05					
		Service		0.2					
		Replace		0.5					
		Repair		0.5					
1113	Air Starting Motor	Inspect		0.05					
		Service		0.05					
		Replace			1.0				
		Repair			1.0				
1114	Governor	Inspect		0.05					
		Adjust		1.5					
		Replace			1.0				
		Repair			1.0				
1115	Control Linkage	Inspect		0.05					
		Replace		0.1					
		Repair			1.0				
1116	Fuel Injector Control	Inspect		0.05					
		Repair			1.0				
		Replace			1.0				
1117	Engine Block	Inspect		0.05					
		Repair		1.0				2, 3, 4, 5, 6, 7, 13 and 14	A
		Replace				40			
		Overhaul					60		

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level					(5) Tools and equipment	(6) Remarks
			C	O	F	H	D		
11	DIESEL ENGINE - Cont								
1118	Torque Converter	Inspect		0.02					
		Test		0.05					
		Repair			8.0				
		Replace				8.0		16 thru 23	
		Rebuild					16		
1119	Fuel Injectors	Adjust		0.2					
		Replace			0.5			1, 2 and 24	D
1120	Valves, Intake & Exhaust	Adjust		1.0					
		Replace			6.0			8 thru 12	B
12	FUEL SYSTEM								
1201	Fuel Tank	Inspect		0.1					
		Service	0.5						
		Repair			2.0				
		Replace				6.0			
1202	Fluid Pressure Filter	Inspect		0.1					
		Service		0.1					
		Repair		0.1					
		Replace			1.0				
1203	Valves	Inspect		0.1					
		Replace		0.1	1.0				
1204	Hoses, Tubing and Fittings	Inspect		0.1					
		Replace							
13	LAND DRIVE SYSTEM								
1301	Flexible Coupling	Inspect		0.1					
		Service		0.1					
		Repair		1.0					
		Replace		2.0					
1302	Transmission	Inspect		1.0					
		Service		1.0					
		Replace			5.0				
		Repair				8.0			
		Overhaul					16	29, 30 and 31	
1303	Wheels and Tires	Inspect		1.0					
		Service		1.0					
		Replace			4.0				
		Repair					16		

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level					(5) Tools and equipment	(6) Remarks
			C	O	F	H	D		
13	LAND DRIVE SYSTEM - Cont								
1304	Wheel Spindle Grease Retainer Assembly	Inspect		0.4					
		Service		0.5					
		Replace		2.0					
14	MARINE DRIVE SYSTEM								
1401	Gathering Box	Inspect		0.1					
		Service		0.1					
		Replace			2.0				
		Repair			6.0				
		Overhaul				8.0			
1402	Gathering Box - Marine Gear Angle Drive Couplings	Inspect		0.1					
		Service		0.1					
		Replace		1.0					
		Repair		1.0					
		Overhaul			5.0				
1403	Marine Gear	Inspect		0.1					
		Service		0.1					
		Replace			5.0				
		Repair				8.0			
		Overhaul					10		
1404	Propellers & Propeller Shafts	Inspect		0.1					
		Service		0.5					
		Replace			5.0				
		Repair			6.0				
15	COMPRESSED AIR SYSTEM								
1501	Air Supply System	Inspect		0.3					
		Service		0.5					
1502	Air Compressor	Inspect		0.1					
		Service		1.0					
		Replace			1.0				
		Repair				16			
		Overhaul					32		
1503	Air Supply Tanks and Valves	Inspect		0.1					
		Service		0.5					
		Adjust		0.5					
		Replace			2.0				
1504	Air Compressor Governor	Inspect		0.1					
		Service		0.1					
		Adjust		0.5					
		Replace			1.0				
		Repair			2.0				

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
15	COMPRESSED AIR SYSTEM - Cont								
1505	Main Air Supply Filter	Inspect Service Replace		0.1 0.1	 0.5				
150501	Air Dryer	Inspect Service Replace	0.1	 0.1	 4.0				
150502	Solenoid, Valve	Inspect Replace	0.1		 1.0				
150503	Push Button Switch Momentary Contact	Inspect Replace	0.1		 0.5				
1506	Air Starting Control and Supply System	Inspect Service Adjust Replace		0.1 0.1 0.1	 2.0				
1507	Airbrake Control and Supply System	Inspect Service Adjust Replace Repair		0.1 0.1 0.5	 1.0 2.0				
1508	Transmission Shifting Control System	Inspect Service Repair Replace		0.1 0.2	 1.0 1.0				
1509	Engine Cutout Control Systems	Inspect Service Repair		0.1 0.2	 1.0				
1510	Throttle Control System	Inspect Service Adjust Repair		0.1 0.2 0.1	 1.0				
1511	Marine Gear & Radiator Fan Control System	Inspect Service Adjust Repair		0.1 0.2 0.5	 1.0				
1512	Tire Inflation-Deflation Control and Supply System	Inspect Adjust Repair		0.1 0.2	 1.0				

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
15	COMPRESSED AIR SYSTEM - Cont								
1513	Ramp Seal Control & Supply System	Inspect		0.1					
		Service		0.2					
		Adjust		0.5					
		Repair			1.0				
		Replace			6.0				
1514	Cargo Well Pump Control System	Inspect		0.1					
		Service		0.2					
		Repair			1.0				
		Replace			3.0				
1515	Windshield Wiper Control & Supply System	Inspect		0.1					
		Repair			1.0				
		Replace			2.0				
1516	Air Horn Control & Supply System	Inspect		0.1					
		Adjust		0.1					
		Repair			1.0				
		Replace			1.0				
16	STEERING SYSTEM								
1601	Land Steering	Inspect		0.1					
		Service		0.2					
		Adjust		0.5					
		Repair			1.0				
		Replace			2.0				
1602	Marine Steering	Inspect		0.1					
		Service		0.2					
		Adjust		0.5					
		Repair			1.0				
		Replace			2.0				
17	COOLING SYSTEM								
1701	Radiator & Vane	Inspect		1.0					
		Test		1.0					
		Replace			4.0				
		Repair				4.0			
1702	Expansion Tank Cap & Line	Inspect		0.1					
		Service		0.2					
		Replace				2.0			
		Repair				4.0			

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level					(5) Tools and equipment	(6) Remarks
			C	O	F	H	D		
18	GAGES & INSTRUMENTS								
1801	Temperature Gages	Inspect		0.1					
		Repair			1.0				
1802	Oil Pressure Gages	Inspect		0.1					
		Repair			1.0				
1803	Steering Pressure Gage	Inspect		0.1					
		Repair			0.1				
1804	Main Air & Tire Air Pressure Gages	Inspect		0.1					
		Repair			0.5				
1805	Fuel Quantity Gage	Inspect		0.1					
		Repair			0.5				
1806	Sight Level Quantity Gage	Inspect		0.1					
		Repair			0.5				
1807	Ramp Seal Air Pressure Gage	Inspect		0.1					
		Repair			0.5				
1808	Starting Air Pressure Gage	Inspect		0.1					
		Repair			0.5				
19	WINCH EQUIPMENT								
1901	Winch Brake	Inspect		0.1					
		Service		0.2					
		Adjust		0.5					
		Repair			1.0				
1902	Winch Control Stand	Inspect		0.1					
		Service		0.2					
		Repair		1.0					
1903	Speed Control Linkage	Inspect		0.1					
		Service		0.2					
		Replace		1.0					
20	MISCELLANEOUS HULL ACCESSORIES								
2001	Anchor	Inspect		0.1					
		Service		0.3					
		Replace		0.5					

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
20	MISCELLANEOUS HULL ACCESSORIES - Cont								
2002	Ventilating Fans	Inspect		0.1					
		Service		0.2					
		Replace			1.0				
		Repair			1.0				
2003	Heater	Inspect		0.1					
		Service		0.2					
		Replace			1.0				
		Repair			1.0				
2004	Lifelines and Safety Rails	Inspect		0.1					
		Service		0.2					
		Replace		1.0					
2005	Seats	Repair		2.0					
		Replace		1.0					
2006	Portable Toilet	Service	0.5						
		Replace		2.0					
2007	Canopy	Inspect	0.1						
		Repair		1.0					
		Replace		2.0					
21	HYDRAULIC START AND WHEEL ALIGNMENT SYSTEM								
2101	Hydraulic Starting Motor	Inspect	0.1						
		Replace		2.0					
2102	Hydraulic Pump	Inspect	0.1						
		Replace		2.0					
2103	Accumulator	Inspect	0.1						
		Service			0.5				
		Replace			1.0				

Section II - MAINTENANCE ALLOCATION CHART - Cont

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	O	F	H	D	(5) Tools and equipment	(6) Remarks
21	HYDRAULIC START AND WHEEL ALIGNMENT SYSTEM - Cont								
2104	Hydraulic Hand Pump	Inspect	0.1						
		Replace			2.0				
2105	Pressure Gage	Inspect	0.1						
		Replace			0.5				
2106	Hydraulic Reservoir	Inspect	0.1						
		Replace			2.0				
2107	Hydraulic Oil Filter	Inspect		0.1					
		Service		0.1					
		Replace			1.0				
2108	Valves	Inspect	0.1						
		Replace			4.0				
2109	Lines	Inspect	0.1						
		Replace			8.0				
2110	Emergency Start Control Valve	Inspect	0.1						
		Replace			1.0				
2111	Start Cable for Emergency Start	Inspect	0.1						
		Replace			0.5				
2112	Wheel Alignment Spool Valve	Inspect	0.1						
		Replace			1.0				

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) Reference code	(2) Mainte-nance level	(3) Nomenclature	(4) National/NATO stock number	(5) Tool number
1	F	Test Set, Diesel Engine........................	4910-00-690-8452	
2	H	Plate Set, Cylinder Head Holding.........	5120-00-706-5579	
3	F	Expander, Crankshaft Rear Oil .... Seal	4910-00-363-7535	
4	H	Puller, Mechanical: Crankshaft............ and Oil Pump Gear	2815-00-670-5005	
5	H	Reamer, Hand, Connecting Rod.......... Bushing	5110-00-363-7545	
6	H	Reamer Set: Piston Bushing................	4910-00-789-2104	
7	H	Remover-Replacer, Piston Pin............	5180-00-766-7240	
8	H	Cleaner, Valve Guide..........................	5120-00-766-2141	
9	H	Driver, Valve Seat Insert	5120-00-423-6723	
10	H	Installer, Valve Guide..........................	5120-00-'706-5588	
11	F	Remover, Pushrod..............................	5120-00-494-1843	
12	H	Remover, Valve Seat..........................	5120-00-706-5586	
13	H	Fixture, Cam Follower Holder	2815-00-705-9278	
14	H	Installing Tool, Gear: Camshaft............	5120-00-473-7456	
15	F	Puller Kit, Mechanical	5120-00-856-3558	
16	H	Installer, Pump Hub Bushing................	5120-00-706-5571	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS - Cont

(1) Reference code	(2) Mainte-nance level	(3) Nomenclature	(4) National/NATO stock number	(5) Tool number
17	F	Driver, Plug, Bearing and Bushing: Torque Converter Supply Pump	5120-00-766-4742	
18	F	Remover, Supply Pump Rear Bearing Sleeve	5120-00-706-5563	
19	H	Remover, Torque Converter Pilot	5120-00-706-5570	
20	H	Tool Assembly, Stator	5120-00-706-5564	
21	F	Tool Assembling, Torque Converter Hub and Pump	5120-00-706-5569	
22	F	Tool Replacing: Converter Pump Hub Seal	5120-00-706-5577	
23	F	Tool, Replacing: Selector Valve Seat	5120-00-706-5575	
24	F	Remover, Injector	5120-00-219-8400	
25	H	Tool Set, Fuel Pump	5180-00-219-8407	
26	H	Tool Set, Blower, Diesel Engine	4940-00-611-7945	
27	H	Repair Kit, Injector Tube	5180-00-596-8541	
28	F	Driver, Bearing and Bushing: Water Pump Coupling	5120-00-363-7572	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS - Cont

(1) Reference code	(2) Maintenance level	(3) Nomenclature	(4) National/NATO stock number	(5) Tool number
29	H	Compressor, Clutch Spring: Transmission	5120-00-706-5574	
30	H	Drift Pin: Transmission Planetary	5120-00-706-5572	
31	H	Wrench, Spanner: Transmission Bearing Locknut	5120-00-706-5573	
32	F	Puller, Propeller	2090-00-654-1494	

Section IV. REMARKS

Reference code	Remarks
A	Repair of crankshaft includes metalizing, alining and grinding.
B	Repair of valves and inserts includes refacing.
C	Service of filter includes replacing element and gasket.
D	Minor repair in third echelon.

APPENDIX C

EXPENDABLE SUPPLIES AND MATERIALS LIST

SECTION I. INTRODUCTION

C-1. SCOPE.

This appendix lists expendable supplies and materials needed to operate and maintain the LARC. These items are authorized by CTA 50-1970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic 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 (e.g., "Use cleaning compound, item 5, App D").

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

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 part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

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 (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisy your requirements.

Section II - EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	0		Adhesive (MIL-A-1154)	qt
2	0		Arctic antifreeze compound (MIL-C-11755)	ga
3	0		Borax (SS-S-535)	bx
4	0		Corrosion inhibitor compound (O-I-490)	lb
5	0		Distilled water (O-W-41)	ga
6	0		Drycleaning solvent (P-D-680)	ga
7	0		Ethylene glycol inhibited antifreeze (O-A-548, type 1)	ga
8	0		Fuel oil (VV-F-800)	ga
9	0		Kerosene (VV-K-211D)	ga
10	0		Leather preservative (MIL-L-10095)	pt
11	0		Oxalic acid- (O-0-690)	lb
12	0		Rosin core solder	bx
13	0		Rubber cement (MM-M-189A)	qt
14	0		Rubber cement (3M) (EC-870)	qt
15	0		Sodium bicarbonate	lb
16	0		Sodium chromate (O-S-588)	lb
17	0		Toilet deodorant powder (53800) 6B73547	oz
18	0		Toilet Tissue (53800) 6B73537	pk

Appendix D

ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

Page

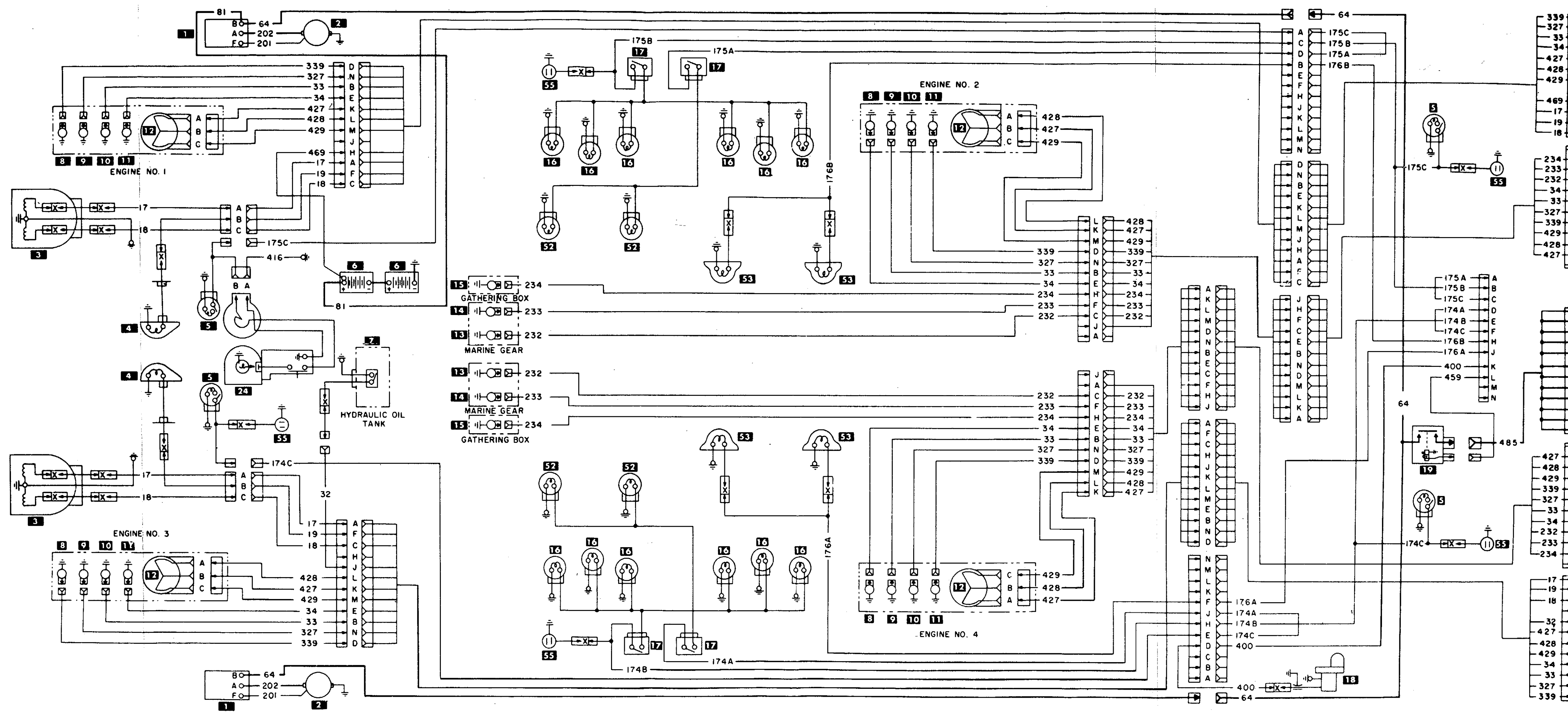
General. This appendix contains the instructions for the fabrication of seat and canopy cover for the LARC-60 which are authorized for fabrication at organization maintenance.

Refer to FO-3 and FO-4 for Illustrated List of manufactured items.

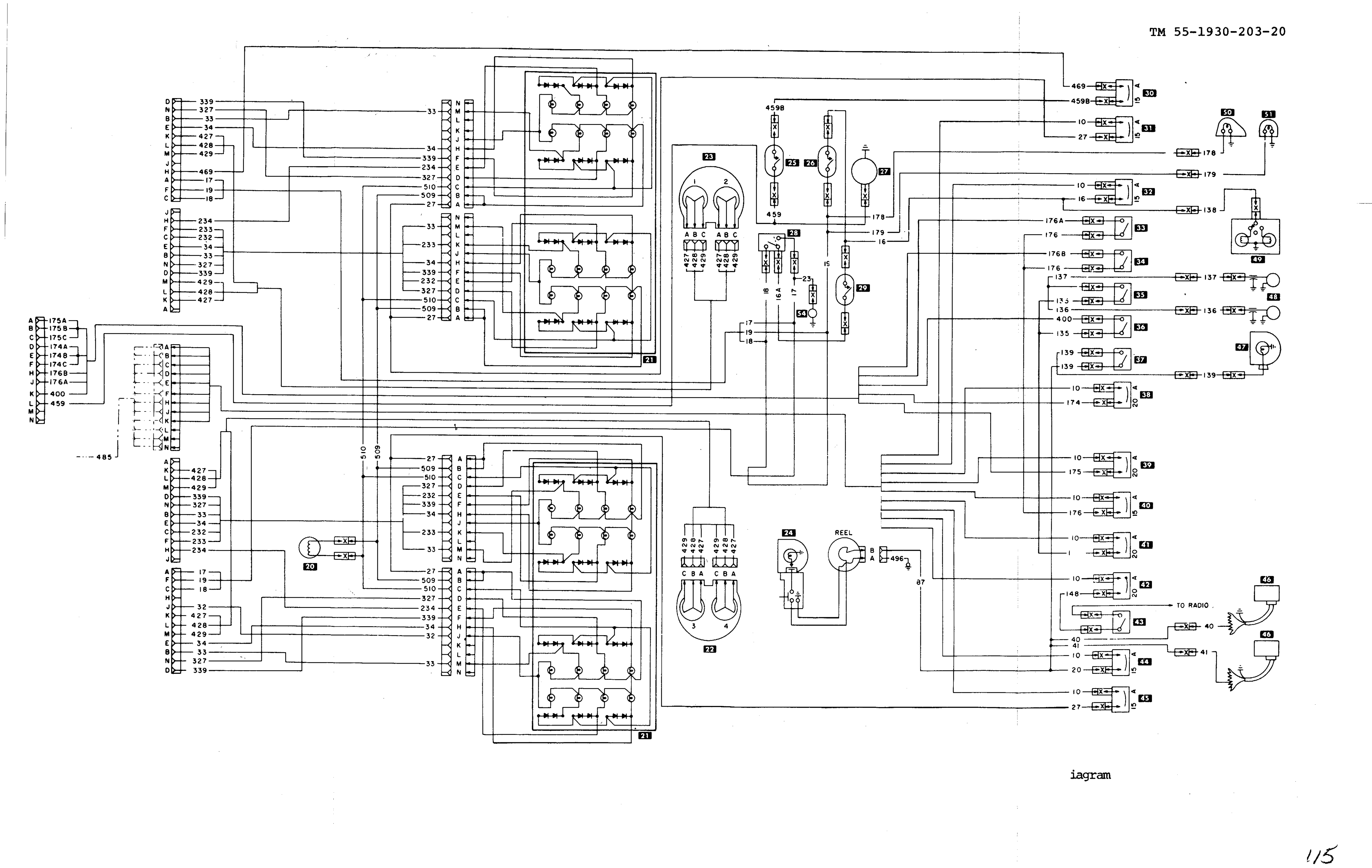
☆U.S. GOVERNMENT PRINTING OFFICE: 1988 554-030/80106

INDEX

1. Voltage regulator
2. Battery charging generator
3. Headlight
4. Running light
5. Wing compartment light
6. Battery
7. Low hydraulic fluid warning switch
8. Torque converter and transmission low oil pressure switch
9. Torque converter and transmission high oil temperature switch
10. Engine water temperature thermostatic switch
11. Engine low oil pressure switch
12. Tachometer generator
13. Marine gear high oil
14. Marine gear low oil temperature switch pressure switch
15. Gathering box high oil temperature switch
16. Upper machinery compartment light
17. Compartment light switch
18. Cab heater
19. Master relay
20. Master warning light
21. Warning light panel
22. Electrical tacnometer
23. Electrical tachometer
24. Spot and trouble light
25. Master switch
26. Navigation light switch
27. Battery charging indicator
28. Dimmer switch
29. Headlight switch
30. Master switch control circuit breaker
31. Starboard engine and gathering box warning light circuit breaker
32. Headlight and navigation light circuit breaker
33. Port cargo light switch
34. Starboard cargo light switch
35. Ventilating fan switch
36. Heater switch
37. Searchlight switch
38. Port compartment light circuit breaker
39. Starboard compartment light circuit breaker
40. Cargo light circuit breaker
41. Heat and ventilation circuit breaker
42. Radio circuit breaker
43. Radio switch
44. Searchlight and trouble light circuit breaker
45. Port engine and gathering box warning light circuit breaker
46. Instrument lights
47. Searchlight
48. Cab ventilating fan
49. Cab dome light
50. Bow light
51. Range anchor light
52. Low machinery compartment light
53. Cargo light
54. High beam indicator light
55. Outlet socket assembly

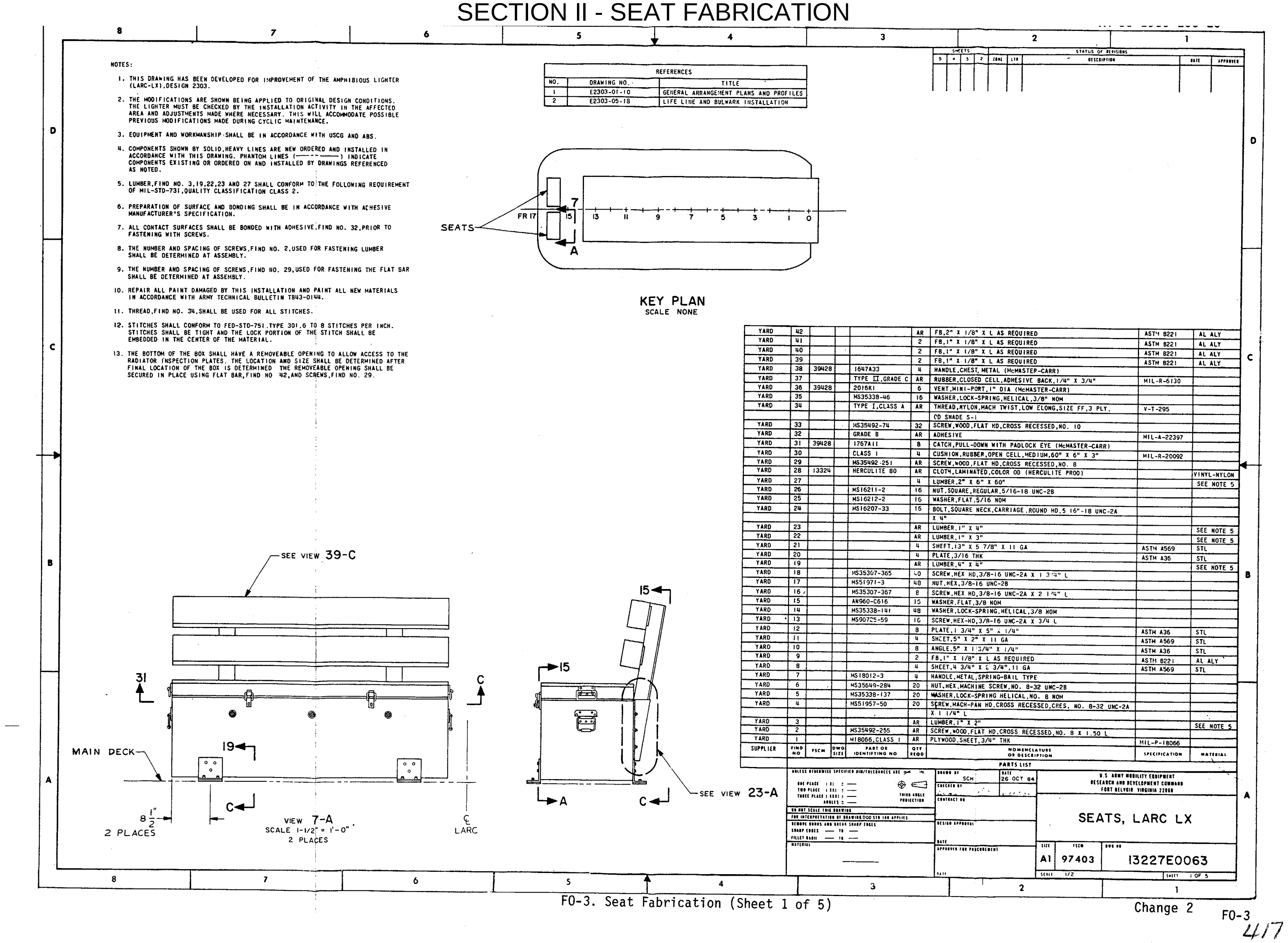


FO-1. Electrical System Wiring Diagram



FO-2. Electrical System Wiring Diagram

SECTION II - SEAT FABRICATION



REFERENCES		
NO.	DRAWING NO.	TITLE
1	E2303-01-10	GENERAL ARRANGEMENT PLANS AND PROFILES
2	E2303-05-18	LIFE LINE AND BULWARK INSTALLATION

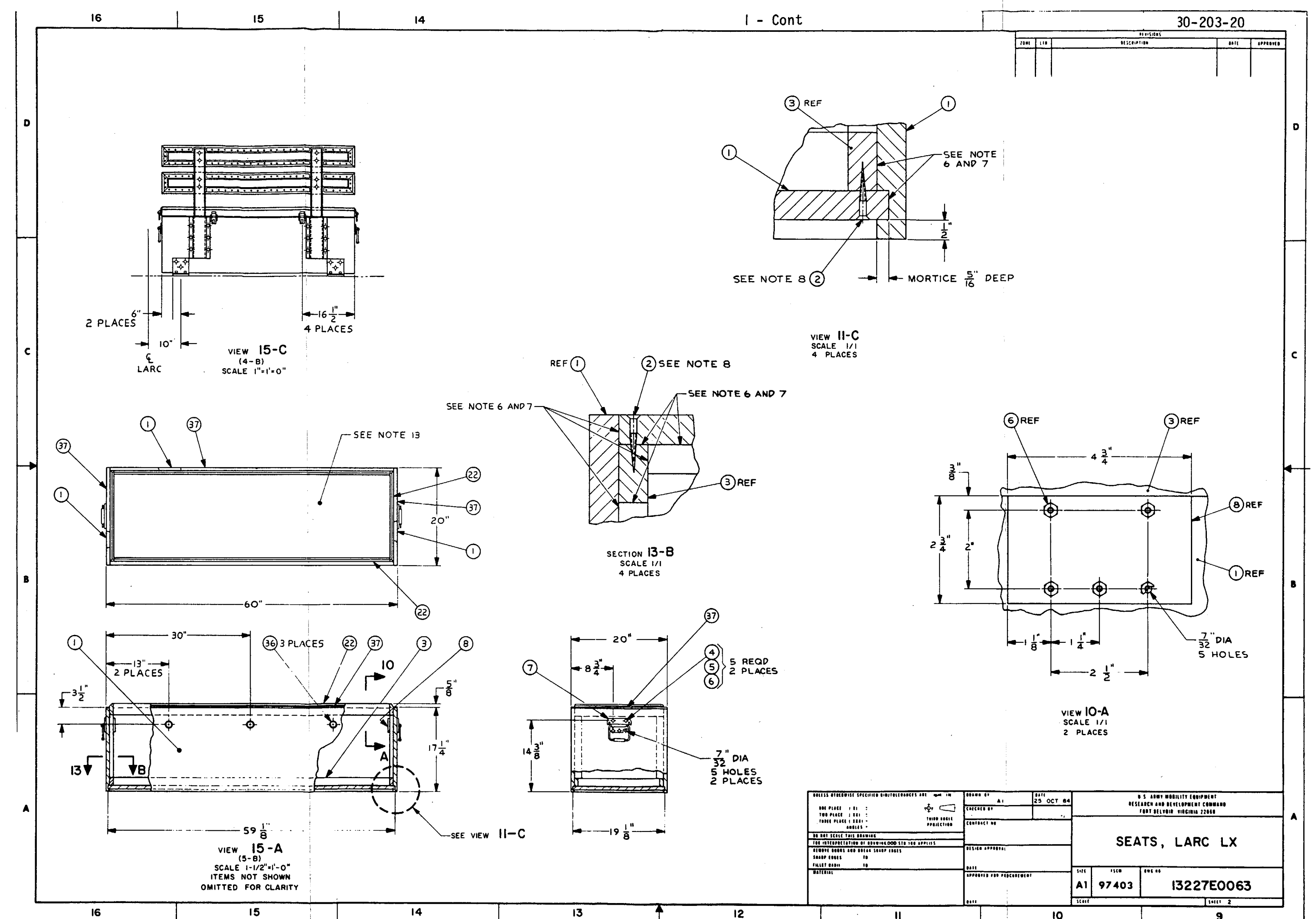
PARTS LIST

SUPPLIER	FIND NO	FSCM	DWG SIZE	PART OR IDENTIFYING NO	QTY REQD	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	MATERIAL
YARD	42				AR	FB,2" X 1/8" X L AS REQUIRED	ASTM B221	AL ALY
YARD	41				2	FB,1" X 1/8" X L AS REQUIRED	ASTM B221	AL ALY
YARD	40				2	FB,1" X 1/8" X L AS REQUIRED	ASTM B221	AL ALY
YARD	39				2	FB,1" X 1/8" X L AS REQUIRED	ASTM B221	AL ALY
YARD	38	39428		1647A33	4	HANDLE,CHEST,METAL (McMASTER-CARR)		
YARD	37			TYPE II,GRADE C	AR	RUBBER,CLOSED CELL,ADHESIVE BACK,1/4" X 3/4"	MIL-R-6130	
YARD	36	39428		2016K1	6	VENT,MINI-PORT,1" DIA (McMASTER-CARR)		
YARD	35			MS35338-46	16	WASHER,LOCK-SPRING,HELICAL,3/8" NOM		
YARD	34			TYPE I,CLASS A	AR	THREAD,NYLON,MACH TWIST,LOW ELONG,SIZE FF,3 PLY, OD SHADE S-1	V-T-295	
YARD	33			MS35492-74	32	SCREW,WOOD,FLAT HD,CROSS RECESSED,NO. 10		
YARD	32			GRADE B	AR	ADHESIVE	MIL-A-22397	
YARD	31	39428		1767A11	8	CATCH,PULL-DOWN WITH PADLOCK EYE (McMASTER-CARR)		
YARD	30			CLASS 1	4	CUSHION,RUBBER,OPEN CELL,MEDIUM,60" X 6" X 3"	MIL-R-20092	
YARD	29			MS35492-251	AR	SCREW,WOOD,FLAT HD,CROSS RECESSED,NO. 8		
YARD	28	13324		HERCULITE 80	AR	CLOTH,LAMINATED,COLOR OD (HERCULITE PROD)		VINYL-NYLON
YARD	27				4	LUMBER,2" X 6" X 60"		SEE NOTE 5
YARD	26			MS16211-2	16	NUT,SQUARE,REGULAR,5/16-18 UNC-2B		
YARD	25			MS16212-2	16	WASHER,FLAT,5/16 NOM		
YARD	24			MS16207-33	16	BOLT,SQUARE NECK,CARRIAGE,ROUND HD,5 16"-18 UNC-2A X 4"		
YARD	23				AR	LUMBER,1" X 4"		SEE NOTE 5
YARD	22				AR	LUMBER,1" X 3"		SEE NOTE 5
YARD	21				4	SHEET,13" X 5 7/8" X 11 GA	ASTM A569	STL
YARD	20				4	PLATE,3/16 THK	ASTM A36	STL
YARD	19				AR	LUMBER,4" X 4"		SEE NOTE 5
YARD	18			MS35307-365	40	SCREW,HEX HD,3/8-16 UNC-2A X 1 3/4" L		
YARD	17			MS51971-3	48	NUT,HEX,3/8-16 UNC-2B		
YARD	16			MS35307-367	8	SCREW,HEX HD,3/8-16 UNC-2A X 2 1/4" L		
YARD	15			AN960-C616	15	WASHER,FLAT,3/8 NOM		
YARD	14			MS35338-141	48	WASHER,LOCK-SPRING,HELICAL,3/8 NOM		
YARD	13			MS90725-59	16	SCREW,HEX-HD,3/8-16 UNC-2A X 3/4 L		
YARD	12				8	PLATE,1 3/4" X 5" X 1/4"	ASTM A36	STL
YARD	11				4	SHEET,5" X 2" X 11 GA	ASTM A569	STL
YARD	10				8	ANGLE,5" X 1 3/4" X 1/4"	ASTM A36	STL
YARD	9				2	FB,1" X 1/8" X L AS REQUIRED	ASTM B221	AL ALY
YARD	8				4	SHEET,4 3/4" X 2 3/4",11 GA	ASTM A569	STL
YARD	7			MS18012-3	4	HANDLE,METAL,SPRING-BAIL TYPE		
YARD	6			MS35649-284	20	NUT,HEX,MACHINE SCREW,NO. 8-32 UNC-2B		
YARD	5			MS35338-137	20	WASHER,LOCK-SPRING HELICAL,NO. 8 NOM		
YARD	4			MS51957-50	20	SCREW,MACH-PAN HD,CROSS RECESSED,CRES, NO. 8-32 UNC-2A X 1 1/4" L		
YARD	3				AR	LUMBER,1" X 2"		SEE NOTE 5
YARD	2			MS35492-255	AR	SCREW,WOOD,FLAT HD,CROSS RECESSED,NO. 8 X 1.50 L		
YARD	1			M18066,CLASS 1	AR	PLYWOOD,SHEET,3/4" THK	MIL-P-18066	

FO-3. Seat Fabrication (Sheet 1 of 5)

FO-3. Seat Fabrication (Sheet 1 of 5)

SECTION II - SEAT FABRICATION - Cont



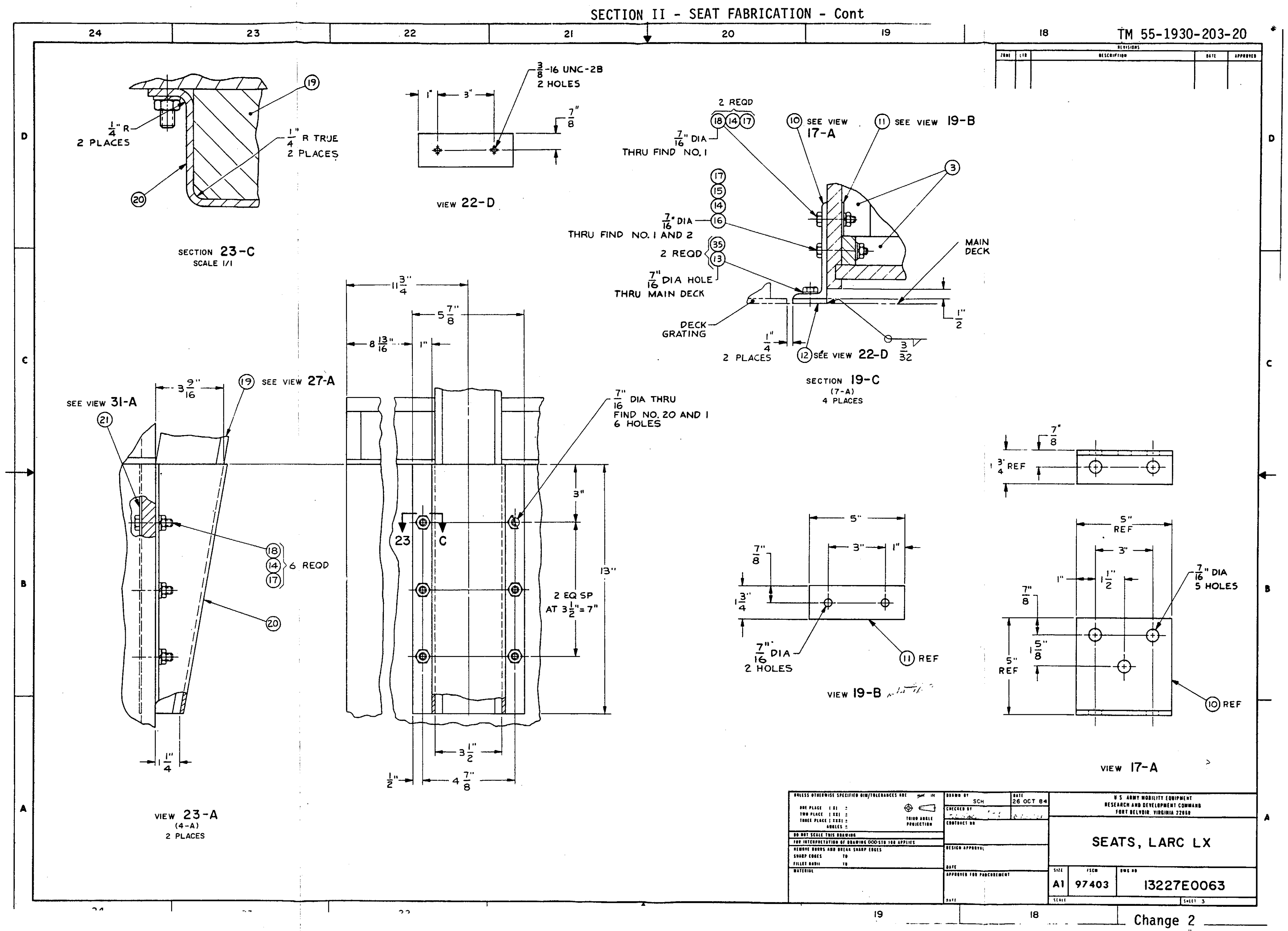
FO-3. Seat Fabrication (Sheet 2 of 5)

Change 2

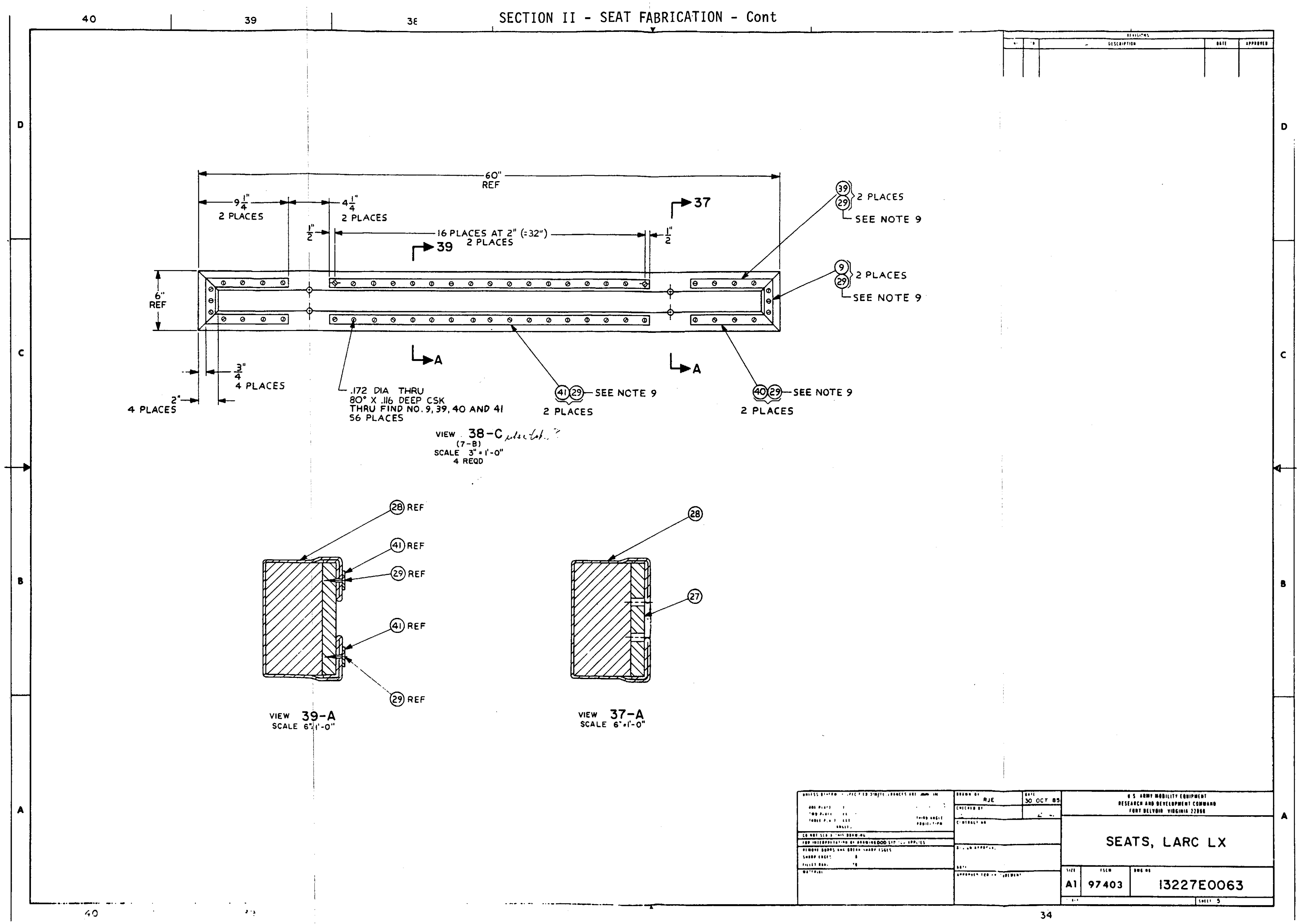
FO-4

419

FO-3. Seat Fabrication (Sheet 2 of 5)

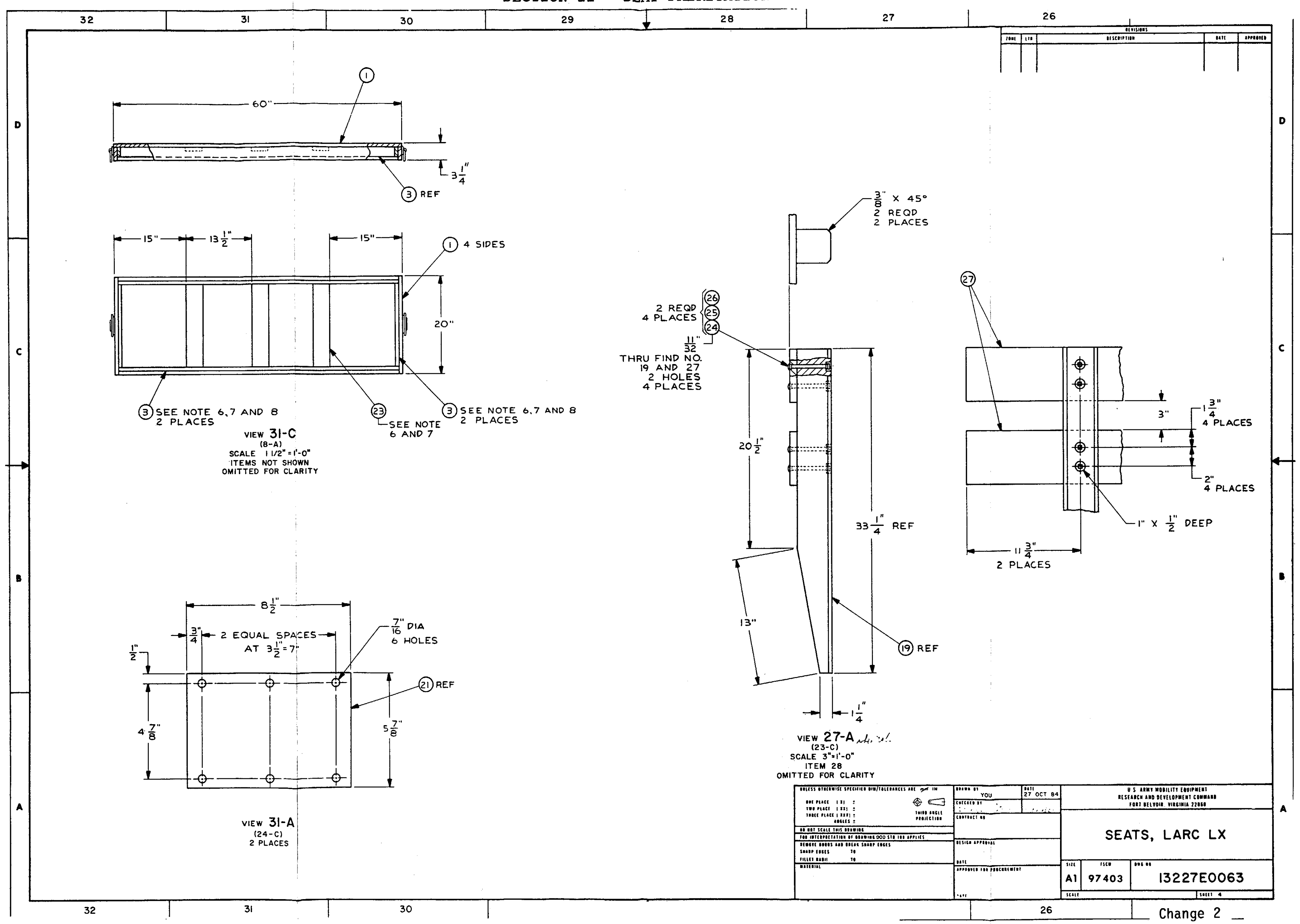


FO-3. Seat Fabrication (Sheet 3 of 5)

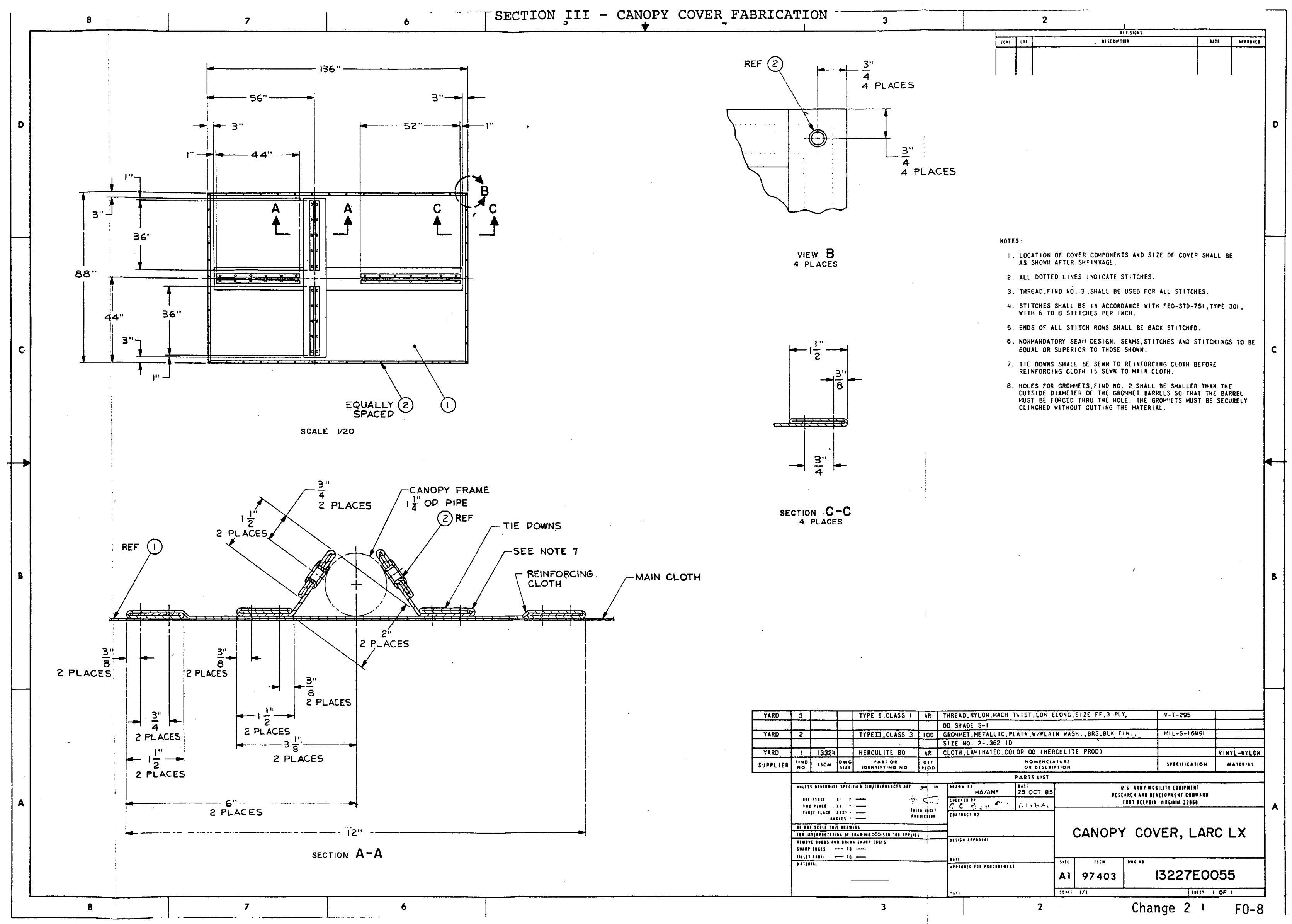


FO-3. Seat Fabrication (Sheet 4 of 5)

SECTION II - SEAT FABRICATION - Cont



FO-3. Seat Fabrication (Sheet 5 of 5)



FO-4. Canopy Cover Fabrication

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.
PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 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

PIN: 012471-000