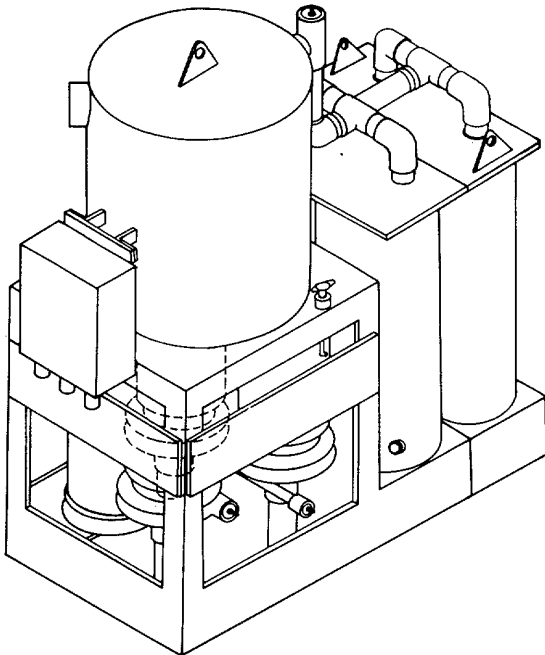


TECHNICAL MANUAL
 UNIT, INTERMEDIATE DIRECT
 SUPPORT
 AND INTERMEDIATE GENERAL
 SUPPORT
 MAINTENANCE INSTRUCTIONS

**MARINE SANITATION
 SYSTEM**
 FOR
 LANDING CRAFT UTILITY (LCU)
 NSN 1905-01-154-1191



INTRODUCTION	1-1
--------------	-----

UNIT MAINTENANCE INSTRUCTIONS	2-1
-------------------------------	-----

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

INTERMEDIATE GENERAL SUPPORT MAINTENANCE INSTRUCTIONS	4-1
---	-----

APPENDIXES	A-1
------------	-----

ALPHABETICAL INDEX	INDEX-1
--------------------	---------

This copy is a reprint which includes current pages from Change 1.

Approved for public release. Distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
 17 JANUARY 1989

TECHNICAL MANUAL

No. 55-1905-223-24-11

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

UNIT, INTERMEDIATE DIRECT SUPPORT,
AND INTERMEDIATE GENERAL SUPPORT
MAINTENANCE INSTRUCTIONS
FOR THE
MARINE SANITATION SYSTEM
FOR
LANDING CRAFT UTILITY (LCU)
NSN 1905-01-154-1191

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

TABLE OF CONTENTS

	<u>PAGE</u>
CHAPTER 1 INTRODUCTION	1-1
Section I General Information.....	1-1
Section II Equipment Description and Data.....	1-2
Section III Principles of Operation	1-6
CHAPTER 2 UNIT MAINTENANCE INSTRUCTIONS	2-1
Section I Repair Parts; Special Tools; Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment.....	2-1
Section II Service Upon Receipt.....	2-1
Section III Unit Preventive Maintenance Checks and Services (PMCS).....	2-8
Section IV Unit Maintenance Troubleshooting Procedures	2-13
Section V Unit Maintenance Procedures.....	2-19
Section VI Preparation for Storage or Shipment.....	2-102
CHAPTER 3 INTERMEDIATE DIRECT SUPPORT MAINTENANCE INSTRUCTIONS	3-1
Section I Repair Parts; Special Tools; Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment	3-1
Section II Service Upon Receipt.....	3-1
Section III Intermediate Direct Support Preventive Maintenance Checks and Services (PMCS).....	3-2

TABLE OF CONTENTS - Continued

	<u>PAGE</u>
Section IV Intermediate Direct Support Troubleshooting Procedures	3-4
Section V Intermediate Direct Support Maintenance Procedures	3-6
Section VI Preparation for Storage or Shipment.....	3-17
CHAPTER 4 INTERMEDIATE GENERAL SUPPORT MAINTENANCE INSTRUCTIONS	4-1
(Deleted)	
APPENDIX A REFERENCES	A-1
APPENDIX B MAINTENANCE ALLOCATION CHART	B-1
APPENDIX C EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST	C-1
APPENDIX D TORQUE VALUES	D-1
GLOSSARY ABBREVIATIONS AND DEFINITIONS	Glossary 1
ALPHABETICAL INDEX	Index 1

CHAPTER 1

INTRODUCTION

	Page
Section I General Information.....	1-1
Section II Equipment Description and Data.....	1-2
Section III Principles of Operation	1-6

SECTION I. GENERAL INFORMATION

- 1-1. **Scope.** The scope of this manual is as follows:
- a. Type of Manual. Unit, intermediate direct support, and intermediate general support.
 - b. Name of Equipment. The equipment covered by this manual is the ORCA II 24 Marine Sanitation System installed aboard the LCU 2000 class watercraft.
 - c. Purpose of Equipment. The marine sanitation system collects, treats, and discharges sewage waste.
- 1-2. **Maintenance Forms, Records, and Reports.** Department of the Army forms and procedures used for equipment maintenance are prescribed by DA PAM 738-750, The Army Maintenance Management System.
- 1-3. **Destruction of Army Materiel to Prevent Enemy Use.** Refer to TM 750-244-3 for instructions covering the destruction of Army materiel to prevent enemy use.
- 1-4. **Reporting Equipment Improvements Recommendations (EIR).** If your sanitation system needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at Commander, U.S. Army Troop Support Command, ATTN: AMSTR-QX, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. We'll send you a reply.
- 1-5. **Preparation for Storage or Shipment.** Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the Preventive Maintenance Checks and Services (PMCS) before storing. When removing the equipment from administrative storage, the PMCS should be performed to assure operational readiness. Disassembly, and repacking of equipment for shipment or short term storage, are covered in paragraph 2-28.

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1-6. **Equipment Characteristics, Capabilities, and Features.** The major characteristics, capabilities, and features of the ORCA II-24 sanitation system are as follows.

a. Characteristics.

- (1) Self-contained (with exception of chlorine storage tank, commode warning light, and remote status indicator panel).
- (2) Electrically operated.
- (3) Automatic.
- (4) Sewage processing unit.

b. Capabilities and Features.

- (1) Collects, treats, and discharges sewage waste.
- (2) Operates with salt, brackish, or fresh water.
- (3) Has warning system to indicate tank full conditions.
- (4) Provides sanitary service for up to 24 people.

CAUTION

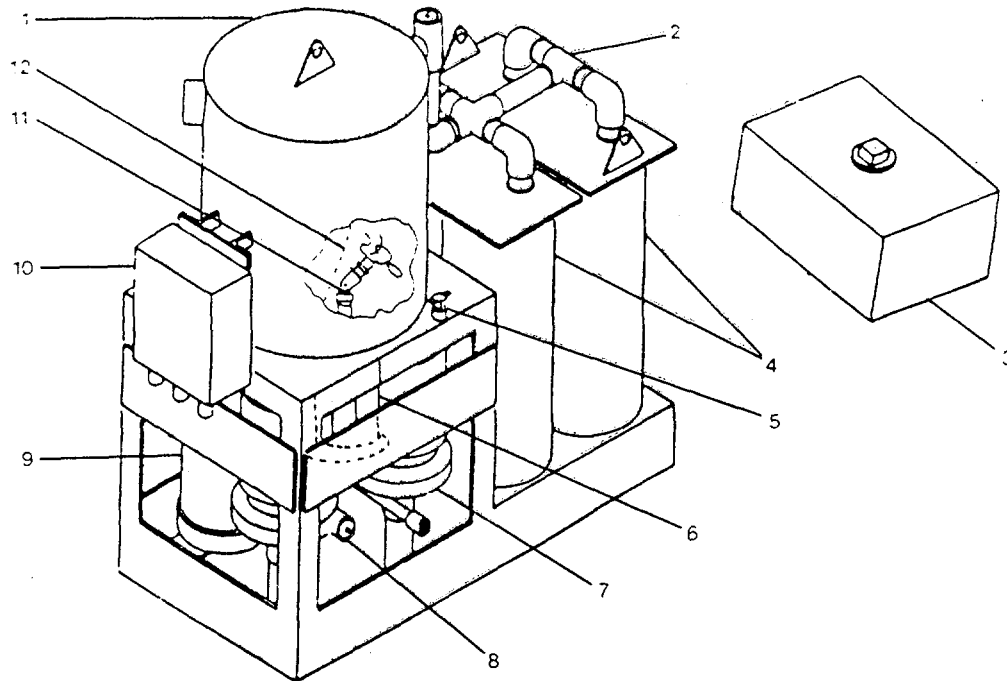
Under no condition may the sewage handling capacity of the individual system be exceeded. An overload condition could cause damage to other system components.

1-7. **Location and Description of Major Components.** FIGURE 1-1 shows the location and description of major components. The following information concerns dataplates on components in the marine sanitation system.

a. Recording Identification Data. Serial numbers and model numbers are shown on dataplates on the equipment. Since wear may cause dataplates (nameplates) or stencils on the equipment to become unreadable, serial numbers, model numbers, Control Parts List (CPL) numbers, and other appropriate data should be recorded. This information is important when servicing and when replacing or ordering parts.

b. Location of Dataplates (Nameplates).

- (1) Sanitation Device. The dataplate is located on the left side of the external framework on the electrical junction box (control module assembly) end of the unit.



LEGEND

1. TREATMENT TANK AND COVER. A 14 GALLON TANK ON THE TOP LEFT HAND SIDE OF THE UNIT.
2. VENT PIPING. 1-1/2 INCH, PVC PIPING LOCATED ON THE SEDIMENTATION MODULE COVER ON THE TOP RIGHTHAND SIDE OF THE UNIT.
3. BLEACH STORAGE TANK. A 10 GALLON SEPARATE MOUNTED TANK LOCATED WITHIN 10 FT. OF, AND AT LEAST ONE FT ABOVE THE UNIT.
4. SEDIMENTATION MODULES. FOUR 8 INCH DIAMETER TANKS LOCATED ON THE RIGHT SIDE OF THE UNIT (EACH MODULE CONSISTS OF TWO TANKS).
5. BLEACH METERING VALVE. A VALVE LOCATED ON THE CABINET AND IN FRONT OF THE TREATMENT TANK.
6. FLOW PUMP AND MOTOR. A ½ H.P. CENTRIFUGAL PUMP LOCATED IN THE REAR. RIGHTHAND SIDE OF THE FRAME ENCLOSURE.
7. SLUDGE RETURN PUMP AND MOTOR. A ½ H.P. CENTRIFUGAL PUMP LOCATED IN THE FRONT, RIGHTHAND SIDE OF THE FRAME ENCLOSURE.
8. DISCHARGE PUMP AND MOTOR. A ½ H.P. CENTRIFUGAL PUMP LOCATED IN THE FRONT, LEFTHAND SIDE OF THE FRAME ENCLOSURE.
9. WASTE DISPOSER. A ¾ H.P. GARBAGE DISPOSAL ASSEMBLY LOCATED IN THE REAR, LEFTHAND SIDE OF THE FRAME ENCLOSURE.
10. ELECTRICAL JUNCTION BOX. HOUSES THE ELECTRICAL CONTROLS FOR THE AUTOMATIC OPERATION OF THE UNIT. IT IS LOCATED ON THE LEFT SIDE OF THE TREATMENT TANK.
11. BACKWASH SPRAY NOZZLE. A SPRINKLER HEAD MOUNTED INSIDE THE TREATMENT TANK AND BEHIND THE RETENTION/REDUCTION SCREEN.
12. RETENTION/REDUCTION SCREEN. A SIZE 25/014 WIRE CLOTH SCREEN MOUNTED INSIDE THE TREATMENT TANK.

Figure 1-1. Location and Description of Major Components.

(2) Pumps. The dataplates on all pumps are located on the pump motor housings.

1-8. **Equipment Data.** The following is the general equipment data for the sanitation device and all associated components.

a. Sanitation Device.

Model Orca II 24, by Envirovac Inc.

Capacity:

Sewage 720 gl per day
 Persons 24

Dimensions and Weights:

Height 42 inches
 Width 18 inches
 Length 38 inches
 Dry Weight 670 lb
 Wet Weight 885 lb

Allowable Pitch and Roll 30 degrees

Allowable Hydrostatic Head 10 ft water

Hypochlorite Requirement 1.50 gl per day

External Piping Connections:

Sewage Inlet 3 in (FNPT)
 Sewage Outlet (at discharge pump) 3/4 in (FNPT)
 Vent Outlet 1-1/2 in (FNPT)
 Backwash Inlet 1/2 in (FNPT)
 Input 110/220 Vac, 1-phase, 50/60 Hz, 30 amp
 Current Draw 115/220 Vac, 3.5 kva

b. Associated Components.

Treatment Tank Capacity, 14 gl

Sedimentation Modules:

Quantity 2
 Capacity 4.78 gl each

Waste Disposer:

Waste King, Model WK-750-1-SM 3/4 hp, 115/230 Vac, 60 Hz

Flow Pump and Motor:

Motor:

Baldor, Model CL3503A 1/2 hp, 3450 RPM
 115/220 Vac, 60 Hz

Pump: Tecumseh Model 23938

Impeller Diameter..... 2-7/8 in

Sludge Return Pump and Motor:

Motor:

Baldor, Model CL3503A 1/2 hp, 3450 RPM
 115/220 Vac, 60 Hz

Pump: Tecumseh Model 23938

Impeller Diameter 2-7/8 in

Discharge Pump and Motor:

Motor:

Baldor, Model CL3503A 1/2 hp, 3450 RPM
 115/220 Vac, 60 Hz

Pump: Tecumseh Model 23938

Impeller Diameter 2-7/8 in

Hypochlorite (Bleach) Storage TankCapacity, 10 gl

Location Requirements:

Horizontal..... Within 10 ft of the unit
 Vertical..... Minimum of 1 ft above the unit

Retention/Reduction ScreenWire Cloth, 24/014

Sprinkler Head:

Pressure.....30 psi
 Flow2.9 gl per minute
 Commode Warning Light..... 110/120 Vac

1-9. **Safety, Care, and Handling.** Personnel must, at all times, observe all safety regulations while performing maintenance or repairs. Do not perform a maintenance procedure without first reading the entire procedure thoroughly, assuring yourself the task can be done safely. General safety WARNINGS and FIRST AID Data appear in the front matter of this manual. Review these WARNINGS before starting a maintenance task. Also, WARNINGS, CAUTIONS, and NOTES appear in procedures throughout this manual and are of paramount importance to personnel and equipment safety.

SECTION III. PRINCIPLES OF OPERATION

1-10. **Sanitary System General.** FIGURE 1-2 illustrates how the sanitation device interfaces with other external components in the sewage system. For the operation of these individual system components, refer to TM 55-1905-223-10.

1-11. **System Functional Description.** The following describes the sanitation system design and the sewage treatment process.

a. System Design.

- (1) The Marine Sanitation Device is a self-contained unit. All of the major components are located within the enclosure panels of the unit, with the exception of the chlorine storage tank.
- (2) The system is equipped with an electronic monitoring system which automatically controls the treatment of sewage, warns of any motor shutdown, and pinpoints the problem motor. It also warns of any treatment tank overload condition, thus avoiding damage to other system components or to the vessel's electrical supply.
- (3) The control system comprises two modular units. The junction box (control module) (FIGURE 1-3) houses the electronic monitoring circuit and an in-line circuit breaker. The Remote Status indicator, located in the engine room control center, is a panel which indicates individual motor operating conditions, treatment tank overload, and the system operating condition. This is accomplished with constantly lit or flashing panel lights (FIGURE 1-4). Refer to TM 55-1905-223-10.

b. Treatment Process.

- (1) The Marine Sanitation Device (MSD) processes sewage from existing facilities. Raw sewage from the sanitation facilities is routed into the treatment tank (1, FIGURE 1-5) for maceration. The macerated sewage is continuously recycled through the treatment tank until the solids are small enough to pass through the retention/reduction screen (2). This screen is under a continuous backwash by an impact sprinkler (3) to prevent a buildup of solids and consequent plugging of the screen. After passing through the retention/reduction screen, the effluent flows into a series of sedimentation tanks where the movement of solids is restricted, forcing fallout of suspended matter. The solids that fall out are then returned to the treatment tank by a sludge return pump for reprocessing.
- (2) The effluent will finally pass through the sedimentation modules and be discharged overboard. Disinfection of the effluent is achieved through liquid hypochlorination with common household bleach, and by chemical oxidation within the treatment tank. This is accomplished by using a metering system, which allows an appropriate amount of liquid hypochlorite to flow from a storage container into the treatment tank. A high level warning system is provided with the MSD to indicate a treatment tank full condition. This is done by using a sensor suspended in the tank (4, FIGURE 1-5). The sensor is activated when an 80% tank capacity level is reached. This activation immediately turns on a warning light

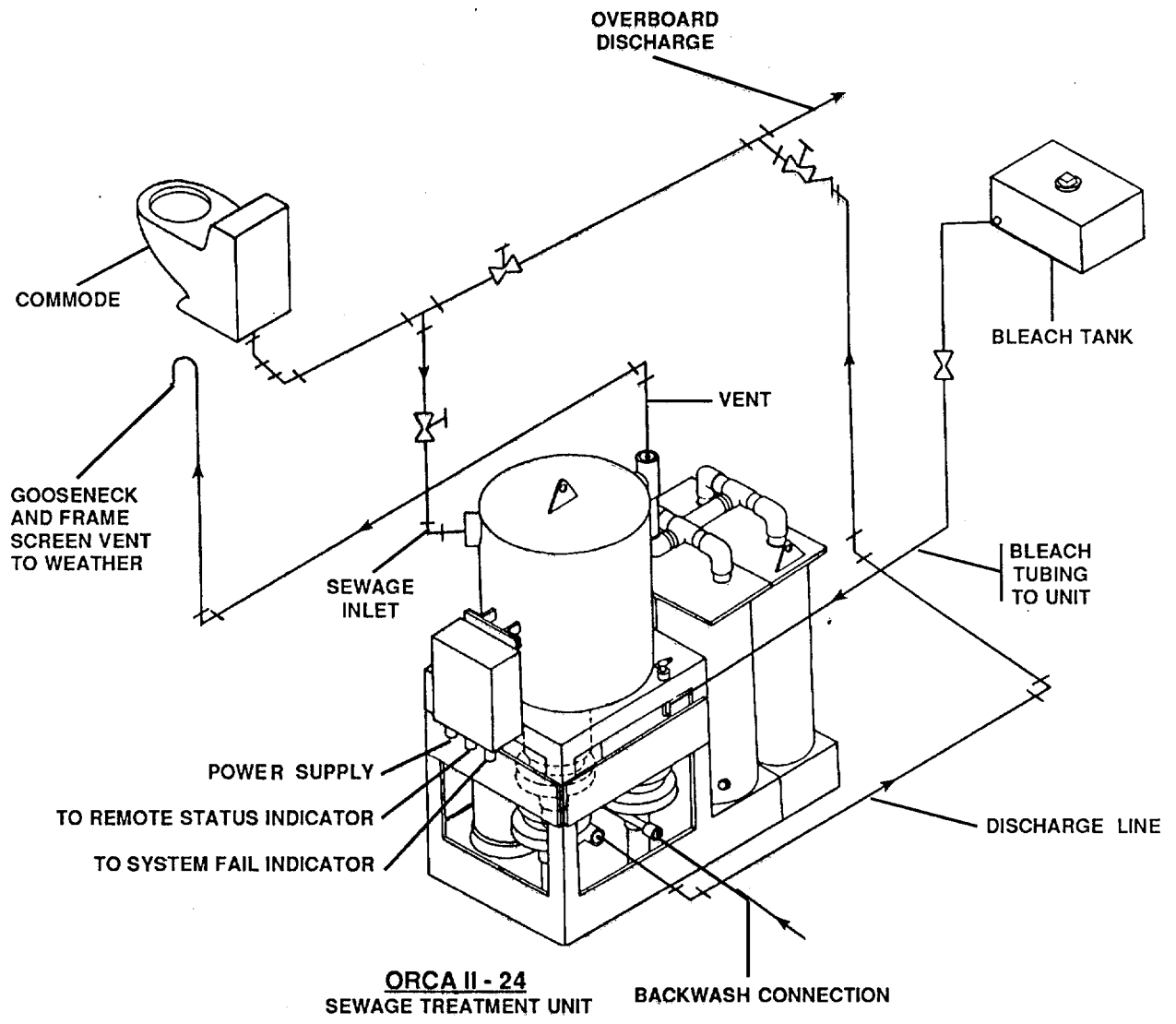


Figure 1-2. Interface of Treatment Unit with External Components.