
SPORT CRUISER & SPORT YACHT OWNER'S MANUAL

Welcome

Congratulations on becoming the new owner of the world's most prestigious yacht. We at Sea Ray® Boats, Inc. welcome you into our worldwide and ever-expanding family of boating enthusiasts.

Every journey lets you enjoy the excitement of a new adventure. Your new Sea Ray is more than a boat; it is a way of living. Our organization is dedicated to providing pleasure and fulfillment to your boating experience.

Sea Ray's commitment – Excellence by Design – has enabled us to create a superior craft providing you with comfort, performance, safety and dependability. All of our boats comply with safety standards set by the United States Coast Guard and are designed, engineered and manufactured in accordance with applicable recommendations and guidelines of the National Marine Manufacturers Association (NMMA) and the American Boat and Yacht Council (ABYC).

The Owner's Manual Packet, to be kept on board your Sea Ray, introduces you to all the features which make our boats so incomparable. For years of trouble-free boating, take the time now to carefully review the information in your Owner's Manual Packet and really get to know your boat. **Have everyone who will operate your yacht read this manual.**

The Owner's Manual Packet contains the following:

- **Sea Ray Warranty Statement**
Read the Sea Ray Warranty Statement so you will be familiar with the terms.
- **Specification Sheet**
The Specification Sheet lists standard equipment for your boat as well as available optional equipment and useful specifications needed for safe boating.

- **Parts Manual**

The Parts Manual helps you locate items and understand the layout of your Sea Ray. It also makes it easier when ordering replacement parts.

- **Sea Ray Yacht Owner's Manual**

The Sea Ray Sport Cruiser/Sport Yacht Owner's Manual gives you valuable operating and safety information about your responsibilities as an owner/operator.

- **Original Equipment Manufacturer (OEM) Information**

This section of your Owner's Manual Packet contains information from the manufacturer of equipment installed on your boat. Examples include the engine, steering and VHF radio. Throughout the Owner's Manual you will be referred to information provided by manufacturers of specific systems.

Because our Product Development and Engineering Division is continually upgrading our products, some descriptions in this manual may differ somewhat from equipment on your boat. If this occurs, please refer directly to the updated information in the accompanying Owner's Manual Packet. If such information is not included, consult your authorized dealer for assistance.

Because your purchase represents a substantial investment, we know you will want to take the necessary measures to protect its value. We suggest you plan a program for proper operation, periodic maintenance and safety inspections. If you have questions which are not fully covered by the Owner's Manual Packet or the manufacturer's instructions, please consult your authorized dealer for assistance.

Thank you for selecting a Sea Ray®!

Bon Voyage
Sea Ray 

OWNER'S MANUAL PACKET CONTENTS

	Sea Ray Owner's Manual	Sea Ray Owner's Manual Specific Information	Sea Ray Owner's Manual Packet	Sea Ray Specification Sheet	Sea Ray Parts Manual	Engine Operator's Manual	OEM Manual
Accident Reporting	X		X				
Alarms	X					X	X
AM/FM Cassette Stereo	X						X
Anchoring	X		X				
Auto-Pilot System							X
Battery System	X	X			X		
Bilge Layout		X*			X		
• Bilge Blower	X						X
• Bilge Pump	X						X
Canvas	X				X		
Capacity Plate	X				X		
Carbon Monoxide	X						
Certifications	X	X					
Cleaning	X						X
Cockpit		X					
Communication Equipment	X						X
Compass	X						X
Console		X			X		
Construction Standards	X	X					
Controls	X	X					
Depth Finder							X
Dimensions		X		X			
Drains	X	X			X		
Education	X						
Electrical System	X	X			X		
Electrolysis	X	X					
Emergency Engine Shutdown	X						X
Emergency Procedures	X						
Engine	X					X	
Environmental Considerations	X						
Equipment:							
• Recommended	X						
• Required	X		X				
• Standard		X		X			
Fire	X						
Fire Suppression Equipment	X		X				X
Flame Arrestor	X		X			X	
Flooding, Swamping	X						
Fuel System	X					X	X
Gauges	X	X					
Gear Shift	X					X	
Global Positioning System (GPS)							X
Graphics			X		X		
Head System	X	X	X		X		
Homologations (International)	X	X					
Hotlines (Safety)	X	X	X				
Identification Numbers	X	X					
Ignition	X	X				X	
Ignition Protection	X	X					
Impaired Operation	X	X					

OWNER'S MANUAL PACKET CONTENTS (CONT'D)

	Sea Ray Owner's Manual	Sea Ray Owner's Manual Specific Information	Sea Ray Owner's Manual Packet	Sea Ray Specification Sheet	Sea Ray Parts Manual	Engine Operator's Manual	OEM Manual
Instrument Use & Calibration	X	X					
Layout		X	X	X			X
Lifesaving Equipment	X						
Lifting	X	X					
Lightning Protection	X			X			
Lights	X			X			
Load Capacity	X	X					
Maintenance	X					X	X
Maneuvering	X						X
Monitors	X						X
Nautical Terms	X		X				X
Navigation	X						
Operation	X						
Optional Systems		X	X				
Personal Flotation Devices	X						X
Power Capacity	X			X			
Powertrain	X					X	
Propeller	X					X	
Propulsion						X	X
Required Equipment	X		X			X	
Registration			X				
Safety	X						
Sealing		X					
Seaworthiness Inspection	X						
Service Schedule						X	X
Spare Parts					X		
Specifications		X		X			
Stability	X	X					
Start-In-Gear Protection	X					X	
Steering	X				X		
Sump		X			X		
Symbols	X						
Switches		X					
Tank Capacities		X		X			
Throttle	X				X	X	
Through-Hull Fittings	X	X			X		
Trim Tabs	X	X			X		
Troubleshooting	X					X	X
Upholstery	X				X		
Ventilation	X	X					
Warning Labels	X		X		X		
Warranty		X					
Water System	X	X			X		
Weight		X		X			
Winterizing	X						
Wiring Schematics		X					X

To replace any material from the Owner's Manual Packet, contact your Sea Ray® dealer.

Information in this publication is based upon the latest product specifications available at printing. Sea Ray Boats, Inc. reserves the right to make changes at any time, without notice, in the colors, equipment, specifications, materials and prices of all models, or to discontinue models. Should changes in production models be made, Sea Ray® is not obligated to make similar changes or modifications to models sold prior to the date of such changes.

* If available at the time of publication of the manual.

KEY TO SYMBOLS ON PRINTS

 PROPULSION SYSTEM TRIM	 PROPULSION SYSTEM TRIM BOW UP	 PROPULSION SYSTEM TRIM BOW DOWN	 TRIM TAB TRIMMING OPERATION	 SINGLE LEVER CONTROL (THROTTLE & SHIFT)	 CONTROL LEVER OPERATING DIRECTION
 LIFT POINT OR PROPER LOCATION OF SLING	 ENGINE START	 ENGINE STOP	 FUEL LEVEL	 FUEL FILTER	 ENGINE
 ENGINE COOLANT	 ENGINE (COOLANT) WATER JACKET TEMPERATURE	 ENGINE OIL PRESSURE	 WARNING ELECTRICAL HAZARD	 FIRE RISK	 NO OPEN FLAME NO SMOKING
 ROTARY CONTROL (QUANTITY INCREASES WITH WIDTH OF SYMBOL)	 FRESH WATER BASED COOLANT	 LEADED FUEL	 UNLEADED FUEL	 OIL	 WASTE WATER/ SEWAGE
 FUEL, GENERAL	 DIESEL FUEL	 LIFT POINT	 ELAPSED TIME	 ENGINE ROTATIONAL SPEED	 BILGE PUMP
 BILGE BLOWER	 PROPELLER	 INTERIOR LIGHT	 RUNNING LIGHTS UNDER POWER	 ANCHOR LIGHT	 WINDSHIELD WIPER
 WINDSHIELD WASHER	 WINDSHIELD WIPER AND WASHER	 COMPASS	 ANCHOR	 HORN	 BATTERY

TABLE OF CONTENTS

SECTION 1 • GENERAL INFORMATION

Introduction	1.1
Warranty & Construction Standards	1.1
Registration	1.1
Education	1.1
Dealer's Responsibilities	1.1
Owner/Operator Responsibilities	1.2
Insurance	1.2
Parts & Equipment	1.2
Servicing Your Sea Ray	1.2
Certifications and Specifications	1.3
Manufacturer's Certifications	1.3
Manufacturer's Specifications	1.4
Nautical Terms	1.5
Safety	1.5
Explanation of Safety Precautions	1.6
Warning Labels	1.6
Lifesaving Equipment	1.6
Minimum Required Equipment	1.7
Additional Recommended Equipment	1.8
Impaired Operation	1.8
Load Capacity	1.9
Power Capacity	1.9
Stability	1.9
Maintaining Control	1.10
Weather	1.10
Dam Spillways	1.11
Operating In Shallow Water	1.11
Float Plan	1.12
Paint, Cleaning Agents & Other Substances ..	1.12
Water Sports	1.12
Safety Hotlines	1.13
Operation Guidelines	1.13
Boarding	1.13
Starting, Shifting and Stopping	1.14
Handling Dock Lines	1.14
Casting Off	1.15
Approaching the Dock	1.15
Anchoring	1.16
Windlass	1.18
Maneuvering and Control	1.19
Navigation	1.22
Navigational Buoys and Markers	1.22
Nautical Charts	1.24
Right-Of-Way	1.24
Navigational Lights	1.26
Navigating In Fog	1.26
Emergency Situations	1.26
Distress Signals	1.27
Fire	1.28
Fire Suppression Equipment	1.28
Flooding, Swamping	1.29
Collisions and Leaking	1.30

Water Rescue	1.30
Grounding	1.31
Towing	1.31
Propulsion, Control or Steering Failure	1.32
Exhaust Emissions	1.32
Carbon Monoxide	1.32
Medical Emergency	1.32
Accident Report	1.32
Trailer	1.33
Hitches	1.34
Maneuvering With A Trailer	1.34
Launching and Loading	1.35
Environmental Considerations	1.36
Fuel & Oil Spillage	1.36
Waste Disposal	1.36
Excessive Noise	1.37
Wake/Wash	1.37

(This section contains 37 pages)

SECTION 2 • BILGE & UNDERWATER GEAR

Bilge	2.1
Drain Plug	2.1
Bilge Pumps	2.1
Bilge Blowers	2.2
Engines	2.3
Marine Gears	2.3
Engine Mounts	2.3
Engine Exhaust System	2.4
Engine Removal	2.5
Vibration & Causes	2.5
Fresh Water Cooling System	2.6
Underwater Gear	2.6
Outdrive Impact Protection	2.6
Propellers	2.7
Shaft Log & Strong Seal™	2.10
Shafts	2.10
Strut	2.10
Rudder & Rudder Stuffing Box	2.10
Seacocks & Strainers	2.11

(This section contains 12 pages)

SECTION 3 • INSTRUMENTS & CONTROLS

Steering System	3.1
Power Steering	3.1
Hydraulic Steering System	3.2
Hydraulic Power Steering System	3.2
Gear Shifts & Throttle Controls	3.3
Maneuvering	3.3
Single gear Shift/Throttle Control	3.4
Cable Gear Shift & Throttle Controls	3.5
Hydraulic Gear Shifts & Throttle Controls	3.5

Electric Gear Shifts & Throttle Controls	3.6
Gear Shifts & Throttle Controls (for Detroit Diesel Engines) (Electric — DDEC or Twin Disc®)	3.7
Power Trim & Tilt Operation	3.7
Power Tilt Operation	3.8
Trim Tabs	3.8
Carbon Monoxide Monitor	3.9
Instrument Gauges	3.10
Tachometer (with Hour Meter)	3.10
Oil Pressure Gauge	3.10
Water Temperature Gauge	3.10
Voltmeter	3.10
Fuel Gauge	3.10
Synchronizer Gauge	3.11
Console Dimmer	3.11
Navigation Lights	3.11
Marine Compass	3.11
Instrument Gauges (Optional)	3.12
Main EMS Display	3.12
Hour Meters	3.12
Quad Gauge	3.12
Tachometer	3.13
Detroit Diesel Electronic Display Module (EDM)	3.13
Systems Monitor	3.14

(This section contains 15 pages)

Section 4 • Fueling & Starting

Fuel Systems	4.1
Fuel Tank	4.1
Electric Fuel Valves	4.1
Crossover Fuel System	4.2
Fuel Recommendations	4.2
Fuel Filters (Gasoline)	4.2
Fuel Filters (Diesel)	4.2
Fueling Precautions	4.3
Starting Engines	4.4
Stern Drives	4.4
Inboard Engines	4.5
Stopping the Engines	4.7
Stern Drives	4.7
Inboard Engines	4.7
Emergency Stop Switch	4.7

(This section contains 7 pages)

SECTION 5 • WATER SYSTEM

Water Systems	5.1
Filling The Water Tank	5.1
Checking Water Level	5.1
Sanitizing The Water System	5.1
Water Pump & Filter	5.1
Pneumatic Accumulator Tank	5.2

Water Heater	5.2
Shower System	5.3
Fresh Water Washdown	5.3
Dockside Water Inlet	5.3
Gray Water System	5.4

(This section contains 4 pages)

Section 6 • Head System

Head Systems	6.1
Requirements For Operators	6.1
Portable Self-Contained Head	6.1
Portable Self-Contained Head With Dockside Pump-Out	6.1
Dockside Pump-Out Option	6.1
Vacu-Flush® Head	6.2
Holding Tank Operation	6.2
Macerator (Optional)	6.3

(This section contains 3 pages)

Section 7 • Electrical System

DC System	7.1
Batteries	7.1
Keeping Batteries Charged	7.2
Ignition Protection	7.2
Electrical System Circuit Protection	7.2
Main DC Breaker Panel	7.3
Battery Switches	7.3
Emergency Start System	7.4
12 Volt Accessory Receptacle	7.4
120 Volt AC/12 Volt AC Transformers	7.4
Electronics Circuit with Ground Plate	7.4
Lighting	7.4
AC System	7.5
120 VAC/60 Hz Electrical System	7.5
240 VAC/60 Hz Electrical System	7.5
220 VAC/50 Hz Electrical System	7.6
Shore Power Hook-up	7.6
Main Distribution Panel Controls & Functions	7.7
Converter	7.10
Ground Fault Interrupter Outlets	7.10
Generator	7.11
Starting The Generator	7.11
Stopping the Generator	7.12
Electrolysis & Zinc Anodes	7.12
Marine Electronic Cathodic Anti-Corrosion System (Mercathode®)	7.13

(This section contains 13 pages)

SECTION 8 • ACCESSORIES

Air Conditioning & Heating	8.1
---	------------

Cablemaster	8.1
Canvas	8.2
Storage	8.2
Care & Maintenance	8.2
Installation Tips	8.3
Bimini Top	8.3
Convertible Top/Sun Shade & Boot	8.3
Side Curtains	8.4
Aft Cover	8.4
Windshield Cover	8.4
Bridge Enclosure	8.4
Bridge Cover	8.4
Coffee Maker	8.5
Entertainment Center	8.5
Automatic Fire Extinguisher	8.5
Horn	8.6
Ice Maker	8.6
Refrigerator/Freezer	8.7
Spotlight	8.7
Stoves	8.7
Microwave	8.7
Telephone	8.8
Vacuum System	8.8
Oil Change System	8.8
Bow Thruster	8.9
Power Ventilation System	8.10
Electric Windshield Vent	8.10
Cockpit Step/Seating	8.10

(This section contains 10 pages)

Section 9 • Storage & Recommissioning

Laying-Up Instructions	9.1
Lifting The Boat	9.1
Supporting The Boat During Storage	9.1
Draining The Boat	9.2
Winterization Checklist For Boats	
Stored On Land	9.2
Boat Storage	9.2
Ice Maker	9.2
Engines	9.2
Generator	9.2
Air Conditioner	9.2
Batteries	9.2
Head System	9.2
Water System	9.3

Fuel Systems	9.3
Fitting Out After Storage	9.3
Fuel System	9.3
Exhaust System	9.3
Batteries	9.4
Miscellaneous	9.4
Security Considerations	9.4

(This section contains 4 pages)

Section 10 • Care & Refinishing

Maintenance and Reconditioning	10.1
Fiberglass & Gelcoat	10.1
Stains & Scratches	10.1
Special Care For Boats That Are Moored	10.1
Care For Bottom Paint	10.1
Bilge/Engine Compartment	10.2
Topside Areas	10.2
Acrylic Plastic Sheeting	10.2
Upholsteries	10.2
Vitracore® Cabinets	10.3
Cleaning Recommendations	
For Marine Fabrics	10.3

(This section contains 3 pages)

Section 11 • Service Information

Useful Service Information	11.1
Service Guide	11.2
Quick Reference Departure Checklist	11.4
Boarding the Boat	11.4
Preparing to Depart and After Launching	11.5
Starting the Engine	11.5
While Underway	11.6
Returning to Port	11.6
Securing the Boat	11.7
If the Engine Does Not Start	11.7
Operating the Generator	11.8

(This section contains 8 pages)

Index

LIST OF TABLES & ILLUSTRATIONS

Information in this publication is based upon the latest product specifications available at printing. Sea Ray® Boats, Inc. reserves the right to make changes at any time, without notice, in the colors, equipment, specifications, materials and prices of all models, or to discontinue models. Should changes in production models be made, Sea Ray® is not obligated to make similar changes or modifications to models sold prior to the date of such changes.

Sport Cruiser/Sport Yacht Owner's Manual
Printed in the U.S.A August 1998, Revised August, 1999
© Sea Ray Boats, Inc. • A Brunswick Company
MRP #1306232

The following are registered trademarks of the Brunswick Corporation: Sea Ray® & The SR Wave Logo



SECTION 1 • GENERAL INFORMATION

INTRODUCTION

This manual has been compiled to help you operate your Sea Ray® boat safely and pleasurably. It contains details of the craft, typical equipment supplied or fitted, systems and information pertaining to operation and maintenance. Please read this manual carefully, and familiarize yourself with the operation of all systems before using your craft.

If you are not familiar with the Sea Ray® boat you have purchased, for your own comfort and safety, please ensure that you obtain handling and operating experience before taking command. Your dealer or yacht club can direct you to sources of instruction.

Store this manual in a secure area, and transfer it to the new owner when you sell the vessel.

WARRANTY & CONSTRUCTION

STANDARDS

Sea Ray® provides a Warranty Statement describing terms and conditions under which defects in your boat will be repaired. Familiarize yourself with the warranty and follow instructions regarding proper operation and maintenance. Failure to follow instructions can void the warranty.

Sea Ray® also outlines Construction Standards detailing industry standards followed in building your boat (see the *Welcome* page at the beginning of the manual). Consult your marine dealer for any additional information.

REGISTRATION

In addition to the registration requirements for your boat in the state where it is used most frequently. Many states require **additional registration** when an out-of-state boat is used within their boundaries. Contact state boating authorities or any marine dealer for registration requirements.

EDUCATION

Although this manual is extremely informative, it does not contain everything you need to know regarding the safe operation of your Sea Ray® boat. We strongly urge you to get instruction in proper handling and navigation before taking command.

Some agencies you may consider which offer boating courses are:

- U.S. Coast Guard Auxiliary
- United States Power Squadrons
- Canadian Power and Sail Squadrons
- Red Cross
- State Boating Offices
- Yacht Clubs

Consult your marine dealer for an agency near you or check your telephone directory. Information is also available by calling 1-800-336-BOAT for the Boat U.S. Foundation. **International owners/operators should consult their marine dealer.**

Many books provide information that is valuable to you as a boat owner/operator. A book that is considered to be the most well-rounded is *Chapman – Piloting, Seamanship and Small Boat Handling*, by Elbert S. Maloney, published by Hearst Marine Books. In addition, there are many free pamphlets available from your local Coast Guard Auxiliary. It is highly recommended that you read additional publications other than just this owner's manual to become a well-informed boat owner/operator.

DEALER RESPONSIBILITIES

Although your boat has undergone a series of rigid inspections throughout the manufacturing process, the final factory check is not the last one before you take delivery. Your dealer must perform additional pre-delivery checks and service your Sea Ray® in preparation for delivery. Dealer responsibilities include providing:

- An adequate orientation in the general operation of your Sea Ray® boat.
- An "In Service Form" to be completed and signed by both the dealer and the consumer after inspection of boat by consumer.
- An explanation of safety considerations regarding the use of containment systems and components.
- A complete Owner's Manual Packet containing literature and information regarding your Sea Ray® boat and its separate warranted products, warranty and registration cards, and operation, installation and maintenance instructions.
- A review of all warranties, pointing out the importance of mailing warranty and registration

forms to various manufacturers within the required time limits, and assistance in accomplishing same.

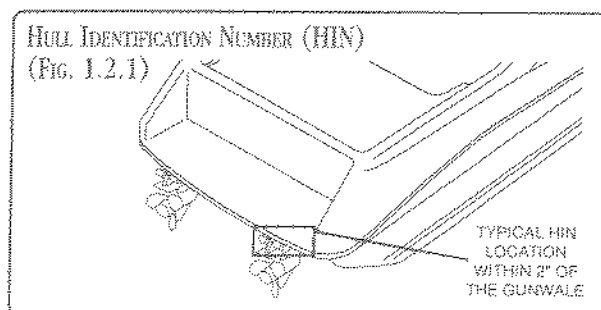
- Instructions on obtaining local and out-of-area service during and out of warranty periods.

OWNER/OPERATOR RESPONSIBILITIES

The owner/operator is responsible for examining the boat before accepting delivery to ensure all systems are working properly. In addition, the owner/operator is responsible for understanding and compliance with the following procedures and operational requirements:

- State registration
- Warranty registration
- Warranty terms and conditions
- Rules of the road
- Break-in procedure
- Return boat to dealer for inspection after 50 hours of operation in salt water, 100 hours fresh water, or at the end of the first year, whichever comes first
- Proper maintenance of boat and its systems
- Safety equipment
- Safety training of passengers and crew
- Insurance
- Knowledge of boat systems
- Seaworthiness/operational inspection
- Safe operating practices
- Avoiding use of drugs/alcohol
- Environmental regulations
- Accident reports
- Assistance to other boaters

The "Hull Identification Number," located on the transom, is on permanent file with Sea Ray® Boats, Inc. Data is kept regarding equipment and accessories, as well as dealer/shipping information. It is the most important identifying factor and must be included in all correspondence and orders. **Failure to include this number will only create delays.** Also of vital importance are the engine serial numbers and parts numbers. When writing about or



ordering parts for your engines always include these numbers.

INSURANCE

You must establish insurance coverage before operating your boat for the first time. As the boat owner, you are legally responsible for damage or injury caused by your boat. Insurance also protects against loss by fire, theft or other causes and provides liability protection against accidents.

PARTS & EQUIPMENT

Personal equipment and supplies accumulated on a boat can amount to a great deal more weight than the owner realizes, and may result in a loss of speed. Keep such weight to a reasonable minimum. When accessories or extra items are added, consider their weight and select their location to maintain the desired trim of the boat, fore, aft and athwartship. A drop in RPM will be noted as weight is added, and it may be advisable to change propeller size to compensate. Because of these variables, Sea Ray® cannot guarantee performance standards such as speed. Consult your Sea Ray® dealer when considering the addition of any item of major weight.

WARNING

Use only Marine Rated parts to replace such items as starters, distributors, alternators, generators, carburetors, fuel pumps, etc. Do not use Automotive Parts because they are not ignition protected and could cause a fire or explosion.

SERVICING YOUR SEA RAY

It is important that the owner/operator follow the recommended maintenance outlined by the Service Guide (see pg. 11.2). Please keep in mind that this guide is based on average operating conditions and recommended maintenance should be increased if above average use or severe operating conditions exist.

Replacement parts or additional equipment may be purchased through your Sea Ray® dealer.

To find a SEA RAY® dealer in your area, call:

Sea Ray® Customer Service:

Phone: 1-800-SRBOATS

FAX: 1-314-213-7878

To find repair and parts facilities for equipment installed on your boat, refer to the original equipment manuals which can be found in your owners packet.

CERTIFICATIONS & SPECIFICATIONS

MANUFACTURER'S CERTIFICATIONS

A **CE mark** means that your Sea Ray® Boat has been certified with applicable International Organization for Standardization directives.

NMMA certification means that your Sea Ray® Boat has been judged by the National Marine Manufacturers Association to be in compliance with

applicable federal regulations and American Boat and Yacht Council standards.

The following information is furnished in compliance with ISO directives and RSG guidelines in effect as of the date of publication of this manual. Sea Ray® will provide additional information if standards are amended.

The following information, required for export of the vessel, must be filled out by the dealer:

Boat Model: _____	
Design Category:	<input type="checkbox"/> Ocean <input type="checkbox"/> Offshore <input type="checkbox"/> Inshore <input type="checkbox"/> Sheltered Waters
Hull Identification Number: _____	
Maximum Recommended Load: _____	
Recommended Number of Passengers: _____	
Maximum Rated Engine Power: _____	
<u>Engine Installed</u>	
Manufacturer: _____	
Model and Number: _____	
<u>Weight of Craft</u>	
With Engine and Permanently Attached Items: _____	
Without Engine: _____	

CERTIFICATION DESIGN CATEGORIES

The definitions of the Design Category are as follows:

- **Ocean:** Designed for extended voyages where conditions may exceed wind force 8 (Beaufort scale) (47 mph and above) and significant wave heights of 4 meters (13.12 feet) and above, and vessels largely self-sufficient.
- **Offshore:** Designed for offshore voyages where conditions up to, and including, wind force 8 (39-46 mph) and significant wave heights up to, and including, 4 meters (13.12 feet) may be experienced.
- **Inshore:** Designed for voyages in coastal waters, large bays, estuaries, lakes and rivers

where conditions up to, and including, wind force 6 (25-31 mph) and significant wave heights up to, and including, 2 meters (6.56 feet) may be experienced.

- **Sheltered Waters:** Designed for voyages on small lakes, rivers, and canals where conditions up to, and including, wind force 4 (13-18 mph) and significant wave heights up to, and including, 0.5 meters (1.64 feet) may be experienced.

The "significant wave height" is considered to be the primary factor for determining design category and other parameters (e.g. meteorological) are descriptions of when these wave heights may be expected to occur. (Refer to page 1.10 for weather information.)

MANUFACTURER'S SPECIFICATIONS

Sea Ray® provides specific information about your boat in compliance with ISO 10240, American Boat and Yacht Council (ABYC) Technical Report T-24 and other applicable standards and directives. The following is included in the Owner's Manual Packet supplied with the boat.

US—DOMESTIC BOATS

- Warranty Terms & Conditions
- Hull Identification Number
- Engine/Transmission Serial Numbers
- Type of Boat/Series Name
- Dimensions – Feet (Meters):
 - Length
 - Beam
 - Vertical Clearance
 - Draft
- General Arrangements:
 - Deck Plan
 - Interior Plan
 - Profile
- Propulsion:
 - Engine Type
 - Propeller
 - Shafting
- Electrical:
 - Rated Amperage
 - Voltages – Frequency – Phases
 - Battery Capacity
 - Switches, Fuses, Circuit Breakers (location, type)
 - Wiring Diagrams
- Tank Capacities – Gallons (Liters):
 - Fuel
 - Fresh Water
 - Holding Tanks

- System Diagrams:
 - Water
 - Fuel
 - Exhaust
 - Ventilation
 - Bilge Pumping
 - Steering
 - Engine Cooling
- Stability/Flotation Capability
- Strong Points for Docking & Lifting
- Warning Labels, Part Numbers & Ordering Procedure
- Standard Equipment
- Optional Equipment
- Reference Manuals for Other Equipment
- Contacting Manufacturers of Other Systems
- Contacting Factory Service Department
- Construction Features
- Construction Standards

International—Non Domestic Boats

- Type of Boat/Series Name
- Hull Identification Number
- Maximum Recommended Load
- Propulsion:
 - Maximum Rated Engine Power
 - Manufacturer
 - Model and Number
- Stability/Flotation Capability
- Weight
 - With Engine
 - Without Engine

NAUTICAL TERMS

Abeam – object 90 degrees to center line on either side of boat.

Abaft – a point on a boat that is aft of another.

Aft – toward the rear or stern of the boat.

Astern – behind or to the stern of the boat.

Beam – the width of a boat.

Bow – the fore part of a boat..

Bow Eye – Bolt with looped head mounted on extreme forward part of bow.

Bulkhead – vertical partition in a boat.

Chine – meeting juncture of side and bottom of boat.

Chock – deck fitting, used as guides for mooring or anchor lines. Also, a wedge to stop wheels from rolling.

Cleat – deck fitting with arms or horns on which lines may be made fast.

Cockpit – an open space from which a boat is operated.

Dead Rise – the amount of stern to bow inclination of the keel from horizontal (level).

Deck – upper structure which covers the hull between gunwales.

Draft – depth of water required to float boat and its propulsion system.

Fathom – six feet.

Fenders – rope or plastic pieces hung over the side to protect the hull from chafing.

Freeboard – height of exposed hull from water line to deck.

Ground tackle – general term referring to anchors, anchor lines, etc.

Gunwale (pronounced gun'li) – meeting juncture of hull and deck.

Hatch – an opening in deck to provide access below.

Head – toilet or toilet area in a boat.

Headroom – vertical distance between the deck and cabin or canopy top.

Helm – steering console.

Hull – the basic part of a boat that provides buoyancy to float the weight of the craft and its load.

Keel – the major longitudinal member of a hull; the lowest external portion of a boat.

Knot – unit of speed in nautical miles per hour.

Lee – the side that is sheltered from the wind.

PFD – Personal Flotation Device; life preserver.

Sport Cruisers/ Sport Yachts

Port – term designating left side of the boat.

Rudder – Movable fixture at the stern used for steering.

Scupper – hole permitting water to drain overboard from deck or cockpit.

Sheer – curve or sweep of the deck as viewed from the side.

Snub – to check or tighten a line suddenly.

Starboard – term designating right side of the boat

Stern – the aft end of a boat.

Stern drive – outboard unit of an inboard/outboard (I/O) engine installation.

Stringer – longitudinal members fastened inside the hull for additional structural strength.

Transom – transverse part of stern.

Wake – disturbed water that a boat leaves behind as a result of forward motion.

Windward – toward the direction from which the wind is blowing.

SAFETY

NOTICE

The law requires the owner/operator to assist any person or boat in distress as long as he does not endanger his boat.



WARNING

A qualified operator must be in control of the boat at all times. Do not operate the boat while under the influence of alcohol or drugs. Never operate your boat at speeds which exceed the operator's ability to react if an emergency develops. At night, turn on the appropriate navigation lights and cruise at a reduced speed that will allow you plenty of time to avoid dangerous situations.

The tremendous feeling of freedom inherent in boating can be overshadowed by disaster if you ignore safety precautions. This manual presents basic guidelines, but it does not address every possible risk you may encounter. You are strongly urged to:

- Take a boating safety course.

- Get hands-on training from your boat dealer.
- Regularly review safety requirements.
- Maintain your boat and its systems.
- Have your boat inspected at least annually by a qualified mechanic or dealer.

Refer to the table of minimum required safety equipment on page 1.6.

EXPLANATION OF SAFETY PRECAUTIONS

This manual provides safety precautions which must be observed when operating or servicing your boat.

The following precautions appear throughout the manual. Learn to recognize the degree of precaution and understand the associated instructions. The precautions listed are not all-inclusive. Always use common sense in the operation of your boat.

WARNING LABELS

Mounted at key locations throughout the boat, warning labels advise the owner/operator of imperative safety precautions to follow when operating and/or servicing equipment. **Do not remove or obstruct any warning label.** Replace any label which becomes illegible. See the Parts Manual for replacement part numbers and ordering procedure.

Four basic types of labels include:

DANGER

DANGER – Immediate hazards which **WILL** result in severe personal injury or death if the warning is ignored.

WARNING

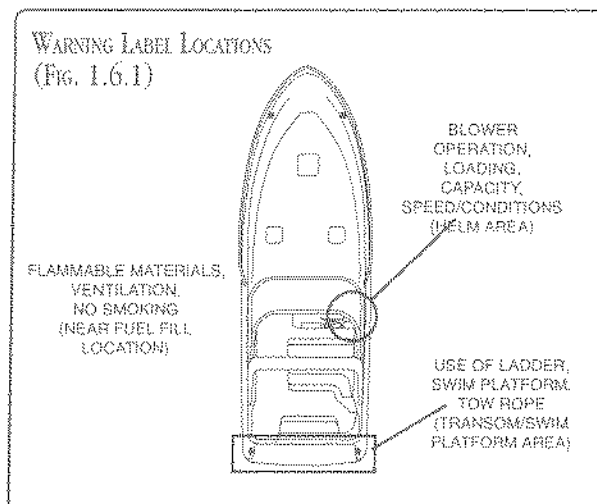
WARNING – Hazards or unsafe practices which **COULD** result in severe personal injury or death if the warning is ignored.

CAUTION

CAUTION – Hazards or unsafe practices which could result in minor injury or product or property damage if the warning is ignored.

NOTICE

Information which is important to proper operation or maintenance, but is not hazard-related.



LIFESAVING EQUIPMENT



WARNING

Always wear a personal Flotation Device (PFD) when boating.

Even strong swimmers can tire quickly in the water and drown due to exhaustion, hypothermia, or both. The buoyancy provided by a personal flotation device (PFD) will allow the person who has fallen overboard to remain afloat with far less effort and heat loss, extending survival time necessary to find and retrieve them.

Boat operators are required to carry one wearable personal flotation device (Type I, II, III or V) for every person on board. Boats must also have at least one throwable device (Type IV).

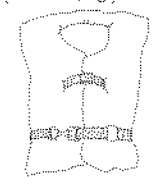
PFD Classifications:

(Fig. 1.7.2)



Off-Shore Life Jacket (Type I) – most buoyant, it is designed to turn an unconscious person face up; used in all types of waters where rescue may be slow, particularly in cold or rough conditions.

(Fig. 1.7.3)

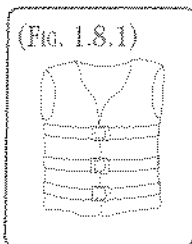


Near-Shore Life Vest (Type II) – “keyhole” vest with flotation-filled head and neck support is also designed to turn a person face up, but the turning action is not as pronounced; used in calm, inland waters or where quick rescue is likely.

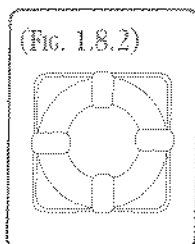
MINIMUM REQUIRED EQUIPMENT

Consult your national boating law enforcement agency.

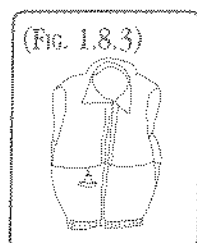
EQUIPMENT	CLASS A (Less than 4.8 meters [16 feet])	CLASS 1 (4.8 to less than 7.9 meters [16 to less than 26 feet])	CLASS 2 (7.9 to less than 12.2 meters [26 to less than 40 feet])	CLASS 3 (12.2 to less than 19.8 meters [40 to less than 65 feet])
Bell, Whistle	Some means of making efficient sound signal, for example, whistle or air horn and a bell audible for .5 nautical mile.			
Fire Extinguisher -Portable (if <u>no fixed fire extinguishing system</u> is installed in machinery spaces)	At least one (ABYC recommends two for boats 4.8 to less than 7.9 meters [16 to 26 feet]) B-I type Coast Guard approved portable marine fire extinguisher. (Not required on outboard motor boats less than 7.9 meters [26 feet] in length without permanently installed fuel tanks and not carrying passengers for hire, provided construction of boat will not permit entrapment of explosive or flammable gases or vapors.)		At least two (ABYC recommends at least three) B-I type approved portable marine fire extinguishers, or at least one B-II type Coast Guard approved portable marine fire extinguishers.	At least three (ABYC recommends at least four) B-I type approved portable marine fire extinguishers, or at least one B-I type plus one B-II type Coast Guard approved portable marine fire extinguisher.
Fire Extinguisher -Portable (if <u>fixed fire extinguishing system is installed</u> in machinery spaces)	None	None	At least one B-I type approved portable marine fire extinguisher.	At least two B-I type approved portable marine fire extinguishers, or at least one B-II type Coast Guard approved portable marine fire extinguisher.
Lights	Required between sunset and sunrise or in reduced visibility.			
Muffling	Efficient muffling device or system to prevent excessive or unusual engine noise.			
Personal Flotation Devices (PFDs)	One Coast Guard approved Type I, II or III device for each person aboard, plus one throwable Type IV device. Type V device is acceptable if worn for approved use. Always wear a PFD when boating.			
Ventilation	Boats with closed compartments or permanently installed fuel tanks must be equipped with an efficient natural or mechanical bilge ventilator or meet applicable Coast Guard construction standards for fuel and electrical systems.			



(Fig. 1.8.1)
 Flotation Aid (Type III) – vest is designed so conscious wearers can turn face up; often designed for comfort while engaged in sports such as skiing.



(Fig. 1.8.2)
 Throwable Devices (Type IV) – horseshoe buoys, ring buoys and buoyant cushions are designed to be grasped, not worn.



(Fig. 1.8.3)
 Special-Use Devices (Type V) – sailboat harnesses, white-water vests, float coats, and hybrid vests which have minimum inherent buoyancy and an inflatable chamber.

Before purchasing PFDs, ensure that there is an attached tag indicating they are approved by the U.S. Coast Guard or by your national boating law enforcement agency.

Children and non-swimmers must wear PFDs at all times when aboard. All passengers and crew should wear them. A loose PFD is often useless in an emergency.

WARNING

The law requires that PFDs must be readily accessible, if not worn, that is, removed from storage bags and unbuckled.

Throwable devices must also be readily available and right at hand.

The operator is responsible for instructing everyone aboard on the location and use of PFDs.

Size PFDs for the wearer. Children require special attention in the use of PFDs.

Test PFD buoyancy at least once a year.

ADDITIONAL RECOMMENDED EQUIPMENT

In addition to the required equipment, the following list includes items which would be wise to include onboard your boat:

- Visual distress signals for day and night use (required in some areas; consult local regulations)
- Marine radiotelephone
- Charts of your intended cruising area
- Spare keys
- Emergency position-indicating radio beacon
- Portable radio with weather band
- Waterproof flashlight(s)
- Extra batteries
- Mooring lines
- Fenders
- Lead line
- Ground tackle (at least 2 anchors, rode, shackles)
- Boat hook
- Manual bilge pump
- Spare parts kit (spark plugs, fuses, etc.)
- Instruction manuals for engine and accessories
- First aid kit
- Tool kit:
 - Assorted screwdrivers (Phillips and flat blade)
 - Pliers (regular, vise-grip, and water pump)
 - Wrenches (box, open-end, allen, adjustable)
 - Socket set (metric or U.S. standard as appropriate)
 - Electrical tape

IMPAIRED OPERATION



Special attention must be given to the effects of alcohol and drugs while boating. No other single factor is involved in so many marine accidents and deaths. The detrimental effects of alcohol and drugs are increased by the wind, waves and sun, quickly impairing your ability to react. Boating laws are far more strict today than in the past, and enforcement is tougher on those who use alcohol and drugs when boating.

WARNING

CONTROL HAZARD – Federal laws prohibit operating a boat while under the influence of alcohol or drugs. These laws are vigorously enforced.

LOAD CAPACITY


The certification plate, located on the hull near the helm or transom indicates maximum weight and number of persons your boat can handle under normal sea conditions (see Fig. 1.9.1). **Do not exceed the load capacities stated.**

The U.S. Coast Guard requires boats less than 6.4 meters (20 feet) to have a certification plate stating the maximum number of persons and the maximum weight the vessel will handle safely under normal conditions.


International (ISO) requirements state that any craft up to 24 meters (78.7 feet) must display a certification plate.

The information present on the certification plate does not relieve the operator from responsibility. Use common sense and sound judgement when placing equipment and/or passengers in your boat.

- The number of seats does not necessarily indicate how many people a boat can safely carry.
- When operating on-plane (above idle speed), allow no more passengers than there are real seats, and insist that passengers sit down in those seats.


WARNING
PERSONAL INJURY HAZARD
 When underway, keep passengers clear of areas not designed for riding. Especially hazardous areas include seat backs, bow, gunwale, transom platform and fore and aft decks.

- Do not permit passengers to ride on parts of your boat not designed for such use.


DANGER
EXTREME HAZARD – Do not use sun pads (if equipped) while craft is underway.

- Overloading violates regulations. Do not carry more weight or passengers than indicated on the certification plate.
- Overloading, improper loading and distribution of weight are significant causes of accidents. Allow yourself an extra margin of safety in rough water.

CERTIFICATION PLATES (EXAMPLES)
(Fig. 1.9.1)

U.S. COAST GUARD MAXIMUM CAPACITIES 7 PERSONS OR 815 LBS. 1820 LBS. PERSONS, MOTOR, GEAR 110 HP MOTOR THIS BOAT COMPLIES WITH U.S. COAST GUARD SAFETY STANDARDS IN EFFECT ON THE DATE OF CERTIFICATION MANUFACTURER: SEA RAY BOATS, INC. MODEL: DESIGN COMPLIANCE WITH HARRIS REQUIREMENTS IS BORROWED FROM RESPONSIBILITY FOR PRODUCTION CONTROL LOAD AND H.P. CAPACITY STEERING AND ELECTRICAL SYSTEMS VENTILATION - LEVEL FLOTATION MANEUVERABILITY - NAVIGATION LIGHTS NATIONAL MARINE MANUFACTURERS ASSN.	U.S. COAST GUARD MAXIMUM CAPACITIES 9 PERSONS OR 1175 LBS. 2230 LBS. PERSONS, MOTOR, GEAR 225 HP MOTOR THIS BOAT COMPLIES WITH U.S. COAST GUARD SAFETY STANDARDS IN EFFECT ON THE DATE OF CERTIFICATION MANUFACTURER: SEA RAY BOATS, INC. MODEL: DESIGN COMPLIANCE WITH HARRIS REQUIREMENTS IS BORROWED FROM RESPONSIBILITY FOR PRODUCTION CONTROL LOAD AND H.P. CAPACITY STEERING AND ELECTRICAL SYSTEMS VENTILATION - LEVEL FLOTATION MANEUVERABILITY - NAVIGATION LIGHTS NATIONAL MARINE MANUFACTURERS ASSN.
U.S. COAST GUARD MAXIMUM CAPACITIES 11 PERSONS OR 2360 LBS. 3140 LBS. PERSONS, MOTOR, GEAR 300 HP MOTOR THIS BOAT COMPLIES WITH U.S. COAST GUARD SAFETY STANDARDS IN EFFECT ON THE DATE OF CERTIFICATION MANUFACTURER: SEA RAY BOATS, INC. MODEL: DESIGN COMPLIANCE WITH HARRIS REQUIREMENTS IS BORROWED FROM RESPONSIBILITY FOR PRODUCTION CONTROL LOAD AND H.P. CAPACITY STEERING AND ELECTRICAL SYSTEMS VENTILATION - LEVEL FLOTATION MANEUVERABILITY - NAVIGATION LIGHTS NATIONAL MARINE MANUFACTURERS ASSN.	U.S. COAST GUARD MAXIMUM CAPACITIES 12 PERSONS OR 3200 LBS. 3930 LBS. PERSONS, MOTOR, GEAR 400 HP MOTOR THIS BOAT COMPLIES WITH U.S. COAST GUARD SAFETY STANDARDS IN EFFECT ON THE DATE OF CERTIFICATION MANUFACTURER: SEA RAY BOATS, INC. MODEL: DESIGN COMPLIANCE WITH HARRIS REQUIREMENTS IS BORROWED FROM RESPONSIBILITY FOR PRODUCTION CONTROL LOAD AND H.P. CAPACITY STEERING AND ELECTRICAL SYSTEMS VENTILATION - LEVEL FLOTATION MANEUVERABILITY - NAVIGATION LIGHTS NATIONAL MARINE MANUFACTURERS ASSN.

POWER CAPACITY

Do not exceed the maximum engine power rating stated on the builder's plate attached to your boat, or the largest available engine option for your boat offered by Sea Ray® (see Fig. 1.9.1).

PROPELLERS

Your Sea Ray® has been equipped with propellers which our tests have shown to be the best suited for general use under normal conditions and load. In some situations you may wish to change propellers to give your boat slightly different performance characteristics. In general, changing to lower pitch propellers will increase acceleration and load-pulling ability, but with a slight decrease in top speed. Conversely, moving to higher pitch propellers will attain higher top speed with a light load, but will sacrifice acceleration and power. Your particular requirements should be discussed with your Sea Ray® dealer. **Under no circumstances use propellers which allow the engines to operate at higher than recommended RPM.**

STABILITY

Your boat was manufactured to specific stability and flotation standards. Any deviation from the recommended load capacities will put your boat in jeopardy of swamping and/or sinking.

In addition:

- Stability may be substantially reduced if equipment is added to the superstructure.
- Stability is substantially reduced by loose fluids or weight within the hull. Keep bilge area as dry as possible, and close openings in rough weather.

WARNING

STABILITY HAZARD – Load boat properly. The manufacturer's load rating is the maximum allowed under normal conditions. Adjust downward if weather, water or other conditions are adverse.

Allow passengers to ride only in areas that do not pose a hazard to themselves or the boat. Passengers should remain seated while boat is moving.

MAINTAINING CONTROL

GENERAL CONSIDERATIONS

- You are responsible for passengers' actions. If they place themselves or the boat in danger, immediately correct them.
- Know how your boat handles under different conditions. Recognize your limitations and the boat's limitations. Modify speed in keeping with weather, sea and traffic conditions.
- Instruct passengers on the fundamentals of operating your boat in case you are unable to do so.
- Instruct passengers on location and use of safety equipment and procedures.

WARNING

CONTROL HAZARD

- A qualified operator must be in control of the boat at all times.
- Always operate boat within maneuvering speed limitations.
- Exercise constant attention to the boat's direction when underway.
- Always keep a firm grip on the steering control.

WARNING

COLLISION HAZARD – Turn on navigation lights at night and in other reduced visibility situations, and cruise at reduced speed to allow time to avoid dangerous situations.

WARNING

SPEED HAZARD

- Operate boat at speeds within ability to maintain control and react if an emergency occurs.
- Reduce speed at night, in congested waterways and when weather and sea conditions warrant.
- Watch your wake. It might capsize a small craft. You are responsible for damage caused by your wake.

VISIBILITY

- The law requires the operator to "maintain a proper lookout by sight (and hearing)."
- Operator must insist on unobstructed vision, particularly to the front. Move passengers or load if they block the view when the boat is above idle speed.
- Post a lookout to watch for obstacles when visibility from the helm is limited due to operating conditions.
- Be sure that other boats or objects are not in the way before making quick turns.

WARNING

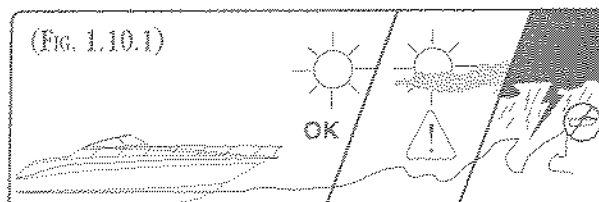
VISIBILITY HAZARD

- Keep visibility clear. Move passengers if they obstruct operator's view.
- Designate a lookout to watch for obstacles and other vessels when the field of vision from the helm is limited due to operating conditions

WEATHER

Getting caught in severe weather is hazardous. Bad weather and/or rough sea conditions can cause an

(Fig. 1.10.1)



uncomfortable and more importantly an unsafe situation. Consult local weather information for the latest weather conditions or any impending deterioration of the weather before setting out and while underway. Following are a few basic weather-related rules:

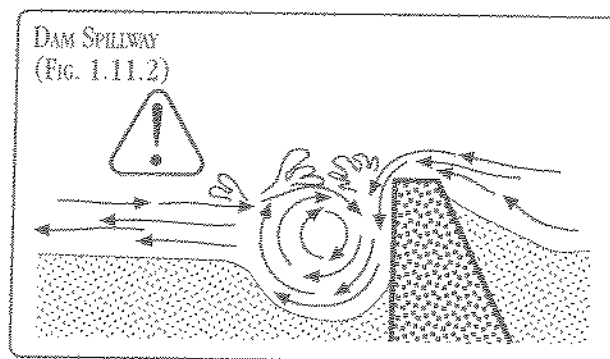
- Learn storm signals and take appropriate action (See Fig. 1.10.1).
- Check the weather and sea conditions before leaving and while underway.
- A sudden change in wind direction or speed or an increase in wave height indicates deteriorating weather.
- Wear a personal flotation device.
- If a storm approaches, immediately seek a safe harbor.
- If a storm hits, have everyone sit low in the boat. Secure (close) all windows, hatches and doors to minimize the risk of flooding. Head the bow into the wind with enough power to maintain slow headway.
- Secure equipment safely when underway in rough weather.
- If you encounter fog, determine your position, set a safe course, slow down and alert other boats of your presence with a sound signal.
- If a lightning storm approaches, the safest action is to dock and disembark. If you cannot return to shore, seek shelter **inside** the boat and remain there until the storm passes.
- Lightning will seek a ground when it strikes. The best protection is a properly grounded lightning rod placed high enough to provide

a protective umbrella over the hull. Stay clear of the lightning rod, all attached wiring and all metal parts of the boat.

- **Stay out of the water during a lightning storm.** If caught swimming during a storm, get back into the boat and remain there until the storm passes.

DAM SPILLWAYS

Avoid the waters above and below dam spillways. Dangerous currents and turbulence exist in both areas causing rapidly changing and hazardous conditions.



OPERATING IN SHALLOW WATER

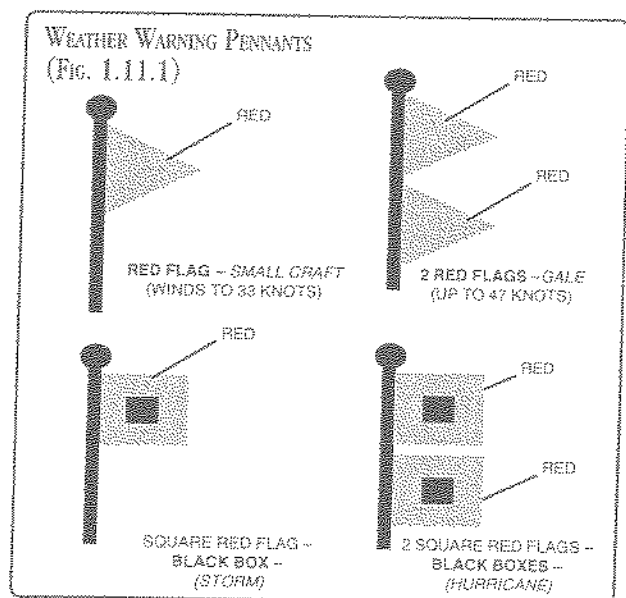
⚠ WARNING

COLLISION HAZARD – Use extra caution when underwater/floating objects may be present. Hitting an object at high speed or severe angle can seriously injure people and damage your boat. Use extreme care when operating in shallow water or when operating in reverse.

Operating in shallow water presents obvious hazards. In addition to insufficient draft, sand bars, stumps or other unmarked obstructions in deep water can cause serious damage to the boat.

Other hazards in shallow water include mud, sand, weeds and debris, which can foul your engine's propeller and cooling water intakes. Excessive vibration may indicate a fouled or damaged propeller.

Stern drive equipped boats feature outdrive impact protection in the event the outdrive unit strikes an underwater object (see Section 2 – *Outdrive Impact Protection*)



Become familiar with the area in which you are operating. Consult tide tables, charts and ask local boaters. If you know or suspect shallow water, post a lookout and proceed with caution.

FLOAT PLAN

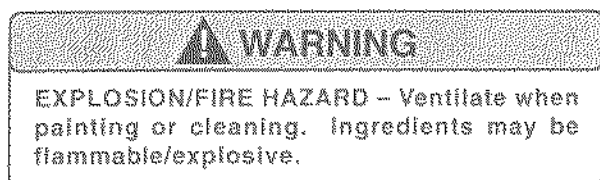
File a float plan with a friend or relative about where you intend to cruise. Give a good description of the boat. Advise of any changes in cruise plans.

These precautions will enable your friend or relative to tell the Coast Guard or your national boat agency where to search for you and what type of boat to look for if you fail to return.

Advise the same person when you complete your trip to prevent false alarms about your safety.

PAINT, CLEANING AGENTS & OTHER SUBSTANCES

The use of products containing chlorine, phosphates, perfumes and non-degradable ingredients should be avoided. Consult your marine dealer regarding environmental regulations before painting the hull. Fumes can last for hours, and chemical ingredients can harm people, property and the environment. Common household cleaning agents may cause hazardous reactions. Read and understand directions before proceeding.



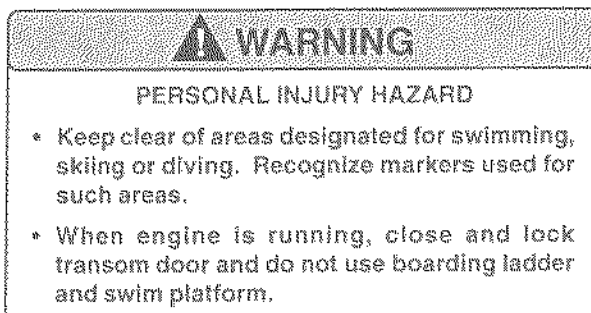
WATER SPORTS

SWIMMING

- Do not swim from a moving boat.
- Many areas prohibit swimming from boats except in designated areas.
- Make sure boat's engine is turned off before allowing people to swim anywhere near your boat. Shut the engine OFF and remove the key from the ignition switch so that nobody will accidentally start the engine while swimmers are nearby.
- Turn off engine when taking swimmers or skiers aboard or when putting them overboard. Never

permit use of the transom swim platform while engine is running.

- Slow down and exercise extreme caution when cruising in an area where there might be swimmers or skiers in the water.



SKIING



- Anyone who water skis must know how to swim.
- Never drive the boat directly behind a water skier. At 22 knots (25 m.p.h.), it takes only 5 seconds to overtake a fallen skier who was 60 meters (200 feet) in front.
- Keep a downed skier in sight and on the operator's side of the boat when approaching the skier. Never back up to anyone in the water.
- Learn the signals to communicate with a skier. Although a skier cannot operate the boat from their position, they should be able to control it through hand signals (Fig. 1.13.1).

Turn – Arm raised, circle with index finger extended.

Skier in Water – Extend one ski vertically out of water.

Back to Dock – Pat top of head.

Cut Motor – Draw finger across throat.

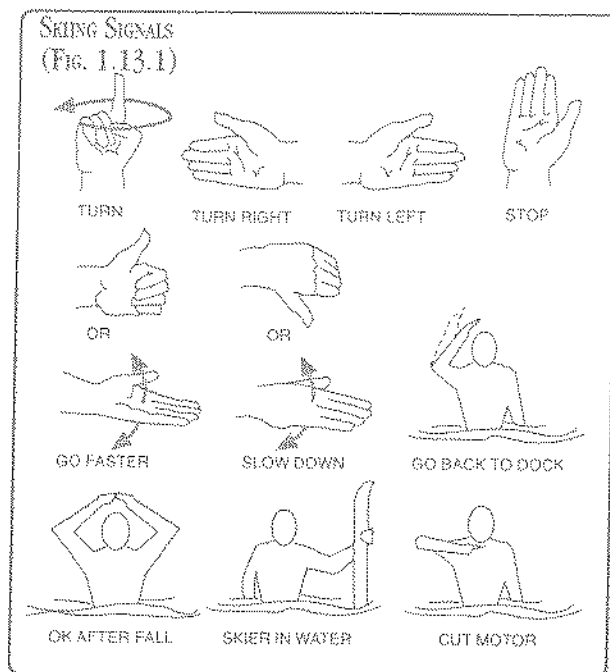
Slow Down – Thumb pointed down or palm down, move hand up and down.

Faster – Thumb pointed up or palm up, move hand up and down.

OK – Raise arm and form a circle with thumb and index finger.

Stop – Raise arm with palm vertical and facing forward.

Turn Right – Extend arm out from body to the right.



Turn Left – Extend arm out from body to the left.

OK After a Fall – Clasp hands together overhead.

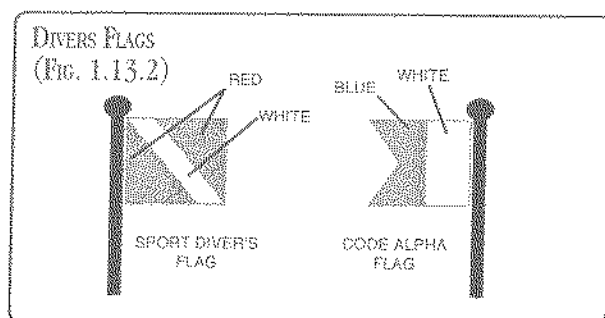
- Be aware of sudden release of tow rope. It can backlash into cockpit and cause injury to onboard passengers.

DIVING

- Recognize and respect diving flags. Keep at least 30 meters (100 feet) away.

Sport Divers Flag – Red flag with diagonal white stripe marks a diver in the water.

Code Alpha Flag – Blue and white pennant designates boat being used in dive operations.



IN GENERAL

When engaged in water sports, be safe and courteous to others sharing the water:

- Be considerate to fishermen.

- Do not water ski in congested areas.
- Avoid navigation markers.
- Stay well clear of other boats and skiers.

SAFETY HOTLINES

The U.S Coast Guard offers many pamphlets on safety and other information not covered in this book. Contact your local Coast Guard unit or call the toll-free safety hotlines below for information.

- U.S. Coast Guard 1-800-368-5647
- Canadian Coast Guard 1-800-267-6687

In other countries, ask your marine dealer for information on how to contact the national boating law enforcement agency.

OPERATION GUIDELINES

While this section presents the most basic operating principles, it is not intended to address all conditions that may be encountered during operation of the boat.

Sea Ray recommends that you take a course of certified instruction before operating a boat.

Become familiar with the location of the boat's equipment, drains, safety features and specifications before operating and maneuvering.

BOARDING

- Board only one person at a time.
- Load gear after you are aboard. Carrying gear while boarding can make you lose balance.



WARNING

SLIPPING HAZARD – Wet decks are slippery. Wear proper footwear and use extreme caution on wet surfaces.

- Distribute equipment weight evenly.
- Instruct passengers where to sit during on-plane operation to reduce possibility of falling overboard during high speed maneuvers.
- If gear is not immediately needed, stow it in secure area.
- Safety gear must be immediately accessible at all times.

- Children and non-swimmers must wear PFDs at all times when aboard. All passengers and crew should wear them, since a loose PFD is often useless in an emergency. The law requires that PFDs, if not worn, must be readily accessible, that is, removed from storage bags and unbuckled. Throwable devices must be readily available, that is, right at hand. The operator is responsible for instructing everyone aboard on their location and use.

STARTING, SHIFTING AND STOPPING

Before starting the engine, remove accessory canvas and attach the emergency engine stop switch lanyard to the emergency stop switch and to the operator (if applicable). See the engine operator's manual for detailed instructions.

Do not ignore any alarm! Correct any problems before casting off.

STARTING ENGINE CHECKLIST:

- Fuel – supply adequate, including reserve
- Oil – level adequate
- Battery(ies) – power adequate
- Drain plugs – installed
- Gear – neutral
- Bilge blowers – run at least 4 minutes before starting
- “Sniff test” – no leaks or fumes
- Emergency stop switch (if applicable) – attached to operator and stop switch
- Gauges (after ignition and warmup) – readings normal (see engine operator's manual)

SHIFTING

- Shift to neutral and allow boat to lose almost all headway before shifting into forward or reverse.
- Reversing gear acts as a braking mechanism. Use caution. Sudden slowing of forward motion may cause following sea to swamp the boat.
- Become thoroughly familiar with the boat's response to movement of the controls. (See Section 3 – *Instruments & Controls*.)



CAUTION

Pause in neutral while shifting, wait for boat to lose headway, and then shift quickly. Easing into gear can damage transmission.

STOPPING ENGINE CHECKLIST:

- Gear – neutral
- Mooring lines – secure
- Engine – idle 5 minutes to cool
- Ignition – off



CAUTION

- Turn off engine at idle speed. Racing the engine before switching off can draw water into the engine through the exhaust, causing internal damage.
- If boat is equipped with an emergency stop switch, wear the lanyard at all times when operating the boat but use it to stop only in an emergency. Do not use it to shut off the engine during normal operation.

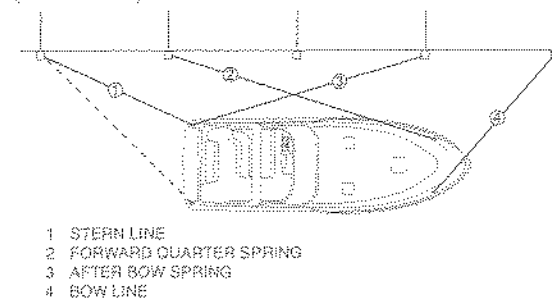
HANDLING DOCK LINES

Dock lines secure a boat in its berth and help maneuver the boat close to the pier. Dock lines for recreational boats are usually made of nylon because it stretches, is durable and is easy on the hands. The number and size of dock lines increase as the size of the boat increases.

The basic lines used for docking are:

- Bow Line – Fastened to the boat's forward cleat and run forward at about a 45 degree angle to a dock cleat or pile to prevent the boat from moving astern.
- Stern Line – Fastened to the boat's after cleat and run astern at about a 45 degree angle to a dock cleat or pile to prevent the boat from moving forward.
- Spring Lines – As many as four, but generally two:
 - After Bow Spring – Fastened to the after bow and run aft to a dock cleat or pile;

BASIC DOCKING LINES
(Fig. 1.14.1)



- Forward Quarter Spring – Fastened to the stern and run forward to a dock cleat or pile.

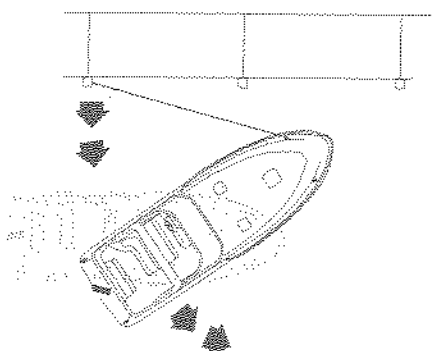
Spring lines are especially valuable when tide movement is significant. They also help in controlling the boat when leaving a dock.

CASTING OFF

Casting off procedures vary depending on wind, current and traffic. Some general guidelines are:

- Start engine before casting off.
- Put adequate space between boat and dock before trying to move away.
- Successful maneuvering secrets:
 - Since a boat turns at its stern, the stern must have enough clearance to move back toward the dock as the bow moves away from the dock.
 - Use wind and current to move a boat whenever possible, aided by spring lines as needed.
- Power slowly ahead about 1 meter (3 feet) with the after bow spring line fastened. (See Fig. 1.15.1). At the same time, turn the wheel toward the dock. The combination of rudder/propeller action and the spring line will swing the stern away from the dock.
- Bring aboard the spring line and fenders.
- Check for loose or trailing lines which can foul the propeller.
- Back the boat with rudder/propeller centered until well clear of the dock.
- Swing the bow away. The stern will move toward the dock, but if you have allowed enough room, it will not hit the dock.
- Proceed slowly, sounding a long horn blast to alert other boats that you are departing.

CASTING OFF FROM A DOCK
(Fig. 1.15.1)



Leaving Mooring

- Because the boat is heading into the wind and the stern is already clear, this is fairly simple.
- Untie from mooring buoy and back slowly away several boat lengths.
- When you can see the mooring buoy, it is safe to move forward, giving the buoy wide clearance.

APPROACHING THE DOCK

Procedures vary depending on whether you tie up at a:

- Pier (parallel to shore) or wharf (not parallel)
- Slip (between piles, at right angle to pier or wharf)
- Mooring (anchoring buoy away from shore)

Some procedures apply in all situations:

Move slowly and plan maneuvers ahead of time. Use wind and current whenever possible to move or slow the boat and remember that boats do not have brakes. To slow forward motion, back off on the throttle. After the boat slows and the engine idles, shift to reverse and gradually increase throttle until the boat stops.

If there is more than one way to approach a berth, use the most conservative maneuver:

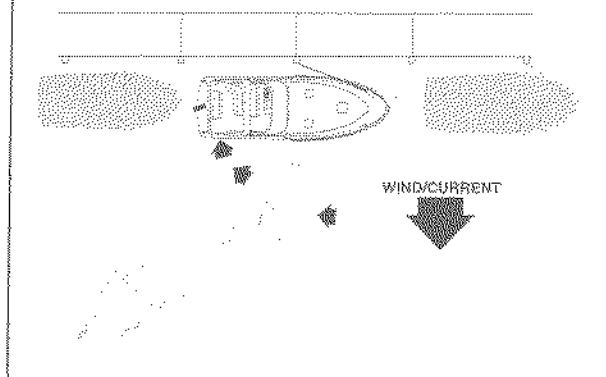
- High Wind/Current – Approach against the wind or current.
- Mild Wind/Current – Approach against the stronger of wind or current.

Use fenders to protect the boat. **Never use arms or legs to try to stop a boat's movement.**

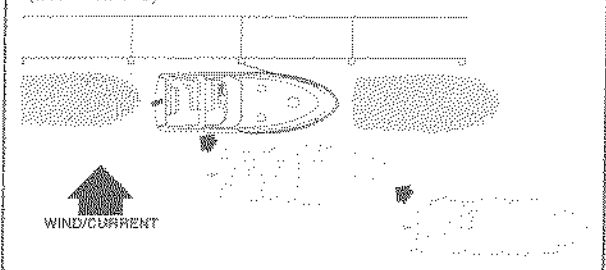
APPROACHING A PIER/WHARF

- Approach at a 45 degree angle.
- When the boat is a few feet from the dock, bring the stern closer by turning the wheel away from the dock, keeping the engine at idle. Then shift to reverse and turn the wheel toward the dock. Remember that some boats do not steer well in reverse, and tight turns are difficult.
- Have adequate docking gear ready for use. Put fenders out and attach lines on side of boat that will be next to the dock.
- If possible, station experienced crew at the bow and stern, each with dock lines.
- When the boat is fairly close, throw the first line under-handed to a person on the dock,

APPROACHING A PIER (OFFSHORE WIND)
(Fig. 1.16.1)



APPROACHING A PIER (ONSHORE WIND)
(Fig. 1.16.2)



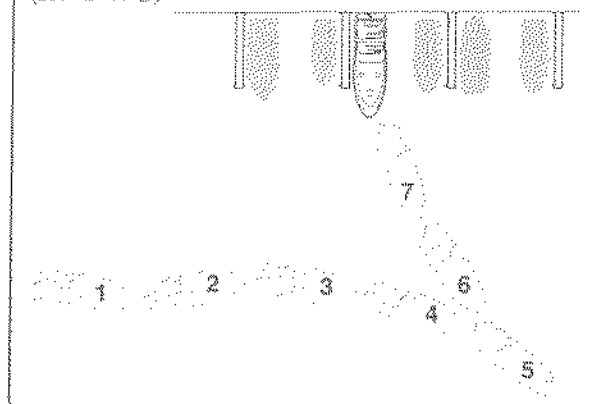
aiming it over his head and upwind. The bow line is usually the first line.

- If no one is on the dock, get as close as you can and loop any line over a piling or cleat.
- Wait for boat to lose headway before securing lines. Secure the after bow spring line first.
- Keep engine running at idle and in neutral until all lines are secured.

APPROACHING A SLIP

- Put out fenders.
- Turn the stern toward the slip, much like preparing to back a car into a garage.
- Shift to reverse and maneuver slowly into slip.
- Shift to forward as you enter, turn wheel to other side and give throttle a short burst of power to align the boat with the slip.
- Shift to reverse. Back slowly.
- When almost completely in, shift to forward to stop.
- Keep engine running at idle and in neutral until all lines are secured.

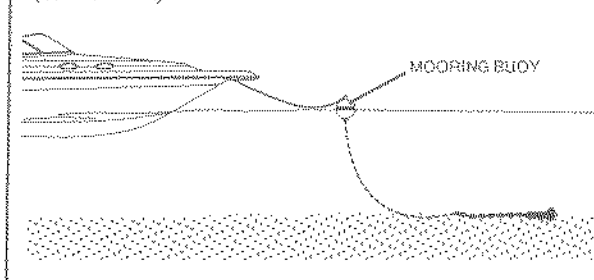
APPROACHING A SLIP
(Fig. 1.16.3)



APPROACHING A MOORING

- Moor only in designated areas. Never moor to a navigational buoy.
- As you approach, note how other boats lie at mooring buoys. Since they are heading into the wind/current, approach your mooring at the same heading. If there are no other boats, estimate the wind/current direction as best you can.
- Shift to neutral when you think you have enough headway to reach your buoy.
- Station a crew member at the bow with a boat hook to pick up the mooring line. As the boat gets closer, you will lose sight of the buoy from the helm so the crew member forward must signal direction and distance.
- Keep engine running until the crew member signals that the mooring line is secured.

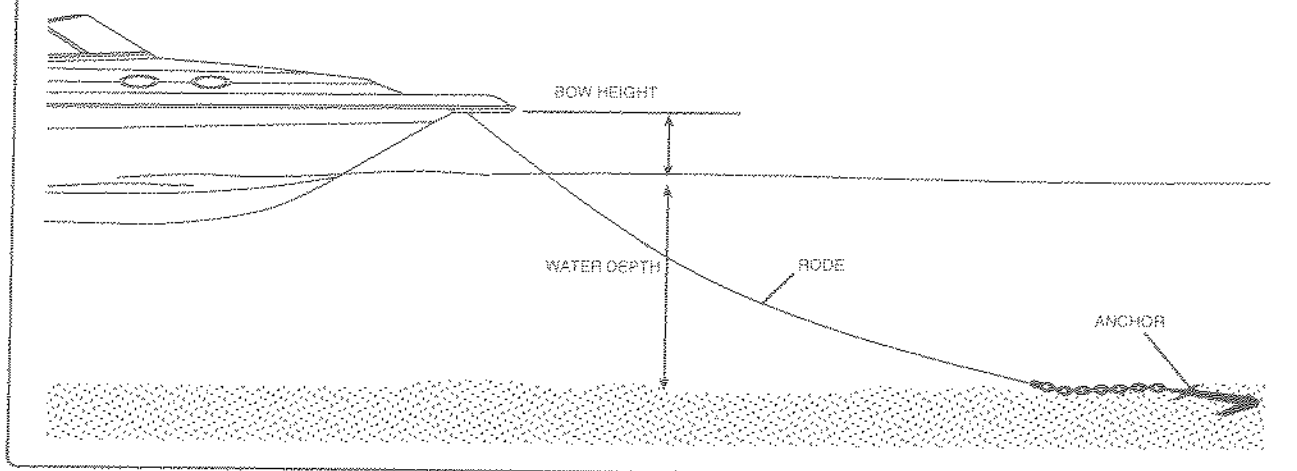
APPROACHING A MOORING
(Fig. 1.16.4)



ANCHORING

Wind and sea conditions affect an anchored boat. The boat is not moving through the water, and without headway there is no control. Stay alert! Be sure that the anchor will hold under all circumstances if you are leaving the boat.

ANCHORING ARRANGEMENT
(Fig. 1.17.1)



Understand the principles of rode and scope and their effect on anchor performance.

The rode is the line connecting the anchor to the boat. Nylon line is ideal because it is light, strong, stretches, can be stowed wet and is easy to handle. Add a short chain between the anchor and the nylon line to prevent abrasion of the line.

The scope is technically defined as the ratio of the rode length to the vertical distance from the bow to the sea floor. Scope depends on the type of anchor, bottom, tide, wind and sea conditions.

- Minimum is 5:1 for calm conditions; norm is 7:1; severe conditions may require 10:1.

$$\text{Scope} = \frac{\text{Rode Length}}{\text{Bow Height} + \text{Water Depth}}$$

Since you want to know how much rode to use when anchoring, the formula is:

$$\text{Rode Length} = (\text{Bow Height} + \text{Water Depth}) \times \text{Scope}$$

Example:

$$\text{Rode Length} = (3 \text{ feet} + 10 \text{ feet}) \times 7^*$$

$$\text{Rode Length} = 13 \text{ feet} \times 7^*$$

$$\text{Rode Length} = 91 \text{ feet}$$

* Scope factor may range from 5 to 10 or more. Less than 5, the anchor breaks out too easily.

LOWERING THE ANCHOR

Be sure there is adequate rode for the depth of water and secure rode to both the anchor and the boat.

- Stop completely before lowering the anchor.
- Keep feet clear of coiled line as it pays out.

- Turn on the anchor light at night and in reduced visibility.

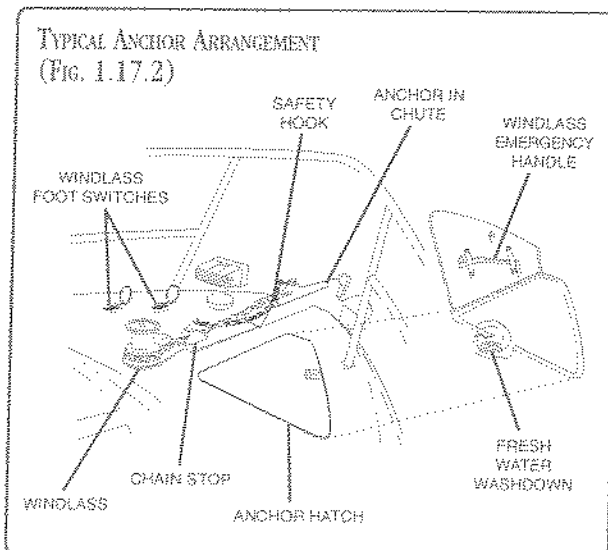
WARNING

SINKING HAZARD – Anchor from the bow if using one anchor. A small current can make a stern-anchored boat unsteady; a heavy current can drag a stern-anchored craft under water.

COLLISION HAZARD – Anchor only in areas where your boat will not disrupt other boats. Do not anchor in a channel or tie up to any navigational aid. It is dangerous and illegal.

ANCHORING ARRANGEMENT

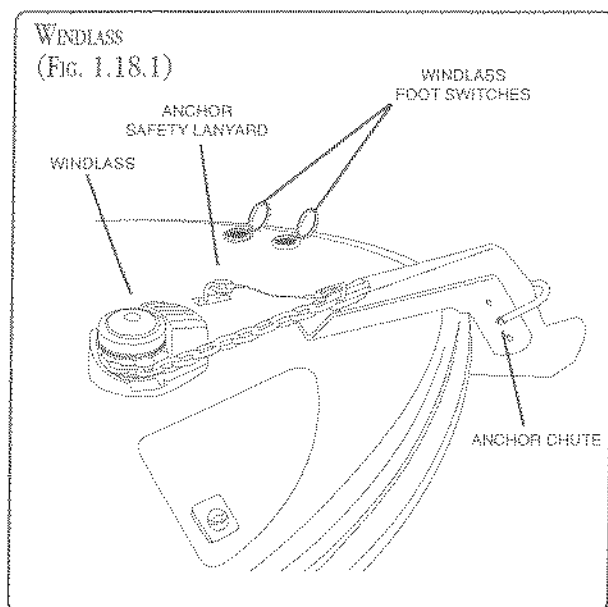
If your Sea Ray is equipped with a windlass and an anchor chute, stow the anchor in the chute when not in use.



NOTE: Before using the anchor, be sure the anchor lanyard is removed from the anchor and the anchor is secured to the windlass chain.

WINDLASS

The windlass is wired to the 12 volt system through the WINDLASS breaker located in the bilge DC breaker box. The windlass facilitates the anchoring of your sport yacht by automatically lowering and raising the anchor. To operate the windlass, the windlass "MAIN" switch on the helm switch panel must be ON.



NOTICE

Anchor should be independently secured to prevent accidental release.

ATTACH THE SAFETY LANYARD TO THE ANCHOR to insure that the anchor is held in place should the windlass fail. DO NOT use the safety hook to SUPPORT the anchor in a stored position.

TO OPERATE FROM THE HELM:

- Make sure that the safety lanyard and chain stop (if optionally equipped) are removed from the anchor chain (see Fig. 1.18.1).
- Turn the windlass "MAIN" rocker switch ON. (See the Owner's Manual Supplement for the location on your Sea Ray.)
- Push the windlass toggle switch (located beside the rocker switch on the helm switch panel) UP to raise the anchor. To lower the anchor, pull the toggle switch DOWN. (See the

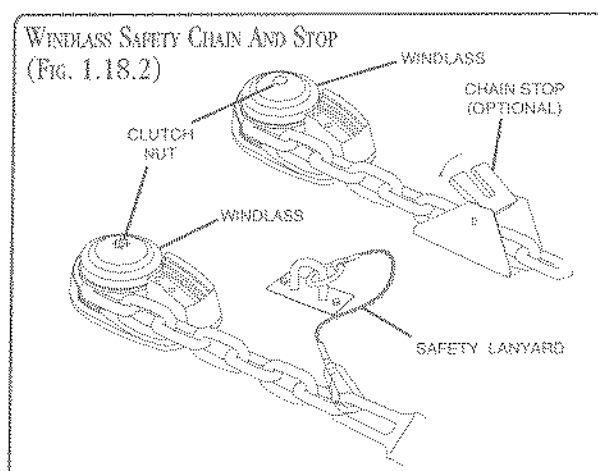
Owner's Manual Supplement for the location on your Sea Ray.)

TO OPERATE FROM BOW:

- Make sure that safety lanyard (Fig. 1.18.2) and chain stop (if equipped, Fig. 1.18.2) are removed from anchor chain.
- Lift protective cap on foot switches (see Fig. 1.18.1) and depress UP or DOWN switch for the desired result.

TO OPERATE MANUALLY:

- Insert the emergency handle into the clutch nut (Fig. 1.18.2).
- Turn handle clockwise to retrieve anchor.



MAINTENANCE:

⚠ DANGER

Make sure that the power is off before any work is performed on the windlass.

- Periodically check the motor and control box electrical connections, remove any residue and cover the connections with a small coating of grease.
- It is recommended, at least once a year, to disassemble the windlass and remove any residue build-up.
- Using the emergency handle (see Fig. 1.18.1), unscrew the clutch nut by turning the handle counterclockwise.
 - Remove the chain wheel and upper and lower cones.

- Wash down with fresh water and remove any residue.
- Coat upper and lower cones with a light film of lubricant.
- Reassemble the unit and tighten clutch by turning the handle clockwise.

NOTICE

It is important that the windlass clutch is tight for proper operation and safety. Periodically check the clutch and tighten if necessary.

With the anchor in the stowed position, tighten the windlass clutch by inserting the emergency handle into the clutch nut (Fig. 1.18.2) and turn clockwise.

REFER TO WINDLASS OPERATOR'S MANUAL FOUND IN YOUR OWNER'S MANUAL PACKET FOR DETAILED OPERATING INSTRUCTIONS.

ANCHORING PROCEDURES

To anchor, bring the bow into the wind or current and put the engine in neutral. When the vessel comes to a stop, lower the anchor from the bow. The anchor line should be 5 to 7 times the depth of the water.

SETTING THE ANCHOR

There is no best way to set an anchor. Experiment to see how your anchor performs.

One method is to turn the rode around a bitt and slowly pay out as the boat backs from the anchor site. When the proper scope has been reached, snub the rode quickly, causing the anchor to dig into the bottom.

- Reverse engine slowly to drive the anchor in and prevent it from dragging.
- Secure the rode to the bitt or cleat.

Occasionally check your position against the shoreline or other permanent landmark. If the anchor is dragging allowing you to drift, reset the anchor and pay out more line.

WEIGHING ANCHOR

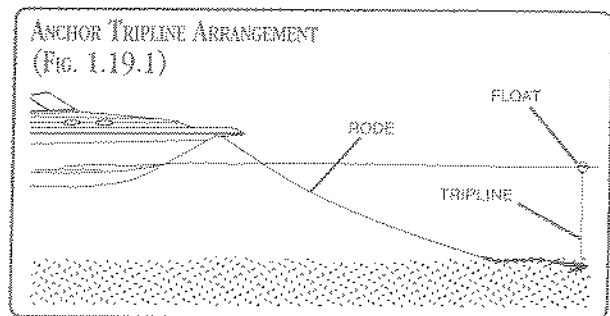
To weigh (or retrieve) the anchor, start the boat and run slowly up to the anchor, taking in the rode as you go. The anchor will usually break out when the rode becomes vertical. Coil lines to let them dry before stowing.

Be careful that trailing lines do not foul in the propeller.

CLEARING A FOULED ANCHOR

A fouled anchor can test your patience and ingenuity. One of the best methods of breaking free is to set a tripline before you lower anchor.

- Attach a line to the crown or head of the anchor and the other end to a float.
- The line should be just long enough to reach the surface of the water, allowing for tides.
- A 9.5 mm (3/8-inch) polypropylene line is a good choice because it is light, strong and floats.
- If the anchor snags, pull vertically on the tripline to lift the anchor by the crown.



MANEUVERING AND CONTROL

Become familiar with the boats operating characteristics at slower speeds before maneuvering at full throttle. Wind and current will have a more pronounced effect on the boat at slower speeds and maneuvering is far more difficult. It is recommended that maneuvering skills be practiced in open water away from traffic.



WARNING

COLLISION HAZARD

- Turn on navigation lights at night and in other reduced visibility situations, and cruise at a reduced speed to allow time to avoid dangerous situations.
- Use extra caution when underwater/floating objects may be present. Hitting an object at high speed or severe angle can seriously injure people and damage your boat. Use extreme care when operating in shallow water or when operating in reverse.



WARNING

PERSONAL INJURY HAZARD

- When underway, keep passengers clear of areas not designed for riding. Especially hazardous areas include seat backs, bow, gunwale, transom or forward platform and aft sundeck.
- Passengers in bow rider seats must exercise constant caution. When water is rough, move from bow rider area to aft passenger seats.
- Remain alert. Use of drugs, alcohol or other substances which impair judgment poses a serious threat to yourself and others. The boat operator is responsible for the behavior of passengers.
- Ensure emergency stop switch lanyard is always attached to operator while boat is in operation.



WARNING

SPEED HAZARD

- Operate boat at speeds within the operator's ability to maintain control and react if an emergency occurs.
- Reduce speed in congested waterways.
- Avoid showboating! Turning suddenly, jumping waves, or steering close to other boats, docks or obstacles can cause personal injury and boat damage.



WARNING

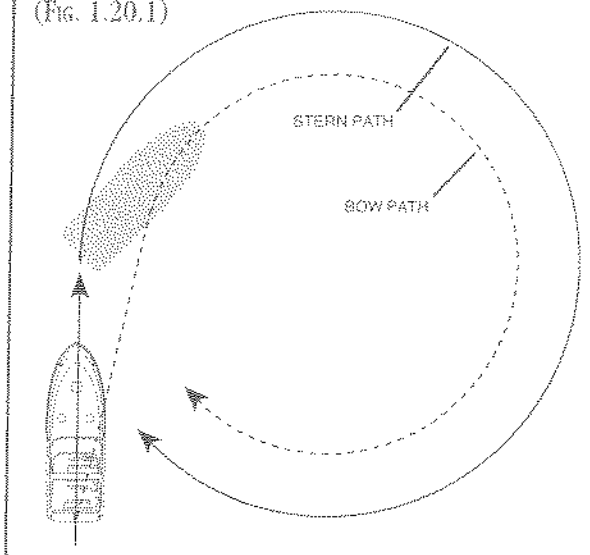
MANEUVERING HAZARD

- Always operate within maneuvering speed limitations.
- Exercise constant attention to the direction of the boat when underway.
- Always keep a firm grip on the steering control, especially when steering torque is strong.

STEERING

Steering response depends upon throttle, motion and position of the drive unit. It is important to understand that since both thrust and steering are at the stern of the boat, the bow will follow a smaller turning circle because thrust is pushing the stern away from the direction of the turn (see Fig. 1.20.1).

BOW AND STERN TURNING PATHS
(Fig. 1.20.1)



Steering a boat differs from steering an automobile in several ways:

- Turn the steering wheel in the direction that you want the bow to turn, but remember that the boat will be turning at the stern.
- Steering control will be reduced when in reverse.
- A boat needs to be making headway for proper control. Avoid overcorrecting and veering from side to side at slow speeds by keeping the steering wheel centered.
- The operator must always keep a firm grip on the steering wheel. There may be noticeable pull or torque on the steering wheel under certain engine trim positions and/or bow-up attitude such as when getting up on plane. This effect may be reduced or eliminated by changing the engine trim so that the propeller shaft is more parallel to the water's surface.



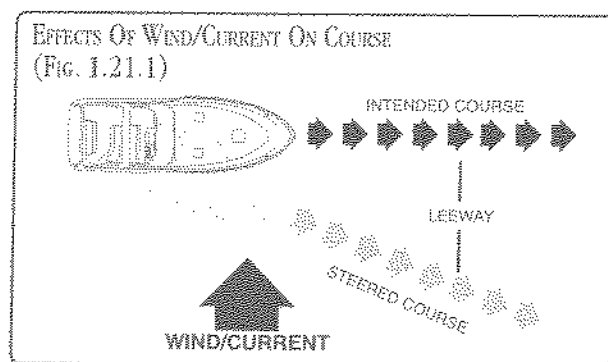
WARNING

CONTROL HAZARD

- Boat steering usually is not self-centering. Steering is affected by engine and propeller torque, trim plane, wave and current action, and the speed of the hull through the water. Constant attention and control of the boat's direction is required for safe operation.
- Some steering systems are especially sensitive to engine torque and operator seating. Practice under varying conditions to prevent accidents.

WIND AND CURRENT

Wind and/or current will cause the boat to deviate from the intended course of travel. Leeway is the amount of difference between the intended course and the course that must be steered in order to end up at the same position. Because the boat is being pushed sideways by the wind or current, it is actually tracking through the water at an angle. A boat moving slowly with a strong wind or current will need to steer into the wind/current at a greater angle to its intended course to compensate for leeway than will a faster moving boat.



TRIMMING

Your boat is designed to plane at a particular speed and weight distribution. As speed decreases or weight increases, the stern will settle lower in the water and the hull will push a hill of water, increasing drag and requiring more power to move through the water.

On stern drive equipped cruisers, power trim enables you to adjust the bow attitude up or down by changing the propeller angle in relation to the hull (see Fig. 1.21.2).

Hydraulic trim tabs are adjusted independently of each other and of the power trim, enabling adjustment bow attitude up and down as well as to correct for side to side list. Trim tabs provide attitude adjustment at lower speeds when power trim may be ineffective.

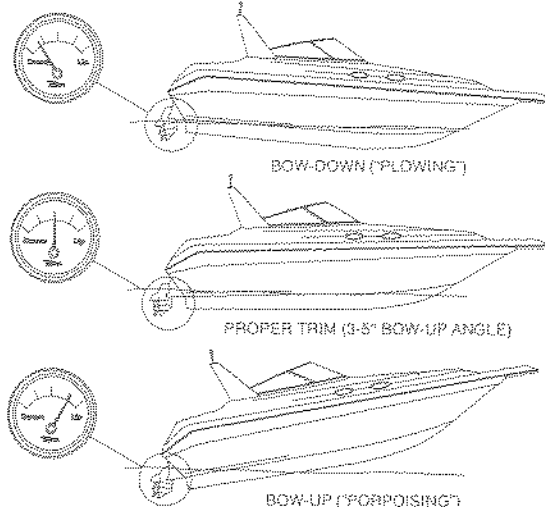


WARNING

MANEUVERING/CONTROL HAZARD

- Ensure continuous visibility of other boats, swimmers, and obstacles during bow-up transition to planing.
- Adjust engine to an intermediate trim as soon as boat is on plane to avoid possible ejection due to boat spinout. Do not attempt to turn boat when engine is trimmed extremely down/under/in.

EFFECTS OF TRIMMING (Fig. 1.21.2)



A properly trimmed boat:

- Operates at a correct running attitude of a 3 to 5 degree angle to the water (bow slightly up).
- Reduces drag and increases fuel efficiency.
- Preserves good forward vision.
- Increases safety.

Use short bursts of rocker switches to adjust power trim and trim tabs. Pushing switches too far at once may cause sudden steering problems. Adjusting one trim tab more than the other will adjust list caused by improper equipment storage, too many people on one side or a strong cross wind.

To achieve proper trim:

- Trim the engine fully down/under/in and set the throttle at moderate to maximum when starting out.
- Once on plane, trim the engine slightly up/out to avoid a bow-down condition ("plowing") which can cause unpredictable and inefficient steering. Attempting to turn or encountering a moderate wave in a bow-down condition may result in an abrupt turn or spinout.
- Avoid trimming the engine too far up/out which will cause a bow-up condition leading to bouncing ("porpoising") or propeller ventilation. If propeller speed increases suddenly, reduce engine RPM and trim the drive unit down/under/in until propeller ventilation stops.



CAUTION

If stern drive is equipped with power tilt for trailering, use it only for that purpose. Tilting drive unit into the trailering zone while underway may damage the drive unit or engine.

Stern drive lower units may have a trim tab to compensate for steering torque. Torque is caused by the propeller shaft not being parallel to the water surface and will cause the boat to pull to one side.

NAVIGATION

The following is only a general overview of boating "Rules of the Road". This manual does not contain all of the rules of navigation. Therefore, you are strongly urged to acquire instruction in navigation before taking command of your boat.

The two basic types of navigational rules are:

- **Inland Rules** – these rules govern vessels on the inland waters of the United States.
- **International Rules** – these rules apply to vessels on the high seas.

Basic principles apply, however some differences do exist. Learn and understand the rules which govern the type of boating in which you will be engaged. Make sure to consult your marine dealer for any additional "local rules and regulations" which may apply. Keep in mind that every situation which may occur cannot possibly be covered. Therefore, common sense must prevail.

It is Important to understand the following "Basic Rules" of boating:

- **Underway** – Any boat which is not anchored, made fast to shore or dock, nor aground
- **Power-Driven Vessel** – any boat propelled by an engine. (Includes sailboats propelled by an engine regardless of whether or not the sails are in use).

Power-Driven vessels must give right-of-way to the following:

- Any vessel unable to maneuver
- Any vessel with restricted maneuverability
- Any vessel engaged in commercial fishing
- Any sailing vessel

- **Sailing Vessel** – any boat propelled by sail only. (no engine in operation).

Sailing vessels must give right-of-way to the following:

- Any vessel unable to maneuver
- Any vessel with restricted maneuverability
- Any vessel engaged in commercial fishing

- **Vessel Engaged in Fishing** – any commercial fishing boat with gear that restricts maneuverability (not included are trolling lines or other gear which does not impede maneuverability).

Vessel engaged in commercial fishing must give right-of-way to the following:

- Any vessel unable to maneuver
- Any vessel with restricted maneuverability

NAVIGATIONAL BUOYS AND MARKERS

Waterways are marked with hazard/warning and directional buoys and markers. They are located to help keep you on course and away from hazardous situations. It is important to familiarize yourself with the different buoys and markers used in navigation.

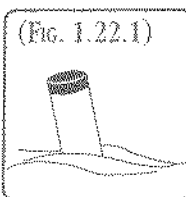
Consult local boating authorities for the type of hazard/warning buoys and markers used in the jurisdiction where you will be boating.

Two primary marking systems are used in the U.S.:

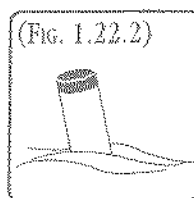
- **Uniform State Waterway Marking System (USWMS)** – used on inland waters and maintained by the individual states.

The USWMS marks well defined channels with a lateral system of red and black buoys. That is, the sides of the channel are lined with buoys and a boater should pass between them.

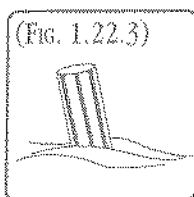
The USWMS marks areas of obstruction and channels which are not well defined with the cardinal system. The cardinal system requires that the boater:



pass north or east of BLACK-TOPPED white buoys.



pass south or west of RED-TOPPED white buoys.



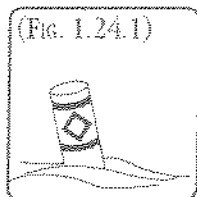
pass outside (away from shore) of RED and WHITE vertically STRIPED buoys.

TYPICAL NAVIGATION MARKERS
(FIG. 1.23.1)



- ① DANGER! - THE NATURE OF THE DANGER MAY BE INDICATED INSIDE THE DIAMOND SHAPE SUCH AS ROCKS, REEFS, DAMS, SNAGS OR CONSTRUCTION.
- ② DIVERS DOWN FLAGS - REQUIRED BY FEDERAL LAW TO BE DISPLAYED BY DIVERS. BOATS EXERCISE CAUTION.
- ③ INFORMATION - GIVES DIRECTIONS, DISTANCES AND OTHER NON-REGULATORY MESSAGES.
- ④ GREEN CAN BUOY - NAVIGATE TO PORT FACING UPSTREAM.
- ⑤ MID CHANNEL - PASS CLOSE TO THIS BUOY ON EITHER SIDE.
- ⑥ RED NUN BUOY - NAVIGATE TO STARBOARD FACING UPSTREAM.
- ⑦ MOORING BUOY - WHITE WITH REFLECTORIZED BLUE BAND. MAY HAVE A WHITE LIGHT OR REFLECTOR.
- ⑧ CAUTION - CONTROLLED AREA AS INDICATED IN CIRCLE SUCH AS SPEED LIMIT, NO FISHING, NO ANCHORING, SKIING ONLY, SLOW NO WAKE, NO PROP BOATS, NO SKIING.
- ⑨ BOATS KEEP OUT! - THE NATURE OF THE DANGER MAY BE PLACED OUTSIDE THE CROSSED DIAMOND SUCH AS WATERFALLS, SWIM AREAS OR RAPIDS.

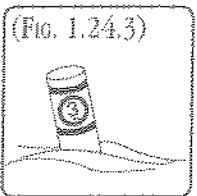
Be aware that the following USWMS regulatory markers **MUST be obeyed**. The regulatory markers are white with geometric shapes painted in international orange (see Fig. 1.24.1 to 1.24.4).



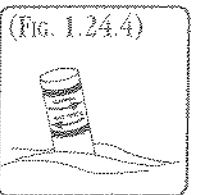
DANGER – DO NOT approach this marker. To do so could result in damage to the vessel or injury.



STAY OUT! – boats are prohibited to operate beyond these markers.



CONTROL SPEED – the speed limit enforced in this area is displayed on the marker.



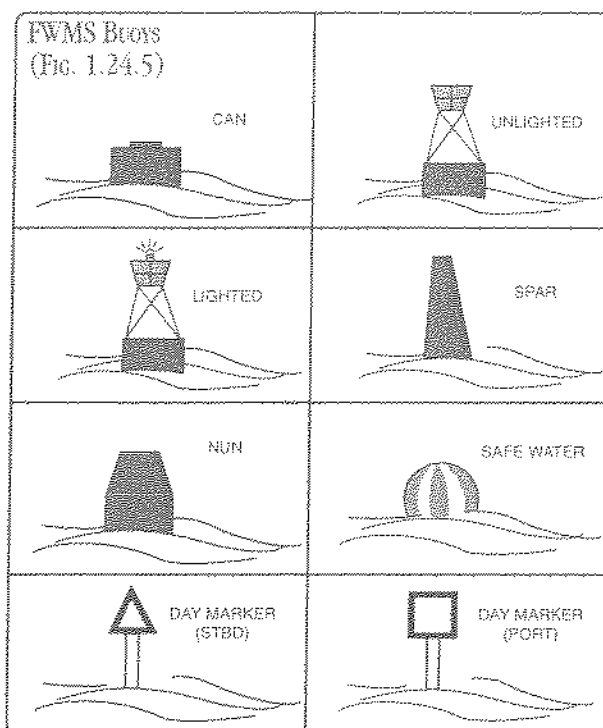
DIRECTIONAL – these markers point out the direction to various sites on the waters.

• Fresh Water Management System (FWMS)

Additionally, the FWMS is further modified into the Western River Buoyage, and the Intercoastal Waterway Buoyage. Consult local authorities for the marking system used in your area.

The FWMS lateral marking system employs a variety of markers (see Fig. 1.23.8). However, the position, color and numbering of the markers remains consistent. That is, the right side (starboard) of a channel is always marked with RED, EVEN numbered buoys and the left (port) side marked with GREEN, ODD numbered buoys.

The phrase “**red right returning**” is a good way to remember the correct course between the red and the black or green buoys when returning to harbor. It refers to the **red** buoys marking the **right** side of the channel when **returning** to port (or heading upstream). When leaving port (or heading downstream), the opposite is true. Red buoys are on the left and black or green buoys are on the right.



If the seaward direction is difficult to determine, compare the navigational aids you see with a nautical chart.

In addition, sound producing and lighted buoys are used in conditions of low visibility, fog and darkness.

Storms, collisions or unusual tides may cause a buoy to be missing, adrift or off the charted position. Pass buoys at a distance because even on the correct location, they may be very close to the danger they mark. Report misplaced buoys to the proper authorities.

NAUTICAL CHARTS

Nautical charts produced by the National Ocean Service, U.S. Army Corps of Engineers and others provide critical information regarding water hazards, safe channels, depth, course and headings to guide you while boating. It is extremely important to learn charting and navigation skills before taking command of a vessel. Consult your marine dealer for charts of your area.

RIGHT-OF-WAY

There are three ways of encountering another vessel on the water – meeting, crossing or overtaking.

Generally, the vessel with less maneuverability has the right-of-way. Stay clear of the vessel and pass to his stern. Small pleasure boats

must always stay clear of and yield to large commercial boats in narrow channels.

The vessel which has the right-of-way is the "privileged boat". This boat can hold speed and course. The "burdened boat" is the vessel which must make any adjustment to course and/or speed necessary to keep clear of the privileged boat.

When meeting another vessel head-on, neither boat has the clear right-of-way, both vessels should decrease speed and pass port to port (Fig. 1.25.1). However, if both vessels are on the left side of a channel, each should initiate two short blasts of the horn and pass starboard to starboard. If you find yourself overtaking a slower vessel which is in your path of travel, you are the burdened vessel. Make any adjustment necessary to avoid collision and pass either to port or starboard. Signal your intent to do so by sounding your horn twice if passing on the port and once if passing on the starboard (Fig. 1.25.2). When encountering a situation whereby you and another vessel will be crossing paths of travel, the starboard vessel has the right-of-way (Fig. 1.25.3).

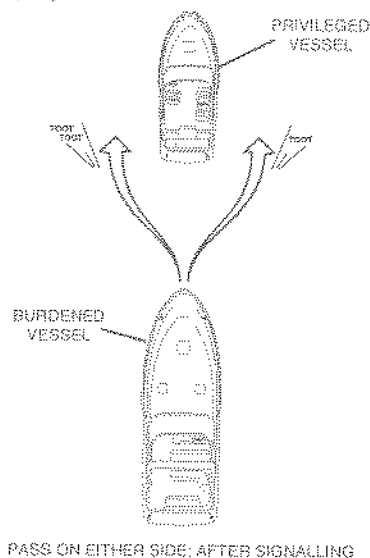
Having the right-of-way does not excuse you from accountability in the event of a collision. The general prudential rule of boating states that in the event that a collision appears unavoidable, both vessels have the responsibility to act in such a manner as to avoid collision.



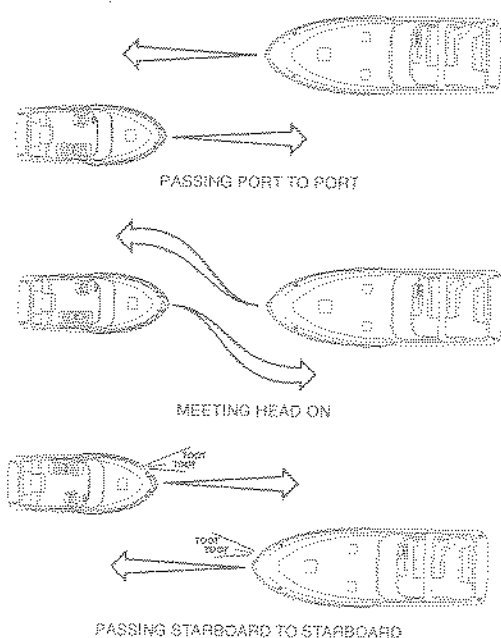
CAUTION

- Follow navigation rules to avoid collisions.
- Less maneuverable boats generally have the right of way. Steer clear of the stand-on (right-of-way) boat and pass to its stern.
- If a collision appears unavoidable, both vessels must act. Prudence takes precedence over right-of-way rules if a crash is imminent.

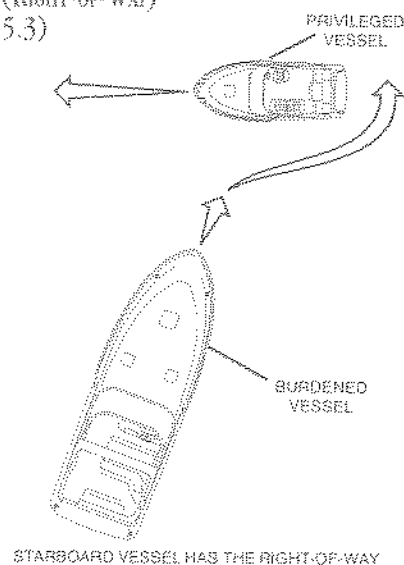
OVERTAKING (RIGHT-OF-WAY)
(Fig. 1.25.2)



MEETING (RIGHT-OF-WAY)
(Fig. 1.25.1)



CROSSING (RIGHT-OF-WAY)
(Fig. 1.25.3)

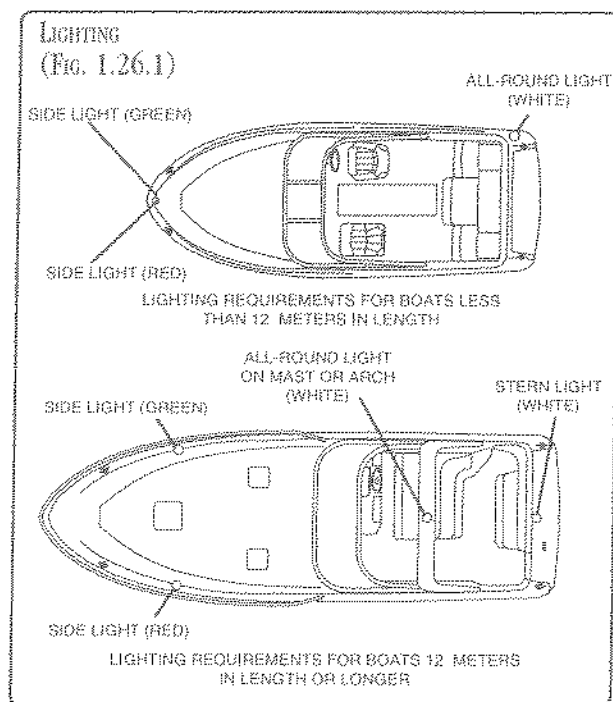


NAVIGATIONAL LIGHTS

When operating between sunset and sunrise and during periods of reduced visibility navigational lights must be operational. It is common for manufacturers to provide proper lighting, however, it is the responsibility of the owner/operator to learn and comply with local boating requirements. It is important that the owner/operator learn to recognize navigational light groupings from any position encountered.

BOAT NAVIGATIONAL LIGHTS

- **Masthead Light** – white light on mast visible forward, port and starboard



- **All-Round Light** – white light on mast visible from any direction
- **Side Lights** – red light on the port, forward hull; green light on the starboard, forward hull
- **Stern Light** – white light visible from behind.
- **Anchor Light** – white light visible from any direction.

Sailboats, commercial fishing vessels, public safety boats, dive boats and dredges have different lighting requirements. Also international and inland lighting rules differ slightly, learn to recognize the lighting requirements in your area. Avoid lights you do not recognize.

Nighttime operation requires extra caution. All Rules of the Road apply, but regardless of who

has right-of-way, it is wise to slow down and stay clear of other boats. If possible, have a passenger help keep watch. Help your night vision by avoiding bright lights.



WARNING

Do not operate the boat between sunset and sunrise with the navigation light switch in the **ANCHOR LIGHT** position. **RUNNING LIGHTS** are required at night to indicate direction of travel and right-of-way.

NAVIGATING IN FOG

Avoid operating in foggy weather, but if visibility is reduced by fog, mist or heavy rain, a boat underway must reduce speed, maintain a vigilant lookout and sound a warning signal of one prolonged blast (approximately five (5) seconds) of the horn or whistle every two (2) minutes.

- Pay close attention to maintain bearing and speed.
- Wear PFDs.
- Have passengers help to lookout.

A boat at anchor in an area of reduced visibility must ring a bell rapidly for five (5) seconds at one (1) minute intervals.

If you hear a fog signal forward or abeam, immediately slow or stop, then proceed with caution until any danger of collision has passed.

EMERGENCY SITUATIONS

Plan ahead. The time to think about emergencies is before they happen. As the owner/operator, you must take control and direct what will happen next. Know what to do **before** you encounter any of the following emergency situations.

NOTICE

The law requires the owner/operator to assist any person or boat in distress as long as he does not endanger his boat.

The 1971 Boating Safety Act grants protection to a "Good Samaritan" boater offering assistance in good faith and absolves that boater from any civil liability arising from the assistance given.

DISTRESS SIGNALS

MARINE RADIOS

A radio is the most important means of receiving information and summoning aid that a boat operator has. Learn proper radio procedure to be prepared for emergency situations.

VHF-FM is the most common short-range radio and single sideband (SSB) radios are used for longer range. Designated emergency radio channels are:

- VHF-FM Channel 16
- SSB 2182 kHz

NOAA Weather Radio (NWR) is operated by the National Weather Service and provides continuous weather information for all U.S. waters on both VHF-FM and SSB radio frequencies.

EMERGENCY BROADCASTS

Emergency situations are categorized as:

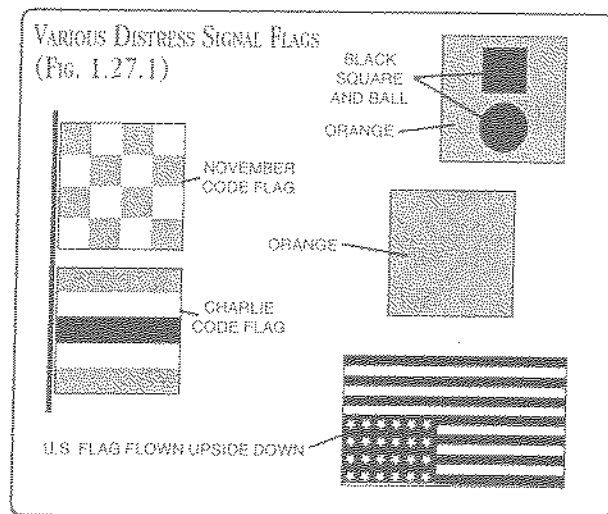
- **Emergency** – life or vessel is in imminent peril.
 - Call sign – “**Mayday, Mayday, Mayday**”
- **Urgency** – emergency situation less severe than an emergency.
 - Call sign – “**Pan-Pan, Pan-Pan, Pan-Pan**” (pronounced Pahn-Pahn)
- **Safety** – weather warnings and navigational safety.
 - Call sign – “**Security, Security, Security**” (pronounced Say-Cure-It-Tay)

Cease all radio transmissions if you hear a distress call. If you can assist, respond on the emergency frequency. If you cannot assist, continue to monitor the emergency frequency until it is obvious that help is being provided.

VISUAL DISTRESS SIGNALS

U.S.Coast Guard regulations require boats in coastal waters and the Great Lakes to carry visual distress signals for day and/or night use.

- Boats less than 4.9 meters (16 feet), open sailboats less than 7.9 meters (26 feet), boats participating in organized events and manually propelled boats must carry night visual distress signals only.
- At least three (3) USCG approved pyrotechnic devices marked with date showing service life must be carried if visual distress signals are



required. They must be readily accessible, in serviceable condition and not expired.

- Carry at least three (3) day and three (3) night signals, or six (6) signals meeting both day and night requirements.
- Store pyrotechnic signals in a well-marked waterproof container in a cool, dry location.

Other universally recognized visual distress signals include:

- Flames in a bucket.
- Code flags November and Charlie.
- Square flag and ball.
- Black square and ball on an orange background flag.
- Orange flag (certified).
- Electric distress light (certified) – for night use only.
- Dye marker (any color).
- Person waving arms.
- U.S. flag flown upside down.

AUDIBLE DISTRESS SIGNALS

U.S.Coast Guard regulations require one mouth, hand or power-operated horn or whistle which is audible for at least one half mile.

Other universally recognized visual distress signals include:

- Radio communication.
- Radio-telegraph alarm.
- Position indicating radio beacon.
- Morse Code SOS sounded by any means (3 short, three long, three short).
- A fog horn sounded continuously.



FIRE

Fire, a serious boating hazard, can be brought under control if you are prepared and act quickly. Boats are relatively small and will generally burn quickly, so remaining on board and battling a fire for an extended amount of time is not recommended. If the fire cannot be extinguished within the first few minutes, the boat will have to be abandoned.

A small fire can be extinguished quickly if extinguishers are accessible, are the correct type and are used correctly. Extinguishers required by the Coast Guard or other boating law enforcement agency are only the minimum needed. Install fire extinguishers where they might be needed and are easily accessible. Test equipment and emergency plans regularly.

Prevention is the safest method of fighting fires. Remember:

- Use extreme caution while fueling.
- Refrain from smoking while fueling.
- Ensure fuel does not leak.
- Use only marine safety-approved cooking and heating systems.



WARNING

EXPLOSION/FIRE/ASPHYXIATION

- Open flame cooking appliances consume oxygen. This can cause asphyxiation or death.
- Maintain open ventilation.
- Liquid fuel may ignite.
- Use fuel appropriate for type of stove.
- Turn off stove burner before filling.
- Do not use stove for comfort heating.

- Open flames demand constant attention.
- Run exhaust blowers at least 4 minutes before starting engine.
- Use "sniff test" to check for fumes in bilge and engine compartment.
- Store flammable material in containers which are safety-approved by the Coast Guard.
- Keep flammable material containers in a locker, sealed from the boat's interior and vented overboard.
- Ensure ventilation systems are unobstructed.
- Remove canvas before starting engine.

- Extinguish smoking material carefully.
- Use special care with flames or high temperature near urethane foam.



WARNING

FIRE/ASPHYXIATION HAZARD – Use special care with flames or high temperature near urethane foam used in construction of your boat. Burning, welding, lights, cigarettes, space heaters, etc. can ignite urethane foam. Once ignited, it burns rapidly, producing extreme heat, releasing hazardous gases and consuming much oxygen.

- Check cleaning products for flammability.
- Ventilate when cleaning or painting.
- Disconnect electrical system from its power source before performing maintenance. (See Section 7 – *Electrical System*.)
- Replace breaker or fuse with same amperage device.
- Electrical appliances must be within the rated amperage of boat circuits.
- Observe the boat carefully while the electrical system is energized.
- Only a qualified marine electrical technician may service the boat's electrical system.

FIRE SUPPRESSION EQUIPMENT

GENERAL

Fire requires a combination of fuel, heat and oxygen in order to burn. Fire suppression equipment removes one or more of these three elements to eliminate the fire.

THE FIRE TRIANGLE
(Fig. 1.28.1)



REMOVING ONE ELEMENT ELIMINATES THE FIRE.

- Fire suppression equipment can be either fixed or portable. Fixed systems are located in machinery compartments. They should be

supplemented by portable extinguishers mounted at key sites and easily accessible, for example, near the engine compartment, galley and helm.

- Coast Guard and other boating law enforcement agency regulations govern the number and type of devices on board. Be sure you are knowledgeable of the regulations within your area.
- See *Safety – Minimum Required Equipment*, Pg. 1.6

FIXED SYSTEM

- Fire extinguisher is installed permanently in one or more machinery spaces. In the event of a fire, a sensor releases fire-killing extinguishant in the compartment.
- The fixed system is wired to the ignition and turns on when the engine is started.
- An indicator light on the dash is activated when the fire suppression system is available. The light goes out when the system discharges.
- See Section 8 – *Automatic Fire Extinguishing System*.

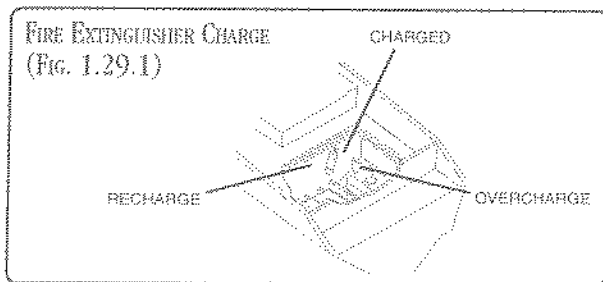
PORTABLE EXTINGUISHERS

Extinguishers are rated in the following classifications according to type of fire:

- "A" – Combustible solids (wood, plastic)
- "B" – Flammable liquids (oil, gasoline)
- "C" – Electrical fires

Sizes are identified by Roman numerals – from "I" (smallest) to "V" (largest). Small size provides only a few seconds of firefighting capability.

Check that fire extinguishers are fully charged and become familiar with their use.

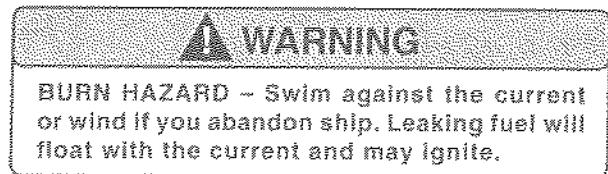


It is important to follow the manufacturer's instructions for periodic testing of the portable extinguishers on your boat. **Do not** test by squirting small amounts of the agent; this may cause the extinguisher to fail or become ineffective if needed.

IN THE EVENT OF A FIRE

- Extinguish smoking materials, shut off blowers, stoves, engines and generators.
- Throw burning materials overboard if possible.
- If the fire is accessible, empty the contents of fire extinguishers at the base of the flames.
- Move anyone not involved in fighting the fire away from the flames.
- Signal for help.
- Grab distress signals and survival gear, put on PFDs and prepare to abandon ship.
- If equipped with a fixed fire extinguishing system, heat sensors will automatically set the system off, flooding the compartment with extinguishant. Wait fifteen (15) minutes before inspecting the fire area to allow the area to soak and cool. Have portable fire extinguishers ready and avoid breathing fumes caused by the fire or extinguishant.

If an explosion is imminent, grab distress signals and survival gear, put on PFDs and immediately abandon the boat.



- Get clear of danger, account for all who were on board and render assistance.
- Keep everyone together and use distress signals.

FLOODING, SWAMPING

Operator disregard for hazardous weather and water conditions is one of the most common causes of flooding or swamping, along with improper loading, handling and anchoring. Be aware of the possible consequences of your actions. Insist everyone wear a personal flotation device (PFD) when boating.

Remember:

- The bilge ventilation vents are the first areas where downflooding type water ingress occurs.
- Match speed and operation of the boat to sea conditions.
- Strictly adhere to the amount of weight and number of persons for safe operation under normal conditions.

- Adjust weight/number of persons to compensate for water conditions.
- Ensure proper bilge pump operation.
- Anchor from bow if using only one anchor.
- Adjust trim and close openings in rough weather.
- Reverse engine(s) only when forward speed is sufficiently slow to prevent following sea from swamping boat.
- The speed of operation should never exceed the ability to maneuver the craft safely.

IN THE EVENT OF SWAMPING OR CAPSIZING

- Shut off engines, generators and blowers.
- Account for all who were on board.
- Do not attempt to swim to shore. It is farther away than it looks.
- **Stay with the boat.** It will float even with major damage. Hang onto or climb up on the hull and signal for help.

A swamped or overturned boat is much easier for rescuers to locate than a person in the water. Leave the safety of the boat only as a last resort and only after carefully assessing the situation.

COLLISIONS AND LEAKING

Keep a sharp lookout for other boats, especially on the way back to port and at night. Be aware that fatigue caused by glare, motion, noise and vibration will reduce reaction time. Know and obey the rules of the road and be courteous. If a collision occurs:

- Account for everyone on board and check for injuries.
- Immediately switch on bilge pumps and operate manual bilge pumps if needed to reduce water intake.
- Check for structural damage and assess the extent of leaks.
- Slow down or stop to reduce water intake, unless maintaining speed would keep the hole above water.

Stay with the boat and signal for help if damage is serious. Otherwise, patch the hole from the outside with whatever means are available.

WATER RESCUE

A person who has fallen overboard must be rescued before hypothermia or drowning occurs. The amount of time they stay afloat may be

determined by rough water conditions, bulky boating clothing, swimming ability, intoxication, any injuries sustained and exhaustion.

Successful recovery of a person in the water depends on boat handling skills (being familiar with your boat's speed and turning ability) and practicing rescue procedures.

Rescue is a combination of returning to the victim, making contact and getting them back on board.

RETURNING TO THE VICTIM

- Immediately sound an alarm and keep the victim in sight.
- Slow the boat and keep pointing toward the person overboard. At night, direct the best available light source at the person.
- Throw a life preserver, even if the person is wearing a PFD. It will serve as another visual marker.

MAKING CONTACT

- Stop or slow the boat and circle toward the victim.
- Try to approach from downwind or into the waves.
- Keep the victim on the helm side so the boat operator has the victim constantly in sight.
- When almost alongside, stop the engine in gear to prevent propeller "windmilling".

GETTING THE VICTIM BACK ABOARD

- Assist the person in boarding the boat. The person should normally be brought in over the stern.
- If the person is injured, a **capable** rescuer may put on a PFD with a safety line attached and enter the water to assist the victim.

DROWNING

- Try to reach to the drowning victim or throw a life preserver. Swim to rescue a drowning victim only as a last resort.
- Handle with care. Spinal injuries may have occurred.
- Try to resuscitate. At least two people on board should be CPR certified.
- Keep the victim warm and signal for help as soon as possible.

GROUNDING

Running aground may be avoided by paying attention to marker buoys or indicated by waves as they form into breakers when passing over a sand bar.

If you do run aground, the course of action depends on how hard the boat hits bottom and whether the boat remains stranded. If it is a simple touch, you may need only to inspect the hull and propulsion. If you are aground, assess the situation before reacting. In some cases, throwing the boat into reverse can cause more damage.

IN THE EVENT OF RUNNING AGROUND

- Inspect for damage to the hull, propulsion and steering systems.
- Check for leaks. If water is coming in, stopping the intake of water takes priority over getting free.
- Determine water depth all around the boat and type of bottom (sand, mud, rocks, etc.). This will help you decide which way to move the boat.
- Determine if tide, wind or current will drive the boat harder aground or will help free it.

TOWING

A recreational boat towing another is usually a last resort because of possible damage to one or both boats. The Coast Guard or a private salvage company is better equipped. A recreational boat may assist by standing by, and possibly keeping the disabled boat's bow at a proper angle until help arrives. Only when conditions are ideal – that is, seas are calm, disabled boat is small, and one or both skippers know correct technique – should a recreational boat tow another.



WARNING

PERSONAL INJURY HAZARD – Towing or being towed stresses the boat's hardware and lines. Failure of any part can seriously injure people or damage the boat.



CAUTION

PRODUCT DAMAGE

- While being towed, seacocks on non-operating engines and generator must be closed to prevent water from being forced into the engine's exhaust and causing internal damage.
- While being towed and engines are not being operated, propeller shaft(s) should be prevented from turning by locking the shaft(s) using a pipe wrench or other suitable method. This will prevent damage to the shaft seal and transmission bearing.

TOWING VESSEL

- Be sure your boat will not run aground too.
- Because you are maneuverable and the grounded boat is not, you should pass the towline to the grounded boat.
- Use double-braided or braid-on-braid line. Never use three-strand twisted nylon; it has too much elasticity and can snap back dangerously.
- Fasten the towline as far forward as possible on the upwind or up-current side of the towing boat. Fastening it to the stern will restrict maneuverability of the towing boat.
- If possible, use a bridle.
- Move slowly to prevent sudden strain on slack line.
- Be ready to cast loose or cut the line if the towing situation becomes hazardous.

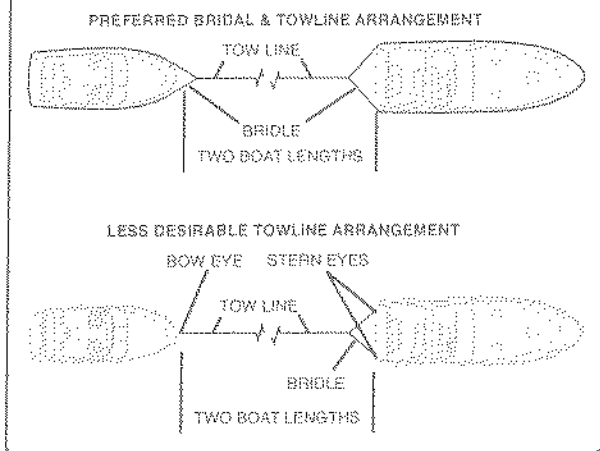
VESSEL BEING TOWED

- Attach the towline to the bow eye, or forward bitt if the fitting can take the load.
- If it is necessary to be towed after being freed, keep someone at the wheel to steer.

BOTH VESSELS

- If you secure the towline to a fitting, be sure the fitting is fastened with a through bolt and is reinforced on the underside.
- Creating a bridle with a line around the hull or superstructure will distribute the load over a wide area; pad pressure points. This technique can be used on both the towing and towed boat.
- Leave at least two (2) boat lengths between vessels to allow for adequate movement.
- Keep lines clear of propellers on both boats.

TOWING ARRANGEMENT
(Fig. 1.32.1)



- Keep hands and feet clear of the other boat.
- Never hold a towline after it is pulled taut.

PROPULSION, CONTROL OR STEERING

FAILURE

- Shut off engine.
- Put out an anchor to prevent drifting.
- Determine if you can fix the problem yourself. See engine operator's manual if engine is flooded.
- Signal for help.

EXHAUST EMISSIONS

⚠ DANGER

EXTREME HAZARD – Ensure adequate ventilation. Engines and generators produce carbon monoxide gas (CO). Prolonged exposure can cause serious injury or death. To reduce CO accumulation, increase air movement by opening windows or adjusting canvas. The following conditions require special attention:

- Operating at slow speed or dead in the water.
- Operating with the bow high.
- Operating engine and/or generator in confined spaces.
- Using canvas curtains.
- Blocking hull exhausts.
- Winds blowing exhaust toward boat occupants.

You can be overcome by fumes from your own engine or generator or from neighboring boats (see Fig. 1.33.1). Ensure continuous movement of fresh air.

CARBON MONOXIDE

Carbon monoxide is an odorless, colorless, extremely toxic gas that is the product of any type of combustion produced by engines, heaters, stoves or generators. Symptoms of carbon monoxide poisoning are dizziness, ears ringing, headaches, nausea and unconsciousness. A poisoning victim's skin often turns cherry red. CO is a major threat because its presence is not likely to be noticed until its effects are felt.

CO concentrations can occur when there are exhaust system leaks, inadequate ventilation or poor air circulation from the motion of the boat (also known as backdrafting) (see Fig. 1.33.1).

To minimize the danger of CO accumulation:

- Operate without the canvas installed.
- Operate with the windshield power vent open and the forward hatch open if the convertible top is installed.
- Operate all combustion devices in well-ventilated areas.
- Use fans or forced air if necessary.
- Avoid idling for long periods of time.
- Inspect the exhaust system regularly.

If CO poisoning is suspected, have the victim breathe fresh air deeply. If breathing stops, resuscitate. A victim often revives, then relapses because organs are damaged by lack of oxygen. Seek immediate medical attention.

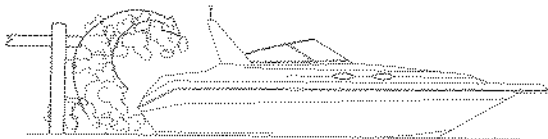
MEDICAL EMERGENCY

In an emergency, you may be far from professional medical assistance. Be prepared. Take a first aid course, and carry a first aid kit. Be aware of any special conditions that may affect anyone on board.

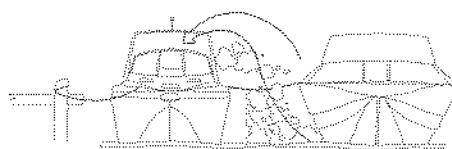
ACCIDENT REPORT

Contact the state boating agency where the accident occurs. In the absence of a state enforcement agency, contact the nearest Coast Guard office. Other countries may have differing requirements for reporting an accident. Consult the nation which you are visiting for accident requirements.

**EXAMPLES OF HOW HIGH LEVELS OF CARBON MONOXIDE
MAY ACCUMULATE**
(FIG. 1.33.1)



BLOCKING HULL EXHAUSTS. OPERATING AT SLOW SPEED OR DEAD IN THE WATER. (ILLUS. A)



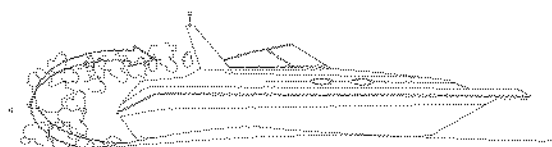
OPERATING ENGINE AND/OR GENERATOR IN CONFINED SPACES. (ILLUS. D)



USING CANVAS CURTAINS. (ILLUS. B)



OPERATING WITH THE BOW HIGH. (ILLUS. E)



WINDS BLOWING EXHAUST TOWARD BOAT OCCUPANTS. (ILLUS. C)



GOOD VENTILATION. (ILLUS. F)

NOTICE

The U.S. Coast Guard and state agencies require a report to be filed by the operator of a boat involved in an accident involving loss of life, disappearance, injury requiring treatment beyond first aid, loss of boat or property damage exceeding \$500.

TRAILERING

When selecting a trailer for your boat, ensure that the structure conforms to the shape of your hull, provides support near the keel, and good fore and aft support.



WARNING

The trailer selected must conform to the boat's weight and hull shape.

The towing vehicle must have the capability of pulling the load. Towing a load which exceeds the vehicle's towing capacity may cause loss of control.

The certification label on the trailer shows the Gross Vehicle Weight Rating (GVWR). Make sure that the total weight of your boat, engine, gear, and trailer does not exceed the GVWR.

Consult your state authority (Dept. of Motor Vehicles) for requirements regarding registration, lights, brakes, GVWR, etc. Compliance with other states through which you may be traveling would be prudent as these requirements vary widely from state to state.

The following will help to ensure a safe and pleasurable trip when trailering your boat.

- Check brakes on towing vehicle for fluid levels and proper operation before you depart.
- Inspect trailer springs and undercarriage for loose or missing parts.
- Ensure that the tires are inflated properly. Under-inflated tires heat up rapidly causing damage or failure.
- Check wheel bearings and lug nuts.
- Tail lights and turn signals should be in proper working order.
- It is important that the tongue weight is between 5% and 10% of the total weight of your boat.

and trailer. Too much or too little tongue weight will cause the towing vehicle to sway.

To determine tongue weight:

- Weigh your trailered boat on a commercial scale.
 - Park boat and trailer on a level, paved surface.
 - Place a sturdy box on a bathroom scale.
 - Position the scale under the tongue jack, ensuring that the trailer tongue is exactly parallel to the ground.
 - Read tongue weight on the scale.
 - Adjust weight if necessary by rearranging equipment, changing the position of the boat on the trailer, or rearranging the axle on the trailer frame.
- Stow convertible top, if equipped.
 - A spare tire for the trailer as well as the towing vehicle and the appropriate tools should be carried.
 - Ensure that any covers or hatches are secured before towing.

HITCHES

There are two basic types of hitches, weight-carrying and weight-distributing. Consult local regulations for the type(s) of hitch which is allowable in your area.

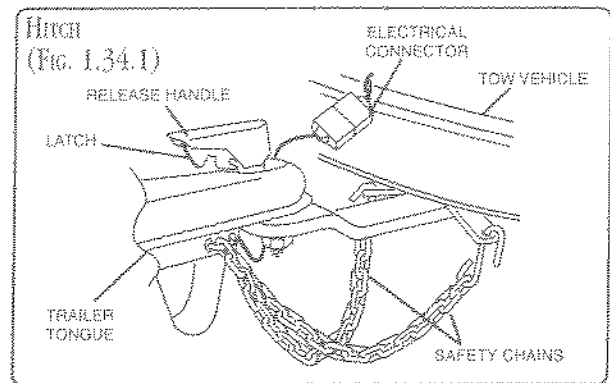
WEIGHT-CARRYING HITCHES

This is an inexpensive, somewhat simple bumper hitch. The entire tongue weight is supported at the hitch (bumper). This type of hitch is adequate for light trailers however, its use is not allowed in some areas.

WEIGHT-DISTRIBUTING HITCHES

A necessity for tongue weights which exceed 350 pounds, this hitch is designed to distribute the load to all wheels of both the towing vehicle and the trailer. Heavier loads can be hauled with less wear on the towing vehicle. Some types of weight distributing hitches are equipped with anti-sway bars which improve control of towing vehicle and trailer.

- The hitch coupler **MUST** match the size of the hitch ball. Check the trailer coupler for the correct diameter of ball to be used.
- Always use a hitch with the same or greater class number as the trailer



SAFETY CHAINS

Properly installed safety chains prevent the trailer from becoming completely detached while you are traveling. Crossing the chains under the tongue will prevent the trailer from dropping to the road in the unlikely event that it becomes separated from the hitch.

- Safety chains should have a breaking strength of at least the gross weight of the trailer.
- Secure the safety chains to the trailer tongue with bolts.
- Hook the chains in the form of an "X" to the towing vehicle (Fig. 1.34.1).

MANEUVERING WITH A TRAILER

Exercise caution when towing by allowing extra following distances to avoid having to make sudden stops. Be aware of decreased acceleration capability and allow more room for overtaking slower traffic. Be prepared for trailer sway caused by the air turbulence of larger overtaking vehicles.

Remember that the trailer will turn inside the track of the towing vehicle, so corners, curbs and other obstructions must be given wider clearance. The boat will probably obstruct the rear view of the driver and additional mirrors may be required on the towing vehicle.

Some basic considerations when towing are:

- Become familiar with accelerating, slowing and stopping smoothly.
- Signal your intentions well ahead of time when turning or passing and allow for the extra length of the vehicle and trailer.
- Periodically stop and examine tires and wheel bearings for overheating. Check connections and test tiedowns, covers and fastenings for tightness.

Familiarize yourself with backing up by practicing

with an empty trailer in an empty parking lot. Get a feel for backing up straight by making small steering corrections and remember that the trailer will turn in the opposite direction of the towing vehicle (see Figs. 1.36.1 to 1.36.4).

- Back the trailer slowly. Avoid oversteering and do not rush.
- Turn the steering wheel in the opposite direction that you want the trailer to turn. If you want the trailer to back to the left, turn the towing vehicle's wheels to the right and vice versa.
- As the trailer begins to turn, move the steering wheel back toward center. The trailer will continue to turn at an increasing rate and the steering wheel must now be turned in the opposite direction to slow the turning rate.
- If the trailer does not turn sharply enough, or "jackknifes" (turns too sharply), stop. Pull ahead and try again.

If possible, have someone outside of the towing vehicle to give guidance. Remember that proficiency in backing up a trailer comes with practice.

LAUNCHING AND LOADING

PRIOR TO LAUNCHING

Prepare the boat for launch in the parking lot, away from the ramp. Try to observe other launchings and take note of any effects of current and wind or problems on the ramp. Allow adequate time for the trailer wheel bearings to cool and check for the following:

- Boat cover removed.
- Garboard drain plug(s) installed.
- Fuel and water tanks filled.
- Equipment loaded and distributed for proper boat trim.
- All tiedowns removed.
- Bow and stern docking lines fastened and fenders rigged.
- Stern drive(s) tilted up.
- Electrical connections to tow vehicle disconnected.

LAUNCHING

Check that wheel chocks are available and recheck to be sure that the drain plugs are installed. Do not release the winch line until the boat is in the water.

When approaching the ramp, back the trailer to the left whenever possible to provide better launching visibility. Position someone outside of the tow vehicle to provide guidance and back straight down the ramp.

- Proceed backing down the ramp, keeping tow vehicle/trailer as straight as possible and stop with the trailer wheels at the water's edge.



CAUTION

Allow sufficient time for trailer wheel bearings to cool before submerging.

- Set tow vehicle parking brake and place wheel chocks behind tow vehicle wheels.



CAUTION

Never leave the tow vehicle unattended on the ramp with only the parking brake set.

- Release trailer tilt latch (if equipped) and have a helper hold bow line from the ramp.
- Tighten the trailer winch brake and release the anti-reverse lock, but do not unhook the winch cable from the bow eye.
- Let the boat slide off the trailer into the water, then unhook the winch cable from the bow eye. Hook the winch cable to the trailer or rewind onto winch. Use gloves when handling cable.



WARNING

PERSONAL INJURY HAZARD

Severe injury is possible if the winch system malfunctions or the cable breaks. Do not allow anyone to stand near the winch or cable.

- Use bow and stern lines to pull boat to pier and tie off lines.
- Return trailer tilt to horizontal position and lock in place. Remove wheel chocks and drive tow vehicle and trailer up the ramp to a parking area.
- Lower stern drive(s), start engine and allow to warm up.
- Cast off lines and slowly depart from the launch area.

LOADING

Begin preparing to load the boat onto the trailer before approaching the ramp by stopping engine

and tilting stern drive unit to the up position. Loading the boat onto the trailer is almost the reverse procedure as launching the boat:

- Back the trailer down the ramp following the same procedures and safety precautions as for launching.
- Release tilt latch (if equipped) and maneuver the boat onto the trailer using the bow and stern lines.
- Hook the winch cable to the boat's bow eye. Use gloves when handling cable.



WARNING

PERSONAL INJURY HAZARD

Severe injury is possible if the winch system malfunctions or the cable breaks. Do not allow anyone to stand near the winch or cable.

- Set winch anti-reverse lock and crank boat onto trailer.
- While trailer is tilted and boat/trailer is still inclined on the ramp, open the garboard drain plugs.
- Lock trailer tilt in horizontal position and secure boat with tiedowns
- Remove wheel chocks and drive tow vehicle and trailer up the ramp to a parking area.

AFTER LOADING

Inspect the hull and particularly the propeller for nicks or other damage. If the boat has been in salt water, wash down the hull and trailer as soon as possible and wipe down the hardware and canvas with a soft clean cloth and protectant.

Reconnect electrical connections from trailer to tow vehicle, stow equipment, replace boat cover and complete securing the tiedowns.

ENVIRONMENTAL CONSIDERATIONS

FUEL & OIL SPILLAGE

Regulations prohibit discharging fuel or oily waste in navigable waters. Discharge is defined as any action which causes a film, sheen or discoloration on the water surface, or causes a sludge or emulsion beneath the water surface. A common violation is bilge discharge. Use rags or sponges to soak up fuel or oily

waste, then dispose of it properly ashore. If there is much fuel or oil in the bilge, contact a knowledgeable marine service to remove it. Never pump contaminated bilge overboard. Help protect your waters.

Fill tank(s) less than rated capacity. Allow for fuel expansion.

WASTE DISPOSAL

- Many areas prohibit overboard sewer discharge. Close and disable flow-through waste systems to prevent discharge in such areas.
- Bag all refuse until it can be disposed of ashore. Regulations prohibit disposal of plastic anywhere in the marine environment and restrict other garbage disposal within specified distances from shore.

NOTICE

- There is a possibility of being fined for having an operable direct overboard discharge of waste in some waters. Removing seacock handle, in closed position, or other means must be used to avoid fine.
- It is illegal for any vessel to dump plastic trash anywhere in the ocean or navigable waters of the United States.

The Coast Guard is requiring any ocean-going boats 40 feet or larger to have a written "waste management" plan on board. While the requirement is aimed at commercial and passenger ships, there is no exception for recreational boats. "Ocean-going" means any boat going beyond the three-mile coastal U.S. boundary. The written plan can be as simple as:

All vessel refuse is placed in trash bags which are stored on board until they can be disposed of in dumpsters on shore. This policy is reviewed by all crew and passengers. The person in charge of carrying out the plan is:

Name: _____



CAUTION

Do not place facial tissues, paper towels or sanitary napkins in head. Such material can damage the waste disposal system and the environment.

EXCESSIVE NOISE

Many areas regulate noise limits. Even if there are no laws, courtesy demands that boats operate quietly.

WAKE/WASH



WARNING

SPEED HAZARD – Watch your wake. It might capsize a small craft. You are responsible for damage caused by your wake.

Power boat wakes can endanger people and vessels. Each power boat operator is responsible for injury or damage caused by the boat's wake. Be especially careful in confined areas such as channels or marinas. Observe "no wake" warnings.



CAUTION

Reduce speed in congested waterways.
Be alert for No Wake markers.

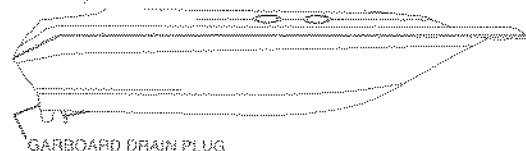
SECTION 2 • BILGE & UNDERWATER GEAR

BILGE

DRAIN PLUG

Your Sea Ray® is fitted with a brass garboard drain plug. This is a threaded plug which is installed through the outside of the transom. We recommend that you remove the drain plug when dry docking your boat. **MAKE SURE TO REPLACE THE DRAIN PLUG BEFORE LAUNCHING.**

GARBOARD DRAIN PLUG LOCATION
(FIG. 2.1.1)

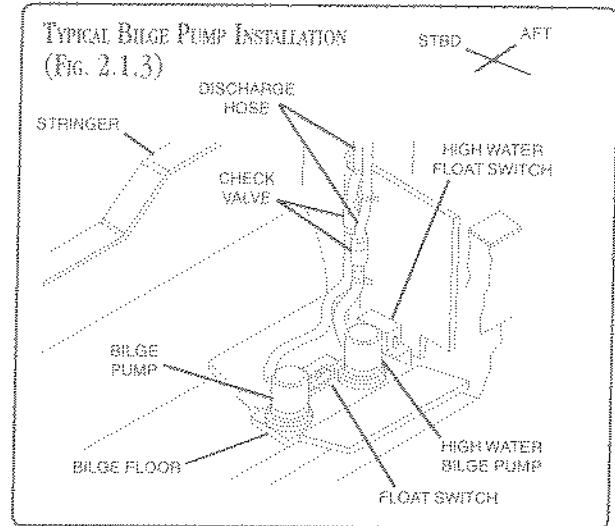
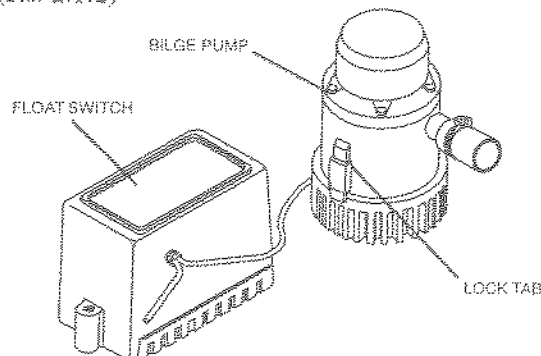


BILGE PUMPS

A bilge pump and float switch are located in each bilge sump. The emergency high water bilge pump and float switch is located adjacent to the aft bilge pump.

Each bilge pump is equipped with a switch on the dash with a MANUAL and AUTO position. When the switches are in the MANUAL position, the pump(s) will run continuously. When in the AUTO position, the pump(s) are activated when there is enough water in the bilge to raise the float switch to its highest position; and deactivated when the water

BILGE PUMP & FLOAT SWITCH
(FIG. 2.1.2)



recedes. The pumps should **NOT** be left in the **MANUAL** mode unless the bilge is being pumped out for servicing.

The emergency bilge pump and float switch are wired to the high water bilge alarm. Should the pump be activated by water in the sump, the alarm will sound and the indicator light on the systems monitor panel will be on.

Each pump is protected by a breaker on the main DC breaker panel.

Some bilge pumps may be fitted with an in-line check valve. Bilge pumps that must be equipped with very long discharge hoses are equipped with the check valve. The check valve prevents the residual water in the hose from coming back into the bilge which would cause the pump to cycle on and off trying to pump out the same water.

Because of the weight of water, 8.3 pounds per gallon (1 kilogram per liter), it is important to keep the bilge as free of water as possible.

MAINTENANCE

Frequently inspect the area under the float switches to ensure they are free from debris and gummy bilge oil. To clean, soak in heavy duty bilge cleaner for 10 minutes, agitating several times. Check for unrestricted operation of the float. Repeat the cleaning procedure if necessary.

Inspect the bilge pump intakes and keep them free of dirt or material which may impede the flow of water through the pump. To clean the pump strainer,

depress the lock tabs on both sides of the pump and lift the pump motor.

Inspect the check valve located in the discharge line.

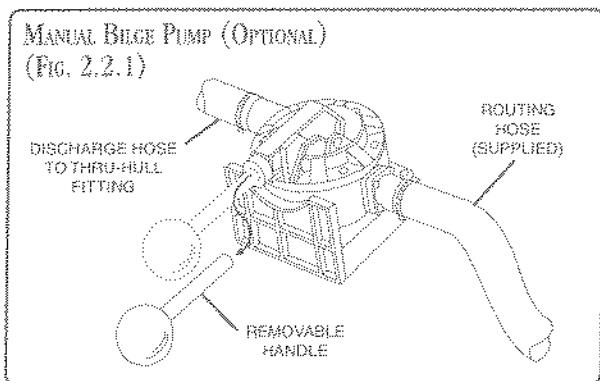
TROUBLE SHOOTING

If water does not come out of discharge hose:

1. Depress the breaker on the bilge DC breaker panel to ensure it has not tripped.
2. Remove the motor module to see if the impeller rotates with the power on.
3. Remove any debris that may have accumulated in the nozzle section or strainer base.
4. Check hose and connection on hull side for debris and proper connections.

An optional manual bilge pump may be installed on your boat. It is equipped with either a fixed position or a movable suction routing hose, depending on the specifications for your particular boat. If the suction hose is the fixed position type, it may be equipped with a selector lever to change the area from which the pump draws water.

To operate, make sure that the open end of the hose is completely submerged in the water to be removed, insert the removable handle into the pump and begin pumping. (see the Owner's Manual Supplement for the location of optional manual bilge pump (if supplied) in your vessel.



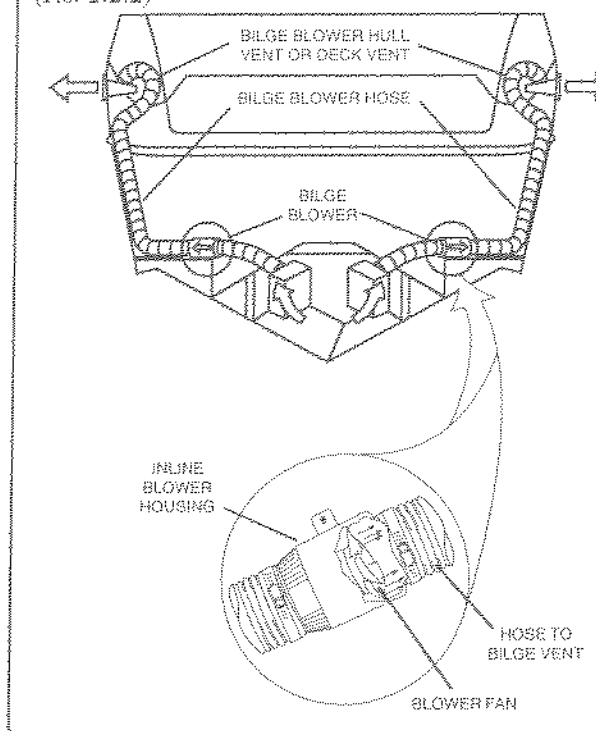
NOTICE

The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters and contiguous zones of the United States. Violators are subject to a fine of \$5,000.

BILGE BLOWERS

Your Sea Ray® is equipped with two in-line bilge blowers to provide bilge ventilation. The blowers are

TYPICAL BILGE BLOWER INSTALLATION
(FIG. 2.2.2)



wired through two circuit breakers on the main DC breaker panel with a switch on the dash panel and DC distribution panel.

With gasoline engines: Run the blowers for four minutes before starting the engines or generator; when operating below cruising speed and at all times when the generator is running.

DANGER

GASOLINE VAPORS CAN EXPLODE.

Before Starting Engine:

- Check engine compartment for gasoline vapors.
- Operate blower for 4 minutes. Run blowers below cruising speed.

With diesel engines: Run the blowers when operating below cruising speed to dissipate bilge heat build-up and at all times when vessel is at rest.

MAINTENANCE

The bilge blowers should be checked periodically to ensure that the hoses are securely fastened to blowers. Check for corrosion of wires and make sure 12 volt wires are secured in place.

TROUBLE SHOOTING

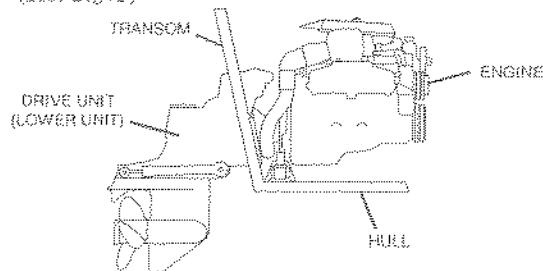
If your bilge blower fails to operate:

1. Depress the breakers on the main DC breaker panel to ensure they have not tripped.
2. Check to see if the blower hose is fastened to the blower.

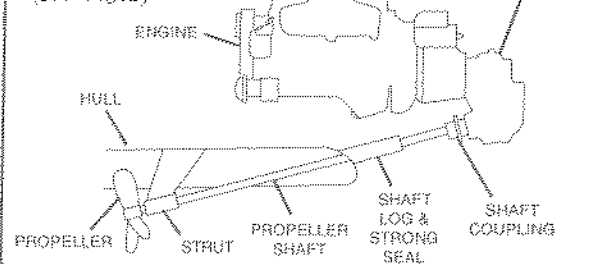
ENGINES

The engine is the heart of your Sea Ray® boat. Proper attention to and maintenance of your engine will assure you of many hours of pleasurable, safe boating and will prevent unnecessary engine problems. A general maintenance program consists of proper lubrication, cleaning of fuel filters, fuel lines and air filters. When washing down, or at any other time, take care that water does not enter the air inlet

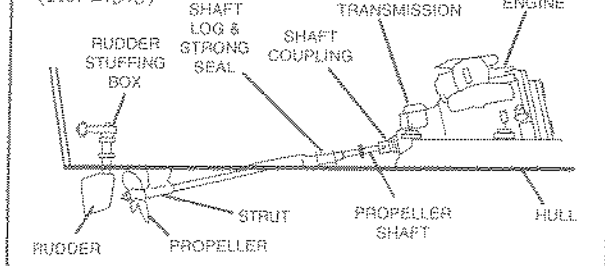
TYPICAL STERN DRIVE ENGINE
(FIG. 2.3.1)



TYPICAL V DRIVE ENGINE
(FIG. 2.3.2)



TYPICAL INBOARD ENGINE
(FIG. 2.3.3)



on fuel injection systems. Water entering the air inlet when the engine is not operating may go directly into the cylinders, resulting in rust and possibly internal engine damage.

CAUTION

Avoid the contact of flammable materials with hot engine parts.

You must fully comply with the manual provided by the engine manufacturer. Follow the recommended maintenance and warranty schedule in your Engine Operator's Manual included in the Owner's Manual Packet.

MARINE GEARS

REDUCTION GEARS

A reduction gear reduces the rotating speed of the propeller shaft in relation to the engine RPM. This permits the use of a larger propeller while allowing the engine to attain its rated RPM, thereby increasing efficiency.

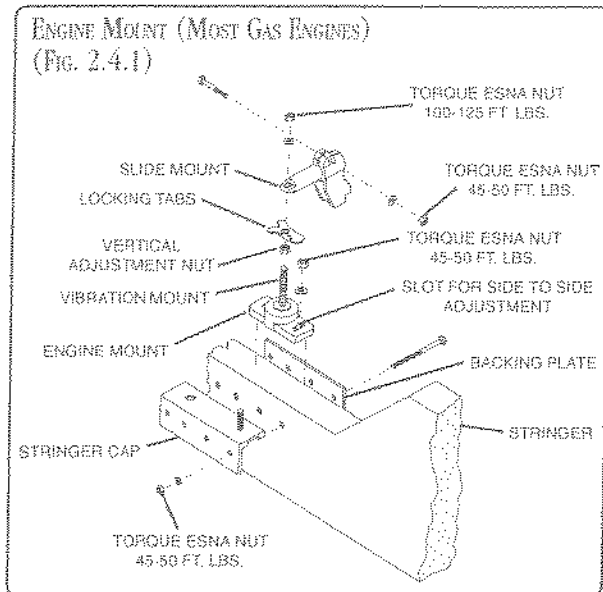
REVERSE GEARS

The reverse gear incorporates the clutch and controls the rotation of the propeller. The position of the clutch control or shifting lever indicates the motion which the clutch and reverse gear are transmitting. The center position of the lever indicates neutral. **Engine RPM should never exceed 1000 when engaging or disengaging the clutch. Higher RPM will result in unnecessary wear and shortened life of the unit, and perhaps breakage.**

Marine reverse gears are hydraulically operated, thereby making it imperative to periodically maintain and check oil level. If the correct oil level is not maintained, slippage occurs, causing damage to the clutch plates. Too much oil will cause foaming and erratic clutch operation. For additional information see the Engine and/or Transmission Operator's Manual.

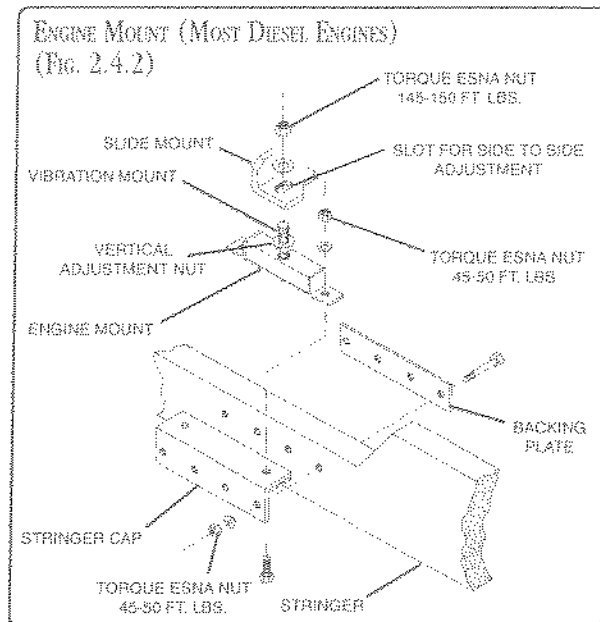
ENGINE MOUNTS

The adjustable type engine mounts permit adjustment sideways as well as vertically. Vertical adjustment nuts lock up or down on the threaded vertical stud, with a slot provided to allow side to side adjustment on the engine.



Important: The large adjustment lock-nuts on these mounts must be tightened properly to retain alignment. (See Fig. 2.4.1 and 2.4.2.)

It is also advisable to spray a protective coating on the studs and nuts.

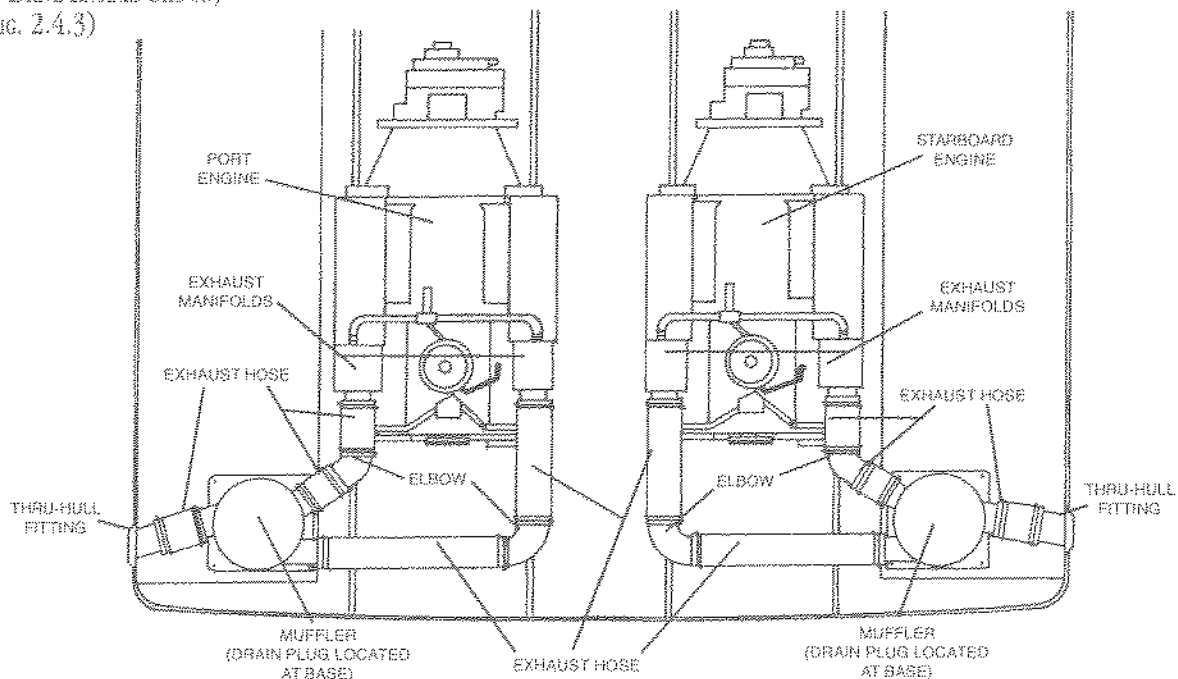


ENGINE EXHAUST SYSTEM

INBOARD/OUTBOARD SYSTEM

The exhaust system on inboard/outboard engines is an integral part of the engine assembly. Refer to the engine manual in the owner's packet for inboard/outboard exhaust information.

TYPICAL INBOARD ENGINE EXHAUST COMPONENT LAYOUT (MUFFLER SYSTEM)
(V-Drive Engines Shown)
(Fig. 2.4.3)



NOTE: MUFFLER LOCATION AND EXHAUST HOSE ROUTING MAY BE DIFFERENT THAN THIS ILLUSTRATION DUE TO BILGE LAYOUT REQUIREMENTS FOR DIFFERING ENGINE AND EQUIPMENT OPTIONS.

MUFFLER SYSTEM (INBOARD AND V DRIVES)

The muffler type exhaust system used on Sea Ray® boats with inboard engines is designed so that the water from the raw water cooling system is pumped through the mufflers and then overboard through the exhaust outlet thru-hull fitting. Make sure water is flowing from the exhaust outlets while the engines are operating. A plug is located in the base of each muffler. When servicing or winterizing, remove the plug to drain the water out of each muffler. Replace the plug after all water has drained from the muffler.

Prior to every boat use, examine the exhaust system fittings to ensure tightness. Leaks in the exhaust system may permit carbon monoxide exposure.

WARNING

Hose clamps must be tight at all times to avoid exhaust leaks and possible carbon monoxide exposure.

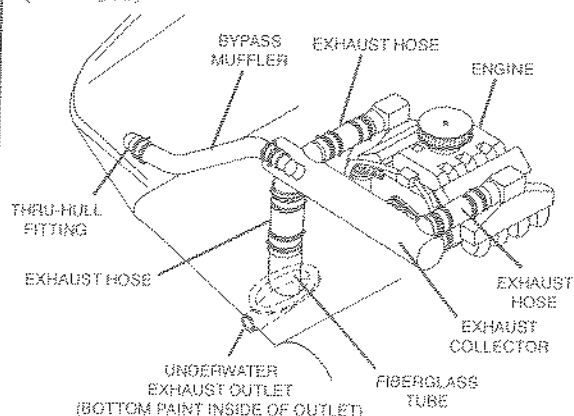
NOTICE

When bottom painting the boat make sure to paint inside the underwater exhaust outlet as well as the outside.

UNDERWATER EXHAUST SYSTEM (INBOARD AND V DRIVES)

The underwater exhaust system used on Sea Ray® boats with inboard engines is designed to expel exhaust under the boat and eliminate the need for mufflers. This system is self-draining and does not need winterization.

TYPICAL INBOARD ENGINE EXHAUST
(UNDERWATER NON-MUFFLER SYSTEM)
(Fig. 2.5.1)



ENGINE REMOVAL

Should the removal of an engine become necessary, **see your Sea Ray® dealer**. The following is only a generalized procedure to follow.

1. Shut off the fuel lines and close the engine seacocks.
2. Remove all electrical wires, fuel lines, raw water intake hoses and exhaust fittings from the engine.
3. Unbolt the engine coupling from the shaft coupling and then slide the shaft and coupling back from the engine.
4. Detach both throttle and shift connections. **Do not bend or twist the cables, as damage may result.**
5. Remove the mounting stud nuts for the engine and lift the engine out, leaving the mounts bolted to the stringer caps.

NOTE: Some V-Drive configurations may require boat to be out of the water to pull the engine. Propeller removal may be required to gain shaft clearance to remove engine.

To reinstall, reverse the above procedure. Check the coupling and shaft alignments, as well as water hoses and wiring connections. Also check for fuel and exhaust leaks and make sure seacock is open before starting engine.

WARNING

Make sure to plug the fuel line to avoid fuel leakage, contamination, fire and explosion hazard.

VIBRATION & CAUSES

Some vibration is to be expected in your boat because of the action of the engines and the propeller. But excessive vibration indicates conditions which must be promptly corrected to avoid damage. The following are some conditions which may cause vibrations.

FOREIGN OBJECT INTERFERING WITH PROPELLER ACTION

Weeds, ropes, fishing lines or nets can become wrapped around the propeller and/or shaft, causing vibration and loss of speed. Always stop and then reverse the propeller after going through a weedy area to unwrap and clear away any weeds which may have accumulated. Although reversing will sometimes help to unwrap lines and nets, they are difficult to remove without hauling.

Always check for loose or trailing dock lines before getting underway. When towing a dinghy or surfboard, remember that a long line may easily become entangled with the propeller when backing down.

BENT PROP (AND/OR SHAFT)

A badly damaged or distorted prop or shaft is an obvious cause of vibration. Even when the propeller appears to be perfect, make sure it has not been pulled off-center by the prop key.

ENGINE & SHAFT OUT OF ALIGNMENT

Although the shaft is properly aligned when it leaves the factory, after transit and after the boat has been in the water a few days, the alignment should be rechecked. The shaft coupling is the connecting point between the shaft and the engine and the alignment should be set at .003" to .005". Refer to *Shafts* in this section of the Owner's Manual.

COUPLING OUT OF TRUE

Although an extremely unlikely condition, check the couplings if other efforts to correct the vibration fail. Check the engine half of the coupling (with dial indicator on the face) to see that it runs true with the shaft coupling. Also check the coupling keys. They must fit correctly to prevent forcing the couplings off center.

ENGINE PART HITTING BOAT STRUCTURE

Engines are flexibly mounted to reduce transmission of vibration to the hull structure. If some part of the engine, such as the oil pan, reverse gear or reduction gear housing, contacts a stringer, brace, or part of the hull, vibration will result. The flexible shaft log allows a limited side motion of the shaft, but an excessive "whip" can cause the shaft to strike the sides of the shaft hole or the shaft log with resultant vibration.

OTHER CAUSES

Other causes of vibration include the following: engine out of tune, a bent rudder, a worn strut bearing, a component of the exhaust system vibrating against the hull or improper contact between shaft taper and the propeller hub bore.

FRESH WATER COOLING SYSTEM

Your engine may be equipped with a fresh water cooling system; refer to your engine operator's manual. The fresh water cooling system is a closed system which helps protect engines from internal corrosion and provides more even distribution of engine temperature. Change the coolant annually.

COOLANT RECOMMENDATIONS

The standard mixture of water and coolant is a mixture of 30% environmentally safe, non-toxic antifreeze and 70% water, which protects to 0°F (-18°C). This will allow the coolant to expand properly and maintain normal operating engine temperature. In colder climates, the coolant level should be increased to 50/50, which protects to -34°F (-37°C), for proper coverage. **To find engine coolant capacity, refer to your Engine Owner's Manual in the Owner's Manual Packet.**

UNDERWATER GEAR

OUTDRIVE IMPACT PROTECTION

(STERN DRIVES ONLY)

Impact damage can occur in either a forward or reverse direction. It can occur while trailering or in the water. When trailering, make certain outdrive unit is in its highest position. If an underwater object is struck while boat is moving forward, the hydraulic system cushions the kick-up of the drive unit as it clears the object, thereby preventing or greatly reducing damage to the drive unit.

CAUTION

Impact protection systems cannot be designed to ensure total protection from impact damage under ALL operating conditions. If an object is struck at a severe angle or high rate of speed, damage naturally can occur. Use extreme caution when operating in shallow water areas where known underwater obstacles are present. Use extreme care to prevent striking an underwater object with drive unit while operating boat in reverse, as no impact protection is afforded to the drive unit in this position.

If engine should strike a submerged object, STOP THE ENGINE as soon as possible and examine drive unit for damage. If damage is present or suspected the boat should be taken to an authorized

dealer for thorough inspection and necessary repair. Operating a damaged drive unit could cause additional damage to other parts of engine, or could affect controllability of the boat. If continued running is necessary, do so at greatly reduced speeds.

PROPELLERS

Propellers should be free of nicks, excessive pitting and any distortions that alter the propellers from their original design. Badly damaged props should be replaced, but those that are chipped, bent or merely knocked out of shape can be reconditioned by your marine dealer.

When doing extensive cruising, it is advisable to carry extra propellers aboard.

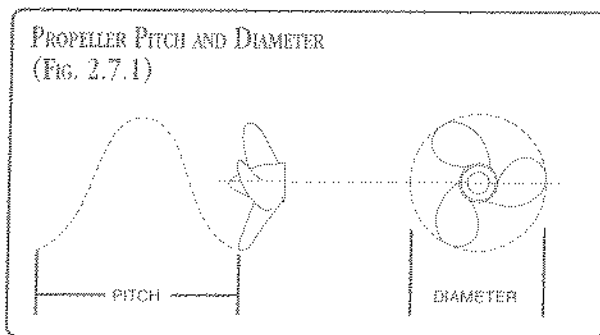
BASIC PROPELLER CHARACTERISTICS

Propellers have two basic characteristics:

- Diameter
- Pitch.

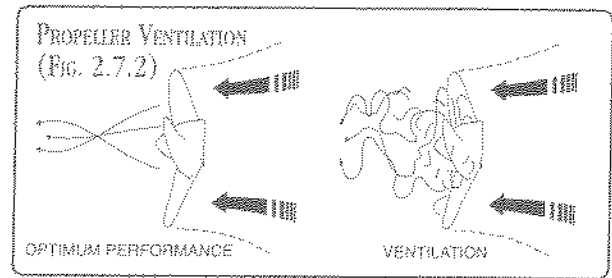
Diameter is that distance measured across the propeller hub line from the outer edge of the 360° that is made by the propeller's blade during a single rotation. Pitch is that distance in inches that a propeller will travel if rotated one revolution without any slippage (see Fig. 2.7.1).

For example, a propeller with a 12-inch pitch, when rotated 360° would, theoretically, advance 12 inches through the water. Actually, no propeller applied to any boat is 100% efficient. No 12-inch pitch blade will, in a single rotation, advance a boat 12 inches. This variance is referred to as slippage.



VENTILATION, ITS CAUSES AND CORRECTIONS

While often called "cavitation," ventilation is really a different effect. At times when a boat enters or leaves a sharp turn, the propeller seems to slip and lose thrust and the engine may over-speed (see Fig. 2.7.2). This problem is normally caused by air or aerated water



entering the propeller. (A damaged propeller can also cause ventilation.) Ventilation can usually be corrected by one or more of the following:

1. Replace the damaged or incorrect propeller with the recommended one.
2. With stern drives, set the outdrive at a lesser trim angle (trim the unit downward).

CAVITATION, ITS CAUSES AND CORRECTIONS

Cavitation is a phenomenon that occurs in all propeller-driven craft under certain conditions. The surface of propeller blades are not perfectly flat, and as water is drawn through the blades to be discharged aft into the propeller's slip stream, the water flowing over the curved surface of the blade encounters areas of greater and less pressure.

In those areas of reduced pressure, air bubbles are formed. When they move out of the low pressure area these bubbles collapse. If they collapse while in contact with an object, such as part of the propeller blade or trim plane, the bubbles create such highly localized forces that they erode the surface of the object. In the case of the propeller, such damage is sometimes called a "burn." It may be caused by an irregularity in the propeller's leading edge, and it should be corrected by reconditioning the propeller or by replacement.

Cavitation is a normal occurrence in modern sport boats, and prop inspection should be part of routine maintenance.

PROPELLER TORQUE AND ITS CORRECTION

Some of the more powerful motors create a considerable torque effect; that is, a twisting motion causing the boat to ride with one sheer lower than the other. This twisting reaction is caused by the direction of propeller rotation lifting one side of the boat. This causes an uneven drag, so that a boat's bow may tend to fall off in one direction or the other from the intended course given by the wheel.

Stern drive units are equipped with adjustable trim tabs which may be adjusted to balance

"steering torque" so that the steering wheel will turn with equal ease in each direction. Follow the trim plane adjustment instructions in the Engine Owner's Manual.

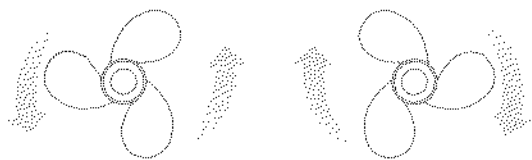
Torque action may occur when maximum or close to maximum rated horsepower is applied. Any slight torque may be offset by shifting passenger or gear weight laterally to the high side of the boat.

COUNTER-ROTATING PROPELLERS

On twin engine equipped cruisers, one propeller turns in a clockwise direction while the other turns counterclockwise in order to maintain a straight course through the water.

When removing or replacing propellers, be sure to install the correct propeller on the correct drive.

COUNTER-ROTATING PROPELLERS
(FIG. 2.8.1)



PROPELLER INSTALLATION (INBOARD AND V-DRIVES)

For proper rotation, the installation of propellers on your Sport Yacht requires the right hand propeller to be installed on the starboard side and the left hand propeller to be installed on the port side. Install in the following manner:

1. Inspect the key. It must be chamfered so that the corners of the key do not touch the keyway fillets (see Fig. 2.8.2, Illustration #2).
2. Install the propeller on the shaft without the key in the keyway. Slide the propeller all the way on the shaft until it seats. Mark the shaft on the leading edge of the hub with a felt tip marker and remove the propeller.
3. Install the key in the keyway and slide the propeller on the shaft. If the key is not pinned, tap the key back slightly as the propeller slides up the taper. This will ensure that the propeller does not ride the key up the keyway end radius, thus forcing the propeller off-center. The propeller is properly seated if the hub is in the same position as previously marked.
4. Install a (2 x 4) board against the hub perpendicular to the keel and rotate the propeller clockwise until one blade rotates against the board (do not put a board between the strut and the rudder) (see Fig. 2.8.2, Illustration #4).
5. Install the large bronze nut on the propeller shaft and seat the propeller with the correct torque as listed in the following chart.

PROPELLER INSTALLATION
(FIG. 2.8.2)

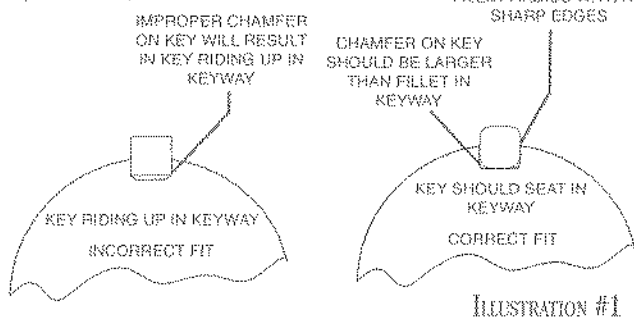


ILLUSTRATION #1

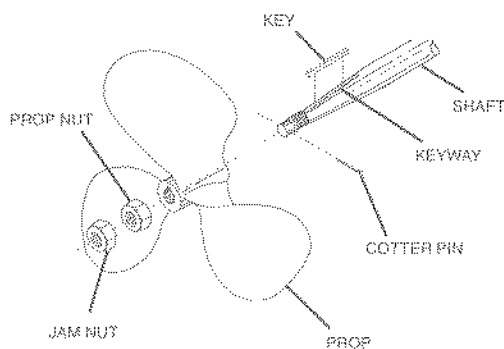


ILLUSTRATION #3

ALL CORNERS OF KEY SHOULD BE CHAMFERED

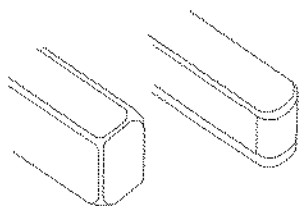


ILLUSTRATION #2

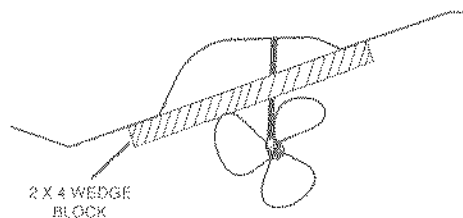


ILLUSTRATION #4

Shaft Diameter	Thread Size	Prop Nut	Prop Nut Torque Ft. Lbs.	Jam Nut Torque Ft. Lbs.
1"	3/4"	Bronze	100-125	100
1 1/4"	7/8"	Bronze	150-175	100
1 1/2"	1 1/8"	Bronze	250-275	100
1 3/4"	1 1/4"	Bronze	275-300	100
2"	1 1/2"	Bronze	325-350	100
2 1/2"	1 3/4"	Bronze	400-425	100

6. Install the Jam Nut (see preceding chart).

NOTICE

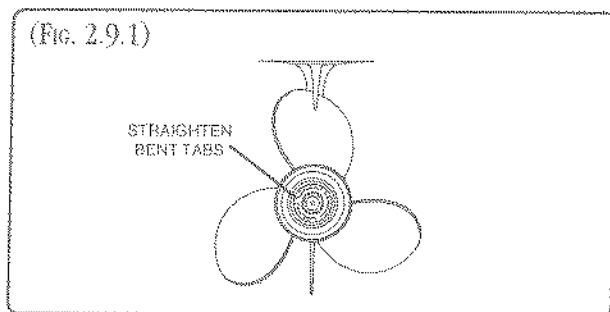
If the jam nut and prop nut are installed properly, the propeller should not loosen. If you tighten both nuts holding only the propeller blade, the nuts could possibly thread back on the shaft to the cotter pin. It is important that the above procedure be followed.

7. Install the cotter pin.

PROPELLER REMOVAL AND INSTALLATION (STERN DRIVES)

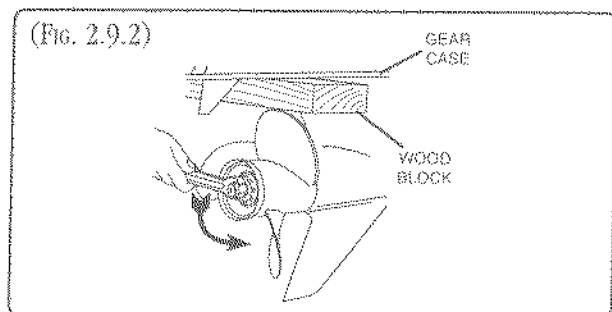
1. Shift throttle control/gear shift to NEUTRAL.

(Fig. 2.9.1)



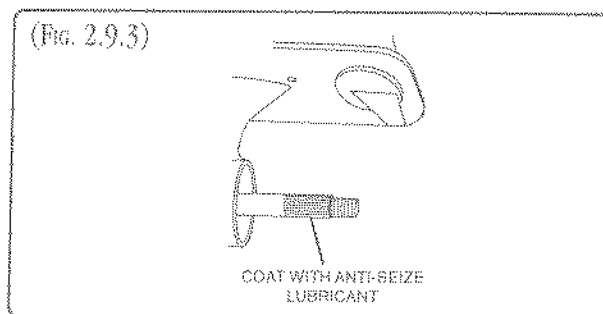
2. Straighten the bent tabs on the propeller nut retainer (see Fig. 2.9.1).

(Fig. 2.9.2)



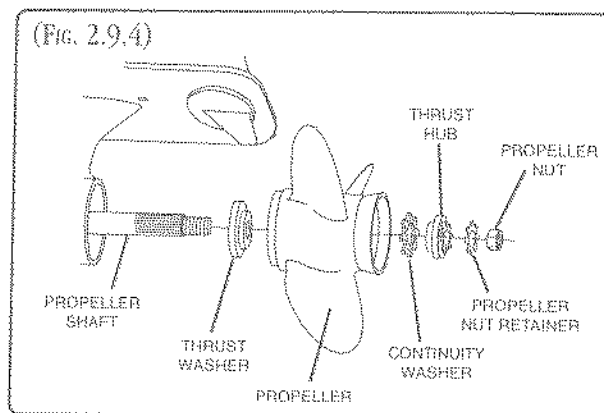
3. Place a block of wood between the gear case and propeller to stop propeller from rotating and remove propeller nut (see Fig. 2.9.2).
4. Pull the propeller straight off the shaft. If the propeller is seized to the shaft and cannot be removed, have the propeller removed by an authorized dealer.

(Fig. 2.9.3)



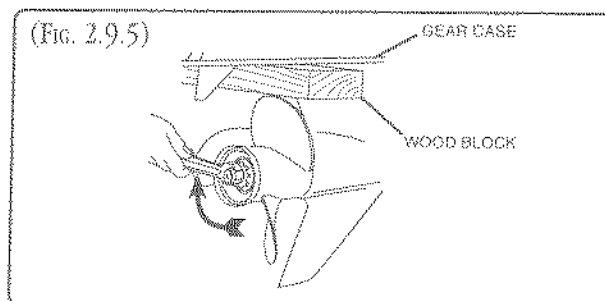
5. Coat the propeller shaft with an anti-seize lubricant (see Fig. 2.9.3).

(Fig. 2.9.4)

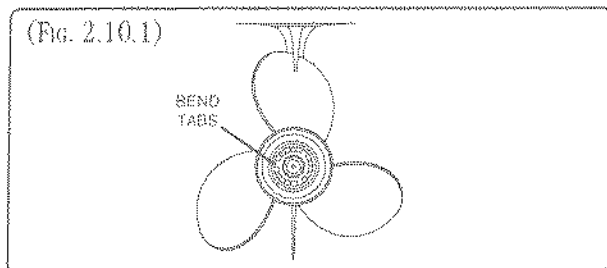


6. Install the thrust washer, propeller, continuity washer, thrust hub, propeller nut retainer and propeller nut onto the shaft (see Fig. 2.9.4).
7. Place a block of wood between the gear case and propeller and torque propeller nut to recommended manufacturer's specifications (see Fig. 2.9.5). To find correct torque, refer to your Engine Owner's Manual in the Owner's Manual Packet.

(Fig. 2.9.5)



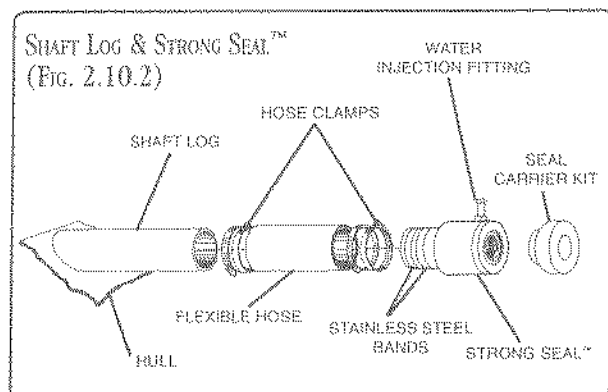
8. Secure the propeller nut by bending three (3) of the tabs of the propeller nut retainer into the thrust hub grooves (see Fig. 2.10.1).



SHAFT LOG & STRONG SEAL™

(INBOARD AND V-DRIVE ENGINES)

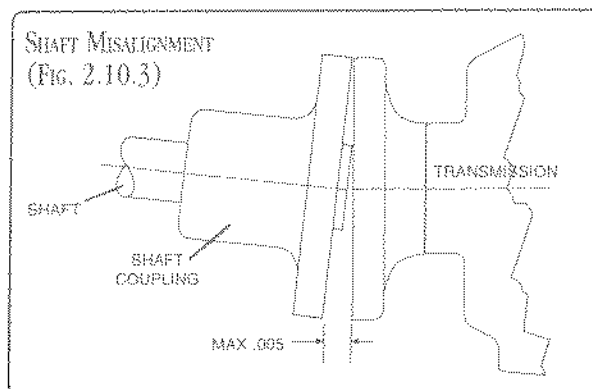
The shaft log (Fig. 2.10.2) is a fiberglass tube which provides an opening through the bottom of the boat for the propeller shaft. The Strong Seal™ is connected to it by a short length of special flexible hose which serves to absorb normal shaft vibration. The Strong Seal™ prevents water from leaking around the shaft and into the boat. Shaft alignment and straightness must be correct to assure proper operation of the Strong Seal™.



REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

SHAFTS (INBOARD AND V-DRIVE ENGINES)

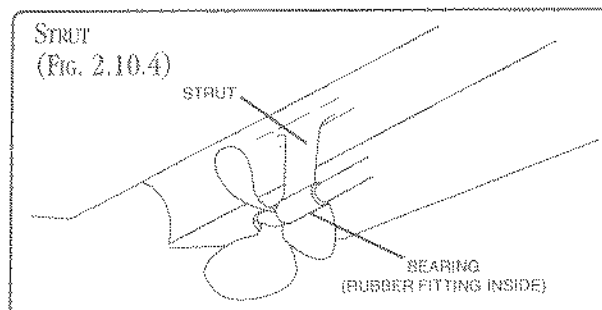
The shaft coupling is the connecting point between the shaft and the engine. The alignment should be set at .003" to .005" (0.08-0.13mm). Misalignment is much exaggerated in Fig. 2.10.3, but a slight misalignment will cause loss of power, excessive wear, noise and vibration. It should not be tolerated. When checking for parallel coupling faces (the proof of proper alignment), use a feeler gauge not more than .003 to .005 of an inch thick (0.08-0.13mm).



With coupling faces brought together by hand – not bolted – the feeler gauge should be tightly gripped at all points around the edges of the couplings. Next, hold the engine coupling flange stationary and rotate the shaft coupling flange 90 degrees in either direction. The feeler gauge should still be tightly gripped at all points around the edges of the couplings.

STRUT (INBOARD AND V-DRIVE ENGINES)

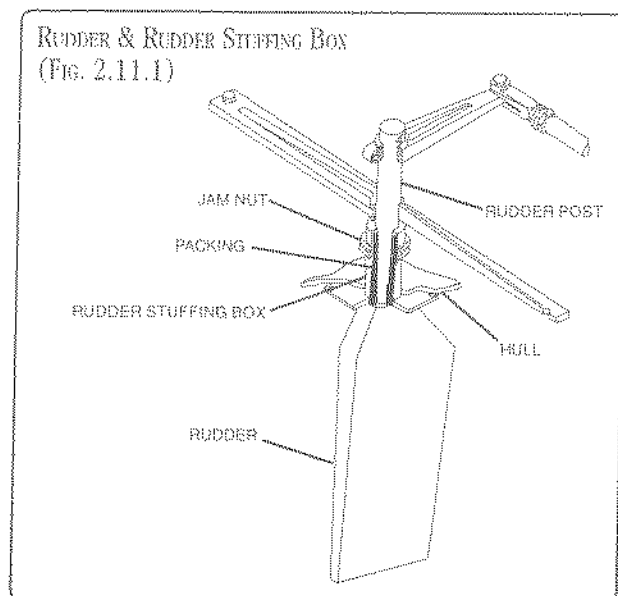
The strut is the bronze casting fastened to the bottom of the hull to support and form a bearing for the propeller shaft. A replaceable rubber bearing is inserted to minimize wear and protect the shaft where it passes through the strut hub. During lay up periods, squirt castor oil into this bearing to keep it from freezing to the shaft. Never use machine oil or grease on rubber bearing. Periodically check all strut fastenings to assure that they are secure. To replace the rubber cutlass bearing see your Sea Ray® dealer.



RUDDER & RUDDER STUFFING BOX

(INBOARD AND V-DRIVE ENGINES)

The rudder is the vertical flat surface aft of the propeller that pivots about a vertical axis and changes the direction of the boat through the



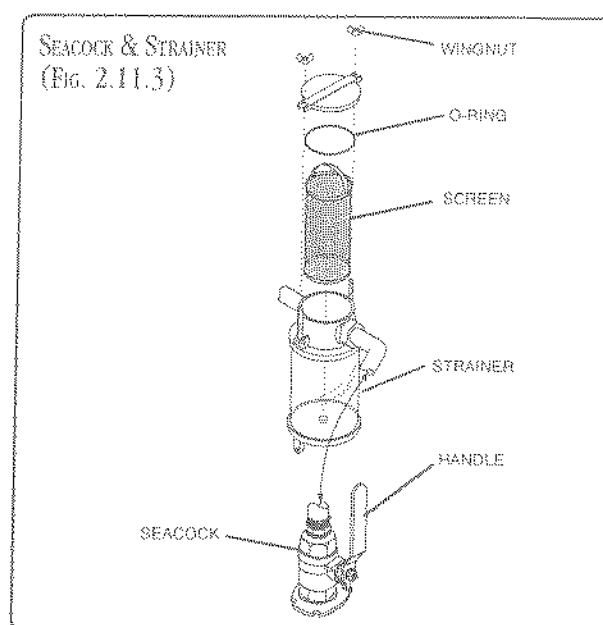
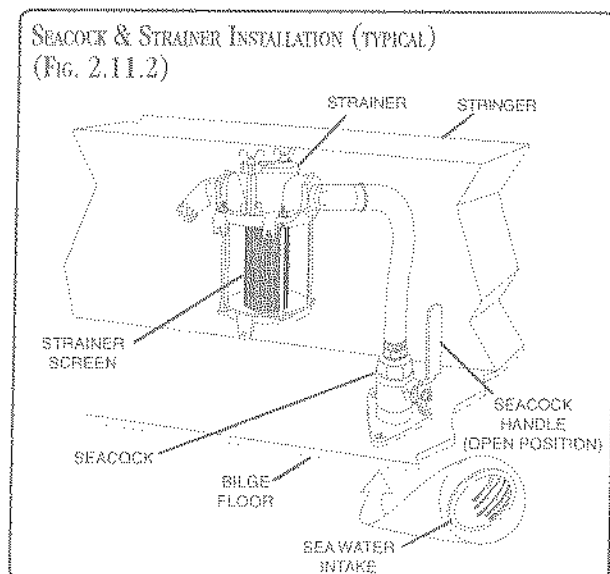
water. The rudder stuffing box prevents water from leaking into the boat where the rudder post enters the hull.

Rudder repacking is seldom required. If repacking is necessary, use 1/4" flax packing. The rudder requires little maintenance. **The rudder post, however, should be greased with a waterproof marine grease at least once a season.**

SEACOCKS & STRAINERS

Seacocks are provided to minimize flooding and provide a means of opening and closing to maintain hoses.

Cooling water to inboard and V-drive engines, generator and A/C units located throughout the bilge area is provided through the seacocks and strainers.



Strainers should be inspected and cleaned frequently. If operation of the air conditioning is excessive it is important that the A/C unit strainers are inspected more frequently than other strainers.

The seacock body should be inspected and lubricated annually.

NOTICE

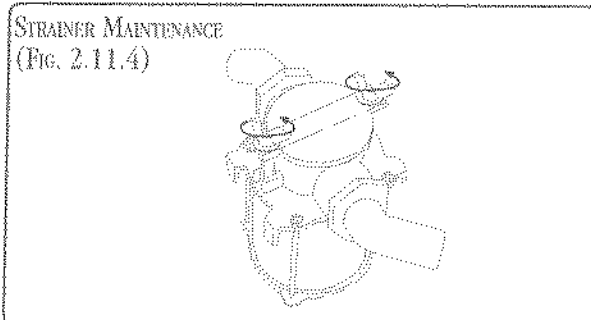
While being towed, you must close all main engine and generator engine seacocks to prevent water from being forced into the engine's exhaust and causing internal damage.

TO CLEAN THE STRAINERS

1. Close the seacock by turning the handle against water flow (horizontally).

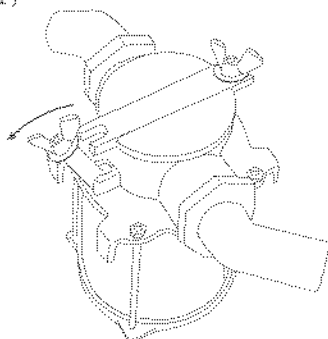
NOTE: Some seacocks are equipped with locking tee handles which must be loosened before operating the handle.

2. Loosen wingnuts on top of strainer (see Fig. 2.11.4).



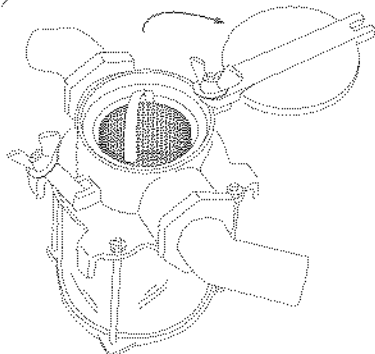
3. Release wingnut from slot in strainer cap by pulling forward (see Fig. 2.12.1).

STRAINER MAINTENANCE
(Fig. 2.12.1)

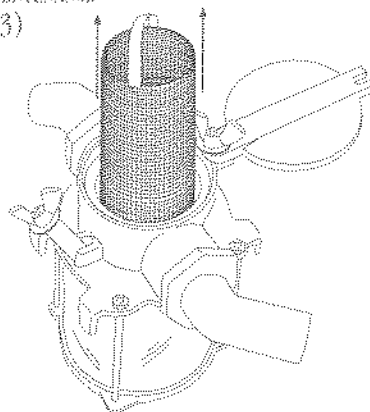


4. Rotate strainer cap clear of strainer housing (see Fig. 2.12.2)

STRAINER MAINTENANCE
(Fig. 2.12.2)



STRAINER MAINTENANCE
(Fig. 2.12.3)



5. Remove and wash stainless steel screen (see Fig. 2.12.3)
6. Replace the screen, rotate cap into position on the housing, engage wingnut into slot and tighten both wingnuts.
7. Open the seacock by turning the handle with water flow (vertically) and check for leaks.

SECTION 3 • INSTRUMENTS & CONTROLS

STEERING SYSTEM

CAUTION

Boat steering is not self-centering. Steering is affected by engine and propeller torque, trim plane setting, wave and current action, and the speed of the hull through the water. Constant attention and control of the direction of the boat are required for safe operation.

Steering system integrity and control is imperative when engaging in recreational water activities. Constant attention must be paid to the continued proper performance of the steering system.

POWER STEERING (INBOARD/OUTBOARD ENGINES)

The power steering used with stern drives is a mechanical system with enclosed cable. The steering wheel is connected to the stern drive power steering unit by cable. **THE CABLE CONNECTIONS AT THE HELM AND AT THE RUDDER TIE BAR SHOULD BE INSPECTED AT LEAST TWICE A YEAR. A loose connection can result in a sudden loss of steering and control.**

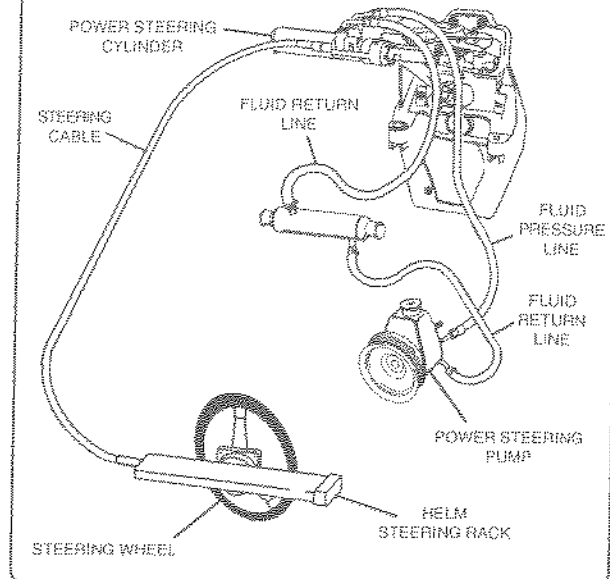
Push-pull cable steering should be checked for proper lubrication of the cable, proper alignment, with no binding or looseness, and no interference in the system. Cable and attachment to the outdrive should be checked for wear, rust or corrosion on a regular basis and be properly lubricated. Check the anchor post at the aft end of the cable to be sure it is secured and free from rust and corrosion.

A routine maintenance schedule for the power steering system should be set up to include a normal service for every 50 hours of operation or 60 days (whichever comes first); under severe service – every 25 hours of operation or 30 days (whichever comes first). **NOTE: Operation in salt water is considered severe service.**

SERVICE SHOULD INCLUDE:

- Lubricate the control valve through the grease fitting with multipurpose lubricant until grease appears around the rubber boot.

TYPICAL CRUISER POWER STEERING SYSTEM
(FIG. 3.1.1)



- Coat power assist steering output shaft and exposed steering cable end with appropriate lubricant.
- Lubricate cable end guide pivot point with SAE 30W engine oil.
- Check power assist steering fluid level and add type "A" automatic transmission fluid as required to bring level up to "FULL" mark on the dipstick, which is attached to fill cap.
- Inspect all hydraulic lines and hoses as part of routine maintenance for leaks. Be certain that lines and hoses are free from friction and extreme heat and adjoining parts. Tighten fittings and clamps as needed.
- Check all bolts for tightness on a regular basis.
- Check pump pulley drive belt often for wear and proper tension. Overtight belts may cause bearing failure. Loss of the belt compounds affect steering severely.

REFER TO THE ENGINE OPERATOR'S MANUAL FOR PROPER FLUID LEVELS AND LUBRICANTS.

Sea Ray® recommends that all repairs and/or replacements to steering systems be made by qualified dealers authorized by manufacturer of the steering system of your boat.

REFER TO OWNER'S PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

HYDRAULIC STEERING SYSTEM

The hydraulic steering system is used primarily on boats with inboard engines, equipped with dual control stations; however, it is often used on boats with a single fly bridge control station. Strict adherence to the following guidelines must be followed to ensure safe recreational boating.

Periodically remove the plug in the helm unit and check the oil level visually. The oil level should be within 1/2" (1-1/4 cm) of the filler hole.

The system must be filled with hydraulic oil meeting MIL Spec H-5606 A. Refer to steering system owner's information in the owner's packet for specific hydraulic oils that can be used.

Periodically check the mechanical connections and linkages at the cylinder. Replace worn parts, tighten loose parts and lubricate as needed. The steering system is protected against over-pressure situations by a pressure relief valve. Sometimes when returning the wheel from a hard-over position, a slight resistance may be felt and a clicking noise may be heard. This is a completely normal situation caused by the releasing of the lockspool in the system.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

HYDRAULIC POWER STEERING SYSTEM

The hydraulic power steering system uses the boat's engines to provide the "power" for the steering system via a mechanical or electrical motor driven hydraulic pump.

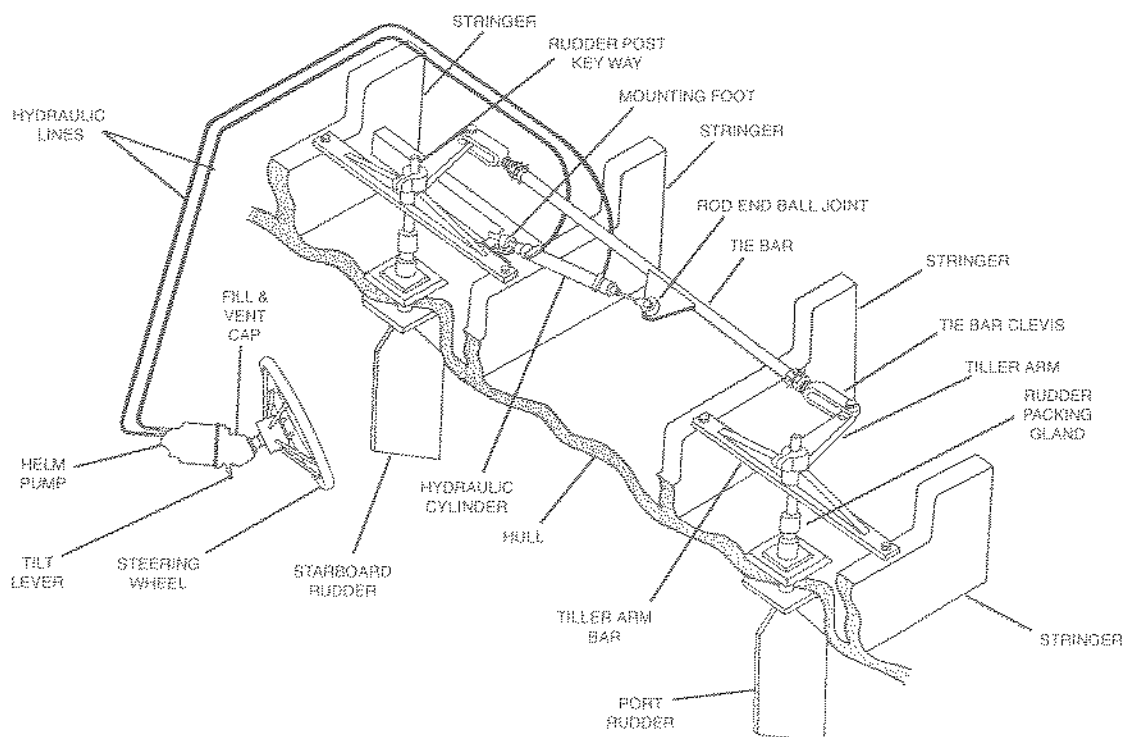
A manual hydraulic steering system, consisting of a helm and a hydraulic cylinder (fitted with an integral servo cylinder and a power steering valve), supplies the "control" portion of the steering system.

Under normal conditions, with engines running, a hydraulic oil supply is in a standby mode, ready to be directed to the steering cylinder as dictated by the steering wheel, servo cylinder and power steering valve. Turning the steering wheel left or right makes the system go from "standby" into "operating" mode and move the steering cylinder accordingly.

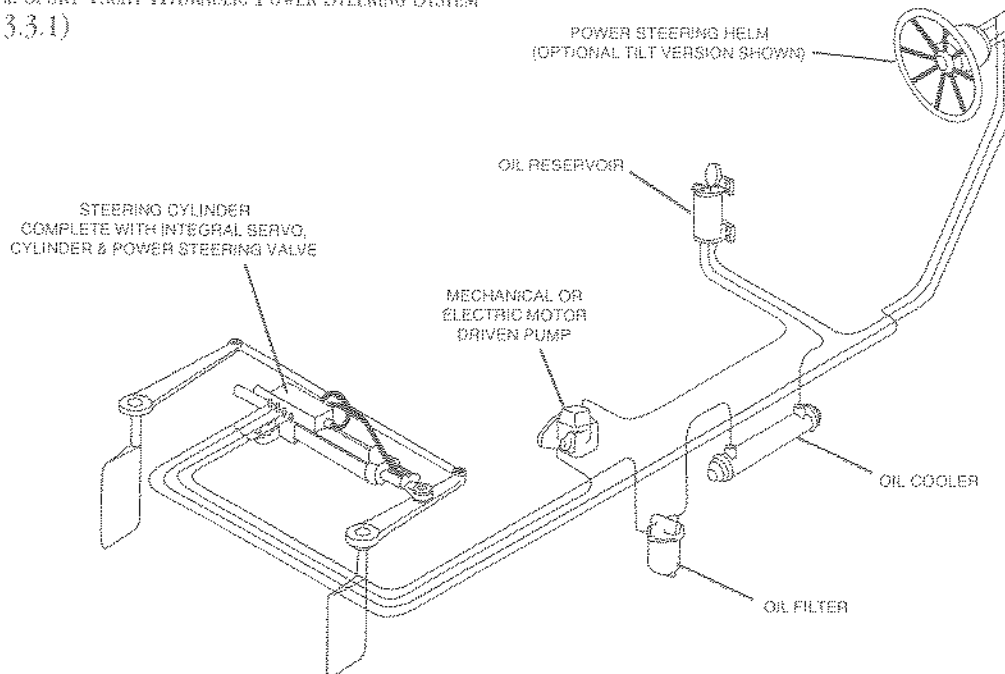
In the event of a power source failure, hydraulic oil from the steering helm is automatically diverted into the servo and steering cylinder, providing the helmsman with manual backup steering.

An engine room mounted oil reservoir allows easy fill and assists the in-line cooler in cooling the hydraulic oil. An in-line oil filter helps to

TYPICAL SPORT YACHT HYDRAULIC STEERING ASSEMBLY
(FIG. 3.2.1)



TYPICAL SPORT YACHT HYDRAULIC POWER STEERING SYSTEM
(Fig. 3.3.1)



protect the steering system components against contaminants.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

GEAR SHIFTS & THROTTLE CONTROLS

Your Sport Cruiser may be equipped with stern drive throttle control(s). Sport Yachts may be equipped with electric or hydraulic throttle controls. There are different functions, operating and maintenance instructions which must be followed to prevent improper operation and maintenance. Read and understand the information in the Owner's Manual Packet for your boat model's gear and throttle controls.

Your boat has start in-gear protection. For safety's sake and as a good habit to get into, always put the gear selector(s) in the NEUTRAL position and the throttle selector(s) in the IDLE position before starting the engines.

⚠ WARNING

- Shift selector(s) to NEUTRAL before starting engines.
- Shift only when engine is at idle.
- Reversing at high speeds can cause flooding/swamping due to water being pushed over the transom (stern).

⚠ CAUTION

- Shift quickly; easing into gear can damage the transmission.
- Hydraulic controls FORWARD and REVERSE positions should always be in the full travel extremes in either direction for positive engagement and minimum wear.

MANEUVERING

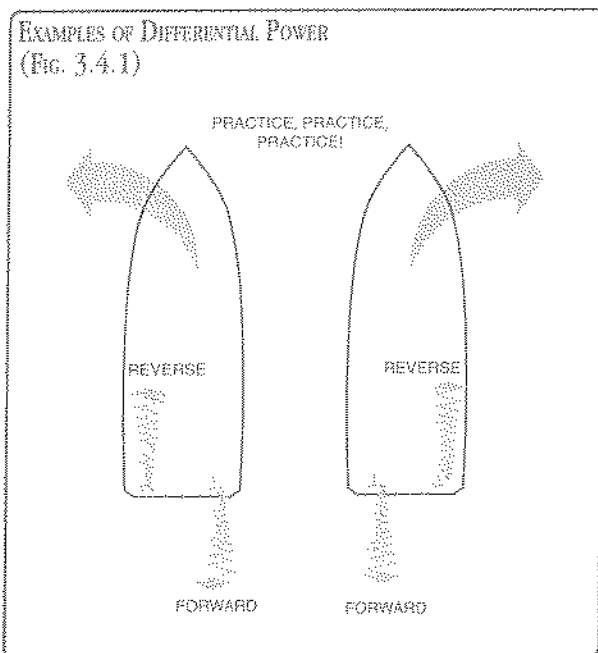
Operating your boat in reverse comfortably requires practice. Find open water and practice reversing techniques. Here are a few things to remember:

- Bring engines to IDLE before shifting.
- Pause in NEUTRAL while shifting to allow the boat to lose headway, then shift quickly.

Reversing the shift lever will cause a "braking action" when maneuvering the boat at low speeds. Care

should be exercised in using the reverse throttle for "braking action" as the sudden slowing of the boat's forward motion will create a following wake which may rise above the transom and flood/swamp the boat if the boat is moving at too great a speed. All propellers are designed to give maximum forward thrust, so the reverse thrust of the propeller will not be as efficient.

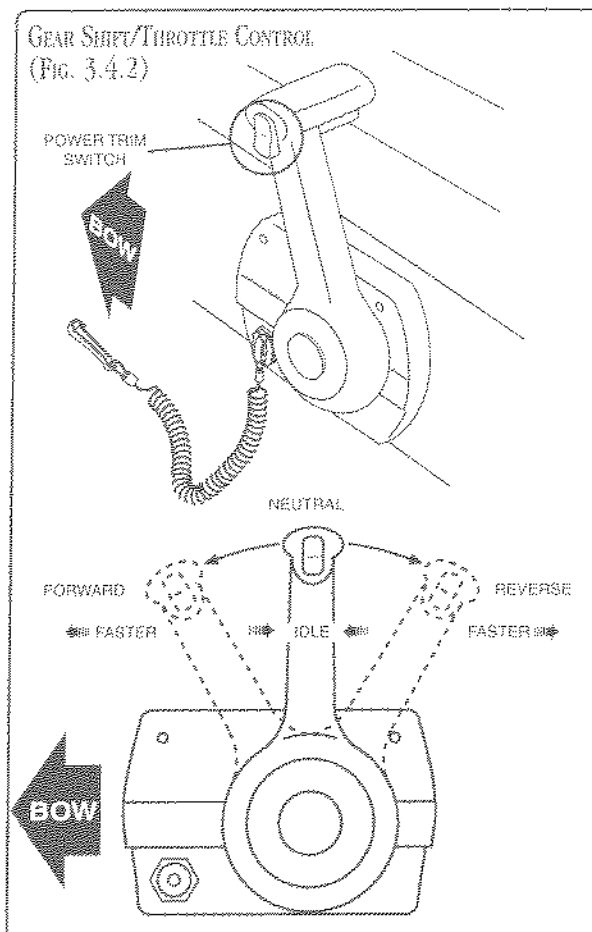
Each gear shift lever can be used independently from the other. For example, while idling you can shift one forward and the other in reverse. This is called *differential power*, and it will increase your boat's maneuverability. We suggest that you go to open water and practice, practice, practice.



SINGLE GEAR SHIFT/THROTTLE CONTROL (SPORT CRUISERS)

The shift/throttle control unit for the engine activates both the shifting mechanism and the throttle. The control must be in the neutral position to start your engine. Moving the lever forward engages the forward gear and then the throttle advance. To reverse power, bring the control lever back to neutral position, then move it further back to engage the reverse gear and increase reverse thrust.

Throttle controls are equipped with a "throttle only" mechanism which allows the shift mechanism to be disengaged from the throttle. This allows the throttle to be advanced without shifting the transmission when starting. The "throttle only" mechanism may differ from one style gear shift/



throttle unit to another, refer to your Gear Shift/Throttle Manual for proper operation of this feature.

The throttle control regulates the RPM of the engine. Regulating the RPM of the engine will control the speed of the boat.

Reversing the shift mechanism will act as a braking action, as sudden slowing of the boat from forward motion will create a following wake which may rise above the transom and flood the boat if the boat is moving at too great a speed. All propellers are designed to provide maximum forward thrust, so the reverse thrust of the propeller will not be as efficient.

Controls may vary slightly depending on the particular Sea Ray® model and engine combination.

MAINTENANCE

Periodically check and seasonally lubricate the linkages with medium weight oil.

Occasionally it will be necessary to adjust the tension on the cables to ensure a positive and direct response of the control lever action.

REFER TO OWNER'S PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

CABLE GEAR SHIFT & THROTTLE CONTROLS (SPORT CRUISERS)

There are two gear shift levers and two throttle control levers.

The gear shift levers have three positions: FORWARD, NEUTRAL (center), and REVERSE. The gear shift levers must be in the NEUTRAL position when starting the engines. A detent can be felt when the control is in exact neutral. **Forward and reverse positions should always be in the full travel extremes in either direction for positive engagement and minimum wear.** Each gear shift lever can be used independently from the other, for example, when idling one shift can be put in forward and the other in reverse for tight maneuvering. **Shift gears only with engines idling.**

The throttle controls regulate the RPM of the engines. Pushing the levers forward will increase engine RPM. Regulating RPM of the engines will control the speed of the boat through the water.

MAINTENANCE

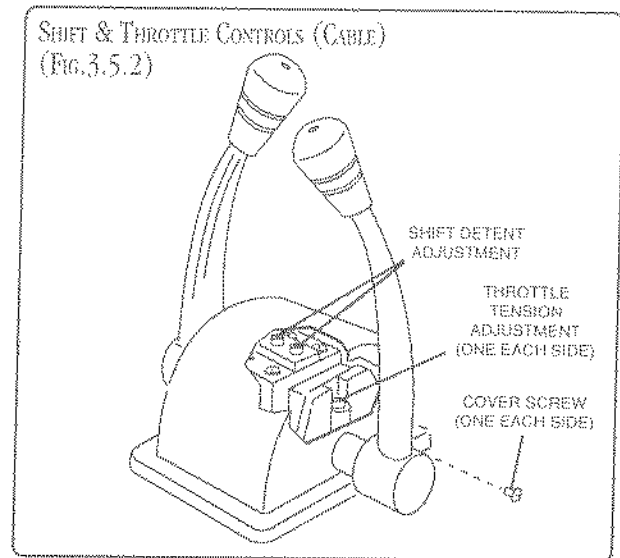
Periodically check and seasonally lubricate the linkages with medium weight oil.

Occasionally it will be necessary to adjust the tension on the cables to ensure a positive and direct response of the control lever action.

TO ADJUST CABLE TENSION:

- Remove the two (2) screws which attach the stainless steel dome and lift the dome free of the unit (see Fig. 3.5.2).
- With a screwdriver, turn the adjustment screw

SHIFT & THROTTLE CONTROLS (CABLE)
(Fig. 3.5.2)



while moving the throttle lever back and forth until a positive action is obtained (see Fig. 3.5.2).

- Repeat the same procedure on the shift lever detent screw (see Fig. 3.5.2).

HYDRAULIC GEAR SHIFTS & THROTTLE CONTROLS (SPORT YACHTS)

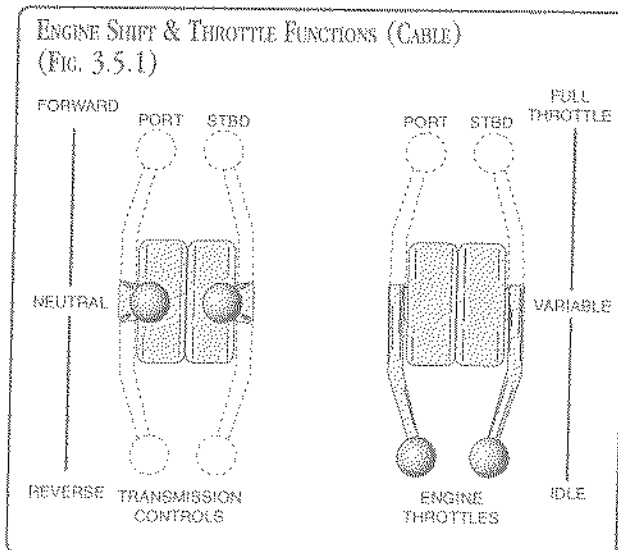
Your boat may be equipped with hydraulic gear shifts and throttle controls as standard equipment (see Fig. 3.6.1).

The gear shift lever for each engine, twin lever controls on port side of control station, has three positions: forward, neutral, and reverse. The control lever must be in the neutral (center) position when starting the engine(s). A positioning indent can be felt when the control is in exact neutral. Forward and reverse positions should always be in full travel extremes in either direction for a positive engagement and minimum wear.

The throttle controls, twin lever controls on starboard side of control station, regulate the RPM of the engines. Periodically check and seasonally lubricate the linkage with medium weight oil.

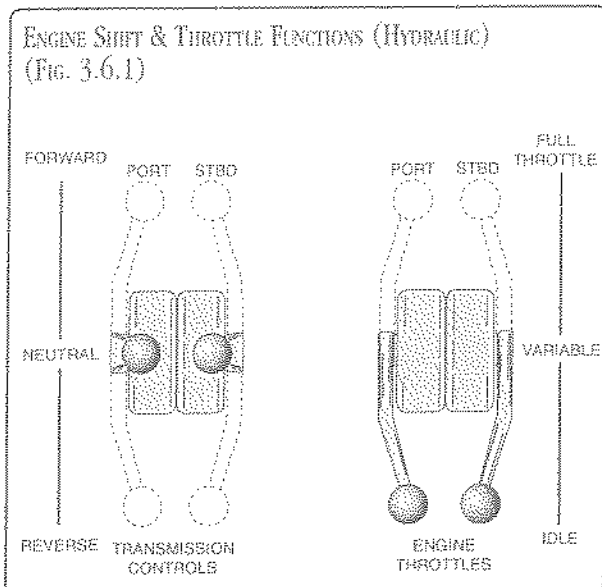
NOTE: Prior to starting engines, both throttles and clutches should be synchronized. This is done by moving the sender's control arm in a complete cycle fore and aft, stop to stop and neutral to neutral. This is done at only one station, either upper or lower.

ENGINE SHIFT & THROTTLE FUNCTIONS (CABLE)
(Fig. 3.5.1)



CAUTION

Hydraulic controls FORWARD and REVERSE positions should always be in the full travel extremes in either direction for positive engagement and minimum wear.



OPERATION

1. Throttle Senders:
Forward Motion – Increases Throttle
Aft Motion – Decreases Throttle
2. Transmission Senders:
Forward Position – Forward Direction
Center Position – Neutral
Aft Position – Reverse Direction

MAINTENANCE

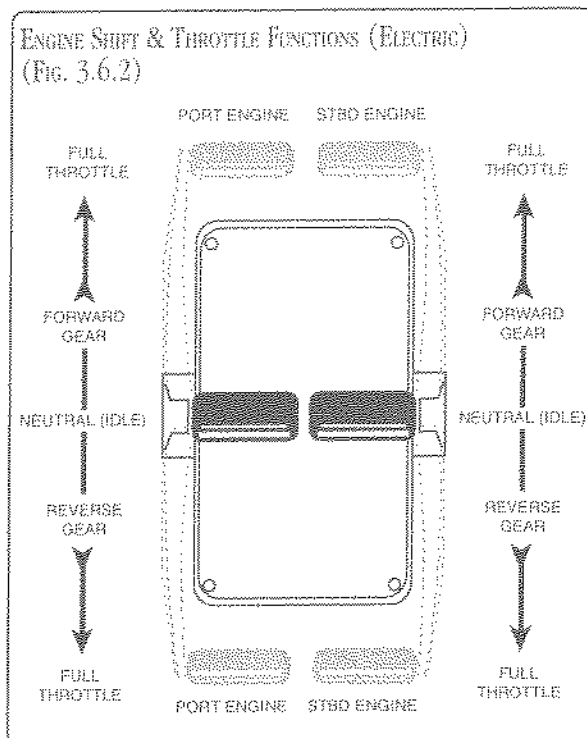
The clutch and throttle sender bodies are made of 6061-t6 aluminum, which have been anodized. To clean them, a warm soapy water solution should be used. Do not use an abrasive compound.

NOTE: When working on an engine and operating the engine throttle arm by hand, disconnect throttle linkage from the control slave. If linkage is not disconnected, the pilot check valve will not allow throttle movement unless a sender arm is actuated to move the throttle.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

ELECTRIC GEAR SHIFTS & THROTTLE CONTROLS (SPORT YACHTS)

Your boat may be equipped with electric gear shifts and throttle controls as standard equipment (see Fig. 3.6.2). They are located on the starboard side of the control station. Electric controls offer many advantages, including ease of shifting, no mechanical linkages, choice of control station



selection and much more. Sea Ray® recommends that you read the Owner's Manual for electric controls to take full advantage of this equipment.

NOTE: Prior to starting engines (diesel):

- Shift throttle and gear levers into the NEUTRAL position at all control stations.
- Ensure that the boat's DC power is ON.
- Select the control station at which you will start the engines.
- Follow the engine START sequence according to the Engine Owner's Manual.

OPERATION

1. The port lever operates the gear and throttle for the port engine and the starboard lever operates the starboard engine gear and throttle.
2. Moving the lever forward to the first indent engages the forward gear. Moving the lever backwards to the first indent engages the reverse gear.
3. Moving the levers further forward or backwards increases throttle and boat speed.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

GEAR SHIFTS & THROTTLE CONTROLS (FOR DETROIT DIESEL ENGINES) (ELECTRIC - DDEC OR TWIN DISC®)

(SPORT YACHTS)

If your boat has Detroit Diesel propulsion it may be equipped with either DDEC or Twin Disc® electric gear shift and throttle controls as *optional* equipment. Located on the control station, electric controls offer many advantages, including ease of shifting, no mechanical linkages, and much more. Sea Ray® recommends that you read the Owner's Manual for electric control options on your sport yacht in order to take full advantage of this option.

NOTE: Prior to starting engines (diesel):

- Shift throttle and gear levers into the NEUTRAL position.
- Ensure that the boat's DC power is ON.
- **DDEC only** - Turn system activation switch ON.
- Follow the engine START sequence according to the Engine Owner's Manual. Also see Section 4 - *Fueling & Starting*.

TO OPERATE DDEC

1. Engine Throttles:
Forward Motion - Increases engine speed
Aft Motion - Decreases engine speed
2. Engine Gearshifts:
Forward Position - Forward Motion
Center Position - Neutral
Aft Position - Reverse Motion

TO OPERATE TWIN DISC®

1. The port lever operates the gears and throttle for the port engine. The starboard lever operates the engine gears and throttle for the starboard engine.
2. Moving the lever forward to the first indent engages the forward gear. Moving the lever backwards to the first indent engages the reverse gear.
3. Moving the levers further forward or backwards increases boat speed.

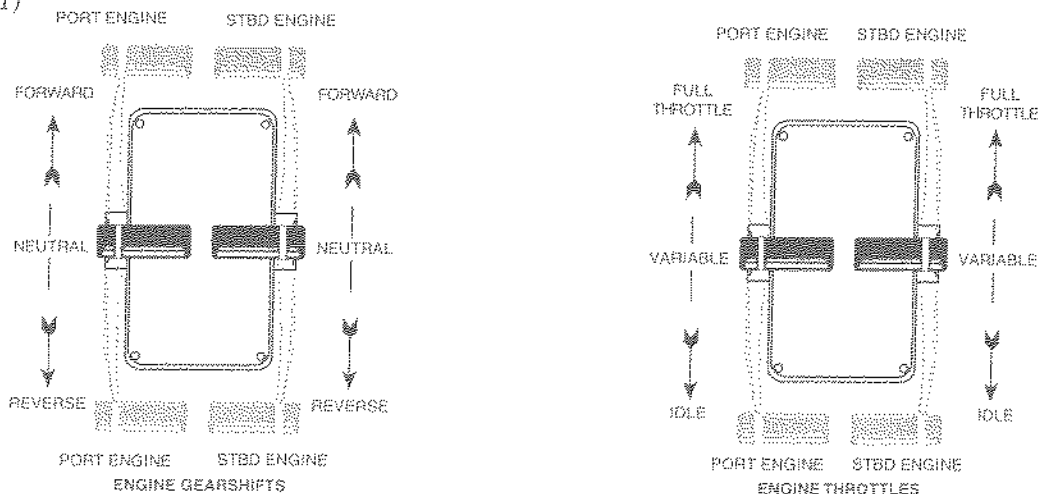
REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

POWER TRIM & TILT OPERATION (STERN DRIVES ONLY)

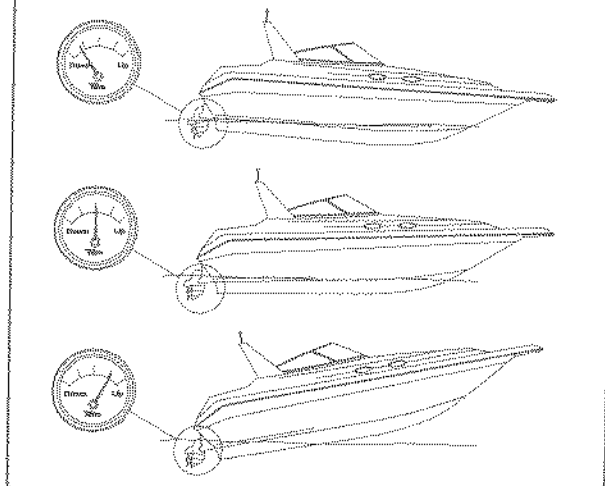
The Power Trim & Tilt System on stern drive cruisers allows the operator to raise and lower the drive unit for trailering, launching, beaching, shallow water operation, and while underway to provide the ideal boat angle (in relation to water surface) for a given load and water condition. In most cases, best all-around performance is obtained with the drive unit adjusted so that the boat will run at a 3° - 5° angle to the water (front of hull just slightly out of the water). The Power Trim and Tilt switch(es) is located on the helm control panel.

NOTE: Boats can be operated in a manner and at certain speeds causing trim angles such that visibility

ENGINE SHIFT & THROTTLE FUNCTIONS (DDEC ELECTRIC OPTION)
(FIG. 3.7.1)



EFFECTS OF POWER TRIM
(FIG. 3.8.1)



is partly or completely obscured. Motor trim angles, hull trim plane angles (if equipped), and boat load distribution as well as hull speed are factors affecting a boat's trim angle. This standard cannot assure visibility such that a boat can be operated without some loss of visibility for the helm during high trim angles. High trim angle will result from operation at speeds during the transition from displacement mode to planing mode, rapid accelerations, incorrect loading, improper motor trim angles and improper hull trim plane angles. During these conditions it is expected that a lookout will be maintained as required by the Rules of the Road.

Moving Bow UP (Drive Unit UP) Characteristics:

- Reduces wetted surface of hull, generally increasing top speed.
- Increases clearance over submerged objects.
- May cause boat to accelerate and get up on plane slower.
- In excess, can cause bouncing, porpoising, and/or propeller ventilation.
- Causes overheating if trimmed up beyond water pickup.

Moving Bow DOWN (Drive Unit DOWN) Characteristics:

- Will help boat to accelerate and get up on plane faster.
- Could improve boat ride in rough water (at partial throttle).
- Will reduce boat speed in most cases.
- Reduces "porpoising"

To Trim Bow of Boat UP (Drive Unit UP):

- Press UP on TRIM switch until the drive unit moves to properly trim the boat or until trim limit switch stops upward travel.



CAUTION

NEVER trim the drive unit UP using the TRAILER switch while boat is underway. Severe damage to drive unit may result if the unit is raised beyond the gimbal ring support flanges at engine speeds above 1,200 RPM.

To Trim Bow of Boat DOWN (Drive Unit DOWN) or To Lower Drive Unit from Raised Position:

- Press DOWN on TRIM switch until the drive unit moves to properly trim boat or until the drive unit reaches the end of down travel.

POWER TILT OPERATION (STERN DRIVES ONLY)

The Power Tilt allows the operator to raise and lower the drive unit for trailering, beaching and launching. The Power Tilt switch is located either on the helm control panel or on the shift/throttle control (see Fig. 3.4.2).

To Raise Drive Unit for Trailering, Beaching Launching or Shallow Water Operation:

- Press and hold TRAILER switch until drive unit reaches desired height or end of upward travel.

NOTE: Power Trim pump motor operates both Power Trim and Tilt. The pump motor is protected from over-heating by an internal circuit breaker. If trim/trailer switch is held depressed after drive unit reaches end of upward travel, the internal circuit breaker will open and the pump will stop. If this should happen, release switch and allow motor to cool for approximately one minute. Once motor is cool, the circuit breaker will reset automatically and trim operation may be resumed.

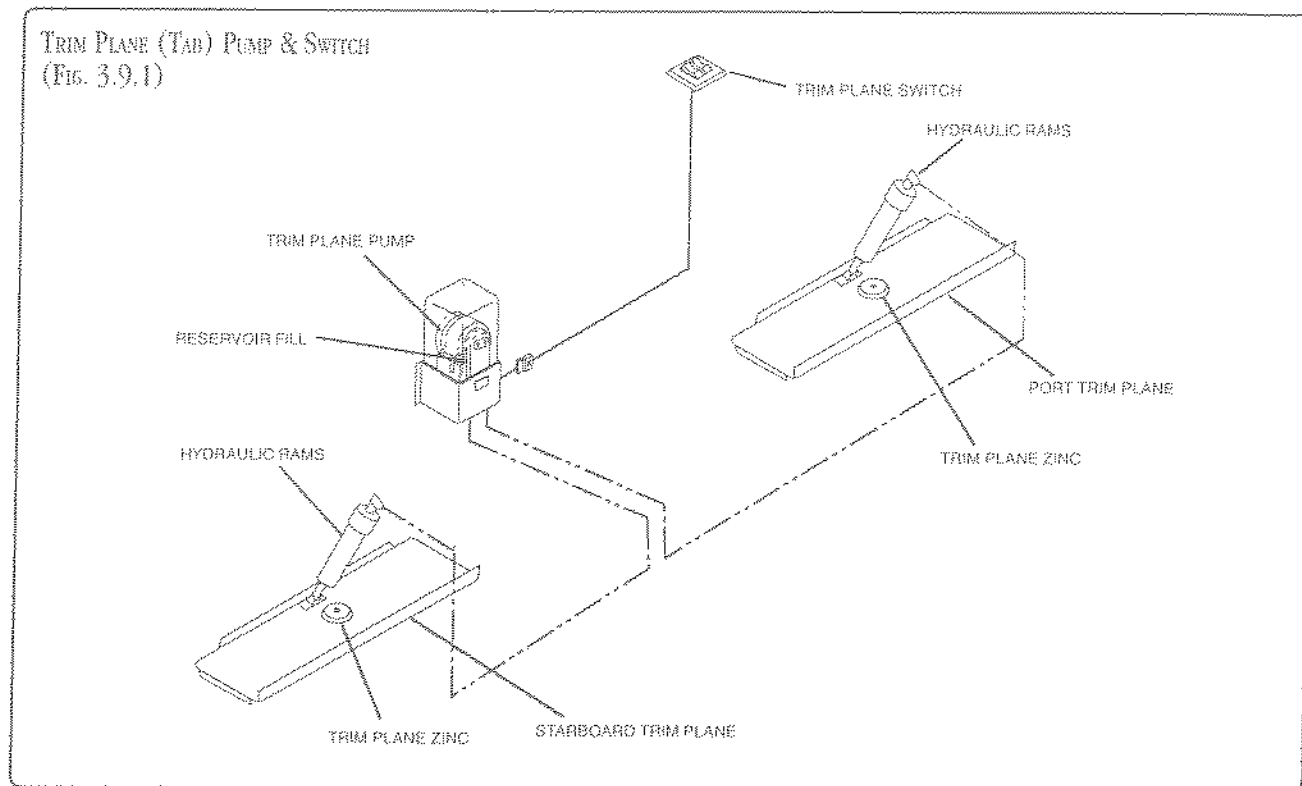
REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

TRIM TABS

The trim tabs on your Sea Ray® are operated with a rocker type momentary switch on the dash and are protected by a circuit breaker on the helm DC breaker panel.

To trim the bow of your boat down, push the top halves of both rockers down in short bursts. If you hold the rockers down, you will over trim the boat

TRIM PLANE (TAB) PUMP & SWITCH
(Fig. 3.9.1)



and the bow will dig in. To correct over trimming, push bottom halves of both rockers to obtain desired planing angle.

The two trim tabs on the transom of your boat can also be used to trim the list of your boat that may be caused by improper storage of gear, too many people on one side, or a strong cross wind. Operation of the rocker switch should be momentary short bursts to achieve proper attitude of the hull.

When running wide open, most boats do not require any trim unless heavily loaded.

In heavy following seas or when running in an inlet best maneuverability is obtained with a bow high attitude. To be sure the tabs are full up in the zero position, push the bottom halves of the rockers for several seconds. **Have your dealer explain and demonstrate trim tab functions and their effect on your boat's hull attitude to the water.**

The trim tab pump is located in the bilge, mounted on the transom. To service the unit, remove the tinted plastic cover to gain access to reservoir fill plug and motor parts. Hydraulic trim tabs use Type A Dexron II automatic transmission fluid, which should be filled up to the FULL mark on the pump base. Add fluid with the trim tabs in the "Up" position only.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

CARBON MONOXIDE MONITOR

The carbon monoxide (CO) monitor is provided when the boat is equipped with a gasoline engine and/or generator.

The CO monitor is an electronic instrument that detects CO. When a potential hazard exists, the monitor will alert the occupants by a flashing DANGER light and alarm.

The monitor is mounted in the cabin and operates through a fuse located behind the main distribution panel or a breaker on the DC distribution panel.

It is extremely important that you become totally familiar with your CO monitor and its functions.

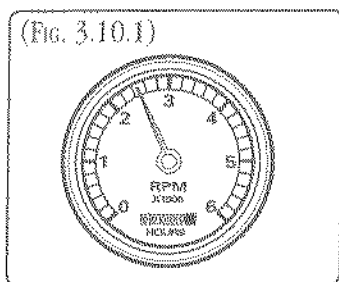
SEE THE OWNER'S HANDBOOK IN YOUR OWNER'S MANUAL PACKET FOR DETAILED INFORMATION AND OPERATING INSTRUCTIONS.

INSTRUMENT GAUGES

Your boat is equipped with analog gauges as standard equipment. The following information is a brief description of the gauge packages. Refer to the Owner's Manual Packet and/or consult the dealer for complete instructions regarding your boat's gauge package.

TACHOMETER (WITH HOUR METER)

(Fig. 3.10.1)



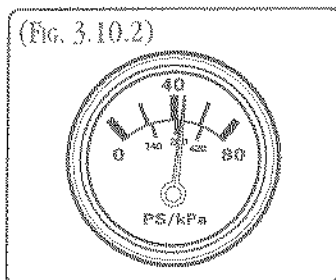
The tachometer indicates the revolutions per minute (RPM) of the engine. It does not indicate the speed of the boat through the water or over the bottom. Your Engine

Operator's Manual states the maximum full throttle RPM at which your engine should operate. This should not be exceeded. The tachometer should also be used to determine the most comfortable and economical cruising RPM.

The hour meter measures cumulative hours of operating time and are available for both engines and generator. Engine hour meters are located on the tachometer. They should be used to keep a careful log of engine maintenance as well as performance data and fuel consumption. Do not leave ignition key on with the engines off, as this will increase the engine hours on the hour meter. A generator hour meter is located on the generator gauge panel.

OIL PRESSURE GAUGE

(Fig. 3.10.2)



Very little serious trouble can occur in an engine which will not be reflected on the oil pressure indicator. Maximum oil pressure is controlled by a preset valve in the oil pump. Note the

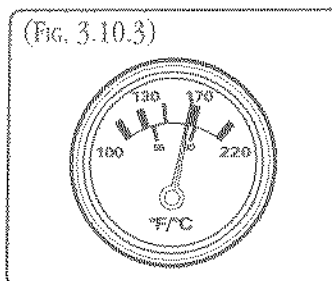
reading which this gauge records when the engine is new, as it is the "norm" which can be used as reference during the life of the engine. IF A COMPLETE LOSS OF OIL PRESSURE OCCURS, TURN ENGINE OFF AT ONCE.

Continued running after loss of pressure will cause engine damage. First, manually check the oil level. If low oil level is not the cause, consult your Sea Ray® dealer. DO NOT RESTART THE ENGINE UNTIL THE PROBLEM HAS BEEN CORRECTED.

Slight fluctuations in gauge readings are not uncommon during operation and may be due to the characteristics of the lubricating oil. Greater fluctuations should be investigated. The cause may be a clogged oil filter element which should be replaced with every oil change.

WATER TEMPERATURE GAUGE

(Fig. 3.10.3)



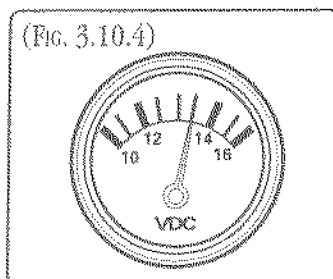
The engine water temperature gauge indicates temperature of the cooling water circulating inside the engine. Your engine is equipped with a thermostat so a predetermined

engine temperature should be reached soon after starting the engine and maintained thereafter while the engine is running.

Refer to your Engine Operator's Manual for proper gauge readings. If the temperature approaches above normal on your gauge, shut down engine at once.

VOLTMETER

(Fig. 3.10.4)



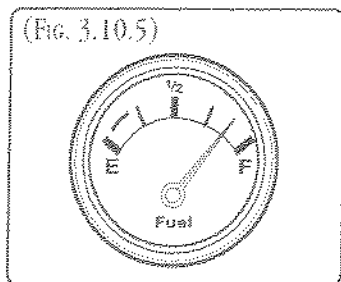
The voltmeter indicates battery voltage. Normal engine operating voltage will range from 12.0 to 15.5 volts when the alternator is charging. Significantly

higher or lower readings indicate a battery problem, alternator malfunction or heavy battery drain.

FUEL GAUGE

The fuel gauge indicates the amount of fuel in the fuel tank. The most accurate reading of the fuel gauge is at idle speeds when your boat is in an approximately level position. At slow plane when your boat is in a bow up position, the gauge will

(Fig. 3.10.5)



comparison to the hours of use versus known fuel consumption (GPH/LPH).

read inaccurately because the fuel in the tank travels to the rear of the tank and away from the fuel sending unit. Because the gauge readings are approximate, they should be used in

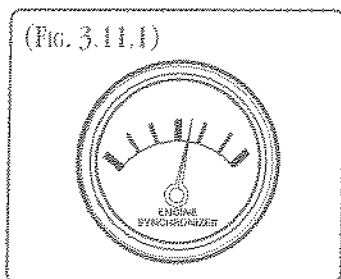
Although the navigation lights supplied with your Sea Ray® are of top quality, failure may occur for a variety of reasons:

1. There may be a blown fuse or tripped breaker. (Replace the fuse or reset the breaker.)
2. The bulb may be burned out. (Carry spare bulbs for replacement.)
3. The bulb base may be corroded. (Clean the base periodically and coat it with nonconductive grease.)
4. A wire may have come loose or may be damaged. (Repair as required.)

SYNCHRONIZER GAUGE



(Fig. 3.11.1)



The synchronizer gauge indicates which engine is running slower by the needle registering to the slower engine. To synchronize the engines, adjust the engine RPM

with the throttles until the needle is centered in the gauge. The engine synchronizer is designed to operate between 1500 RPM and Wide Open Throttle (WOT). When engines are not under load and running in neutral gear, they will tend to surge and indicate out of synchronization very easily.

REFER TO YOUR ENGINE OPERATOR'S MANUAL FOR PROPER GAUGE READING.

CONSOLE DIMMER



There is a CONSOLE DIMMER control located on the helm switch panel which controls the intensity of the gauge and switch panel lights. The gauge and switch panel lights are turned on when the navigation running lights are turned on.

NAVIGATION LIGHTS



Navigation lights must be displayed while underway from sunset to sunrise or in conditions of reduced visibility. It is wise to run at reduced speed whenever navigation lights are needed. The term "underway" denotes not at anchor or dock. Trolling or drifting with power off is considered underway and normal running lights must be displayed. At anchor, in open water, a 360 degree white anchor light must be displayed.

TO OPERATE THE RUNNING LIGHTS:

Push NAVIGATION switch on control station switch panel to the RUNNING position.

TO OPERATE THE ANCHOR LIGHTS:

Push NAVIGATION switch on control station switch panel to the ANCHOR position.

If your boat is equipped with a sport spoiler and you opt to install radar, it then becomes your responsibility to reevaluate your lighting situation to make certain the navigation lights on your boat meet government navigational lighting requirements. You will most likely have to raise the mast light. Consider the weight of the radar you install; be certain it is not too heavy for your sport spoiler.

MARINE COMPASS

A marine compass is deflected and its usefulness impaired when other instruments or objects containing iron, magnets, or electric current carrying wires are in its vicinity. A newly installed compass must be adjusted to compensate for these influences if they must remain in proximity to it.

The compensating or adjusting should be done by a qualified compass adjuster. A compass can seldom be corrected to zero deviation on all headings, so you will be provided with a deviation card or chart showing the correction to be applied when laying out a compass course or making your navigational calculations. Keep this card at the helm at all times.

After your compass is adjusted, do not permit items such as iron or steel to be placed near it, even temporarily, as they will affect its accuracy. The compass must be readjusted if any items which affect it are removed, relocated or added in its vicinity.

When not in use, the compass should be protected from excessive and prolonged sunlight. If your compass becomes sluggish or erratic, it should be serviced by an authorized repair station.

To keep the plexiglass dome free from scratches, remove salt deposits and dust with a damp cloth. An occasional treatment with paste wax will help preserve the dome surface.

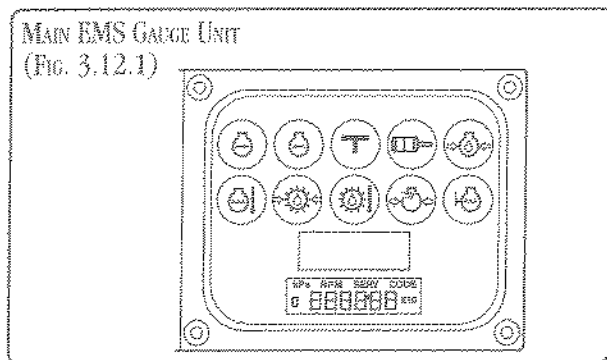
REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

INSTRUMENT GAUGES (OPTIONAL)

There are two *optional* electronic gauge packages available for selected models. They are the Caterpillar® Engine Monitoring System (EMS) and the Detroit Diesel® Electronic Display Module (EDM).

The following information is a brief description of the optional gauge packages. Refer to the Owner's Manual Packet and/or consult the dealer for complete instructions regarding your boat's gauge package.

MAIN EMS DISPLAY



EMS is an electronic monitoring system designed to display various engine/transmission parameters. The main EMS gauge has ten (two rows of five) indicators to display system related diagnostics. A digital LCD is functional to scroll through the different engine/transmission parameters monitored. A port and starboard scroll switch is located on the control station switch panel.

The parameters monitored include the following functions:

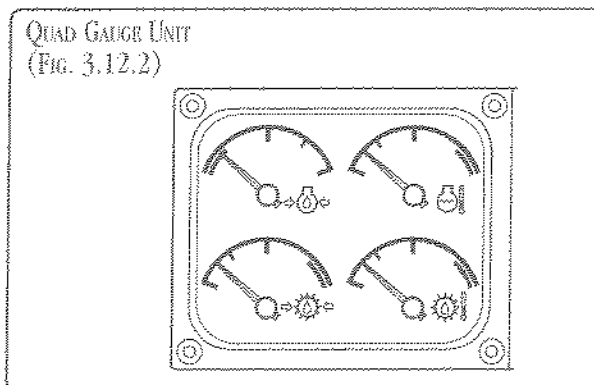
- Engine Overspeed (Main and Back-up Speed Sensors)
- Engine Oil Pressure

- Engine Coolant Temperature and Coolant Level
- Transmission Oil Pressure and Oil Temperature
- Percent Load (Actuator)
- Fuel Rate (Throttle)
- Engine Hours

Hour Meters

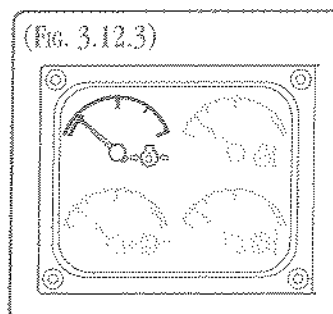
The hour meters measure cumulative hours of operating time. There are hour meters on top of each Caterpillar® engine and an hourmeter readout on the Main EMS display by method of scrolling. They should be used to keep a careful log of engine maintenance as well as performance data and fuel consumption. Do not leave ignition key on with the engines off, as this will increase the engine hours on the hour meter. The generator hour meter is located on the generator gauge panel.

QUAD GAUGE



The quad gauge unit displays in analog format engine oil pressure, engine coolant temperature, transmission oil pressure and transmission oil temperature.

OIL PRESSURE GAUGE



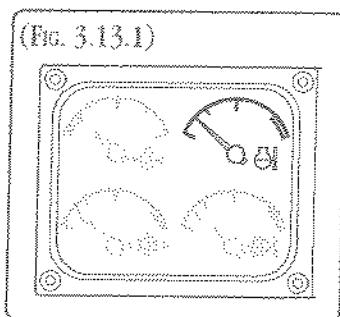
The oil pressure gauge is often the best indicator of engine problems or difficulties. Maximum pressure is controlled by a preset valve in the oil pump. Note the reading which this gauge records after the

break-in period, as it is the "norm" which can be used as reference during the life of the engine.

IF A COMPLETE LOSS OF OIL PRESSURE OCCURS, TURN ENGINE OFF AT ONCE. Continued running after loss of pressure will cause engine damage. First, manually check the oil level. If low oil level is not the cause, consult your Sea Ray® dealer. **DO NOT RESTART THE ENGINE UNTIL THE PROBLEM HAS BEEN CORRECTED.**

Slight fluctuations in gauge readings are not uncommon during operation and may be due to the characteristics of the lubricating oil. Greater fluctuations should be investigated. The cause may be a clogged oil filter element which should be replaced with every oil change.

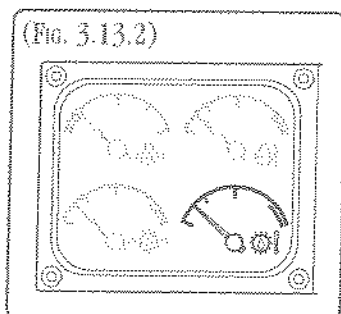
WATER TEMPERATURE GAUGE



The water temperature gauge indicates temperature of the cooling water circulating inside the engine. Your engine is equipped with a thermostat so a predetermined engine temperature

should be reached soon after starting the engine and maintained thereafter while the engine is running. Refer to your Engine Operator's Manual for proper gauge readings. **If the temperature approaches above normal on your gauge, shut down engine at once.**

TRANSMISSION OIL TEMPERATURE GAUGE



The transmission oil temperature gauge indicates temperature of the transmission fluid inside the engine transmission. **If the temperature approaches above normal on your gauge, shut down**

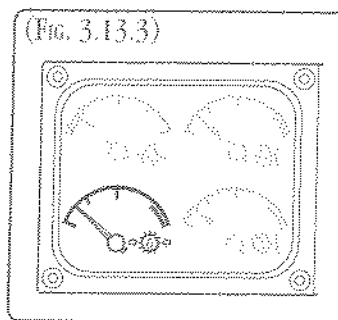
engine at once. Refer to Engine Owner's Manual for normal operating range.

TRANSMISSION OIL PRESSURE GAUGE



The transmission oil pressure gauge indicates pressure of the transmission fluid inside the engine transmission. **If the pressure approaches above or below normal on your gauge, shut down**

(Fig. 3.13.3)



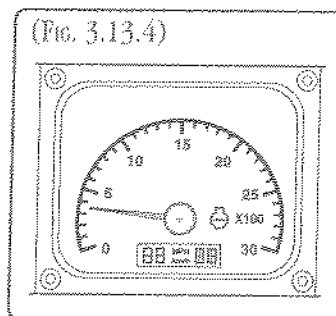
engine at once. Refer to Engine Owner's Manual for normal operating range.

Note: It is normal for the oil pressure to fluctuate when the engines are throttled up.

TACHOMETER



(Fig. 3.13.4)



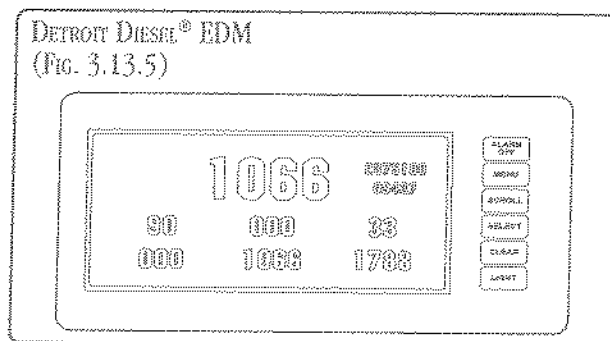
The tachometer indicates the revolutions per minute (RPM) of the engine on an analog gauge. It does not indicate the speed of the boat through the water or over the bottom. Your Engine Operator's Manual

states the maximum full throttle RPM at which your engine should operate. This should not be exceeded. The tachometer should also be used to determine the most comfortable and economical cruising RPM.

A three-digit LCD indicator displays vessel speed and a two-digit indicator displays trolling mode status or synchronization mode status.

DETROIT DIESEL ELECTRONIC DISPLAY MODULE (EDM)

DETROIT DIESEL® EDM
(Fig. 3.13.5)



The Electronic Display Module (EDM) automatically turns on with the ignition key. The module briefly sounds its audible alarm and

runs through checks of the display and internal circuits. Following the checks, it receives and displays engine and transmission data. It always shows engine speed, coolant temperature, oil pressure, fuel consumption rate, battery voltage, transmission oil temperature, transmission oil pressure, gear direction, and the active control station number.

The six pushbuttons on the keypad allow you to access information and features, displaying it in the text window.

SYSTEMS MONITOR (SPORT YACHTS ONLY)

The Systems Monitor consists of a Display Control Module (DCM) located at the control station and a Bilge Interface Module (BIM) located in the bilge. The DCM and BIM are connected to each other by a coax cable and the BIM is continuously looking at all inputs for an alarm condition.

The Systems Monitor is connected directly to the 24 volt battery bank through a circuit breaker and continuously monitors two emergency high water pumps, two bilge pumps and the bilge heat detector. The engine and generator functions are only active when ignition voltage is turned on. The circuit breaker is on the main DC breaker panel located in the bilge.

The BIM collects signals from critical engine functions, generator oil pressure, bilge pumps, high water emergency bilge pumps and bilge heat detection and transmits that information to be displayed on the DCM.

The features of the DCM include a two line LCD display with backlighting of the display, audible alarm and an Audible Reset/Alarm Select push button switch.

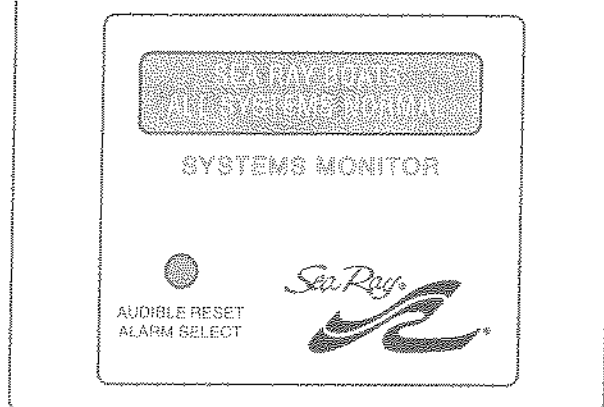
The LCD display will read in two lines. For example, at normal operation it will read:

SEA RAY BOATS
ALL SYSTEMS NORMAL

NOTE: Some functions only read on one line. See page 3.14 (DCM functions) for all DCM display readouts.

Backlighting of the LCD is achieved by turning ON the navigation lights switch. Intensity is controlled by the electronic dimmer control. Both are located on the control station switch panel.

SYSTEMS MONITOR DISPLAY CONTROL MONITOR (DCM)
(Fig. 3.14.1)



CAUTION

Never ignore an alarm.

CAUTION

IF THE ENGINE INDICATOR(S) AND ALARM COME ON WHILE RUNNING, QUICKLY CHECK AND NOTE THE OIL PRESSURE AND WATER TEMPERATURE GAUGE READINGS. TURN OFF ENGINE IMMEDIATELY. Check for leaks and see if the cooling water pickup is blocked or clogged. If necessary, clear the water pickup of any foreign matter. DO NOT RESTART THE ENGINE UNTIL CAUSE FOR ALARM SOUNDING HAS BEEN FOUND AND CORRECTED.

NOTICE

DIESEL ENGINES ONLY - If an engine stalls during docking or slow maneuvering, the buzzer will sound until the engine is restarted. The buzzer will also sound while the engines are cranking and will continue until they start.

ENGINE ALARM

Engines installed in Sea Ray® boats utilize an audible engine alarm. The alarm indicates a problem with one or more of the following: engine water temperature, engine oil pressure and transmission oil temperature.

Read the Engine Operator's Manual supplied by the engine manufacturer to learn how to use the engine properly.

DISPLAY CONTROL MODULE (DCM) FUNCTION TABLE

FUNCTION	DESCRIPTION	DCM
Normal Operation	No Alarms	SEA RAY BOATS ALL SYSTEMS NORMAL
BIM Coax Cable to DCM	Cable Connection Fault	DATA LINK FAILURE ALARM SYSTEM OFF-LINE
Forward Emergency *	Forward Emergency Pump Under the Master Stateroom Hatch is Running	PUMP ALARM FORWARD EMERGENCY
Aft Emergency *	Aft Emergency Pump in the Engine Room is Running	PUMP ALARM AFT EMERGENCY
Forward Bilge	Forward Bilge Pump in the Engine Room is Running	PUMP ALARM FORWARD BILGE
Aft Bilge	Aft Bilge Pump in the Engine Room is Running	PUMP ALARM AFT BILGE
Oil Pressure *	Engine Oil Pressure Too Low	PORT (OR STBD) ENGINE ALARM OIL PRESSURE
Water Temperature *	Engine Cooling System Too Hot	PORT (OR STBD) ENGINE ALARM WATER TEMPERATURE
Transmission Temperature *	Transmission Cooling System is Hot	PORT (OR STBD) ENGINE ALARM TRANSMISSION TEMPERATURE
Exhaust Temperature *	Engine Malfunction, Exhaust Too Hot	PORT (OR STBD) ENGINE ALARM EXHAUST TEMPERATURE
Fuel Filter Condition *	Fuel Filter Needs Cleaning	PORT (OR STBD) ENGINE ALARM FUEL FILTER CONDITION
Generator Alarm *	Generator Oil Pressure is Low Generator Stopped Running	GENERATOR ALARM (No Second Line Reading)
Engine Diagnostics * Mercruiser® Engines Only	Mercruiser® Engine Alarm	PORT (OR STBD) OIL PRESSURE, WATER TEMPERATURE OR TRANSMISSION TEMPERATURE ALARM
CAT® Diagnostics * Caterpillar® Electric Engines Only	For CAT® Diagnostic Engines	PORT (OR STBD) ENGINE ALARM CAT DIAGNOSTIC

The CAT® Diagnostic feature is for Caterpillar® electronic engines and will refer the operator to look at the port or starboard Caterpillar® Engine Monitoring System (EMS) on the gauge panel at the helm. See Fig. 3.10.1 and text for more information about the EMS gauge unit.

* Function has an audible alarm.

SECTION 4 • FUELING & STARTING

FUEL SYSTEMS

Fuel lines, filters and all fuel system components should be checked at the start of each season and periodically thereafter, particularly after any work has been done aboard the boat, which might have affected any part of the system. Be certain that all are in proper condition and that the entire system is fuel tight.

Only a qualified marine mechanic should be allowed to work on the fuel system. Damage can be done to fuel system components by indiscriminate tightening of connections, including flexible fuel line sections.

Make sure that fuel lines are in good condition and that they do not come in contact with any moving parts.

WARNING

DO NOT store fuel or flammable liquids in closed storage areas. Ventilation has not been provided for explosive vapors.

WARNING

Leaking fuel is a fire and explosion hazard. Inspect system regularly. Examine fuel tanks for leaks or corrosion at least annually.

CAUTION

Never start an engine until you are certain that gasoline fumes are not present in engine compartment or elsewhere in the boat.

NOTICE

In rough seas, allow approximately 15% reserve when planning fuel consumption.

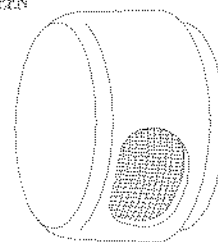
FUEL TANK

The fuel system aboard your Sea Ray® consists of one or two fuel tanks, depending on boat model, and one of the following for each tank: fuel fill, fuel tank vent and anti-siphon valve. Some Sport Yachts

may be equipped with electric fuel valves in lieu of anti-siphon valves.

The fuel tank vent (Fig. 4.1.1) serves as a pressure/vacuum release and safety overflow. The thru-hull fitting has a flame arrester, making it imperative that you keep the screen clean and in excellent repair. Replace the screen immediately if it becomes damaged or displaced. Periodically check the vent to assure that it is not clogged.

FUEL VENT WITH SCREEN
(FIG. 4.1.1)



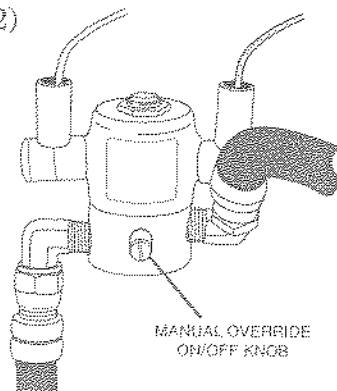
ELECTRIC FUEL VALVES

(GASOLINE SYSTEMS ONLY)

All gasoline engines and generators are equipped with an electric fuel valve installed in-line on the fuel hose between the fuel tank and the engine or generator. The valve is wired to the ignition switch. When the ignition is turned ON, the valve opens; when the ignition is turned OFF, the valve closes. The manual override knob on the side of the valve should be left in the OFF position at all times.

In the event of an electrical malfunction, the valve can be opened and closed manually by turning the manual override knob.

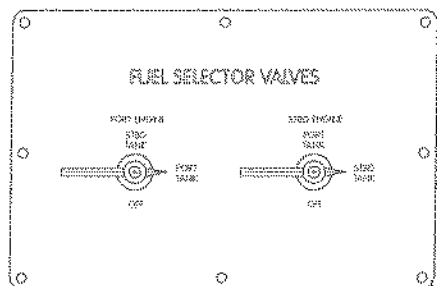
TYPICAL ELECTRIC FUEL VALVE
(FIG. 4.1.2)



CROSSOVER FUEL SYSTEM (DIESEL ONLY)

The crossover fuel system (Fig. 4.1.2) allows the engines to draw fuel from either tank. This allows switching to an alternate tank in case of fuel contamination or for even fuel weight distribution.

TYPICAL CROSSOVER FUEL BOARD (DIESEL)
(Fig. 4.2.1)



During normal operating conditions of boats equipped with diesel engines, set the return fuel valves to the same tank the engine is drawing fuel from. Example: If the port engine is drawing fuel from the port fuel tank and starboard engine is drawing fuel from the starboard fuel tank, set the return fuel valve for the port engine to the port tank and the starboard engine to the starboard tank.

FUEL RECOMMENDATIONS

The quality of the fuel is very important for satisfactory engine performance and long engine life. Fuel should be clean and free of contamination. Your fuel tanks should be kept full of fuel whenever possible. This will reduce the amount of water condensation and reduce the possibility of contamination.

CAUTION

Use of improper gasolines can damage your engine seriously. Engine damage resulting from use of improper gasoline is considered misuse of engine and voids warranty.

NOTICE

Always use fresh gasoline. Gasoline forms gum and varnish deposits, and may cause trouble if held in a tank for too long.

NOTICE

GASOLINE RECOMMENDATIONS



The use of any good grade unleaded regular or premium gasolines with a minimum posted octane rating [(A.K.I.) Anti-Knock Index] of 87, are satisfactory for use in gasoline marine engines. In areas where unleaded regular or premium gasolines are not available, a good grade leaded regular with a minimum posted octane rating (A.K.I.) of 89 may be used. However, gasolines containing alcohol, either methyl alcohol (methanol) or ethyl alcohol (ethanol) may cause increased:

1. Corrosion of metal parts.
2. Deterioration of rubber and plastic parts.
3. Fuel permeation through flexible fuel lines.
4. Wear and damage of internal engine parts.
5. Starting and operating difficulties.

AVOID USING FUELS WITH ALCOHOL ADDITIVES

RECOMMENDED FUEL: (GASOLINE)



Some of these adverse effects are due to the tendency of gasolines containing alcohol to absorb moisture from the air, resulting in a phase of water and alcohol separating from the gasoline in the fuel tank.

The adverse effects of alcohol are more severe with methyl alcohol (methanol) and are worse with increasing alcohol content.

FUEL FILTERS: (GASOLINE)



The fuel filters installed on the engine should be replaced in accordance with the Engine Owner's Manual. The filters help keep the fuel free of water and contamination and keep particles from entering the engine's carburetor.

RECOMMENDED FUEL: (DIESEL)



#2 Diesel fuel.

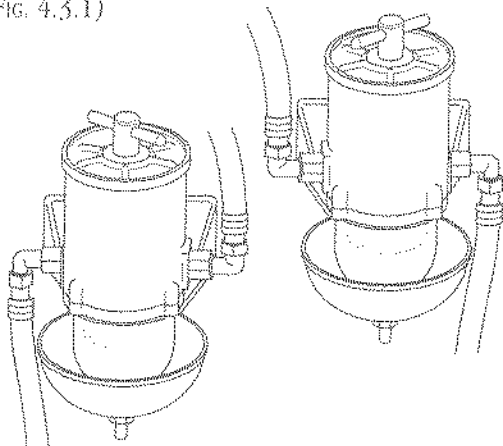
FUEL FILTERS: (DIESEL)



Primary and secondary fuel filters are installed on each engine of your Sea Ray® to help keep the fuel as clean as possible. Primary fuel filters are the Racor water separating fuel filters. The secondary fuel filters should be replaced in accordance with the Engine Owner's Manual.

Use of any methanol, gasohol or alcohol based fuel additive will damage the fuel filter.

RACOR® WATER SEPARATING FUEL FILTERS
(Fig. 4.3.1)



REFER TO THE ENGINE OPERATORS MANUAL FOR MORE DETAILED INFORMATION.

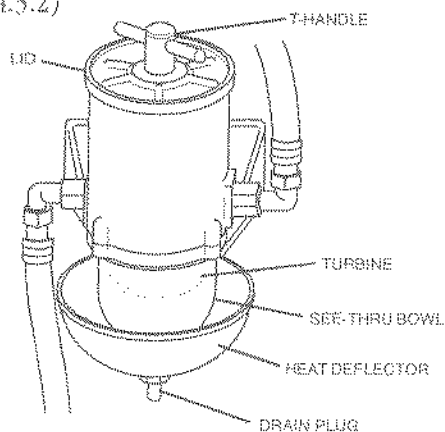
RACOR® FUEL FILTER MAINTENANCE

A major cause of poor starting or power loss is the result of a clogged filter element or a fuel system air leak. Check that the lid and drain plug are properly tightened.

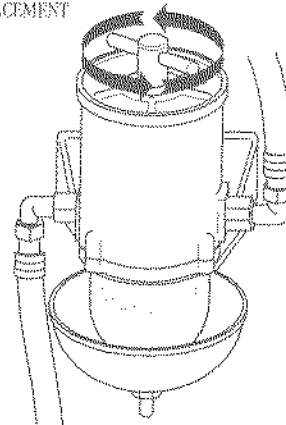
Inspect or drain the collection bowl of water daily. To drain water:

1. Shut down the engine of the filter to be maintained.
2. Loosen the T-handle on the top lid to break the vacuum within the filter (see Fig. 4.3.3).
3. With a suitable collection container in place, remove the drain plug and drain water and contaminants (see Fig. 4.3.2).

RACOR® WATER SEPARATING FUEL FILTERS DRAIN PLUG
(Fig. 4.3.2)



RACOR® WATER SEPARATING FUEL FILTERS
ELEMENT REPLACEMENT
(Fig. 4.3.3)

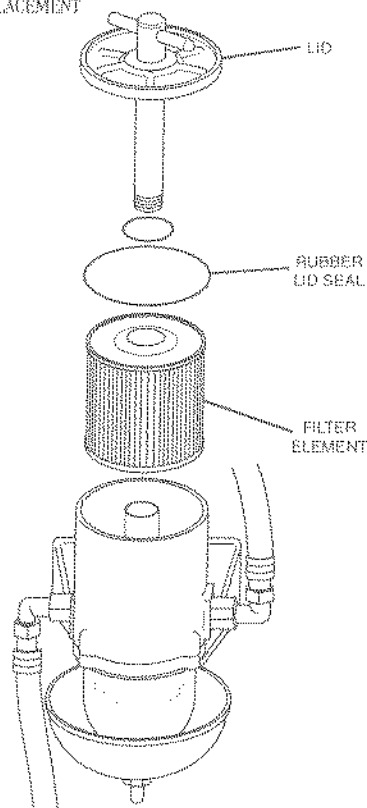


4. Replace the drain plug and, if necessary, prime the filter by removing the lid and filling the filter with clean fuel.
5. Replace the lid and tighten the lid T-handle by hand only. Do not overtighten.

Replace the filter element at regular intervals or if power loss is noticed. To replace the element:

1. Shut down the engine of the filter to be maintained.
2. Remove the lid. Remove the element by holding the molded handle and slowly pulling upward with a twisting motion (see Fig. 4.3.4).

RACOR® WATER SEPARATING FUEL FILTERS
ELEMENT REPLACEMENT
(Fig. 4.3.4)



3. Replace the lid rubber seal with the one supplied with the new element. Apply a coating of clean fuel or motor oil to this seal prior to reassembly. Insert the new element with a slow downward twisting motion.
4. Fill the filter with clean fuel, then replace the lid. Tighten the lid T-handle by hand only. Do not overtighten.
5. Start the engine and check for leaks. Correct any leaks with the engine shut down.

It is recommended that spare filter elements be carried as one tankful of excessively contaminated fuel can plug a filter.

FUELING PRECAUTIONS



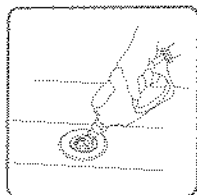
Certain precautions must be carefully and completely observed every time a boat is fueled, even with diesel fuel. Diesel fuel is nonexplosive but it will burn.

BEFORE FUELING

- Make sure your boat is tied securely to the fueling pier.
- Turn off engines, bilge blowers, fans and other devices that can produce a spark.
- Close all windows, doors and hatches to prevent fumes from entering the boat.
- Disembark all people not needed for the fueling operation.
- Prohibit all smoking on board and nearby.
- Have a fire extinguisher close at hand.
- Ensure fuel is filled in filter pipe marked "Fuel".

WHILE FUELING

- Do not leave boat unattended.
- Keep nozzle or can spout in contact with the fill opening to guard against static sparks.
- Do not spill fuel.
- Do not over fill. Filling a tank until fuel flows from the vents is dangerous. Allow room for expansion.



AFTER FUELING

- Close fill openings.
- Open windows, doors, hatches.

- Wipe up any spilled fuel. Dispose of wipe-up rags on shore.

⚠ DANGER

GASOLINE VAPORS CAN EXPLODE.

Before Starting Engine:

- Check engine compartment for gasoline vapors.
- Operate blower for 4 minutes.

Run blowers below cruising speed.

- Check for fuel fumes in the bilge; continue to ventilate until odor can no longer be detected. Check for any drips or liquid fuel.

⚠ WARNING

DO NOT run the engines or generator in an enclosed area, such as a closed boat house, as there is the possibility of build-up and inhaling of carbon monoxide.

⚠ CAUTION

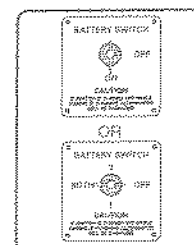
Ensure that engine compartment openings are clear and free of debris (i.e. bird nests, bees nests, etc.)

STARTING ENGINES

The engine operation and maintenance manual furnished with your boat describes pre-start and starting procedures. **The following notes are basic reminders; they are not intended to cover every detail of starting. We urge you to thoroughly read and understand your engine manual.**

STERN DRIVES

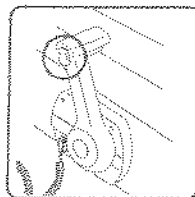
1. Turn battery switch to ON for ON/OFF type battery switch or BOTH position for dual battery switch (as equipped).



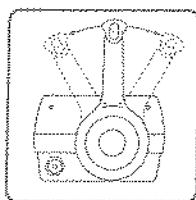
- Run bilge blowers at least four minutes. Check the bilge for fuel fumes or liquid. Always check bilge by visual inspection and smell. Do not start the engine until the source of fumes is determined and corrected and the bilge area is safely ventilated.



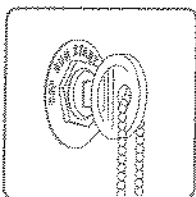
- Place drive unit(s) in full DOWN/IN position.



- Place control handle in NEUTRAL.

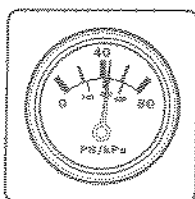


- Position throttle setting as follows:
COLD ENGINE - Press THROTTLE ONLY button and move control/throttle lever to full throttle, then return to about 1/4 throttle. In extreme cold it may be necessary to pump lever more than once.
WARM ENGINE - Press THROTTLE ONLY button and move control/throttle lever to 1/4 throttle position.
FLOODED ENGINE - Press THROTTLE ONLY button and move control/throttle lever to full throttle. Be prepared to decrease engine speed to 1000-1500 RPM as soon as engine starts.
- Turn ignition key clockwise to START. Release key when engine starts and allow switch to return to RUN position. Move control/throttle lever back to decrease engine RPM to 1000-1500 RPM if necessary.

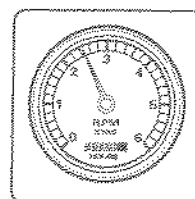


AFTER STARTING ENGINE:

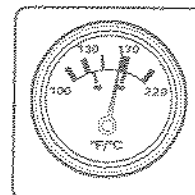
- Check oil pressure gauge immediately after engine starts. If oil pressure is not within specified range, (see engine operator's manual ENGINE SPECIFICATIONS), stop engine immediately and determine cause.



- If engine is cold, run engine for 1 or 2 minutes at fast idle (1000-1500 RPM).

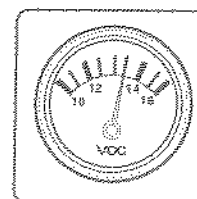


- After engine has warmed up, check water temperature gauge to ensure that engine temperature is not abnormally high. If it is, stop engine immediately and determine cause.



NOTE: Refer to engine Owner's Manual for correct reading.

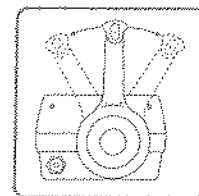
- Be sure charging system is functioning correctly.



- Observe power package for fuel, oil, water and exhaust leaks. The engine and electrical equipment should be shut off if fuel leaks are found.

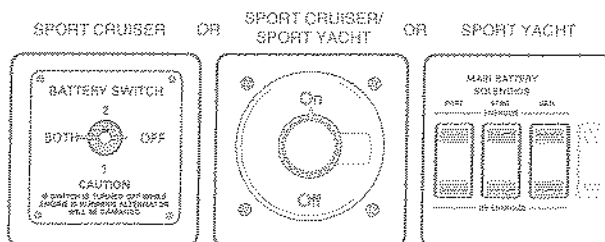
SHIFTING

- To shift drive unit, return control/throttle lever to NEUTRAL, (THROTTLE ONLY button will pop out to engage shifting when lever is advanced).
- Move control/shift lever with a firm, quick motion forward to shift to FORWARD gear, or backward to shift to REVERSE. After shifting drive unit, advance throttle to desired setting.

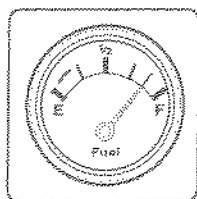


INBOARD ENGINES

- Check battery switch(es) for ON position.



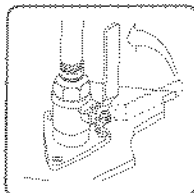
2. Check the fuel tank level.



3. Check the oil and coolant levels. See your Engine Operator's Manual for proper readings.

4. Check engines for coolant drain plug installations.

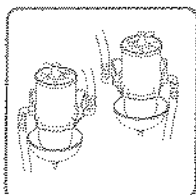
5. Check seacocks for open position.



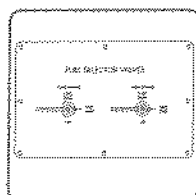
6. Make sure strainers are clean and watertight.



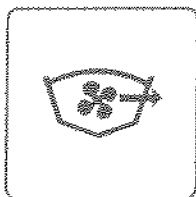
7. Check fuel filter tops for tightness.



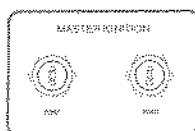
8. Check fuel valves on crossover fuel board (diesel only).



9. With gasoline engines, run bilge blowers at least four minutes. Check the bilge for fuel fumes or liquid. **Do not start the engine(s) until the source of fumes is determined and corrected and the bilge area is safely ventilated.**

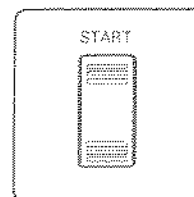


10. Turn MASTER IGNITION breakers and keys, located on the DC distribution panel, ON. Listen for alarm buzzers which indicate ignition power.



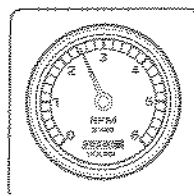
NOTE: With gasoline engines there is about a five (5) second delay before the buzzer sounds.

11. After ignition power is verified, check shift for neutral position and push and hold ignition switch to the momentary start position to start the engine(s).



Important: Do not operate starter for more than 10 seconds without allowing starter to cool off for 2 minutes. This will also allow the batteries to recover between starting attempts. Once engine has started and sufficient oil pressure is achieved, alarm buzzer will stop.

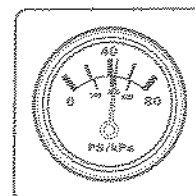
Important: Check engine RPM on tachometer as soon as engine starts. Do not allow RPM to exceed 1500. Move throttle lever down to decrease RPM.



Alarm Will Sound When:

- Engine oil pressure is too low.
- Engine temperature is too hot.
- Outdrive oil is too low. (Stern drive only)
- Transmission temperature is too hot. (Inboard only)
- Engine stalls.

12. Check the oil pressure and look at exhaust port to assure that the engine is pumping water.



13. Let the engines warm up at idle and check for leaks. If engine is cold, run for a short period of time at fast idle speed that does not exceed 1500 RPM.

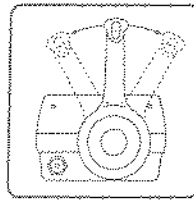
14. Shut down the engines and recheck fluid levels; top off if necessary.

NOTE: For general operation of the engine, its instruments and controls, follow detailed instructions on *Engine Break-In* in the Engine Operator's Manual.

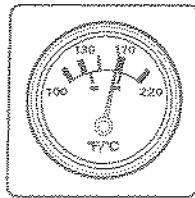
STOPPING THE ENGINES

STERN DRIVES

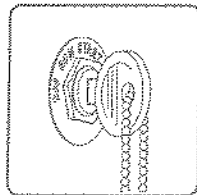
1. Move control/shift lever to **NEUTRAL** and allow engine to drop to **IDLE** speed.



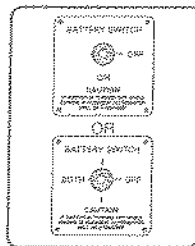
2. Secure mooring lines.
3. If engine has been run at high speed for a long period of time, allow engine to cool by running at **IDLE** speed for 3 to 5 minutes.



4. Turn ignition key to **OFF**.

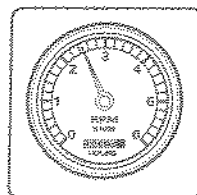
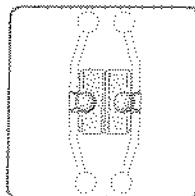


5. (If applicable) Turn battery switch and fuel shut-off valve to **OFF** position.

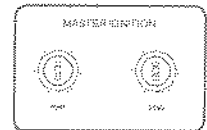


INBOARD ENGINES

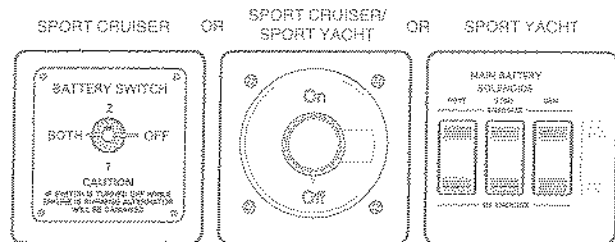
1. Bring throttle controls to **IDLE** position.
2. Bring gear shift controls to **NEUTRAL** position.
3. Secure mooring lines.
4. Idle engine for 5 minutes to cool the engine.



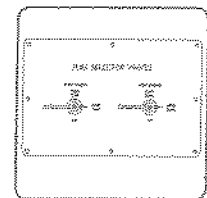
5. Turn ignition switches to **OFF** position.



6. Turn battery switches **OFF**.



7. Turn fuel valves **OFF** (diesel only).



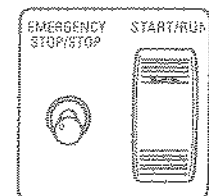
EMERGENCY STOP SWITCH

(DUAL CONTROL STATION BOATS ONLY)

Your boat may be equipped with an emergency stop switch. The emergency stop switch gives the boat operator the ability to shut down the engines from the opposite control station from which they were started. The switch need not be used if starting and stopping the engines from the same control station.

OPERATION OF EMERGENCY STOP SWITCH

1. If the momentary start switch is in the **RUN** position, switch to **OFF** position.
2. Press and hold emergency stop switch until engine(s) stops completely. Release switch.



NOTE: Run bilge blowers for 4 minutes before restarting engine(s). Follow **engine starting instructions**.

SECTION 5 • WATER SYSTEM

WATER SYSTEMS

The fresh water system aboard your boat is pressurized. When a faucet is opened, pressure in the system is reduced as the water level drops. A pump is activated by a pressure sensing switch in the pump. The pump will continue to run after all faucets are closed and the pressure set point of the sensor is reached.

Hot water is provided by either a heat exchanger connected with the engine or an electric hot water heater (see Fig. 5.4.1).

The fresh water system is activated by the FRESH WATER PUMP circuit breaker on the main distribution panel. The breaker must be ON to operate the head, shower, ice maker, fresh water wash down or faucets.

FILLING THE WATER TANK

To fill your water tank you should use a plastic hose. Do not use a rubber hose; it can give the water a disagreeable flavor. The hose should be kept for filling use only. After using the hose it should be emptied. Start at one end and raise the hose to shoulder level and walk to the opposite end of the hose, allowing the remaining water to flow out. You should store your water tank filling hose in a dry, clean place. It is also a good practice to cover the ends of the hose to keep the inside clean.



CAUTION

Fresh water fill plate is clearly marked for water only. Do not attempt to put anything other than fresh water in tank.

To begin initial operation, fill the tank with water and open all faucets, both hot and cold. Switch the pump to the ON position. Allow time for the water heater to fill. Shut off each faucet, cold first, as flow becomes steady and free of air. Shutting off the last faucet should cause the pump to shut off. If pump does not stop after one (1) minute, check system for leaks.

CHECKING WATER LEVEL

To check the water level in the tank, press the water level switch on the main distribution panel located

in the salon. The display will indicate the amount of water in the tank.

SANITIZING THE WATER SYSTEM

Although your dealer initially sanitizes the water system, if the system has not been used for a long period of time or you suspect it may be contaminated, use a water treatment additive to sanitize the potable water system. Water treatment additives are available at marine/RV supply stores.

If water treatment additives are not available, adhere to the following procedure for complete sanitation of your potable water system.

1. Prepare a 64:1 water-chlorine solution (one gallon [4 liters] of water and 1/4 cup [60 ml] Clorox or Purex household bleach [5% Hypochlorite solution]). With tank empty, pour chlorine solution into tank, using one gallon solution for each 15 gallons of tank capacity (one liter for each 15 liters of tank capacity).
2. Complete filling tank with fresh water. Open each faucet and drain cock until air has been released and the entire system is filled.
3. Allow to stand for three hours.
4. Drain and flush with potable fresh water.
5. To remove excessive chlorine taste or odor which might remain, prepare a 20:1 water-vinegar solution (five gallons [20 liters] water to one quart [one liter] vinegar) and allow this solution to agitate in the tank for several days by vehicle motion.
6. Drain tank and again flush with potable water.

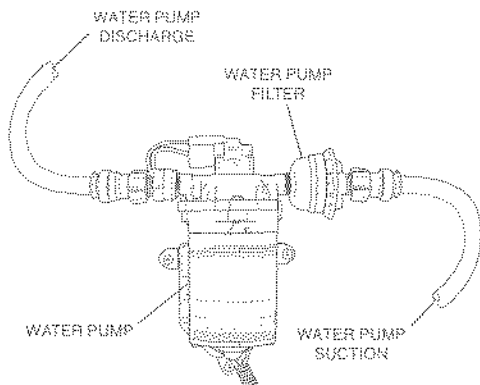
WATER PUMP & FILTER

The pump has a filter to prevent particles from entering the pump head. The filter should be checked and cleaned periodically (see Fig. 5.2.1).

Some water tanks, where the pump is installed lower than the tank, are fitted with a shut-off valve located in-line between the tank and the pump. The valve is provided so that you can disconnect the water pump connections without having to drain the water tank.

Before servicing the system, turn the WATER SYSTEM breaker OFF and release pressure on the system by opening a faucet.

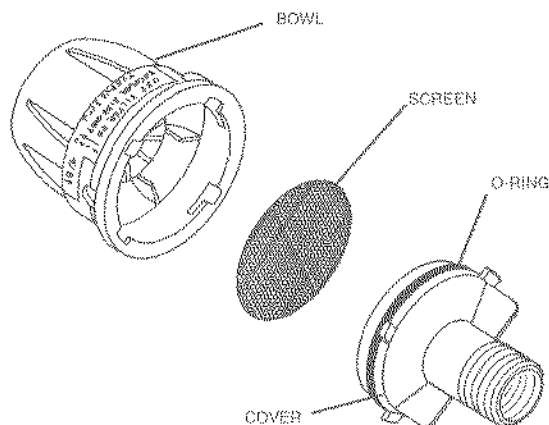
WATER PUMP AND FILTER
(Fig. 5.2.1)



TO CLEAN THE WATER PUMP FILTER:

1. Turn the WATER SYSTEM breaker OFF
2. Release pressure on the system by opening a faucet.
3. Remove the screen and rinse with clean water.
4. Replace, making sure the O-ring is in place when replacing the cover.

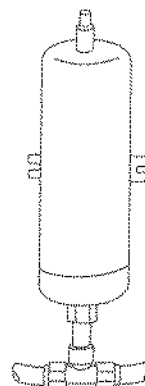
WATER PUMP FILTER
(Fig. 5.2.2)



PNEUMATIC ACCUMULATOR TANK

The pre-pressurized pneumatic accumulator tank is located in the bilge adjacent to the water pump and filter. The function of the tank is to provide the pressurized water system with an air back-pressure water reservoir, which provides instant water pressure to the faucet outlets before the pump must start.

PNEUMATIC ACCUMULATOR TANK
(Fig. 5.2.3)



REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

Water Heater

The water heater runs off the 120 volt dockside system or generator and has a "WATER HEATER" circuit breaker on the main distribution panel that must be ON to operate the unit.

The water heater has a check valve to prevent hot water from back-washing into the cold water source and a pressure relief valve to avoid damage to the heater from over pressure or too high a temperature.

The hot water exchanger is designed to heat water without having to turn the hot water heater on. It works by pumping water from the engine cooling system, out the intake manifold to the hot water heater. It is then circulated through a coil inside the water heater where it heats the potable water. The water from the engine then exits the water heater and returns to the engine through the engine water pump.

INITIAL START-UP OR AFTER WINTERIZATION

1. Make sure the WATER HEATER breaker is OFF.
2. Make sure drain and pressure relief valve is closed.
3. Fill the heater with water by turning ON the FRESH WATER PUMP breaker.
4. Open the hot water faucets until all air is eliminated from the system.
5. Make certain the heater is full of water. **COMPLETE FAILURE OF THE HEATING ELEMENTS WILL RESULT IF THEY ARE NOT COMPLETELY IMMERSSED IN WATER AT ALL TIMES.**
6. Turn the WATER HEATER breaker ON.

The water heater is equipped with an adjustable combination temperature regulating control and manual reset high limit device located behind the lower access cover. **ALWAYS DISCONNECT POWER TO THE UNIT BEFORE REMOVING THE ACCESS COVER.** Refer to the water heater information in the Owner's Manual Packet for instructions on adjusting the thermostat.

To maintain water heater properly, drain whenever the possibility of freezing occurs and frequently inspect lines and connections for leaks.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

SHOWER SYSTEM

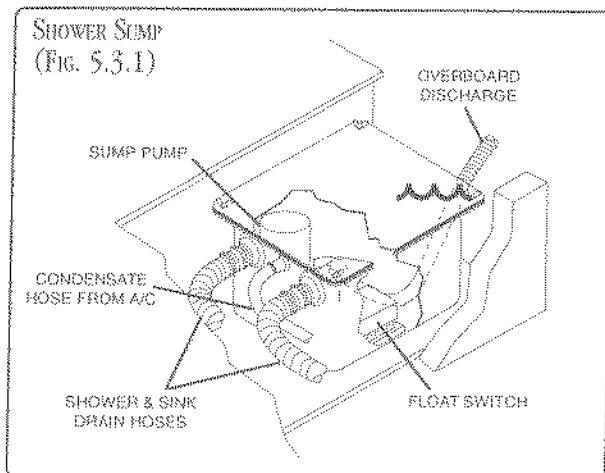
The shower drains into a self-contained shower sump containing a pump and float switch.

NOTE: Air conditioner condensation also drains into the shower sump.

The sump pump is fully automatic and is protected by a breaker on the main DC distribution panel (see Supplemental Information for the location in your boat). Check the pump and float switch for obstructions and proper working order.

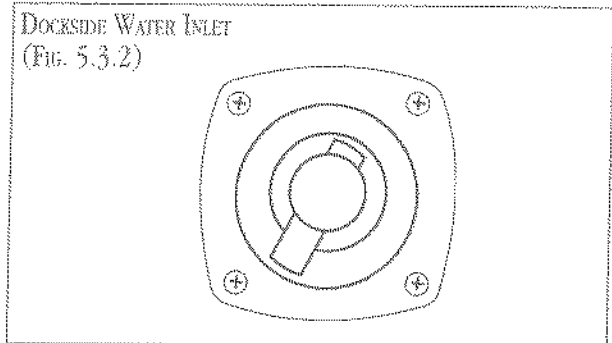
The pump comes on when there is enough water in the sump to raise the float switch and start the pump. If it does not come on after one or two gallons of water drain from the shower, turn the water off and check the pump and float switch for proper operation.

After using the shower, it is recommended that you run a gallon of clean water through the shower drain to clean out soap residue. Check the pump and float switch for obstructions and proper working order.



FRESH WATER WASHDOWN

The washdown spigot is located in the cockpit. The system uses water from the fresh water tank. The WATER SYSTEM breaker must be ON to operate the system.



WARNING

- Before connecting dockside water hose to the sport yacht's dockside water inlet, ensure that dockside water pressure does not exceed your sport yacht's water system pressure limit.
- **DO NOT** leave boat unattended with the dockside water hose connected.
- Dockside water should be connected during periods of heavy water usage only.

DOCKSIDE WATER INLET

The dockside water inlet allows use of a dockside water source to provide water for the boat's fresh water system.

To Use The System:

1. Make sure the WATER SYSTEM breaker is OFF.
2. Remove the plug from the face of the dockside water inlet.
3. Connect a drinking water hose to the water outlet on the dock, then to the dockside water inlet on the boat and turn on the water at the dock.

All fresh water faucets and showers are now usable. To disconnect the system, reverse the procedure, making sure the plug is reinstalled tightly.

GRAY WATER SYSTEM

(OPTIONAL ON SOME MODELS)

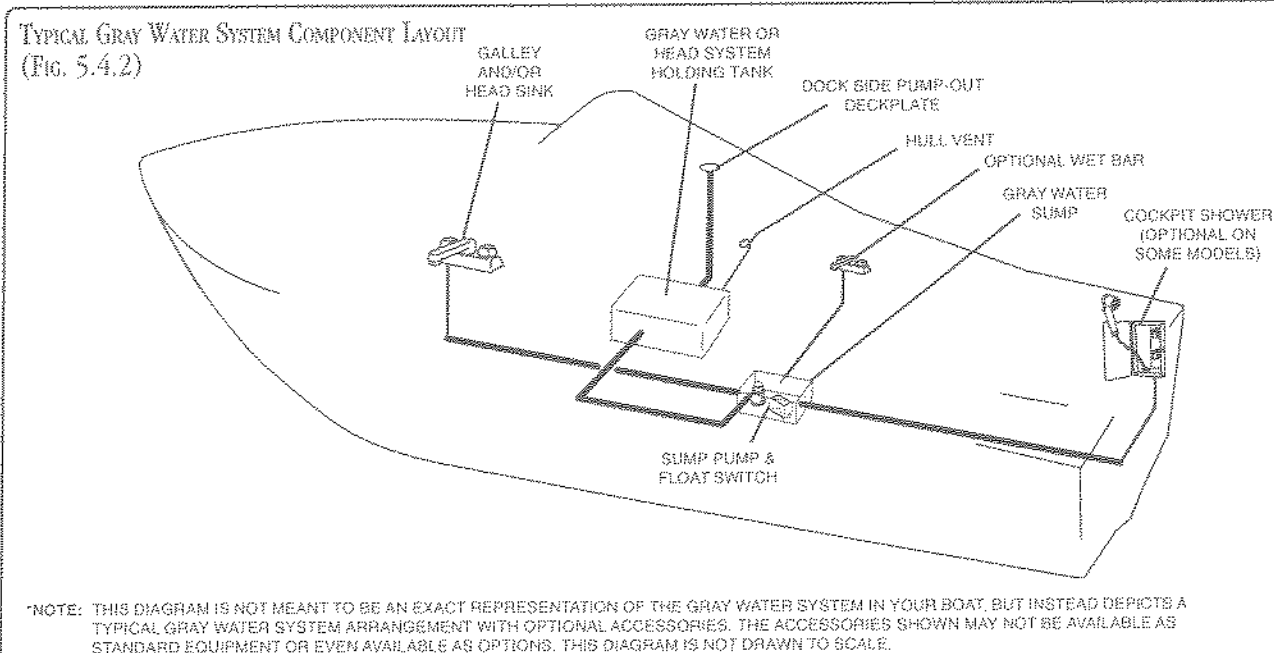
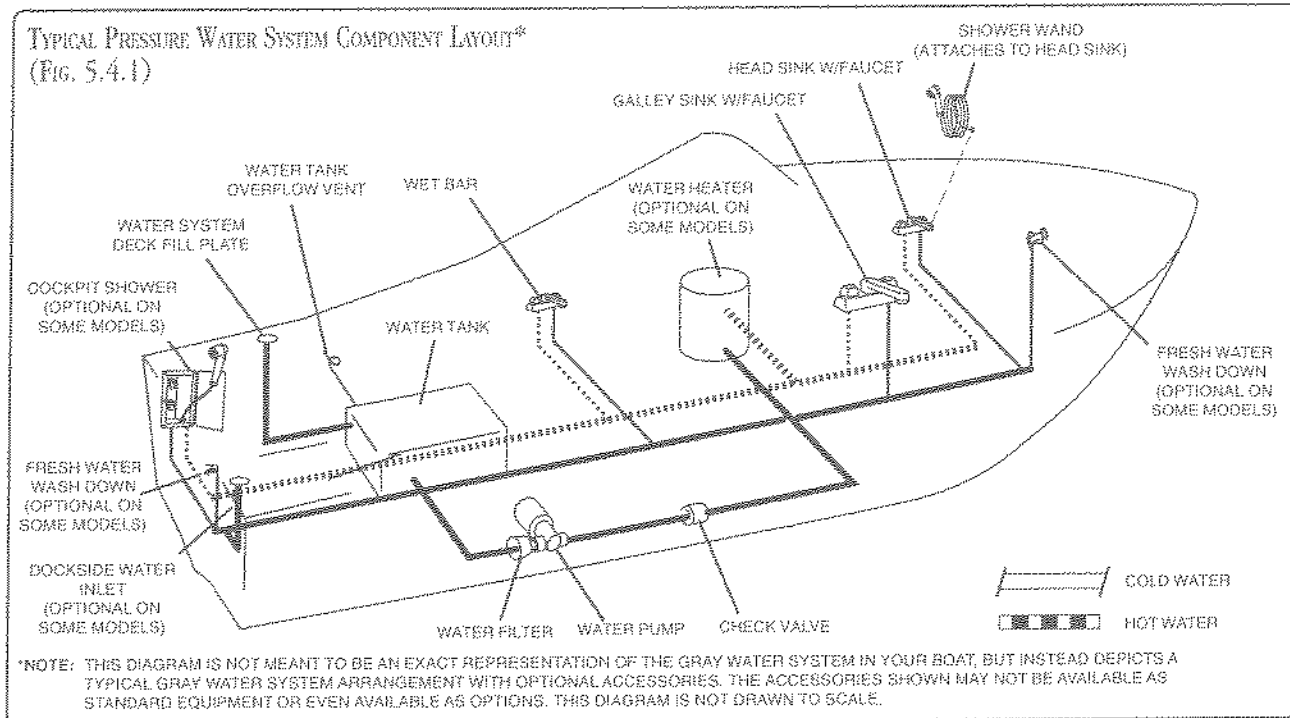
The gray water system is designed for boats that are used in areas that restrict overboard water discharge (see Fig. 5.4.2).

The system directs waste water from accessories such as the galley and head sinks and shower to a

sump that is fitted with a float switch and pump that pumps the water to the gray water tank. The tank must be emptied when it becomes full.

To empty the gray water system holding tank, the services of a dockside pump out station will be needed.

Follow instructions at the station and make sure pump out station hose is inserted into the deck plate marked GRAY WATER/WASTE.



SECTION 6 • HEAD SYSTEM

HEAD SYSTEMS

Your Sea Ray® Sport Cruiser or Sport Yacht is available with a variety of head system options. Below is a description of each option. You should be aware of which option(s) your boat is equipped with and read the sections pertaining to it. The Owner's Manual Packet in your boat contains information pertaining to your head system that should be carefully read.



CAUTION

Do not flush facial tissue, paper towels or sanitary napkins in head. Such material can damage waste disposal system and the environment.

NOTICE

There is a possibility of being fined for having an operable direct overboard discharge in some waters. Close waste discharge seacock and remove handle or take other measures to avoid fine.

REQUIREMENTS FOR OPERATORS

The Environmental Protection Agency (EPA) standards state that in freshwater lakes, freshwater reservoirs or other freshwater impoundments whose inlets or outlets are such as to prevent the ingress or egress by vessel traffic subject to this regulation, or in rivers not capable of navigation by interstate vessel traffic subject to this regulation, marine sanitation devices certified by the U.S. Coast Guard installed on all vessels shall be designed and operated to prevent the overboard discharge of sewage, treated or untreated, or of any waste derived from sewage. The EPA standards further state that this shall not be construed to prohibit the carriage of Coast Guard-certified flow-through treatment devices which have been secured so as to prevent such discharges. They also state that waters where a Coast Guard certified marine sanitation device permitting discharge is allowed include coastal waters and estuaries, the Great Lakes and interconnecting waterways, freshwater lakes and impoundments accessible through locks,

and other flowing waters that are navigable interstate by vessels subject to this regulation (40 CFR 140.3).

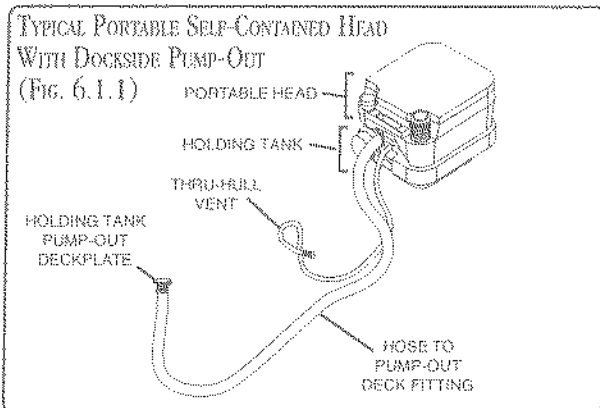
PORTABLE SELF-CONTAINED HEAD

The portable self-contained unit has two individual holding tanks. The top tank is fitted with a hand pump and holds the fresh water and chemicals. The bottom tank holds waste material.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

PORTABLE SELF-CONTAINED HEAD WITH DOCKSIDE PUMP-OUT

The optional portable head with dockside pump-out is the same head as described above, except that the bottom holding tank has a dockside pump-out hose attached. The hose leads to a waste plate on the deck. The holding tank can be emptied by a dockside sewage pump-out station (see *Dockside Pump-Out Option* in this section) or pumped directly overboard using the macerator option (see *Macerator* in this section).

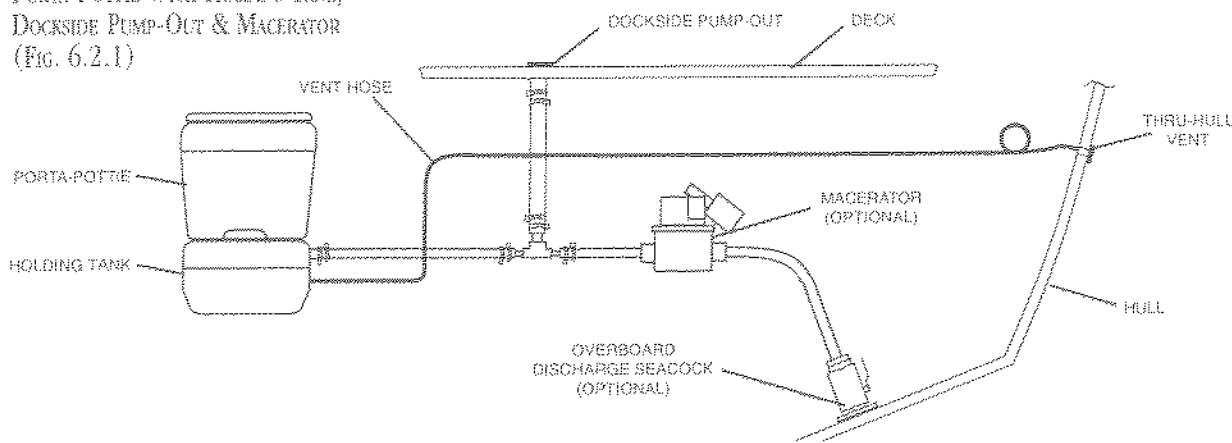


REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

DOCKSIDE PUMP-OUT OPTION

To empty the holding tank, the services of a dockside pump-out station will be needed. Follow the instructions at the station and make sure the pump-out station hose is inserted into

PORTA-POTTIE WITH HOLDING TANK,
DOCKSIDE PUMP-OUT & MACERATOR
(FIG. 6.2.1)



the deck plate marked WASTE. The holding tank can also be emptied by using the macerator, if your boat is equipped with this option (see *Macerator* in this section).

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

VACUFLUSH® HEAD

The VacuFlush® head utilizes a HEAD SYSTEM breaker on the main distribution panel. The foot pedal at the base of the toilet opens a mechanical seal and vacuum forces waste through the opening in the bowl to an accumulator tank, through the vacuum pump and then to the holding tank or treatment tank. To Operate:

1. Turn ON the WATER SYSTEM breaker.
2. Turn ON the HEAD SYSTEM breaker.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

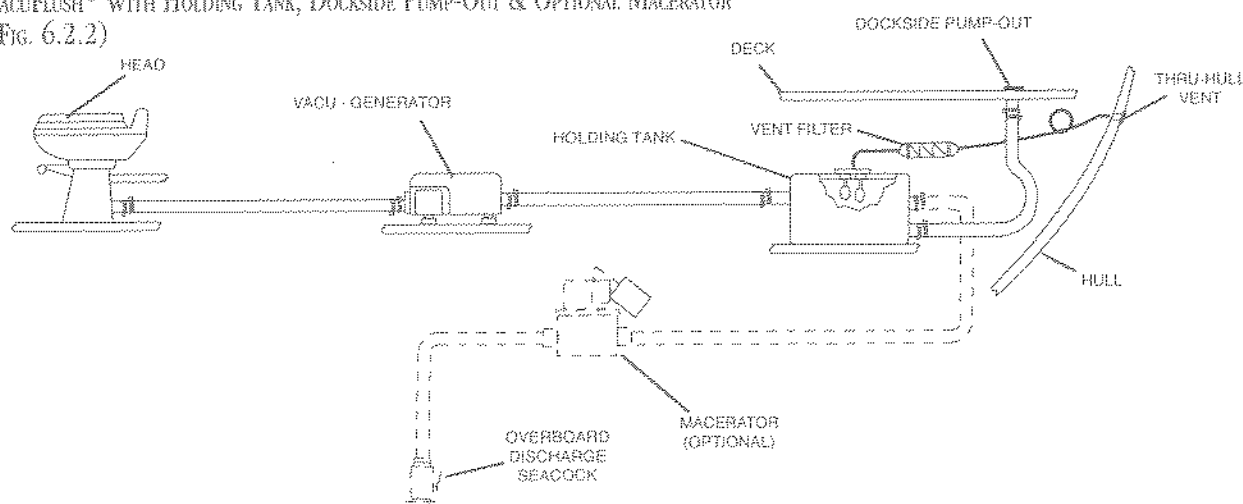
HOLDING TANK OPERATION

Waste from the head is directed into the holding tank located in the bilge. The holding tank fluid level indicator is located on the main distribution panel or in the head which indicates 3/4 FULL, FULL and DO NOT FLUSH, or on some models may read FULL, 1/2, or EMPTY. When the FULL light is on, the DO NOT FLUSH light will also be on. When these lights are ON, the holding tank must be emptied before the head can be reused.

DOCKSIDE PUMP-OUT

To empty holding tank, the services of a dockside pump out station will be needed. Follow instructions at the station and make sure pump out station hose is inserted into the deck plate marked WASTE. The holding tank can also be emptied through utilization of the macerator (if supplied) (see *Macerator* in this section).

VACUFLUSH® WITH HOLDING TANK, DOCKSIDE PUMP-OUT & OPTIONAL MACERATOR
(FIG. 6.2.2)



MACERATOR (OPTIONAL)

The macerator gives the boat operator the means of discharging the holding tank contents directly overboard through a seacock in the bottom of the hull. This option is available in conjunction with the dockside pump out. **DISCHARGE OF SEWAGE DIRECTLY OVERBOARD IS FOR USE ONLY WHERE APPROVED.**

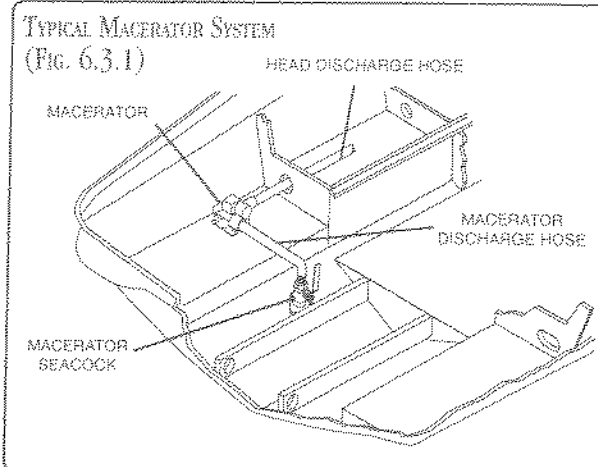
Since direct overboard discharge is prohibited in many areas, the macerator seacock is normally closed. The macerator seacock is equipped with a system interlock switch which prevents the operation of the macerator when the macerator seacock is closed. The light on the MACERATOR switch on the DC Distribution Panel will be lighted when the macerator is operational. If the light is not lighted, it is visual confirmation the macerator seacock is closed and that the macerator cannot be operated. Check that the macerator seacock handle is in the open position and the light on the switch is lighted before operating the macerator.

TO OPERATE THE MACERATOR:

1. Turn the HEAD SYSTEM breaker ON and open the macerator seacock located on the bilge floor.
2. Operate discharge switch located on the DC Distribution Panel in the salon.
3. When tank is empty, release the switch and close the macerator seacock.

MAINTENANCE

Prior to each use and at regularly scheduled intervals (see Section 11 – *Service Guide*), cycle the macerator seacock handle open and shut to ensure proper operation of the seacock.



NOTICE

There is a possibility of being fined for having an operable direct overboard discharge of waste in some waters. Removing the seacock handle, in the closed position, or other means must be used to avoid fine.

It is illegal for any vessel to dump plastic trash anywhere in the ocean or navigable waters of the United States.

SECTION 7 • ELECTRICAL SYSTEM

DC SYSTEM

The 12 volt direct current (DC) electrical system derives its power from the batteries, which are kept charged by an engine-driven alternator and an AC converter. The battery voltage is indicated by the voltmeter on the DC distribution panel. The batteries supply power through the circuit breakers on the main DC breaker panel, then to the control station and DC distribution panel breakers. The 12 volt control station systems are protected by the CONTROL STATION MAIN breaker, and the 12 volt functions on the DC distribution panel are protected by the CABIN MAIN breaker on the main DC breaker panel.

Enlist the aid of your dealer for a careful analysis of DC power needs on your boat. It may be necessary to add batteries or auxiliary charging methods to supply adequate power for the additional accessories you may want to add to your sport yacht.

BATTERIES

The batteries in your boat have been selected for their ability to furnish starting power based on engine starting requirements, as well as their ability to power the DC system.

When replacing a battery refer to your engine operation and maintenance manual to find the recommended battery for the engine installed in your boat.

Sea Ray® recommended batteries are available through your local Sea Ray® dealer.



CAUTION

Always disconnect battery cables before doing any work on the engine's electrical system or alternator wiring to prevent arcing or damage to the alternator.

TO REMOVE THE BATTERY CABLES:

1. Turn OFF all items drawing power from the batteries.
2. Turn OFF the CONVERTER breaker.
3. Turn OFF battery switches.

4. Remove the negative cable first, then the positive cable. To replace the cables, reverse the procedure.

Battery Maintenance

Probably the most life-shortening experience for a battery is to be drained to zero charge before recharging. When a battery discharges, the active material on both positive and negative plates converts to lead sulfate, causing the plates to become more alike in electrical charge. The electricity-conducting battery acid becomes weaker and the voltage drops. As the battery remains discharged, this process continues until the reversing process of recharging the battery becomes impossible. It is recommended that a battery not be discharged more than 50 percent. If the battery does become run down, recharge it as soon as possible.

Overcharging a battery can be just as detrimental to its life as running it down too far. Battery acid can percolate and overflow or escape as explosive hydrogen gas. The resulting heat buildup in the battery will cause the plates to soften and shed the charging grid's active material. Batteries will maintain their charge much better in cold temperatures.

Simply starting the engine to recharge the battery may not be effective. The alternator only creates charging power at higher engine speeds, so simply idling or trolling may not generate enough power to recharge the battery.

In general:

- Check the fluid level in the cells approximately every 3 weeks, and more often in summer and hot zones.
- The fluid level must be between the lower and the upper markings.
- Replenish only with distilled water. Do not use metal funnels.
- Coat battery terminal clamps with silicone grease. Keep batteries clean and dry.
- Use a charger designed to charge automotive/marine batteries. Use charger only when batteries are disconnected from the boat's electrical circuit.

KEEPING BATTERIES CHARGED

DANGER

- Never use an open flame in the battery storage area.
- Avoid striking sparks near the batteries.
- A battery will explode if a flame or spark ignites the free hydrogen given off during charging.

DANGER

EXPLOSION HAZARD

DO NOT USE JUMPER CABLES IN THE ENGINE COMPARTMENT

The battery in your boat is kept charged basically the same way as the battery in your automobile; by the alternator. However, there is one major difference, most boats are used much less often than an automobile. If the engine is not run often the battery will not hold its charge. To keep batteries charged read the following information:

CAUTION

While the engine is running, the battery terminal clamps must not be loosened or detached nor should the battery switch(es) be turned off, otherwise the alternator and other electronic units will be damaged.

CONNECTING JUMPER CABLES

Jumper cables are not ignition protected. Sea Ray® does not recommend using jumper cables in the engine compartment. The engine compartment may accumulate dangerous explosive gasoline fumes/vapors and hydrogen gas from batteries being charged. DO NOT introduce a possible spark producing element into the engine compartment.

Ignition Protection

DANGER

GASOLINE VAPORS CAN EXPLODE

Use **ONLY** Marine Rated parts to replace such items as starters, distributors, alternators, generators, etc. Do not use Automotive Parts because they are not ignition protected and could cause a fire or explosion.

To avoid the possibility of creating sparks in a gasoline environment, all electrical components in the bilge are ignition protected. **Do not use Automotive Parts because they are not ignition protected and could cause a fire or explosion.**

Protective terminal covers, such as rubber boots on electrical connections, must be in place when engine is operating or when working in the bilge.

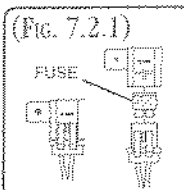
ELECTRICAL SYSTEM CIRCUIT PROTECTION

In the event it becomes necessary to replace an electrical fuse or breaker, **REPLACE THE FUSE OR BREAKER ONLY WITH A FUSE OR BREAKER OF THE SAME RATING.** The fuse or breaker's amperage is marked on the breaker.

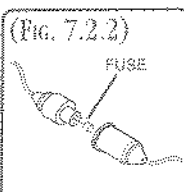
If a fuse or breaker is replaced with a fuse or breaker of lower amperage, it will be insufficient to carry the electrical load of the equipment it is connected to and cause nuisance blowing or tripping.

If a fuse or breaker is replaced with a fuse or breaker of higher amperage, it will not provide adequate protection against an electrical malfunction and could create a possible fire hazard.

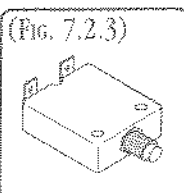
Some of the various types of fuses and breakers used on your boat are as follows:



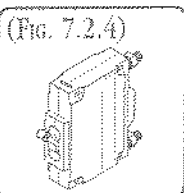
This is an in-line fuse holder and uses an automotive-type blade fuse.



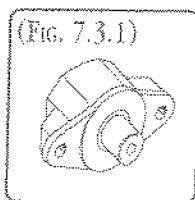
This is a typical in-line fuse on the positive line. It is used for the Mercathode® system on the stern drive lower unit.



This type of breaker is found on the Helm DC Breaker Panel, normally located behind the access panel below the helm. These breakers protect the trim tabs, wipers, windshield vent, navigation lights, hatch lift, spot light, engine synchronizer, horn, instrument lights, 12V receptacle and accessories.

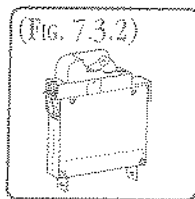


This type of breaker is typically found on the Main Distribution Panel. It selects the electrical power source, either from the generator or from shore power.

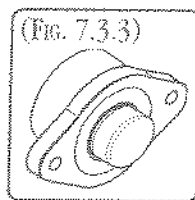


(Fig. 7.3.1)

These two types of breakers are typically found on the main DC distribution panel. They are used to protect the bilge pumps, sump pumps, bilge blowers, control station main, electronics, systems monitor, oil change pump, stereo memory and accessories.

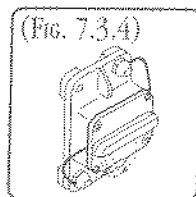


(Fig. 7.3.2)



(Fig. 7.3.3)

These two types of breakers are used to protect high amperage equipment. They are typically found in the bilge and protect the windlass and the swim platform lift.



(Fig. 7.3.4)

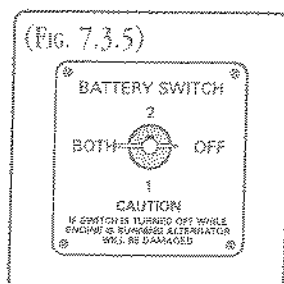
MAIN DC BREAKER PANEL

The main DC breaker panel distributes 12 volt power to all of the boat's 12 volt DC accessories, including sending power to the 12 volt breakers on the DC distribution panel and control station switch and/or breaker panel.

In the event one of the breakers trip, determine and correct the fault, then reset the tripped breaker. See Supplemental Information for Main DC Breaker Panel location.

BATTERY SWITCHES

DUAL BATTERY SWITCH (SPORT CRUISERS)



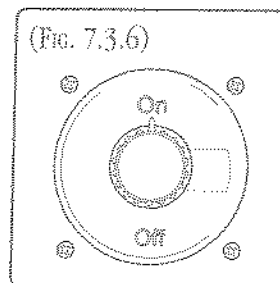
(Fig. 7.3.5)

- In the OFF position you have no power to the engine and DC loads.
- In the "1" position you have power from number 1 battery only.
- In the "2" position you have power from number 2 battery only.

- In the "BOTH" position you have power from BOTH batteries at the same time. This parallels the batteries to assist in starting the engine on your boat.

ON/OFF BATTERY SWITCH

(SPORT CRUISERS & SPORT YACHTS)



(Fig. 7.3.6)

When the switches are in the OFF position, all 12 volt power to the engines and accessories is turned off, except power to the bilge pumps and stereo memory. The battery switches must be ON to start the engines or generator. Turn battery

switches OFF when leaving boat for extended time to save batteries.

DC DISTRIBUTION PANEL BATTERY SWITCHES

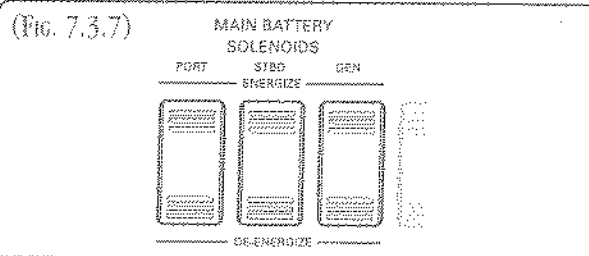
(SOME SPORT YACHTS)

Three battery switches are located on the DC distribution panel and on the DC breaker panel. They energize three battery solenoids, one for each engine and one for the generator. The battery solenoids are located in the engine compartment. When the solenoids are in the OFF position all 24/12 volt current to the engines and accessories are turned off except power to the bilge pumps. The battery solenoids must be ON to start the engines or generator. Turn battery solenoids OFF when leaving boat for extended time to save batteries (See fig. 7.3.7).

NOTE: The bilge pumps, emergency bilge pump and stereo memory CANNOT be turned OFF with the battery switches. The entire remaining DC system CAN be turned OFF with the battery switches.

CAUTION

Always stop engines before switching batteries to OFF position.

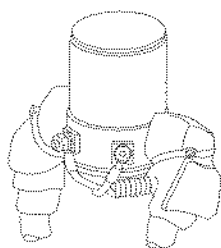


(Fig. 7.3.7)

EMERGENCY START SYSTEM

The emergency start system utilizes a momentary switch, located on the control station switch panel and an emergency start solenoid, located in the bilge. Holding the switch energizes the solenoid which parallels the batteries to assist in starting. Use emergency start when the charge of one bank of batteries is insufficient to start its corresponding engine. To engage the emergency start system, start whichever engine has sufficient battery power, then hold emergency start switch while starting the other engine.

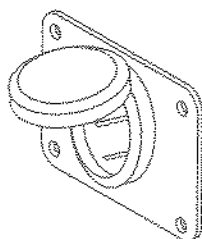
EMERGENCY START SOLENOID
(FIG. 7.4.1)



12 VOLT ACCESSORY RECEPTACLE

Your Sea Ray® Cruiser or Sport Yacht has a 12 volt accessory receptacle at the control station. It is a DC ("cigarette lighter") style receptacle to be used with any 12 volt accessories using this type of plug.

TYPICAL 12 VOLT ACCESSORY RECEPTACLE
(FIG. 7.4.2)



120 VOLT AC/12 VOLT AC

TRANSFORMERS

Your boat may be equipped with one or more 120 volt AC transformers. This will allow you to operate the 12 volt AC lighting while your boat is using the 120 volt AC shore power or generator. This helps relieve some of the lighting load from the DC system. Read and understand the information for the transformer in your Owner's Manual Packet.

ELECTRONICS CIRCUIT WITH GROUND PLATE

The 50 amp electronics circuit utilizes a circuit breaker in the main DC breaker panel to feed the fuse block at the control station. The fuse block is to be used for electronic equipment only. There is a static ground buss located at the control station for mounting of electronic equipment static grounds only, not for current carrying grounds. It is grounded via a ground plate mounted on the bottom of the hull. Do not use bottom paint on the ground plate as it will destroy the effective area of grounding.

LIGHTING

Your boat is equipped with different lighting fixtures throughout. **Never replace a defective light with any bulb other than the type and wattage required.**

Halogen Lighting

The bulb **MUST** be protected from contaminants. Use appropriate protection, such as clean cloth gloves, when handling or disposing of all halogen-cycle bulbs. Wear eye protection. Turn power off when installing or before removing lamp. Allow lamp to cool before removal.

CAUTION

The filament bulbs used in all halogen-cycle lamps generate intense heat. To avoid the possibility of fire, do not use lamp at close range to materials that are combustible or affected by heat or drying. Halogen-cycle bulbs are pressurized and could shatter if scratched or damaged. Glass halogen-cycle bulbs should be protected against contact with liquids when operating.

Remove grease or fingerprints from quartz halogen-cycle bulbs with a grease-free solvent (alcohol) before use. Allow solvent to completely dry before light is turned on.

HALOGEN BULB
(FIG. 7.4.3)



AC SYSTEM

120 VAC/60 Hz ELECTRICAL SYSTEM

The 120 volt AC electrical systems operate on the two dockside 30 amp, 60 cycle shore power cordsets or the optional 50 amp and 30 amp cordsets or the optional onboard generator.



CAUTION

Never operate shore power at less than 105 volts.

On boats equipped with the standard dual 30 amp shore power system, it may be difficult to operate all 120 volt appliances simultaneously. Use good common sense while operating several options at once, as the amperage draw of the accessories selected may be greater than the AC electrical system can provide through its configuration. It may be necessary to turn off some accessories while operating others.

NOTICE

The actual usage of equipment will depend on the amperage output of the power source available.

In order to operate all appliances simultaneously, the generator or combination of generator and shore power (example: generator - Line 1, shore power - Line 2) may need to be used.

Line voltage from the generator or shore power cord(s) is shown by the voltmeter(s) on the main distribution panel. The ammeter indicates amperes being drawn through the circuit breakers on the main distribution panel.

The main distribution panel main breakers are equipped with a source selector slide to prevent the generator and shore power from being energized at the same time (on the same line) and damaging the electrical system. Both breakers must be in the OFF position before switching to an alternate power source.



CAUTION

Under no circumstances override the source select system.

The 120 volt wiring installed on Sea Ray® boats consists of three color-coded wires. The black wire is the "hot" feed, white is the common, or neutral,

and the green wire is the ground. All branch breakers and switches for AC equipment are installed on the "hot" wire. The green conductor of the shore power is connected through a galvanic isolator and then connected to the main AC grounding buss behind the main distribution panel. The main breaker may trip if there is a surge in line voltage, an electrical storm or an onboard system overload. The main breaker interrupts both the neutral and hot feeds in the AC circuit to prevent equipment damage due to internal overloads and external surges.

240 VAC/60 Hz ELECTRICAL SYSTEM

The 240 volt AC electrical systems operate on a 50 amp/60 cycle shore power cordset, or the optional onboard generator.

Line voltage from the generator or shore power is shown by the voltmeter(s) on the main distribution panel. The ammeter(s) indicate amperes being drawn through the appropriate power source's circuit breakers on the main distribution panel.

NOTICE

The actual usage of equipment will depend on the amperage output of the power source available.

The main distribution panel main breakers are equipped with a source selector slide to prevent the generator and shore power from being energized at the same time and damaging the electrical system. Both breakers must be in the OFF position before switching to an alternate power source.



CAUTION

Under no circumstances override the source select system.

The 240 volt system wiring consists of four color-coded wires. The black and black/red wires are the "hot" feeds, the white is the common, or neutral, and the green wire is the safety ground. All branch breakers and switches for AC equipment are installed on the "hot" wires. The shore main circuit breakers protect the white neutral feed and the black hot feed wires. The green conductor of the shore power is connected through the galvanic isolator to the AC grounding buss behind the main distribution panel.

220 VAC/50 Hz ELECTRICAL SYSTEM

(INTERNATIONAL OPTION)

The 220 volt AC electrical systems operate on the two dockside 16 amp, 50 cycle shore power cordsets or the optional 32 amp and 16 amp cordsets or the optional onboard generator.

On boats equipped with the dual 16 amp shore power system, it may be difficult to operate all 220 volt appliances simultaneously. Use good common sense while operating several options at once, as the amperage draw of the accessories selected may be greater than the AC electrical system can provide through its configuration. It may be necessary to turn off some accessories while operating others.

NOTICE

The actual usage of equipment will depend on the amperage output of the power source available.

In order to operate all appliances simultaneously, the generator or combination of generator and shore power (example: generator -Line 1, shore power - Line 2) may need to be used.

Line voltage from the generator or shore power is shown by the voltmeter on the main distribution panel. The ammeter indicates amperes being drawn through the appropriate power source's circuit breakers on the main distribution panel.

The main distribution panel main breakers are equipped with a source selector slide to prevent the generator and shore power from being energized at the same time and damaging the electrical system. Both breakers must be in the OFF position before switching to an alternate power source.



CAUTION

Under no circumstances override the source select system.

The 220 volt wiring installed on Sea Ray® Boats consists of three color-coded wires. The black wire is the "hot" feed, white is the common, or neutral, and the green wire is the ground. All branch breakers and switches for AC equipment are installed on the "hot" wire. The green conductor of the shore power is connected through a galvanic isolator and then connected to the main DC ground buss bar behind the main distribution panel. The main breaker may trip if there is a surge in line voltage, an electrical storm or an onboard system overload. The main breaker interrupts both the neutral and hot feeds in

the AC circuit to prevent equipment damage due to internal overloads and external surges.



CAUTION

Never operate 220 volt shore power at less than 205 volts.

SHORE POWER HOOK-UP

1. Make sure the MAIN breaker and all AC branch breakers on the main distribution panel are OFF.
2. Ensure dockside breaker is OFF, then plug the shore power cord(s) into the shore power inlet. Turn clockwise to lock. Thread the locking ring on the inlet to secure cable and prevent accidental unplugging.



CAUTION

Shore power cord should be secured or routed to avoid laying or falling into water and to avoid stress on shore power plug and inlet.

3. Plug the dockside cord into the shore power outlet box on the dock. Turn the circuit breaker on the dock to the ON position.



CAUTION

It is imperative that the shore power outlet is dry before plugging into the dock power inlet.

4. Check the polarity lights on the main distribution panel. The POWER lights should be on. If the REVERSE POLARITY lights are on, have the dockmaster check the dockside power for a reversed connection or reversed wiring.
5. If the REVERSE POLARITY light is NOT ON, slide the shuttle mechanism to expose the SHORE breaker and switch it to the ON position.
6. Turn individual breakers ON.

MAINTENANCE FOR SHORE POWER CABLE SET & SHORE POWER INLETS



WARNING

Disconnect the power cable from power source before performing maintenance.

The metallic parts of your cable set and power inlet are made to resist corrosion. In salt water environment, life of the product can be increased by periodically wiping the exposed parts with fresh water, drying and spraying with a moisture repellent.

A soiled cable can be cleaned with grease-cutting household detergent. A periodic application of vinyl protector will help both ends and cable maintain their original appearance.

In case of salt water spray or immersion, rinse plug end and/or connector end thoroughly in fresh water, shake or blow out excess water and allow to dry. Spray with a moisture repellent before reuse.

MAIN DISTRIBUTION PANEL CONTROLS & FUNCTIONS

NOTE: The following main distribution panel descriptions are based on standard construction with the 120 volt AC system. Sea Ray® Boats are available with three different voltage options. The main distribution panel in your boat will be equipped with the appropriate AC voltage breakers and meters; either 120, 120/240 or 220 volt.

SERVICING THE MAIN DISTRIBUTION PANEL

(Servicing should be referred to a qualified electrician).

TO REPLACE A FAULTY COMPONENT (BREAKER OR INDICATOR LIGHT) IN THE MAIN DISTRIBUTION PANEL:

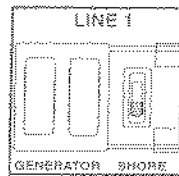
1. Turn all breakers OFF.
2. Make sure the generator (if equipped) is OFF.
3. Unplug the shore power.
4. Remove screws from all sides except the hinged side of panel. The main distribution panel is hinged to swing open for servicing.

Reverse the procedure for closing the panel.

TYPICAL MAIN DISTRIBUTION PANEL CONTROLS

1. Line 1 120 Volt Main Breakers:

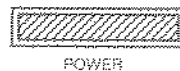
- GENERATOR 120V Breaker
- SHORE 120V Breaker



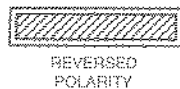
Power source selection.

Supplies power to Line 1 branch breakers on main distribution panel from either shore power or generator.

2. Power/Reversed Polarity Indicator Lights



Power: When lit, indicates shore power connection is correct. Energize shore power system.

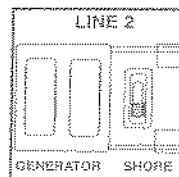


Reversed Polarity: When lit, indicates reversed polarity for shore power system. Do not energize shore power system.

Disconnect shore power cords and alert the dock-master of the situation.

3. Line 2 120V Main Breaker

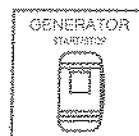
- GENERATOR 120V Breaker
- SHORE 120V Breaker



Power source selection.

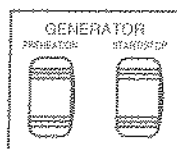
Supplies power to Line 2 branch breakers on main distribution panel from either shore power or generator.

4. Generator Start/Stop Switch



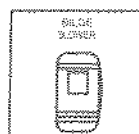
Gas models have a single switch. Depress the top of the momentary switch to start or the bottom to stop the generator. Run position is in the center.

5. Generator Preheat Switch (Diesel)



Diesel models are equipped with a separate preheat switch. Depress "PREHEAT/ON" to preheat glow plugs on diesel generator.

6. Bilge Blower On/Off Switch



Turns the bilge blowers ON and OFF.

7. Ignition Key Switch



Master keyswitch for providing ignition power to control station engine ignition switch.

8. Port Ignition 12V Breaker



Turn ON to supply power to the port engine ignition keyswitch.

9. Starboard Ignition 12V Breaker

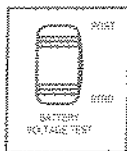


Turn ON to supply power to the starboard engine ignition keyswitch.

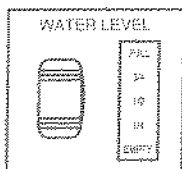
10. Battery Bank Selector Switch



Selects which bank of batteries is indicated on the voltmeter. Monitors the cabin DC load bank until switch is depressed to monitor the other.

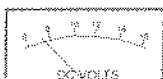


11. Water Level Switch & Indicator Panel



Depress switch to indicate on the lighted display how much water is in the water tank.

12. Voltmeter DC



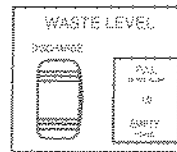
Indicates the amount of DC volts being produced.

13. Waste Level Indicator Panel



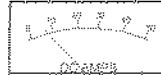
Indicates power to head system and amount of waste in holding tank when head system breaker is ON.

14. Waste System Control Switch



DISCHARGE switch operates macerator with holding tank macerator option.

15. Ammeter DC



Indicates the amount of DC amps being drawn through the DC branch breakers.

Electrical System Breakers

In the event it becomes necessary to replace an electrical breaker, REPLACE THE BREAKER WITH ONLY A BREAKER OF THE SAME RATINGS. The breaker's amperage is marked on the breaker.

If a breaker is replaced with a breaker of lower amperage, it will be insufficient to carry the electrical load of the equipment it is connected to and cause nuisance tripping.

If a breaker is replaced with a breaker of higher amperage, it will not provide adequate protection against an electrical malfunction and create a possible fire hazard.

16. Head System 12V System Breaker



Supplies power to the VacuFlush® head system and waste level indicator panel.

17. Macerator 12V Breaker



Supplies power to holding tank system, waste level indicator, or macerator option.

18. Power Vents 12V Breaker



Supplies power to the power vents in galley and head.

19. Refrigerator 12V Breaker (if supplied)



Supplies DC power to the refrigerator/freezer.

20. Accessory 12V Breaker



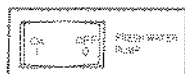
Unused (Supplied for owner's use).

21. Entertainment 12V Breaker



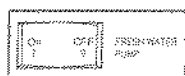
Supplies power to cabin stereo and TV amplifier.

22. Fresh Water Pump #2-12V Breaker



Supplies power to second fresh water pump.

23. Fresh Water Pump #1-12V Breaker



Supplies power to first fresh water pump.

24. AFT Cabin Lighting 12V Breaker



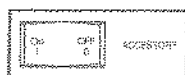
Supplies power to salon, guest stateroom and aft head lighting.

25. FWD Cabin Lighting 12V Breaker



Supplies power to forward stateroom, forward head and dining area lighting.

26. Accessory 120V Breaker



Unused (Supplied for owner's use).

27. Accessory 120V Breaker



Unused (Supplied for owner's use).

28. FWD Air Conditioner 120V Breaker



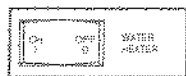
Supplies power to the forward stateroom air conditioner.

29. Microwave 120V Breaker



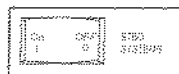
Supplies power to microwave.

30. Water Heater 120V or 240V Breaker



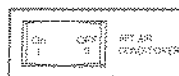
Turns on hot water heater.

31. Stbd Systems 120V Breaker



Supplies power to starboard receptacles, appliances, etc.

32. Aft Air Conditioner 120V or 240V Breaker



Supplies power to the aft air conditioner.

33. Air Conditioner Pump Relay 120V or 240V Breaker



Turns on air conditioner, raw water cooling pump.

34. Converter 120V Breaker



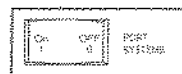
Turns on the 120V AC to 12V DC converter.

35. Stove 120V or 240V Breaker



Supplies power to the stove.

36. Port Systems 120V Breaker



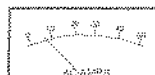
Supplies power to port lighting, port receptacles, appliances, etc.

37. Galley Systems 120V Breaker



Supplies power to galley outlet, refrigerator/freezer, blender option, coffeemaker and galley AC lighting.

38. AC Ammeter 120V (Line 1)



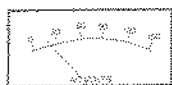
Indicates the amount of 120 volt amperage that is being used by the equipment energized on line 1.

39. AC Ammeter 120V (Line 2)



Indicates the amount of 120 volt amperage that is being used by the equipment energized on line 2.

40. AC Voltmeter 120V (Line 1)



Indicates the 120 volt AC power source voltage.

41. AC Voltmeter 120V (Line 2)



Indicates the 120 volt AC power source voltage.

CONVERTER

The battery charging unit installed on your Sport Yacht is fully automatic and is designed specifically for the marine environment. The high frequency characteristic has allowed these chargers to achieve a huge size and weight reduction over their previously used equipment. Commonly called high frequency or smart chargers, these units bring a new sophistication to the battery charger field. These units feature a built-in amperage indicator and a dual color power on LED. When the charger is on the LED will be RED, indicating charger is in fast charge mode. After the absorption cycle is complete (approx. 3 hours) the LED will change to GREEN, indicating the charger is in float mode.

Charging characteristics contain 4 elements:

- **Bulk Charge** - this is initiated at power up and provides the chargers full-rated current to the battery bank until a predetermined voltage level of 14.2 to 14.4V is achieved and/or a certain time has passed.
- **Absorption Charge** - this stage immediately follows the bulk charge mode. It maintains the battery voltage at the bulk charge voltage level, but gradually decreases the current as the battery accepts the charge until it reaches a predetermined current level.
- **Float Charge** - this stage is designed to hold the battery at a safe, low voltage (typically 13.3V) providing up to the chargers full rated amperage to accommodate DC load requirements. The charge will remain in this mode until the AC power is cycled off and then on again.



WARNING

Never block air circulation through the unit.
Never store any gear on top of the unit.



CAUTION

When operating converter for prolonged periods of time, check battery water level at least weekly. Refer to "Battery Maintenance."

NOTICE

Leave the converter running at all times to maintain the 12 volt system voltage.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

GROUND FAULT INTERRUPTER OUTLETS

The ground fault interrupter outlet(s) (GFI) is located in the galley and/or head. Each outlet is equipped with a test and reset switch in the center face plate. All exposed 120 volt outlets are protected by this outlet.



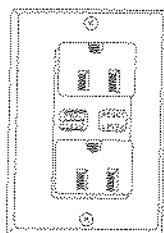
CAUTION

Persons with heart problems or other conditions which make them susceptible to electric shock may still be injured by ground faults on circuits protected by the GFI receptacle. No safety devices yet designed will protect against all hazards or carelessly handled or misused electrical equipment or wiring.

The GFI receptacle is designed to protect people from the line-to-ground shock hazards which could occur from defective power tools or appliances operating from this device, or from down-line outlets protected by it. It does not prevent line-to-ground electric shock, but does limit the time of exposure to a period considered safe for normally healthy persons. It does not protect persons against line-to-line, or line-to-neutral faults. The GFI receptacle does not protect against short circuits or overloads. This is the function of the circuit breaker.

In the event of power failure which has not affected the fuse or breaker serving these particular outlets, unplug all cord-connected appliances from the GFI protected outlets, and restore power by pressing in the RESET

GFI OUTLET
(Fig. 7.11.1)



button on the GFCI receptacle. To test, press the TEST button. The RESET button will pop out indicating that power is off at all the GFCI protected outlets. Push the RESET back in and reconnect the appliances one at a time. A defective appliance which trips the GFCI should be repaired at once.

If the RESET button will not stay in after all appliances have been disconnected from the circuit, call a qualified electrician.

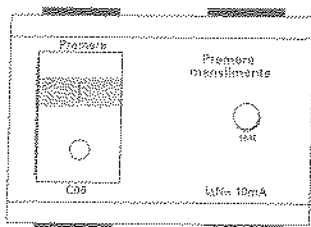
If the RESET button does not pop out when the TEST button is pressed, PROTECTION IS LOST. Do not use any outlets on the circuit. Call a qualified electrician. TEST REMINDER: FOR MAXIMUM PROTECTION AGAINST ELECTRICAL SHOCK HAZARD, TEST YOUR GROUND FAULT CIRCUIT INTERRUPTER AT LEAST ONCE A MONTH. TEST PROCEDURE:

1. Push TEST button. The RESET button will pop out. Power is now off at all outlets protected by the GFCI, indicating that the device is functioning properly.
2. If RESET does not pop out when testing, do not use any outlets on this circuit. Protection is lost. Call a qualified electrician.
3. To restore power, push RESET button. Enter date on record card.

INTERNATIONAL RECEPTACLE

All readily accessible 220V outlets are protected by a Residual Current Circuit Breaker (RCCB) (Fig. 7.11.2). This current breaker is mounted in an accessible location such as under a cabinet and

RCCB OUTLET
(Fig. 7.11.2)



includes a test switch to verify proper operation. Its function is similar, but not identical to the 120V GFI.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

GENERATOR (IF EQUIPPED)

Your Generator Owner's Manual can be found in the Owner's Manual Packet onboard. We highly recommend the reading of this manual to familiarize yourself with the operation of the generator.

CAUTION

Do not run the generator in an enclosed area, such as a closed boathouse, as there is a possibility of build-up and inhaling of carbon monoxide.

DANGER

GASOLINE VAPORS CAN EXPLODE.

Before Starting Generator:

- Check machinery compartment for gasoline vapors.
- Operate blower for four (4) minutes.

Run blower at all times when generator is running.

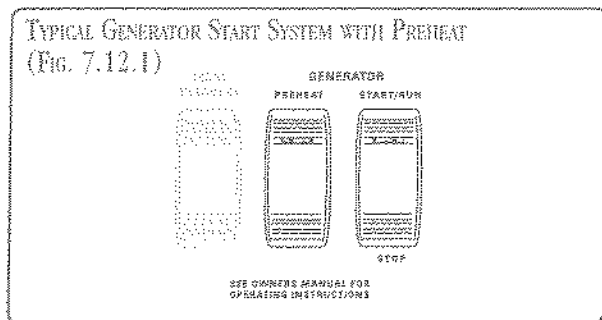
NOTICE

Pre-start generator prior to getting underway as there is a possibility that it will not pick up water if started underway. Make sure the "MAIN GENERATOR" breaker is "OFF" and there is no load on the generator before starting it.

STARTING THE GENERATOR

(Remote control switches are located on the main distribution panel or local switches on the generator.)

1. Check fuel tank levels.
2. Check oil and coolant levels. See Generator Operator's Manual for proper readings.
3. Check generator for coolant drain plug installation.
4. Open the generator seacock.
5. Run the bilge blowers for at least four minutes before starting and any time the generator is



running. If fuel fumes are detected, do not start the generator until the source of fumes is determined and corrected and the bilge area is safely ventilated.

- While holding the PREHEAT switch depressed, depress the START switch. The starter motor will run, thereby cranking the engine. As soon as the engine runs, release the START switch, but continue to hold the PREHEAT switch depressed for 2 or 3 seconds. Release the PREHEAT switch when the oil pressure reaches approximately 20 psi. This bypasses the Low Oil Pressure shutdown until the engine's oil pressure rises to its normal running pressure. Now release the PREHEAT switch.

- Check generator exhaust port to verify that water is flowing. If not, shut generator down and refer to your Generator Operator's Manual.

NOTE: To start the Westerbeke® generator from the generator mounted controls, a bypass switch, located on the side of the generator mounted control box, must be turned ON. The bypass switch must be OFF to start and stop the generator from the DC main distribution panel.

READ THE OWNER'S MANUAL IN THE OWNER'S MANUAL PACKET FOR YOUR GENERATOR MODEL.

SHIFTING FROM SHORE POWER TO GENERATOR POWER:

- Turn all AC systems and branch circuit breakers OFF. Turn both main breakers on the main distribution panel OFF.
- Start the generator.
- Slide the source select shuttle mechanism on the main distribution panel to expose the GENERATOR breaker(s) and turn it ON.
- Turn the individual system breakers ON.

STOPPING THE GENERATOR

- Prior to generator shut down turn OFF all AC equipment and breakers including main breakers and allow the generator to run a few minutes to cool down. If desired, transfer to shore power.
- Stop the generator by switching START/RUN/STOP switch on main distribution panel to STOP position or holding stop switch on generator until generator stops.
- Leave stop switch on main distribution panel in the stop position when generator is not in use to prevent overheating electric fuel valve.

For boats equipped with the multiplex system, press and release the generator switch. After the generator stops, the multiplex system must reset for 20-30 seconds and then may be restarted at any time.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

ELECTROLYSIS & ZINC ANODES

Electrolytic corrosion of metals on power boats can result in serious deterioration. The boat owner must be aware of the possibilities of galvanic action (the deterioration of metals due to dissimilar characteristics when placed in salt water) and/or electrolysis. It is the owner's responsibility to check for and replace damaged parts due to galvanic deterioration. Refer to your Sea Ray® dealer to investigate the source of stray corrosive currents.

Your boat has zinc plates installed on the transom below the waterline and on each of the trim tabs (see Fig 7.13.1).

Zinc plates protect underwater hardware. Zinc, being much less "noble" than copper-based alloys and aluminum used in Sea Ray® underwater fittings, will deteriorate first and protect the more noble parts.

CAUTION

Replace zinc sacrificial anodes if they are corroded 50% or more.

Zinc anodes generally require replacement about once a year. (In salt water areas, replace every six months.) The need to replace anodes more frequently may indicate a stray current problem within the boat or at the slip or mooring. If zinc

anodes do not need replacing after one year, they may not be providing proper protection. Loose anodes or low-grade zinc may be the problem.

DO NOT PAINT BETWEEN THE ZINC AND THE METAL IT CONTACTS, AND DO NOT PAINT OVER THE ZINC.

When an AC shore power system is connected to the boat, the underwater metal fittings will, in effect, be connected through the water to grounded metals ashore. The zincs will be consumed at a faster rate unless the marina maintains a protective system to prevent this. In this case, hanging a zinc in the water bonded to the metal outlet box on the dock will reduce zinc loss on the boat. Do not connect this zinc to the boat's ground system.

It is extremely important that all electrically operated DC equipment and accessories be wired so that the ground polarity of each device is the same as that of the battery. Sea Ray® boats have a negative ground system, which is the recommended practice throughout the marine industry. All metal items (fuel tanks, underwater gear, etc.) in the boat are connected to the zinc anode by the green bonding wire.

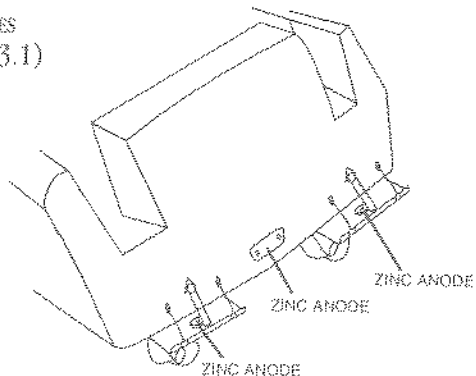


CAUTION

Never disconnect AC green wire (safety ground) from the engine terminal.

Electrolysis can also be caused by "stray currents" due to a fault in an electrical item, even though correctly grounded. A galvanic current isolator (zinc saver) is standard on all Sea Ray® boats. It is installed between the shore power ground and the boat's AC grounding connection to the DC bonding system. This connection maintains the safety ground from dockside power while stopping the flow of DC corrosive currents.

ZINC PLATES
(FIG. 7.13.1)



MARINE ELECTRONIC CATHODIC ANTI-CORROSION SYSTEM (MERCATHODE®)

(STERN DRIVE CRUISERS ONLY)

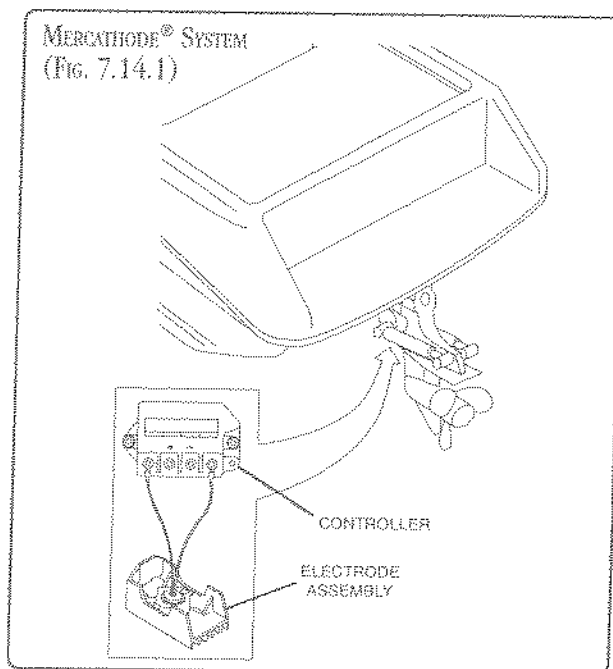
The automatically controlled Cathodic Anti-Corrosion System for marine installation protects underwater metals from the effects of corrosion and electrolysis on stern drives. The system components are designed for trouble-free marine service. Damaged or open connectors are generally the cause of operation difficulties. **DO NOT PAINT THE MERCATHODE® SYSTEM.**

The anode and reference electrode are attached to the electrode assembly under each stern drive unit. The solid state controller is mounted within a plastic housing in the bilge on the transom. The male connector is for the reference electrode and female connector for the anode. The other two leads are for connecting to the 12 volt system.

MAINTENANCE

The Mercathode® system should be tested to ensure adequate output. This test should be made where the boat is moored, using Quicksilver® Reference Electrode and Test Meter. Contact your authorized Sea Ray® dealer to arrange for this test.

MERCATHODE® SYSTEM
(FIG. 7.14.1)



REFER TO THE ENGINE OWNER'S MANUAL FOR INSTRUCTIONS AND WARRANTY INFORMATION.

SECTION 8 • ACCESSORIES

NOTE: Not all accessories described here are standard equipment or even available as options. Options and features subject to change without notice. It is advisable to refer to the Owner's Manual Packet and read information provided by individual equipment manufacturers for operation and maintenance of equipment.

AIR CONDITIONING & HEATING

The air conditioning/heating system installed in your Sea Ray® is of the size and capacity best suited for the size of your boat.

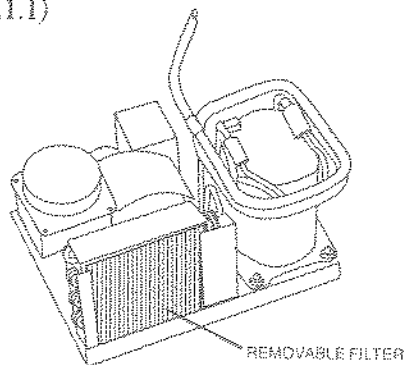
The system is fitted with a return air filter that should be cleaned once a month. To remove the air filter for cleaning, slide filter out of the compressor/blower unit (see Fig. 8.1.1).

The system is cooled to maintain optimal operating temperature by a raw water pump. The pump draws water through a seacock in the bilge and filters it through a sea water strainer. (The sea water strainer should be inspected and cleaned frequently. To clean strainer, refer to Section 2 – *Seacocks & Strainers*.) The water passes through the air conditioning/heating unit, then flows overboard.

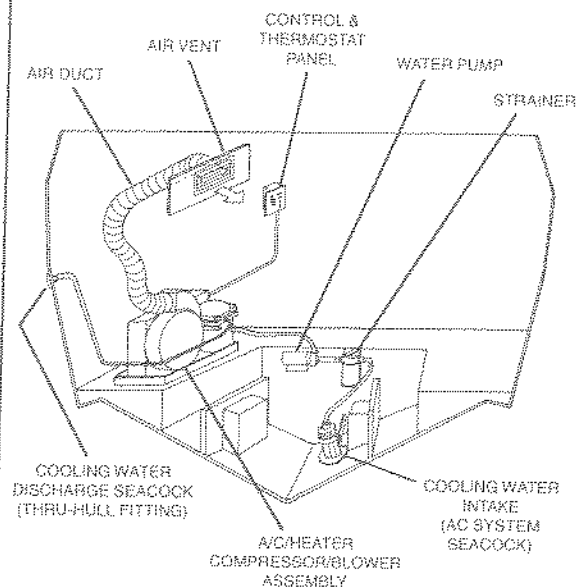
TO START SYSTEM:

1. Make sure the seacock for the cooling pump is open.
2. Turn ON the AIR CONDITIONER PUMP/RELAY circuit breaker on the main distribution panel.

TYPICAL AIR CONDITIONING COMPRESSOR/BLOWER
(Fig. 8.1.1)



TYPICAL AIR CONDITIONING COMPONENT ARRANGEMENT
(Fig. 8.1.2)



3. Follow the instructions in the Air Conditioner/Heater manual for control pad operation.

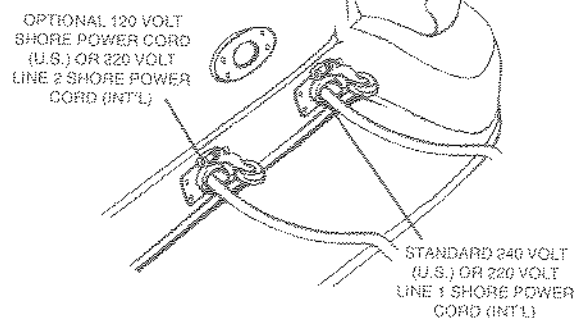
REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

CABLEMASTER

(OPTIONAL ON SOME MODELS)

Your Sea Ray® may be equipped with the Cablemaster automatic shore power cord advance/retrieve system located at the transom (see Fig. 8.1.3). The system will advance and

TYPICAL CABLEMASTER SYSTEM (AUTOMATIC SHORE POWER
CABLE ADVANCE/RETRIEVE SYSTEM)
(Fig. 8.1.3)



retrieve the shore power cord(s) as needed to hook up the shore power system. The circuit breaker is located on the DC breaker panel.

TO OPERATE:

1. Remove shore power cord cover.
2. Press the switch to the "OUT" position to advance cable to the shore power hookup, or the "IN" position to rewind cable for storage. This is a momentary switch which returns automatically to the center OFF position.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

CANVAS

DANGER

Exhaust fumes from engines contain deadly Carbon Monoxide gas (CO). Boats with canvas or poor ventilation are most likely to collect fumes. CO sickness symptoms include headache, nausea and dizziness. DO NOT mistake for sea sickness. Ventilate boat. See boat owner's manual for more details.

Sea Ray® is committed to boating safety. Please refer to Exhaust Emissions and Emergency Procedures (See Section 1 - *General Information*). It is important to read and understand the effects of carbon monoxide and how to ventilate your boat to prevent the build-up of this invisible gas.

Attached to the inside of the bimini or convertible top is a **DANGER** tag for Carbon Monoxide gas (CO) build-up and a **WARNING** tag for excessive speeds while canvas is installed. The Aft Curtain also has a **WARNING** tag stating "The Aft Curtain is not designed to be used while engine is running or boat is underway." If your canvas does not have these tags, or they are lost or are unable to be read, contact your dealer for replacement labels.

The canvas manufacturer has provided the canvas piece name and position on each canvas piece, with a sewn on white label. Do not remove these tags. They will help you with identification and position for easier installation procedures.

It is recommended that you decide which canvas pieces you want to remove or install before you leave the boat slip. Removing or installing canvas on the water could be difficult as not all water conditions

allow for your stability while attempting removal or installation.

Components of your canvas set consists of metal frame tubes, sliding adjustable support poles, frame mounts, zippers, zipper valance, velcro and snaps. If any of these components need replacing, contact your dealer.

STORAGE

- Do not fold or store any of the canvas set pieces while wet. All canvas should be rolled or folded when dry and stored in a clean, dry place.
- For clear vinyl pieces, the recommended methods for storage are rolling or laying down flat. The clear vinyl should never be folded or creased as cracking will result. To protect the clear vinyl from rubbing against itself while rolled or stored flat, place a piece of very soft, non-abrasive cloth between the pieces. If the surface of the clear vinyl becomes scratched see your dealer.
- When storing the Aft Curtain, fold the canvas over the clear vinyl window (DO NOT FOLD CLEAR VINYL), then roll or store flat.

CAUTION

Roll the aft cover up for storage to avoid damage to vinyl windows.

CARE AND MAINTENANCE

The fabric should be cleaned regularly before substances such as dirt, pollen, etc. are allowed to accumulate on and become embedded in the fabric. The fabric can be cleaned without being removed from the framework. Simply brush off any loose dirt, pollen, etc.; hose down and clean with a mild solution of a natural soap in lukewarm water (no more the 100° F., 38° C.). Rinse thoroughly to remove soap. DO NOT USE DETERGENTS. Allow to completely air dry.

If you have stubborn cleaning cases, call your dealer for proper procedures. Do not try your own cleaning procedures as they may void any warranties.

After each use, especially in salt water areas, rinse the canvas completely with fresh cold water. Then let the canvas set dry completely before stowing.

All metal components of the canvas set should be rinsed with fresh cold water and exposed components wiped dry to maintain appearance and

working order. (See Section 10 - Care and Refinishing for more information regarding the care and maintenance of your canvas set.)

NOTICE

Keep vinyl side curtains from touching stainless steel bows on the convertible top/sunshade or bimini top. Prolonged contact in the hot sun may damage clear vinyl material.

REFER TO OWNER'S PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

INSTALLATION TIPS

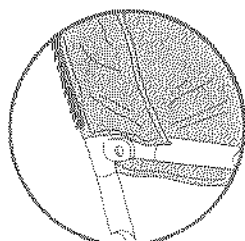
NOTICE

It is recommended for safety and ease of installation that two (2) or more people are available to

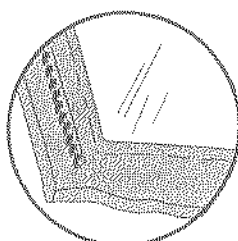
Zippers are located on each canvas piece. When attaching any canvas piece, make sure canvas is centered on the frame bows and only partially zip the zippers. This helps to hold the piece in place and relieves tension, helping the other sides zip or snap easier. After all the sides of the piece are secure, finish zipping all the zippers. This will ensure a tight fit.

- Make sure that zippers are fully engaged before zipping them completely. DO NOT force them shut.
- The large zippers have locking sliders. Be sure to lift the tabs to release the lock.
- When installing canvas tops start the forward and aft zippers, zipping them only about 12" to 18" before closing them all the way. Be sure the top is centered on

ZIPPERS
(FIG. 8.3.1)



ZIPPER ON CANVAS



ZIPPER ON WINDOW

the frame.

The frames have center marks engraved in the tubing. Line up the canvas with the mark and pull taut to each side.

Be sure the top canvas is centered after it has been folded or removed for any reason.

- Lubricate zippers and fasteners with pure silicone spray, or a product made especially for this use. **DO NOT USE PETROLEUM BASED PRODUCTS**, as it will stain the canvas.
- Hang all your curtains to the top.
- Join the down zipper, closing only approximately 3" to 4", you may have to open the top zipper on the corners, and the side to allow enough slack to join the down zippers.
- When installing the aft curtains, engage the top and down zippers as above, leaving them open except for 3" to 4". Pull the curtain back and fasten around the hull. Close all zippers.

BIMINI TOP

The bimini top installs over the bridge and rolls up on the aft support when not in use. When installing or storing the bimini top, the pins must be removed from the support tubes. The boot zips over the bimini top after it is rolled up on the aft support.

CONVERTIBLE TOP/SUN SHADE & BOOT

The convertible top installs over the cockpit seating area for protection from the elements. The front portion of the top can be rolled back and secured by two built-in zippers to convert it to the sun shade position. The two middle bow straps adjust to put tension on the middle bows.

The top can be rolled up on the aft support when not in use. The boot zips over the top after it is rolled up on the aft support.

When installing or storing the convertible top, the securing pins must be removed from support tubes.



WARNING

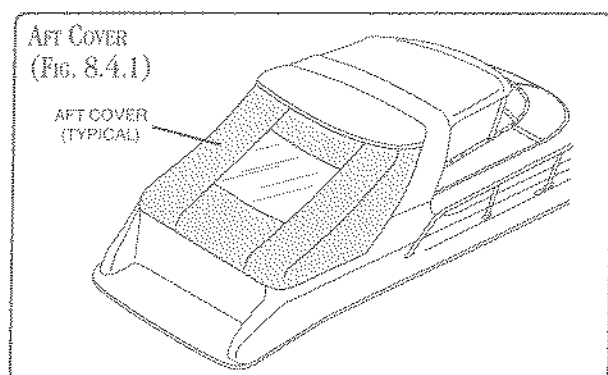
Sun shade should not be used when vessel speed exceeds 45 mph.

SIDE CURTAINS

The transparent vinyl side curtains snap to the side of the windshield frame and zip to the underside of the convertible top or bimini top. There is a port and starboard side curtain, which roll up for storage when not in use. Do not fold the side curtain since permanent damage can occur to the vinyl material.

AFT COVER

The aft cover extends over the cockpit area from the aft end of the convertible top or bimini top.



INSTALLATION PROCEDURE:

1. Zip aft cover to zipper track on convertible top or bimini top approximately 6 inches (15 cm) on both sides of center.
2. Snap center snap at transom.
3. Snap all snaps along both sides up to side curtain.
4. Zip up side curtain and aft cover.



WARNING

The aft cover is not designed to be used while engine is running or boat is underway.

WINDSHIELD COVER

The windshield cover set helps to cut down on the amount of sun light entering the boat's interior. The windshield cover set helps to prevent the interior from fading and gives you added privacy. To install the canvas covers, simply unroll and snap to the windshield frame. The windshield cover set will also cover the port and starboard salon side windows.

BRIDGE ENCLOSURE

(FLY BRIDGE SPORT YACHTS ONLY)

The bridge enclosure attaches to the bimini top. It encloses the bridge to allow operation in inclement weather.

TO INSTALL THE ENCLOSURE:

1. Pull up on the canvas and zip the top edge of the enclosure about 6 inches (15 cm) on each side.
2. Snap the bottom edge of the canvas.
3. Zip the top edge the rest of the way.
3. Install the side curtain panels by zipping them to the top and snapping bottoms to the bridge.
4. The back curtain for the enclosure zips to the back edge and clips at the bottom.

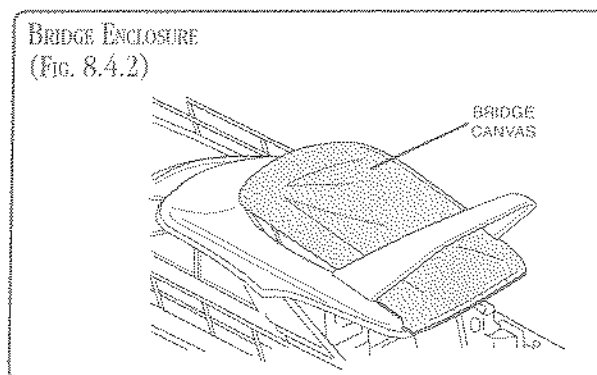
Storage: Roll the vinyl panels up. Do not fold.

NOTE: Keep vinyl side curtains from touching stainless steel bows. Prolonged contact in the hot sun may damage clear vinyl material.

BRIDGE COVER

(FLY BRIDGE SPORT YACHTS ONLY)

The bridge cover stretches over the bridge and snaps in place to keep it clean and dry when the boat is not in use.



TO INSTALL THE COVER:

1. Spread cover over bridge.
2. Fit front over venturi.
3. Snap along the sides and then across the back.

COFFEE MAKER

The drip coffee maker operates on the AC electrical system. It is protected by the "GALLEY SYSTEMS" breaker on the main distribution panel which must be ON to operate the coffee maker.

To keep the coffee maker operating efficiently, the mineral deposits left by water must be flushed out using the cleaning method described in the instruction booklet.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

ENTERTAINMENT CENTER

The Cruiser or Sport Yacht entertainment center equipment options vary from boat to boat. Refer to the Owner's Manual Packet to find individual instructions for the equipment installed on your boat.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

TELEVISION SIGNAL SELECTOR & ANTENNA TUNER

To operate the TV signal selector, push the button marked SHIP for onboard TV antenna reception. Push the button marked SHORE for dockside cable reception.

Your boat may be equipped with a 12 volt TV antenna tuner located adjacent to the signal selector. To operate, turn ON the 12 volt ACCESSORY breaker on the main distribution panel. Press the button on the face of the box to turn ON and rotate knob to get best reception.

TV SIGNAL SELECTOR & ANTENNA TUNER
(Fig. 8.5.1)

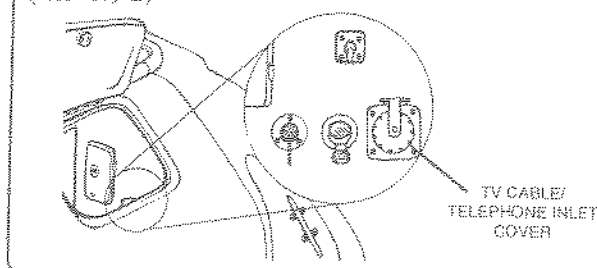


CABLE TELEVISION CONNECTION

The dockside telephone inlet is shared by the TV cable inlet inside the same waterproof cap. The inlet is located next to the shore power inlet.

1. Open the TV cable/telephone inlet cover.
2. Connect the TV coax cable to the TV cable receptacle.
3. Run the cable to the dockside receptacle and connect coax cable into receptacle.

TYPICAL CABLE TELEVISION CONNECTION
(Fig. 8.5.2)



12 VOLT STEREO

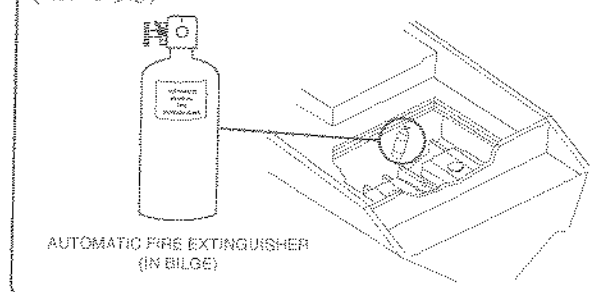
The stereo is protected by the stereo breaker on the dash and/or main DC distribution panel. The power source and fuse protection for the stereo memory and clock is inside the main DC distribution panel. Power is maintained even if the battery switch is off.

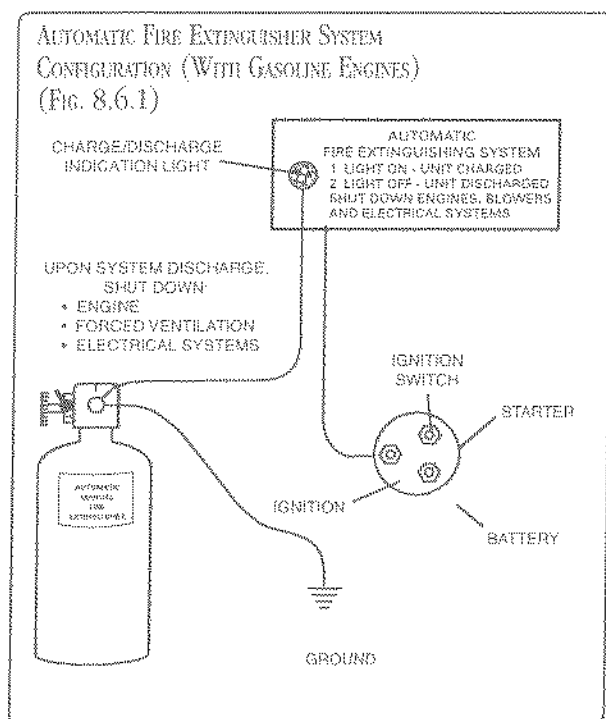
REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

AUTOMATIC FIRE EXTINGUISHER

Your boat may be offered with the standard automatic fire extinguishing system. The system is installed in the bilge. **Location will differ from boat model to boat model due to different bilge layout requirements.** In the event of a fire, the heat sensitive automatic head will release extinguishant, totally flooding the area in fire-killing concentrations. The system indicator light is wired to the ignition and is turned ON when the ignition is turned ON.

TYPICAL AUTOMATIC FIRE EXTINGUISHER LOCATION
(Fig. 8.5.3)





The system indicator light is located on the helm instrument panel. Under normal circumstances, when the ignition is ON the Indicator light is lit. If the unit discharges, the light will go out.

WHEN ACTUATION OCCURS, IMMEDIATELY SHUT DOWN ALL ENGINES, POWERED VENTILATION, ELECTRICAL SYSTEMS AND EXTINGUISH ALL SMOKING MATERIALS. DO NOT OPEN THE ENGINE COMPARTMENT IMMEDIATELY!! THIS FEEDS OXYGEN TO THE FIRE, AND FLASHBACK COULD OCCUR.

On boats equipped with diesel engines, the system incorporates an engine shutdown switch with override system.

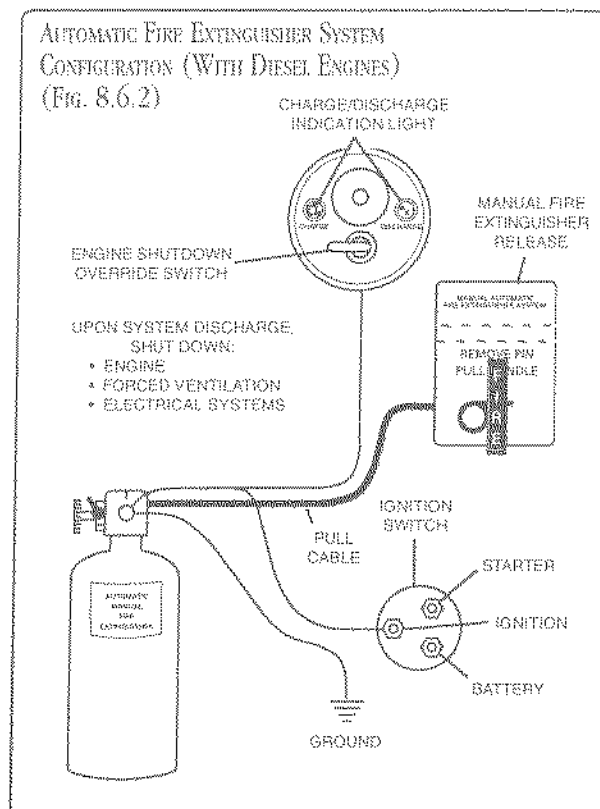
Allow the extinguishant to "soak" the compartment for at least fifteen (15) minutes and for hot metals or fuels to cool before cautiously inspecting for cause of damage. Have portable extinguishers at hand and ready. Do not breathe fumes or vapors caused by the fire.

Your boat also needs to be equipped with approved portable fire extinguishers. It is your responsibility to equip and maintain those fire extinguishers.



WARNING

- In case of fire DO NOT open engine compartment.
- Shut down engines, generator and blowers.



REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

HORN

ELECTRIC HORN

The horn is operated by a momentary switch on the dash and is protected by a circuit breaker on the dash breaker panel. There is no maintenance required on the horn itself, although it is advisable to avoid spraying water directly into the horn.

AIR HORN

The dual air horn is operated and protected by a momentary button and HORN breaker on the dash switch and breaker panels.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

ICE MAKER

The GALLEY SYSTEMS breaker supplies power to the ice maker and must be ON to operate the unit. The 12 volt FRESH WATER PUMP breaker must

also be ON to supply water to the icemaker. Do not block air flow through the ventilation panels at the bottom of the unit.

To START UNIT:

1. Make sure water tank is full.
2. Turn FRESH WATER PUMP and GALLEY SYSTEMS breakers ON.
3. Turn ON icemaker switch, located under the ice maker door.

As a precaution, the first few cycles of ice cubes should not be used because of possible contamination in the line. Once the icemaker is full, the unit will shut off automatically and cycle as ice cubes are used.

To Remove The Icemaker:

1. Make sure the FRESH WATER PUMP and GALLEY SYSTEMS breakers are OFF.
 2. Close petcock water valve to icemaker.
 3. Remove screws securing the unit to the cabinet.
 4. Slide the icemaker out.
 5. Disconnect the icemaker water lines and unplug.
- REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

REFRIGERATOR/ FREEZER

12 Volt DC SYSTEM

The 12 volt system utilizes a REFRIGERATOR breaker located on the main distribution panel. To operate the unit on 12 volt power, preferably with engines operating, turn the switch on the refrigerator to ON.

AC Voltage System

The refrigerator operates on the AC voltage shore power system, or onboard generator (if applicable). To operate the unit on AC power, connect the shore power system, turn the MAIN breaker ON then turn the REFRIGERATOR breaker ON.



Do not cover refrigerator vents.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

SPOTLIGHT

To OPERATE THE SPOT LIGHT:

1. Turn ON the SPOT LIGHT switch on the dash switch panel.
2. Press POWER button on spot light control pad.
3. Press arrow buttons to direct spot light.
4. Press the SPEED button to select horizontal travel speed of spot light.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

STOVES

The electric stove operates on the AC voltage shore power system, or onboard generator (if applicable).

The 120 volt STOVE breaker on the main distribution panel supplies power to the stove and must be ON to operate the stove.

STOVES WITH LIDS:

A safety switch on the lid recess deactivates the power switch, turning off power to the stove control knobs when the lid is installed.



WARNING

DO NOT use this appliance for comfort heating.

REFER TO THE STOVE OPERATOR'S MANUAL FOUND IN YOUR OWNER'S MANUAL PACKET FOR DETAILED OPERATING INSTRUCTIONS AND WARRANTY.

MICROWAVE

The AC voltage MICROWAVE breaker on the main distribution panel supplies power to the microwave and must be ON to operate unit.

REFER TO THE MICROWAVE OPERATOR'S MANUAL FOUND IN YOUR OWNER'S MANUAL PACKET FOR DETAILED OPERATING INSTRUCTIONS AND WARRANTY.

TELEPHONE

(OPTIONAL ON SOME MODELS)

The telephone option consists of a waterproof inlet, a 50 foot (15 meter) shore cord and telephone outlet in the boat. The dockside telephone inlet is shared by the TV cable inlet inside the same waterproof cap (see Fig. 8.5.2). The inlet is located next to the shore power inlet. See Supplemental Information for location of telephone inlet in your boat.

TELEPHONE SYSTEM HOOKUP

1. Open the telephone/TV cable inlet cover.
2. Connect shore cord to dock telephone inlet and then to the boat inlet.
3. Telephone outlet(s) in the boat are now operational.

Vacuum System

(Optional On Some Models)

The vacuum unit is wired to the AC electrical system OUTLETS breaker which must be ON to operate the system. The 24 foot (7 meter) hose connects to the inlet on the face of the vacuum system.



CAUTION

This is a DRY vacuum ONLY. DO NOT vacuum liquids or wet carpet. Damage to equipment or electrical shock may result.

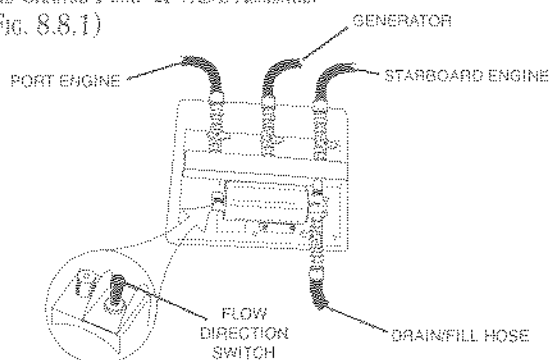
REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

OIL CHANGE SYSTEM

(OPTIONAL ON SOME MODELS)

The oil change system simplifies changing the oil in the engines and generator. The pump is self priming and pumps in either direction. Reservoir jugs are provided to pump the old oil into and to store new oil. The oil pump is protected by the OIL CHANGER breaker on the main DC distribution panel.

OIL CHANGE PUMP & VALVE ASSEMBLY
(Fig. 8.8.1)



OPERATING INSTRUCTIONS:

(SERVICE ONE ENGINE AT A TIME.)

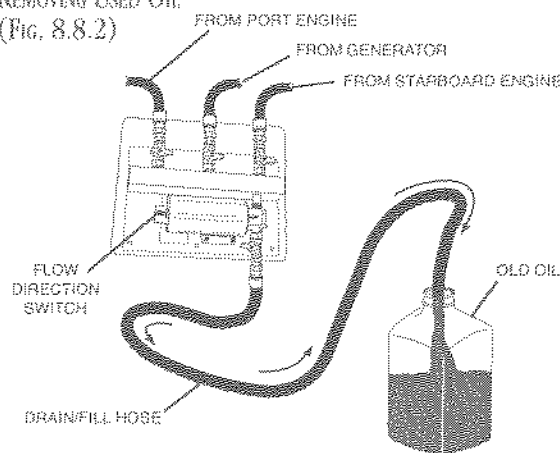


CAUTION

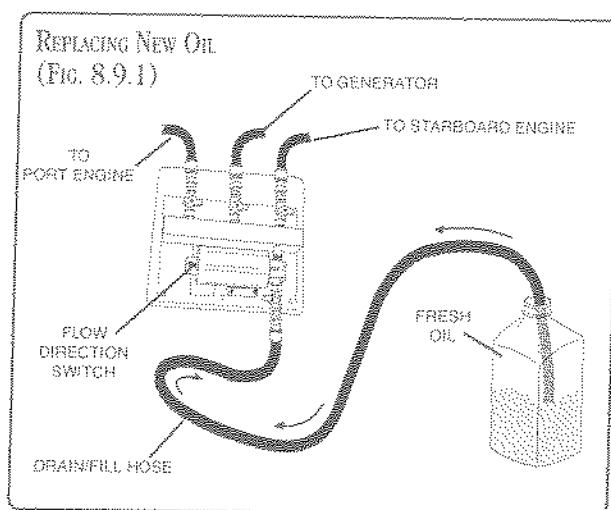
Have only one valve open at a time. Make sure other valves are closed to prevent accidental over filling.

1. Run engines for several minutes to warm the oil and mix the sludge.
2. Begin by turning the valve to the first engine to be serviced to the open position in line with valve body (vertical).
3. Turn the pump on (switch position indicates the direction of flow) and pump the old oil into containers to be disposed of properly (see Fig. 8.8.2).

REMOVING USED OIL
(Fig. 8.8.2)



4. After the oil has been pumped out of the engine, place the pump discharge hose into a container of pre-measured fresh oil and reverse the pump switch to pump the fresh oil into the engine (see Fig. 8.9.1).



NOTE: Fresh oil should be at least 60° F (16° C).

5. When pumping is complete, shut the pump off and close the valve leading to the engine by turning the valve to the closed position (Horizontal).
6. Repeat for each engine or generator to be serviced.

NOTICE

The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters and contiguous zones of the United States. Violators are subject to a fine of \$5,000.

REFER TO OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

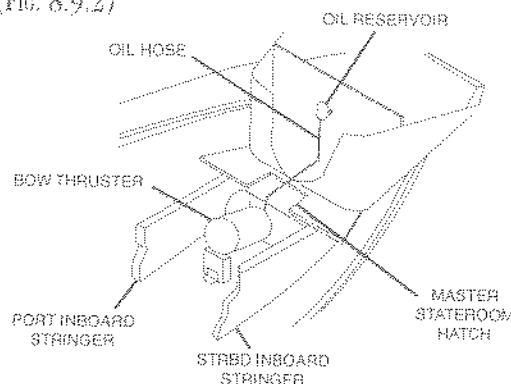
BOW THRUSTER (OPTIONAL ON SOME MODELS)

The optional bow thruster is electrically driven. The bow thruster enhances maneuverability of the bow when docking or performing other maneuvers which requires increased operator control.

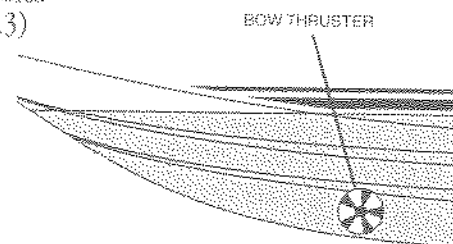
THE BOW THRUSTER WILL ADD THE FOLLOWING EQUIPMENT TO YOUR BOAT:

- **Bow Thruster** - located under the access hatch in the master stateroom.
- **Batteries** - Two (2) 12 volt batteries connected in series to provide 24 volts DC, located in the

BOW THRUSTER (OPTIONAL) (FIG. 8.9.2)



BOW THRUSTER (FIG. 8.9.3)



bilge (see Supplemental Information for location of batteries for your boat).

- **Battery Switch** (24V Bow Thruster) - A rocker switch with indicator light located on the control station.
- **Battery Switch Solenoid** - The solenoid is equipped with two (2) automotive type fuses, one on the line side to power the rocker switch which energizes the solenoid and one on the

NOTICE

If breakers or fuses fail, always replace with the same amperage device. NEVER ALTER overcurrent protection.

load side to power the rocker switch indicator light. (see Supplemental Information for location of the solenoid in your boat).

- **Main Switch** - Located on the helm. It controls the battery solenoid located in the bilge.
- **Converter** - 24 volt/12 amp, located in the bilge (see Supplemental Information for location of the solenoid in your boat).
- **Fuse Protection** - Located in bilge below bow thruster solenoid.

POWER VENTILATION SYSTEM

The power ventilation system removes stagnant air and odor from the head and galley by means of 12 volt exhaust fans mounted to the bulkhead. They are powered by the POWER VENTS breaker on the main distribution panel and turned ON and OFF by the switch in each location.

ELECTRIC WINDSHIELD VENT

(AVAILABLE ON SOME MODELS)

To operate the vent, turn on the battery switch. To open or close vent, push up or down on the WINDSHIELD VENT switch on the control station switch panel.

COCKPIT STEP/SEATING

Some Sea Ray® Boats are fitted with cockpit seating which utilize fold down legs with locking pins. Be sure locking pins are securely fastened to provide a solid platform.

SECTION 9 • STORAGE & RECOMMISSIONING

LAYING-UP INSTRUCTIONS

LIFTING THE BOAT

When lifting the boat always keep the bow higher than the stern to drain the exhaust lines and to prevent water from running forward through the manifold and into the engine where it can become trapped. It may seem expedient to lift only the stern when changing a propeller, but this can result in water entering the engine cylinders, causing hydrostatic lock and resulting in possible internal engine damage and quite possibly engine failure. Even a small amount of water in the engine can cause rust and is to be avoided.

With fiberglass boats, severe gelcoat crazing or more serious hull damage can occur during launching and hauling if pressure is created on the gunwales by slings. Flat, wide belting-type slings and spreaders long enough to keep pressure from the gunwales are necessary. Cable-type slings should be avoided. Do not place the slings where

they may lift on the underwater fittings. There are sling tags on the sides of the deck showing where to place slings for lifting the boat.

Never hoist the boat with an appreciable amount of water in the bilge. Fuel and water tanks should preferably be empty, especially if of large capacity.



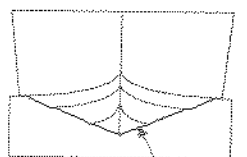
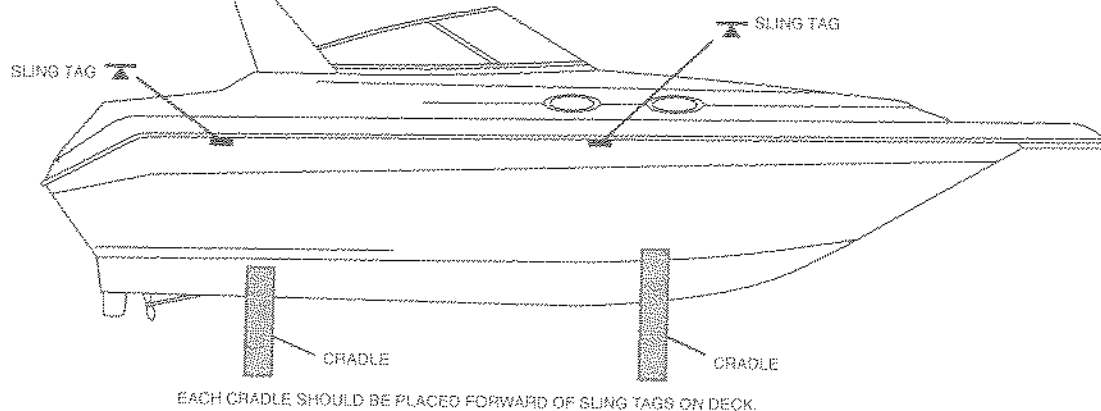
CAUTION

Do not use cleats, bow eyes or stern eyes for lifting.

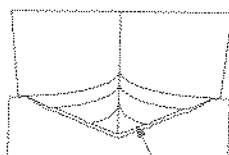
SUPPORTING THE BOAT DURING STORAGE

A cradle is the ideal support for the boat whenever it is not in the water. Properly designed and constructed, it will provide support at the proper points, which is essential to avoid stress on the hull. Boat placement on the cradle should line up as closely as possible to the sling tags on the side of the deck. Do not rest boat on underwater fittings.

PROPER STORAGE ON CRADLE
(FIG. 9.1.1)



RIGHT (NO GAP)



WRONG (GAP)

DRAINING THE BOAT

In climates where freezing occurs, it is important that the bilge be completely drained and dried out when the boat is laid up for the winter. Your Sport Yacht is equipped with a drain plug for this purpose. Some compartments in the bilge may not drain completely because of the position of the boat. They should be pumped out and sponged until totally free of water.

The boat's entire fresh water system must be drained. Open all faucets throughout the boat. Open a connection at the lowest point in the fresh water lines to completely drain them. Break the connections on each side of the water pump. Drain the heads. Drain the water heater. Break the lower connection if necessary.

The engine cooling system and the exhaust system must be free of water if there is danger of freezing. Drain plugs are provided on the engine for this purpose. It is necessary to open a connection or two in the exhaust system to drain the lowest portions; these should be reassembled securely immediately after draining is accomplished.

CONSULT YOUR ENGINE OPERATOR'S MANUAL FOR DETAILED INFORMATION ON PREPARING THE ENGINE FOR STORAGE.

WINTERIZATION CHECKLIST FOR BOATS STORED ON LAND

BOAT STORAGE

- Store boat in a bow high attitude.
- Remove hull drain plug.
- Pour one (1) pint (half-liter) of 50% water/antifreeze mixture in each bilge pump sump.

ICE MAKER

- Shut OFF water supply.
- Disconnect the water line at the garden hose connection on the solenoid valve.
- Allow the unit to run for one hour. Remove any ice cubes ejected during this period.
- Shut OFF the electricity and prop the door open to allow the unit to thaw.
- After it has thawed, wipe it dry.

ENGINES

- Flush engines with fresh water.
- Remove engine drain plugs.

REFER TO YOUR ENGINE OPERATOR'S MANUAL FOR DETAILED INFORMATION ON PREPARING THE ENGINES FOR STORAGE AND WINTERIZATION.

GENERATOR

- Flush generator with fresh water.
- Remove generator drain plugs.
- Remove drain plugs from muffler and strainer.

REFER TO YOUR GENERATOR OPERATOR'S MANUAL FOR DETAILED INFORMATION ON PREPARING THE GENERATOR FOR STORAGE AND WINTERIZATION.

AIR CONDITIONER

- Close thru-hull seacock, remove hoses from sea water pump.
- Flush with fresh water through hose from sea water pump.
- Blow out water lines with air pressure.
- Loosen the screws on the pump head, allowing water to drain from the pump.
- Remove hoses from condensing unit.
- Remove strainer plug.

BATTERIES

- Remove from boat. Remove negative (-) cable first, then positive (+) cable.
- Remove grease and dirt from top surface.
- Grease terminal bolts.
- Store on wooden pallet or thick plastic in a cool dry place. Do not store on concrete.
- Keep under a trickle charge.
- When replacing battery in service, remove excess grease from terminals, recharge as necessary and reinstall in boat.

HEAD SYSTEM

- Flush entire system thoroughly with fresh water.
- Pump out holding tank.

- Remove water line from inlet fitting located on back bottom half of water valve on head.
- Flush one gallon (four liters) antifreeze mixed with one gallon (four liters) of water through toilet and let vacuum pump run for one or two minutes.



CAUTION

Use an automotive or commercial ethylene glycol base antifreeze. Do not use alcohol base products.

- Shut WATER SYSTEM breaker OFF.
- Pump out holding tank.

WATER SYSTEM

- Turn ON fresh water pump.
- Open all faucets, let system drain completely, leave faucets open.
- Turn OFF fresh water pump.
- Remove hoses from water pump.
- Remove hoses from water heater and open drain plug.
- Blow out all lines to clean.
- Pour one (1) pint (half-liter) of 50% water/ environmentally safe, non-toxic antifreeze



CAUTION

Use an automotive or commercial ethylene glycol base antifreeze. Do not use alcohol base products.

mixture in shower drain to fill shower sump.

FUEL SYSTEMS

GASOLINE:

- Fill fuel tank with gasoline and a gasoline stabilizer and conditioner such as "Stabil," to treat the gasoline.
- Run engines for ten minutes to ensure that all gas in the carburetor and fuel lines are treated.



CAUTION

Do not overfill. Filling a tank until the fuel flows from vents is dangerous. Allow room for expansion.

DIESEL:

- Diesel fuel must be treated with a biocide, "Biobor," which prevents bacteria and fungi from contaminating diesel fuel that contains some water.
- Diesel fuel should also get a petroleum distillate additive, such as "Stabil" or "Racor RX1000." This will help assimilate water in the fuel and prevent freezing problems.
- Fill fuel tanks with the treated fuel.
- Run engines for ten minutes to ensure that all diesel fuel in injectors and fuel lines are treated.



CAUTION

Do not overfill. Filling a tank until the fuel flows from vents is dangerous. Allow room for expansion.

REFER TO INDIVIDUAL OWNER'S MANUALS FOR SPECIFIC PROCEDURES.

FITTING OUT AFTER STORAGE

FUEL SYSTEM

Check the entire fuel system for loose connections, worn hoses, leaks, etc. and repair. This is a primary safety precaution.

Check fuel lines for damage and make sure that they do not come in contact with any moving parts.

EXHAUST SYSTEM

Examine the complete exhaust system, from engine to transom. It is imperative that the entire exhaust system be vapor proof and water tight. If a plug or cover was used at the exhaust port, don't forget to remove it. Also check the drain plugs on the bottom of the mufflers. Do not over tighten. Recheck the system with the engines running.

BATTERIES

Before installing the batteries, clean the terminal posts with a wire brush or steel wool and then attach the cables. After the cable clamps are tightened, smear the post and clamps with vaseline or grease to exclude air and acid. Do not apply grease before attaching and tightening the terminal clamps. Examine all wiring.

MISCELLANEOUS

1. Check all thru-hull fittings for unobstructed water passage. Be alert for any deteriorated hoses and/or fittings below the water line which might fail in service and admit water.
2. For inboard engines only: Inspect the rudder stuffing boxes. They should be just tight enough to prevent excessive leaking. Over-tightening will destroy the packing and score the shaft. Check the hose clamps for tightness.
3. For inboard engines only: Make sure the rudder clevis pins on each side of the tie bars are in and safety-wired.
4. For inboard engines only: Check all strut fastenings and thru-hull fastenings.
5. Test the navigation lights.
6. Check all wiring for loose connections.
7. Check all switches and equipment for proper operation.
8. Check bilge blowers for proper operation. Turn ON blowers and place hand over hull blower vent to make sure air is coming from vent.
9. Anchor lines and gear should be inspected and replaced if necessary.
10. If your boat is equipped with a hull drain plug, make sure it is in place.
11. Clean bilge thoroughly if it was not done at lay-up.
12. Check all engine and generator fluid levels.

SECURITY CONSIDERATIONS

Be conscious of the security of your boat. Always remove the keys from the ignition, lock hatches, lock the cabin door, remove and stow any removable electronic gear (fishfinders, LORAN, etc.) and personal gear (fishing poles, etc.) normally left aboard your boat.

SECTION 10 • CARE & REFINISHING

MAINTENANCE AND RECONDITIONING

Your new boat has been designed to provide you with years of enjoyment and satisfaction. In order to maintain the factory new appearance of your boat, we recommend the use of 3M™ Marine's one step Maintenance and Reconditioning Products designed specifically for pleasure boats. Following proper fiberglass maintenance guidelines will help maintain your boat's performance, value, and enjoyment.

FIBERGLASS & GELCOAT

The fiberglass hull, deck and some interior parts consist of the molded shell and exterior gelcoat. The gelcoat is the outer surface, often colored, that presents the shiny smooth appearance which is associated with fiberglass products. In some areas, this gelcoat surface is painted or taped for styling purpose.

Wash the fiberglass regularly with clean, fresh water. Wax gelcoated surfaces to maintain the luster. In northern climates, a semiannual waxing may suffice for the season. In southern climates, a quarterly application of wax will be required for adequate protection.



CAUTION

Sun pad should not be left on deck when not in use. Leaving pad on may affect gelcoat finish.



WARNING

Gelcoat surfaces are slippery when wet. Use extreme care when walking on wet gelcoat.

Always wear non-slip foot gear while washing and waxing boat.



WARNING

Care should be utilized in waxing commonly walked upon areas of the boat to ensure that they are not dangerously slippery.

REFER TO 3M ONE STEP MAINTENANCE AND RECONDITIONING PRODUCTS PAMPHLET IN YOUR OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

STAINS & SCRATCHES

Gelcoat and painted surfaces are very resistant to deep stains. Common surface stains can be removed with diluted household detergents, provided these detergents do not contain ammonia or chlorine. Porcelain-cleaning powders are too abrasive and often contain chlorine and ammonia, either of which would permanently discolor the gelcoat and paint. Alcohol or kerosene can be used for difficult stains but should be washed away promptly with a mild detergent and water. **Never use acetone or any ketone solvents.**

Minor scratches and deeper stains which do not penetrate the gelcoat may be removed by light sanding and buffing.

SPECIAL CARE FOR BOATS THAT ARE MOORED

If permanently moored in salt water or fresh water, your boat will collect marine growth on its bottom. This will detract from the boat's beauty and greatly affect its performance. There are two methods of preventing this:

- Periodically haul the boat out of the water and scrub the bottom with a bristle brush and a solution of soap and water.
- Paint the hull below the waterline with a good grade of antifouling paint. **DO NOT paint the engine outdrive surfaces with bottom paint.**

NOTE: There are EPA regulations regarding bottom paint application. Consult your Sea Ray® dealer for proper application methods.

CARE FOR BOTTOM PAINT

From time to time a slight algae or slime forms on all vessels. The bottom painted portion of the hull can be wiped off with a coarse turkish towel or a piece of old rug while the boat is in the water. Do not use a stiff or abrasive material to clean the bottom paint.

The bottom paint should be inspected annually. If it needs repainting consult your Sea Ray® dealer.

BILGE/ENGINE COMPARTMENT

1. Pump the bilges dry and remove all loose dirt. Be sure that all limber holes are open. If there is oil in the bilge and the source is not known, look for leaks in engine oil lines or engine gaskets. Oil stains can be removed by using a bilge cleaner available from your dealer or a marina. **DO NOT** use flammable solvents.
2. Check all wiring to be sure it is properly supported, that its insulation is intact, and that there are no loose or corroded terminals. If there are corroded terminals, they should be replaced or thoroughly cleaned. Tighten all terminals securely and spray them with light marine preservative oil.
3. Inspect the entire fuel system (including fill lines and vents) for any evidence of leakage. Any stains around joints could indicate a leak. Try a wrench on all fittings to be sure they are not loose, but do not over tighten them. Clean fuel filters and vent screens.
4. Inspect the entire bottom for evidence of seepage, damage or deterioration, paying particular attention to hull fittings, hoses and clamps. Straighten kinked hoses and replace any that do not feel pliable. Tighten loose hose clamps and replace those that are corroded. Tighten any loose nuts, bolts or screws.
5. Refer to your engine operator's manual for engine maintenance details. Wipe off engine to remove accumulated dust and grease. If a solvent is used, make sure it is nonflammable. Go over the entire engine and tighten nuts, bolts, and screws. Inspect the wiring on the engine and clean and tighten the terminals. Inspect the belts and tighten them if needed. Clean and lubricate the battery terminals; fill the battery cells with distilled water as needed.

TOPSIDE AREAS

1. Check grab rails for loose screws, breaks, sharp edges, etc., that might be hazardous in rough weather. Inventory and inspect life jackets for tears and deterioration. Check your first aid kit to make sure it is complete. Check the signaling equipment. Inspect anchor, mooring and towing lines and repair or replace as required. **DO NOT** stow wet lines or they may mildew and rot.
2. Stainless steel and alloy fittings should be cleaned with soap and water or household glass cleaner. Remove rust spots as soon as possible with a brass, silver or chrome cleaner. Irreversible pitting will develop under rust that

remains for any period of time. Never use an abrasive like sandpaper or steel wool on stainless. These may actually cause rust. To help protect the stainless, we recommend the use of a good car wax.

3. When instruments are exposed to a saltwater environment, salt crystals may form on the bezel and the plastic covers. These salt crystals should be removed with a soft, damp cloth; never use abrasives or rough, dirty cloths to wipe plastic parts. Mild household detergents or plastic cleaners can be used to keep the instruments bright and clean.

REFER TO THE OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

ACRYLIC PLASTIC SHEETING (Plastic Glass)

Never use a dry cloth or duster or glass cleaning solutions on acrylic.

To clean acrylic, first flood it with water to wash off as much dirt as possible. Next, use your bare hand, with plenty of water, to feel and dislodge any caked dirt or mud. A soft, grit-free cloth may then be used with a nonabrasive soap or detergent. A soft sponge, kept clean for this purpose, is excellent. Blot dry with a clean damp chamois.

Grease and oil may be removed from acrylic with kerosene, hexane, white (not aviation or ethyl) gasoline or aliphatic naphtha (no aromatic content).

Do not use solvents such as acetone, silicone spray, benzine, carbon tetrachloride, fire extinguisher fluid, dry cleaning fluid or lacquer thinner on acrylic, since they attack the surface.

Remove fine scratches with fine automotive acrylic rubbing and polishing compounds.

UPHOLSTERIES

Exterior fabrics should be cleaned with a sponge or very soft scrub brush and a mild soap and warm water solution. After scrubbing, rinse with plenty of cold, clean water and allow the fabric to air dry in a well ventilated place, preferably away from direct sunlight.

Mildew can occur if your boat does not have adequate ventilation. Heat alone will not prevent mildew; you must also provide for fresh air circulation.

VITRACORE® CABINETS

To maintain the beauty of the galley cabinet surfaces and to prevent using the wrong cleaning agents, please follow the cleaning recommendations listed below.

The following NOTICE label is placed on the fiberglass area of the galley countertop.

Clean often with a soft cloth or sponge and mild soap and water. A **non-ammoniated** spray may also be used. (Examples: Glass Cleaner-Vinegar Glass Works by Miles, Inc.) **Never** use paper towels, abrasive pads or abrasive cleaners! Hairline scratches and minor abrasions can be removed or minimized by using mild automobile polish, Johnson Paste or Mirror Glaze (M.G.M.10).

These care instructions refer specifically to the Vitracore® Cabinets surfaces. Ask your dealer about cleaning any hardware or trim which has been incorporated in your cabinetry.

NOTICE

Care and maintenance of your Vitracore® Cabinets

- **Never use ammoniated window sprays or kitchen scouring components.**
- **Never use solvents such as acetone, gasoline, benzene, alcohol or lacquer thinner.**
- **Polish with light coat of automobile paste wax or plastic cleaner/polish.**
- **Failure to follow these instructions will result in damage to your cabinets.**

CLEANING RECOMMENDATIONS FOR MARINE HEADLINER & FABRIC

NOTICE

Always clean immediately. Test an unseen area of fabric before cleaning stain.

REFER TO THE OWNER'S MANUAL PACKET FOR INSTRUCTIONS AND WARRANTY INFORMATION.

SECTION 11 • SERVICE INFORMATION

USEFUL SERVICE INFORMATION

OWNER _____

HOME PORT _____

BOAT NAME _____

REGISTRATION # _____ STATE _____

HULL SERIAL # _____

WARRANTY REGISTRATION DATE _____

ENGINE MAKE & MODEL _____

SERIAL # _____

OUTDRIVE RATIO _____

SERIAL # _____

PROPELLER SIZE _____

PART # _____

FUEL CAPACITY _____

WATER CAPACITY _____

KEY #, IGNITION _____ DOOR _____

SELLING DEALER _____

CITY & STATE _____

LENGTH _____

BEAM _____

DRAFT _____

VERTICAL CLEARANCE _____

ESTIMATED WEIGHT _____

MAXIMUM LOAD: WEIGHT _____ # PEOPLE _____

GENERATOR SERIAL # _____

MODEL # _____ KILOWATTS _____

SERVICE GUIDE

NOTE: The Service Guide is based on average operating conditions. Under severe operating conditions, intervals should be shortened. Operation in salt water is considered severe operating conditions.

REFER TO THIS MANUAL AND/OR YOUR ENGINE OPERATOR'S MANUAL FOR DETAILS.

	BEFORE EVERY USE	AFTER FIRST 20 HRS.	EVERY 50 HOURS	EVERY 100 HOURS	ANNUALLY
CHECK ENGINE OIL LEVEL	●				
CHANGE ENGINE OIL				●	●
CHECK GENERATOR OIL LEVEL	●				
REPLACE OIL FILTER				●	●
REPLACE ENGINE MOUNTED FUEL FILTER				●	
CHECK TRANSMISSION FLUID LEVEL	●				
CHANGE TRANSMISSION FLUID**					●
CLEAN CRANKCASE VENTILATING SYSTEM		●		●	
CLEAN TRANSMISSION OIL STRAINER SCREEN**					●
CHECK COOLING SYSTEM HOSES & CONNECTIONS FOR LEAKS (WITH ENGINES RUNNING)	●				
TIGHTEN ENGINE MOUNT FASTENERS		●			●
CHECK FOR LOOSE, DAMAGED OR MISSING PARTS	●				
CHECK PICK-UP & WATER IMPELLERS**					●
CHECK ACCESSORY DRIVE BELTS	●				
CHANGE ANTIFREEZE					●
CLEAN AIR CLEANERS		●		●	
CHECK ZINCS IN HEAT EXCHANGER	EVERY 25 HOURS				
CHECK SEA WATER STRAINERS & SEACOCKS*	●	●	●		
LUBRICATE SEACOCKS*					●
CHECK ENGINE ALARMS	●				

Equipment listed to service may not be standard equipment or even available as options on your particular Sea Ray® Cruiser or Sport Yacht. Service the equipment which your boat is equipped with.

* Equipment listed to service may not be standard equipment or even available as options on your particular Sea Ray® Sport Cruiser or Sport Yacht. Service the equipment which your boat is equipped with.

SERVICE GUIDE (CONT'D)

REFER TO THIS MANUAL AND/OR YOUR ENGINE OPERATOR'S MANUAL FOR DETAILS.

	BEFORE EVERY USE	AFTER FIRST 20 HRS.	EVERY 50 HOURS	EVERY 100 HOURS	ANNUALLY
CHECK EXHAUST SYSTEM FOR LEAKS	●	●		●	
CHECK FUEL SYSTEM LINES & CONNECTIONS	●	●	●		
CHANGE WATER SEPARATING FUEL FILTER		●			●
CHECK SHAFT LOG & STRONG SEAL™	●	●	●		
CHECK RUDDER PACKING, TIGHTEN FOR NO LEAKS***		●	●		●
INSPECT CLEVIS PIN ON RUDDER TIE BAR***		●	●		
LUBRICATE RUDDER SHAFT***					●
LUBRICATE THROTTLE & SHIFT LINKAGE PIVOT POINTS		●		●	●
CHECK BATTERY ELECTROLYTE LEVEL	●	●	●		
CHECK ALL ELECTRICAL CONNECTIONS (Including Dockside Power Inlet)		●			●
INSPECT PROPELLER FOR POSSIBLE DAMAGE			●		
CHECK ENGINE TO SHAFT ALIGNMENT***		●			●
CHECK WATER SYSTEM PUMP FILTER		●	●		●
INSPECT FRESH WATER PUMP & WATER SYSTEM		●		●	
CHECK HOLDING TANK LEVEL	●				
CHECK FLUID IN TRIM PLANE PUMPS		●			●
TEST 120 VOLT GFI OUTLET					●
CHECK OIL IN STEERING SYSTEM	EVERY 3 MONTHS				

** Sea Ray® recommends that this maintenance be performed by an authorized service center.

*** Service For Inboard Engines Only.

QUICK REFERENCE DEPARTURE CHECKLIST

As the owner/operator of a Sea Ray® Sport Boat, you are responsible for the safe operation your boat and the safety of your passengers. Always be sure that required documents, navigational equipment and Coast Guard required safety equipment is aboard and in proper working order.

BOARDING THE BOAT*

General

1. Weather Conditions Is it going to be safe to go out
2. Transom Drain Plug Installed
3. PFDs and all other Coast Guard required safety equipment Available for all children and adults
4. Ignition keys Available
5. Tool Box Stocked with a variety of appropriate tools

Trailer

1. Wheel Lug Nuts Tight (None missing)
2. Trailer Lights Working properly
3. Winch and Tie Downs Tight and secure

Boat Systems

1. Bilge Pumps Working. Discharge any appreciable amounts of water overboard
2. Blowers Working. "Sniff" the bilge/engine compartment for fuel odor
3. Navigation Lights Working. Have spare bulbs and fuses aboard
4. Radio/Electronics Working
5. Horn Working
6. Power Trim/Trim Tabs Full range of motion. No excessive play or binding
(If Applicable)
7. Fresh Water Tank Filled and sanitized
(If Applicable)
8. Head System Holding Tank Empty
1. Seacocks Open (handle parallel to hose)
(If Applicable)

Engine

1. Batteries Fully charged (Check water cell levels)
2. Fuel Tank Filled with recommended fuel
3. Fuel System Check for leaks
4. Fuel Filters Check that filters are clean and tight
5. Diesel Racor Fuel Filters Check that filters are clean, tight and free of water
6. Engine Coolant Drain Plugs Secured
7. Steering Fluid Full
8. Throttle & Gearshift Controls Test Full range of motion

*Note: Many of these items should be checked before leaving the house.

QUICK REFERENCE DEPARTURE CHECKLIST (CONT'D)

PREPARING TO DEPART AND AFTER LAUNCHING

General

1. Bilge/Engine Compartment "Sniff" the bilge/engine compartment for fuel odor.
Run the bilge blowers for at least four (4) minutes.
2. Shore Power Cable Disconnected from dockside power inlet
(If Applicable)
3. Lines, Fenders and Anchor Ready for use
4. Passengers/Crew Instructed in duties for getting underway and fitted
for a correct size PFD

Engine

1. Battery Switches In the ON position
2. Fuel Valves Open
(If Applicable)
3. Engine Alarm Test. Should sound after a few seconds
4. Gear Shift & Throttle Controls In NEUTRAL and IDLE positions

STARTING THE ENGINE*

1. Gearshift & Throttle Controls Shift in NEUTRAL (Refer to your Engine Owner's
Manual for startup procedures for your specific engine)
2. Sport Cruisers Turn ignition key clockwise to START. Hold in
START position until engine starts*, then release to
ON position
- Sport Yachts Turn MASTER IGNITION breakers and keys, located
on main distribution panel, ON. Listen for alarm
buzzers which indicate ignition power

NOTE: With gasoline engines there is about a five (5) second delay before the buzzer sounds.
After ignition power is verified, check shift for neutral position and push and hold ignition switch to the momentary start position to start the engine(s)*

IMPORTANT: Do not continue to operate starter for more than 10 seconds without pausing to allow starter motor to cool off for 2 minutes. This also will allow the battery to recover between starting attempts.*



WARNING

Do not run the engine or generator in an enclosed area, such as a closed boat house, as there is the possibility of buildup and inhaling of carbon monoxide.

*If engine fails to start, refer to Pg. 11.7 and/or the Engine Owner's Manual for further troubleshooting procedures

QUICK REFERENCE DEPARTURE CHECKLIST (CONT'D)

WHILE UNDERWAY

GENERAL

1. Passengers/Crew Safely seated with PFD's on or immediately accessible
2. Lines, Fenders and Anchor Stowed

BOAT SYSTEMS

1. Power Trim/Trim Tabs Bring boat to "On Plane"
2. Navigation Lights On at night or in reduced visibility

ENGINE

1. Tachometers Engines operating in safe RPM range
2. Engine Gauges Continually monitor
3. Engine Operation Check idle and shift. Listen for abnormal noises and visually check the engine compartment while underway

RETURNING TO PORT

GENERAL

1. Passengers/Crew Instructed in duties for line handling
2. Lines and Fenders Ready for use

BOAT SYSTEMS

1. Navigation Lights Turned OFF when secured
2. Anchor Light ON if necessary
3. Bilge/Engine Compartment "Sniff" the bilge/engine compartment for fuel odor. Run the bilge blowers if necessary. Check for water in bilge. Run bilge pumps if necessary

ENGINE

1. Gearshift & Throttle Controls Bring to NEUTRAL and IDLE positions
1. Tachometers Idle the engines for five (5) minutes to cool down
2. Ignition Key Turn to OFF position when engines are cooled down
3. Engine Operation Check idle and shift. Listen for abnormal noises

QUICK REFERENCE DEPARTURE CHECKLIST (CONT'D)

SECURING THE BOAT

GENERAL

1. Shore Power Cable Connected to dockside power inlet
(If Applicable)
2. Lines and Fenders Fenders in place, lines tied securely to dock

BOAT SYSTEMS

1. Seacocks Closed (handle perpendicular to hose)
(If Applicable)
2. Helm Switch Panel All switches in the OFF position
3. Gearshift & Throttle Controls In the NEUTRAL and IDLE positions

ENGINE

1. Ignition Switch In the OFF position and keys removed
2. Battery Switches In the OFF position
1. Fuel Valves Closed (handle perpendicular to hose)
(If Applicable)

IF THE ENGINE DOES NOT START

NO STARTER MOTOR RESPONSE

1. Check battery condition for sufficient charge
2. Check battery cable connections tight and free from corrosion
3. Check battery switch in the ON (or BOTH) position
4. Check gearshift/throttle control lever in the NEUTRAL position
5. Check starter motor and solenoid connections
6. Check ignition switch connections

STARTER MOTOR RESPONDS, BUT NO IGNITION

1. Check electrical connections on engine wiring harness and ignition wiring
2. Check that fuel tanks are not empty
3. Check fuel filter and filter/water separator (if applicable) clean

QUICK REFERENCE DEPARTURE CHECKLIST (CONT'D)

OPERATING THE GENERATOR

STARTING THE GENERATOR

1. Generator Seacock Open
2. Bilge Blowers Run for at least 4 minutes and any time the generator is running
3. Depress PREHEAT Preheat time should not exceed 30 seconds
4. Depress START Switch Depress until generator starts
5. When the Generator Starts Release the START switch only (If diesel, continue holding PRE-HEAT for a few seconds)
6. Load The Generator Turn ON the generator main breaker on the Main Distribution Panel. Turn AC breakers ON



WARNING

Do not run the generator or engines in an enclosed area, such as a closed boat house, as there is the possibility of buildup and inhaling of carbon monoxide.

STOPPING THE GENERATOR

1. Breakers Turn AC breakers OFF. Turn OFF the generator main breaker on the Main Distribution Panel
2. Generator Let it run a few minutes to cool down
3. STOP Switch Depress to stop the generator set

INDEX

A

AC System	7.5
Accessory Receptacle, 12 Volt	7.4
Accident Report	1.32
Accumulator Tank, Pneumatic	5.2
Acrylic Plastic Sheeting	10.2
Additional Recommended Equipment	1.8
Aft Cover	8.4
After Launching Checklist	11.5
After Storage, Fitting Out	9.3
Agents, Cleaning	1.12
Air Conditioner, Winterization	9.2
Air Conditioning	8.1
Alarm, Engine	3.14
Anchor, Lowering	1.17
Anchor, Setting	1.19
Anchor, Weighing	1.19
Anchoring Arrangement	1.17
Anchoring Procedures	1.19
Anchoring	1.16
Anodes, Zinc	7.12
Anti- Corrosion System, Marine Electronic Cathodic	7.13
Approaching a Mooring	1.16
Approaching a Pier	1.15
Approaching a Slip	1.16
Approaching a Wharf	1.15
Approaching the Dock	1.15
Arrangement, Anchoring	1.17
Audible Distress Signals	1.27
Automatic Fire Extinguisher	8.5

B

Basic Propeller Characteristics	2.7
Batteries	7.1
Batteries, Fitting Out	9.4
Batteries, Winterization	9.2
Battery Cables, Removal	7.1
Battery Maintenance	7.1
Battery Switch, Dual	7.3
Battery Switch, On/Off	7.3
Battery Switches	7.3

Battery Switches, DC Distribution Panel	7.3
Bilge Blowers	2.2
Bilge Pumps	2.1
Bilge	10.2
Bilge	2.1
Bimini Top	8.3
Blowers, Bilge	2.2
Boarding the Boat Checklist	11.4
Boarding	1.13
Boat Storage, Winterization	9.2
Boat, Draining	9.2
Boat, Lifting	9.1
Boat, Supporting	9.1
Boot, Convertible Top	8.3
Boot, Sun Shade	8.3
Bottom Paint, Care	10.1
Bow Thruster	8.9
Breaker Panel, Main DC	7.3
Bridge Cover	8.4
Bridge Enclosure	8.4
Broadcasts, Emergency	1.27
Buoys, Navigational	1.22

C

Cabinets, Vitracore®	10.3
Cable Gear Shift & Throttle Controls	3.5
Cablemaster	8.1
Canvas Care & Maintenance	8.2
Canvas Installation Tips	8.3
Canvas Storage	8.2
Canvas	8.2
Capacity, Load	1.9
Capacity, Power	1.9
Carbon Monoxide Monitor	3.9
Care & Maintenance, Canvas	8.2
Care for Bottom Paint	10.1
Casting Off	1.15
Cathodic Anti- Corrosion System, Marine Electronic	7.13
Cavitation	2.7
Center, Entertainment	8.5

Certification Design Categories	1.3
Certifications, Manufacturer's	1.3
Chains, Safety	1.34
Charts, Nautical	1.24
Checking Water Level	5.1
Checklist, After Launching	11.5
Checklist, Boarding the Boat	11.4
Checklist, Engine Does Not Start	11.7
Checklist, Operating the Generator	11.8
Checklist, Preparing to Depart	11.5
Checklist, Quick Departure Reference	11.4
Checklist, Returning to Port	11.6
Checklist, Securing the Boat	11.7
Checklist, Starting Engine	1.14
Checklist, Starting the Engine	11.5
Checklist, While Underway	11.6
Checklist, Winterization	9.2
Circuit Protection, Electrical System	7.2
Cleaning Agents	1.12
Cleaning Recommendations, Fabric	10.3
Cleaning Recommendations, Marine Headliner	10.3
Clearing a Fouled Anchor	1.19
Cockpit Seating	8.10
Cockpit Step	8.10
Coffee Maker	8.5
Collisions	1.30
Compass, Marine	3.11
Connecting Jumper Cables	7.2
Considerations, Environmental	1.36
Console Dimmer	3.11
Construction Standards	1.1
Control Failure	1.32
Control	1.19
Control, Maintaining	1.10
Controls & Functions, Main Distribution Panel ..	7.7
Converter	7.10
Convertible Top Boot	8.3
Convertible Top	8.3
Coolant Recommendations	2.6
Cooling System, Fresh Water	2.6
Counter-rotating Propellers	2.8
Cover, Aft	8.4
Cover, Bridge	8.4
Cover, Windshield	8.4
Crossover Fuel System	4.2
Current	1.21
Curtains, Side	8.4

D

Dam Spillways	1.11
DC Distribution Panel Battery Switches	7.3
DC System	7.1
Dealer Responsibilities	1.1
Design Categories, Certification	1.3
Detroit Diesel Electronic Display Module	3.13
Detroit Diesel Gear Shifts & Throttle Controls ..	3.7
Diesel Fuel Filters	4.2
Dimmer, Console	3.11
Display, Main EMS	3.12
Disposal, Waste	1.36
Distress Signals	1.27
Distress Signals, Audible	1.27
Distress Signals, Visual	1.27
Diving	1.13
Dock Lines, Handling	1.14
Dock, Approaching	1.15
Dockside Pump-Out Option	6.1
Dockside Water Inlet	5.3
Drain Plug	2.1
Draining the Boat	9.2
Dual Battery Switch	7.3

E

Education	1.1
Electric – DDEC or Twin Disc® Gear Shifts & Throttle Controls	3.7
Electric Fuel Valves	4.1
Electric Gear Shifts & Throttle Controls	3.6
Electric Windshield Vent	8.10
Electrical System Circuit protection	7.2
Electrical System, 120 Volt AC/60 Hz	7.5
Electrical System, 220 Volt AC/50 Hz	7.6
Electrical System, 240 Volt AC/60 Hz	7.5
Electrolysis	7.12
Electronic Cathodic Anti- Corrosion System, Marine	7.13
Electronic Circuit with Ground Plate	7.4
Electronic Display Module, Detroit Diesel	3.13
Emergency Broadcasts	1.27
Emergency Situations	1.26
Emergency Start System	7.4
Emergency Stop Switch	4.7
Emergency, Medical	1.32
Enclosure, Bridge	8.4

Engine Alarm	3.14
Engine Compartment	10.2
Engine Does Not Start Checklist	11.7
Engine Exhaust System	2.4
Engine Mounts	2.3
Engine Removal	2.5
Engines	2.3
Engines, Winterization	9.2
Entertainment Center	8.5
Environmental Considerations	1.36
Equipment	1.2
Equipment, Additional Recommended	1.8
Equipment, Fire Suppression	1.28
Equipment, Lifesaving	1.6
Equipment, Minimum Required	1.7
Excessive Noise	1.37
Exhaust System, Engine	2.4
Exhaust System, Fitting Out	9.3
Exhaust System, Underwater	2.5
Explanation of Safety Precautions	1.6
Extinguisher, Automatic Fire	8.5
Extinguishers, Portable	1.29

F

Fabric, Cleaning Recommendations	10.3
Failure, Control	1.32
Failure, Propulsion	1.32
Failure, Steering	1.32
Fiberglass	10.1
Filling the water tank	5.1
Filters, Fuel	4.2
Filter, Water	5.1
Fire Extinguisher, Automatic	8.5
Fire Suppression Equipment	1.28
Fire	1.28
Fitting Out After Storage	9.3
Fitting Out, Batteries	9.4
Fitting Out, Exhaust System	9.3
Fitting Out, Fuel System	9.3
Fitting Out, Miscellaneous	9.4
Fixed System	1.29
Float Plan	1.12
Flooding	1.29
Fog, Navigating In	1.26
Fouled Anchor, Clearing	1.19
Freezer	8.7
Fresh Water Cooling System	2.6

Fresh Water Washdown	5.3
Fuel & Oil Spillage	1.36
Fuel Filters, Diesel	4.2
Fuel Filters, Gasoline	4.2
Fuel Gauge	3.10
Fuel Recommendations	4.2
Fuel System, Crossover	4.2
Fuel System, Fitting Out	9.3
Fuel Systems	4.1
Fuel Systems, Winterization	9.3
Fuel Tank	4.1
Fuel Valves, Electric	4.1
Fueling Precautions	4.4

G

Gasoline Fuel Filters	4.2
Gauge, Fuel	3.10
Gauge, Oil Pressure	3.10
Gauge, Optional Oil Pressure	3.12
Gauge, Optional Water Temperature	3.13
Gauge, Quad	3.12
Gauge, Synchronizer	3.11
Gauge, Transmission Oil Pressure	3.13
Gauge, Transmission Oil Temperature	3.13
Gauge, Water Temperature	3.10
Gauges, Instrument	3.10
Gauges, Optional Instrument	3.12
Gear Shift & Throttle Controls, Cable	3.5
Gear Shift/Throttle Control, Single	3.4
Gear Shifts & Throttle Controls, Detroit® Diesel	3.7
Gear Shifts & Throttle Controls, Electric – DDEC or Twin Disc®	3.7
Gear Shifts & Throttle Controls, Electric	3.6
Gear Shifts & Throttle Controls, Hydraulic	3.5
Gear Shifts	3.3
Gear, Underwater	2.6
Gears, Marine	2.3
Gears, Reduction	2.3
Gears, Reverse	2.3
Gelcoat	10.1
Generator	7.11
Generator, Starting	7.11
Generator, Stopping	7.12
Generator, Winterization	9.2
Gray Water System	5.4
Ground Fault Interrupter Outlets	7.10

Ground Plate, Electronic Circuit	7.4
Grounding	1.31
Guide, Service	11.2
Guidelines, Operation	1.13

H

Halogen Lighting	7.4
Handling Dock Lines	1.14
Head System, Winterization	9.2
Head Systems	6.1
Head, Portable Self-Contained With Dockside Pump-Out	6.1
Head, Portable Self-Contained	6.1
Head, Vacu-Flush®	6.2
Heater, Water	5.2
Heating	8.1
Hitches	1.34
Hitches, Weight-Carrying	1.34
Hitches, Weight-Distributing	1.34
Holding Tank Operation	6.2
Hook-Up, Shore Power	7.6
Hookup, Telephone System	8.8
Horn	8.6
Hotlines, Safety	1.13
Hour Meters	3.12
Hydraulic Gear Shifts & Throttle Controls	3.5
Hydraulic Power Steering System	3.2
Hydraulic Steering System	3.2

I

Ice Maker	8.6
Ice Maker, Removal	8.7
Ice Maker, Winterization	9.2
Ignition Protection	7.2
Impact Protection, Outdrive	2.6
Impaired Operation	1.8
Information, Service	11.1
Inlet, Dockside Water	5.3
Installation Tips, Canvas	8.3
Installation, Propeller	2.8
Instructions, Laying -Up	9.1
Instrument Gauges	3.10
Insurance	1.2
International Receptacle	7.11
Interrupter Outlets, Ground Fault	7.10
Introduction	1.1

J

Jumper Cables, Connecting	7.2
---------------------------------	-----

K

Keeping Batteries Charged	7.2
---------------------------------	-----

L

Labels, Warning	1.6
Launching	1.35
Laying-Up Instructions	9.1
Leaking	1.30
Lifesaving Equipment	1.6
Lifting the Boat	9.1
Lighting	7.4
Lighting, Halogen	7.4
Lights, Navigation	3.11
Lights, Navigational	1.26
Load Capacity	1.9
Loading	1.35
Log, Shaft	2.10
Lowering the Anchor	1.17

M

Macerator	6.3
Main DC Breaker Panel	7.3
Main Distribution Panel Controls & Functions	7.7
Main EMS Display	3.12
Maintaining Control	1.10
Maintenance	10.1
Maintenance, Battery	7.1
Maintenance, Shore Power Cable Set	7.6
Maintenance, Shore Power Inlets	7.6
Maneuvering With A Trailer	1.34
Maneuvering	1.19
Maneuvering	3.3
Manufacturer's Certifications	1.3
Manufacturer's Specifications	1.4
Marine Compass	3.11
Marine Electronic Cathodic Anti- Corrosion System	7.13
Marine Gears	2.3
Marine Headliner, Cleaning Recommendations	10.3
Marine Radios	1.27
Markers, Navigational	1.22

Medical Emergency	1.32
Mercathode®	7.13
Meters, Hour	3.12
Microwave	8.7
Minimum Required Equipment	1.7
Miscellaneous, Fitting Out	9.4
Monitor, Carbon Monoxide	3.9
Monitor, Systems	3.14
Moored Boats, Special Care	10.1
Mooring, Approaching	1.16
Mounts, Engine	2.3

N

Nautical Charts	1.24
Nautical Terms	1.5
Navigating In Fog	1.26
Navigation Lights	3.11
Navigation	1.22
Navigational Buoys	1.22
Navigational Lights	1.26
Navigational Markers	1.22
Noise, Excessive	1.37

O

Oil Change System	8.8
Oil Pressure Gauge	3.10
On/Off Battery Switch	7.3
Operating In Shallow Water	1.11
Operating the Generator Checklist	11.8
Operation Guidelines	1.13
Operation, Holding Tank	6.2
Operation, Impaired	1.8
Operation, Power Tilt	3.8
Operation, Power Trim & Tilt	3.7
Optional Instrument Gauges	3.12
Optional Oil Pressure Gauge	3.12
Optional Tachometer	3.13
Optional Water Temperature Gauge	3.13
Outdrive Impact Protection	2.6
Outlets, Ground Fault Interrupter	7.10
Owner/Operator Responsibilities	1.2

P

Paint	1.12
Panel, Main DC Breaker	7.3
Panel, Main Distribution Controls & Functions	7.7

Parts	1.2
Pier, Approaching	1.15
Plan, Float	1.12
Plastic, Acrylic	10.2
Plate, Electronic Circuit with Ground	7.4
Plug, Drain	2.1
Pneumatic Accumulator Tank	5.2
Portable Extinguishers	1.29
Portable Self-Contained Head With Dockside Pump-Out	6.1
Portable Self-Contained Head	6.1
Power Capacity	1.9
Power Steering	3.1
Power Tilt Operation	3.8
Power Trim & Tilt Operation	3.7
Power Ventilation System	8.10
Precautions, Fueling	4.4
Preparing to Depart Checklist	11.5
Procedures, Anchoring	1.19
Propeller Characteristics, Basic	2.7
Propeller Installation	2.8
Propeller Removal	2.9
Propeller Torque	2.7
Propellers	1.9
Propellers	2.7
Propellers, Counter-rotating	2.8
Propulsion Failure	1.32
Protection, Electrical System Circuit	7.2
Protection, Ignition	7.2
Protection, Outdrive Impact	2.6
Pump, Water	5.1
Pump-Out Option, Dockside	6.1
Pumps, Bilge	2.1

Q

Quad Gauge	3.12
Quick Departure Reference Checklist	11.4

R

Radios, Marine	1.27
Receptacle, 12 Volt Accessory	7.4
Receptacle, International	7.11
Recommendations, Coolant	2.6
Recommendations, Fuel	4.2
Recommended Equipment, Additional	1.8
Reconditioning	10.1
Reduction Gears	2.3

Refrigerator	8.7
Registration	1.1
Removal, Battery Cables	7.1
Removal, Engine	2.5
Removal, Ice Maker	8.7
Removal, Propeller	2.9
Report, Accident	1.32
Required Equipment, Minimum	1.7
Rescue, Water	1.30
Responsibilities, Dealer	1.1
Responsibilities, Owner/Operator	1.2
Returning to Port Checklist	11.6
Reverse Gears	2.3
Right-of-Way	1.24
Rudder	2.10

S

Safety Chains	1.34
Safety Hotlines	1.13
Safety Precautions, Explanation	1.6
Safety	1.5
Sanitizing the Water System	5.1
Scratches	10.1
Seacocks	2.11
Seal, Strong™	2.10
Seating, Cockpit	8.10
Securing the Boat Checklist	11.7
Security Considerations	9.4
Service Guide	11.2
Service Information	11.1
Servicing	1.2
Setting the Anchor	1.19
Shade, Sun	8.3
Shaft Log	2.10
Shafts	2.10
Shallow Water, Operating In	1.11
Sheeting, Acrylic Plastic	10.2
Shifting from Shore Power to Generator Power	7.12
Shifting	1.14
Shore Power Cable Set Maintenance	7.6
Shore Power Hook-Up	7.6
Shore Power Inlets Maintenance	7.6
Shore Power to Generator Power, Shifting	7.12
Shower system	5.3
Side Curtains	8.4
Signals, Distress	1.27

Single Gear Shift/Throttle Control	3.4
Skiing	1.12
Slip, Approaching	1.16
Special Care for Moored Boats	10.1
Specifications, Manufacturer's	1.4
Spillage, Fuel & Oil	1.36
Spillways, Dam	1.11
Sports, Water	1.12
Spotlight	8.7
Stability	1.9
Stains	10.1
Standards, Construction	1.1
Start System, Emergency	7.4
Starting Engine Checklist	1.14
Starting Engines	4.4
Starting Engines, Inboard Engines	4.5
Starting Engines, Stern Drives	4.4
Starting the Engine Checklist	11.5
Starting the Generator	7.11
Starting	1.14
Steering Failure	1.32
Steering System	3.1
Steering System, Hydraulic Power	3.2
Steering System, Hydraulic	3.2
Steering	1.20
Steering, Power	3.1
Step, Cockpit	8.10
Stop Switch, Emergency	4.7
Stopping Engines	4.7
Stopping Engines, Inboard Engines	4.7
Stopping Engines, Stern Drives	4.7
Stopping the Generator	7.12
Stopping	1.14
Storage, Canvas	8.2
Stoves	8.7
Strainers	2.11
Strong™ Seal	2.10
Strut	2.10
Stuffing Box	2.10
Sun Shade Boot	8.3
Sun Shade	8.3
Supporting the Boat	9.1
Swamping	1.29
Swimming	1.12
Switch, Dual Battery	7.3
Switch, On/Off Battery	7.3
Switches, Battery	7.3

Switches, DC Distribution Panel Battery	7.3
Synchronizer Gauge	3.11
System, Emergency Start	7.4
System, Fixed	1.29
Systems Monitor	3.14

T

Tachometer	3.10
Tachometer, Optional	3.13
Tank, Fuel	4.1
Tank, Pneumatic Accumulator	5.2
Telephone System Hookup	8.8
Telephone	8.8
Terms, Nautical	1.5
Throttle Controls	3.3
Thruster, Bow	8.9
Top, Bimini	8.3
Top, Convertible	8.3
Topside Areas	10.2
Torque, Propeller	2.7
Towing	1.31
Trailer, Maneuvering With	1.34
Trailerling	1.33
Transformer, 12 Volt AC	7.4
Transformer, 120 Volt AC	7.4
Transmission Oil Pressure Gauge	3.13
Transmission Oil Temperature Gauge	3.13
Trim Tabs	3.8
Trimming	1.21

U

Underwater Exhaust System	2.5
Underwater Gear	2.6
Upholsteries	10.2

V

Vacu-Flush® Head	6.2
Vacuum System	8.8
Valves, Electric Fuel	4.1
Ventilation System, Power	8.10
Ventilation	2.7
Vibration & Causes	2.5
Visibility	1.10
Visual Distress Signals	1.27
Vitracore® Cabinets	10.3
Voltmeter	3.10

W

Wake	1.37
Warning Labels	1.6
Warranty	1.1
Wash	1.37
Washdown, Fresh Water	5.3
Waste Disposal	1.36
Water Filter	5.1
Water Heater	5.2
Water Inlet, Dockside	5.3
Water Level, Checking	5.1
Water Pump	5.1
Water Rescue	1.30
Water Sports	1.12
Water System, Gray	5.4
Water System, Sanitizing	5.1
Water System, Winterization	9.3
Water Systems	5.1
Water Tank, Filling	5.1
Water Temperature Gauge	3.10
Weather	1.10
Weighing Anchor	1.19
Weight-Carrying Hitches	1.34
Weight-Distributing Hitches	1.34
Wharf, Approaching	1.15
While Underway Checklist	11.6
Wind	1.21
Windlass	1.18
Windshield Cover	8.4
Windshield Vent, Electric	8.10
Winterization Checklist	9.2
Winterization, Air Conditioner	9.2
Winterization, Batteries	9.2
Winterization, Boat Storage	9.2
Winterization, Engines	9.2
Winterization, Fuel Systems	9.3
Winterization, Generator	9.2
Winterization, Head System	9.2
Winterization, Ice Maker	9.2
Winterization, Water System	9.3

Z

Zinc Anodes	7.12
-------------------	------

LIST OF TABLES & ILLUSTRATIONS

INTRODUCTION

Owner's Manual Packet Contents	II
Key To Symbols On Prints	IV

SECTION 1 • GENERAL INFORMATION

Hull Identification Number (HIN)	1.2
Warning Label Locations	1.6
PFD Classification Examples	1.6, 1.8
Minimum Required Equipment Table	1.7
Certification Plates (Examples)	1.9
Weather Graphic	10.1
Weather Warning Pennants	1.11
Dam Spillway	1.11
Skiing Signals	1.13
Divers Flags	1.13
Basic Docking Lines	1.14
Casting Off From A Dock	1.15
Approaching A Pier (Offshore Wind)	1.16
Approaching A Pier (Onshore Wind)	1.16
Approaching A Slip	1.16
Approaching A Mooring	1.16
Anchoring Arrangement	1.17
Typical Anchoring Arrangement	1.17
Windlass	1.18
Windlass Safety Chain And Stop	1.18
Anchor Tripline Arrangement	1.19
Bow and Stern Turning Paths	1.20
Effects Of Wind And Current On Course	1.21
Effects Of Trimming	1.21
USWMS Buoy Examples	1.22, 1.24
Typical Navigation Markers	1.23
FWMS Buoys	1.24
Meeting (Right-Of-Way)	1.25
Overtaking (Right-Of-Way)	1.25
Crossing (Right-Of-Way)	1.25
Lighting	1.26
Various Distress Signal Flags	1.27
The Fire Triangle	1.28
Fire Extinguisher Charge	1.29
Towing Arrangement	1.32

Examples Of How High Levels Of

Carbon Monoxide May Accumulate	1.33
Hitch	1.34

SECTION 2 • BILGE & UNDERWATER GEAR

Garboard Drain Plug Location	2.1
Bilge Pump & Float Switch	2.1
Typical Bilge Pump Installation	2.1
Manual Bilge Pump (Optional)	2.2
Typical Bilge Blower Installation	2.2
Typical Stern Drive Engine	2.3
Typical V-Drive Engine	2.3
Typical Inboard Engine	2.3
Engine Mount (Most Gas Engines)	2.4
Engine Mount (Most Diesel Engines)	2.4
Typical Inboard Engine Exhaust Component Layout (Muffler System)	2.4
Typical Inboard Engine Exhaust (Underwater Non-Muffler System)	2.5
Propeller Pitch and Diameter	2.7
Propeller Ventilation	2.7
Counter-Rotating Propellers	2.8
Propeller Installation	2.8
Prop Nut Torque Spec. Table	2.9
Stern Drive Propeller Removal/Installation Sequence	2.9, 2.10
Shaft Log & Strong™ Seal	2.10
Shaft Misalignment	2.10
Strut	2.10
Rudder & Rudder Stuffing Box	2.11
Seacock & Strainer Installation (Typical)	2.11
Seacock & Strainer	2.11
Strainer Maintenance	2.11, 2.12

SECTION 3 • INSTRUMENTS & CONTROLS

Typical Cruiser Power Steering System	3.1
Typical Sport Yacht Hydraulic Steering Assembly	3.2
Typical Sport Yacht Hydraulic Power Steering System	3.3
Examples Of Differential Power	3.4
Gear Shift/Throttle Control	3.4

Engine Shift & Throttle Controls (Cable)	3.5
Shift & Throttle Controls (Cable)	3.5
Engine Shift & Throttle Functions (Hydraulic) ...	3.6
Engine Shift & Throttle Functions (Electric)	3.6
Engine Shift & Throttle Functions (DDEC Electric Option)	3.7
Effects Of Power Trim	3.8
Trim Tab Pump & Switch	3.9
Instrument Gauge Examples	3.10, 3.11
Main EMS Gauge Unit	3.12
Quad Gauge Unit	3.12
Quad Gauge Individual Gauge Examples ..	3.12, 3.13
Detroit® Diesel EDM	3.13
Systems Monitor Display Control Monitor (DCM)	3.14
Display Control Monitor (DCM) Function Table ...	3.15

SECTION 4 • FUELING & STARTING

Fuel Vent With Screen	4.1
Typical Electric Fuel Valve	4.1
Typical Crossover Fuel Board (Diesel)	4.2
Racor® Water Separating Fuel Filters	4.3
Racor® Water Separating Fuel Filters Drain Plug	4.3
Racor® Water Separating Fuel Filters Element Replacement	4.3

SECTION 5 • WATER SYSTEM

Water Pump And Filter	5.2
Water Pump Filter	5.2
Pneumatic Accumulator Tank	5.2
Shower Sump	5.3
Dockside Water Inlet	5.3
Typical Pressure Water System Component Layout	5.4
Typical Gray Water System Component Layout	5.4

SECTION 6 • HEAD SYSTEM

Typical Portable Self-Contained Head With Dockside Pump-Out	6.1
Porta-Pottie With Holding Tank, Dockside Pump-Out & Macerator	6.2
Vacu-Flush® With Holding Tank, Dockside Pump-Out & Optional Macerator ...	6.2
Typical Macerator System	6.3

SECTION 7 • ELECTRICAL SYSTEM

Electrical System Circuit Protection Examples	7.2, 7.3
Dual Battery Switch (Sport Cruisers) Example	7.3
On/Off Battery Switch (Sport Cruisers & Sport Yachts) Example	7.3
DC Distribution Panel Battery Switches Example (Some Sport Yachts)	7.3
Emergency Start Solenoid	7.4
Typical 12 Volt Accessory Receptacle	7.4
Halogen Bulb	7.4
Typical Main Distribution Panel Controls Examples	7.7 - 7.10
GFI Outlet	7.11
RCCB Outlet	7.11
Typical Generator Start System With Preheat	7.12
Zinc Plates	7.13
Mercathode® System	7.13

SECTION 8 • ACCESSORIES

Typical Air Conditioning Compressor/Blower	8.1
Typical Air Conditioning Component Arrangement	8.1
Typical Air Cablemaster System	8.1
Zippers	8.3
Aft Cover	8.4
Bridge Enclosure	8.4
TV Signal Selector & Antenna Tuner	8.5
Typical Cable Television Connection	8.5
Automatic Fire Extinguisher System Configuration (With Gasoline Engines)	8.6
Automatic Fire Extinguisher System Configuration (With Diesel Engines)	8.6
Oil Change Pump & Valve Assembly	8.8
Removing Used Oil	8.8
Replacing New Oil	8.9
Bow Thruster (Optional)	8.9
Bow Thruster	8.9

SECTION 9 • STORAGE & RECOMMISSIONING

Proper Storage On Cradle	9.1
--------------------------------	-----

SECTION 11 • SERVICE INFORMATION

Service Guide	11.1, 11.2
---------------------	------------

