



MARLOW-HUNTER, LLC

*Chapter 4*

***Boating  
Safety***

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## Boating Safety

Boating safety is a paramount objective. Understanding and preparing for the potential hazards one may face on the water is critical. This chapter will discuss the following topics to cultivate a safety mindset and assist your understanding and preparedness for your boating activities:

1. Hazard Alerts
2. General Safety Issues
3. Carbon Monoxide Hazard
4. Other Potential Dangers
5. Fire
6. Distress Signals

### 4.1 Hazard Alerts

As you read your operator's manual, please note the hazard alerts intended to warn you of issues which could impact your safety and that of your passengers. Hazard statements generally have five parts:

1. The hazard symbol.
2. A signal word which indicates the severity of the hazard.
3. A concise description of the hazard.
4. The results of ignoring the hazard.
5. Steps for avoiding the hazard.

The three signal words which indicate the severity of a hazard are DANGER, WARNING, and CAUTION. The meanings they convey are as follows:

**⚠ DANGER ⚠**

**Calls attention to immediate hazards that will result in severe injury or death.**

**⚠ WARNING ⚠**

**Identifies hazards or unsafe practices that could result in personal injury or death.**

**⚠ CAUTION ⚠**

**Indicates hazards or unsafe practices that could result in minor personal injuries, property damage, or component damage.**

Also included in this manual are owner advisory statements identified as "IMPORTANT" or "NOTE". Unlike the hazard communication statements, they alert you to conditions related to equipment, including equipment operation, maintenance, and servicing practices.

*IMPORTANT: This is a general advisory statement or procedure intended to highlight significant issues regarding equipment or to prevent damage to equipment or associated components.*

*NOTE: This is a general advisory statement relating to equipment operating and maintenance procedures. Its intent is to call attention to information more important than normal text.*

### 4.2 General Safety Issues

As boating safety and the safety of your passengers are your responsibility, you should fully understand and become familiar with the operating and safety procedures and precautions in this operator's manual and the accompanying OEM manuals before you launch your new boat.

**⚠ WARNING ⚠**

#### **CALIFORNIA PROPOSITION 65 WARNING**

**Lead on battery posts, terminals and related accessories, exhaust and some constituents from diesel engine exhaust and some materials used in the construction of this product are known to the State of California to cause cancer, and other reproductive harm.**

#### 4.2.1 Safe Operation

Maintain your boat and equipment in safe operating condition. Inspect the hull, engines, safety equipment and all boating gear regularly.

*IMPORTANT: Federal law requires you, the owner or operator, to provide and maintain safety equipment on your new boat. Consult your Coast Guard, state, and local regulations to ensure your boat has all required safety equipment on board. Additional equipment may be recommended for your safety and that of your passengers. Make yourself aware of its availability and use.*

- BE VERY CAREFUL when fueling your boat. Be sure you know the capacity of your boat's fuel tank and the amount of fuel you use when operating at frequently

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used engine speeds (RPMs). See the Fuel chapter in this manual for further details.

- Make sure you have enough fuel on board for anticipated cruising requirements. In general, use 1/3 of your supply to reach your destination and 1/3 to return. Keep 1/3 in reserve for changes in your plans due to weather or other circumstances.

*NOTE: The supply line for the optional generator is located higher on the fuel tank than the engine's supply lines. This is for your safety by preventing the generator from depleting your fuel supply should it ever be left running.*

- Be sure life-saving and fire extinguishing equipment is on board. This equipment must meet regulatory agency standards, and it should be noticeable, accessible, and in a safe operating condition. Your passengers should know where this equipment is and how to use it.
- Keep an eye on the weather. Be aware of possible changing conditions by checking a local weather report before your departure. Monitor strong winds and electrical storms closely.
- Always keep accurate, updated charts of the area on board your boat.
- Before you leave the port or harbor, file a float plan with a family member, relative, friend, or other responsible person ashore.
- Always operate your boat with care, courtesy, and common sense.
- Instruct at least one other passenger aboard in the operating procedures in handling your boat. This person can take over if you unexpectedly become unable to do so.
- Do not allow passengers to ride on parts of your boat other than designated seating areas.
- Ask all passengers to remain seated while the boat is in motion.
- Do not use the swim platform or boarding ladder while engines are running.
- Understand and obey the "Rules of the Road."
- Always maintain complete control of your boat.
- Do not overload or improperly load your boat.

### 4.2.2 Safe Boating Courses

Within the U.S., safe boating information and courses are available from a variety of sources. The Coast Guard Auxiliary website for boat safety, [www.cgaux.org](http://www.cgaux.org), contains a wide selection of opportunities for education on

boat safety. Similarly, the U.S. Power Squadrons website, [www.usps.org](http://www.usps.org), and the Boat Owners Association of the U.S. website, [www.boatus.com/foundation](http://www.boatus.com/foundation), also offers opportunities for education in safety and operation.

Outside the U.S., contact your governmental branch responsible for overseeing your country's recreational boating for educational options on safe boating.

### 4.2.3 Voluntary Inspections

State boating officials in many states or the U.S. Coast Guard Auxiliary offer courtesy inspections to check out your craft. They check your boat for compliance with safety standards and required safety equipment. You may voluntarily consent to one of these inspections and are allowed time to make correction without prosecution. Check with the appropriate state agency or the Coast Guard Auxiliary for details.

### 4.2.4 Rules of the Road

Navigating a boat is much the same as driving an automobile. Operating either one responsibly means complying with a set of rules intended to prevent accidents. Just as you assume other car drivers know what they are doing, other boaters assume you know what you are doing.

As a responsible sailor, you will comply with the "Rules of the Road", the marine traffic laws enforced by the U.S. Coast Guard. There are two sets of rules: The United States Inland Navigational Rules and the International Rules. The United States Inland Rules apply to all vessels inside the demarcation line separating inland and international waters. The Coast Guard publishes the "Rules of the Road" in its publication "Navigational Rules, International-Inland." You can get a copy from [www.uscgboating.org](http://www.uscgboating.org), [www.navcen.uscg.gov](http://www.navcen.uscg.gov) or from your local U.S. Coast Guard Unit or the United States Coast Guard Headquarters, 1300 E Street NW, Washington, D.C. 20226.

### 4.2.5 Safety Equipment

*IMPORTANT: Federal law requires you, the owner, to provide and maintain safety equipment on your boat. Consult your Coast Guard, state, and local regulations, to ensure your boat has all required safety equipment on board. Additional equipment may be recommended for your safety and that of your passengers. Make yourself aware of its availability and use.*

If your boat is configured to American specs, we have installed or provided the following safety equipment in

your Loose Gear Kit:

- (3) Fire Extinguishers
- (1) Throwable Buoyant Cushion
- (1) Air Horn
- (1) Hand Held Flare Kit
- (3) Smoke Detectors
- (3) CO Detectors
- (1) US Coast Guard Pamphlet

### 4.2.6. Additional Equipment

You should consider having additional equipment on board to help make your boating experience safer and more enjoyable. Some examples include the following:

- Boat hook
- Bucket & Sponge
- Commonly used spare parts
- Distress signal kit
- Docking lines
- Extra keys
- Extra V-belts
- Fenders
- First aid kit
- Flashlight & extra batteries
- Manually operated bilge pump
- Navigational charts
- Replacement bulbs
- VHF radio
- Spare fuel and oil filters
- Tool kit

### 4.2.7 Personal Flotation Devices (PFDs)

Within U.S. waters, there must be one U.S. Coast Guard approved wearable personal flotation device of Type I, II, or III for each person on board your boat. The PFDs must be in serviceable condition and readily accessible. A minimum of three PFDs (two wearable and one throwable) is required regardless of the number of persons on board.

When sailing outside U.S. waters, determine and comply with the requirements of the home country for their home waters or by their international agreement for the open seas.

#### (A) PFD Type I, Wearable:

This offshore life jacket has the greatest buoyancy. It is effective for all waters where rescue may be delayed. Its design allows for turning most unconscious persons in

the water from face down position to a vertical or face-up position.

#### (B) PFD Type II, Wearable:

This near-shore buoyant vest provides less buoyancy than a Type I PFD. It is intended for calm inland waters or waters where there is a chance of quick rescue. It turns its wearer to a face-up position as does the Type I PFD, but the turning action is not as pronounced as the Type I, and it will not turn as many persons under the same conditions as a Type I.

#### (C) PFD Type III, Wearable:

Classified as a flotation aid, this PFD allows wearers to place themselves in a vertical or face-up position in the water. Type III PFD has the same minimum buoyancy as a Type II PFD. It has little or no turning ability. People participating in water sports often prefer this PFD because it is intended for use in waters where quick rescue is possible and it is generally the most comfortable for continuous wear.

#### (D) PFD Type IV, Throwable:

You must also have aboard at least one throwable PFD Type IV device. The Type IV device can be thrown to a person in the water and held by the user until rescued. The design does not allow it to be worn. The most common Type IV PFD are buoyant cushions or ring buoys. This PFD must be immediately available for use and in serviceable condition.

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## 4.3 Carbon Monoxide Hazard

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*IMPORTANT: See the NMMA brochure included with your OEM manuals concerning Carbon Monoxide poisoning and its prevention.*

As all responsible sailors know, there are unseen dangers when boating. One danger is serious enough to warrant a lengthy discussion. CARBON MONOXIDE (CO) is an odorless, colorless, and tasteless gas which can be harmful or fatal if inhaled.

### 4.2.1 Carbon Monoxide Safety

Carbon Monoxide accumulation is affected by boat geometry, hatching, windows, door openings, ventilation openings, proximity to other structures and boats, wind

direction, boat speed, boat maintenance, and a multitude of other variables. Therefore, CO prevention and detection should be top of mind.

### 4.2.2 What is Carbon Monoxide?

Carbon Monoxide is a highly poisonous gas formed by the combination of carbon and oxygen. Commonly referred to as CO, its chemical formula is C for carbon and O for oxygen. CO is a colorless, odorless, and tasteless gas that, by itself, cannot be detected by human senses. CO diffuses in the air much more rapidly than other gasses that are detectable by the human senses. The weight of CO is about the same as air so it does not rise or fall like other gasses but will distribute itself throughout the boat. CO is produced any time a material containing carbon is burned. In boating, these materials include, but are not limited to, gasoline, diesel fuel, or propane. All carbon based fuels produce varying amounts of CO, depending on their carbon content. Gasoline is high in carbon and, therefore, produces higher levels of CO. However, the exhaust of all engines and generators as well as any open flame device, produce CO and the same precautions should be taken regardless of the type of fuel.

### 4.2.3 How Carbon Monoxide Can Enter Your Boat

Any device that burns fuel creates Carbon Monoxide. For example, a propane cook-top or a space heater are both potential sources for CO. But the most serious danger comes from the engines and generators aboard your own and neighboring boats. There are four basic ways that CO can enter your boat from a running engine or generator. See "Know the Dangers" page for details.

### 4.2.4 Symptoms of Carbon Monoxide Poisoning

Most important is to know the causes, study the symptoms, and be trained in emergency care. This is the best way to avoid, understand, and respond to any Carbon Monoxide emergency

One or more of the following symptoms can signal the adverse effects of Carbon Monoxide accumulation. The order of this list is generally the sequence of symptoms. However, the number of symptoms and the order of their appearance may change for different people.

**Watering and Itching eyes**  
**Tightness in the chest**  
**Flushed Appearance**  
**Ringling in the ears**

**Throbbing Temples**  
**Inattentiveness**  
**Convulsions**  
**Drowsiness**  
**Headache**  
**Dizziness**  
**Vomiting**  
**Collapse**  
**Nausea**  
**Fatigue**

### 4.2.5 Effects of Carbon Monoxide

When inhaled, Carbon Monoxide is absorbed by the lungs and reacts with the blood hemoglobin to form carbon hemoglobin, which reduces the oxygen carrying capacity of the blood. The result is a lack of oxygen for the tissues, causing subsequent tissue death and, if prolonged, death of the individual. Carbon Monoxide in high concentrations can be fatal in a matter of minutes. Even lower concentrations must not be ignored because the affects of exposure to CO are cumulative and can be just as lethal. Certain health related problems and age increases the effects of CO. People who smoke or are exposed to high concentrations of cigarette smoke, consume alcohol, or have lung or heart disorders are particularly susceptible to an increase in the effects from CO. However, the health of all of the boat's occupants should be considered. Physical exertion accelerates the rate at which the blood absorbs CO. The early effects of CO poisoning are easy to overlook because they are similar to the effects of other boating related stress such as eye strain, fatigue, sun exposure, seasickness, or alcohol consumption. But, as the concentration of CO in the air increases, it has increasingly adverse effects on your health.

### 4.2.6 When Overcome by Carbon Monoxide

When someone falls victim to Carbon Monoxide poisoning, fast and responsive action is crucial. Know the symptoms. The earlier the effects of CO are detected, the better the chances for recovery. The following list shows the sequences of events that must be done in an effort to revive a CO victim: Evacuate, Ventilate, Investigate, Treat.

Complete the Carbon Monoxide poisoning action sequence:

- Move the victim to fresh air.

- Administer oxygen if available. If the victim is not breathing, perform artificial resuscitation per approved CPR procedures until medical help arrives and takes over. Prompt action can mean the difference between life and death.
- Ventilate the area.
- Investigate the source of CO and take corrective action.

As always, you can contact the Red Cross to obtain information for training in CPR or emergency response care.

### 4.2.7 How to Minimize the Accumulation of Carbon Monoxide

Practice good inspection and maintenance habits. Be certain hull exhaust outlets are not blocked or restricted in any way.

Be alert for exhaust gasses from other boats. Always provide adequate ventilation when weather enclosures are in place and engines or generator is running.

Do not run with a high bow angle. Use trim tabs or redistribute the load to maintain a low bow angle. Orient your boat to maximize the dispersion of CO.

We cannot identify or describe every possible variable or combination of variables, you must continually observe passengers for symptoms or Carbon Monoxide intoxication and be aware of the many possibilities of Carbon Monoxide accumulation. For instance, poorly maintained hoses and hose connections on the generator or engine exhaust systems can permit Carbon Monoxide to escape into the interior of your boat. Therefore, the exhaust system must be periodically examined and maintained in order to ensure its integrity. Moreover, all accommodation spaces constantly require proper ventilation.

### 4.2.8 Preventative Maintenance

Frequent inspections and proper maintenance of the engine and exhaust systems as well as proper ventilation of your boat are critical in preventing the accumulation of Carbon Monoxide. It is the owner's responsibility to make sure the entire boat is inspected and maintained against CO.

The exhaust systems of your engine and generator are under constant attack from salt water, gasses, vibration, and normal wear. Inspect every exhaust system component often. Start with a visual inspection. Check

each joint for discoloration, carbon buildup, stains, water leaks, or other signs of damage. Inspect all metal parts for corrosion, discoloration, or flaking. Check that all hose clamps are in good condition and properly tightened. Carefully inspect all exhaust and cooling hoses for signs of wear, dry rot, cracking, discoloration, chafing, or swelling. If any of these conditions exist, have the entire system inspected and corrected by a qualified technician before starting the engines or generator.

Next, start each engine and generator one at a time. Follow the full run of the exhaust system, listening and looking for leaks. While doing this, make sure there is adequate ventilation and that your CO detector is on.

Other items to inspect are as follows: If your boat has access panels, check that the access panels around the engine and exhaust are in place and fit snugly to minimize the opportunity for CO to enter the cabin. There should be no large openings where CO could enter the cabin. Ensure that all ventilation systems are in good working order and are not blocked or punctured. Check all sink drains to assure that they have a good water trap to prevent CO from coming in from the outside.

Finally, because poorly running engines produce excessive CO, make sure engines and generators are tuned up. They should run smoothly and not produce black smoke. The spark plugs (gas engines) and ignition systems should be maintained regularly, and the fuel system and air filters should be in good order.

### 4.2.9 Carbon Monoxide Detectors

If you carefully avoid potential CO accumulation and maintain your systems properly, you will have made great strides towards protecting yourself and others from the dangers of Carbon Monoxide. We have assisted you in your endeavor by providing CO detectors in each living area aboard your boat. We only use CO detectors that are UL approved for marine use. RV and residential models won't withstand the elements of the boating environment. Most CO detectors require specific maintenance procedures to remain accurate and functional. Follow the manufacturer's instructions for the use and maintenance of the CO detectors.

It is strongly recommended that you change CO (if applicable) and Smoke alarm batteries when changing the clocks for Daylight-Saving Time. **Replace Smoke alarms every 10 years and replace Carbon Monoxide (CO) alarms every 5 years** since the sensors in these

# Know the Dangers!



Exercise caution when swimming near or under the back deck or swim platform. Carbon monoxide from exhaust pipes of inboard engines, outboard engines and generators build up inside and outside the boat in areas near exhaust vents.

STAY AWAY from these exhaust vent areas and DO NOT swim in these areas when the motor or generator is operating. On calm days, wait at least 15 minutes after the motor or generator has been shut off before entering these areas. NEVER enter an enclosed area under a swim platform where exhaust is vented, not even for a second.

**It only takes one or two breaths of the air in this “death chamber” to be fatal.**

Blockage of exhaust outlets can cause carbon monoxide to accumulate in the cabin and cockpit area - even when hatches, windows, portholes, and doors are closed.

Exhaust from another vessel that is docked, beached, or anchored alongside your boat can emit poisonous carbon monoxide gas into the cabin and cockpit of your boat. Even with properly vented exhaust, your boat should be a minimum of 20 feet from the nearest boat that is running a generator or engine.

Slow speeds or idling in the water can cause carbon monoxide gas to accumulate in the cabin, cockpit, bridge, and aft deck, even in an open area. A tailwind (force of wind entering from aft section of the motorboat) can also increase accumulation.

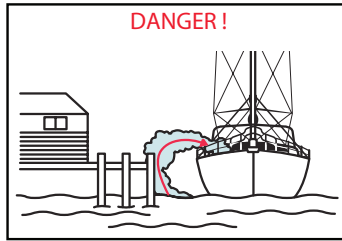
The “station wagon effect,” or backdrafting can cause carbon monoxide to accumulate inside the cabin, cockpit, and bridge when operating the boat at a high bow angle, with improper or heavy loading or if there is an opening which draws in exhaust.

This effect can also cause carbon monoxide to accumulate inside the cabin, cockpit, aft deck, and bridge when protective coverings are used and the boat is underway.

Teak surfing, dragging and water-skiing within 20 feet of a moving watercraft can be fatal.



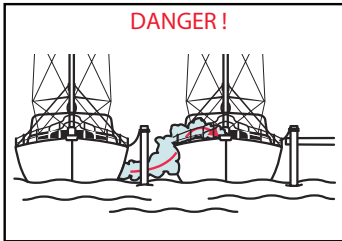
D



Moored to pier blocking exhaust!

**Figure 4.3.** Blocked hull exhaust outlets near a pier, dock, seawall, bulkhead or any other structure can cause excessive accumulation of Carbon Monoxide gas with the cabin areas of your boat. Be certain hull exhaust outlets are not blocked in any way.

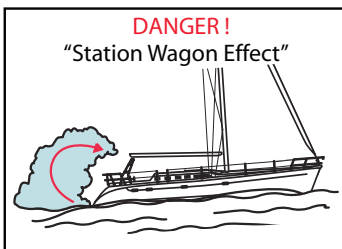
A



Exhaust from other vessels moored alongside!

**Figure 4.4.** Engine and generator exhaust from other vessels alongside your boat, while docked or anchored, can cause excessive accumulation of Carbon Monoxide gas within the cabin and cockpit areas of your boat. Be alert for exhaust from other vessels.

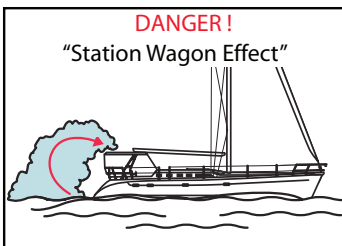
N



Caused by high bow angle!

**Figure 4.5.** Engine or generator exhaust from your boat while underway and operating with a high bow angle can cause excessive accumulation of Carbon Monoxide gas within the cabin and cockpit areas of your boat. Always provide adequate ventilation and redistribute the load to lower the boat angle.

G

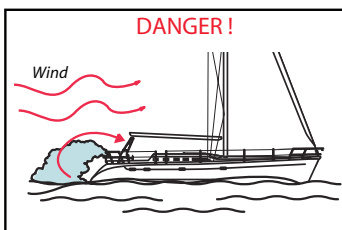


With protective coverings in place!

**Figure 4.6.** When protective weather coverings are in place, engine or generator exhaust from your boat, while docked and/or running, can cause excessive accumulation of Carbon Monoxide gas within the cabin and cockpit areas of your boat. Always provide adequate ventilation when the weather coverings are in place and either the engine or generator are running.

E

R



Slow speed, idle, or wind!

**Figure 4.7.** While underway or drifting slow speed can cause CO buildup, add a tailwind and this can intensify the effect.

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devices can degrade from environmental contamination and age. In addition, conduct monthly testing to ensure the proper operation.

In general, learn how to use your detectors, how they work, what the alarm signals are and what your response should be. A working detector can save lives. It's that simple and that important,

### If the CO detector alarm sounds:

1. Press the Reset/Silence button.
2. Call Emergency Services.
3. Immediately move to fresh air, outdoors, or to an open window or door. Do a head count to check that all persons are accounted for. Do not re-enter the premises nor move away from an open door or window until the emergency responders have arrived, the premises has been aired out, and your alarm remains in its normal operation.
4. After following steps 1, 2, and 3, if your alarm reactivates in a 24 hour period, repeat steps 1 – 3 and call a qualified appliance technician.

### Where to Install Alarms

- For minimum protection, CO alarms should be installed near all sleeping areas.
- For maximum protection, CO alarms should be installed in all sleeping areas.

### Where not to Install Alarms

- Not behind furniture, drapes, closets, or areas that will block air flow to the alarm.
- Not within 12 inches of window openings, exterior doors, heating or return air vents, or any other drafty areas.
- The alarm should not be located within 5 (1.5 m) feet of any cooking appliance.

*NOTE: Consult the CO detector manufacturer's OEM manual for detector operation, care and maintenance.*

### Limitations of the CO alarm

Carbon Monoxide alarms will not work without power. Power loss can occur from a blown or missing fuse,

broken wire, faulty connection, tripped circuit breaker or a discharged battery. Refer to the DC Electric chapter in this manual for details on powering your CO detectors.

This alarm will only detect the presence of CO gas at the sensor. Carbon Monoxide gas may be present in other areas.

Carbon Monoxide alarms may not be heard. The alarm loudness is designed to meet or exceed the regulatory standards. However, the alarm may not be heard if alarms are located in remote locations or behind closed doors. The alarm may not be heard by persons who are hard of hearing, have consumed alcoholic beverages, taken prescription, non-prescription medication or illegal drugs.

This alarm is designed to detect Carbon Monoxide from any source of combustion. It is not designed to detect smoke, fire, or any other gasses. The alarm may not sound at low Carbon Monoxide levels. This product is intended for use in ordinary indoor locations of living spaces. It is not designed to measure compliance with Occupational Safety Health Administration (OSHA) commercial or industrial standards. Individuals with medical problems may consider using warning devices which provide audible and visual signals for levels under 30 PPM.

If you would like to purchase additional CO detectors, contact Customer Service for assistance.

### 4.2.10 Carbon Monoxide Review

Everyone is at risk for Carbon Monoxide poisoning! Particularly sensitive are children, pregnant women, the elderly and people with lung disease, heart disease or anemia.

WHY? Because Carbon Monoxide is an odorless, colorless gas that prevents the blood from carrying oxygen to the vital organs. CO (Carbon Monoxide) is 200 times more likely to replace oxygen in the blood.

Memorize the symptoms of Carbon Monoxide poisoning noted in this chapter (4.2.4) so you will be able to immediately recognize these symptoms should they ever arise.



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Mild Exposure	100 – 400 PPM (parts per million)	causes headaches and fatigue resembling the flu.
Medium exposure	400 – 800 PPM	causes severe headaches, drowsiness, nausea, and rapid heart rate.
Extreme exposure	over 800 PPM	results in unconsciousness, convulsions, heart or respiratory failure, and death.

Many reported cases of Carbon Monoxide poisoning determined that, while victims are aware they are not well, they become so disoriented they are unable to save themselves by either exiting the building or calling for assistance. Also, children and pets may be affected first.

Carbon Monoxide gas is produced when any type of fuel is incompletely burned. Fuel burning engines and appliances (furnace, fireplace, oven, stove, water heater, etc.) also space heaters, gas and charcoal grills produce CO.

Extended operation of unvented fuel burning appliances (range, oven, fireplace, etc.) can build up high CO levels.

### **⚠ WARNING ⚠**

**CO alarms will only indicate the presence of Carbon Monoxide gas at the sensor. Carbon Monoxide gas may be present in other areas. To reduce the risk of Carbon Monoxide poisoning, test the alarm's operation after the boat has been in storage, before each trip, and once a week during use.**

DO NOT attempt to test the alarm by any other means than by using the Test/Reset button.

DO NOT attempt to produce CO to test the alarm. The Test/Reset button tests all functions of the alarm and is the only safe way to be sure the alarm is working properly.

### **⚠ DANGER ⚠**

**Actuation of your CO alarm indicates the presence of Carbon Monoxide (CO) which will KILL YOU!**

**How else to protect your passengers from Carbon Monoxide**

Ensure alarms are installed properly. Carefully read and follow ALL the instructions in this manual. Test your unit every week. Alarms that do not work do not alert you to the presence of Carbon Monoxide.

Make regular visual inspections of all fuel burning equipment including gas water heaters, kitchen gas stoves, space heaters, gas dryers, or other pilots. Check the color of the flame! The color should be blue.

Make regular visual inspections of the engine and generator exhaust systems. Cracked exhaust systems can allow Carbon Monoxide to enter the living area.

Professionally maintain your engine and generator. Although all fuel burning engines and generators produce Carbon Monoxide, a poorly tuned engine and generator will produce relatively more.

## 4.4 Other Potential Dangers

### 4.4.1 Weather

Storms rarely appear without advanced notice. Check the weather forecast before you begin a day of boating. Be aware, however, that weather conditions can change rapidly. If you have a marine radio, listen to the weather reports issued by the U.S. Coast Guard and others. If you have a portable radio, keep it tuned to a station broadcasting frequent weather reports. Many boating clubs fly weather signals. Learn to recognize these signals and listen to your local forecasts before leaving port.

Your surroundings can also be a good indicator of changing weather conditions. Watch for changes in wind direction or cloud formations. There is no substitute for a good understanding of weather conditions and what to do when the weather takes a turn for the worse.

See Figure 4.4, Lighting Storm Warning, for an explanation of the dangers of lightning strikes, with an overview of your protection area.

Refer to the Chapman's Manual for instructions and precautions in operating a craft in adverse weather conditions.

### 4.4.2 Fog

You can judge the likelihood of fog formation by periodically measuring the air temperature and the dew point

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temperature. If the difference between these two temperatures is small, fog is likely to develop.

Foggy conditions include mist, snowstorm, or heavy rain.

Avoid operation in such weather, especially if your boat is not equipped with radar.

### 4.4.2.1 Remember these guidelines:

- Unless your boat is well equipped with charts, head for shore at the first sign of fog and wait until conditions improve. If you have charts on board, take bearings as fog sets in, mark your position, and continue to log your course and speed.
- Make sure all persons on board are wearing their personal flotation devices (PFDs). If your boat has sounding equipment, take soundings regularly and match them with known depths on your charts.
- Station a person forward in the boat as a lookout.
- Reduce your speed. From time to time, stop engines and listen for other fog signals.
- Sound the horn or bell at approximately 2 minute intervals.
- If there is any doubt about continuing your excursion, anchor. Listen for other fog signals while continuing to sound your fog horn.

### 4.4.3 Drugs and Alcohol

Drugs and alcohol affect a person's ability to make sound judgments and react quickly. As a responsible boater, one would refrain from using drugs or alcohol (singly or combined) while operating one's boat. Operation of motorized vessels while under the influence carries a significant penalty. Drugs and alcohol decrease your reaction time, impair your judgment and inhibit your ability to safely operate your boat.

### 4.4.4 Collision

If a serious collision occurs, first check the persons on board for injuries. Then inspect the boat to determine the extent of the damage.

Prepare to help the other craft unless your boat or its passengers are in danger.

Prepare to help the other craft if your bow penetrated the other boat or its passengers are in danger.

If the bow of the other boat penetrated your boat's hull, prepare to plug the fracture once the boats are separate.

Refer to the Documents and Forms chapter in this manual for a discussion on accident reporting.

### 4.4.5 Running Aground

If your boat runs aground, check everyone for injury and inspect damage to the boat or propellers. If lightly grounded, shift weight of passengers or gear to heel the boat while reversing engines. If towing becomes necessary, we recommend using a commercial towing service.

### 4.4.6 Swamped or Capsized Boat

If your boat becomes swamped or capsized, put on a PFD immediately and set off a distress signal. Chances are good that a capsized boat will stay afloat. For this reason, stay with the boat. Do not leave the boat or try to swim to shore except under extreme conditions. A capsized boat is easier to see than a swimmer, and shore may be further away than it appears.

### 4.4.7 Falling Overboard

One of the most frightening emergencies that can occur aboard a boat is a crew member or yourself falling overboard. Although "man overboard" or "MOB" drills have been a part of boating safety for decades, they have been largely overlooked by many responsible boat owners.

Just as important as acquiring the knowledge to rescue a person is the ability to help yourself if you are the person overboard. Be sure and refer to your Chapman's manual for more information. It is packed with useful and essential safety and emergency procedures. To re-board, use the transom extension ladder.

#### 4.4.7.1 Hypothermia

If a person falls overboard, hypothermia may be an immediate concern. Hypothermia means a person's body loses heat to the water faster than the body can replace it. If not rescued, the person will become exhausted and

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likely drown. In general, the colder the water, the shorter the time for survival. PFDs will increase survival time because they provide insulation.

FOR REFERENCE ONLY (TIMES MAY VARY)

Water Temperature	Exhaustion or Unconsciousness	Expected Time of Survival
32.5	Under 15 min	Under 15 to 45 min
32.5 – 40	15 – 30 min	30 – 90 min
40 – 50	30 – 60 min	1 – 3 hrs
50 – 60	1 – 2 hrs	2 – 4 hrs
60 – 70	2 – 3 hrs	2 – 4 hrs
70 – 80	3 – 12 hrs	3 hrs – indefinite
Over 80	Indefinite	Indefinite

3. Have all persons on board put on their personal flotation devices (PFDs).
4. If you can get at the fire, aim the fire extinguisher at the base of the flames and use a sweeping action to put out the fire.
5. If the fire gets out of control, make a distress signal and call for help on the radio.

Deciding whether to stay with the boat or abandon ship will be difficult. If the decision is to abandon ship, all persons on board should jump overboard and swim a safe distance away from the burning boat.

### 4.5.1 Engine Compartment Fire

An optional halon fire extinguisher system is available for your boat. This system functions to automatically extinguish a fire in the engine compartment.

When a fire is detected on your boat, the automatic system will sound an alarm, discharge the extinguisher (Fig. 4.1) and illuminate the “Discharge” LED on the Safety/Fuel panel located at the starboard side of the cockpit (see the DC System chapter in this manual). A relay will shut down the engine, the blower (see Waste System chapter in this manual) and the optional generator.

## 4.5 Fire



**A fire aboard your boat is serious. Explosion is possible and can result in significant property damage, personal injury or death. Respond immediately. Develop a fire response plan.**

Every boater should develop a fire response plan to determine what kind of fire (fuel, electrical, etc.) might break out, where it might break out and the best way to react.

*IMPORTANT: Everyone on board should know where a fire extinguisher is and how to operate it.*

In the event of a fire, consider the following guidelines:

1. Any fire requires stopping the engines immediately.
2. Keep the fire downwind if possible. If the fire is aft, head into the wind.



Figure 4.1

When discharging, a loud sound (similar to that of small arms fire) followed by a “rushing” air sound indicates activation of the extinguisher. If the discharge light activates or if you hear the extinguisher discharging, proceed as follows:

- Be aware the activated automatic fire system will automatically shut down the engine and the blower.

## Boating Safety

- Evacuate all occupied enclosures immediately. If practical, evacuate the boat.
- Do not run the blower.
- Do not open the engine compartment. Allow the halon fire extinguisher to soak the compartment for at least fifteen minutes.
- Wait for hot metals and fuels to cool before inspecting for damage or cause of fire.
- Open engine compartment slowly. Have approved portable fire extinguisher at hand and ready for use.

Do not breathe fumes or vapors caused by fire. HALON FUMES ARE TOXIC!



**Flash fire erupting from the engine compartment can burn you. Opening the engine compartment access panels will feed oxygen to the fire and cause the fire to flash back. Keep engine compartment access panels closed for at least 15 minutes after fire extinguisher discharges.**

Frequently check the extinguisher's green section of the pressure gauge and ensure the pressure indicator is in the normal range.



**In the event of an automatic extinguisher discharge, do not open the engine compartment access panels. The protected space must be kept closed for at least 15 minutes to allow the fire to be fully extinguished**

**and surfaces cooled sufficiently to prevent reflash.**

*NOTE: Consult the automatic fire extinguisher system manufacturer's OEM manual for specifics on system operation and maintenance.*

### 4.6 Distress Signals

#### 4.6.1 Mayday

If you have a VHF radio, heed storm warnings and answer any distress calls from other boats. The word "MAYDAY" spoken three times is the international signal of distress. Monitor marine radio channel 16, which is reserved for emergency and safety messages. You can also use this channel to contact the Coast Guard or other boaters if you have trouble.

*NOTE: Never send a "MAYDAY" message unless there is a serious emergency and you are in need of immediate assistance.*

#### 4.6.2 Visual Distress Signals

The U.S. Coast Guard requires that all boats operating in U.S. Coastal Waters have visual distress signal equipment on board. In general, coastal waters include all waters except rivers, streams, and inland lakes. The Great Lakes are considered coastal waters, as is a river mouth more than two miles wide. Boats owned in the United States and operating on the high seas must also carry visual distress signal equipment. Boats owned in the United States or non-U.S. owned boats operating in home waters of other countries must comply with the

### LIGHTING REQUIREMENTS

Vessel	Notes	Lights	Less than 12 meters (39ft.)	12 (39ft.) meters to less than 20 (65 ft.) meters
Power	This includes sailing vessels under power and motor sailing	White Masthead Light	2 NM (3.7 km) see note	3 NM (5.6 km)
		Sidelights or combination lights	1 NM (1.9 km)	2 NM (3.7 km)
		sternlight	2 NM (3.7 km) see note	2 NM (3.7 km)
Sail	Sailing Vessels under sail alone	Sidelights or combination lights	1 NM (1.9 km)	2 NM (3.7 km)
		sternlight	2 NM (3.7 km) see note	2 NM (3.7 km)

Figure 4.2

## Boating Safety

home country's requirements for visual distress equipment.

The U.S. Coast Guard requires visual distress equipment must be in serviceable condition and stowed in a readily accessible location. Equipment having a date showing useful service life must be within the specified usage date shown. Both pyrotechnic and non-pyrotechnic equipment must be U.S. Coast Guard approved.

Pyrotechnic U.S. Coast Guard approved visual distress signals and associated equipment include: red flares, handheld or aerial orange smoke, hand held or floating launchers for aerial red meteor or parachute flares. Non-pyrotechnic equipment includes an orange distress flag, dye markers, and an electric distress light.

No single signaling device is ideal under all conditions for all purposes. Consider carrying various types of equipment. Careful selection and proper stowage of visual distress equipment is very important. If young children are frequently aboard, you should select devices with packages which children, but not adults, will find difficult to open.

Other helpful publications available from the U. S. Coast Guard include "Aids to Navigation" (U.S. Coast Guard pamphlet #123), which explains the significance of various lights and buoys, the "Boating Safety Training Manual", and "Federal Requirements for Recreational Boats". Check with your local Coast Guard Station, your dealer, or a local marina about navigational aids unique to your area.

### 4.6.3 Running and Navigation Lights

Your boat must have running and navigation lights for safe operation after dark. Observe all navigation rules for meeting and passing. Do not run at high speeds during night operation. Always use common sense and good judgment.

Operating at night can present some special challenges. Not only is your depth perception lessened, bright lights on the shore can cast misleading reflections on the water and if you wear glasses, or worse yet, bifocals, you simply don't see as well at night as you do during the day. It is not only important that you be able to identify other vessels operating in your proximity, it is equally important that other vessels see you. Most recreational vessels are less than 30 feet in length and, according to "The Rules of the Road", shall be equipped with navigation lights. These

lights not only have a certain arc through which they can be seen but must be seen from a minimum distance. See Fig. 4.2 for lighting requirements for recreational vessels both less than 12 meters in length (approximately 39.4"), and over 12 meters in length to 20 meters (65').

The arc of the lights and color allows you to determine the direction a vessel is moving (see Fig. 4.3). How good are your lights? You should test them to see how visible you might be at night. Whether on a trailer or at the marina, switch on your lights and see how well they can be seen.

Light	Arc	Color	Visible Range
Masthead Light	225	Wht	2
Starboard	112.5	Grn	1
Port Sidelight	112.5	Red	1
Sternlight	135	Wht	2



Figure 4.3

If you are at anchor or at a mooring, walk or row away from the boat and see how visible the lights are as you move further away. How easy are they to see against the background of lights on shore?

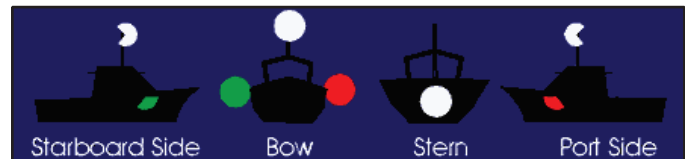


Figure 4.4

It is allowable to have a 360 degree mast light. This mast light, in conjunction with the side lights, will indicate the boat's orientation (see Fig. 4.4).

Check your sidelights from dead ahead. You should see both red and green. However, by moving toward one side by 1-3 degrees, you should then see only one light. If you still see two lights, an approaching vessel won't be able to tell which direction you are going.

When boating at night, remember the following: "When two lights you see ahead, turn your helm and show your red."

### 4.6.4 Sound Signaling Device

Boats configured based on American specs are provided

with a hand-held horn as standard and found within the loose gear. This horn conforms with U.S. Coast Guard requirements for boats of this size. All class A boats are required to have the ability to make an efficient sound. This device should be used to promote safe passing, as well as a warning to other vessels in fog or confined areas, or as a signal to operators of locks or drawbridges. Refer to Fig. 4.5 for a summary of blasts and their meanings.


### **BLAST SIGNALS AND MEANINGS**

One Prolonged Blast	Warning Signal
One Short Blast	Pass on my port side
Two Short Blasts	Pass on my starboard side
Three Short Blasts	Engines in Reverse
Five or More Blasts	Danger Signal

**Figure 4.5**



**⚠ DANGER ⚠**



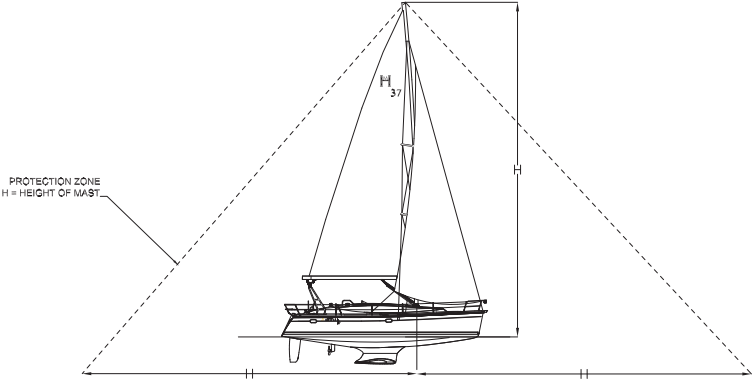
**Lightning Storm Warning**  
All whip antennas should be tied during the storm, unless they are part of the Lightning Protection System.

Precautions during lightning storms:

- \* Occupants should take shelter inside a closed area of the boat, *i.e.* below deck!
- \* Occupants should not have any body parts in the water!
- \* Avoid contact with components of the Lightning Protection System or any type of metal object!
- \* See the protection zone (Faraday Cage) illustration below.
- \* Failure to follow these precautions may result in severe injury or death!

Should lightning strike the boat:

- \* Wait until the threat of the storm has passed then inspect all electronics, electric gear, compass, and the Lightning Protection System for possible damage!
- \* Recalibrate equipment if necessary!



PROTECTION ZONE  
H = HEIGHT OF MAST

Lightning photo courtesy of: National Oceanic and Atmospheric Administration/Department of Commerce

Figure 4.6

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## SPECIFICATIONS

LENGTH OVERALL (LOA).....	39' 1".....	11.91 m
LENGTH OF HULL (LH).....	37' 6".....	11.43 m
LENGTH OF WATERLINE (LWL).....	35' 8".....	10.87 m
BEAM (MAX).....	13' 1".....	3.99 m
DRAFT		
SHOAL.....	5'.....	1.52 m
DEEP.....	6' 6".....	1.98 m
DISPLACEMENT		
SHOAL.....	18,995 lbs.....	8,616 kg
DEEP.....	18,393 lbs.....	8,343 kg
BALLAST		
SHOAL.....	5,727 lbs.....	2,598 kg
DEEP.....	5,125 lbs.....	2,325 kg
SAIL AREA		
FURLING.....	764 sq.ft.....	70.98 sq. m.
STANDARD.....	856 sq.ft.....	79.53 sq. m.
SAIL DIMENSIONS		
I.....	49' 2".....	14.98 m
J.....	12' 1".....	3.68 m
FURLING		
P.....	49'.....	14.93 m
E.....	18' 4".....	5.59 m
STANDARD		
P.....	45' 6".....	13.87 m
E.....	17' 7".....	5.37 m
MAST HEIGHT (FROM WATERLINE)		
FURLING.....	61' 2".....	18.64 m
STANDARD.....	59' 2".....	18.03 m
WATER CAPACITY.....	80 US Gal.....	303 liters
HOLDING TANK CAPACITY.....	25 US Gal.....	94.6 liters
FUEL TANK CAPACITY.....	50 US Gal.....	189 liters
WATER HEATER.....	5 US Gal.....	18.9 liters
LPG TANK CAPACITY.....	10 lbs. (x2).....	4.53 kg (x2)
BATTERIES (HOUSE/START)..... 2x4D/GROUP 24		
BATTERY CHARGER (STANDARD)..... 40 AMP		
INVERTER (OPTIONAL)..... 2000 WATT		
TV (OPTIONAL)..... 24" OR 26"		
INBOARD ENGINES - STANDARD.....	29 HP.....	21.3 kw
INBOARD ENGINES - OPTIONAL.....	39 HP.....	28.7 kw
GENERATOR (OPTIONAL)..... PANDA 4200		
AIR CONDITIONING (OPTIONAL)..... 22,000 BTU (16K and 6K)		
BOW THRUSTER (OPTIONAL)..... 3 HP..... 2.2 kw		
MAXIMUM LOADING..... 10 PEOPLE..... 1,040 kg		
SLEEPING CAPACITY..... SLEEPS 6		
HEADROOM.....	6' 6".....	1.98 m
CE CATEGORY..... A		

## STANDARD FEATURES

### Rigging

Boom vang  
Inboard jib tracks with adjustable cars  
Internal halyards led to cockpit  
Jib furling system  
Jib, 110% furling with acrylic sun cover  
Mainsail, full roach with flaking system and sail cover  
Mainsheet purchase system with adjustable traveler  
Mast, B&R with fractional rig  
Reefing system, dual single line led aft  
Rigging line stoppers and organizers, two sets  
Winch handles (2)  
Winches, (2) Rigging, 2-speed, self-tailing, #40  
Winches, (2) Jib, 2-speed, self-tailing, #46 at helm  
Windex® wind vane

### Cockpit

Bilge pump, manual  
Cockpit arch, stainless steel  
Wheel steering system, rack and pinion  
Halyard tail stowage wells  
Jib winches placed aft at helm station  
Locker, storage deep  
Stern rail seats, stainless steel with drink holders  
Transom swim platform, fold-down  
Transom shower, hot and cold

### Deck/Hull

Anchor roller, double offset  
Anchor well with space for rode and chain  
Blister prevent technology hull  
Bow pulpit, stainless steel  
Deck handrails, stainless steel  
Dorade vents (2)  
Hatches, opening deck, with screens  
HKT Kevlar® hull reinforcement  
Hull, FRP/balsa sandwich above waterline,  
Solid FRP bottom  
Hull, structural grid reinforcement  
Hull windows (6), fixed  
Keel, shoal draft  
Lifelines, double with 2 gates and stainless steel stanchions  
LPG tank storage for two bottles

Mooring cleats, (6) stainless steel  
Nonskid deck  
Ports, opening, with screens  
Rubrail with stainless steel insert  
Rudder, balanced spade, with stainless steel shaft  
Swim platform with stainless steel telescoping ladder  
Through-bolted hull/deck joint

### Forward Cabin

Bench seat  
Hanging lockers (2)  
Mattress  
Private forward cabin  
Smoke and carbon monoxide detectors  
Storage shelving  
Under-berth storage space

### Main Salon

Accordion shades  
Cabin lighting, 12v  
Chart table, forward facing  
Deck side windows, fixed  
Deluxe cushion/fabric package  
Dinette table, convertible to berth with filler cushion  
Handrails, hardwood on both sides  
Hardwood flooring  
Hullside storage cabinets  
Easy engine access  
Navigation station with space for electronics  
Selected hardwood trim  
Cherry laminated furniture  
Companionway steps with stainless steel grab rails

### Galley

Corian® countertop  
Dish rack cabinet with lighting and ventilation  
Dishware, plates, mugs, bowls, (6) sets  
Fresh water system, pressurized, hot and cold  
Microwave  
Sinks, double stainless steel with cutting board  
Storage cabinets, drawers and shelving  
Stove, two burner, LPG gimballed with oven

Waste bin, built-in

### Aft Cabin

Berth, Queen  
Built-in lounge chair  
Hanging locker, cedar-lined  
Private access to head and shower  
Storage shelves and compartment storage space

### Aft Head

Access door, dual  
Anti-bacterial gelcoat  
Marine head with manual pump  
Shower stall with adjustable shower head, seat and folding shower door  
Shower sump pump  
Stainless steel sink  
Storage compartments  
Vanity with Corian® countertop

### Systems/Electronics

12 Volt cabin lighting  
12 Volt DC electrical system with breaker panel  
29hp Yanmar® diesel auxiliary engine with shaft drive and two-blade prop  
Alternator, 80amp  
Battery box, engine start  
Battery boxes (2), house  
Battery charger, 40amp  
Bilge pump, electric, automatic  
Electrical outlets, AC and DC  
Engine panel, deluxe with alarms and hour meter  
Fresh water system, pressurized, hot and cold  
Galvanic isolator  
Navigation light package  
Propane gas system for cooking  
Raymarine® i40 depth sounder with alarm  
Raymarine® i40 knot meter with log  
Shore power system, 120 volt AC with cord  
Tank gauges for fuel, water and waste  
VHF radio with DSC and stainless steel antenna  
Waste holding tank and macerator pump  
Water heater

# EXTERIOR DESCRIPTION



Figure 4.7

# INTERIOR ARRANGEMENT

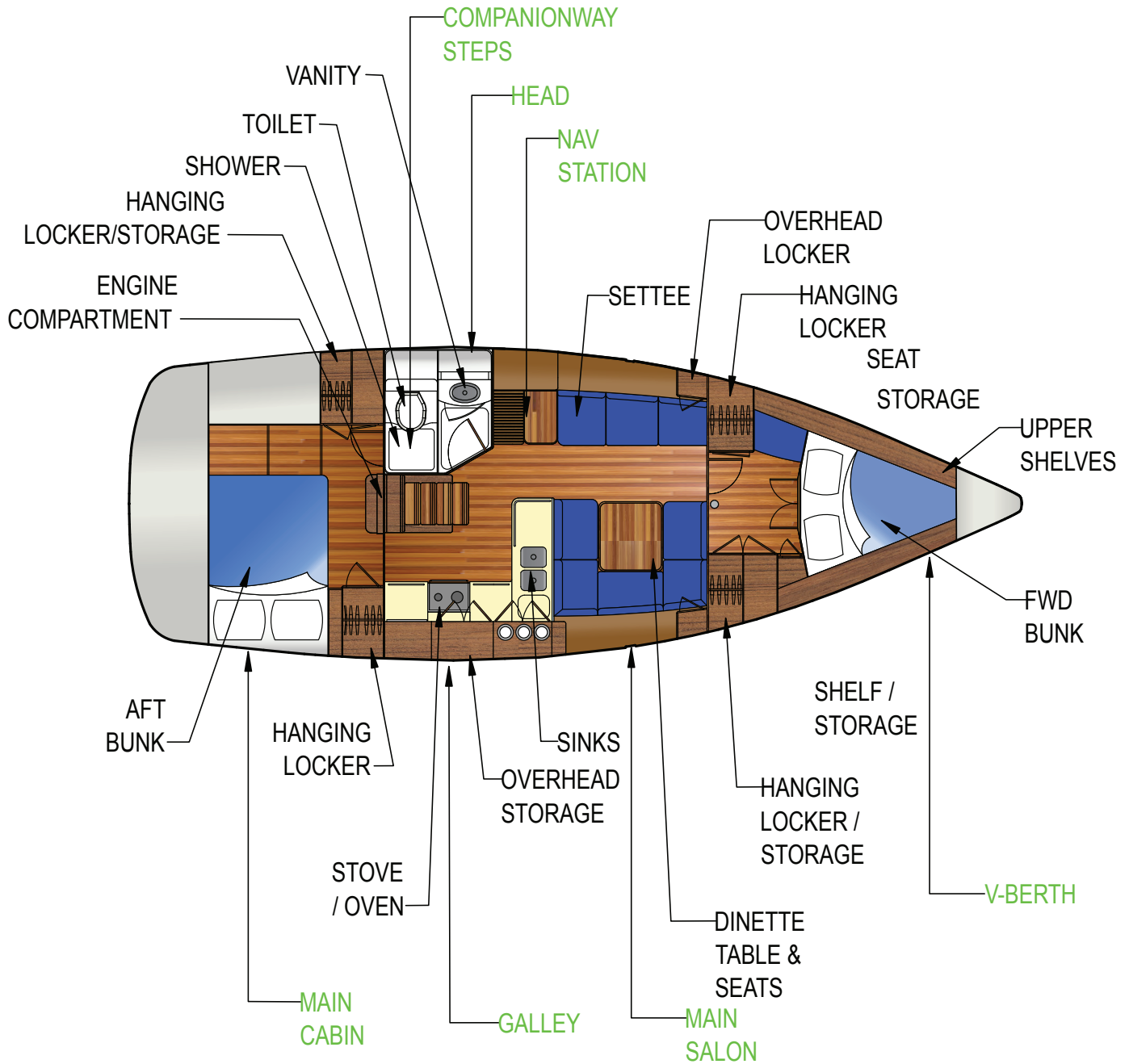


Figure 4.8

# DECK HARDWARE LAYOUT

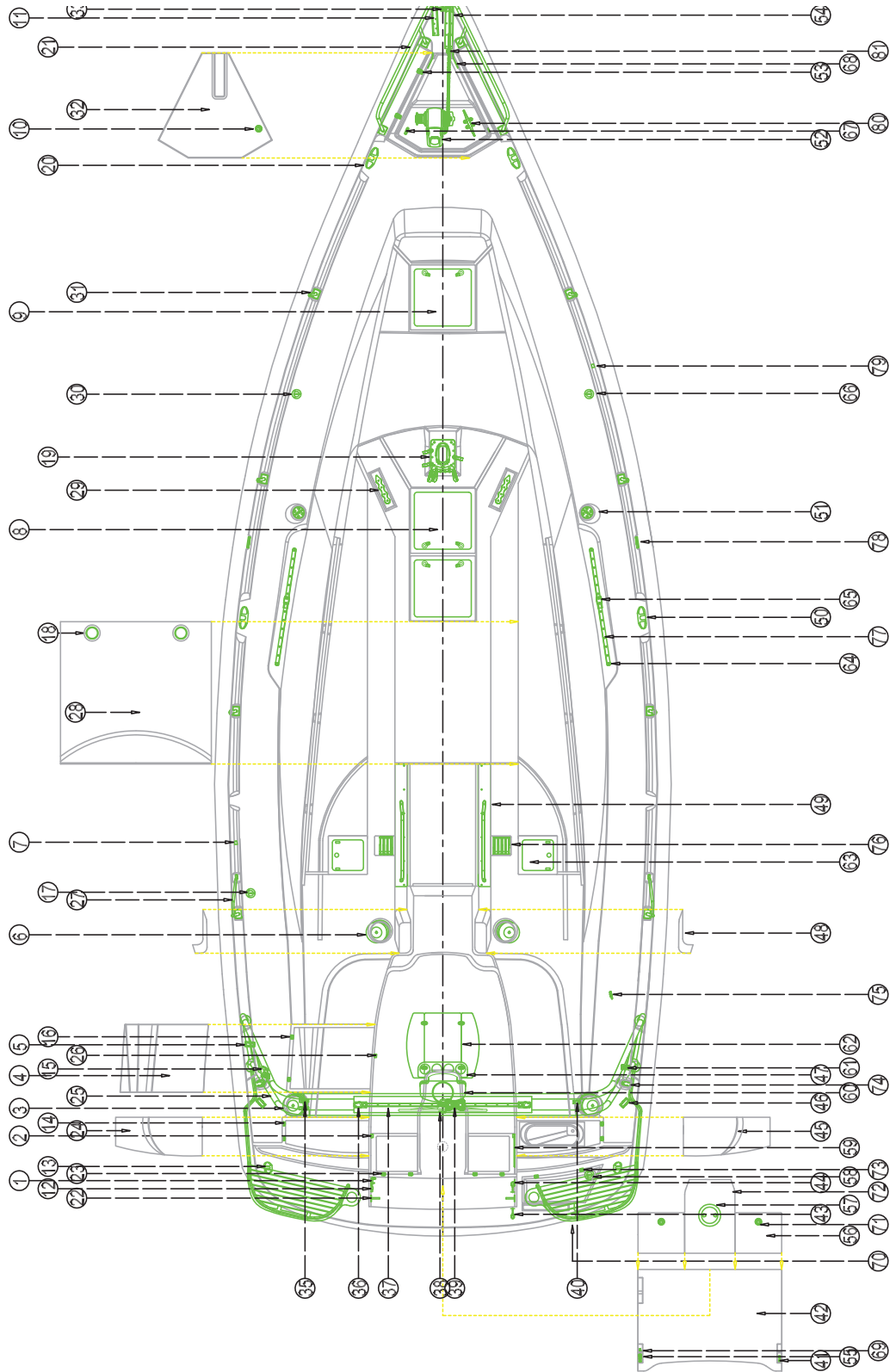


Figure 4.9

## DECK HARDWARE LIST

1	BLOCK - SWIVEL BASE W/ CLEAT	42	SWIM PLATFORM (DOWN POSITION)
2	LATCH - LOCKER LID / RUBBER	43	CABLE W/ SWIVEL EYES - STRB SWIM PLATFORM MOUNT
3	WINCH - HELM / 46SCST (MIRRORED)	44	EYE - STRAP
4	LOCKER LID - GULL WING	45	LID - STRB AFT LOCKER
5	BLOCK - SINGLE/STAND-UP (MAINSHEET)	46	BLOCK - SINGLE/STAND-UP (SPINNAKER)
6	WINCH - COACH ROOF / 40CST (MIRRORED)	47	DRINK HOLDER - PEDESTAL MOUNT
7	VENT - WASTE TANK	48	ROPE LOCKER HOUSING (MIRRORED)
8	HATCH - OPENING (X2)	49	HAND RAIL - COMPANIONWAY (MIRRORED)
9	HATCH - OPENING	50	CLEAT - FOLDING (MIRRORED)
10	LATCH - ANCHORWELL LID	51	CHAINPLATE - INNER
11	BOWROLLER - SECONDARY	52	WINDLASS
12	SHEAVE (SWIM PLATFORM PURCHASE)	53	HINGE - ANCHORWELL LOCKER
13	CLEAT - FOLDING (MIRRORED)	54	BOWROLLER - PRIMARY
14	HINGE - AFT LOCKER LID	55	SHACKLE - D
15	SHEET STOPPER - SINGLE (MAINSHEET - ON ARCH)	56	LID - COCKPIT SOLE LOCKER (MIRRORED)
16	HINGE - GULL WING LOCKER LID	57	PORT INSPECTION - RUDDER POST
17	DECK FILL - WASTE	58	DECK FILL - DIESEL (IN TRANSOM GARAGE)
18	VENT - DECK PLATE (FOR DORADE VENT)	59	COCKPIT SHOWER
19	MAST STEP - W/ BLOCKS	60	PEDESTAL & STEERING WHEEL
20	CLEAT - FOLDING (MIRRORED)	61	BLOCK - SINGLE/CLEAT (TRAVELER) (ON ARCH) (MIRRORED)
21	BOWRAIL	62	COCKPIT TABLE - FOLDING
22	HINGE PIN - SWIM PLATFORM (MIRRORED)	63	HATCH - OPENING
23	HINGE - LOCKER LID (2 PER LID - PORT & STRB)	64	GENOA TRACK END STOP (2 PER TRACK / MIRRORED)
24	LID - PORT AFT LOCKER	65	GENOA LEAD BLOCK (MIRRORED)
25	ARCH	66	DECK FILL - WATER (STRB TANK)
26	LATCH - LOCKER LID / RUBBER	67	U-BOLT
27	STANCHON - GATE	68	CHAFE PLATE - ANCHOR CHAIN (MIRRORED)
28	SEA HOOD	69	BLOCK - SINGLE W/ BECKET
29	ORGANIZER - LINE / QUAD (MIRRORED)	70	SHORE POWER/TV/ENGINE COMP BLOWER VENT (TRANSOM GARAGE - NOT SEEN)
30	DECK FILL - WATER (PORT TANK)	71	LATCH - COCKPIT SOLE LOCKER LID (MIRRORED)
31	STANCHION - POST (X6)	72	QUAD COVER (STEERING HARDWARE ACCESS)
32	LID - ANCHORWELL LOCKER	73	HINGE - TRANSOM GARAGE
33	STEM PLATE	74	BLOCK - LAYDOWN / JIB SHEET (MIRRORED)
34	ANCHOR & CHAIN	75	CLEAT - 5"
35	BLOCK - OVER-THE-TOP (MAINSHEET/TRAVELER) (ON ARCH)	76	SHEET STOPPER - QUAD (MIRRORED - TRIPLE)
36	BLOCK - TRAVELER END (MIRRORED) (ON ARCH)	77	GENOA TRACK (MIRRORED)
37	TRAVELER TRACK (ON ARCH)	78	CHAINPLATE - OUTER
38	BLOCK - SINGLE/STAND-UP (MAINSHEET) (ON ARCH)	79	VENT - WATER TANK
39	TRAVELER CAR (ON ARCH)	80	CLEAT - 10"
40	BLOCK - OVER-THE-TOP (TRAVELER) (ON ARCH)	81	STOPPER - ANCHOR CHAIN
41	EYE - STRAP (MIRRORED)		

Figure 4.10

## AVAILABLE OPTIONS

Air conditioning system with shore power outlet and cord	Painted hull
Alternator upgrade, 120amp	Propeller, 2 blade, folding
Automatic engine room fire extinguishing system	Quiet-flush® head
Barrier coat, epoxy with bottom paint	Raymarine® AIS system
Bottom paint (without barrier coat)	Raymarine® p70 autopilot with linear drive
Bimini	Raymarine® a50 chartplotter with GPS
Bose® Lifestyle 235 entertainment system, 26" flat panel TV, iPod dock, remote cockpit stereo package and environmental speakers	Raymarine® e7 chartplotter with GPS
Cockpit cushions	Raymarine® e95 wide with GPS
Cruising spinnaker gear	Raymarine® e95 wide with GPS and 4kw radar
Davits	Raymarine® e95 MFD with GPS
Deep keel	Raymarine® e95 MFD with GPS and 4kw radar
Diesel heating system	Raymarine® radar (4kw)
Dodger (spray hood)	Raymarine® smart controller/wireless remote
Dynaplate	Raymarine® i50 speed and depth upgrade
Electric rigging winch, #46	Raymarine® i70 package
Electric sheeting winches, #46	Raymarine® Sirius® weather
Engine upgrade 40hp with saildrive	Rigid boom vang (included in furling main option)
Folding deck cleats (6)	Sirius® receiver and antenna (USA only)
Folding wheel, 36" (.91m)	Spare rudder system
Freezer, front opening	Stern rail seat cushions
Generator – Fischer Panda® 4200, 4.0 Kw	Teak furniture and doors
High bilge water alarm and pump	Teak exterior options
Inverter with battery charger upgrade	Three-blade fixed propeller
Leather interior cushions	Tri-cabin version
Lead keel (shoal or deep)	Vertical battens for furling mainsail option
Mattress, innerspring aft cabin	VHF remote mic at helm
Non-skid decking, painted – 2-tone	Wrapped teak bulkheads with teak furniture and floors









MARLOW-HUNTER, LLC

*Chapter 5*

# *Fuel Systems*

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**MH37**



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The fuel systems aboard your boat consist of two components: diesel for the engine and optional generator assemblies and LPG for the stove assembly. Our discussion will include the following topics:

1. Fuel Tank
2. Fuel Supply Lines and Hoses
3. Fuel Valves
4. Fuel Filters
5. Fueling Your Boat
6. LPG System

Refer to Fig. 5.10 at the end of this chapter for a fuel oriented quick reference checklist when boarding your boat. Also, refer to Fig. 5.11 - 5.12 for overall fuel system layout illustrations.

## 5.1 Fuel Tank

Your boat is equipped with a single 50 US gal (189 liter) fuel tank located beneath the aft cabin bunk and accessed through the starboard bunk drop-ins (Fig. 5.1).

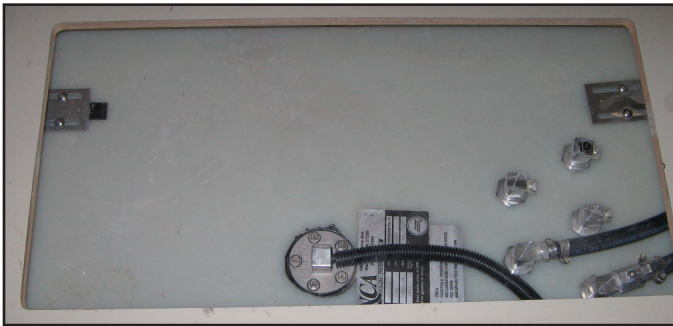
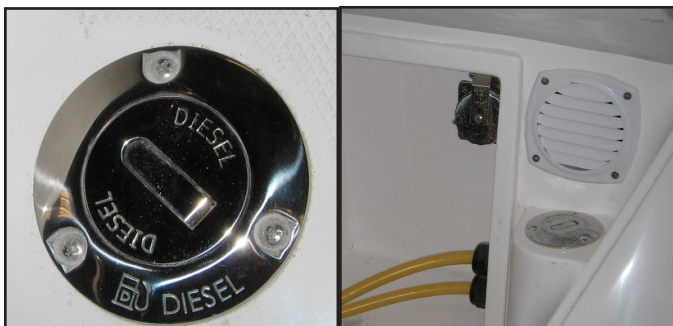


Figure. 5.1

### 5.1.1 Fuel Fill

The fuel tank is filled through the stainless steel deck-fill fitting located within the transom garage (Fig 5.2).



### 5.1.2 Fuel Tank Capacity Monitoring

The fuel tank is equipped with a fuel level sending unit (lower center component Fig. 5.1) which provides an electrical signal to the fuel gauge to indicate its fill level.

### 5.1.3 Fuel Tank Grounding System

The fuel tank and deck fill on your boat are electrically grounded to the engine negative. This grounding system is designed to prevent the discharge of static electricity when fueling your boat. An authorized service technician should inspect this system at least once each year.

### 5.1.4 Fuel Gauge

The fuel gauge is mounted on lower left corner of the safety panel located on the aft lower inboard face of the starboard cockpit seat (Fig. 5.3).

#### **! DANGER !**

Never place yourself near the engine compartment without proper ventilation first. A spark caused by power tools or lighting equipment could result in fire or explosion which could cause personal injury or death.

#### **! WARNING !**

Fuel leaking from any part of the fuel system can lead to fire and explosion that can cause serious bodily injury or death. Inspect system before fueling.

#### **! CAUTION !**

Using the wrong type of fuel will result in severe damage to the engines. Refer to your engine OEM manual for fuel recommendations.

#### **! DANGER !**

Leaking fuel is a fire and explosion hazard. Personal injury or death could occur.



Figure. 5.3

### 5.1.5 Fuel Tank Vent

The fuel tank incorporates a thru-hull vent fitting and is located starboard aft (see left side Fig. 5.4). The fuel tank vent serves as a pressure / vacuum release and safety overflow. The vent incorporates a flame arrestor, thus it is imperative that you keep the screens clear and in excellent repair. Replace the screens immediately if they become damaged or displaced. Periodically check the vent for clogging.



Figure. 5.4

The deck fill and vent hose, fittings, and connections should be inspected for leaks, signs of dry rot or swelling at least once a year. If any of these conditions are present, have an authorized service technician inspect the fuel system immediately. If a leak is found, turn off battery switches, disconnect shore power, and disable any possible source of ignition. Contact your dealer or

Customer Service immediately.

## 5.2 Fuel Supply Lines and Hoses

If any fuel fill or vent hose's are in need of replacement, ensure that only USCG Type A1 or A2 are used.

The engine has a fuel supply hose that runs from the pickup tube in the fuel tank to the water separator (commonly referred to as the fuel filter), then from the water separator to the engine. Also, the engine has a fuel return hose that runs from the engine back to the fuel tank. If your boat has the optional generator, the generator will have the same basic setup with supply and return hoses (Fig. 5.11).

The fuel supply lines or hoses, fitting, and connections should be inspected often for leaks, signs of wear, dry rot, chafing, or swelling. A good way to inspect the fuel hoses is to run your hand along the length of the hose and fittings. Leaks will be revealed as wet spots on your hand. If any evidence of hose deterioration is present, have a qualified technician replace all the hoses with USCG Type A1 or A2 hoses immediately!

### **⚠ DANGER ⚠**

**The use of any hose other than the USCG Type A1 or A2 could result in fuel leakage. Leaking fuel is a fire and explosion hazard. Personal injury or death could result.**

*NOTE: If a leak is found, turn off battery switches, disconnect shore power, and disable any source of ignition. Do not start your engines, the generator, or any devices that could create a spark. Contact your dealer or our Customer Service Department immediately! If hoses need to be replaced, make sure only USCG Type A1 or A2 are used.*

## 5.3 Fuel Valves

Your boat has fuel shutoff valves located at the tank in the supply line route (see engine fuel line lower right Fig. 5.4). These valves start or stop the flow of fuel through the supply lines.

*NOTE: Even if the fuel supply valves are closed, there may be fuel in the supply lines to the filter and engine (and optional generator). Disconnecting these fittings without properly bleeding the system of fuel could result in emptying the fuel filter and causing a fuel spill. Only a qualified technician should ever*

## Fuel Systems

*make repairs to your fuel system.*

Turning the fuel line valve handle so it is perpendicular to the valve body shuts off the supply or return. Turning the handle so it is in line with the valve body opens the valve.

### 5.4 Fuel Filters (Water Separators)

The fuel supplied to the engine (and optional generator) may contain impurities found in the fuel tank or from the fuel itself. If these impurities are not removed prior to starting the engines, performance may be seriously affected. Removal of the fuel impurities is accomplished by external fuel filters.

#### 5.4.1 Engine Filter

The engine has a separate filter located apart from the engine (the engine assembly has a secondary fuel filter) and is mounted on the aft cabin bunk divider. It can be accessed through the bunk's port drop-in (Fig. 5.5).

An authorized service technician should replace the filter annually prior to spring launch. More frequent replacements may be required if engine/generator performance is degraded due to contaminated fuel.

*NOTE: Please refer to the fuel filter manufacturer's OEM manual for further details regarding operation, care and maintenance.*

#### 5.4.2 Generator Filter

The optional generator also has a separate fuel filter (Fig. 5.6) apart from the generator unit (the generator assembly also has a secondary fuel filter). It is located near the engine fuel filter and is mounted on the aft cabin bunk divider and accessed through the bunk's port drop-in.

#### 5.4.3 Fuel Filter Service

Refer to the fuel filter's OEM manual for details regarding the following:

1. Priming the unit
2. Servicing the unit
3. Filter replacement
4. Troubleshooting procedures

### 5. Replacement parts

*NOTE: Please refer to the fuel filter manufacturer's OEM manual for further details regarding operation, care and maintenance.*



Figure 5.5



Figure 5.6

## 5.5 Fueling Your Boat

Before fueling, check the fuel system for leaks. Check components for weakening, swelling, or corrosion.

## Fuel Systems

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Immediately replace any leaking or defective components before operating an engine. Keep the tank as full as practical to reduce condensation and the accumulation of moisture in the fuel system. However, consider fuel expansion during warm and hot weather and fill accordingly. A fuel tank may overflow if its fuel expands beyond its capacity. Fuel expansion may occur in situations involving warmer environments where fuel is pumped from cool underground storage tanks or when air temperatures are cooler (night and early morning).

Follow these procedures to fuel your boat:

1. Safely and securely moor your boat to the dock.
2. Turn off engine (and optional generator).
3. Turn main battery switches off to prevent sparks from electrical equipment (lights, blowers, pumps, etc.) (see DC Electric System chapter in this manual).
4. Disconnect shore power if connected (see AC Electric System chapter in this manual).
5. Put out all cigarettes, cigars, pipes, or other items that may produce a spark or flame.
6. Close all hatches, doors and compartments.
7. Ask guests to leave the boat during fueling.
8. Lift the transom garage door and remove cap from the deck fill pipe.
9. Insert the fuel hose nozzle into the fill pipe. During fueling, maintain contact between the nozzle and the fill pipe.
10. After pumping several gallons of fuel, inspect engine compartment for any signs of fuel leakage.
11. Fill the tank, allowing space at the top of the tank for thermal expansion.
12. Fill slowly near the top to avoid overflow.
13. Remove nozzle after tank is full and replace fill cap. Make sure cap is tight. Lower transom garage door.
14. After fueling is complete, open all hatches, doors, and compartments.
15. Visually check all fuel fittings, lines, and tanks for fuel leakage.
16. Check all lines up to the engine (and optional generator). Smell for fumes.
17. Correct any problem before you start the engine.
18. Turn main battery switches on (see DC Electric System chapter in this manual).
19. Restart engine and restore boat to operating condition (see Getting Underway chapter in this manual).

**IMPORTANT:** *Do not smoke until your boat is clear of the fuel dock.*

**⚠ DANGER ⚠**

**Fuel vapors can explode. Do not smoke at the dock. Extinguish all flames, stove, and other ignition sources before you approach a fuel dock.**

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**⚠ DANGER ⚠**

**Explosive fuel vapors can become trapped in the lower portions of the boat. Close all hatch covers, windows, doors, and compartments while fueling your boat.**

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### 5.6 LPG (Liquefied Petroleum Gas) System

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LPG (Liquefied Petroleum Gas) is a generic term to describe liquefied gasses consisting predominately of Propane (C3) and Butane (C4) hydrocarbons.

Your boat comes equipped with one 10lb LPG tank. LPG is used to fuel your galley stove (see Fig. 5.12 for LPG system layout). The tank is located in the specially designed and fully contained LPG locker located in the aft starboard cockpit seat locker (see Fig. 5.7). For convenience, the locker has additional space for a second LPG tank.

Within the LPG locker is the tank hose connection and regulator/solenoid. The hose connection should be threaded snugly onto the tank. When two tanks are present, switch the hose connection between them as needed.

A remote panel (Fig. 5.8) is located at the galley and mounted on the sink cabinet face. This remote panel allows automatic control over the flow of LPG to the stove. Please refer to the DC Electric Systems chapter in this manual for details on powering the remote panel.



## Fuel Systems



Figure. 5.7

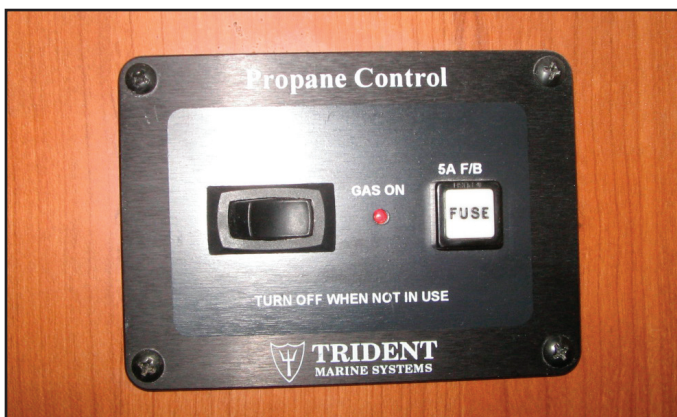


Figure. 5.8

### 5.6.1 Hazard Awareness

1. LPG is extremely flammable! These gasses readily form explosive air-vapor mixtures at ambient temperature. These vapors are heavier than air and may travel to sources of ignition (e.g. along drainage systems, into bilges, etc.).
2. Liquid from the tanks will generate large volumes of flammable vapor (approximately 250:1).
3. Cold burns (frostbite) will result from skin/eye contact with liquid from the tanks.
4. Liquid release or vapor pressure jets present a risk of serious damage to the eyes.
5. Willful abuse involving inhalation of very high concentrations of vapor, even for short periods, can produce unconsciousness and possibly death. Inhalation may cause irritation to the nose and throat, headache,

nausea, vomiting, dizziness, and drowsiness.

6. Unconsciousness or asphyxiation may result in poorly ventilated or confined spaces.

### 5.6.2 Leak Testing

Conduct the following test on your LPG system to check for leaks each time the cylinder supply valve is opened for stove use:

1. Close all range burner valves by turning the controls to the OFF position.
2. Open the manual cylinder and solenoid valve (via the remote switch) and make a note of the reading on the pressure gauge.
3. Close the manual cylinder valve.
4. Check the pressure gauge. It should remain constant for at least 10 minutes. If it does not, gas is leaking out of the system.

If the LPG system has a leak, consult the OEM manual for directions on leak detection and component replacement.

### 5.6.3 Basic LPG Panel/Stove Operation

1. Power up the remote panel (Please refer to the DC Electric Systems chapter in this manual for details on powering the remote panel).
2. Press the "ON" button on the LPG remote panel.
3. Push in the control knob of the desired burner and turn counter-clockwise 90 degrees.
4. While pushing in the control knob, push the ignition button located on the left side of the control knob.
5. Once lit, continue pushing the knob in for 20 seconds to heat up the proper components.
6. Adjust the knob to the desired level of flame.
7. Turn off the burner by turning the control knob clockwise to the off position.

*NOTE: Please refer to the stove top/oven manufacturer's OEM manual for further details regarding operation, care and maintenance.*

### 5.6.3 When Not In Use

## Fuel Systems

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Practice the following safety measures when the LPG system is not in use:

1. All valves (tanks and solenoids) must be closed when the boat is unattended.
2. All valves must be closed immediately in any emergency.
3. All valves are recommended to be closed while the stove is not in operation.

Please refer to the DC Electric chapter in this manual for details on power supply and basic start-up procedure.

### 5.6.4 First-Aid Measures

**Eyes:** Immediately flush eyes with plenty of cool water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Seek immediate medical attention.

**Skin:** In case of cold burns, immediately place affected area in warm water (104-107 F, 40-42 C) and keep immersed until circulation returns. Seek immediate medical attention.

**Other requirements:** Severe inhalation or overexposure to this material may sensitize the heart to cat echo la mine-induced arrhythmia. Do not administer cat echo la mine\* to overexposed individuals. Contact the Poisons Information Service and/or seek further medical advice.

\*(Cat echo la mine are chemical compounds derived from the amino and tyrosine that act as hormones or neurotransmitters. "Wikipedia Encyclopedia")

### 5.6.5 Fire-Fighting Measures

1. Activate emergency systems and/or sound the alarm. Call the Fire Department. Evacuate all persons from the area.
2. Ensure an escape route is always available from any fire. If it is safe to do so, close the container valves. If unable to cut off supply of gas, allow it to burn. Allow any gas-fueled fire to burn out.
3. Keep LPG cylinders or tanks cool, as pressurized containers will explode if subjected to high temperatures.
4. Small LPG fires can be attacked with dry powder fire

extinguishers, provided the fuel supply can be turned off after the fire is extinguished.

### 5.6.6 Accidental Release Measures

As these substances have a very low flash point, any spillage or leak is a severe fire and/or explosion hazard. Take the following measures in the event of a leak:

1. If a leak has not ignited, stop gas flow at container, eliminate all sources of ignition, and evacuate all persons. Stay upwind of release. Inform emergency services.
2. Liquid leaks generate large volumes of flammable vapor, heavier than air, which may travel to sources of ignition (e.g. along drainage systems).
3. Where appropriate, use water spray to disperse the gas or vapor.
4. Vapor may collect in any confined space.
5. If spillage has occurred in a confined space, ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry.
6. Do not enter a vapor cloud. Only trained specialized individuals should attempt to enter a vapor cloud.
7. Wear protective clothing (see section on Exposure Controls / Personal Protection).

Small quantities of spilled liquid may be allowed to evaporate. Vapor should be dispersed by effective ventilation.

In the event of a major leak, contact the appropriate authorities.

### 5.6.7 Handling and Storage

1. Store and use only in equipment/containers for use with your particular appliance. Tanks should only be stored in a locker installed and designed for LPG storage, outside the living areas of the boat.
2. Installation of added appliances should only be performed by qualified personnel.
3. Follow manufacturer's instructions for changing tanks.

## Fuel Systems

4. Ensure good ventilation.
5. Avoid inhalation of vapor.
6. When handling cylinders, wear protective footwear and suitable gloves.
7. When handling cylinders (above head height) protective headgear may be necessary.
8. When changing tanks, wear suitable gloves and safety goggles or face shields.
9. Avoid contact with the eyes.

### 5.6.8 Exposure Controls / Personal Protection

**Skin Protection** – Wear suitable protective overalls with long sleeves to cover exposed skin.

**Eye Protection** – Use chemical goggles or face shield when changing tanks.

**Hand Protection** – Use impervious gloves when changing tanks; use suitable protective gloves when handling cylinders.

**Foot Protection** – Wear safety boots or shoes when handling cylinders.

**Head Protection** – When handling cylinders above head height, protective headgear may be necessary.

### 5.6.9 Stability and Reactivity

Stable at ambient temperatures.

Hazardous polymerization reactions will not occur.

### 5.6.10 Material to Avoid

Avoid contact with strong oxidizing agents.

### 5.6.11 Hazardous Decomposition Products

Normally Carbon Dioxide (CO<sub>2</sub>). Incomplete combustion will generate Carbon Monoxide (CO). See the Boating Safety Chapter for more information on Carbon Monoxide.

*NOTE: High concentrations of CO may be explosive.*

### 5.6.12 Toxicological Information

**Eyes:** Will present a risk of serious damage to the eyes if contact with liquid or vapor pressure jet occurs.

**Skin:** Will cause cold burns (frostbite) if skin contact with liquid occurs.

### Exposure Limits

	Long Term Exposure Limit (PPM) (8 hr TWA)
Butane	800
LPG	1000

(source: CDC)

Figure 5.9

**Inhalation:** Low vapor concentrations may cause nausea, dizziness, headaches, and drowsiness. High vapor concentrations may produce symptoms of oxygen deficiency which, coupled with central nervous system depression, may lead to rapid loss of consciousness.

**Abuse:** Under normal conditions of use, the product is not hazardous. Abuse involving deliberate inhalation of very high concentrations of vapor, even for short periods, can produce unconsciousness and/or result in sudden death.

### 5.6.13 Environmental Information

Spills are unlikely to penetrate the soil. It is also unlikely to cause long term adverse effects to the environment and will photo-degrade under atmospheric conditions.

Spills are unlikely to cause long term effects in the aquatic environment.

### 5.6.14 Disposal Considerations

Product discharge may only be carried out by qualified persons.

- Do not dispose of any LPG container.
- Return all cylinders to the supplier.



**Open flame cooking appliances consume oxygen.**

## Fuel Systems

**This can cause asphyxiation or death.**

**Maintain open ventilation.**

**Liquid fuel may ignite, causing severe burns.**

**Use fuel appropriate for the type of stove installed.**

**Turn off stove before changing tank.**

**Do not use for comfort heating.**

**Use special care for flames near urethane foam. Once ignited, it burns rapidly, producing extreme heat and releasing hazardous gasses and consuming large amounts of oxygen.**

**Specifically follow all warnings and instructions in your Operator's Manual and the equipment OEM manuals provided to you.**

Troubleshooting		
Problem	Cause	Solution
Fuel overflows at the fill plate (tank not full)	Fill or vent line blocked	Check lines. Clear obstruction from line or straighten line if kinked.
Water or moisture in fuel tank	Cap on deck fuel fill plate not tight	Check cap. Tighten.
	Condensation forming on walls of partially filled tank.	See next item above. If problem remains, fuel tank and lines may need to be drained and flushed. See your dealer for service.
Engine cranks but will not start (fuel system)	Poor quality fuel from marina tanks.	Check fuel/water separators. Drain if necessary. Check with your dealer.
	Lack of fuel.	Clean fuel filter, check fuel level. Check whether anti-siphon valve, if so equipped, is stuck shut. Improper starting procedure. Re-view starting procedures in engine manual.
	Clogged fuel filter.	Check and replace fuel filter. Check fuel pump, fuel pump filter and fuel tank line for cracked flanges or restricted fittings.

## **FUEL SAFETY CHECKLIST FOR BOARDING**

**This fuel safety checklist is designed to be used as a quick reference to minimize the risks associated with fuel hazards. You should refer to this checklist every time you board your boat. Read your Operator's Manual so that you have a full understanding of the fuel system on your boat.**

- » Before approaching your boat, extinguish all smoking materials and make certain there are no other sources of possible ignition near your boat.
- » Approach your boat alone to make the initial inspection. Have your guests and crew standby a safe distance away.
- » From the dock, visually inspect your boat for any fuel leaks from the deck fills or hull vents and take notice if there is any odor of fuel.
- » Once aboard, open the cabin door and sniff at the doorway then inside the cabin for fuel odor.
- » Open the machinery compartment hatches and sniff for fuel odor.
- » Inspect the machinery compartments for fuel leaks and sniff for fuel odor.
- » If there are any signs of fuel leakage, either visually or by odor, open doors, hatches, and windows. Evacuate the boat and inform the dock master. Have an authorized service technician inspect your boat.
- » If no signs of fuel are present, board your guests and crew.
- » Run exhaust blower for five minutes before starting the engines or generator.
- » Always be aware of the hazards associated with fuel and practice good common sense.

**"HAPPY AND SAFE BOATING" from the Marlow-Hunter Team**

## FUEL SYSTEM LAYOUT (WITH OPTIONAL GENERATOR)

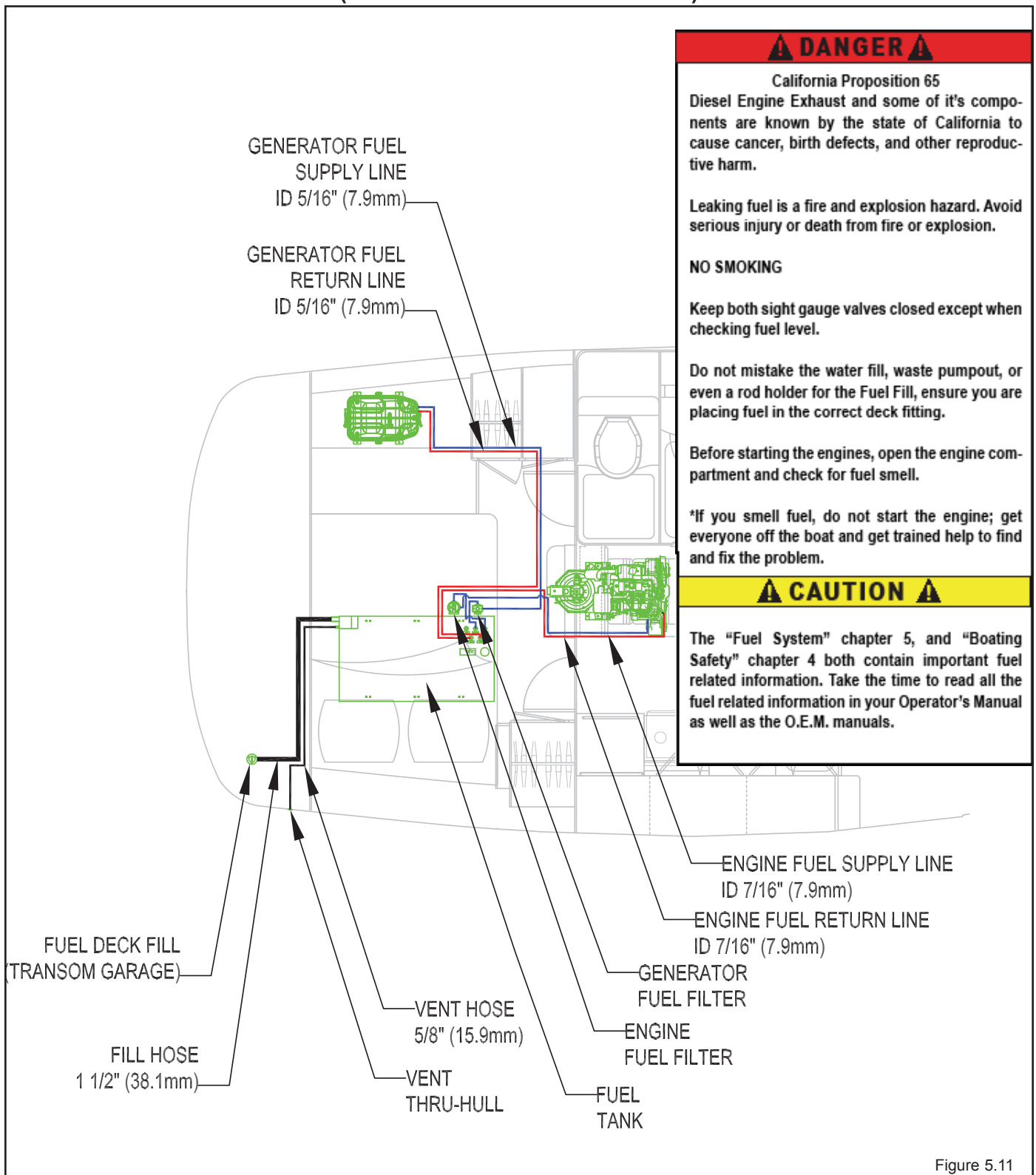


Figure 5.11

# LPG SYSTEM LAYOUT

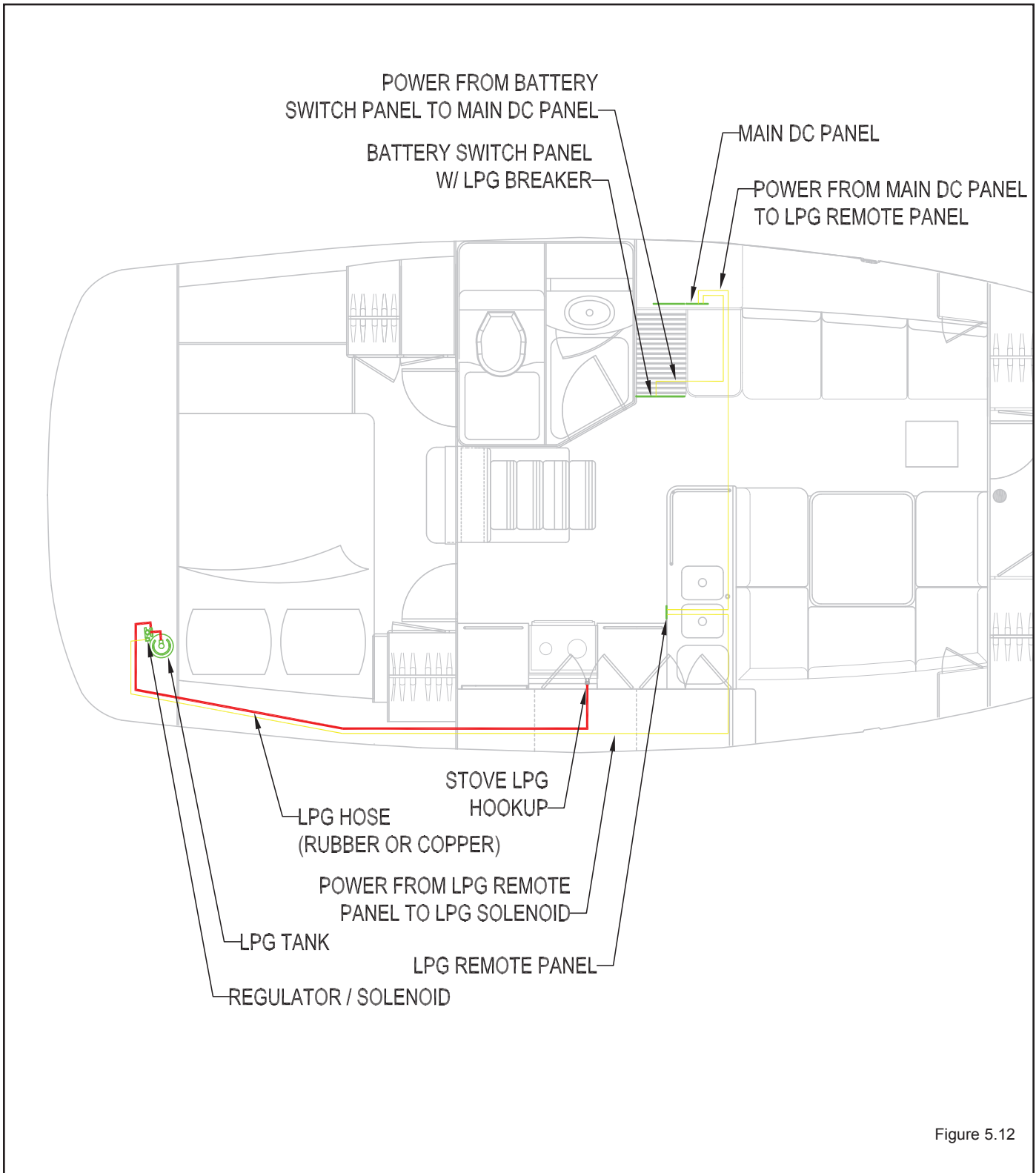


Figure 5.12

