

Your yacht was not provided with a lightning protection system during construction. The reasons are as follows:

1. There is not a procedure for lightning protection that has proven reliable under all conditions. Yachts with elaborate lightning protection systems have sustained serious damage from a direct lightning strike.
2. If the builder were to assert that the yacht was lightning protected, it could instill a false sense of security in the owner or operator, leading to less-than-prudent actions when lightning threatens.
3. Lightning systems are “out of sight, out of mind,” except when lightning threatens. Generally, they are not checked and maintained on a regular basis. A defect in the system (i.e., a break in a ground line) could – in some cases – increase the risk of personal harm, as well as damage to the yacht, as compared to a yacht with no protection. The reason for this is that many lightning protection systems distribute the high voltage throughout the yacht before allowing it to exit through the ground.
4. It is impossible for Catalina Yachts to control changes that you, the owner, may make to the yacht, which could affect the lightning protection system.

You, the owner, must decide whether or not you wish to equip your yacht with lightning protection and, if so, the method of doing it. The following suggestions and comments are also offered:

- A. Keep the system as simple as possible. This will facilitate both installation and inspection/maintenance. Perhaps a single over-size ground (battery cable) from the mast to the engine, coupled with external shroud grounds (see (B) below), will maximize reliability.
- B. The American Boat & Yacht Council (ABYC) recommends straight-line wire runs, which is virtually impossible within the yacht. For grounding the shrouds: A battery cable, which clips to each shroud and extends outside the yacht to the water, can minimize the number of bends required. This method has the added advantage of keeping the power surge outside the boat and allowing easy, routine inspection. The obvious disadvantage is that the clip-on cables are not a permanent installation and may not be in place when an unexpected lightning strike occurs.
- C. Use only top quality materials and go oversize whenever possible.
- D. Keep all permanent attachment points and connections where they are readily available for inspection, yet protected from damage or inadvertent disconnection.

Factory installed metal tanks, 12-volt systems, and major components are grounded to the engine. The engine is grounded via the shaft and propeller to the water. The

purpose of internal grounding is for static charge control and accidental shorts in the internal systems – not to provide lightning protection. However, you can incorporate the ground lines present into a lightning protection system you may wish to add.

By far, the most important consideration regarding lightning is observing common sense safety precautions when lightning threatens. The key considerations are listed in the American Boat and Yacht Council (ABYC) publication Section E-4, which is printed herein.

E-4 LIGHTNING PROTECTION

Based on ABYC's assessment of the existing technology, and the problems associated with achieving the goals of this standard, ABYC recommends compliance with this standard for all systems and associated equipment manufactured and/or installed after July 31, 1998.

4.1 PURPOSE

These standards and recommended practices are guides for the design, construction, and installation of lightning protection systems on boats.

NOTE: *The probability of a lightning strike varies with geographic location and the time of the year, but, when the conditions that create and electrical charge between clouds and the earth exist, there is nothing that can be done to prevent the lightning discharge. A boat can be struck in open water or while tied to the dock.*

4.2 SCOPE

These standards and recommended practices apply to powerboats and sailboats if a lightning protection system is installed.

NOTES: 1. *Complete protection from equipment damage or personal injury is not implied.*

2. *A lightning protection system offers no protection when the boat is out of water, and is not intended to afford protection if any part of the boat comes in contact with power lines while afloat or ashore.*

3. *Protection of persons and small craft from lightning is dependent on a combination of design and maintenance of equipment, and on personnel behavior. The basic guides contained in this standard shall be considered and used in designing and installing a lightning protection system. However, in view of the wide variation in structural design of boats, and the unpredictable nature of lightning, specific recommendations cannot be made to cover all cases.*

4.3 REFERENCED ORGANIZATIONS

ABYC – American Boat and Yacht Council, 3069 Solomon's Island Road, Edgewater, MD 21037-1416. 410-956-1050

NFPA – National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101. 617-770-3000

4.4 DEFINITIONS

Air terminal – A device at the upper most point of the lightning protection system to dissipate the charge or start the lightning ground process.

Equalization bus – A metallic strap, which may be installed on the interior of a boat, substantially parallel to the exterior lightning ground plate, and connected to the lightning ground plate, and connected to the lightning ground plate at both ends. Secondary lightning conductors can be connected to the equalization bus. The equalization bus provides a low resistance path to the lightning ground plate.

Lightning bonding conductor – A conductor intended to be used for potential equalization between metal bodies, and the lightning protection system to eliminate the potential for side flashes.

Lightning ground plate (or strip) – A metallic plate, or strip on the hull exterior below the waterline, that serves to efficiently transfer the lightning current from the system of down conductors to the water.

Lightning protective gap (air gap) – A form of lightning arrester wherein a small air space is provided between two metallic plates, with one connected directly to the vessel grounding plate or strip, and the other to an operating electrical system, such as a radio transmitter or receiver.

Lightning protective mast – A conductive structure, or if non-conductive, equipped with a conductive means, and an air terminal.

Parallel path – A path to ground that may be followed by a lightning strike. This path is separate from the path formed by the primary lightning conductor.

Primary lightning conductor – The main vertical electrical path in a lightning protection system formed by a metallic mast, metallic structure, electrical conductors, or other conducting means, to a ground plate, ground strip, or a metallic hull.

Secondary lightning conductor – A conductor used to connect potential parallel paths, such as the rigging on a sailboat, to the primary lightning conductor, or to the lightning ground plate, strip or equalization bus.

Side flash – An arc-over discharge that occurs from the lightning system to any metallic object.

Zone of protection – An essentially cone shaped space below a grounded air terminal, mast, or overhead ground wire, wherein the risk of direct lightning strike is substantially reduced. See Appendix 1

4.5 REQUIREMENTS – IN GENERAL

4.5.1 To provide a conductive path for the adequate discharge of lightning currents, from the air terminal at the top of a lightning mast to the water (ground), the system shall

4.5.1.1 be essentially vertical, and

4.5.1.2 be essentially straight, and

4.5.1.3 have a conductivity not less than that of a #4 AWG (21.2 mm²) copper conductor, and

4.5.1.3.1 where the system consists of multiple shrouds, stays and mast, they shall have an aggregate conductivity not less than a #4 AWG (22.2 mm²) copper conductor.

4.5.2 Every metallic shroud and stay shall be connected from the chain plate directly to the ground plate or ground strip with a conductor at least #6 AWG (13.3 mm²).

4.5.3 No bend of a conductor shall form an included angle of less than 90°, nor

4.5.3.1 shall it have a radius of bend less than eight inches (203mm).

4.5.4 Large metal objects such as tanks, engines, deck winches, stoves, etc., within six feet (1.8m) of any lightning conductor shall be interconnected by means of a lightning bonding conductor at least equal to #6 AWG (13.3 mm²) copper.

NOTES: 1. *To minimize flow of lightning discharge current through engine bearings, it may be preferable to bond engine blocks directly to the ground plate rather than to an intermediate point on the lightning protection system.*

2. *Large metal bodies on boats include any large masses such as bow and stern pulpits, steering pedestals, horizontal guardrails, handrails on cabin tops, smokestacks from galley stoves, electric winches, davits, metallic hatches, metallic arches, towers, engines, water and fuel tanks, and control rods for steering gear or reversing gear.*

3. *It is not intended that small metal objects such as compasses, clocks, galley stoves, medicine chests, and other parts of the boat's hardware be grounded.*

4. *For illustration purposes see Appendix, Figure 1.*

4.6 REQUIREMENTS – MATERIALS

4.6.1 Corrosion – The material used in a lightning protective system shall be resistant to corrosion.

NOTE: *Where it is necessary to join dissimilar metals, the corrosion effects can be reduced by the use of suitable plating or by installing a metal fitting between the two dissimilar metals that is galvanically compatible with both metals.*

4.6.2 Wire Conductors

4.6.2.1 Wire conductors shall be stranded copper.

4.6.2.1 Stranding of copper wire shall be Type II stranding in accordance with ABYC E-8, *AC Electrical Systems on Boats*, and/or ABYC E-9, *DC Electrical Systems under 50 Volts*.

4.6.3 Other Conductive Means

4.6.3.1 Conductivity shall be equal to , or greater than, #6 AWG (13.3 mm²) copper wire.

4.6.3.2 The thickness of metal ribbon or strip shall be at least 1/32 inch (0.8 mm).

4.6.3.3 Copper braid shall not be used.

4.7 REQUIREMENTS – INSTALLATIONS

4.7.1 To minimize side flashes, and the induction of high voltage to the boat's wiring, lightning conductors in proximity to the boat's wiring shall not be routed in parallel to the boat's wiring.

EXCEPTION: *The primary lightning conductor.*

4.7.2 Conductive Joints – Conductive joints shall be made and supported in accordance with ABYC E-9, *DC Electrical Systems Under 50 Volts*, and

4.7.2.1 shall have an electrical resistance not in excess of that of two feet (0.6m) of the smaller diameter conductor.

4.8 LIGHTNING PROTECTIVE MAST

4.8.1 The lightning protective mast shall be located so that the cone of protection will cover the entire boat. See Figure 1 and Figure 2.

4.8.2 Additional lightning protective means shall be erected to form overlapping zones of protection, to protect a boat of the size that renders the use of a single mast impracticable.

NOTE: *The zone of protection afforded by any configuration of masts, or other elevated, conductive, grounded objects, can readily be determined graphically. Increasing the height of a mast above the striking distance will not increase the zone of protection.*

4.8.3 Lightning Protective Mast Alternatives

4.8.3.1 If the mast is composed of non-metallic material, the associated lightning or grounding conductor shall

4.8.3.1.1 be essentially straight, and

4.8.3.1.2 be essentially fastened to the mast, and

4.8.3.1.3 extend at least six inches (150 mm) above the mast, and

4.8.3.1.4 terminate in an air terminal, and

4.8.3.1.5 be led as directly as practicable to the grounding connection. See E-4.5.1.

NOTE: *Although partially conductive, carbon fiber materials are regarded as non-conductive (non-metallic) for the purpose of this standard.*

4.8.3.2 An outrigger that serves as a lightning protective mast shall have conductivity equivalent to #4 AWG (21.2mm²) copper.

4.9 LIGHTNING GROUND

4.9.1 Primary and Secondary Lightning Ground – A lightning ground for a boat shall consist of any metal surface which is submerged in the water having an area of at least 1 square foot (0.1 m²) and consist of at least one of the following methods.

4.9.1.1 External Ground Plate or Equivalent – The external ground plate shall be located as close to the base of the primary conductor as possible to minimize any horizontal runs in the primary conductor.

NOTE: *The boat's rudders, struts, external ballast keel, or other external metallic surfaces may provide an external ground plate equivalent.*

4.9.1.1.1 If the rudder(s) is used as an external ground plate equivalent, the lightning conductor shall be connected directly to the rudder shaft.

4.9.1.2 Grounding strip – An external grounding strip of copper, copper alloy, stainless steel, or aluminum, shall be installed under water to be used as an earth ground connection for the lightning system. This strip shall have a minimum thickness of 3/16 inch (5 mm), and a minimum width of ¾ inch (19 mm).

NOTES: 1. *The edges of the external ground plate or grounding strip need to be sharp, exposed, and not caulked or faired into the adjoining area.*

2. *A strip approximately one inch (250 mm) wide, and 12 feet (3.7 m) long, has nearly six times the amount of edge area exposed to the water, which, compared to the ground plates, will improve the dissipation of charges.*

4.9.1.2.1 The grounding strip, if used, shall extend from a point directly below the lightning protection mast, towards the aft end of the boat, where a direct connection can be made to the boat's engine.

NOTES: 1. *The use of two thru-bolts at each end of the strip will help to prevent the strip from twisting.*

2. *An equalization bus on the inside of the boat, paralleling the grounding strip on the outside of the boat, may be used as the lightning ground conductor.*

4.9.2 Seacocks and Thru-Hull Fittings – Seacocks and thru-hull fittings, if connected to the lightning ground system, shall not be connected to the main down conductor. They shall be connected to

4.9.2.1 the underwater grounding strip, or

4.9.2.2 the lightning ground plate, or

4.9.2.3 the internal equalization bus.

4.9.3 Multihull boats shall provide a lightning ground connection in accordance with 4.9.1 for each hull that has items to be grounded, attached, or fitted to it.

4.10 REQUIREMENTS – VESSELS WITH METAL HULLS

4.10.1 If there is electrical continuity between metal hulls and masts, or other metallic superstructures of adequate height in accordance with E4.8, then no further protection against lightning is necessary.

4.11 REQUIREMENTS – SMALL BOATS

4.11.1 Small boats without a permanent mast shall be protected by means of a temporary lightning protective mast that may be erected when lightning conditions are observed.

4.11.1.1 The base of the temporary lightning protective mast shall be located as close to the geometric center of the boat as possible, but, if necessary, can be offset, providing the cone of protection will cover the entire boat when the mast is plugged in.

4.11.1.2 The location of the mast base shall be such that persons on the boat can avoid physical contact with the mast or the base.

4.11.1.3 The base should extend as high as possible, and provision shall be made to plug in the upper section of the lightning mast so that it will not be displaced by the rolling and pitching of the boat in rough water.

4.11.1.4 The temporary lightning protective mast shall be all metal, other material if provided with a conductor, with a conductivity at least equal to a #4 AWG (21.2 mm²) conductor.

NOTE: A solid stainless steel whip antenna or equivalent, that has a conductivity less than a #4 AWG (21.2 mm²) conductor, may be used, because of its higher melting temperature, but it will not provide as low a resistance path for the lightning.

4.11.1.5 The temporary lightning protective mast shall be connected to a submerged ground plate of at least one square foot (0.1 m²) in area.

4.11.2 Open Daysailers – As stainless steel rigging may not provide an adequate conductive path for the discharge of lightning currents, protection will depend on the grounding of all rigging as well as the metal masts, or the continuous metallic tracks on nonmetallic masts. These shall be connected at the lower ends to a lightning grounding plate, or a lightning grounding strip located directly below the mast.

4.11.2.1 Metallic rudders at the aft end of the boat shall not be used as the lightning ground for the mast because of the need for a long horizontal conductor to the aft end of the boat.

4.11.2.2 The tiller, or other connections to metallic rudders that the operator will contact, shall be nonconductive materials.

4.11.2.3 Metallic keels or centerboards shall be directly connected to the lightning grounding plate or strip, and may serve as the lightning grounding means if they have the required one square foot (0.1 m²) area in contact with the water. If a centerboard is used as the lightning grounding means, a warning sign shall be provided that clearly states that the centerboard must be in the down position to function as a lightning ground.

FIGURE 1 – BOAT WITH MAST NOT EXCEEDING 50 FEET (15M) ABOVE THE WATER

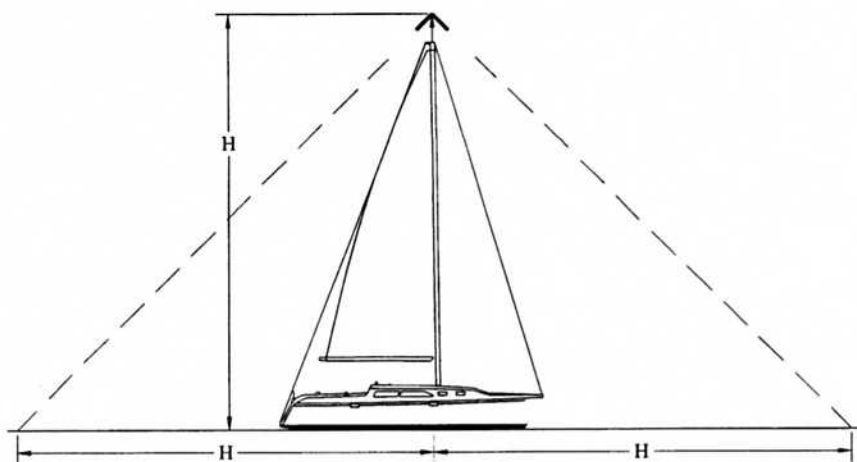


FIGURE 2 – BOAT WITH MAST NOT EXCEEDING 50 FEET (15M) ABOVE THE WATER

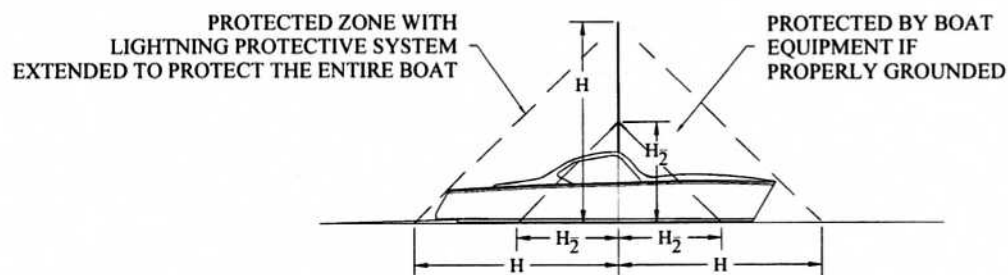
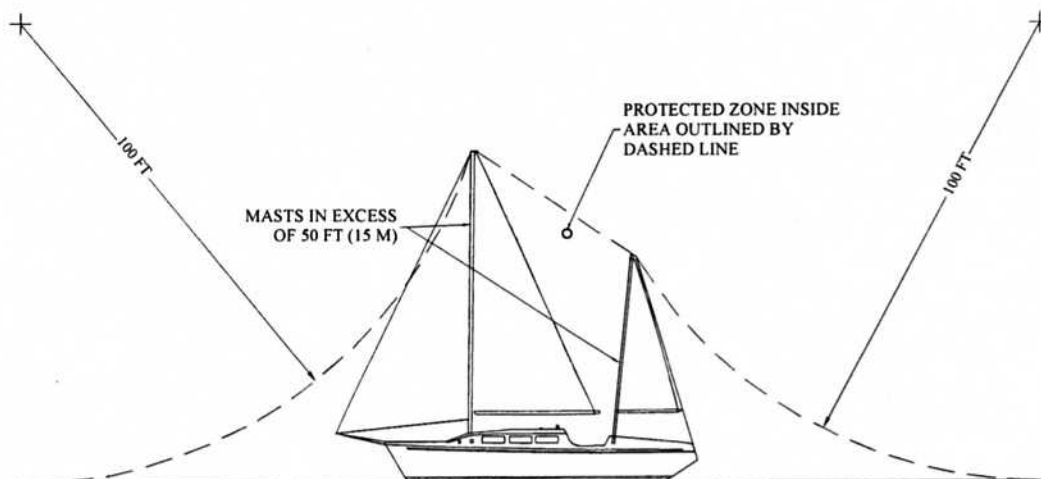


FIGURE 3 – BOAT WITH MASTS IN EXCESS OF 50 FEET (15M) ABOVE THE WATER – PROTECTION BASED ON LIGHTNING STRIKING DISTANCE OF 100 FEET (30M)



APPENDIX – LIGHTNING PROTECTION

This appendix contains additional descriptive information and recommendations pertaining to system maintenance and behavior of personnel.

Ap. 1 Zone of Protection – A grounded conductor, or lightning protective mast, will generally divert to itself a direct strike that might otherwise fall within a cone-shaped space, the apex of which is the top of the conductor of a lightning protective mast, and the base of a circle at the surface of the water having a radius that is related to the height of the top of the conductor or lightning protective mast.

Ap. 1.2 Boats with ungrounded or non-conductive objects projecting above the metal masts or superstructure may have these objects protected by a lightning ground conductor terminating in an air terminal above the object.

Ap. 1.3 Whip type radio antennas should not be tied down during a lightning storm if they have been designed as a part of the lightning protection system.

Ap. 2 Maintenance – Lightning protection provisions are likely to receive scant attention after installation. Therefore, their composition and assembly should be strong, and materials used should be highly resistant to corrosion.

Ap. 2.1 Grounding of metallic objects for lightning protection may increase the possibility of harmful galvanic corrosion. See ABYC E-2, *Cathodic Protection of Boats*.

Ap. 2.2 If a boat has been struck by lightning, compasses, electrical, and electronic gear should be checked to determine whether damage or changes in calibration have taken place.

Ap. 2.3 If a boat has been struck by lightning, the lightning protection system should be inspected for physical damage, system integrity, and continuity to ground.

Ap. 2.4 If a boat has been struck by lightning, it should be hauled for inspection of the hull, underwater structures and thru-hull fittings. Lightning can exit from one or numerous locations below the waterline. Subsequent flooding, sinking, or long term hull damage can result from undetected lightning damage.

Ap. 3 Precautions for Personnel – The basic purpose of protection against lightning is to ensure the safety of personnel. It is therefore appropriate that during a lightning storm the following precautions be taken:

Ap. 3.1 Personnel should remain inside a closed boat, as far as practical.

Ap. 3.2 Arms and legs should NOT be dangled in the water.

Ap. 3.3 Consistent with safe handling and navigation of the boat, personnel should avoid making contact with any items connected to a lightning protection system, and especially in such a way as to form a bridge between these items. For example, it is undesirable that an operator be in contact with reversing gear levers and a spotlight control handle at the same time.

Ap. 3.4 Personnel should NOT be in the water.

Ap. 3.5 Personnel should avoid contact with metal parts of a sailboat's rigging, spars, fittings, and railings.

Ap. 4 For mast heights in excess of 50 feet (15 m), the zone of protection is based on the striking distance of lightning stroke. Since the lightning stroke may strike any object within the striking distance of the point from which final breakdown to earth ground (the water) occurs, the zone of protection is defined by a circular arc, concave upward. See Figure 2. The radius of the arc is the striking distance, and the arc passes through the tip of the mast and is tangent to the water. Where more than one mast is used the arc passes through the tips of adjacent masts. See figure 3.

The striking distance is related to the peak stroke current, and thus to the severity of the lightning stroke. The greater the severity of the stroke, the greater the striking distance. In the vast majority of cases, the striking distance exceeds 100 feet (30 m). Accordingly, the zone based on a striking distance of 100 feet (30 m) is considered to be adequately protected.

The zone of protection afforded by any configuration of masts, or other elevated conductive grounded objects, can readily be determined graphically. Increasing the height of a mast above the striking distance will not increase the zone of protection.

Ap. 5 Materials

Ap. 5.1 The materials used in the lightning protection system should be resistant to corrosion. The use of combinations of metals that form detrimental galvanic couples should be avoided.

Ap. 5.2 In those cases where it is impractical to avoid a junction of dissimilar metals, the corrosion effect can be reduced by the use of suitable plating or special connectors, such as stainless steel connectors used between aluminum and copper alloys. Except for the use of conducting materials that are part of the structure of the boat, such as aluminum masts, only copper should be used

as a lightning conductor system. Where copper is used, it should be of the grade ordinarily required for commercial electrical work, generally designated as being of the 95 percent conductivity when annealed.

Ap. 6 External Ground Plate – An exterior grounding plate of copper, copper alloys, stainless steel or aluminum may be provided by means of a plate which has an area of at least one square foot (0.1 m²) area. The plate should be located as nearly as possible directly below the lightning protection mast. The boats propeller(s), shaft(s), metallic rudder(s), and other metallic surfaces that have the required area, can be effectively used on small boats only where the lightning protective mast is located at the stern, above the in-water metallic objects to be used as the lightning system ground. The stern mast must be tall enough to provide a cone of protection that extends to the bow of the boat.

Ap 6.1 Boats that use lightning grounding plate instead of lightning grounding strip should ground backstays, or other objects aft, to the engine negative terminal, a metallic rudder, or other external ground at the aft end of the boat. The lightning ground shall not be routed through the boat to the lightning grounding plate forward under the lightning mast.

Ap. 7 Grounding Strip – An external grounding strip of copper, copper alloys, stainless steel, or aluminum, installed under the boat in a fore and aft direction, may be used as the earth ground connection for the lightning system. Except for stainless steel, the strip should have a minimum thickness of 3/16 inch (4.8 mm), and a minimum width of 3/4 inch (20 mm). Stainless steel should have a minimum thickness of 1/8 inch (3.2 mm). The length of the strip should extend from a point directly below the lightning protection mast, to the aft end of the boat, where a direct connection can be made to the boat's engine, but the total length of the strip shall not be less than four feet (1.22 m). In a sailing vessel, the backstay and engine should be connected to the aft end of the strip. The strip should be secured to the hull with one, or preferably two, galvanically compatible through bolts at each end. The use of the two bolts at each end, spaced one or two inches apart, will help prevent any tendency for the strip to rotate when the electrical connections are made inside the hull. The strip must be located so that the external strip is submerged under all operation conditions. If the strip is not located so as to be submerged when a sailboat is heeled to port or starboard, then a strip will be required on both port and starboard, sides. All connections to the strip should be as short and direct as possible. Additional thru-hull bolts may be located along the length of the strip for additional connections, such as on a two masted sailboat. Because of the possibility of stray current corrosion of the

securing bolts, the number of thru-hull bolts should be kept to a minimum. To minimize the number of thru-hull bolt connections, and equalization bus can be installed.

Ap. 7.1 The aft end of the lightning grounding strip should be connected directly to the engine negative terminal. This will provide a path inside the hull for any DC stray currents that might be imposed on the thru-hull bolts that attach the lightning grounding strip where those bolts contact bilge water.

Ap. 8 Protection of Equipment – Wherever possible, electronic equipment should be enclosed in metal cabinets that are connected to the lightning grounding system with a minimum #8 AWG (8.39 mm²) conductor. Surge suppression devices should be installed on all wiring entering or leaving electronic equipment.

Ap. 8.1 The grounding of metal rod type radio antennas provides some protection for boats without masts and spars provided that

Ap. 8.1.1 conductors in the grounding circuit of the antenna have a conductivity equivalent to #4 AWG (21.2mm²) copper in accordance with E-4.5, and

Ap. 8.1.2 the top of the antenna is not more than 50 feet (15 m) above the water, and

Ap. 8.1.3 a line drawn from the top of the antenna downward toward the water at an angle of 45 degrees to the vertical does not intercept any part of the boat (see E-4.8), and

Ap. 8.1.4 the antenna loading coil is provided with a suitable protective device for bypassing the lightning current.

NOTES: 1. Because a loading coil presents a high impedance to the flow of lightning current, the portion of an antenna above the bottom of a loading coil is not as effective as a lightning protective mast.

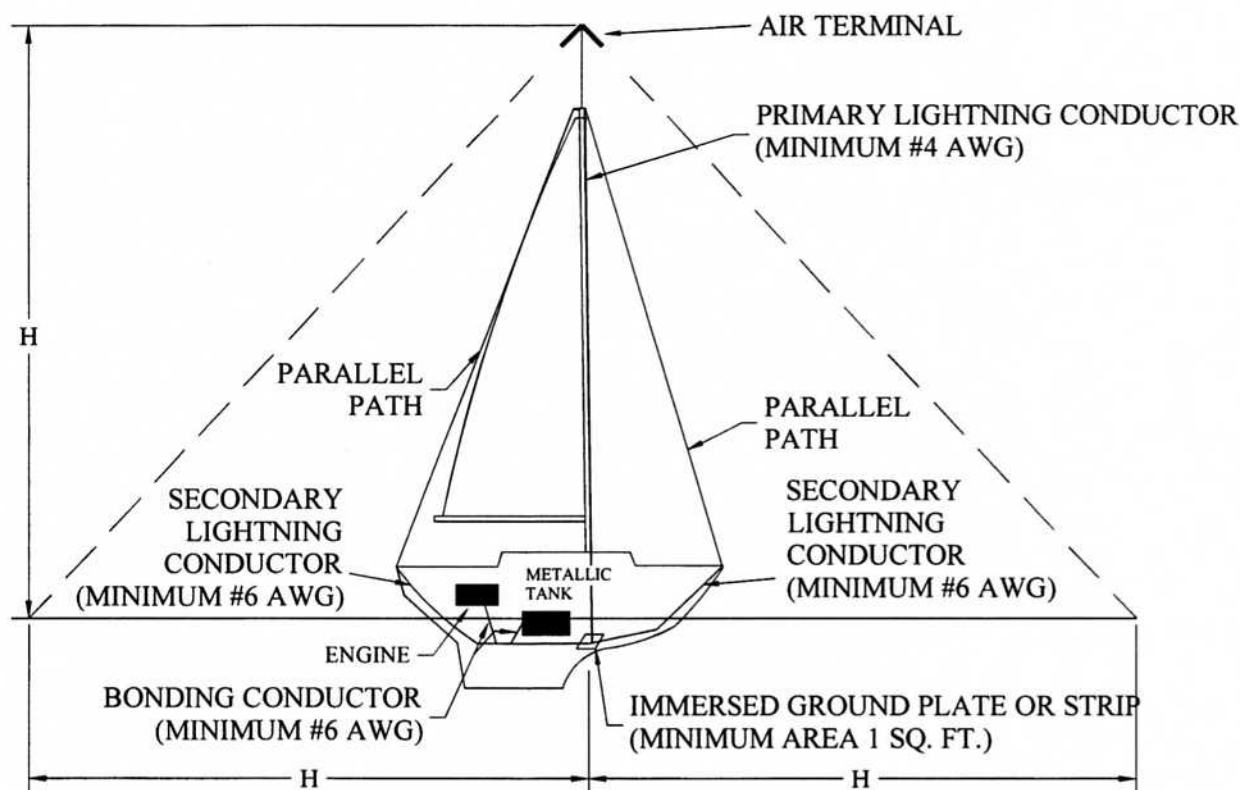
2. Non-conduction antenna masts with spiral wrapped conductors are not considered suitable for lightning protection purposes.

Ap. 8.2 In order to protect the radio transmitter, antenna feed lines shall be

Ap. 8.2.1 equipped with a means for grounding during electrical storms, or

Ap. 8.2.2 protected by lightning arresters or lightning protective gaps.

AP. FIGURE 1 – LIGHTNING PROTECTION SYSTEM



NOTES: 1. An equalization bus is used on the interior of the hull as the termination for secondary conductors and bonding conductors. The primary conductor is connected directly to the immersed ground plate or strip. See E-4.9.

2. All otherwise isolated bare metal objects within six feet (1.8 m) of a lightning conductor shall be connected to the lightning protection system with a minimum #6 AWG (13.3 mm²) bonding conductor.

3. The probability of a lightning strike varies with geographic location and the time of the year. When the conditions that create an electrical charge between clouds and the earth exist, there is nothing that can be done to prevent the lightning discharge. A boat can be struck in open water or while tied to the dock.

ABYC Technical Board Rules provide that:

All reports, including standards and recommended practices and technical information reports, are advisory only. Their use is entirely voluntary. They are believed to represent, as of the date of publication, the consensus of knowledgeable persons, currently active in the field of small craft, on performance objectives that contribute to small boat safety.

The American Boat and Yacht Council assumes no responsibility whatsoever for the use of, or failure to use, standards and recommended practices or technical information reports promulgated by it, their adaptation to any processes of a user, or any consequences flowing therefrom.

Prospective users of the standards and recommended practices and technical information reports are responsible for protecting themselves against liability for infringement of patents.

The American Boat and Yacht Council standards and recommended practices are guides to achieving a specific level of design or performance, and are not intended to preclude attainment of desired results by other means.

Warning Labels

Some, or all of these warning labels were applied to your boat at the factory. If any of these labels are missing, or you require replacement or additional labels, please contact the Catalina Yachts parts department at (818) 884-7700 ext.253.

Catalina Yachts reminds you that it is illegal for any vessel to dump plastic trash anywhere in the navigable waters or the United States, Annex V of the Marpol Treaty is an International Law for a cleaner, safer marine environment. Violation of these requirements may result in civil penalty up to \$25,000. fine and imprisonment.

IT IS ILLEGAL TO DUMP THE FOLLOWING:

U.S. Lakes, Rivers, Bays, Sounds, and 3 Miles From Shore	3 to 12 Miles	12 to 25 Miles	Outside 25 Miles
Plastics Paper Rags Glass Food	Garbage Metal Crockery Dunnage	Plastic, Dunnage, Linning and Packing Materials That Float, Also If Not Ground to Less Than One Inch: Paper Rags Glass	Plastic
State and Local Regulations May Further Restrict the Disposal of Garbage.			

#Lbi-1

DISCHARGE OF OIL PROHIBITED

**THE FEDERAL WATER POLLUTION CONTROL ACT PROHIBITS
THE DISCHARGE OF OIL OR OILY WASTE INTO OR UPON THE
NAVIGABLE WATERS AND CONTIGUOUS ZONE OF THE UNITED STATES,
IF SUCH A DISCHARGE CAUSES A FILM OR SHEEN UPON, OR
DISCOLORATION OF, THE SURFACE OF THE WATER, OR CAUSES
A SLUDGE OR EMULSION BENEATH THE SURFACE OF THE WATER.
VIOLATORS ARE SUBJECT TO A PENALTY OF \$5,000.**

#Lbi-2



WARNING

Keep curtains
away from stove
when it is
being used

7-897

#Lbi-3

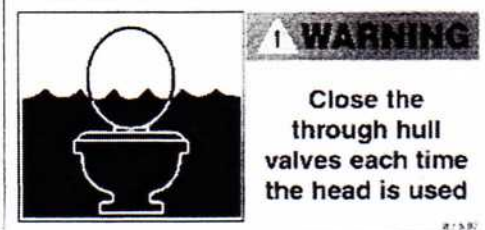


WARNING

- Provide ventilation while cooking appliance is in use.
- It is not safe to use stove or oven for comfort heating.

3-897

#Lbi-4



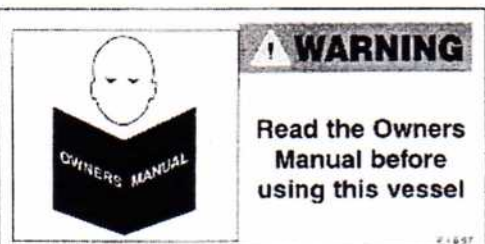
WARNING

Close the through hull valves each time the head is used

#LBI-5

FIRE EXTINGUISHER INSIDE

#LBI-10



WARNING

Read the Owners Manual before using this vessel

#LBI-6

FUEL SHUT OFF VALVES INSIDE

#LBI-11



WARNING

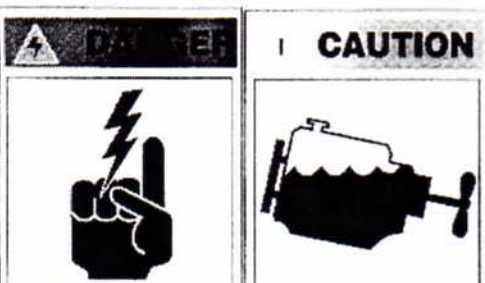
Do Not open door to the engine compartment while engine is running

#LBI-7

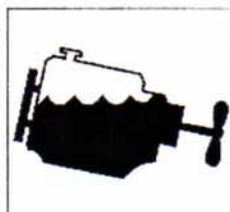


Keep hold of the wheel when backing up

#LBI-12



CAUTION

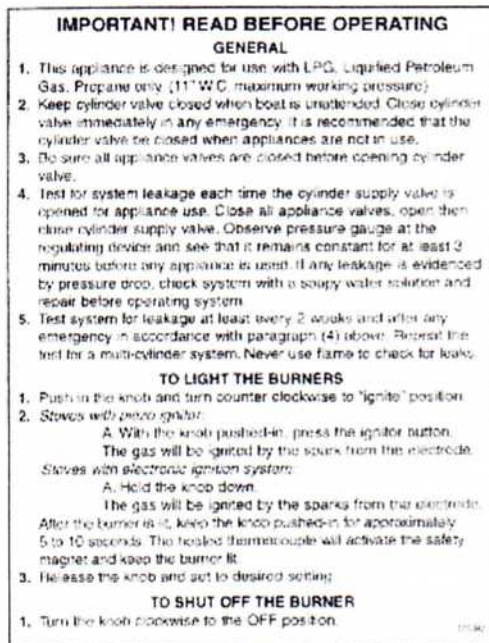


• Watch for overhead wires
• Stay away from overhead power lines

Do Not crank the starter motor more than 30 seconds without draining the aqua-lift muffler

#LBI-9

#LBI-8



IMPORTANT! READ BEFORE OPERATING

GENERAL

1. This appliance is designed for use with LPG, Liquefied Petroleum Gas, Propane only (11" W.G. maximum working pressure).
2. Keep cylinder valve closed when boat is unattended. Close cylinder valve immediately in any emergency. It is recommended that the cylinder valve be closed when appliances are not in use.
3. Be sure all appliance valves are closed before opening cylinder valve.
4. Test for system leakage each time the cylinder supply valve is opened for appliance use. Close all appliance valves, open then close cylinder supply valve. Observe pressure gauge at the regulating device and see that it remains constant for at least 3 minutes before any appliance is used. If any leakage is evidenced by pressure drop, check system with a soapy water solution and repair before operating system.
5. Test system for leakage at least every 2 weeks and after any emergency in accordance with paragraph (4) above. Repeat the test for a multi-cylinder system. Never use flame to check for leaks.

TO LIGHT THE BURNERS

1. Push in the knob and turn counter clockwise to "ignite" position.
2. Stoves with piezo igniter:
A. With the knob pushed-in, press the ignitor button.
The gas will be ignited by the spark from this electrode.
Stoves with electronic ignition system:
A. Hold the knob down.
The gas will be ignited by the sparks from the electrode.
After the burner is lit, keep the knob pushed-in for approximately 5 to 10 seconds. The heated thermocouple will activate the safety magnet and keep the burner lit.
3. Release the knob and set to desired setting.

TO SHUT OFF THE BURNER

1. Turn the knob clockwise to the OFF position.

#LBI-13

Catalina//Yachts

MORGAN DIVISION

June 5, 1999

ENGINEERING DIRECTIVE

HULLS - ALL

SUBJECT: FORESPAR MARELON RUDDER BEARINGS AND
PACKING GLAND

TO: LINE SUPERVISION AND Q.C. INSPECTOR

This non-metallic bearing system is designed to operate with
no lubrication other than water.

Specifically no lubricants such as: petroleum grease, WD-40,
aerosol, or paste, silicone gel, Teflon gel or Lanolin paste.

ONLY WATER.

In the event that leakage occurs around the rudder shaft at
the packing gland, and it becomes necessary to take up on the
packing, observe the following precautions:

1. Overtightening the take-up will result in stiffening the steering system.
2. The take-up must be equal at the bolt locations around the shaft. If not stiffening will occur.
3. The proper amount of take-up should permit an occasional drop or two of water to weep out when the shaft is being turned.

Thanks,

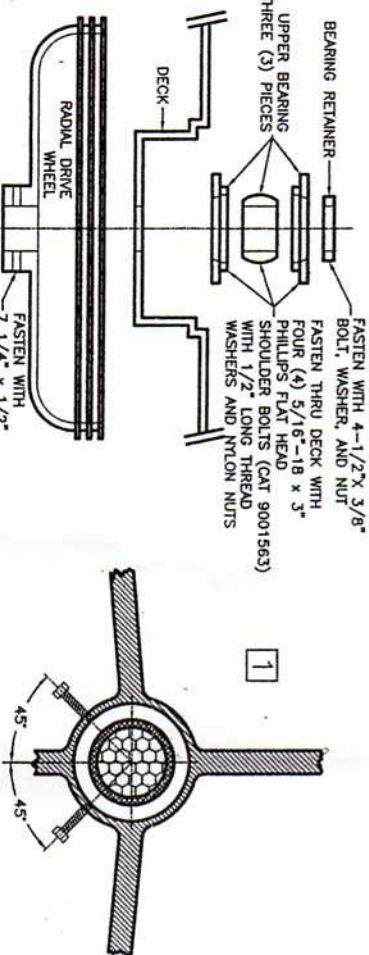


Jerry Lavalette
Engineering Assistant

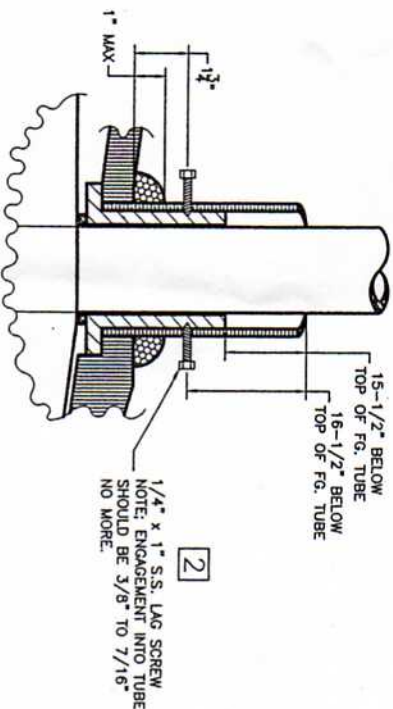
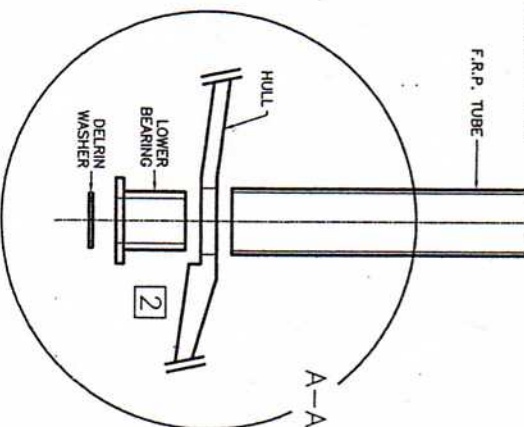
CATALINA / MORGAN / CAPRI / NACRA

7200 Brvan Dairy Rd. • Largo, Florida 33777 • 813-544-6681 • Fax 813-546-7302

NO	REVISION	DATE
1	REVISED BOLTS	3/3/01
2	DELETED FLAT HEAD SCREWS IN LOWER BEARING. ADDED LAG SCREWS IN LOWER BEARING.	3/16/01
3	CORRECTED NONCLAMATURE FOR FASTENERS FOR LOWER PACKING GLAND.	10/31/01



3
1/4"-20 x 1" HEX HEAD BOLT AND NUT
PACKING MATERIAL BETWEEN
LOWER PACKING GLAND
FASTEN WITH TWO (2)
3" x 1/4"-20
HEX HEAD BOLTS
WITH WASHERS AND
NYLON NUTS
F.R.P. TUBE
LOWER PACKING GLAND.



DETAIL: A-A

PROPRIETARY INFORMATION
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UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
GENERAL TOLERANCES
ANGLES: ±0.5°
X.XX: ±0.1
X.XXX: ±0.005
SURFACE FINISH: 63
DO NOT SCALE DRAWING

Cataline Yachts
7200 BRYAN DIARY RD.
LARGO, FL. 33777
(727) 544-6681

TITLE: C310, C380, C400 RUDDER BEARING ASSEMBLY		DRAWING NO.: 400-28051-3	
BOAT: C310 - C380 - C400	DESIGNED BY: C.D.	CHECKED BY:	SCALE: N E B
APPROVED BY:	DATE: 5/4/99	SIZE: B	SHEET: 1/1

C-320 #1084

Bocut

12/16/05

C320 #1084

Australia

Shipping Package List

 PAGE 1 OF 3 #00 BASKET
WEEK ENDING

VENDER NUMBER	OPTION	PART NUMBER	DESCRIPTION	UNIT MEA.	STD. QTY.	QTY. ISSUED	BACK ORDER	CHECKED BY
0020700		5001032	LINE, 3/8 ULS RED MAIN HALLYARD	FT	115	115		115 R
0020700		5001032	LINE, 3/8 ULS RED JIB HALLYARD	FT	115	115		115 R
0020700		5001032	LINE, 3/8 ULS RED JIB HALLYARD	FT	115	115		115 R
0020700	OPTION	5001039	3/8" YB DACRON CODE RED OPT. 2nd RECT	FT	77			
0020700		5001041	LINE, 7/16" YB CODE BLUE MAIN SHEET	FT	100	100		115 R
0020700		5001041	LINE, 7/16" YB CODE BLUE JIB SHEET	FT	50	50		115 R
0020700		5001041	LINE, 7/16" YB CODE BLUE JIB SHEET	FT	50	50		115 R
0020700		5001035	LINE, 5/16" YB TOPPING LIFT TAIL	FT	100	100		115 R
0020700	DELETE W/Furl Opt	5001039	LINE, 3/8" YB FIRST REEF	FT	60			
0020700		5001035	LINE, 5/16" YB TARVELER CONTROL	FT	30	30		115 R
0020700		5001035	LINE, 5/16" YB TARVELER CONTROL	FT	30	30		115 R
			YANMAR TOOL KIT	EA	1	1		115 R
0020000	71113	4010312	TILLER, EMERGENCY 27" C320 mKey	EA	1	1		115 R
0016400		5000268	FURLING, SYS C-310/C320 #SK-7258 #2100	EA	1	1		115 R
0015740	OPTION	0002264	COMPASS, RITCHIE SP50 SOUTH HEMISPHERE	EA	1	1		115 R
0011652		5020469	HANDLE, WINCH 10" ALUM/ #29141110 LEWMAR	EA	1	1		115 R
0008500		16113	BLOCK, MAINSHEET KIT C-320, (1) 2 ON BAIL - 2 #40 - 1 #60	SET	1	1		115 R
		?	HEAD BOARD SHACKLE	EA	2	2		115 R
0008500		16229	PLATE, BACKSTAY C320	EA	2	2		115 R
		13225*	1/2" x 1" CLEVIS PIN	EA	3	3		115 R
		13337*	1/8" x 1" COTTER PIN	EA	3	3		115 R
		30042*	SNAP SHACKLE	EA	1	1		115 R
0020165		0002170	PUMP, #BP4410 BILGE GUSHER TITAN / HANDLE	EA	1	1		115 R
		24117*	GENOA LOW LEAD BLOCKS	EA	2	2		115 R
		?	ICE CUBE TRAY SET	EA	1	1		115 R
		?	PLASTIC SINK STOPPER	EA	3	3		115 R
0001010		5021021	KEY, #1799 BRZ DECK KEY	EA	3	3		115 R
GELL ROOM			1 Qt. WHITE - 1 PT. BLUE, GRAY & SEASHELL	SET	1	1		115 R
0016680		0002031	HOLDER, POT #93171	SET	1	1		115 R
0005271		0060282	#30PCM25LSHORE POWER 30' W/ADAPTER	EA	1			
0011652		5020686	PORTLIGHT SIZE1 ROUND END SCREEN	EA	6	6		115 R
0011652		5020556	SIZE 40 HATCH SCREEN	EA	1	1		115 R
0011652		5020554	SIZE 44 HATCH SCREEN	EA	1	1		115 R
0011652		0002465	OCEAN SEZE 65 SCREEN	EA	1	1		115 R

12/16/05

C320 # 1084

Shipping Package List

PAGE 2 OF 3 #00 BASKET
WEEK ENDING

VENDER NUMBER	OPTION	PART NUMBER	DESCRIPTION	UNIT MEA	STD. QTY.	QTY. ISSUED	BACK ORDER	CHECKED BY
0008500		16110	BLOCK, MAST COLLAR FURLING - 6 #40	KIT	1	1		H/D R
			MAINSAIL	EA	1			
			BATTENS	SET	1			
	OPTION		FURLING MAINSAIL	EA	1	1		H/D R
	OPTION		110% FURLING JIB COLOR	EA	1			
			135% FURLING GENOA COLOR <i>Capt. Navy</i>	EA	1	1		H/D R
	OPTION		150% FURLING GENOA COLOR	EA	1			
		30727	SCHAEFER #2100 FURLING SYSTEM TUBE	EA	1	1		H/D R
			40" SS WHEEL TAPER	EA	1	1		H/D R
	OPTION		40" LEATHER WRAPPED WHEEL TAPER	EA	2			
0005271	OPTION	0060282	CORD, #30PCM50L SHORE POWER 50' (FOR AG)	SET	1			
0009475	GB12A	5020344	LENS, #63141 CHART TABLE LIGHT	EA	1	1		H/D R
	SHIP PKG	Q19909	SAFETY AND EQUIPMENT PACKAGE	EA	1			
	SHIP PKG	Q12908	Canvas Package with: 1 - Mainsail Cover, 1 - Pedestal Cover, and 4 - Winch Covers: Captain	SET	1	1		H/D R
	SHIP PKG	QUPG41A	Canvas Package 1-Pedestal Cover and 4 - Winch Covers Captain Navy. (No Mainsail)	SET	1			
0005054	SHIP PKG	6010189	LINEN, PKG. C320	EA	1	1		H/D R
			Poleless Cruising Spinnaker, 1.5 oz Nylon with Gear and Sheets Specify Color Option A _____ or Option B _____					
			Spinnaker Assembly	SET	1			
	SHIP PKG	0061065	HUBBELL BOOT, #60CM33VP - OPT.	EA	1	1		H/D R
	SHIP PKG	0061066	CONNECTOR, BODY #26CM13V OPT.	EA	1	1		H/D R
			Varnish OPT.	PT.	1	1		H/D R
			RIGGING					
			FORESTAY W/TURNBUCKLE		1	1		H/D
			BACKSTAY W/TURNBUCKLE		1	1		H/D
			BACKSTAY BRIDLES W/TURNBUCKLE		2	2		H/D
			UPPERS W/TURNBUCKLES		2	2		H/D
			FWD LOWERS W/TURNBUCKLES		2	2		H/D
			AFT LOWERS W/TURNBUCKLES		2	2		H/D
			INTERMEDIATES W/TURNBUCKLES		2	2		H/D
			PINS FOR TURNBUCKLES		1	1		H/D
			mast head light			1		H/D

C320 # 1084

Shipping Package List

PAGE 3 OF 3 #00 BASKET
WEEK ENDING

[illegible]

10/05

C320 Equipment Location

Hull #1084

Date 3-17-06

Q.C	Lead Man	yes	no	Item	Q.C	Lead Man	yes	no	Item
<input checked="" type="checkbox"/>		OK		1. life lines	<input checked="" type="checkbox"/>		OK		20. transom panel
<input checked="" type="checkbox"/>			NA	2. dodger	<input checked="" type="checkbox"/>		OK		21. mesh bags
<input checked="" type="checkbox"/>			NA	3. bimini	<input checked="" type="checkbox"/>		OK		22. tables dinett/ cockpit
<input checked="" type="checkbox"/>		OK		4. cockpit cushions	<input checked="" type="checkbox"/>		OK		23. helm wheel nut
<input checked="" type="checkbox"/>			NA	5. cockpit microphone	<input checked="" type="checkbox"/>		OK		25. warning labels
<input checked="" type="checkbox"/>			NA	6. cockpit table lid	<input checked="" type="checkbox"/>			NA	26. cockpit grate
<input checked="" type="checkbox"/>			NA	7. C.P. table drain plugs	<input checked="" type="checkbox"/>			NA	27. safety package
<input checked="" type="checkbox"/>			NA	8. radar dome/bracket	<input checked="" type="checkbox"/>		OK		28. Cloud Pegs
<input checked="" type="checkbox"/>			NA	9. cockpit display	<input checked="" type="checkbox"/>				29.
<input checked="" type="checkbox"/>		OK		10. sails	<input checked="" type="checkbox"/>			NA	30. table birth ext.
<input checked="" type="checkbox"/>		OK		11. helm wheels	<input checked="" type="checkbox"/>		OK		31. table birth cushion
<input checked="" type="checkbox"/>			NA	12. stereo face plate	<input checked="" type="checkbox"/>		OK		32. Elect MANUALS
<input checked="" type="checkbox"/>			NA	13. stereo remote	<input checked="" type="checkbox"/>		OK		33. FAUCE + Flow Regs
<input checked="" type="checkbox"/>		OK		14. nav panel keys	<input checked="" type="checkbox"/>		OK		34. CANVAS PKG
<input checked="" type="checkbox"/>			NA	15. U.F.O. antenna	<input checked="" type="checkbox"/>		OK		35. PED GUARD
<input checked="" type="checkbox"/>			NA	16. whip antenna	<input checked="" type="checkbox"/>			NA	36. CD LRAY
<input checked="" type="checkbox"/>			NA	17. wind indicator	<input checked="" type="checkbox"/>			NA	37. FIL/DVD Remotes
<input checked="" type="checkbox"/>		OK		18. coupling bolts	<input checked="" type="checkbox"/>		OK		37. Rigging E boxes
<input checked="" type="checkbox"/>		OK		19. helm seat	<input checked="" type="checkbox"/>		OK		38. furling tube & box

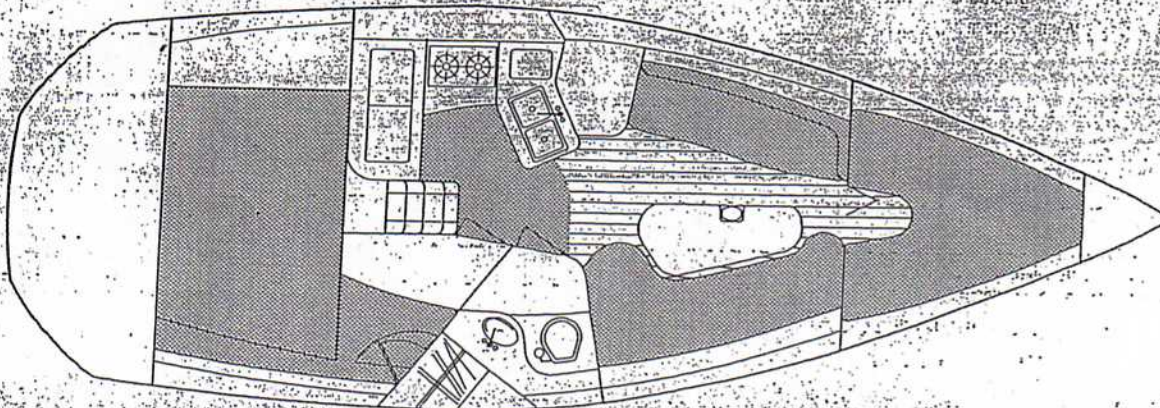
Trailer items

Mast, boom, spreaders, furling tube, shipping crate
See trailer load form

Note: see attached check off list for shipping crate items

Special items

Shortages



Lead Man

Sheng

Q.C.

[Signature]

date

3-17-06