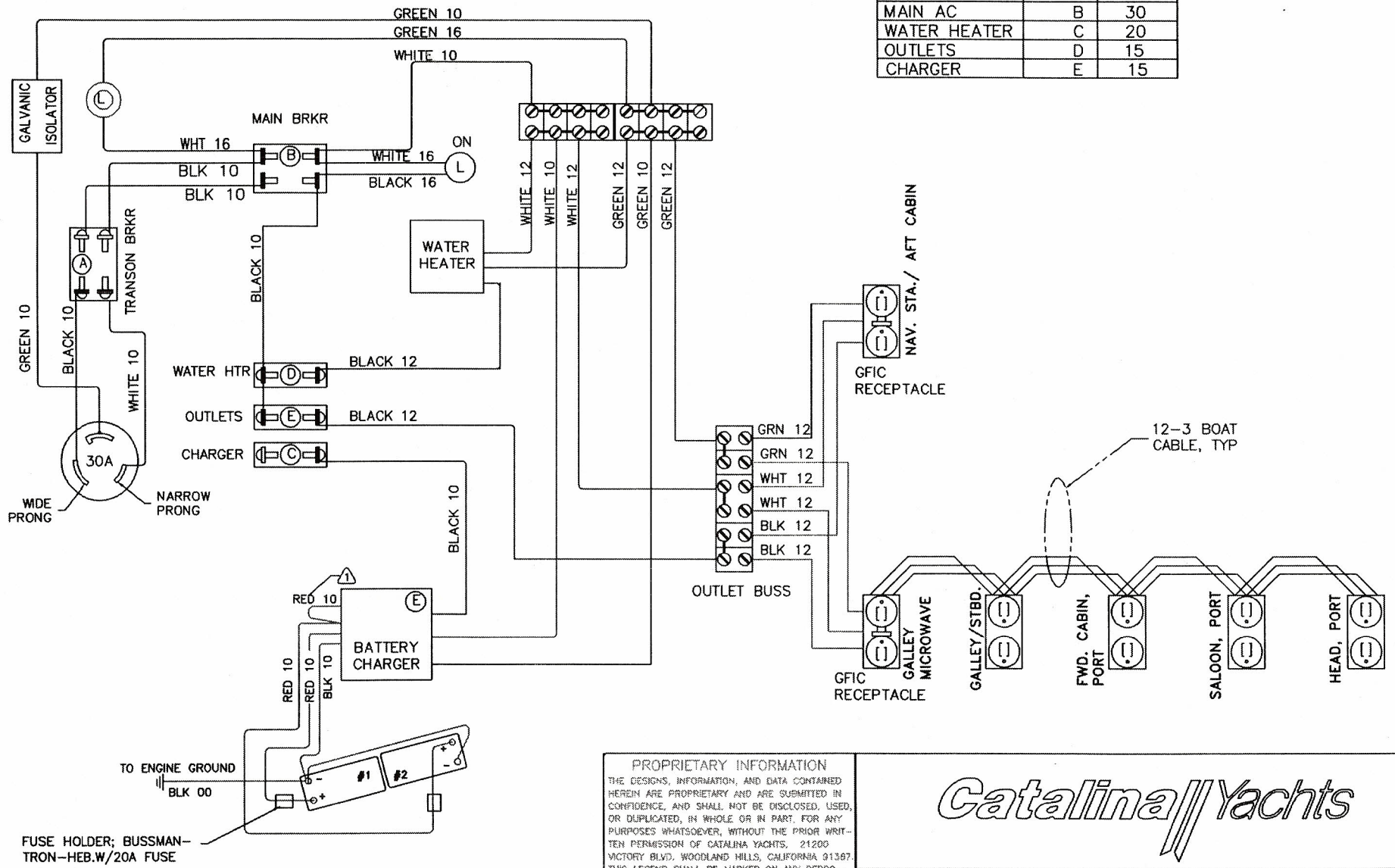
NOTES: (UNLESS OTHERWISE SPECIFIED)

1. UNUSED POSITIVE TERMINALS MUST BE CONNECTED TO ACTIVE TERMINAL PER MANUFACTURER'S INSTRUCTIONS.
2. FUSE MUST MATCH CHARGER OUTPUT AND BE INSTALLED WITHIN 7" OF TERMINAL.

BREAKER SCHEDULE

BREAKER	Symbol	AMP
TRANSOM	A	30
MAIN AC	B	30
WATER HEATER	C	20
OUTLETS	D	15
CHARGER	E	15

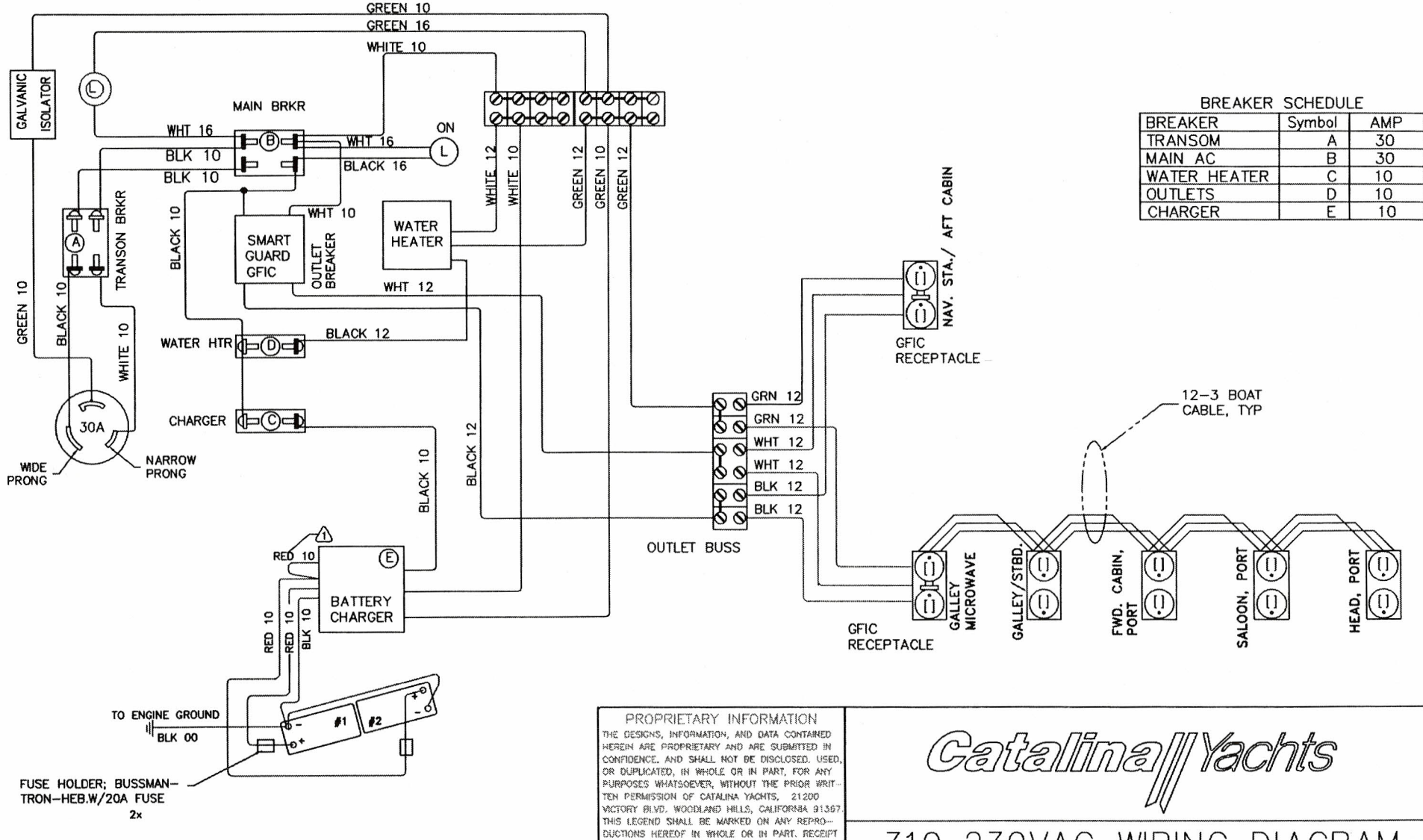


Catalina Yachts

310 115VAC WIRING DIAGRAM

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. UNUSED POSITIVE TERMINALS MUST BE CONNECTED TO ACTIVE TERMINAL PER MANUFACTURER'S INSTRUCTIONS.
2. FUSE MUST MATCH CHARGER OUTPUT AND BE INSTALLED WITHIN 7" OF TERMINAL.
3) PANEL: SEAWARD PB4048

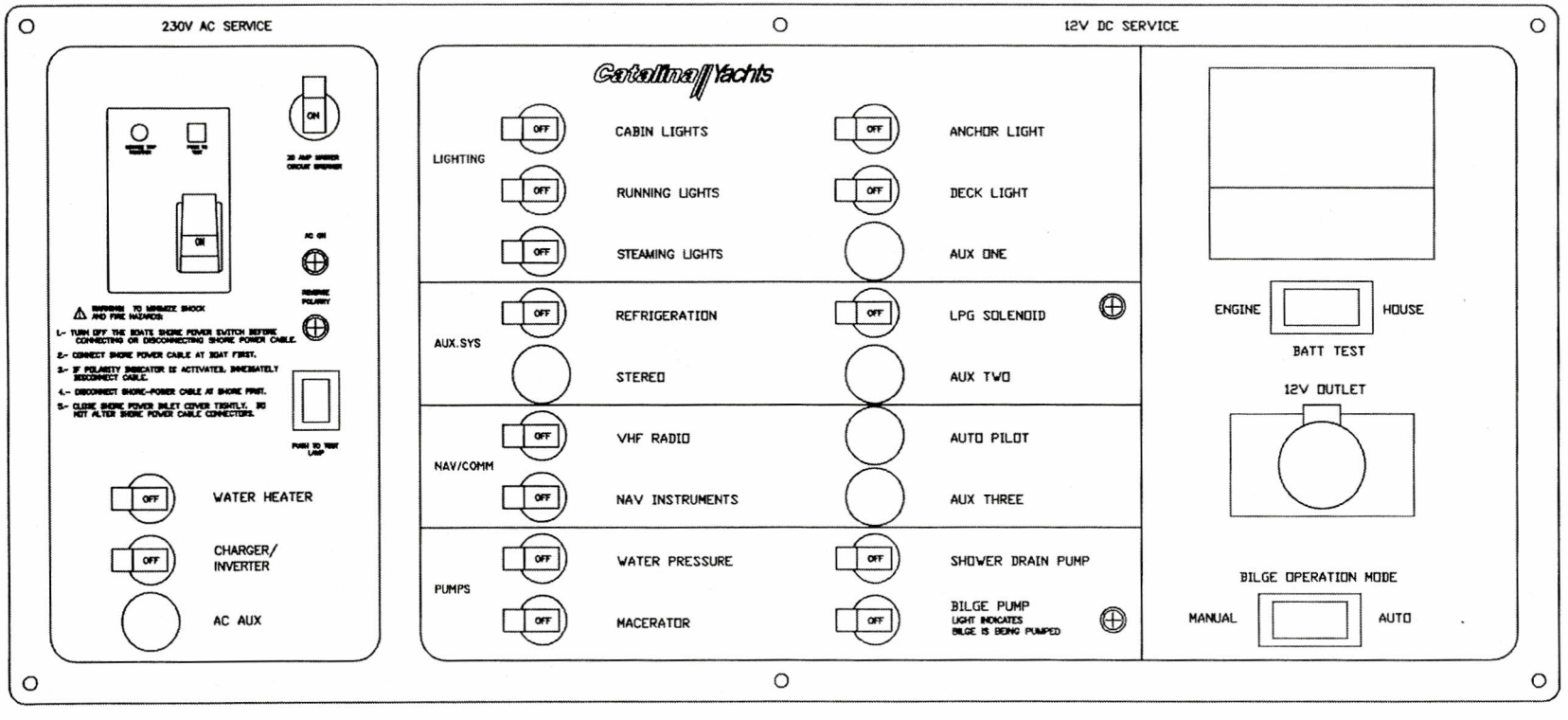


BREAKER SCHEDULE

BREAKER	Symbol	AMP
TRANSOM	A	30
MAIN AC	B	30
WATER HEATER	C	10
OUTLETS	D	10
CHARGER	E	10

Catalina Yachts

310 230VAC WIRING DIAGRAM

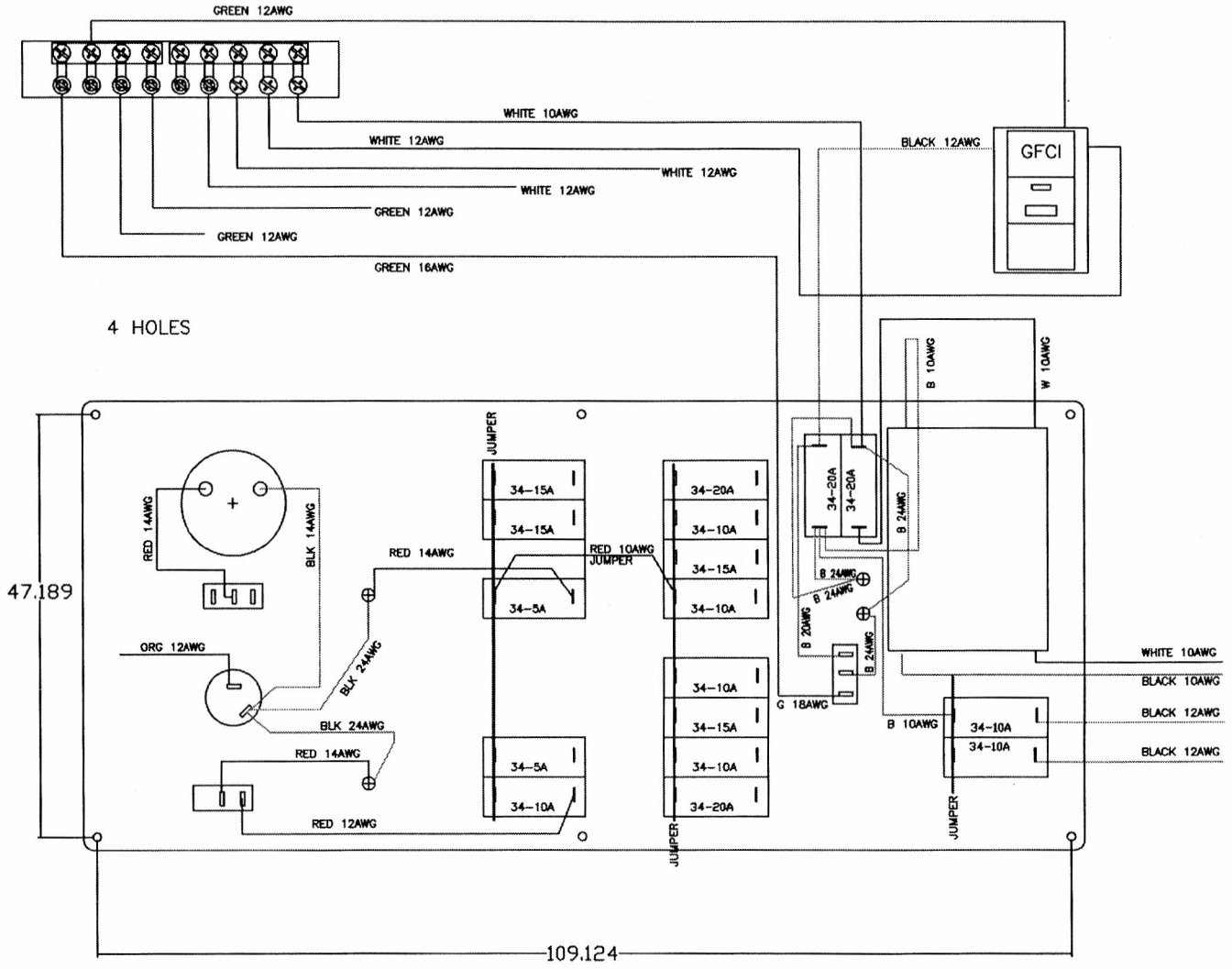


OPERATOR'S VIEW

Catalina Yachts

9.2.99

310 CONTROL PANEL, 230VAC/12VDC



REAR VIEW

Catalina Yachts

8.17.99

310 CONTROL PANEL, 230VAC/12VDC

PLUMBING:

THE HEAD:

1. Read the instructions supplied by the toilet manufacturer for operating your marine toilet. These instructions are also printed on the toilet pump housing. Be sure everyone who will be using the head is familiar with these instructions.

2. Immediately before using the head, the inlet valve "A" must be opened. This provides flushing water to the toilet. The valve should be kept closed when the head is not is use. This will prevent water from flooding the boat if the valve in the toilet pump should fail.

3. Waste will be pumped directly into the holding tank when the bowl is emptied. A minimum amount of water for every flush should be used in order to take best advantage of the tanks capacity between pump-outs.

3. To clean the head, use hot water and soap. High strength cleaners may cause damage to the valves and seals in your pump system. If there is any problem with the head, it should be corrected immediately.

EMPTYING THE TANK THROUGH THE DECK DISCHARGE PLATE:

1. The holding tank should be emptied via the deck discharge plate only at approved shore-based pump-out stations.

2. Remove the cap from the deck discharge plate. The threads on the plate cap should be periodically coated with silicone spray or petroleum jelly to ensure a good seal.

3. The pump-out station suction hose should form a seal at the deck plate.

4. Be sure inlet valve "A" is closed when the tank is being emptied.

5. After the tank is empty, you may wish to open valve "A" and pump water through the toilet and into the tank to dilute residual sludge and rinse the tank and lines.

6. Close all valves after the tank is emptied and recap the deck plate.

EMPTYING THE TANK USING THE MACERATOR PUMP:

1. Read the macerator pump operating instructions supplied by the pump manufacturer.

2. Close the inlet valve "A".

3. Open the through hull valve "B".

4. Turn on the pump with the switch on the 12 volt panel.

5. The pump will change tone after it becomes primed. It will resume the higher pitched tone after the tank is emptied.

6. You may wish to rinse the tank, hose lines, and macerator pump by pumping clear water through the head, then repeating the procedure for emptying the tank.

7. Turn off the macerator pump and close valve "B" immediately after emptying the holding tank.

MACERATOR PUMP AND TROUBLESHOOTING:

PROBLEM 1: The macerator pump motor starts then stops.

A. Check the breaker: It should be "IN" or "ON".

B. Check the valves: "B" valve must be open.

C. Check the vent line. If the boat has been sailed at extreme angles of heel, fluid may be clogging the vent line. Disconnect the vent at the tank and empty the hose into a disposable container.

D. Sludge may have formed in the bottom of the tank. This should be diluted as much as possible. The tank should be emptied regularly to prevent sludge build up.

PROBLEM 2: The head toilet pump has excessive back pressure and will not evacuate the bowl.

A. Refer to the toilet manufacturer's specifications and operation instructions.

PROBLEM 3: The macerator pump, when one, makes a high-pitched sound but does not empty the tank.

A. Impeller in macerator pump is faulty and must be replaced.

B. The vent is clogged and the pump cannot pull a prime against the vacuum in the tank.

C. The hose into the pump may be clogged.

E. The pump may be drawing air through the deck plate preventing a prime. Check seal at deck plate marked "waste", and lubricate threads.

INSTRUCTION FOR SANITIZING POTABLE WATER SYSTEM:

To assure complete sanitation of your potable water system it is recommended that the following procedures be used. This applies if it is a new system, one not used for a period of time, or one that may have become contaminated.

(1) Prepare a chlorine solution using one gallon water and ¼ cup Chlorox 2 household bleach (5% hyperchlorite solution). With tank empty, pour chlorine solution into tank. Use one gallon solution for each 15 gallons tank capacity.

(2) Complete filling tank with fresh water. Open faucet and drain cock until all air has been released and entire system is filled.

(3) Allow to stand for three (3) hours.

(4) Drain and flush with potable water. (IMPORTANT)

(5) To remove excessive chlorine taste or odor which might remain, prepare a solution of one quart vinegar to five gallons water and allow this solution to agitate in tank for several days by vessel motion.

(6) Drain tank and again flush with potable water. (IMPORTANT)

The above recommendations conform to section 10.8 in the A119.2 code covering electrical, plumbing, and heating of a recreational vehicle. The solution is approved and recommended by competent health officials.

MANUAL BILGE PUMP:

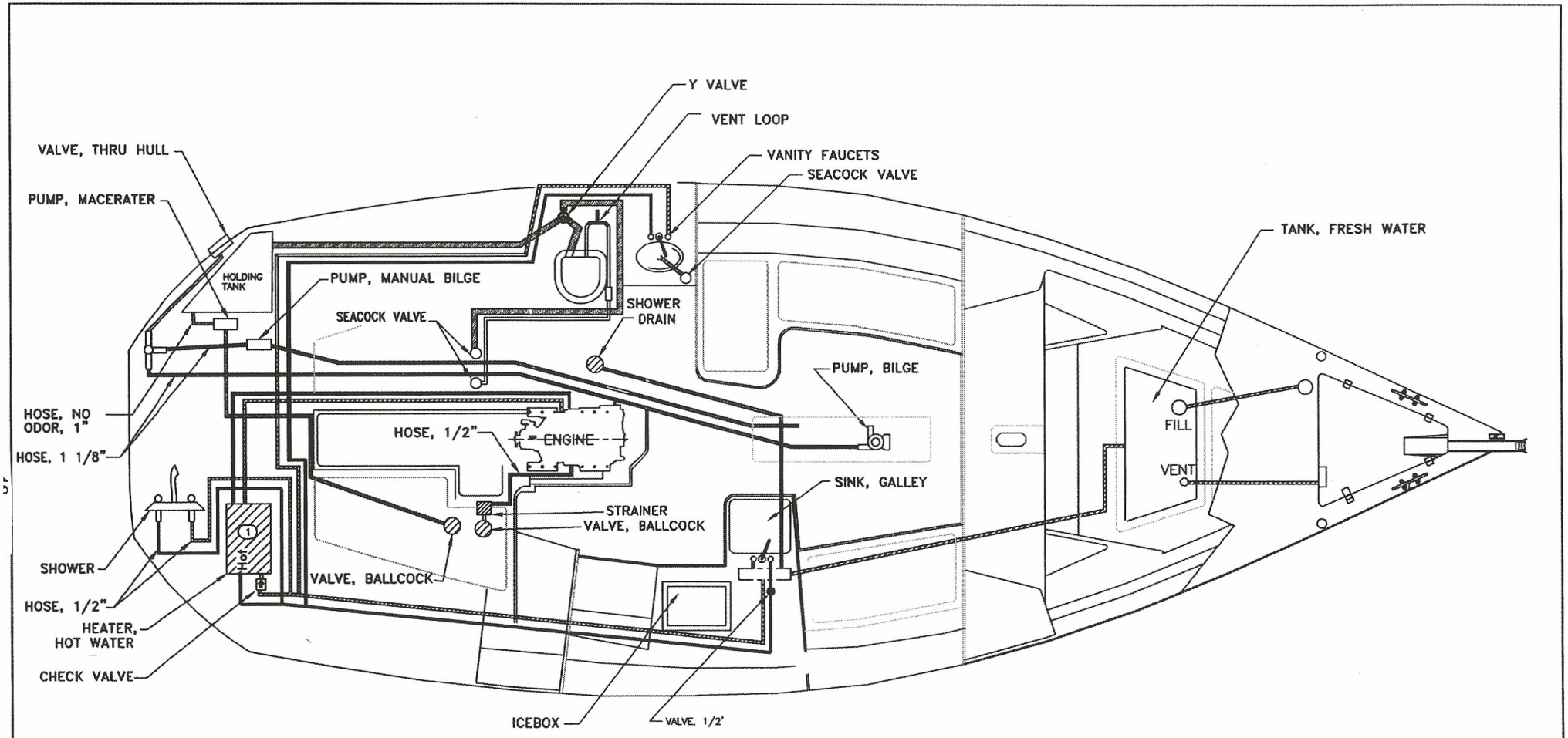
The manual bilge pump is located in the cockpit. Insert the handle through the water tight fitting in the cockpit to operate the pump. The pump intake hose is in the keel stub under the main cabin sole. There is a screen on the bilge pump pick-up. This screen should be periodically checked and cleared of debris.

SEACOCKS:

All underwater through hull fittings are equipped with seacock ¼ turn valves. It is good practice to close all seacock valves when leaving the boat, especially for long periods of time.

To close seacock valves, turn handle perpendicular to flow. To open, turn handle ¼ turn to parallel.

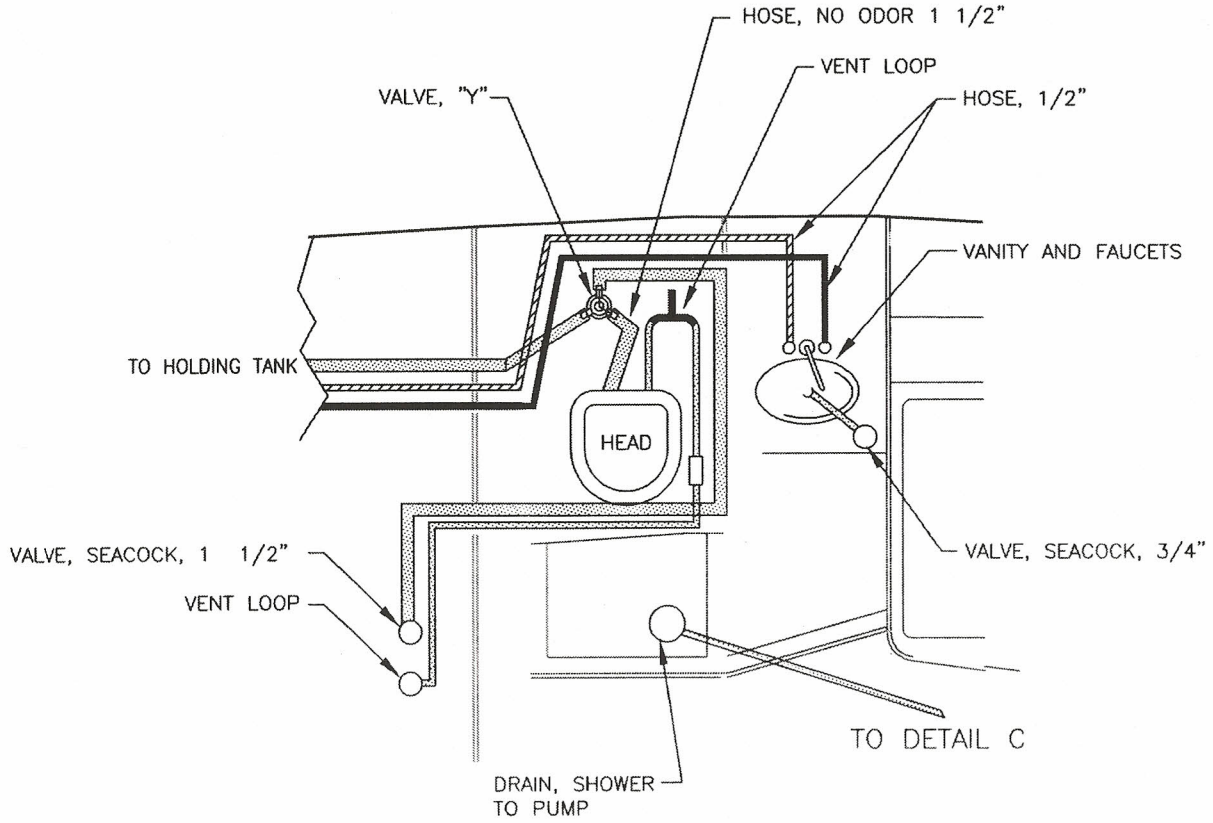
It is good practice to operate the seacock valves at least once a month to keep the seals lubricated. Refer to the through hull and seacock maintenance guide supplied by the manufacturer enclosed in this manual.



Catalina Yachts

310 PLUMBING PLAN

DETAIL "B"



HOSE TABULATION	
SYMBOL	USAGE
	COLD WATER
	GREY WATER
	HOT WATER

Catalina Yachts

310 HEAD PLUMBING

AUXILLARY POWER:

GENERAL ENGINE INFORMATION:

WARNING: Do not open engine compartment doors when engine is running. Contact with hot or moving engine parts can cause serious injury.

For a complete description of your engine, please consult the guide supplied by the engine manufacturer. This can be found in your owner's packet.

Two points are worth special attention. Firstly, marine engines work under conditions tougher than those conditions of automotive engines. Your marine engine faces constant torquing not encountered on the highway. For this reason, you must change your engine's crank oil as recommended in the engine manufacturer's guide. Secondly, before using your engine, the shaft coupling must be adjusted within a tolerance of .003 T.I.R. thousandths after launching. This is done during commissioning of the yacht. Be sure that your dealer has made this adjustment before using your engine.

Change the oil in accordance with manufacturer's recommendations. Keep spare filters and alternator belts on hand. Keep your fuel tank full whenever possible to prevent water condensation in your fuel tank.

To retard electrolysis, we recommend installing a zinc collar immediately on the propeller shaft when the boat is to be used in salt water.

SHAFT PACKING BOX (STUFFING BOX):

The packing gland is located aft of the engine. Properly adjusted shaft packing gland should drip slightly with the engine off. Too loose an adjustment will allow too much water in the bilge and engine operation will spray water from the shaft. Too tight an adjustment will rob the engine of power, and the lack of water lubrication in the packing gland can generate enough heat to damage the gland and/or score the propeller shaft.

ADJUSTMENT:

1. Holding the packing nut with one wrench, use a second wrench to loosen the lock nut. Turn the lock nut far enough to keep it from interfering with the next adjustment (2 or 3 turns).

2. Tighten the packing nut to obtain 1 to 2 drops per minute. Hand tightening of the packing nut is often sufficient to obtain this adjustment. If this is not the case, an additional ¼ to ½ turn with the wrench should produce the desired result.

3. Hold the packing nut in place with one wrench, and use the second wrench to bring the locking nut securely against the packing nut. Make certain that the locking nut is tight. Failure to do this could allow the allow the packing nut to back off when the engine is operating.

4. Operate the engine at slow speeds in forward and reverse and use a light to check for excessive water at the packing nut. Shut off the engine and recheck packing for proper drip.

SHAFT ALIGNMENT:

For proper operation of the engine, the propeller shaft and engine must be aligned.

Alignment is gauged at the engine and shaft coupling. Alignment procedures must be done with the boat in the water after the mast is stepped, and the rigged is tuned.

1. Remove coupling flange bolts and check propeller shaft for clearance. Adjust stuffing box so that excessive seepage is prevented, yet the shaft is allowed to spin freely.

2. Slide shaft away from engine and check coupling mating surfaces. These must be clean.

3. Slide shaft forward to connect coupling surfaces. Pilot on transmission flange must align with recess in shaft coupling flange. This is an indication of correct axial alignment.

4. With coupling flanges in contact, measure gap around edge of coupling with .003 feeler gauge. Maximum allowable gap at any point is three thousandths of an inch. Take this measurement several times…rotating shaft ¼ turn each time. Any gap in excess of .003 must be corrected by changing engine position, especially fore/aft tilt. For example, excessive gap at the bottom of the coupling (see drawing) indicates engine is tilted too far aft (front too high). Using a 15/16 end wrench, loosen lock nuts on forward motor mounts(s). Lower front of engine by clockwise rotation of motor mount nuts. Remeasure gap at coupling. A gap at the top of the coupling would require the exact reverse procedure.

5. Pull shaft backwards as in step 2. Again slide shaft forward, rechecking axial alignment as in step 3.

6. Repeat steps 4 and 5 until alignment within tolerance is achieved.

7. Tighten motor mount lock nuts and install coupling bolts.

NOTE: Alignment should be checked yearly, or whenever any excess vibration is noticed. The alignment can also be affected by changes in rigging tension.

FUELING:

The fuel system consists of a fuel tank, fuel suction and return lines, a primary fuel filter/water separator and a secondary fuel filter on the engine and an electric fuel pump (on engine) controlled by the engine key switch, a deck fill plate, and an overboard vent through the transom.

Reliability depends on the clean fuel being supplied to the engine since the close tolerances required by the engine's fuel delivery system make it intolerant of dirt or water contamination. The engine is supplied with primary and secondary filters that prevent contaminants from reaching the engine where they could cause damage. However, a clogged filter, although providing this protection, can also stop an engine. Keeping the filters free of dirt and water is critical.

BEFORE FUELING:

1. Extinguishing all smoking materials and check around the fueling area for other sources of spark or flame. Remove if found.

2. Shut off the engine, and any electrical accessories or devices.

3. De-energize all electrical equipment by turning the selector switch to the off position.

4. Close all hatches and ports.

5. Ensure that a fire extinguisher is readily available.

6. Ensure that the proper (diesel, not gasoline) hose is about to be used.

WARNING: Do not fuel during an electrical storm. Besides the obvious hazard of lightening, the possibility of static discharge is greatly increased at this time.

FUELING PROCEDURE:

1. Remove fill pipe cover using a proper tool.

2. Place nozzle of fuel hose in the fill pipe. Keep the nozzle in contact with the deck plate rim during fueling to avoid the possibility of a static spark.

3. Fill slowly. Do not overfill. If it is not possible to see the meter on the fuel pump, the attendant or a crew member should call out the gallonage from the fuel dock. Filling the tank to only 95% of capacity will avoid overflow problems on a hot day.

4. Replace cover, clean up any spilled fuel. If any rags, etc., were used for this purpose, dispose of them ashore.

5. Check below decks for presence of fumes or fuel leakage. Check bilge, engine space, and main cabin. If fumes or evidence of leakage are found, determine the cause, correct it, and clean up any spillage before proceeding.

6. The engine should be started only when it is certain that no potentially hazardous conditions exist.

FUEL SANITATION:

BACTERIAL CONTAMINATION:

Bacterial contamination of the diesel fuel can cause problems. The bacterium need both water and fuel to exist, and thrive at the fuel/water interface in a fuel tank. As they multiply, they form more water and a filter choking brown slime. Their presence will not be known until rough weather churns up the fuel tank causing clogged filters at the worst possible time.

Keeping water out of the fuel will prevent the problem entirely. However, a certain amount of water, due to normal condensation in the tank, is to be expected.

FUEL ADDITIVES:

Fuel additives or fungicides provide another means of combating contamination. Additives break the water down to a molecular level, dispersing it throughout the fuel and allowing it to pass harmlessly through the fuel system. Several brands of this product are available at marine stores.

EXHAUST SYSTEM MAINTENANCE:

In-board engine installations on sailboats differ from engine installations on powerboats. The primary difference is that the engine is usually installed below the waterline of the vessel.

The benefits of these locations are that the weight of the engine is where it will not adversely effect trim, and that the shaft is at an efficient angle for powering and minimum drag when sailing.

Engine installations below the waterline require special attention to the design of the exhaust system. The discharged cooling water must be exhausted above the waterline to avoid excessive back pressure on the engine and prevent sea water from traveling up the exhaust line and entering the engine.

To exhaust the engine above the waterline, the discharged cooling water and require special attention to the design of the exhaust gas must be "lifted" to a level above the through hull fitting on the transom.

The exhaust cooling water and exhaust gas are lifted above the waterline by an "aqua-lift" type muffler. The aqua-muffler performs three jobs:

1. It mixes engine gas and water to cool the gas and lower exhaust line temperature.

2. It baffles and deadens engine exhaust noise.

3. It creates pressure required to lift and expel cooling water.

As shown in the illustration, the inlet tube into the aqua-lift is short and the outlet tube is long near the bottom of the tank.

As water accumulates in the bottom of the tank, exhaust gas pressure builds in the top of the tank. This forces the cooling water up the exit tube and through the exhaust line overboard.

The system required exhaust pressure in the tank to function. When the starter motor is turning over, before the engines fires, water is being pumped through the cooling system by the belt driven cooling water pump. It is very important not to operate the starter motor for more than 30 seconds if the engine does not fire. Should it be necessary to operate the starter motor more than 30 seconds, water must be drained from the aqua-lift by opening the drain at the base of the aqua-lift.

The drain valve may be opened until the engine fires, if desired. All Catalina are equipped with anti-siphon valves as an additional precaution to prevent cooling water from entering the engine.

The function of the anti-siphon valve is to prevent cooling water from being siphoned through the through hull valve, through the engine cooling system and into the aqua-lift muffler when the engine is not operating.

If the muffler were to fill completely with water, water would travel up to inlet tube and enter the engine block.

The Catalina exhaust system is basically simple and will provide trouble free service if you perform regular maintenance and inspection. The important points to remember are:

1. Close the engine cooling water through hull valve when you are not operating the engine.

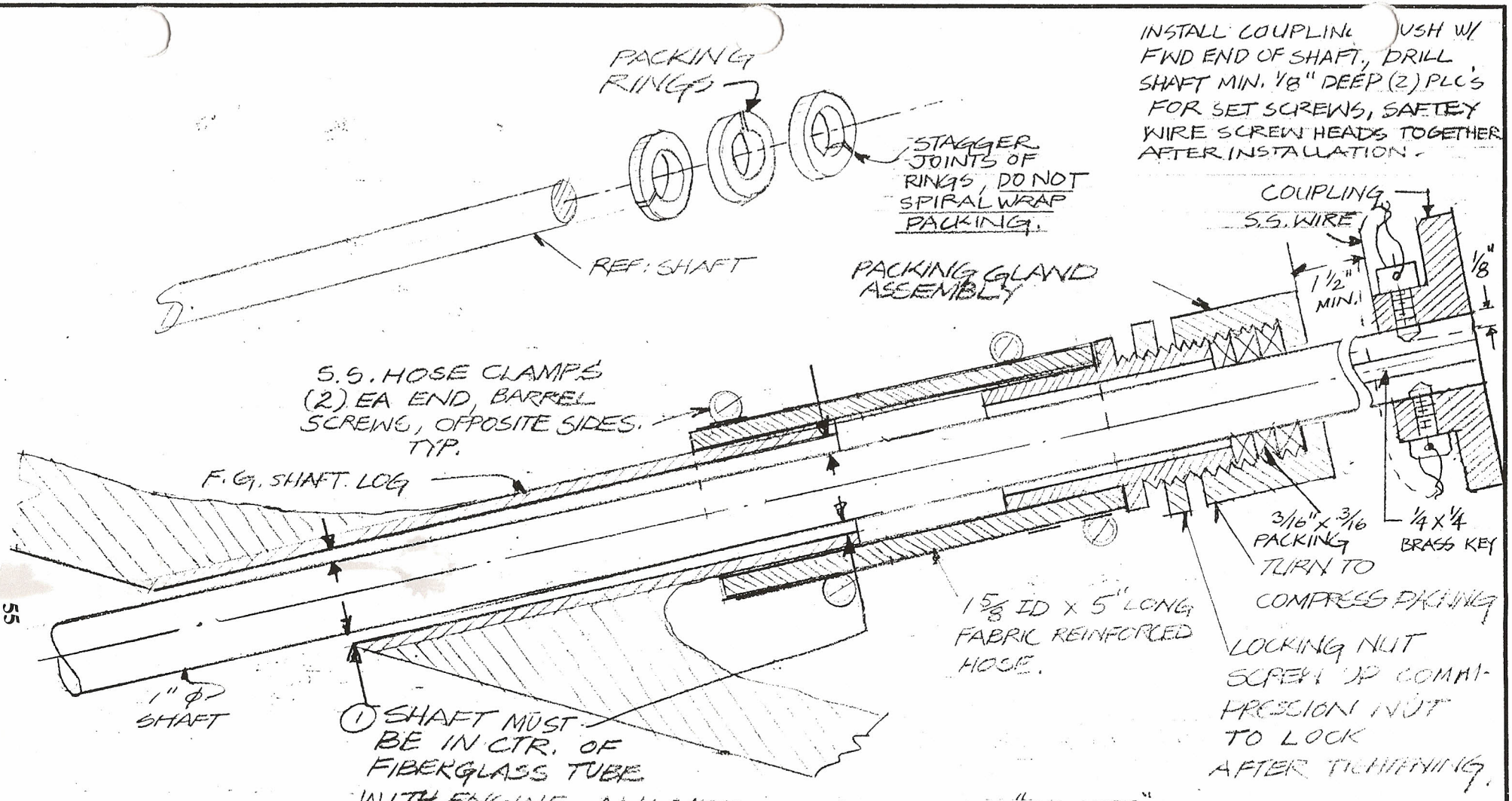
2. Do not operate the starter motor for more than 30 seconds without draining the aqua-lift muffler.

3. Periodically disassemble the anti-siphon valve. Be sure the valve is not fouled with salt deposits and that it opens freely under the cap.

4. Check the operation by removing the valve:

    A. Put a finger over one large hole and blow through the other. Air should not escape through the cap.

    B. If you suck through one large hole with a finger over the other, air enter the valve through the cap.



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-3 10.21.94 ADD "S.S. WIRE"
-2 12-30-88, ADD COUPLING INSTRUCTION.
REV.-1 .12-5-86, SHAFT ALIGN. NOTE (1)

(C) PACKING GLAND SHOULD NOT BE OVER TIGHTENED - ONE TO TWO DROPS PER MINUTE IS NORMAL

(B) SHAFT MUST NOT CONTACT GLAND OR LOG, SHAFT MUST IN CTR OF LOG AND GLAND.

(A) MAINTAIN CLEARANCE BETWEEN ENGINE COUPLING AND PACKING GLAND FOR REMOVAL AND REPACKING OF GLAND

CATALINA YACHTS
21200 VICTORY BLVD.
WOODLAND HILLS, CA

SCALE: ~	APPROVED BY: VERBAL F.B. - 12-9-88	DRAWN BY G.D.
DATE: 3/22/88		REVISED 10.21.94

PACKING GLAND/COUPLING ASSEMBLY.

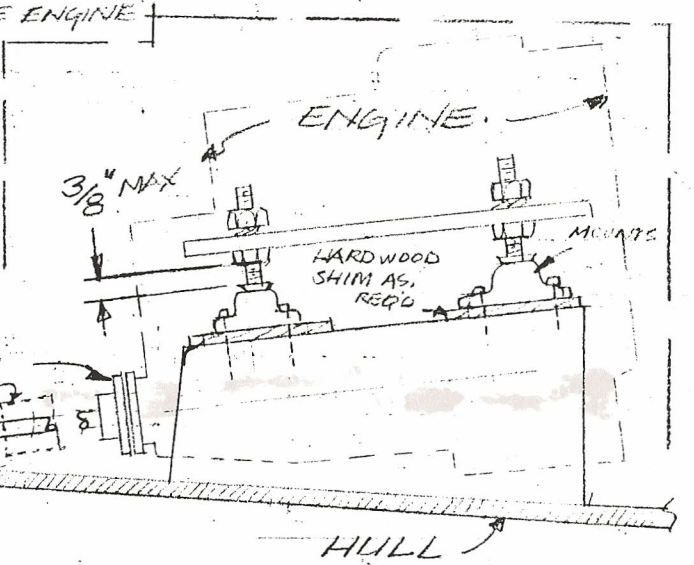
INBOARD MODELS

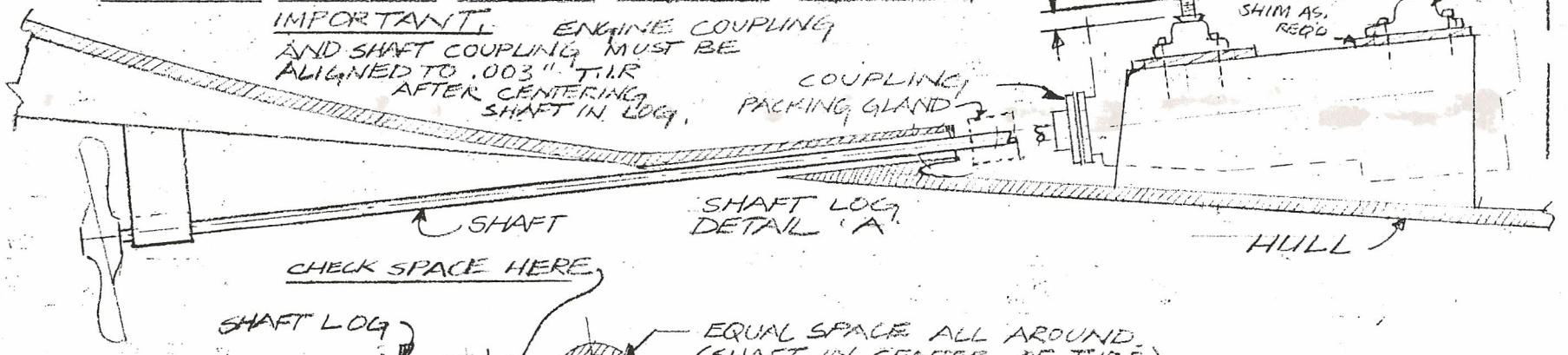
DRAWING NUMBER 250-50006 -3

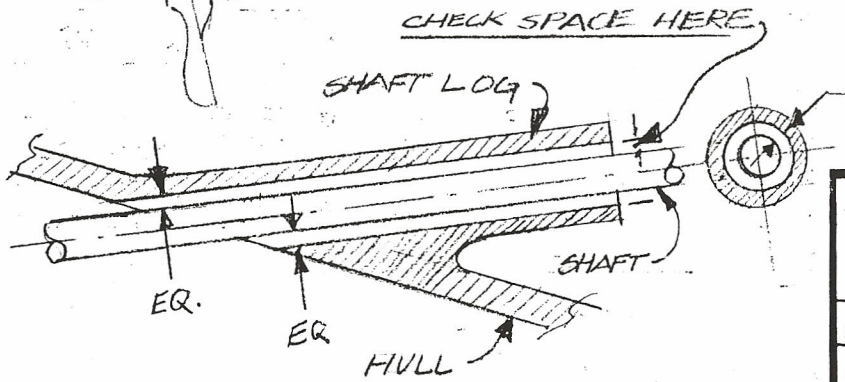
PROP SHAFT AND LOG ALIGNMENT.

THE PROP SHAFT MUST BE IN THE CENTER OF THE FIBERGLASS SHAFT LOG, WHICH PASSES THRU THE HULL THIS CAN BE CHECKED IN THE FOLLOWING WAY:

1. HAVE A SUPPLY OF RAGS ON HAND TO SLOW THE FLOW OF WATER INTO THE BOAT AFTER THE PACKING GLAND HAS BEEN REMOVED
2. LOOSEN THE TWO HOSE CLAMPS HOLDING THE RUBBER HOSE TO THE SHAFT LOG; SLIDE THE RUBBER HOSE WITH THE PACKING GLAND ATTACHED, FORWARD, FAR ENOUGH TO EXPOSE THE END OF THE FIBERGLASS SHAFT LOG.
3. WATER WILL ENTER THE BOAT THRU THE SHAFT LOG.
4. WORKING QUICKLY CHECK THE LOCATION OF THE SHAFT IN THE LOG, IT SHOULD BE IN THE CENTER.
5. USE A RAG TO HELP SLOW THE FLOW OF WATER WHILE INSPECTING THE SHAFT POSITION
6. REPLACE THE RUBBER HOSE ON THE SHAFT LOG.
7. RAISE OR LOWER THE ENGINE AS REQUIRED TO CENTER THE SHAFT IN THE LOG.
8. DONOT RAISE THE ENGINE SO THAT MORE THAN 3/8" OF THREAD IS EXPOSED ON THE ENGINE MOUNT.
9. INSTALL HARDWOOD SHIMS UNDER MOUNTS AS REQ'D.







SHAFT LOG DETAIL (A)

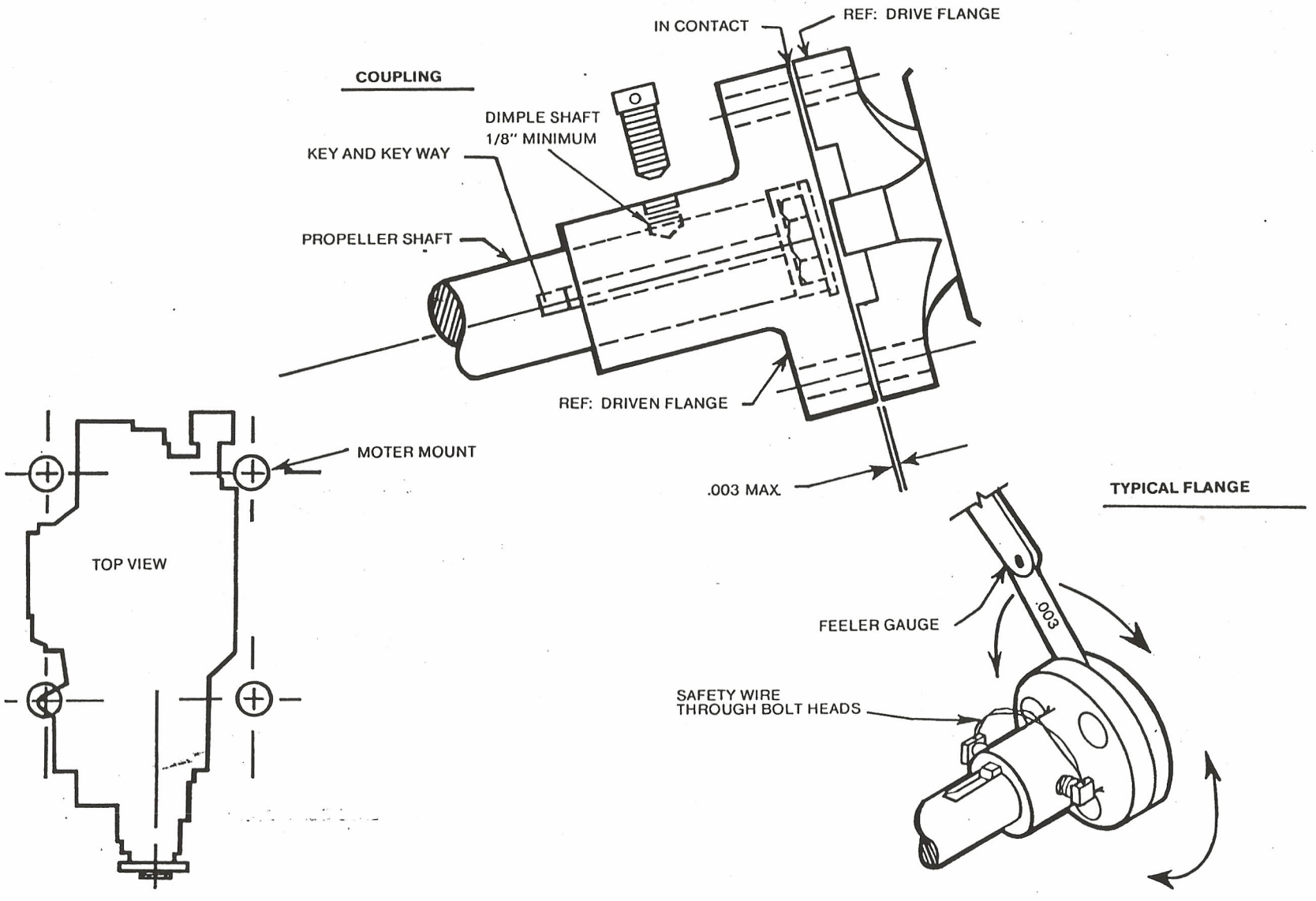
CATALINA YACHTS
21200 VICTORY BLVD.
WOODLAND HILLS, CA

SCALE: NONE	APPROVED BY:	DRAWN BY G.D.
DATE: 1-21-87		REVISED

PROP SHAFT AND LOG ALIGNMENT PROCEEDURE.

ALL INBOARD MODELS.

DRAWING NUMBER 250-5000 5 -0



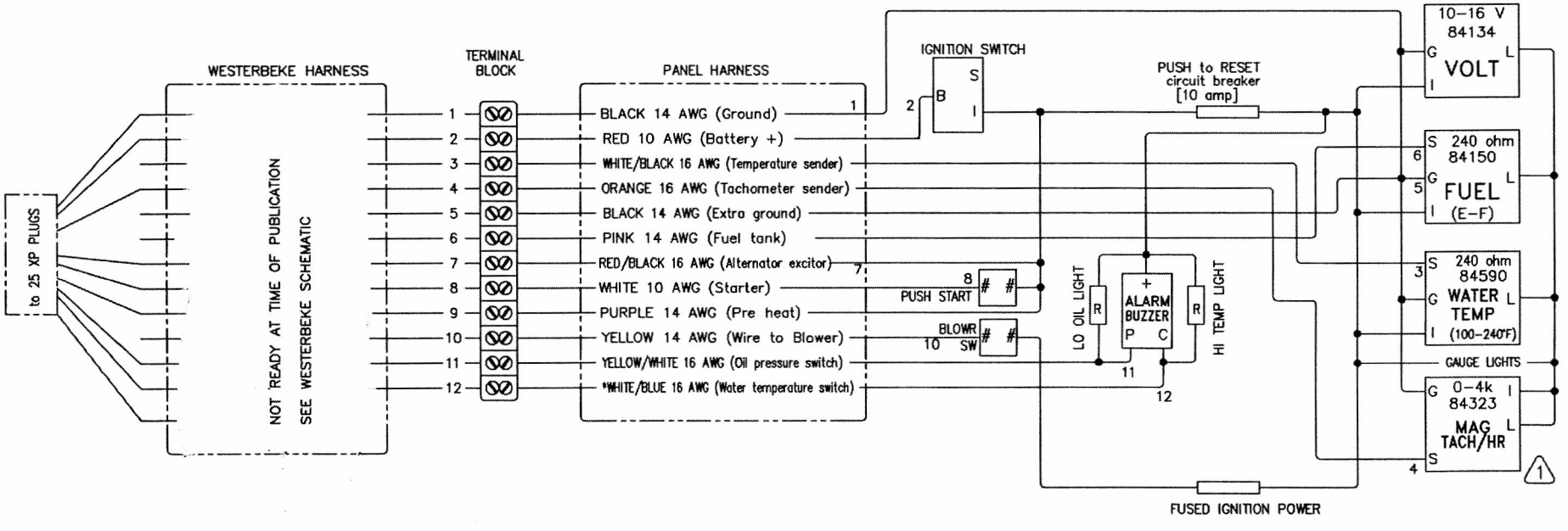
MEASURE GAP BETWEEN MATING FACES OF COUPLING FLANGES. MAXIMUM ALLOWABLE GAP AT ANY POINT IS .003 WHEN ANY POINT OF COUPLING FACES ARE IN CONTACT. TAKE THIS MEASUREMENT SEVERAL TIMES, ROTATING SHAFT 1/4 TURN EACH TIME. THIS MEASUREMENT MUST BE MADE WITH COUPLING BOLTS REMOVED.

CATALINA YACHTS INC. 21200 VICTORY BLVD. WOODLAND HILLS, CA
SHAFT ALIGNMENT ILLUSTRATION
CATALINA OWNERS MANUAL

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. TACHOMETER CALIBRATION: FOR 2GM/3GM (97 TEETH) SET TESTER SWITCH TO 3200, ADJUST THE "TACH CAL SCREW" TO INDICATE 2000 RPM.

GAUGES



Catalina Yachts

310 25XP HARNESS TO SEAWARD HELM POD

STEERING:

EMERGENCY TILLER:

It is recommended that the skipper and crew become familiar with the emergency tiller and its use.

The emergency tiller should be stored in a convenient location, known to everyone operating the boat.

A dry run of the system will minimize confusion in an emergency:

1. Locate the emergency tiller.
2. Remove the wheel. Keeping a wrench handy for this purpose is a good idea.
3. Insert the emergency steering tiller in the rudder post cap.

NOTE: The emergency steering tiller moves the whole steering, including cables and quadrant. These elements must be free to move in order to steer the boat.

CATALINA SAILBOATS WITH MARELON RUDDER BEARINGS AND PACKING GLAND:

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, silicon gel, Teflon gel or Lanolin paste. ONLY WATER.

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

1. Over-tightening 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.

ACCOMMODATION:

GALLEY STOVE:

There is a gimbaled stove with oven in the galley area It comes with an operation and maintenance booklet provided by the stove manufacturer. The standard LPG gas bottle is located in a vapor-tight container located in the stern locker. The container is fitted with a drain and vent fitting on the transom. Keep these clear at all times.

A few additional points of operation for the standard LPG stove are below:

It is recommended that every time the LPG tank valve is opened for use, the operator close the valve and watch that the gauge needle remains constant. The gauge should read approximately 110 PSI. If you can detect a failing in pressure over a 15-minute period of time, there is a leak. LEAKS CAN BE DANGEROUS.

a. If a leak occurs, check all appliance burners to see if they are in the "OFF" position.
b. Make sure the oven control is in the "OFF" position.
c. Check all fittings with a soap and water solution.
   NEVER USE A FLAME TO CHECK FOR LEAKS.

If you cannot find the leak, contact the stove manufacturer promptly.

To light the oven: Light the right front burner to bleed air from the system for at least one (1) minute. Turn the temperature control knob from the "OFF" position to the "PILOT ON" position. After this has been done, light the pilot in the oven (constant pilot).

After the oven is lit, turn the oven temperature control knob to the desired temperature.

Notes on the Solenoid: The solenoid must be turned on to test gauge for leaks. Both the solenoid and the tank valve must be turned on to receive fuel. The solenoid is an electrical device for turning on or off the fuel from inside the cabin at the electrical panel.

Points to remember: All stoves have been safety tested, however, it is wise to remember to never leave the boat when oven or burners are on. Turn off the tank when you leave the boat for more than one or two days. Always blow out the pilot light when you will be away from the boat for more than two days, and check for leaks when you open the tank.

UPHOLSTERY FABRIC CLEANING INSTRUCTIONS

1. Regular vacuum cleaning or brushing in the direction of the pile with a soft brush.

2. Stains should, if possible, be removed at once with a damp cloth. Do not allow stains to harden and age.

3. Greasy stains can be removed with ordinary cleaning fluid.

4. For overall cleaning, use commercial types of upholstery shampoo using only the foam to protect the back padding from moisture. After a minute or so, remove foam, and when dry, vacuum or brush in the direction of the pile.

5. Do not use heat such as an iron or steam.

6. The use of some kind of fabric protector such as "Scotch Guard" is strongly recommended when the cushions are new, and after each cleaning.

7. Cabin Shades: When shades become soiled, wipe off with Fantastic or similar product.

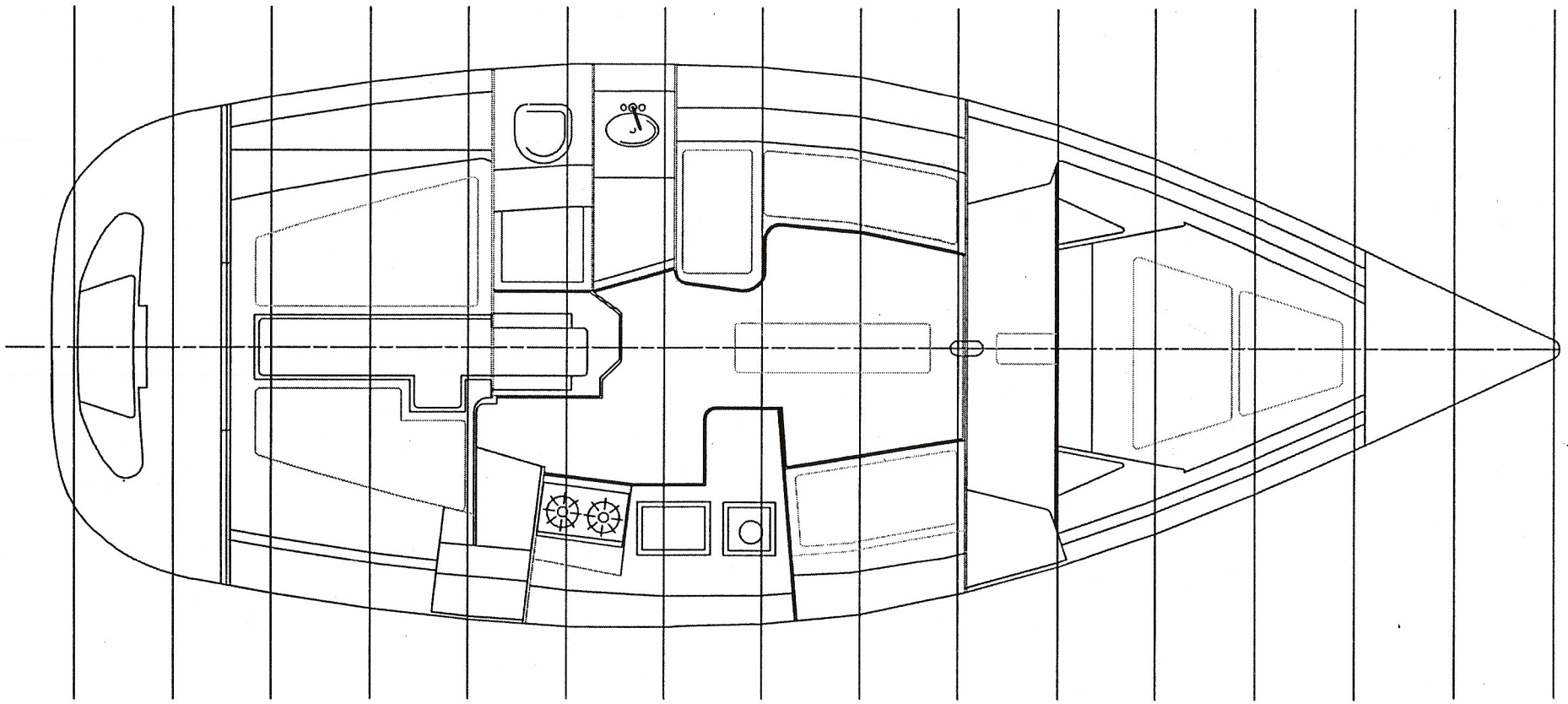
8. Brisa – Ultra leather HP:

   Care Instructions:

   - Spot clean with mild soap and water.
   - Air dry or dry quickly with warm setting of a hair dryer.
   - For stubborn stains, use mild solvent.

   On the 3M 1-8 rating scale, with 8 being the best, the following results were achieved using mild detergent in the 1:50 solution with water.

STAIN	MILD DETERGENT
Red Wine, Liquor	8.0
Coca Cola	8.0
Tea	8.0
Coffee	7.5
Milk	8.0
Ketchup, Mayonnaise	8.0
Mustard	7.0
Steak Sauce, Soy Sauce	8.0
Butter, Salad Oil	8.0
Chocolate	8.0
Make-up, Face Cream	8.0
Lipstick	6.0
Suntan Oil	8.0
Shoe Polish	7.0
Machine Oil	8.0
Urine, Blood	8.0
Ball-point Pen, Crayon	7.5
Magic Marker	7.0

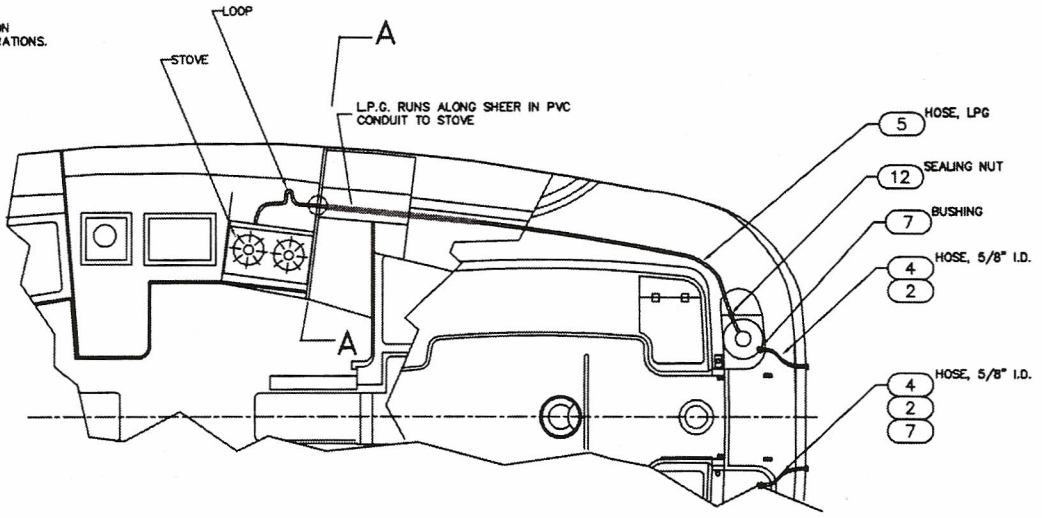


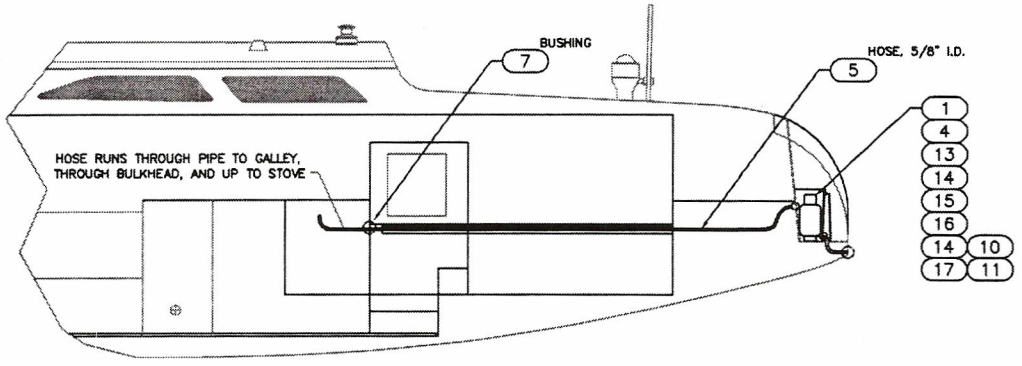
Catalina// Yachts

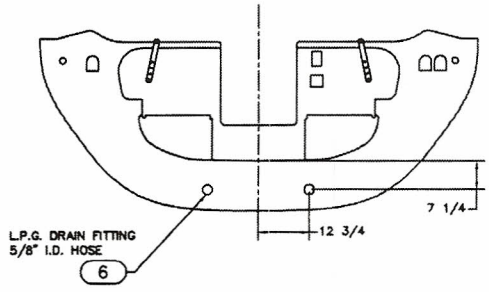
310 ACCOMODATIONS LAYOUT

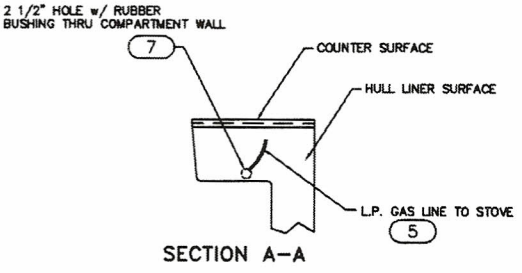
NOTES: (UNLESS OTHERWISE SPECIFIED)

1. GAS TIGHT SEALING NUTS REQ'D. ON ALL ELECTRICAL AND HOSE PENETRATIONS.









SECTION A–A

ITEM	DESCRIPTION
17	LABEL, I.D, SEAWARD, 1.5x3"
16	SOLENOID, LPG
15	PRESSURE GAUGE
14	PRESSURE REGULATOR, LPG
13	SHUT OFF VALVE, LPG
12	SEALING NUT, GAS TIGHT
11	WIRE, 14AWG, BLACK (REF DC ELEC PLAN)
10	WIRE, 14AWG, BLUE (REF DC ELEC PLAN)
9	
8	BUSHING, THROUGH HULL
7	BUSHING, RUBBER, 2 1/2"
6	HOSE, LPG (TANK TO SOLENOID)
5	HOSE, LPG (SOLENOID TO STOVE)
4	HOSE, 5/8"
3	
2	CLAMP, SS, 3/4'
1	TANK, LPG

PARTS LIST

Catalina Yachts

310 LPG PLAN

DECOMMISSIONING

WINTERIZING YOUR ENGINE:

LAYING UP:

In cold climates where yachts are decommissioned during the winter, your Catalina may be safely stored in the water, provided adequate measures are taken to prevent ice damaged to the hull. Check with your yard to determine the feasibility of storing in the water.

When the boat is to be stored on land, the mast may be left stepped on the deck. However, it is recommended that the mast be removed at the time of hauling for a thorough inspection and preparation for next season.

This allows plenty of time over the winter months to order and replace the shrouds or rigging parts needed, avoiding any delays in the spring commissioning.

AFTER HAULING:

1. Wash bottom, removing growth (where permitted by environmental regulation).

2. Wash topsides, deck, and all other exterior fiberglass surfaces. Wax all except the nonskid surfaces.

3. Remove all sails. Follow sailmaker's instructions or instructions Section 3.8, in regard to cleaning. Schedule any repairs required and store in a dry place.

4. Remove all sheets and lines, clean, store in a dry place.

5. If the mast had been removed from the yacht, remove all stays and shrouds from the mast. Wash the entire stay or shroud assembly, using fresh water and a stiff brush. Dry thoroughly, and coil into large non-kinking coils. Store the coils in a dry place. Wash and wax all spars. Coil halyards into non-kinking coils, and put in a dark colored plastic bag to protect them from sunlight if storing outdoors. Lash them to the mast. Store the mast either inside or outside with adequate support along its length.

6. If mast is to be left in place, remove the boom, clean and store as described before. Clean shroud/stay end fittings, toggles, etc. using fresh water and a stiff brush. Apply a light coat of silicone grease, paying particular attention to the end fittings where they connect to the stays and shrouds.

7. Clean and lubricate all deck hardware that contains moveable parts. Follow manufacturer's instructions on winches.

8. Remove all gear such as books, documents, bedding, PFD's, anything moveable that is subject to rust, corrosion or mildew.

9. Remove all food supplies from lockers or ice chest. Wash out ice chest interior with a weak solution of Chlorox. Leave ice chest lid open.

10. Stored batteries should be fully charged, and both positive and negative terminals should be disconnected. The batteries may be either left aboard or stored in a cool, dry place. Sub zero temperatures will not harm a fully charged battery.

11. Close all manual shutoffs for the stove fuel system.

12. Winterize the head system in accordance with the manufacturer's instructions.

    A. Empty the holding tank, flush it out with fresh water several time. Add a holding tank chemical.
    B. Pump all the water out of the head.
    C. Shut off the head intake through hull.
    D. Remove the head intake line from the through hull. Put it in a container of potable water and pump it through the head. (Do not use ordinary anti-freeze), drain the head completely.
    E. Reconnect the intake line to the through hull.
    F. Shut the discharge through hull (if applicable).

    IMPORTANT: Always follow manufacturer's instructions wherever possible for winterizing the head system.

13. Hot and cold water system:

    A. Empty the water tanks as much as possible. (There will always be a small amount of water left.)

    B. Add a potable water ant-freeze, sold in marine and RV stores (Do not use ordinary anti-freeze, it is toxic), to your water tank and a small amount of water. Pump this water/anti-freeze mixture through the water lines to all faucets. Do not forget to pump some from both tanks, if the boat has two. Also, drain the pumps. Do not allow anti-freeze to remain in the pump as this will damage the pump

    C. Close the sink drain through hulls, or plug the sink, if the through hull is above the waterline.

    IMPORTANT: Always follow the manufacturer's instructions wherever possible for wintering the hot and cold water system.

14. Remove all electronic gear that may require servicing during the winter.

15. Remove fire extinguishers for weighing, checking, and any necessary recharging. If an automatic fire extinguisher system is installed, return the cylinders to the yacht and reinstall as soon as possible.

16. If cushions are left aboard, bring cockpit cushions below and place all cushions on edge to encourage ventilation.

17. Leave all interior lockers open to encourage ventilation.

18. Ensure that cockpit and deck scuppers are open and free.

19. If the boat is to be covered, ensure that the cover is installed in such a way as to provide adequate ventilation, and that the cover is not permitted to chafe against the hull or deck.

20. If the boat is not be covered, ensure that mechanisms, such as winches and steering pedestals are provided with adequate covers.

21. If the mast is to remain stepped, snug all shrouds and halyards to minimize noise and wear.

GENERAL RULES:

We recommend the following procedures be followed when storing the yacht for prolonged winter months. Begin by consulting your authorized dealer about storing the boat in or out of water in freezing climates. If at all possible, the manufacturer recommends keeping the yacht in dry storage for severe winters.

All through hull fittings should be drained and closed off. Water in the sanitation system and other tanks should be pumped out. Fill the lines and fittings with anti-freeze to prevent water from running in, freezing or expanding, and cracking the lines and fittings.

For diesel engines, consult the manufacturer's manual for special instructions.

> Unless the manufacturer's manual states otherwise, drain the block, disconnect the water hose from the through hull fittings, attach an additional length of hose and place the end of this hose in a bucket of anti-freeze. Run the engine until straight anti-freeze comes out of the exhaust line. Stop the engine at this point, plug or cap the exhaust line, and remove the additional hose and bucket.

OWNER/USER RESPONSIBILITY

GENERAL SAFETY TIPS:

1. Do not venture out when the weather conditions are unfavorable or are predicted to become so. Listen to weather forecasts, check with your Harbor Patrol office, and look out for small craft warnings.

2. Be especially careful in areas where there may be commercial shipping traffic. Keep well away from shipping channels. Keep a sharp lookout when crossing the shipping channels.

3. Learn to follow the rules of the road. All other sailors will expect that you know them and abide by them. The U.S. Coast Guard (BBE-2), 400 S. Eleventh Street, S.W. ,Washington, D.C. 20590, will supply free literature on this. You local branch or Harbor Patrol office may have it available.

4. If your boat has a genoa sail that obscures the helmsman's vision, have a dependable person in the crew keep a sharp look-out under the genoa sail for traffic.

5. When sailing at night, provide safety harnesses for yourself and your crew, and secure these lines to the boat. Use approved harnesses.

6. Purchase all Coast Guard required safety equipment and learn how to use it.

7. Enroll in a C.G. class or other certified boating and sailing class. You will learn a lot and enjoy sailing even more.

8. Do not take more than a safe number of persons aboard your boat when sailing.

9. Marine insurance is worth every penny you pay for it. Take out insurance from the start. See your dealer for a recommended marine agent if you do not have one.

10. Keep all seat hatches and main hatch closed during rough weather or gusty winds which could unexpectedly strike the boat and cause a knock down.

11. CAUTION! The aluminum mast, and the metal parts conduct electricity. Coming in contact with, or approaching an electrical power line can be fatal. Stay away from overhead power lines and wires of any kind, when launching, underway, or when stationary.

REQUIRED SAFTETY EQUIPMENT:

FIRE EXTINGUISHER:

It is wise to locate a minimum of two, approved for marine use, fire extinguishers, one for forward of the galley and one behind the galley, preferably below the cockpit hatch. Should an alcohol stove or engine fire start, you can always reach a fire extinguisher.

For example, you do not want to locate both of your extinguishers in the bow area because if you are located in the cockpit, you would have to get by the danger area to reach them if the fire is either in the galley or engine area.

Dry chemicals extinguishers should be inverted occasionally to prevent the contents from packing. Extinguishers should be recharged yearly or after each use, according to manufacturer's recommendations.

LIFE VESTS:

Keep a Coast Guard approved life vest aboard for each crew member. Wear them during rough weather and night sailing. Children should wear vests at all times no matter how they object.

HORN:

Your yacht should be equipped with a horn capable of producing a blast that can be heard for a distance of one mile.

FLARES:

The law requires that your yacht be equipped with a minimum of 3 day/night flares.

SUGGESTED SAFETY EQUIPMENT AND SAFETY PACKAGE:

MEDICAL KIT:

A basic medical kit is a wise investment for any boat owner. Suggested items include: Motion sickness pills, aspirin, bandages, etc. We recommend that you personalize your medical supplied for you and your crew's specific needs.

TOOL KIT:

A varied arrangement of tools is again, a wise investment, to have on your boat. Tailor your tool box for the conditions that you sail. For local sailing, with professional help just a phone call away, you only need a small array of tools. However, for long range cruising, a more extensive supply of tools will be needed.

LIGHTNING PRECAUTIONS:

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

1. There is no a procedure for lightning protection which is 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 confidence 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 lightening threatens. Generally, they are not checked and maintained on a regular bases. 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 the impossible for Catalina Yachts to control changes which you, the owner, may make to the yacht, which could affect lightning protection systems.

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. For your guidance, a copy of ABYC recommendations is attached. The following suggestions and comments are also offered:

1. 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 2 below), will maximize reliability.

2. 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 advantages 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.

3. Use only top quality materials to go oversize wherever possible.

4. 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, 100 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 in a lightning protection system you may wish to add.

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

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 at both ends. Secondary lightning conductors can be connected to the equilization 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 a 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 (21.2mm^2) 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 (21.2mm^2) 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 (13.3mm^2).

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 (13.3mm^2) 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.

4.6.2.2 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 (13.3mm^2) copper wire.

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

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 securely fastened to the mast, and

4.8.3.1.3 extend at least six inches (150mm) 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 ($21.2mm^2$) 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 ($0.1m^2$) 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 (5mm), and a minimum width of 3/4 inch (19mm).

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 (250mm) wide, and 12 feet (3.7m) 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 E-4.8, 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, or other material if provided with a conductor, with a conductivity at least equal to a #4 AWG (21.2mm^2) conductor.

NOTE: A solid stainless steel whip antenna or equivalent, that has a conductivity less than a #4 AWG (21.2mm^2) 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 m^2) 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 non-conductive 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 m^2) 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

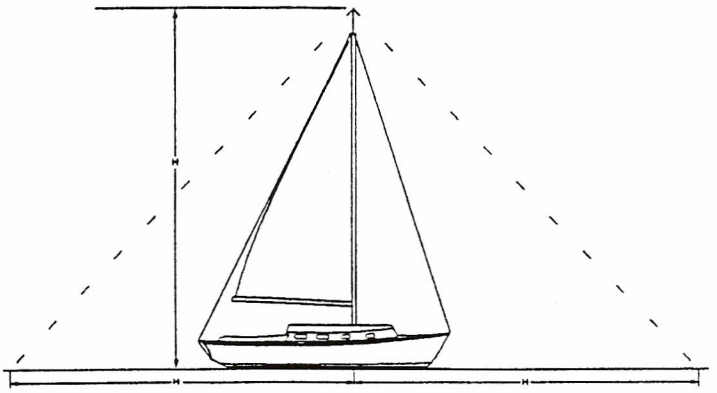


FIGURE 2 - BOAT WITH MAST NOT EXCEEDING 50 FEET (15M) ABOVE THE WATER

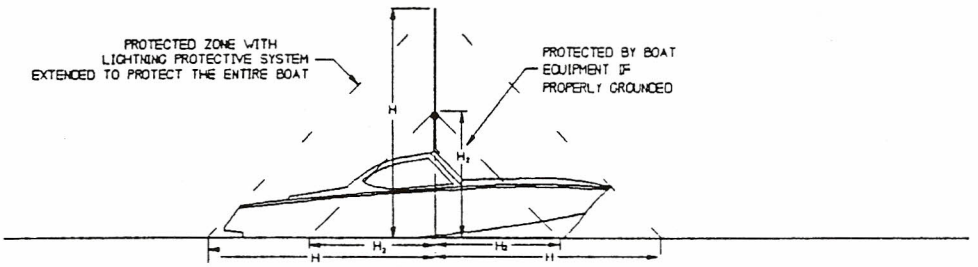
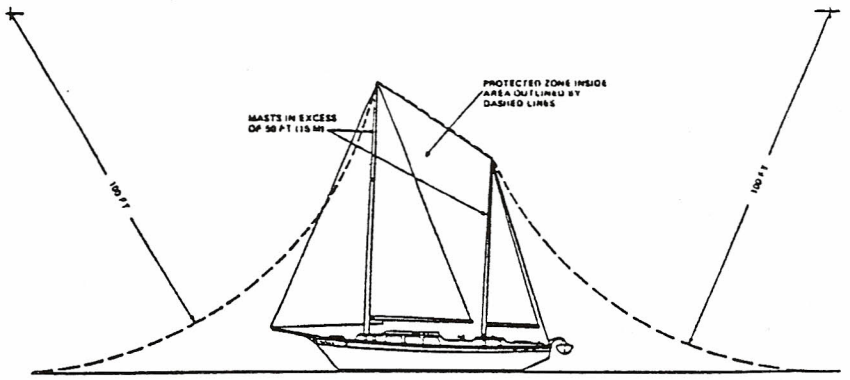


FIGURE 3 - BOAT WITH MASTS IN EXCESS OF 50 FEET (15M) ABOVE THE WATER - PROTECTION BASED ON LIGHTNING STRIKING DISTANCE OF 100 FEET (30M)



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 (15m), the zone of protection is based on the striking distance of the 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 (30m). Accordingly, the zone based on a striking distance of 100 feet (30m) 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 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 m^2) area. The plate should be located as nearly as possible directly below the lightning protection mast. The boat's 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 a lightning grounding plate instead of the 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 (4.8mm), and a minimum width of 3/4 inch (20mm). Stainless steel should have a minimum thickness of 1/8 inch (3.2mm). 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 (1.22m). 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 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 operating 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 the 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, an 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 (8.39mm^2) 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 (21.2mm^2) copper in accordance with E-4.5, and

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

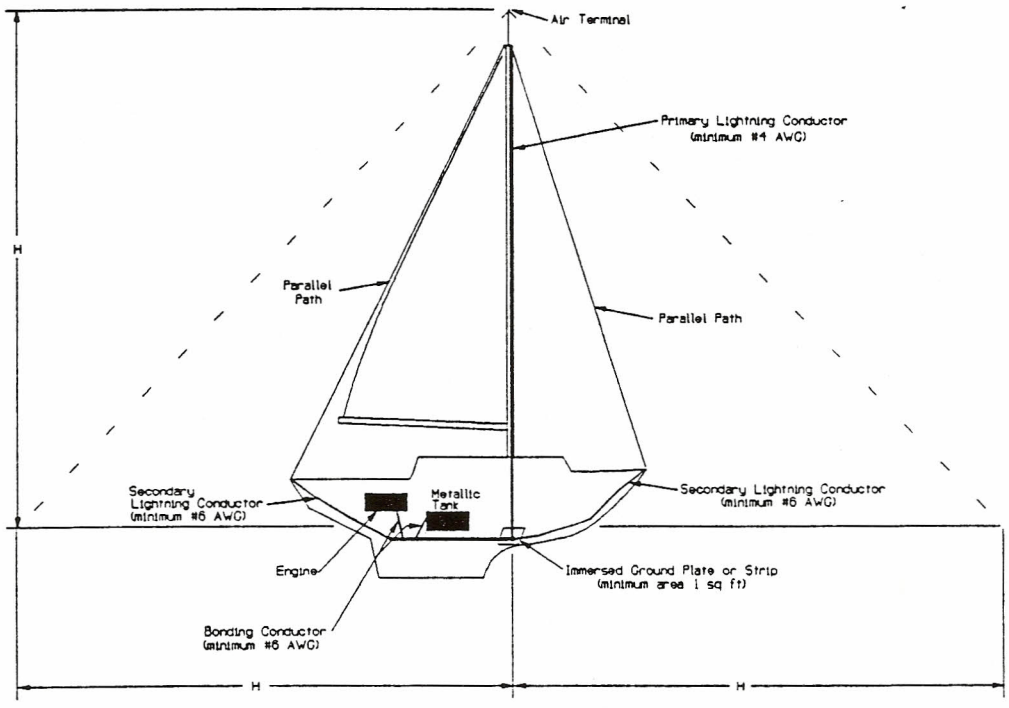
2. Non-conducting antenna masts with spiral wrapped conductors are not considered suitable for lightning protection purposes.

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 (1.8m) of a lightning conductor shall be connected to the lightning protection system with a minimum #6 AWG (13.3mm^2) 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.

COMMISSIONING PACKAGE

Qty.	Stock #	Description
1 each	439950	West Marine TR-22 anchor
20 foot	106484	Acco 5/16 galv PC chain
1 each	121434	New England 5/8x250' anchor line
2 each	173310	3/8 galv anchor shackle
2 each	137711	Taylor 8"x20" Big B fender
14 foot	122622	New England 3/8 fender line (3x7')
1 each	383044	Stearns USCG white throwable cushion
1 each	115881	Aluminum folding radar reflector
1 each	358178	Orion Star Tracer meteor flare kit
1 each	157792	Orion red HH flare 3-pack
1 each	103707	Tempo "Nature Safe" horn
2 each	126219	Kidde 10BC fire extinguisher
1 each	260425	"Cruiser" first aid kit
1 each	209239	Eveready halogen flashlight
6 each	112458	Kent USCG Type II lifejacket
1 each	328601	Chapmans Piloting & Small Boat Handling
4 each	121863	New England 5/8x25' dock line
1 each	117291	Brass bell 6"
1 each	103929	Beckson yacht log book
1 each	372318	Builds 2 pks Safety whistle 2 pk

LITERATURE AND WARRANTIES FOR EQUIPMENT WHICH MAY BE SUPPLIED WITH THIS MANUAL:

Batteries, 12 volt wet cell

Headsail furling gear

Dutchman flaking system

Inboard engine

Factory installed electronics

Galley foot pump, fresh water

Countertop pump, fresh water

Running lights

Marine head

Galley stove

Bilge pump

Pedestal steering

Water heater

Pressure water pump

Rudder bearings

Packing gland

Anchor windlass

Through-hull valves "seacock"

LEWMAR

User Notes

Small "vent" hatches are restricted to 90 degree opening and should not be forced beyond their "stop" position, as damage to the lever mechanism may occur. Larger hatches are not self supporting beyond the vertical position and will fall fully open if unrestrained.

The locking ventilation position is used by closing the handles into the catch block centre slot. Care should be taken not to stand on or load the hatch lid in this position, as damage could occur to the handle or catch block.

Always wash the hatch with soap, water and a soft cloth.

Never use abrasive or solvent cleaners on the acrylic lid, as this may at a later date damage the acrylic.

To avoid risk of injury care should be taken to keep hands and limbs clear of lever and lid pinch zones while operating and adjusting the hatch.

Always wash the Portlight or Fixedlight with soap, water and a soft cloth.
Never use abrasive or solvent cleaners on the window, as this may at a later date damage the acrylic.

Friction lever adjustment

The friction lever units installed on Ocean hatches are pre-set when manufactured to give correct positioning with a minimum opening load. It may be necessary occasionally to adjust the lever setting to correct the operation of the hatch.

Adjustment is made by means of the socket head screws on either side of the lever assembly.

Using a 4mm (5/32") hexagon key, turn the adjusting screw approximately 1/8th of a turn in a clockwise direction to increase the positioning force. This is most easily carried out in the fully open or closed positions.

Do not over tighten the adjusting screws
On hatches with multiple lever units, care must be taken to adjust all levers to a similar loading.

Open the hatch and check for correct operation.

Re-adjust if necessary until the desired operation is achieved.

Lubricants should not be used on the friction level assemblies as this will adversely affect the function of the units.

Forespar®

MARELON® THRU-HULL/SEAVALVE INSTRUCTIONS

This marine seavalve is made of **MARELON®** , a glass reinforced nylon composite. It exceeds standards for marine use set by UL, American Boat and Yacht Council, American Bureau of Shipping, and Lloyd's Registry. It is a complete system including thru-hull fitting, valve body, and hose connector.

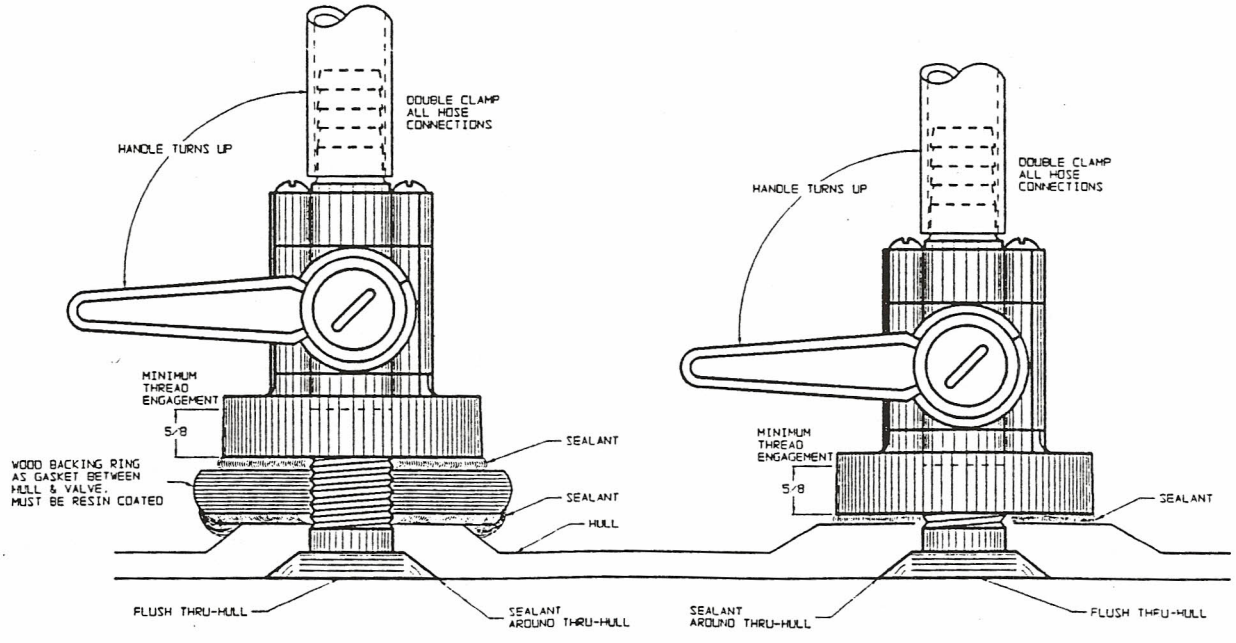
HULL OPENINGS: Prepare a clean round hole in the desired hull location and of the diameter for the chosen thru-hull fitting. See the diameter requirements below. For flush head thru-hull fittings only, make an external 45° chamber 1/4" deep. If the recommended backing block is used, a uniform hole diameter must extend through the backing block.

1/2" and 3/4" Thru-Hull/Sea Valves = 1-1/8" Hole
1" and 1-1/4" Thru-Hull/Sea Valves = 1-1/2" Hole
1-1/2" and 2" Thru-Hull/Sea Valves = 2-1/8" Hole

BACKING BLOCKS; A Backing block or an equivalent structure molded integrally into the resin/glass hull lay up is required for installations on all non-flat hull surfaces. This is also recommended procedure for flat surfaces as well. For wood backing blocks, white oak is a commonly used wood and there may be other suitable materials as well.

THRU-HULL FITTING LENGTH; The thru-hull fitting when fully installed should project beyond the internal hull/backing block surface no less than 1/2" and no more than 1-1/4". Engagement of five (5) full threads will generate the full loading strength of the thru-hull/sea valve assembly which is well in excess of the 500 pounds required by the A.B.Y.C. and U.L. standards.

BEDDING; The thru-hull fitting's external flange should be properly bedded when the fitting is inserted into the hull. The exposed male threads protruding from the inside of the hull should be applied with bedding material as well. The surface of the female threaded round king-nut portion of the valve, which interfaces with the hull surface, may well be bedded also but it is not an absolute requirement and the loading strength will not be impaired if it is not done. Bedding compounds such as 3M's #5200, Sikaflex or Boatlife are to be recommended as well as others that are equally suitable.



THREAD FORM; The thread form used on these thru-hull fittings are king-nuts is a non-tapered buttress type of thread design. The thread form has a higher load carrying capacity, particularly for polymeric materials. Warning, a standard pipe threaded thru-hull fitting will not make a satisfactory join with the king-nut on these valves. For a standard pipe threaded thru–hull fitting use our valves having female pipe thread outlets instead of a king-nut. A buttress thread design with the same amount of clearance as for a conventional pipe thread will give the impression of grater looseness. However, when the joint is taken up tight, there is a greater area of surface interface between threads with a buttress thread form.

KING-NUT INSTALLATION; The fully assembled valve or the round king-nut portion of a disassembled valve is threaded onto the bedding coated thru-hull fitting and tightened down by turning either the thru-hull fitting or the king-nut. A firm hand is sufficient, but if preferred the nut can be torqued to a maximum of 15 foot pounds.

If it is desired to additionally fasten the king-nut to the backing block with screw fasteners, there is provision for such but it is completely unnecessary. It can be seen on the backside of the king-nut that there are four (4) blind 1/4" holes. These may be drilled through to the front side before installation to allow for round headed screw fasteners.

VALVE ASSEMBLY; If the valve body has been disassembled from the king-nut or has been shipped to you in a disassembled condition, proceed to reassemble. Make sure that the white seal ring and a black O-ring are in place in the face of the valve body that interfaces with the king-nut. Orient the valve body in your choice of the four (4) possible positions and screw in the four (4) round headed valve body bolts to a strong hand tight condition. No bedding compound is to be used in this interface. If the valve configuration you are using has the 90 degrees angled hose barb inlet, you may also choose to orient the barb in any of the three (3) possible relations to the handle at this time.

VALVE CONNECTIONS; It is recommended that all hose barb connections be made using two (2) all stainless steel hose clamps. For 1/2" and 3/4" barbs, two (2) 3/8" wide hose clamps are recommended. For 1" and larger hose barbs, two (2) 1/2" wide hose clamps should be used. If the valve configuration you are using has a female pipe threaded inlet, you must exercise care in the installation of the pipe nipple. Use a Teflon pipe thread sealant. Be sure you are not cross threading by improper alignment and do not torque than 15 foot pounds.

MAINTENANCE; Forespar®'s MARELON® Thru-hull/Sea valves are corrosion free and provide great peace of mind in that regard. They are relatively maintenance free; lubrication is not required. All that is requires is to open and close them two or three times on an occasional basis. The frequency os this is determined by two (2) things. Whether the valves are rountinely kept in an open or closed position, and the rate of sea growth fouling that occurs where you keep your boat. If the fouling is high and the valves are usually kept in the closed position, it may be necessary to operate the valves every couple of months to free the valve ball from growth. In the low growth/rountinely open situation, once every six (6) months may be adequate.

All **MARELON®** valves of the integral thru-hull design have a removable plug in the handle. This plug is made to fit into the external end of the thru-hull fitting. If the occasion arises that you want to disassemble a valve while the boat is in the water, someone willing to go into the water can insert this plug into the thru-hull.

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Phone (714) 858-8820 Fax (714) 858-0505

page 81 "MATERIAL and EQUIPMENT LOG (To be added)