
CATALINA CAPRI 22

OWNER'S MANUAL

4th Edition August 21, 2001

FOREWORD

Congratulations on the acquisition of your new Capri 22 sailboat. All Capri sailboats are designed and built with care using quality materials to assure you years of sailing enjoyment with a minimum of upkeep and maintenance.

Before attempting maintenance or operation of your sailboat, please read the Catalina Yachts/Capri Sailboats Limited Warranty booklet and fill out the enclosed warranty registration card.

The registration card enables Catalina to inform you of developments and modifications to enhance the performance or comfort of your yacht. It is also important to be able to contact owners to comply with Coast Guard notification requirements.

The commissioning and rigging of your Capri 22 sailboat should be handled by experienced boat yard personnel under the direction of your authorized dealer.

Maintaining your boat properly can become a satisfying part of your sailing activities. A regular inspection is the best preventive maintenance. It will help keep your boat safe and in good condition while in use, and insure peace of mind when the boat is left unattended.

Take good care of your boat and take the time to learn and practice good seamanship.

PREFACE

This manual is intended and supplied to help owners of Capri sailboats understand their boats and answer common questions about maintenance and systems design specific to Capri sailboats.

This manual is not intended to provide sailing instructions. It is assumed the operator will consult books written for that purpose, or take sailing lessons or courses to gain the knowledge necessary for the safe operation of the vessel.

The systems descriptions and illustrations in this manual apply to boats built at the time of publication. Our policy of constant improvement necessitates that changes have been made to the Capri sailboat since its introduction. Therefore, these illustrations and descriptions may not apply to boats built before the time of publication.

Owners of earlier hulls, who have questions not answered herein, should consult their local Capri dealer, or write to the builder. Please include your hull number in all correspondence.

The maintenance checklists contained within this manual are intended as guidelines for boats in normal service under typical conditions.

Climate and use will vary and may require additional or special maintenance. Consult with you local boat yard or Catalina dealer for specific maintenance and precautions recommended for your purposes and climate.

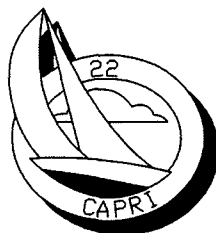
AN IMPORTANT WORD OF CAUTION: *The aluminum and other metal parts conduct electricity. Coming in contact with or near an electrical power line or lightning can cause severe injury or death. Stay away from overhead electrical power lines when sailing and/or launching the boat.*

INDEX

1.0	SPECIFICATIONS	
1.1	Owner's Record.....	5
1.2	Reference Data Sheet.....	6
2.0	COMMISSIONING CHECK LIST	
2.1	Wing Keel Model.....	7
2.2	Pre-Launch Check List.....	7
2.3	In The Water Check List.....	7
	2.3.1 Electrical.....	7
	2.3.2 Hull and Deck.....	7
	2.3.3 Rigging and Hardware.....	8
2.4	Sailing Check List.....	8
3.0	Yacht Systems	
3.1	Rigging	
	3.1.1 Stepping the Mast.....	9
	3.1.2 Tuning the Mast.....	9-10
	3.1.3 Rigging the Boom	10
	3.1.4 Bending on the Mainsail.....	10-11
	3.1.5 Bending on the Jib.....	11
	3.1.6 Rigging Length Check List	12
	3.1.7 Sail Plan Standard Rig	13
	3.1.8 Sail Plan Tall Rig	14
	3.1.9 Main Sail Reefing.....	15
	3.1.10 Main Sail Reefing Illustration.....	16
	3.1.11 Backstay Tensioner Purchase.....	17
	3.1.12 Mainsheet and Vang Arrangement.....	18
	3.1.13 Spreader Assembly.....	19
	3.1.14 Control Arrangement Racing Package.....	20
	3.1.15 Deck Hardware Standard.....	21
	3.1.16 Deck Hardware Racing.....	22
3.2	Sailing and Docking Tips	
	3.2.1 Hoisting and Setting Sails.....	23
	3.2.2 Positioning The Jib Fairlead Blocks.....	23
	3.2.3 Boom Vang.....	23
	3.2.4 Docking Under Various Conditions.....	23-24
	3.2.5 Points of Sail.....	24-25
	3.2.6 Rules of the Road (Partial List)	25-26
3.3	Electrical	
	3.3.1 Batteries.....	26-27
	3.3.2 12 Volt wiring Diagram.....	28
	3.3.3 Electrical Panel Functions.....	29-30
	3.3.4 Navigation Lights.....	30
3.4	Accommodation	
	3.4.1 Galley Unit, Equipment and Operation	31

3.4.2	Accommodation Plan.....	32
3.4.3	Galley Layout.....	33
3.5	Auxiliary Power	
3.5.1	Recommended Outboard Engine	34
3.5.2	Outboard Bracket.....	34
3.6	Trailering and Launching	
3.6.1	Recommendations for Trailering.....	34-35
3.6.2	Ramp Launching Your Capri Sailboat.....	35-36
3.6.3	Hauling Out Your Capri Sailboat.....	37
4.0	DECOMMISHIONING	
4.1	Winterizing Your Capri 22 Sailboat	
4.1.1	Laying Up.....	37-38
4.1.2	Before Hauling.....	38
4.1.3	After Hauling.....	38-39
4.2	General Notes	39
5.0	MAINTENANCE GUIDE	
5.1	Pre-Use Maintenance.....	40
5.2	Monthly Maintenance.....	40
5.3	Seasonal Maintenance.....	40-41
5.4	Fiberglass Maintenance and Repair.....	41
5.4.1	Fiberglass Touch-Up and Repair.....	42-43
5.5	Bottom Painting and Preparation.....	43
5.6	Teak Maintenance	44
5.7	Spar Maintenance	
5.7.1	Standing Rigging.....	44
5.7.2	Fittings.....	44
5.7.3	Spars.....	45
5.8	Sail Maintenance	45-46
5.9	Interior Cushions, Fabric Covers	46
6.0	OWNER-USER RESPONSIBILITY	
6.1	General Safety Tips.....	47
6.2	Required Safety Equipment	48
6.3	Suggested Safety Equipment and Safety Package.....	48
6.4	Safety Package, Factory Option	49
6.5	Anchors, Anchoring and Mooring	49
6.6	Lighting Precautions	50

YACHT NAME



REGISTRATION OR DOCUMENTATION N°	PORT OF CALL
DATE OF COMMISSIONING	HULL NUMBER
OWNER'S NAME	OWNER'S ADDRESS

LENGTH OF HULL..... 22'-0" LENGTH WATERLINE..... 20'-0"	DRAFT FIN KEEL 4'-0" DRAFT SHOAL KEEL..... 2'-8"									
BEAM..... 8'-2"	DISPLACEMENT FIN KEEL..... 2200 lbs. DISPLACEMENT SHOAL KEEL..... 2250 lbs.									
FUEL CAPACITY..... MOLDED COMPARTMENT FOR A 6 GAL. TANK	ENGINE MFG. AND MODEL ENGINE SEAL NUMBER									
SAIL AREA (SQ. FT.) <table style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">STD.</td> <td style="text-align: center;">TALL</td> </tr> <tr> <td>MAIN.....</td> <td style="text-align: center;">127</td> <td style="text-align: center;">137</td> </tr> <tr> <td>TOTAL W/ 100% FORETRIANGLE.....</td> <td style="text-align: center;">229</td> <td style="text-align: center;">255</td> </tr> </table>		STD.	TALL	MAIN.....	127	137	TOTAL W/ 100% FORETRIANGLE.....	229	255	INSURANCE COMPANY INSURANCE POLICY NUMBER
	STD.	TALL								
MAIN.....	127	137								
TOTAL W/ 100% FORETRIANGLE.....	229	255								
SAIL NUMBER	RADIO TELEPHONE CALL NUMBER									

Capri 22 Specifications

Rev: 4/6/05

PRINCIPAL DIMENSIONS

Length Over All*	24' 8"	(7.52 m)
Length of Hull	22' 0"	(6.71 m)
L.W.L.	20' 0"	(6.10 m)
BEAM	8' 2"	(2.49 m)

Distance from W/L to masthead:

Std: 31' 3 3/4" (9.54 m)

Tall: 33' 3 3/4" (10.15 m)

Theoretical hull speed 6.0 knots

WING KEEL

Draft	2' 8"	(0.81 m)
Ballast	700 lbs.	(318 kg)
Designed weight	2250 lbs.	(1021 kg)
Disp/Length	125.6	
Sail Area/displ:	Std.: 21.34, Tall: 23.76	

FIN KEEL

Draft	4' 0"	(1.22 m)
Ballast	650 lbs.	(295 kg)
Designed weight	2200 lbs.	(998 kg)
Disp/Length	122.8	
Sail Area/displ:	Std.: 21.66, Tall: 24.12	

STANDARD RIG

Mainsail, Rated:	127 ft ²	(11.80 m ²)
Total w/100%		
Foretriangle:	229 ft ²	(21.27 m ²)
I =	25' - 0"	(7.62 m)
J =	8' - 2"	(2.49 m)
P =	26' - 0"	(7.92 m)
E =	9' - 9"	(2.97 m)

TALL RIG

Mainsail, Rated:	137 ft ²	(12.72 m ²)
Total w/100%		
Foretriangle:	255 ft ²	(23.69 m ²)
I =	29' - 0"	(8.84 m)
J =	8' - 2"	(2.49 m)
P =	28' - 0"	(8.53 m)
E =	9' - 9"	(2.97 m)

* Length of rudder included.

TANKAGE AND CAPACITIES

Ice Box:	48 Quart	(0.05 m ³)
Fuel: capacity for	6 Gal.	(22.7 lt.) Portable
Holding:	Porta-Potty	
Berths:	4 Adults.	

HEADROOM

Max: 4' 2" (1.27 m)

ENGINE AND CONTROLS

(Recommended) 4-10 HP Outboard

RIGGING

Single Spreaders

Shrouds:

Upper 5/32" (0.40 cm) wire 1x19

Lower 1/8" (0.32 cm) wire 1x19

Forestay 5/32" (0.04 cm) wire 1x19

Backstay 5/32" (0.04 cm) wire 1x19

Rope Halyards 5/16" (0.79 cm), Low Stretch, led aft.

Boom Vang, Block and tackle.

RATINGS

PHRF (May vary by area) 210 Typical.

ALL SPECIFICATIONS ARE APPROXIMATE

Note: Specifications And Or Equipment Subject To Change Without Notice.

2.0 COMMISSIONING CHECK LIST

2.1 WING KEEL MODEL

The Capri 22 is available with a wing keel option. The wing keel decreases the draft by approximately 1' 4" and increases ballast weight by approximately 50 lbs. The intent of the wing keel design is to increase the effectiveness of the keel foil and improve performance to weather. It also increases the stability by the addition of weight and the effect of the wing shape in the water.

Generally wing keel boats tend to be stiffer, resist heeling, and are more stable both at anchor and underway.

Wing keels tend to turn more quickly than fin keels, however you should not tack so quickly as to lose flow over the keel and cause excessive leeway.

2.2 PRE-LAUNCH CHECK LIST:

1. _____ Antifouling paint applied if required.
2. _____ Hull sides clean, gel coat OK.
3. _____ Decks clean.
4. _____ Teak cleaned and oiled.
5. _____ Interior finished, oiled, and clean.
6. _____ Cushions, galley – clean and in place.
7. _____ Hatch lids present and fit OK.
8. _____ Lifelines and pulpits rigged and OK.
9. _____ Spreaders taped and drilled at base end; upper shroud wired to tip end and taped.
10. _____ Standing rigging pinned to mast.
11. _____ Rigging lengths verified with checklist in kit.
12. _____ Mast boom inspected; cotter pins, sheaves, tangs, and spreaders OK.
13. _____ Check overhead for electrical wires that may interfere with the space required to raise the mast to its full upright position. If there are wires of any kind, anywhere near the boat, do not raise the mast. Move boat to another location, away from any wires. Contact with wire can be fatal.

2.3 WATER CHECK:

2.3.1 ELECTRICAL

1. _____ Electrical equipment operational:
_____ Running _____ Cabin _____ Master Panel
2. _____ Check battery hold down.
3. _____ Check battery fluid level.
4. _____ Check battery terminals for tightness.

2.3.2 HULL AND DECK

1. _____ Main hatch: no leaks, slides freely; hatch boards fit OK.
2. _____ Cabin windows, hose tested for leaks.
3. _____ Forward hatch, hose tested for leaks.

2.3.3 RIGGING AND HARDWARE

1. _____ Mast stepped.
2. _____ Pin, tape, and tune standing rigging.
3. _____ Backstay adjuster, boom vang (if required).
4. _____ Blocks, cars, cleats rigged, OK.
5. _____ Test winches; winch handle present.

2.4 SAILING CHECK LIST

1. _____ Tiller moves freely, 45 degrees minimum, to each side of center line.
2. _____ Sails and halyards, OK.
3. _____ Boat performance under sail, OK.
4. _____ All accessory equipment operates, OK.
5. _____ All boat, engine, and accessory literature and/or manuals aboard.
6. _____ Warranty cards completed and mailed, owner registration card attached,
owner informed of warranty responsibilities.

3.0 YACHT SYSTEMS

3.1 RIGGING:

3.1.1 STEPPING THE MAST:

CAUTION: The aluminum and other metal parts conduct electricity. Coming into contact with or near an electrical power line or lightning can cause severe injury or death. Stay away from overhead electrical power lines when sailing and/or launching the boat.

When trailering your boat, always try to undo as little rigging as possible. It is necessary only to detach the forestay before lowering the mast.

1. Before raising the mast, make sure halyards are neatly tied down and that they are on proper sides of the spreaders. You should never attempt to raise the mast unless the upper shrouds (those that pass over the spreaders) and the aft lower shrouds are attached to the deck fittings and the turnbuckles are well “started” into their barrels. The turnbuckles must not be completely tightened, however, because slack is needed in the shrouds to enable the mast to be fully raised. The backstay should be attached to the transom chain plate. The upper shrouds, aft lower shrouds, and backstay will keep the mast from falling over when it is raised, therefore, all of these must be attached to the chain plates before the mast is raised.
2. Make sure that the shrouds and stays are not fouled. Backstay should lie clear of the transom. You may step the mast on land or while the boat is in the water. It seems to be easier on land because the boat is more stable. Also, it keeps other sailors from getting impatient while they wait for you to move out of the launch area.
3. Walk the mast aft and drop the mast foot into the mast step located on top of the deck, keeping the mast in centerline of boat, insert the pivot bolt and locking nut.
4. One crew member should pull on a line tied securely to the forestay while another pushes up on the mast and walks from the cockpit forward. With the mast erect, attach the forestay.

3.1.2 TUNING THE MAST:

Your mast is held aloft by the standing rigging (forestay, backstay, upper shrouds, and aft, lower shrouds). The term “tuning” refers to adjustment of the standing rigging so that the mast remains “in column” (not

bent) when under load. This is accomplished by following the procedure outlined below:

AT THE DOCK:

1. Adjust forestay and backstay so that the mast is straight up and down. Tie a bolt to a 6 to 7 foot long piece of light line to make a quick plumb bob, and tape the free end of the line to the front of the mast as high up as you can reach. This device will help you to determine whether the mast is perpendicular or not. Otherwise, sight your mast with a corner of a building.
2. Adjust the upper shrouds so that the mast is deflected forward at the spreaders, approximately 3 inches. This is called "prebend". The mast should not be deflected sideways or athwartship.
3. The upper shrouds should be firm. A 50 pound push should deflect the upper shroud about 1" at shoulder height.
4. The aft lower shrouds (2 of them) should be adjusted so that they are tighter than the upper shrouds. The lowers shrouds should be tensioned equally until the middle of the mast is pulled aft to reduce the prebend to 1-1½". The dynamic tension created by the spreaders pushing the middle of the mast forward and the lower shrouds pulling the middle of the mast aft, stabilize the mast and prevent "pumping" or excessive movement of the middle of the mast fore and aft, when sailing.

3.1.3 RIGGING THE BOOM

1. Attach the mainsheet block with becket to the "outboard" or aft end of the boom.
2. Shackle mainsheet fiddle block with cam-cleat to the backstay traveler.
3. "Dead-end" tie the mainsheet to the becket on the block on the boom and then "reeve" the mainsheet by passing the line back and forth through the fiddle block pulleys and the block pulley. Tie a "figure eight" knot at end of mainsheet to keep from losing the end of mainsheet while under sail.

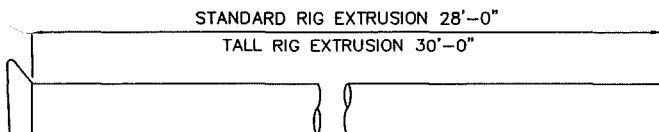
3.1.4 BENDING ON THE MAINSAIL

1. Feed the clew of the mainsail into the groove on the boom starting at gooseneck fitting and pulling out the end of boom. This is much easier if done by two persons, one feeding and the other pulling out.
2. Insert tack pin at the gooseneck fitting, passing the pin through the sail's grommet. Release the outhaul line (starboard, aft clam cleat underside of boom) and attach the outhaul shackle to the clew (aft end) of the sail. Pull in the line to remove wrinkles and re-cleat.

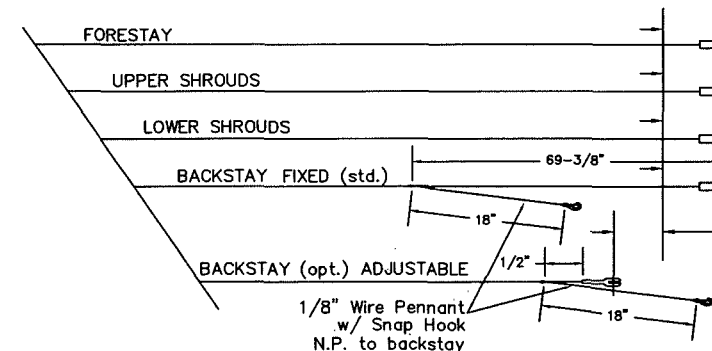
3. Insert the battens noting that the battens are different lengths. The correct battens must be used, shorter ones at the head and longer ones at the foot of the sail.
4. Shackle headboard of the mainsail to the halyard. Look aloft to ensure that halyard is not fouled.
5. Start headboard sail slug and insert all slugs under in the correct order, pushing the sail up the mast slightly as you go. Insert the stop in the track after all the sail slugs have been inserted. Secure the stop in place on the mast just above the sail feed slot in the mast. With the stop in place the sail can be lowered or reefed without the slugs coming out of the track on the mast. Sail is now ready for hoisting.

3.1.5 BENDING ON THE JIB

1. Find tack of sail – this is the forward lower corner of jib. Fasten the sail to the stem fitting at the bow using a shackle.
2. Connect jib to forestay by starting at the bottom snap and working up to the top snap in sequence.
3. Shackle head of jib to rope halyard, again sighting aloft to ensure that halyard is running clear and not wrapped around the forestay or spreader.
4. Find middle of jib sheet line and attach the jib sheet lines to the clew of the jib sail. Run the jib sheet lines back to the cockpit keeping them outside of the shrouds. Pass the ends of the jib sheets through the jib fairlead blocks that have been previously attached to the tracks that are located on the cabin top of the boat. Tie figure-eight stopping knots in the ends of the jib sheets to keep them from pulling through the blocks when you tack.
5. Boats equipped with the factory-supplied roller furling gear for the jib, should read all instructions supplied with the furling gear, before operating the furling unit. The sail will sheet to the cabin top in the normal fashion.
6. The optional genoa will sheet to the tracks on the cockpit coaming. The sheets should lead around the shrouds to the blocks on the tracks and aft to the optional winches, figure-eight knots in the ends of the sheets are recommended.



CHECK OVERHANG LENGTHS BEFORE STEPPING



STANDARD	TALL	TOP FITTING	BOTTOM FITTING
1'-4 1/2"		T-BOLT	5/16" STUD
0'-5 1/4"		T-BOLT	5/16" STUD
0'-6"		T-BOLT	1/4" STUD
3' - 3 5/8"		EYE 5/16" PIN	5/16" STUD
1'-7"		EYE 5/16" PIN	FORK 1/4" PIN

RUNNING RIGGING

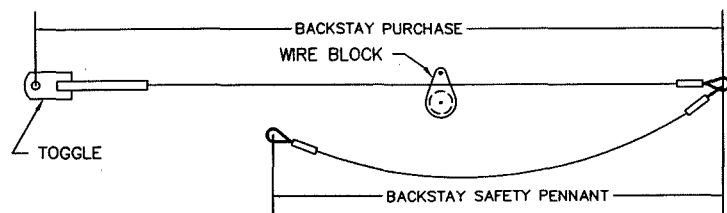
DESCRIPTION	MATERIAL	LENGTH	QTY.
SPINN TOPPING LIFT (Performance Opt.)	5/16" LOW STRCH	40' 0"	1
BACKSTAY ADJUSTER LINE (Perf. Opt.)	1/4" DACRON	17' 0"	1
REEFING LINE (on boom)	1/4" DACRON	23' 0"	2
BOOM VANG LINE	5/16" DACRON	28' 0"	1
FOREGUY (Performance Option)	5/16" DACRON	25' 0"	1
GENOA SHEET (150% Genoa Option)	3/8" DACRON	55' 0"	1
JIB SHEET (135% Std.) (delete w/ 150 Opt.)	3/8" DACRON	40' 0"	1
TRAVELER CONTROL LINES	1/4" DACRON	13' 0"	2
SPINNAKER SHEET (Performance Option)	5/16" DACRON	50' 0"	2
MAINSHEET	3/8" DACRON	45' 0"	1
OUTHHAUL (on boom)	1/4" DACRON	20' 0"	1
CUNNINGHAM	1/4" DACRON	10' 0"	1
CUNNINGHAM-REEFING LINE	1/4" DACRON	8' 0"	1

STANDING RIGGING

DESCRIPTION	MATERIAL	LENGTH		QTY.
		STD.	TALL	
BACKSTAY FIXED	5/32" WIRE 1x19	31'-5 5/8"	32'-11 3/8"	1
BACKSTAY ADJUSTABLE (opt.)	5/32" WIRE 1x19	26'-6"	27'-9"	1
FORESTAY	5/32" WIRE 1x19	25'-5"	29'-5 3/4"	1
UPPER SHROUDS	5/32" WIRE 1x19	24'-2 1/2"	28'-2 3/4"	2
LOWER SHROUDS	1/8" WIRE 1x19	12'-5 1/2"	14'-4 1/2"	2
BACKSTAY PURCHASE (opt.)	5/32" WIRE 7x19	7'-8"	7'-8"	1
B.S. SAFETY PENNANT (opt.)	1/8" WIRE 1x19 P.C.	3'-9"	3'-9"	1

HALYARDS

DESCRIPTION	MATERIAL	LENGTH		QTY.
		STD.	TALL	
MAINSAIL HALYARD	5/16" LOW STRETCH	64'-0"	70'-0"	1
JIB HALYARD	5/16" LOW STRETCH	57'-0"	61'-0"	1
SPINNAKER HALYARD (Perf. Opt.)	1/4" LOW STRETCH	60'-0"	64'-0"	1



NOTES: 1) TOLERANCES $\pm 1/2"$

2) MEASUREMENTS FROM CENTER OF EYE TO CENTER OF EYE OR END OF STUD

REV. 18 : FURLING LINE DELETED FOR CDI FF2 FURLING 6/28/04
 REV. 17 : B.S. ADJ. LINE TO 1/4" x 17' was 5/16" x 28' 1/19/04
 REV. 16 : BACKSTAY ADJUSTER LINE TO 5/16" was 3/8" 11/17/03
 REV. 15 : ADDED FURLING LINE FOR SCHAEFER SNAP FURLING HULLS 1032 + 5/15/03
 REV. 14 : LABELED LINES FOR OPTIONS 8.16.02
 REV. 13 : (2) TRAVELER LINES 13' WAS 8' 7.26.02 HULL# 996 - UP
 REV. 12 : (2) REEFING LINES 23' WAS 1X17', OUTHHAUL WAS 4'. 8.21.01

CAPRI Sailboats

21200 VICTORY BLVD.
 WOODLAND HILLS, CA.
 91367-(818)884-7700

SCALE: NONE

APPROVED BY:

DRAWN BY

DATE: 10-22-91

DANIEL CASAL

TITLE:

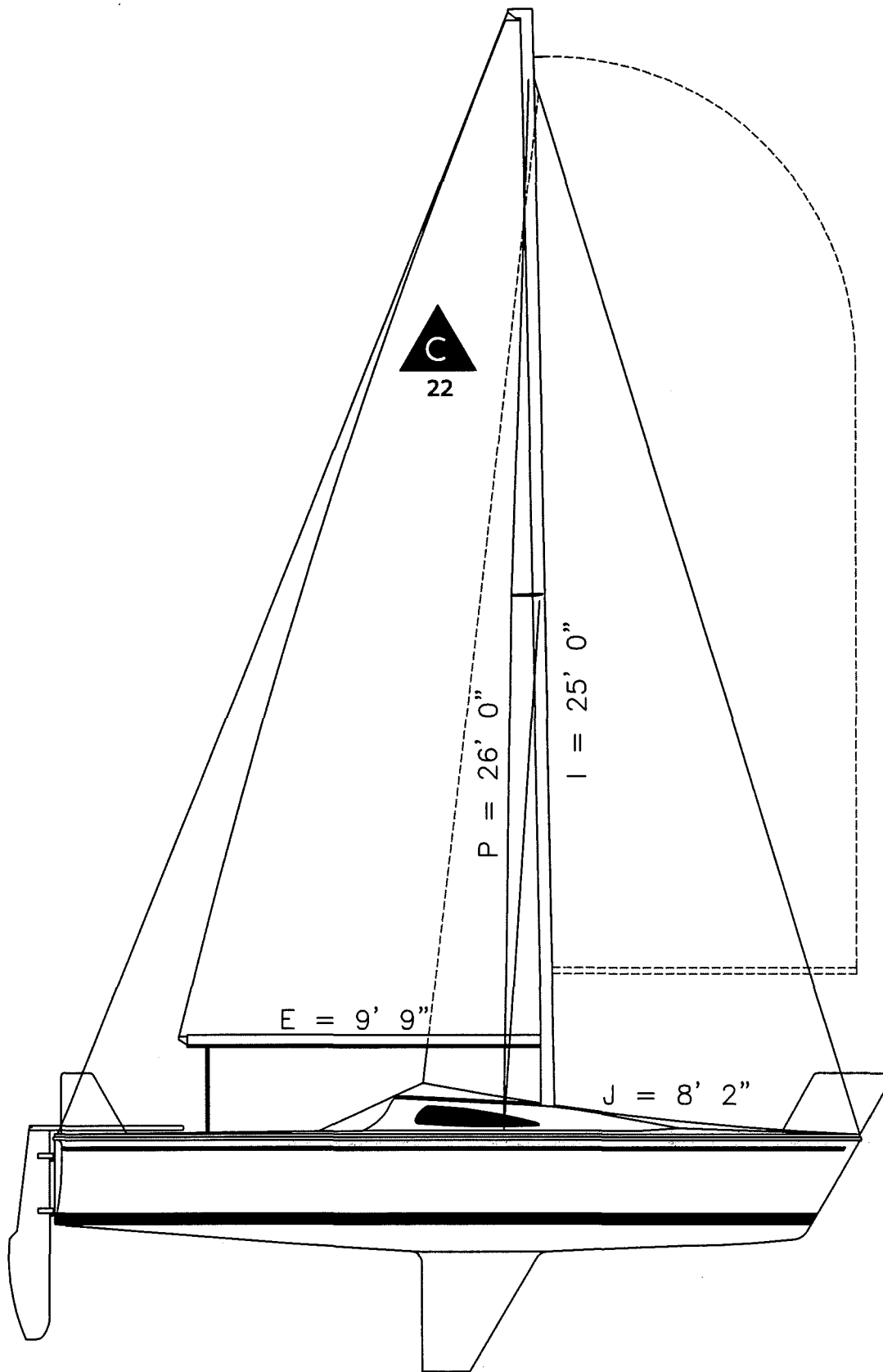
RIGGING LENGTH

BOAT:

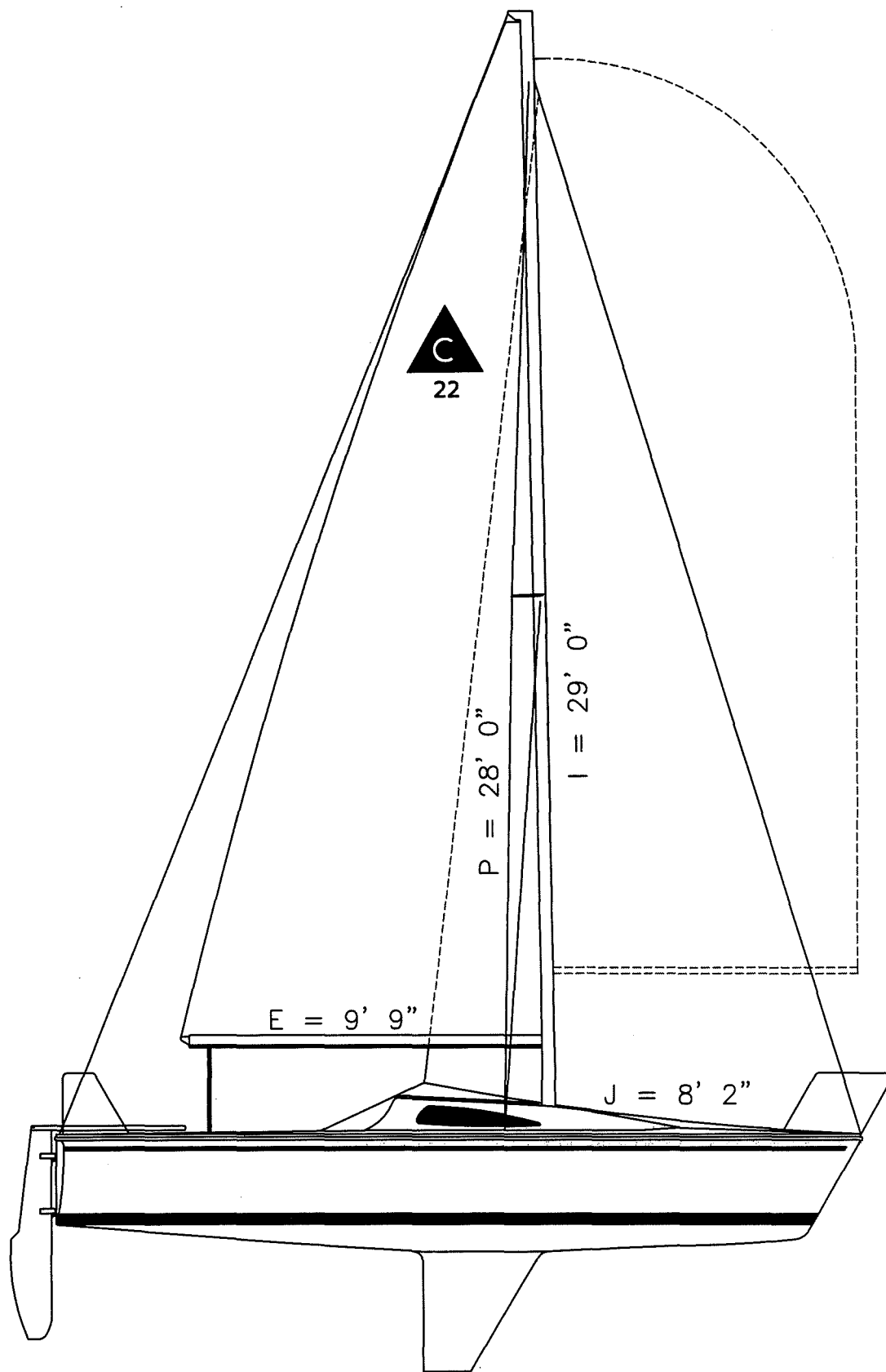
CAPRI 22

DRAWING NUMBER

220-34001-18



3.1.7 SAIL PLAN STANDARD RIG



3.1.8 SAIL PLAN TALL RIG

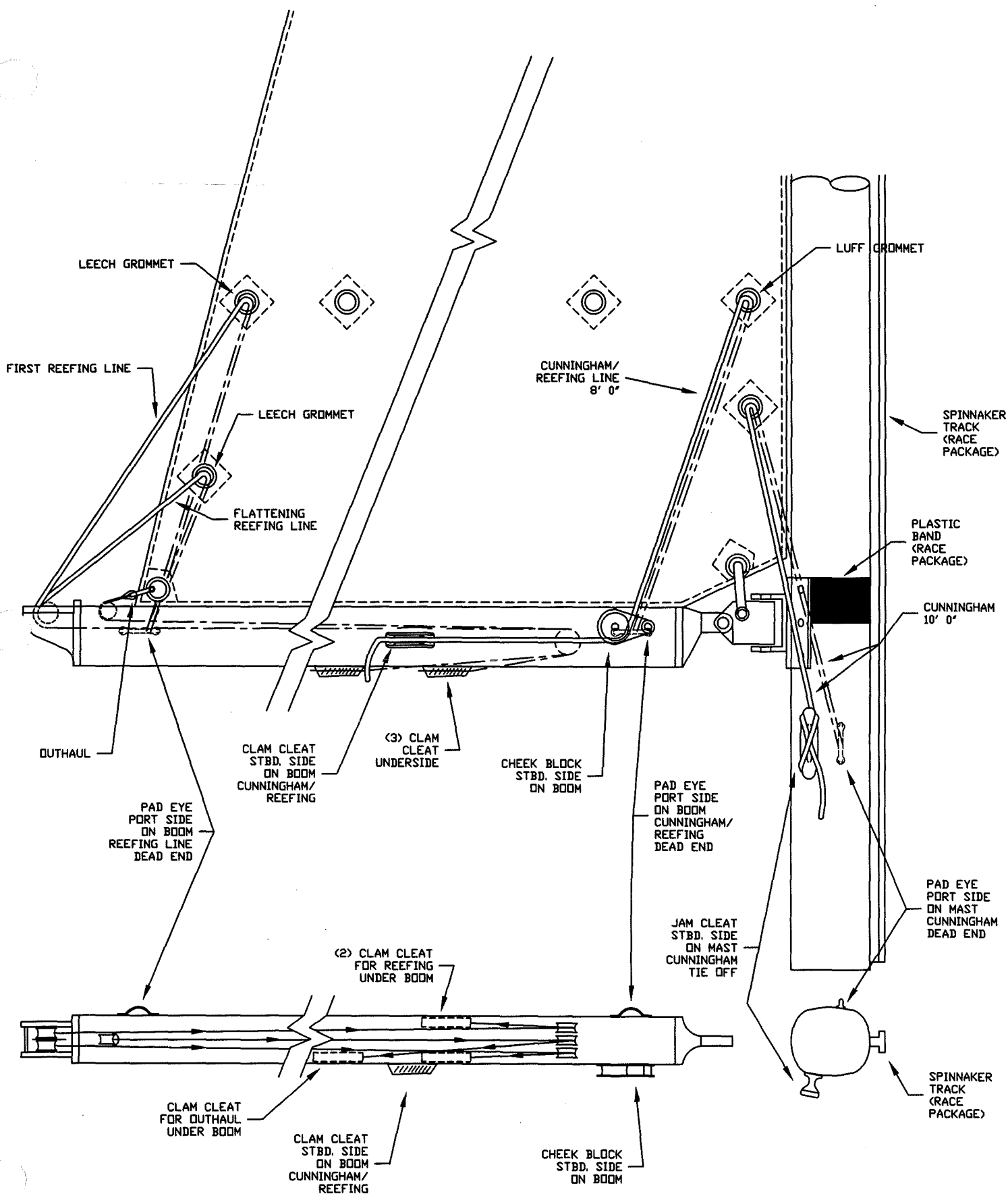
3.1.9 MAIN SAIL REEFING

Reefing should always be done before it becomes necessary. Some sailors use the rule of thumb that, if the thought of reefing occurs to you, it is time to reef. Sailing at extreme angles of heel – 25 degrees or more – is not efficient, fast, or comfortable.

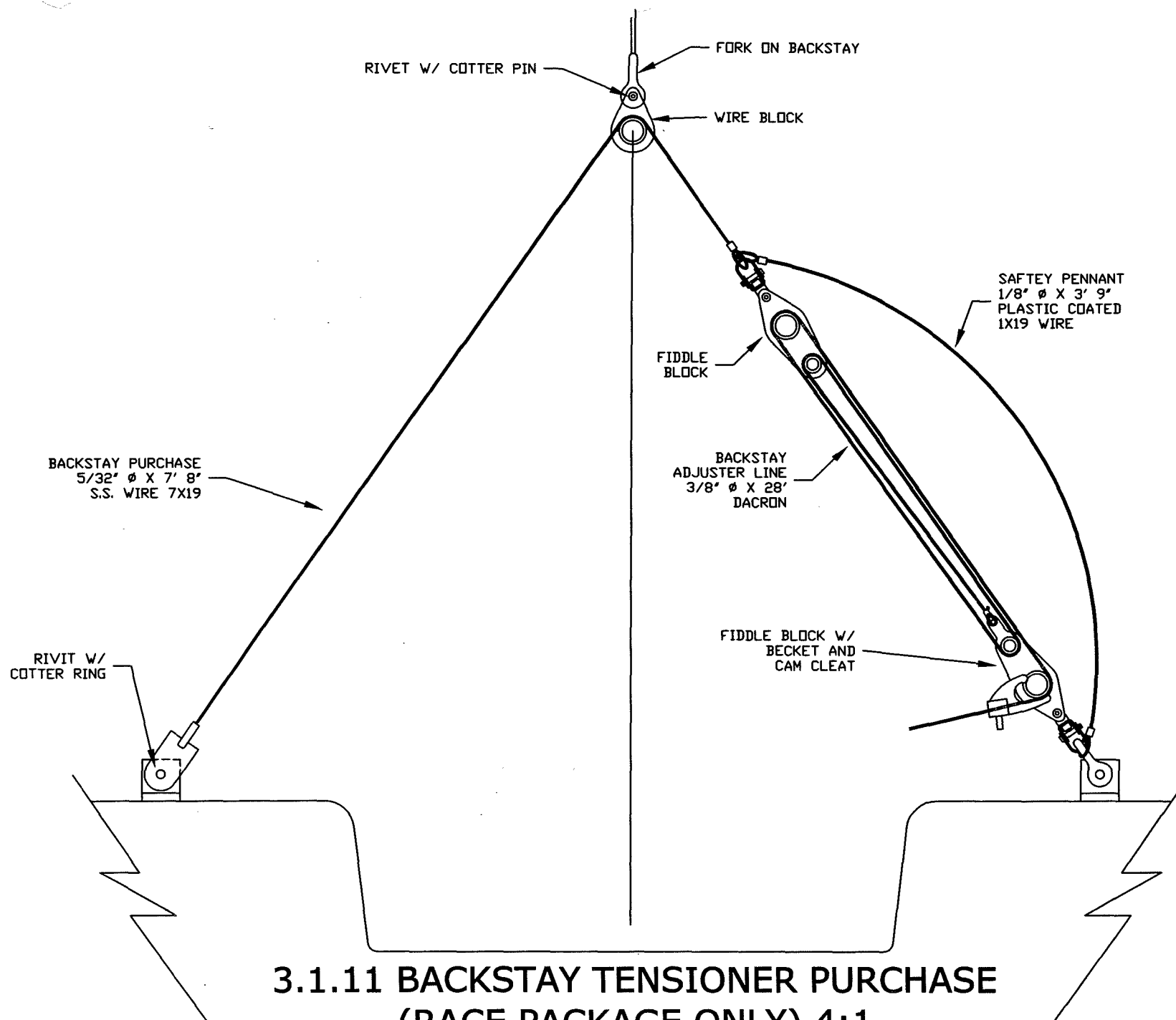
Run the reefing lines provided through the cringles (grommets) in the luff and leech of the main sail in preparation for reefing. Per illustration 3.1.10 Mainsail Reefing, one crew stationed in the cockpit and one crew at the mast is recommended for fast, safe reefing.

REEFING PROCEDURE:

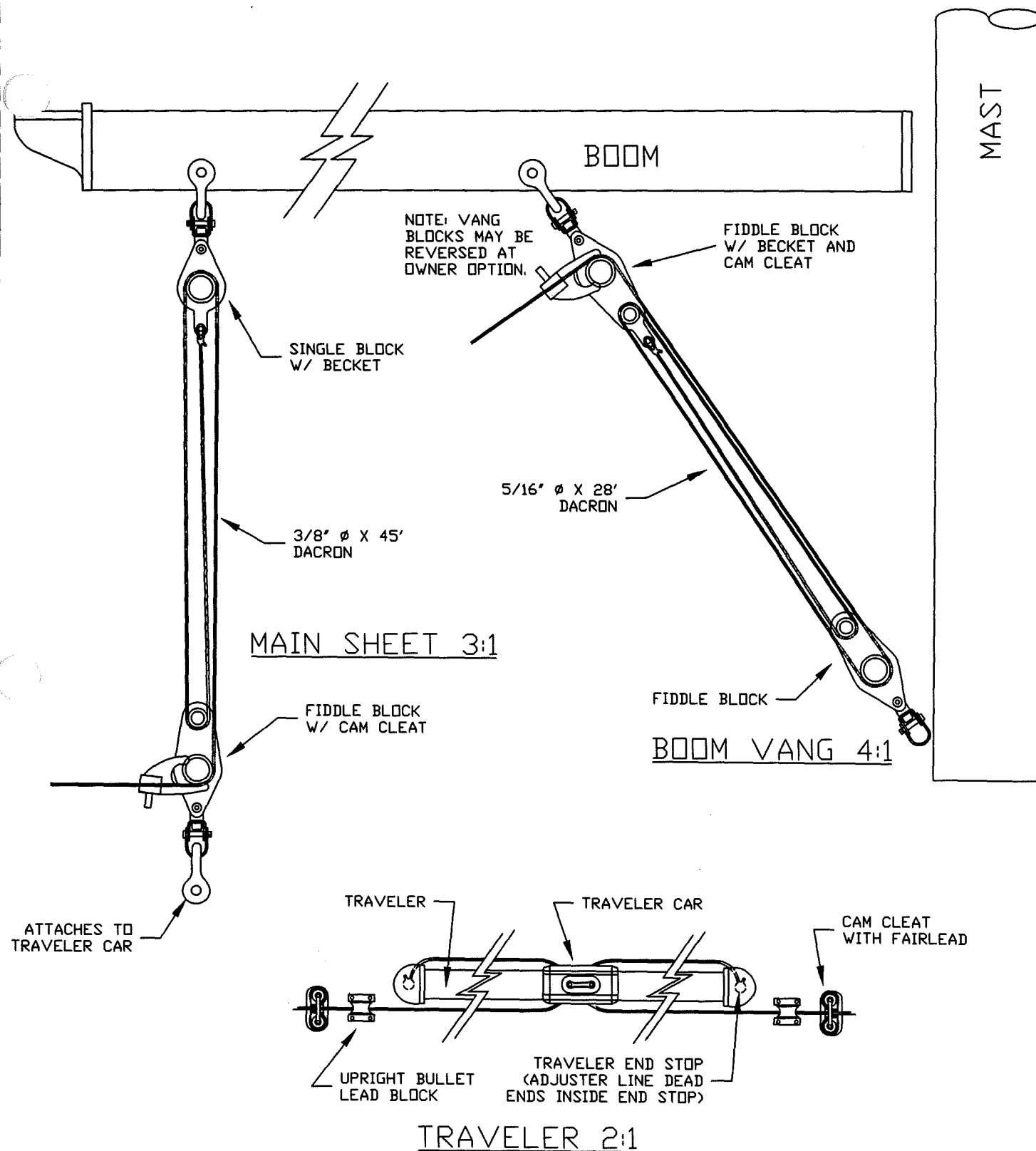
1. Point the boat into the wind so that the main sail is luffing and the end of the boom is over the cockpit.
2. Release the main halyards to a predetermined point. Marking the halyard with ink or a colored thread woven into the line is helpful. Re-cleat the halyard after lowering.
3. Pull the luff grommet down to the gooseneck by pulling the luff reefing line through the cheek block on the starboard side of the boom. A 2:1 purchase is created on the luff. Cleat the luff reefing line in the clam cleat on the starboard side when the grommet meets the gooseneck.
4. Ease the mainsheet.
5. Pull the leech grommet down to the boom by pulling the leach reefing line on the starboard side of the boom, and make the line fast.
6. Trim in the mainsheet.
7. Snug up the main halyard, as required, to flatten out the main sail.



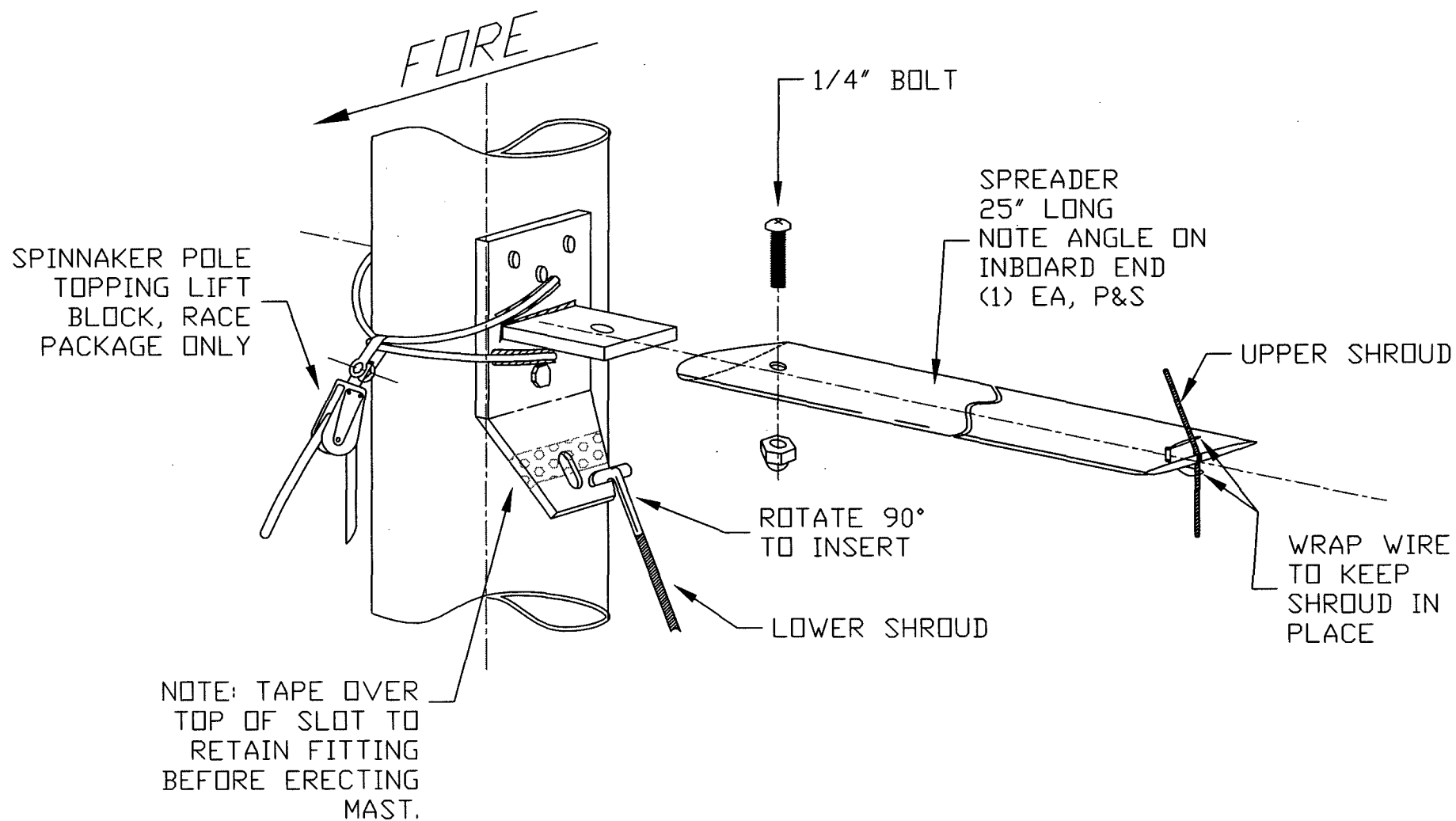
3.1.10 MAINSAIL REEFING



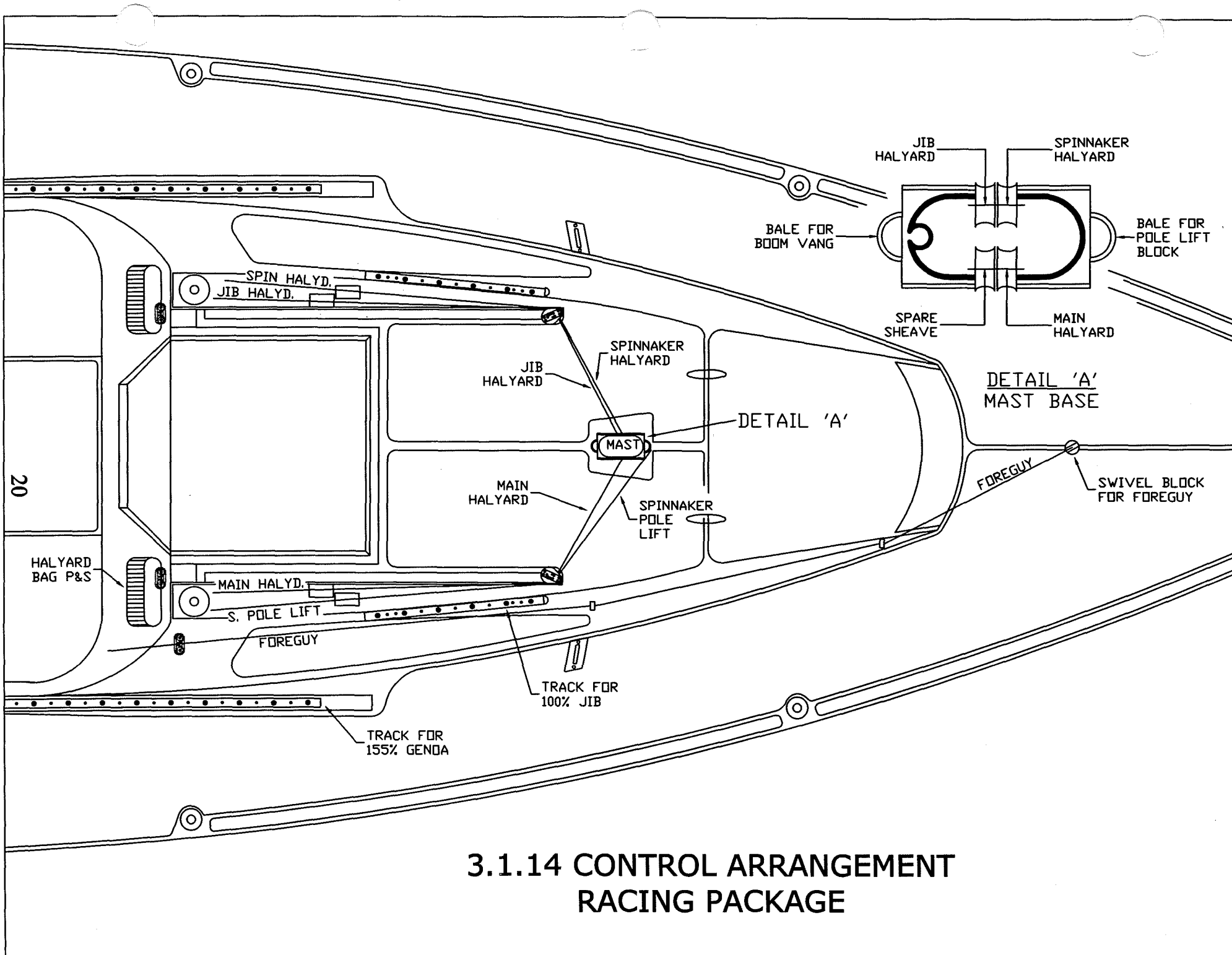
**3.1.11 BACKSTAY TENSIONER PURCHASE
(RACE PACKAGE ONLY) 4:1**

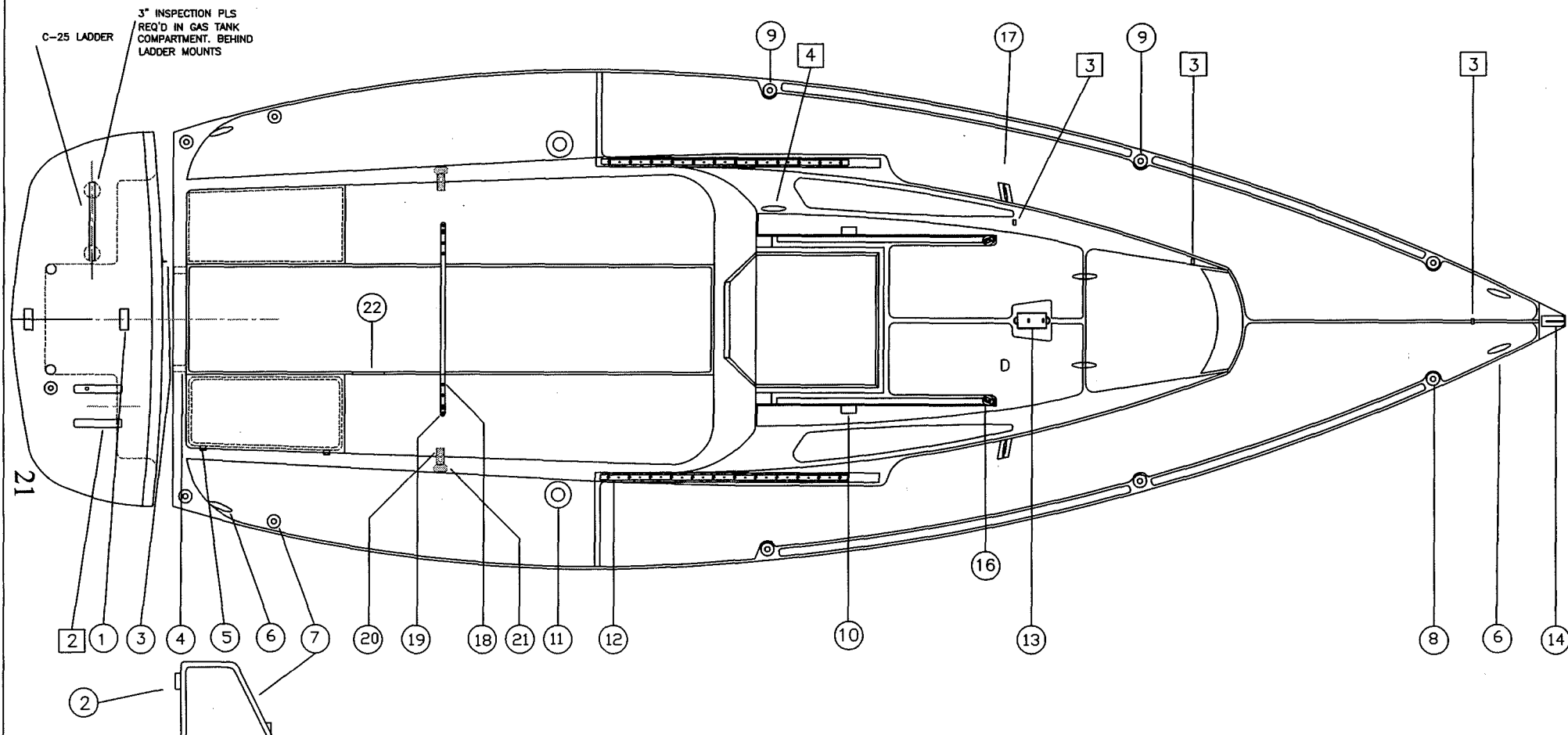


3.1.12 MAINSHEET, TRAVELER, AND VANG ARRANGEMENT



3.1.13 SPREADER ASSEMBLY





○ = STANDARD PACKAGE

1. GUDGEON (2)
2. STERN LIGHT, STBD. SIDE
3. CHAINPLATE (PORT SIDE ONLY)
4. COCKPIT DRAINS, P&S
5. HINGE (2) EACH, P&S
6. 6" CLEAT, P&S (4) TOTAL
7. STERN LOOP, P&S
8. BOW PULPIT
9. 18" 0°DEGREE SINGLE STANCHION (4) TOTAL
10. HALYARD CLEAT, P&S
11. WINCH, PRIMARY PER SCHEDULE, P&S

12. 47" TRACK, P&S W/CARS
13. MAST STEP S.S
14. STEMHEAD WELDMENT
16. SINGLE CHEEK BLOCK, PORT & STBD.
17. CHAINPLATE, P&S
18. 32"TRAVELER W/CAR
19. TRAVELER END STOP, PORT & STBD.
20. BLOCK, BULLET LEAD, UPRIGHT, P&S
21. CLEAT, CAM W/FAIRLEAD, PORT AND STBD.
22. MANUAL BILGE PUMP W/THRU DECK HANDLE

□ = DECK HARDWARE, MISC OPTIONAL

2. OUTBOARD BRACKET (SAME AS CAPRI 25)
- HEADSAIL FURLING GEAR
3. PLASTIC FAIRLEADS, SCREW FASTEN (3) REQ'D
4. ALUM JAMB CLEAT 4-1/2"

PROPRIETARY INFORMATION
THE DESIGNS, INFORMATION, AND DATA CONTAINED HEREIN ARE PROPRIETARY AND ARE SUBMITTED IN CONFIDENCE, AND SHALL NOT BE DISCLOSED, USED, OR DUPLICATED, IN WHOLE OR IN PART, FOR ANY PURPOSES WHATSOEVER, WITHOUT THE PRIOR WRITTEN PERMISSION OF CATALINA YACHTS, 21200 VICTORY BLVD., WOODLAND HILLS, CALIFORNIA 91367. THIS LEGEND SHALL BE MARKED ON ANY REPRODUCTIONS HEREOF IN WHOLE OR IN PART. RECEIPT OF THIS DOCUMENT SHALL BE DEEMED TO BE AN ACCEPTANCE OF THE CONDITIONS SPECIFIED HEREIN.

Catalina Yachts

21200 VICTORY BLVD.
WOODLAND HILLS, CA.
91367-(818)884-7700

SCALE: NONE

APPROVED BY:

DRAWN BY

E.W.S

DATE: 5/26/00

REVISED 12/4/03

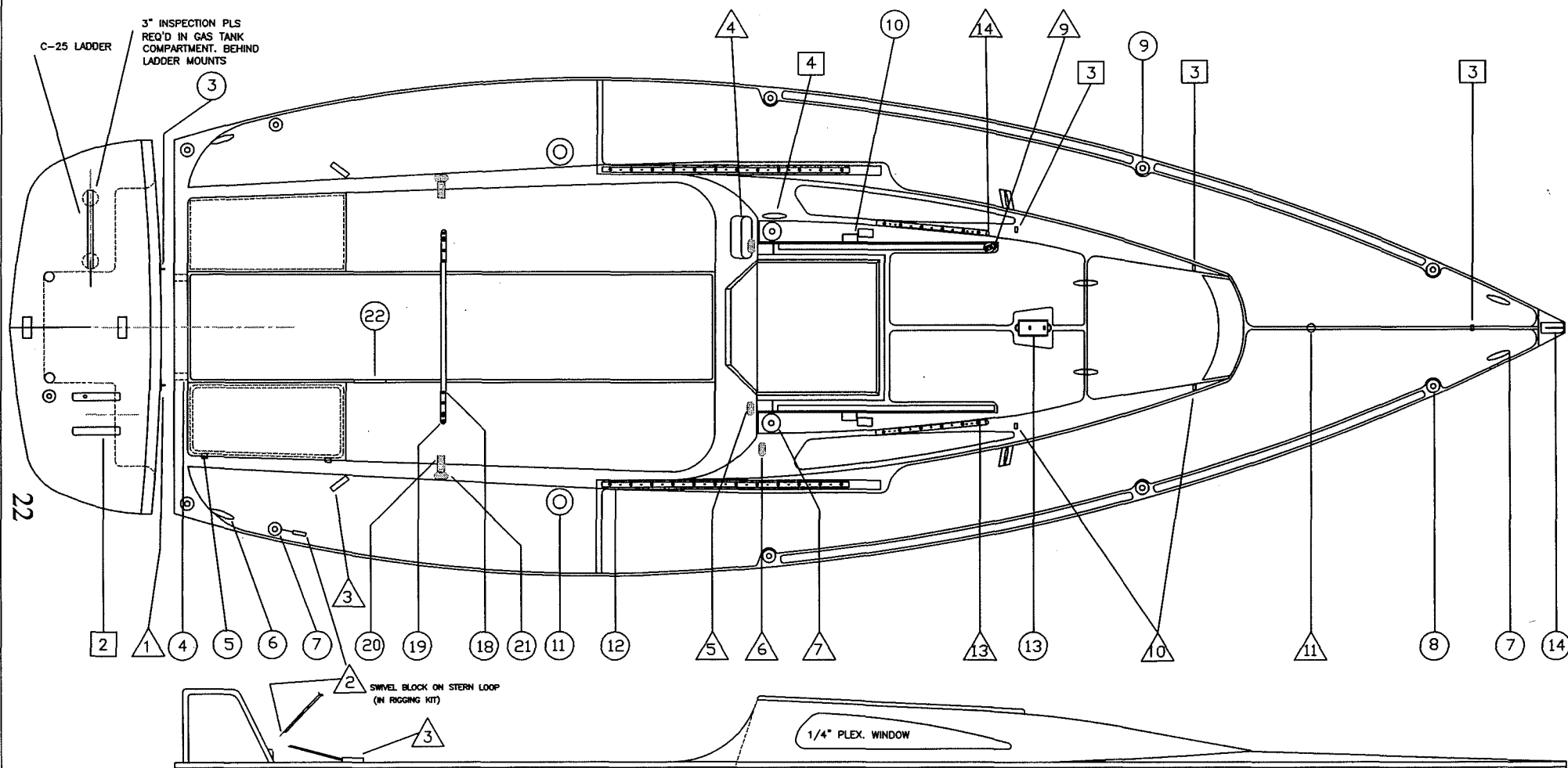
DECK PLAN STANDARD

BOAT:

CAPRI-22 II (NEW)

DRAWING NUMBER

222-24002-2



○ = STANDARD PACKAGE

1. GUDGEON (2)
2. STERN LIGHT
3. CHAINPLATE (PORT SIDE ONLY)
4. COCKPIT DRAINS, P&S
5. HINGE (2) EACH, P&S
6. 6\" CLEAT, P&S (4)
7. STERN LOOP, P&S
8. BOW PULPIT
9. 18\" 0\"DEGREE SINGLE STANCHION (4) TOTAL
10. HALYARD CLEATS
11. WINCH, PRIMARY PER SCHEDULE, P&S
12. 47\" TRACK, P&S W/CARS
13. MAST STEP S.S.
14. STEMHEAD WELDMENT
15. 5\" BLACK ALUM. JAMB CLEAT, P&S*
16. SINGLE CHEEK BLOCK, P&S
17. CHAINPLATE, P&S
18. 32\"TRAVELER W/CAR
19. TRAVELER END STOP, P&S
20. BLOCK, BULLET LEAD, UPRIGHT, P&S
21. CLEAT, CAM W/FAIRLEAD, P&S

22. MANUAL BILGE PUMP W/ THRU DECK HANDLE

△ = RACING PACKAGE

1. B.S. CHAINPLATE, EYEBOLT, (2) TOTAL W/R.P.
2. SWIVEL BLOCK, P&S, SHACKLE TO STERN LOOP
3. CLAM CLEAT, P&S
4. 8\" X 10\" POCKET W/ (2) FASTENERS, P&S
5. HARKEN CAM CLEAT, P&S
6. CAM CLEAT
7. WINCH, HALYARD, PER SCHEDULE, P&S
8. CLAM CLEAT
9. DOUBLE CHEEK BLOCK, P&S (REPLACES 16)
10. BULLS EYE (2)
11. SWIVEL BLOCK (FOR FOREGUY)
12. MAST STEP, S.S. W/BALES (2)
13. 21 1/4\" TRACK P&S
14. PLASTIC END STOP, P&S

□ = DECK HARDWARE,
MISC. OPTIONAL

2. OUTBOARD BRACKET
- HEADSAIL FURLING GEAR
3. PLASTIC FAIRLEADS, SCREW FASTEN (3) REQ'D
4. ALUM JAMB CLEAT 4-1/2\"

PROPRIETARY INFORMATION
THE DESIGNS, INFORMATION, AND DATA CONTAINED HEREIN ARE PROPRIETARY AND ARE SUBMITTED IN CONFIDENCE, AND SHALL NOT BE DISCLOSED, USED, OR DUPLICATED, IN WHOLE OR IN PART, FOR ANY PURPOSES WHATSOEVER, WITHOUT THE PRIOR WRITTEN PERMISSION OF CATALINA YACHTS, 21200 VICTORY BLVD., WOODLAND HILLS, CALIFORNIA 91367. THIS LEGEND SHALL BE MARKED ON ANY REPRODUCTIONS HEREOF IN WHOLE OR IN PART. RECEIPT OF THIS DOCUMENT SHALL BE DEEMED TO BE AN ACCEPTANCE OF THE CONDITIONS SPECIFIED HEREIN.

Catalina Yachts

21200 VICTORY BLVD.
WOODLAND HILLS, CA.
91367-(818)884-7700

SCALE: NONE

APPROVED BY:

DRAWN BY

E.W.S

DATE: 5/26/00

REVISED

12/4/03

DECK PLAN (RACING PACKAGE)

BOAT:

CAPRI-22 II (NEW)

DRAWING NUMBER

222-24002-2

3.2 SAILING AND DOCKING TIPS

3.2.1 HOISTING AND SETTING SAILS:

1. Always attempt to have your boat head to wind when hoisting sails, even if this involves moving to another spot after launching. If your boat has an outboard, motoring slowly dead to windward while hoisting sail is good seamanship. Be sure to detach the backstay pigtail from the end of the boom before raising the sails. Raise the sails and secure the halyards so that the leading edges of the two sails are smooth and wrinkle or "scallop" free.
2. If leaving the dock under sail, always leave by pushing off with enough FORWARD momentum to allow you to steer and in such a direction that sails will fill after pushing off. Often bystanders will try to help you shove off and then merely shove your boat sideways. This will not allow your sails to fill and soon you will be drifting backwards out of control.

3.2.2 POSITIONING THE JIB FAIRLEAD BLOCKS:

1. When under way, move the jib fairlead block along its track so that neither the foot nor leach (trailing edge) of the sail flutters appreciably. Moving the jib block forward a few inches pulls down on the leech of the sail. Moving the jib block back or aft a few inches pulls the foot of the sail tighter and flatter. Experience can help you find the most efficient setting.

3.2.3 BOOM VANG:

1. If your boat was ordered without a boom vang, make sure you always pull in the excess mainsheet line when you execute a downwind "jibe". Otherwise, the boom can rise up in the air and catch on the backstay. Refer to the illustration in the rigging section of this manual for the boom vang arrangement.

3.2.4 DOCKING UNDER VARIOUS CONDITIONS:

1. There are many docking methods depending upon the wind velocity and dock position relative to the wind direction. You should get advice from experienced local sailors and watch how they dock their boats under varying conditions.
2. Always arrange to come into a dock such that the boat can be easily stopped when you get there. To do this:

- a. Come in under power, in neutral, with no sails up.
 - b. Going slowly with only the jib up, which can be made to luff by releasing the jib sheet.
 - c. Coasting downwind with bare poles onto a downwind dock.
 - d. Or such that both sails can be luffed completely when your boat finally comes to rest beside the dock. "Luffing" means that the sails are shaking harmlessly in the wind and not driving the boat. If you are underway with both main and jib sails raised, always come into a dock headed directly into the wind and with both sails luffing. Otherwise you will ram the dock or your crew may get hurt trying to stop the boat. Always plan it so that the boat will almost coast to a standstill when you reach the dock. If you must come into a leeward or downwind dock, motoring, bare pole coasting, or using JUST A LUFFING JIB will get you in safely.
3. Remind your crew to make sure both his feet are clear before he steps onto the dock and stops the boat by pushing on its gunwales or "railing". He should have ample bow line in his hand while stepping off.
 4. Practice docking with an experienced sailing friend before you take beginners out in your boat that will not yet understand how to help you dock the boat.

3.2.5 POINTS OF SAIL:

1. While underway, you will always be on one of the following "points of sail":

To Weather: The sails are hauled in close and the boat heels as you sail into (across) the wind at about 45 degrees to the direction of its source.

Reaching: The sails are let out about halfway with the boat heeling less than when sailing to weather. You are now sailing across the wind; REACHING is broken down into close, beam, and broad reaching.

Running: The sails are let out all the way with boom nearly touching the shrouds. The jib is often pulled over on the side opposite the side the boom is over in a condition called "wing and wing." The boat sails upright with little or no heeling.

2. You can execute two kinds of turns:

Tacking by Coming About: You turn the boat through the “eye of the wind.” The sails luff or flap briefly, then fill on the opposite side of the boat.

Tacking by A Jibe: You turn away from the source of the wind, the boom is hauled in rapidly, the main sail flips across to the other side and the main sheet is quickly paid out again. (Not to be attempted in strong winds without risk of damaging the rigging.)

3. In general, in light wind let the sails out to get more forward drive and less side slipping. In heavy winds, let out the main sail and spill the wind so that the boat does not heel over excessively. Always ease off the main sail to prevent heeling. The jib must be sheeted in to keep the boat moving. In the event that there is too much wind, stay off the water. If you are caught in too much wind, reduce sail area by reefing or taking down the mainsail and jibsail and motoring.

The key to good sailing in various wind conditions is “balance.” The main sail can be eased off to adjust the boat’s balance. You should never have to push or pull the steering tiller to great extremes in order to keep the boat going straight ahead. You are not balancing the wind pressure on the two sails if this is the case. Ask questions of more experienced sailors and find out how to keep the boat in balance under different kinds of sea and wind conditions. Better yet, enroll in a sailing class, or refer to **Chapman’s Piloting, Seamanship and Small Boat Handling** for a complete list of rules. Become familiar with the rules for safe operation of your boat **before** you leave the dock.

3.2.6 RULES OF THE ROAD (Partial List):

Here are some specific basics from the Rules of the Road that will help to introduce you to them. This is a very partial list and you should investigate the rules as soon as possible.

1. When two sailing vessels approach each other having the wind on opposite sides, the one with the wind from the port side shall avoid the other (starboard tack is privileged). Avoidance maneuvers should be made as soon as possible.
2. When both have the wind from the same side, the windward boat will avoid the other.

3. When overtaking another (including a power craft), the overtaking vessel must keep clear.
4. In all situations IN OPEN WATER, sailing craft are privileged over power craft except when overtaking, or unless the power craft is military or commercial. Common sense dictates that you keep clear of large ships of all types. Never assume the right of way, not all boaters are familiar with the rules of the road, practice them or keep a good look out at all times.
5. In no situation in restricted waters shall a sailboat embarrass a large ship.

3.3 ELECTRICAL:

3.3.1 BATTERIES:

A marine grade 12 volt, deep cycle 85 AMP hour battery, powers your electrical system. Attention should be given to maintaining the proper level of distilled water. Do not overfill. The battery is located in the starboard, transom storage compartment.

The battery is provided with a tie-down to prevent tipping over at extreme angles of heel. Be sure the tie-down is fastened securely.

With proper care, the battery installed in your Capri 22 will provide long and satisfactory service. Proper care is not difficult, if a few basic points are kept in mind:

WARNING:

The electrolyte in a battery is a solution of sulfuric acid. If any should enter the eyes, rinse immediately with large amounts of fresh water and seek medical attention. Electrolyte spilled on skin should be rinsed well with fresh water, also. Even a small amount of electrolyte spilled on clothing will destroy the clothing.

ELECTROLYTE LEVEL:

The electrolyte level in a battery should never be allowed to fall low enough to expose the plates. This not only results in a loss of battery capacity while the battery is low, but will also cause hardening of the active material on the battery plates. This will result in a permanent loss of battery capacity.

CAUTION!

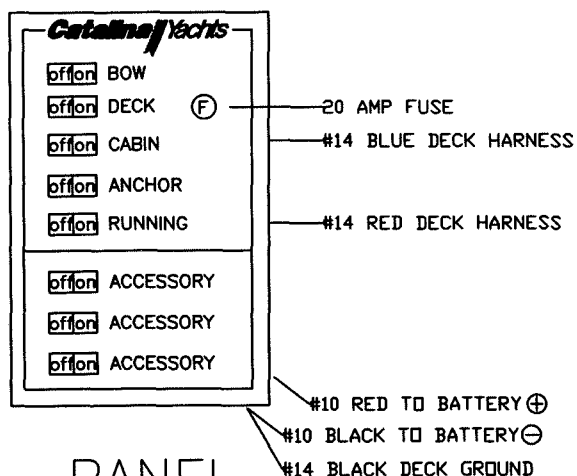
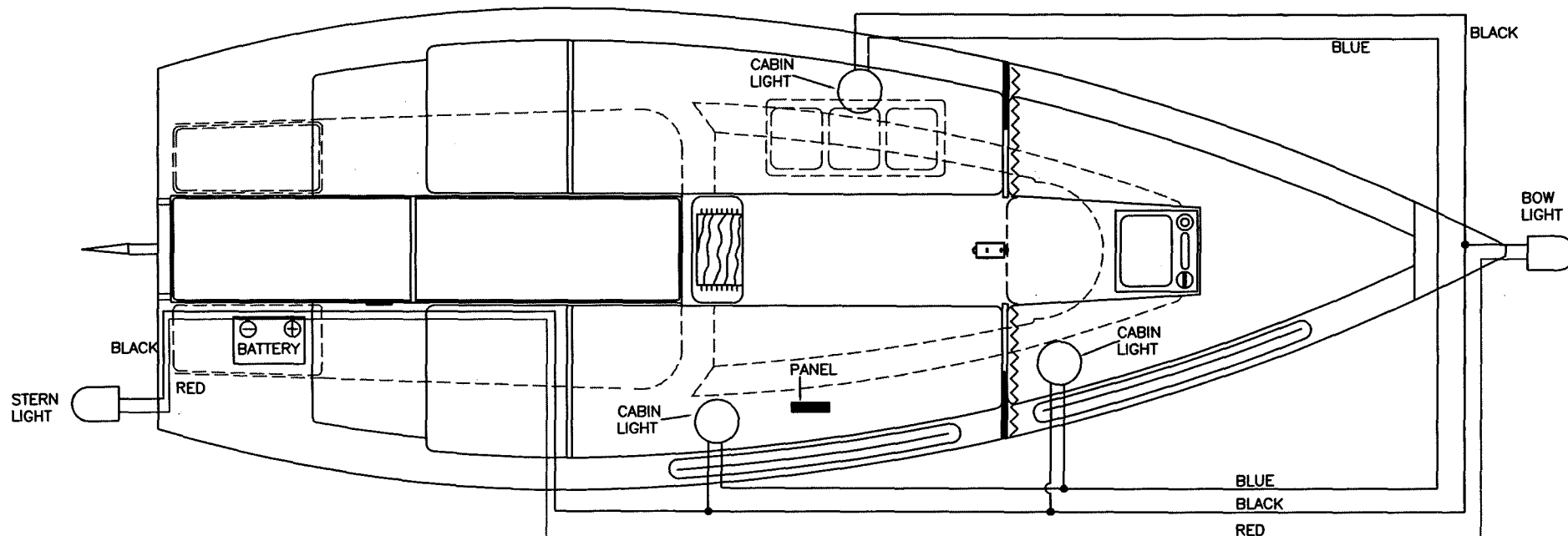
Use only pure distilled water to replenish electrolyte levels. The water from many city water supply systems is unsatisfactory for battery use.

DISCHARGE STATE:

Leaving a battery in a discharged state for any length of time can also result in a permanent loss of capacity for the battery. Doing so, in cold weather, can destroy the battery, since it will freeze at relatively low temperatures.

CLEAN CONNECTIONS:

Keep battery connections clean and tight. A cupful of strong baking soda solution and a toothbrush will clean corrosion from the terminals and neutralize any spilled acid. (Do not allow any of the solution to enter the battery cells.) A coating of petroleum jelly on the battery terminals will inhibit corrosion.



NOTE: BATTERY MUST BE SECURED IN POSITION WHEN TRAILERING OR UNDERWAY.

Catalina Yachts

21200 VICTORY BLVD.
WOODLAND HILLS, CA.
91367-(818)884-7700

SCALE: NONE

APPROVED BY:

DRAWN BY

DATE: 6/27/00

K.W.N.

REVISED

12 VOLT WIRING DIAGRAM

BOAT:

CAPRI 22 II

DRAWING NUMBER

222-60002-1

3.3.3 ELECTRICAL PANEL FUNCTIONS:

The electrical D.C. master panel is located in the cabin on the starboard side of the boat. A removable fiberglass cover prevents accidental contact with live wires, covers the back of the panel. The master switch turns all electrical functions on and off, and should be left in the off position when the boat is not being used.

The functions of the switches are as follows:

BOW LIGHT: Option, Capri 22's with the optional mast lighting have a 225-degree white light installed on the forward face of the mast. This light is for use when under power at night, in conjunction with the "RUNNING LIGHTS" which are operated by a separate switch on the control panel. The "BOW LIGHT" is not required when the boat is being operated under sails only, at night.

DECK LIGHT: Option, Capri 22's with optional mast lighting, have a combination "BOW LIGHT" and "DECK LIGHT" fixture on the forward face of the mast. The "DECK LIGHT" switch turns the deck light on or off. The deck light illuminates the deck when docking or anchoring or picking up a mooring. It is not recommended for use when underway, as the light on the deck will interfere with night vision.

CABIN LIGHTS: Controls power to the three cabin lights mounted under the weather deck above the berth on the port and starboard side. Each fixture has a switch and can be controlled individually.

ANCHOR LIGHT: Option. The anchor light is a single bulb fixture, 360 degree white light at the masthead. The switch on the panel turns the fixture on or off. International rules require an anchor light to be illuminated when a vessel is anchored in negotiable waters. Should your Capri 22 not have a permanently installed anchor light, a portable battery operated light can be hung from the mast when anchored.

RUNNING LIGHT: The running lights are for use when underway, under sail alone, at night. The running lights consist of a combination red (port side) and green (starboard side) single bulb fixture mounted on the bow pulpit and a white 135-degree stern light mounted on the stern rail. The switch on the panel turns both fixtures on or off.

ACCESSORY: The three accessory switches are provided as a convenience to owners who wish to install additional 12-volt equipment. Attaching the negative wire from your optional equipment to the ground stud on the back of the panel and the positive lead to the output side of the switch will allow you to control the power to that accessory through the panel. Any accessories wired through the panel should not exceed

the ampere rating of the 10-gauge wire supplying power to the panel from the battery. Some types of accessories may be wired directly to the 12-volt battery. Check the equipment manufacturer's recommendations for wiring the power connections.

3.3.4 NAVIGATION LIGHTS

Your Capri 22 has as standard equipment, lights which comply with the International Rules for Navigation for vessels powered by sail alone. This consists of a two-color light (red-port side and green-starboard side) on the bow pulpit and a white light on the stern rail. Both lights are controlled by the RUNNING LIGHTS on your 12-volt electric panel in the cabin.

For operation under power an additional light is required. This is a 225 degree white light, displayed at least 1 meter above the two color light on the bow pulpit. This additional light, "BOW LIGHT," is a part of the mast lighting option package. The bow light should only be used when under power between dusk and dawn.

Should you plan on operating under power when running lights are required and you do not have a permanently installed BOW LIGHT, a portable battery operated type may be used by affixing it the mast at least 1 meter (39 1/2") above the light on the bow pulpit. Fixtures of this type are available in most marine supply stores.

The waters in which you operate may have additional lighting requirements. Check with local authorities before navigating when lights are required.

Always check your lights before leaving the dock to insure all fixtures work; this is good insurance against being caught out without operable navigation lights.

3.4 ACCOMMODATIONS AND GALLEY:

3.4.1 GALLEY UNIT, EQUIPMENT, AND OPERATION:

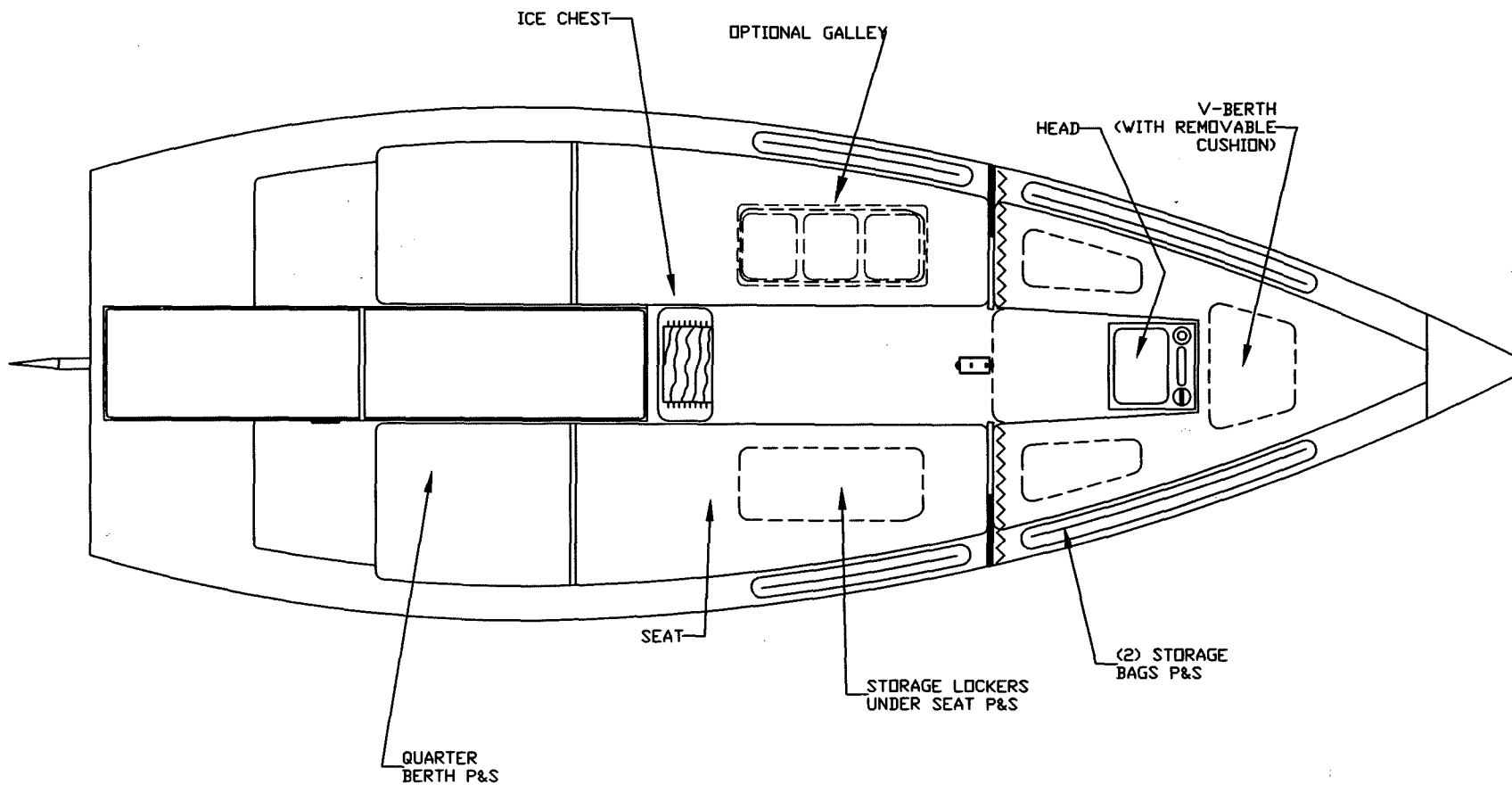
The Capri 22 optional galley unit is installed under the port settee. The galley is accessed by removing the berth cushion, which can be stowed on the opposite berth or forward, and lifting up the wooden cover under the cushion. The wooden cover can be stored underneath the aft berth cushion when the galley is in use.

The galley consists of:

- a. A molded fiberglass tray that contains the galley components.
- b. A removable plastic basin.
- c. A single burner, wick type stove.
- d. A storage compartment with a Plexiglas lid, which can be used as a cutting board.

Notes for the safe use of the galley:

1. Read the stove operation instructions before attempting to use the stove especially regarding filling and lighting the stove.
2. To use the stove lift it vertically out of the storage space, rotate the stove 45 degrees and reposition it in over the storage space.
3. Never replace the wooden cover or cushion over the stove while it is hot from use. Allow it to cool thoroughly before storing.
4. Be sure all cushions, curtains, and other flammable items are clear of the stove before lighting.
5. Always keep a bucket of water handy when using an alcohol stove. A fire from spilled alcohol can be extinguished with water.
6. Keep a fire extinguisher within reach when operating the stove.
7. The basin can easily be removed to pour waste water overboard. Some fresh water lakes prohibit the discharge of any waste; therefore check with local authorities before doing so.
8. Fresh water for use in the galley can be kept in a jug in the icebox.
9. Never cook in the cabin with all of hatches tightly closed. The process of combustion can deplete the oxygen in the cabin causing suffocation.



Catalina Yachts

21200 VICTORY BLVD.
WOODLAND HILLS, CA.
91367 - (818) 884-7700

SCALE: NONE

APPROVED BY:

DRAWN BY

DATE: 6/27/00

K.W.N.

REVISED

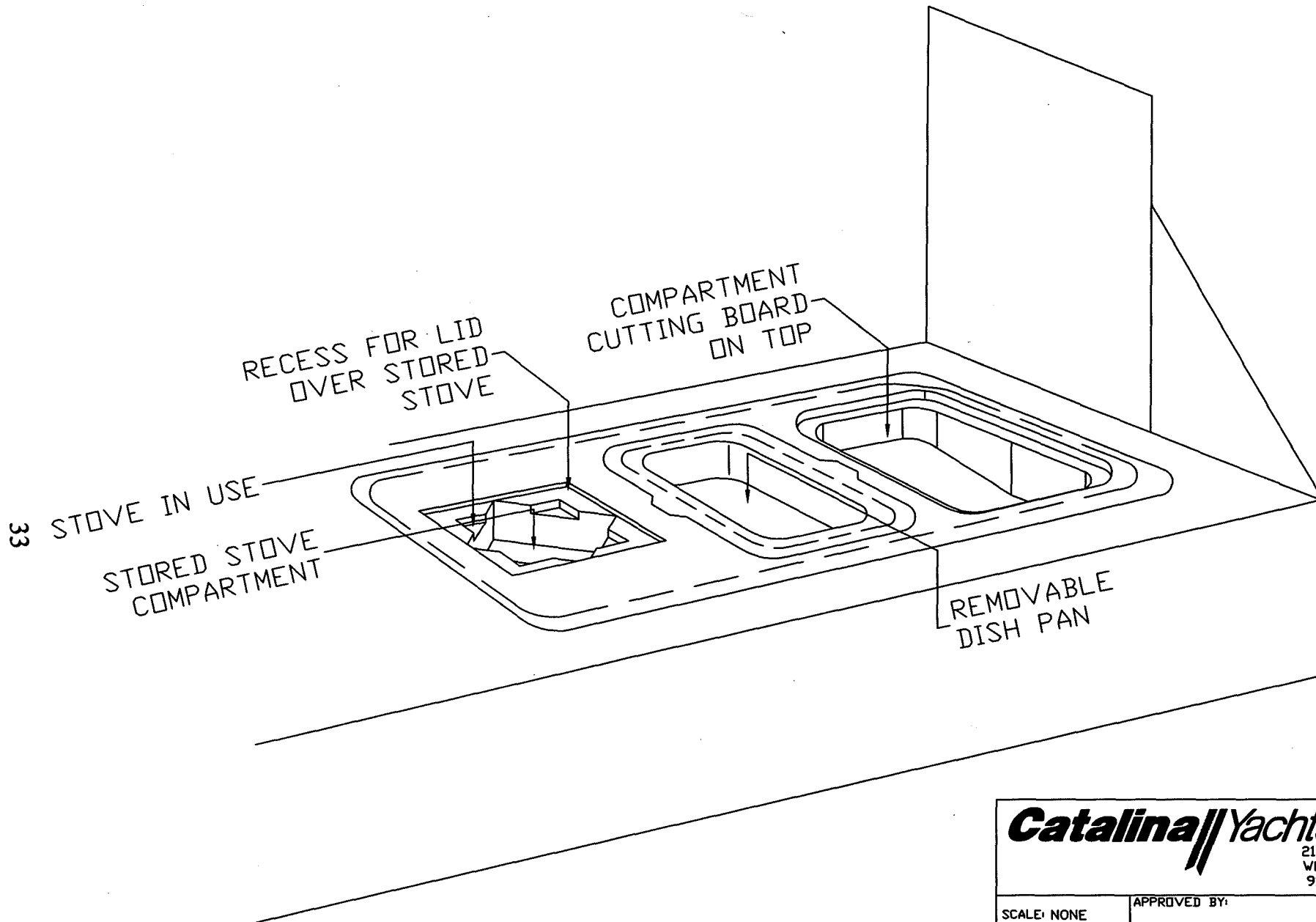
ACCOMMODATION PLAN

BOAT:

CC22 II (NEW)

DRAWING NUMBER

222-60002-1



3.4.3 GALLEY LAYOUT

Catalina Yachts

21200 VICTORY BLVD.
WOODLAND HILLS, CA.
91367-(818)884-7700

SCALE: NONE

APPROVED BY:

DRAWN BY

DATE: 3/22/89

K.V.N.

REVISED

GALLEY LAYOUT

BOAT:

CC22 II (NEW)

DRAWING NUMBER

222-43000-0

3.5 AUXILIARY POWER:

3.5.1 RECOMMENDED OUTBOARD ENGINE:

An outboard engine of 4 to 10 horsepower should be adequate to propel your Capri 22 sailboat at hull speed under usual conditions.

A larger engine will not increase hull speed and may add unnecessary weight to the stern.

Long shaft engines are recommended.

3.5.2 OUTBOARD BRACKET:

The factory installed outboard bracket is spring loaded to assist lifting and lowering the engine. It locks in both the up and down position. Always be sure the bracket is secured in position before operating the engine.

When under sail, the motor should be kept in the raised position and tilted forward so that the propeller is clear of the water to eliminate unnecessary drag.

The motor bracket manufacturers recommended 15 horsepower maximum engine should not be exceeded.

3.6 TRAILERING AND LAUNCHING:

3.6.1 RECOMMENDATIONS FOR TRAILERING:

CAUTION: The aluminum mast and other metal parts conduct electricity, coming in contact with or near an electrical power line or lightning can cause severe injury or death. Stay away from overhead electrical power lines when sailing and/or launching this boat.

Your Capri 22 sailboat is an easy boat to trailer when certain precautions have been properly heeded. The following suggestions will prove helpful.

1. Be sure to read the trailer manufacturer's instructions and warranty carefully and do not exceed the manufacturer's gross vehicle weight for trailer boat and gear.
2. Check tongue weight. Most trailers tow well with 7 to 10 percent of the gross trailer and boat weight on the tongue. If the trailer tends to "fish tail," add tongue weight by moving weight forward or the trailer axles aft.

3. Test the brakes, if installed on the trailer, by operating the master cylinder manually.
4. Inspect the trailer winch cable for broken strands or fraying.
5. Tie the mast and boom securely to the bow and stern. The spars should also be supported in the middle by the cabin top. Pad the mast at all contact points to prevent damage.
6. The boat should be seated properly on the trailer; that is, not ajar or tilted, and with the bow properly snugged into the rubber wedge at the front of the trailer. The weight of the boat should be bearing on the keel, not the padded upright supports.
7. Follow normal trailer procedures of connecting lights and safety chain, and be sure your hitch is well secured. Always test lights before leaving ramp area.
8. Do not allow anyone aft of the transom during launching or loading, because they could be injured if the boat were suddenly dislodged from the trailer.

3.6.2 RAMP LAUNCHING YOUR CAPRI 22 SAILBOAT:

The following generalized launching procedure will aid in launching your boat if yours is a trailerable model.

CAUTION: The aluminum mast and other metal parts conduct electricity, coming in contact with or near an electrical power line or lightning can cause severe injury or death. Stay away from overhead electrical power lines when sailing and/or launching this boat.

Launching Procedure:

1. When launching from the trailer on a ramp, make sure to back the trailer at right angles to the shore. Remember when backing, if you require the rear of the boat to move right, turn your steering wheel to the left and vice versa.
2. If your trailer has an extendable tongue, make sure you extend it while on level ground and then re-insert pegs or stops in their proper holes. If you have a tongue support wheel on the trailer, cranking it down enough to take the weight off the extendable portion of the tongue will help you slide the tongue extension in and out. Be sure to have rubber fenders or "bumpers" hanging along the sides of your boat to protect it from scratching on the dock.

3. Back the trailer into the water until the boat just begins to float. Have a line on the stern and bow to pull the boat off the trailer and tie it to the dock.
4. Set your emergency brake hard and place gearshift lever in park.
5. Take a strain on the trailer winch handle, release the locking pawl, and crank out slack in the bow rope. Then detach bow rope.
6. Next give the bow a shove back. The boat should float free and when clear of the trailer, be pulled into the dock by the crew who then turns it BOW INTO WIND PRIOR TO RAISING SAILS.
7. Before raising sails and actually sailing the boat, make certain that the water depth is sufficient.
8. Crank in the excess line on the trailer winch and park the car and trailer in a suitable spot.

Rudder and Tiller:

1. Always wait until the boat is in the water and at a suitable depth before installing the rudder.
2. Attach the tiller and secure with the wing-nut. A lock washer is also helpful. Occasionally while sailing, reach back and check that the tiller fastening wing-nut is tight. If you raise and lower the tiller arm excessively, the wing-nut can come loose, so try to avoid this unnecessary action.

Final Launching Considerations:

Try not to use a launching ramp that is on a lee shore where you might have difficulty sailing off. In cases where it is necessary, use your auxiliary to get clear of the docks before hoisting the sails.

Determine the wind direction before you do anything else. Then make a plan of action for ease and safety in leaving the launch area docks. Explain to your crew what you plan to do and consider their opinions on getting away from difficult docks. The crew often has much valuable experience behind him and is very often worth listening to!

3.6.3 HAULING OUT YOUR CAPRI 22 SAILBOAT:

1. Submerge the trailer (with the tongue extended) until boat can be floated onto the trailer and the bow secured into the rubber bow chock or V-shaped wedge.
2. Connect the trailer winch line and hook to help guide the boat.
3. Never stand with your face near the winch just in case the winch line should break due to some undetected chaffing. It could hit you in the face and cause serious injuries.
4. Do not try to winch the boat onto the trailer; float it on.
5. Once on land, you can put away sails by folding and then un-step the mast. This is done in the reverse of the stepping procedure. One person resists, pulling on a line attached to the forestay, while standing on the ground directly in front of the boat's bow. The other person slowly lowers the mast backwards.
6. You need only release the forestay to lower the mast. (Do not disconnect the main upper shrouds.)
7. Do not allow mast to lower so far that it pries up on the deck tabernacle fitting where the mast is stepped or it may damage the mast or mast step.
8. Secure the mast for travel as before.

4.0 DECOMMISSIONING:

4.1 WINTERIZING YOUR CAPRI 22 SAILBOAT:

4.1.1 LAYING UP:

In cold climates where yachts are decommissioned during the winter, your Capri 22 sailboat may be safely stored in the water, provided adequate measures are taken to prevent ice damage 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 to order and replace shrouds or rigging parts needed over the winter months, avoiding any delays in the spring commissioning.

Following proper lay-up procedures will minimize the effort needed to re-commission in the spring.

4.1.2 BEFORE HAULING:

1. Consult manufacturer's instructions for winterizing any optional or owner-installed equipment.
2. Inspect the cradle on which the boat will be stored. Check welds and padded poppets for condition and repair as required.
3. Lift the boat with straps per your boat yard's recommendations.

4.1.3 AFTER HAULING:

1. Wash bottom, removing growth and loose paint.
2. Wash topsides, deck, and all other exterior fiberglass surfaces. Wax all except the non-skid surfaces.
3. Remove all sails. Follow sailmaker's instructions (or instructions in section 5.8 SAIL MAINTENANCE) with regard to cleaning. Schedule any repairs required and store in a dry place.
4. Remove all sheets and lines, clean and store in a dry place.
5. If the mast has been removed from the yacht, remove all stays and shrouds from 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 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 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 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, PFDs, and anything moveable that is subject to rust, corrosion, or mildew.

9. Remove all food supplies from lockers and ice chest. Wash out ice chest interior with a weak solution of Clorox. 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. Winterize the head in accordance with manufacturer's instructions. Make sure no liquids are in the head tanks if the head is to be left aboard during the winter.
12. Remove all electronic gear that may require servicing during the winter.
13. Remove fire extinguishers for weighing, checking, and any necessary recharging.
14. If cushions are left aboard, bring cockpit cushions below and place all cushions on edge to encourage ventilation.
15. Leave all interior lockers open to encourage ventilation.
16. Ensure that cockpit and deck scuppers are open and free.
17. 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.
18. If the boat is not to be covered, ensure that mechanisms such as winches and steering pedestals are provided with adequate covers.
19. If the mast is to remain stepped, snub all shrouds and halyards to minimize noise, wear, and chafe.

4.2 GENERAL NOTES:

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 the water in freezing climates. If at all possible, the manufacturer recommends keeping the yacht in dry storage for severe winters.

The hull fittings (if any) should be drained.

Outboard motors should be removed, serviced, and stored in a warm, dry location until reinstalled when commissioning.

5.0 MAINTENANCE GUIDE:

5.1 PRE-USE MAINTENANCE, BEFORE YOU LEAVE THE DOCK:

RIGGING:

1. Inspect turnbuckles – tighten, if necessary.
2. Inspect clevis pins and cotter pins.
3. Visually inspect spreader tips and other areas where sails may chafe during sailing; replace tape as necessary.
4. Halyard free and not tangled.
5. Inspect mast hardware attachment bolts; tighten as required.

HULL AND DECK INSPECTION:

1. Tiller moves freely
2. Bilges and compartments are dry.
3. Thru hull valves, hoses, and clamps OK.
4. Check running lights.

5.2 MONTHLY MAINTENANCE:

RIGGING:

1. Inspect chain plates, fastenings and bolts; tighten as necessary.
2. Inspect blocks, shackles, and cotter pins.
3. Check rigging tune, rigging wire condition.
4. Check turnbuckles and locking pins.

HULL AND DECK:

1. Check cockpit drains, clear debris.
2. Winches turn freely, lubricate as per manufacturer's recommendations.
3. Clean and oil exterior teak as necessary.
4. Clean and wax gel coat surfaces as necessary.

5.3 SEASONAL MAINTENANCE:

RIGGING:

1. Mast head pins and sheave turns freely.
2. Halyards are in good condition and not chafed.
3. Spreader tips and bases; mast fittings.
4. All shroud terminations and swaged fittings.
5. Gooseneck assembly and boom assembly.
6. Mast, boom, and spreaders cleaned and waxed.

HULL, DECK, AND CABIN:

1. All chain plates and through bolts tight.
2. Disassemble winches and lubricate bearings and pawls.
3. Coat electrical system, battery tie downs and terminal connectors to prevent corrosion.
4. Hatch gaskets and hold down dogs seal when closed.
5. Bottom, keel and rudder condition.
6. Lifelines, stanchions, and pelican hooks.

5.4 FIBERGLASS MAINTENANCE AND REPAIR:

One of the major benefits of a fiberglass boat is the elimination of maintenance chores required by other materials. You have only three relatively easy maintenance rules to follow to keep your boat looking like new:

1. Each year, clean, buff, and wax the exterior of the boat.
2. Touch up and patch scratches, scars, and small breaks.
3. Repair any major breaks as soon as possible to avoid additional damage to the hull or deck.

Most fiberglass boats are manufactured of two "layers" of material, permanently bonded together by a chemical reaction. The outside surface is formed by a colored gel coat. This is a special resin material containing concentrated color. It provides a smooth, finished surface.

The second "layer" is made up of polyester resin reinforced with laminations of fiberglass mat, cloth, or woven roving. Both the gel coat and polyester resin are "cured" by a chemical catalyst that causes them to form a hard, strong mass that is highly resistant to impact and damage.

After sailing, a good hosing down with fresh water and a mild detergent will keep you boat sparkling fresh and clean. The non-skid surfaces may need to be scrubbed with detergent. Smooth glass areas may be polished with liquid wax or any good fiberglass wax to add extra luster. In the case of older boats, where some fading of the gel coat has occurred, the surface should be buffed with polishing compound and then wax finished.

When buffing the boat to restore in finish, care should be taken not to cut through the gel coat surface. This is especially true on corner and edges of the hull. A power buffer may be used, or the work may be done by hand, using a lightly abrasive rubbing compound such as Mirro Glaze No. 1 for power buffers, or Dupont No. 7 for hand buffing. Any high quality paste wax may be used after buffing.

5.4.1 FIBERGLASS TOUGH-UP AND REPAIRS:

Scratches, Shallow Nicks, Gouges, Small Holes (That do not penetrate through the hull)

These repairs are easy because only the surface of the boat is damaged. They fall into two categories: (1) damage to the gel coat colored outer surface, and (2) holes or gouges that are deep enough to penetrate the fiberglass reinforced area of the boat. The repair operations are similar.

For damage to the gel coat surface, you will need a small can of gel coat, of the same color as your boat, and a small amount of catalyst. For deeper holes or gouges (1/8" or more) you will also need some short strands of fiberglass which can be trimmed from fiberglass mat or purchased in the form of "milled fibers." These materials can be purchased from your dealer.

- (1) Be sure the area around the damage is wiped clean and dry. Remove any wax or oil from the inside of the hole or scratch.
- (2) Using a power drill with a burr attachment, roughen the bottom and sides of the damaged area and feather the edge surrounding the scratch or gouge. Do not "undercut" this edge. (If the scratch or hole is shallow and penetrates only the color gel coat, skip to step No. 8)
- (3) Into a jar lid or on a piece of cardboard, pour a small amount of gel coat . . . just enough to fill the area being worked on. Mix an equal amount of milled fibers with this gel coat, using a putty knife or small flat stick. Then add two drops of catalyst, using an eyedropper for accurate measurement. For a half-dollar-size pile of gel coat, this amount of catalyst will give you 15 to 20 minutes working time before it begins to "gel." Carefully cut the catalyst into the gel coat and mix thoroughly.
- (4) Work this mixture of gel coat, fibers, and catalyst into the damaged area, using the sharp point of a putty knife or knife blade to press it into the bottom of the hole and to puncture any air bubbles that may occur. Fill the scratch or hole above the surrounding undamaged area about 1/16".
- (5) Lay a piece of cellophane or waxed paper over the repair to cut off the air and start the "cure."
- (6) After 10 to 15 minutes the patch will be partially cured. When it feels rubbery to the touch, remove the cellophane and trim flush with the surface, using a sharp razor blade or knife. Replace the cellophane and allow it to cure completely (30 minutes to an hour). The patch will shrink slightly below the surface as it cures.

- (7) Again use the electric drill with burr attachment to rough up the bottom and edges of the hole. Feather hole into surrounding gel coat, do not undercut.
- (8) Pour out a small amount of gel coat into a jar lid or on cardboard. Add a drop or two of catalyst and mix thoroughly, using a cutting motion rather than stirring. Use no fibers.
- (9) Using your fingertip or the tip of a putty knife, fill the hole about 1/16" above the surrounding surface with the gel coat mixture.
- (10) Lay a piece of cellophane over the patch to start the curing process. Repeat Step 6, trimming patch when partially cured.
- (11) Immediately after trimming, place another small amount of gel coat on one edge of the patch and cover with cellophane. Then, using a rubber squeegee or back of a razor blade, squeegee level with area surrounding the patch. Leave cellophane on patch for 1 to 2 hours, or overnight, for complete cure.
- (12) Using a sanding block, sand the patched area with 600 grit WET sandpaper. Finish by rubbing or buffing with a fine rubbing compound. Some slight color difference may be observed. Weathering will blend touch-up, if properly applied.

5.5 BOTTOM PAINTING AND PREPARATION:

Anti-fouling paint should be applied to the bottom of your Capri 22 if it is to be kept in either fresh or salt water for any length of time. There are many brands available. Anti-fouling paint prevents the growth of algae, barnacles, and other fouling organisms on underwater surfaces.

Capri models are manufactured with an integrally molded blister protection system in the hull laminate. This water absorption barrier material is between the gel coat surface layer and the laminates of the hull.

The bottom may be prepared for painting using conventional dewaxing solvents, then sanding the gel coat surface or using a chemical etching type primer. The keel has been painted using epoxy primer, filler-fairing compound and finished with epoxy paint. This material is a suitable substrate for most anti-fouling systems, however a "test patch" of the intended anti-fouling paint should be tried on a small area to insure compatibility before coating the entire keel area.

5.6 TEAK MAINTENANCE:

WOOD TRIM AND PARTS:

Most exterior wood is teak, and may be kept looking good by regular oiling with teak oil.

Should the teak become weathered, cleaning and bleaching with a commercially available teak cleaner and bleach will restore the color of the wood; then, oil the wood with a good grade teak oil to restore the golden color of the teak. Do not use wire or hard bristle brushes on the wood, as this will remove the softer wood between the annual rings, and leave a rough surface.

Teak may also be varnished with good results if the proper preparation is done. Consult your boatyard or dealer for a recommendation of a varnish suited to your climate.

5.7 SPAR MAINTENANCE:

5.7.1 STANDING RIGGING:

Your boat is equipped with stainless steel standing rigging and Dacron running rigging to give you years of trouble-free service. However, due to normal wear and tear, it is recommended that a periodic inspection be made on all fittings and wire. Turnbuckles should never be neglected; they should be unscrewed from time to time to prevent seizing . . . every three months should be about right for the average sailor. A slightly bent turnbuckle shaft, or broken wire in your shrouds should be replaced immediately. As a rule of thumb, stainless steel standing rigging should be replaced after five (5) years of service.

5.7.2 FITTINGS:

Marine fittings today need little maintenance. Deck hardware should be hosed down with fresh water after each sail in salt water. Stainless steel fittings such as pulpits and lifeline stanchions should be cleaned and waxed periodically to maintain their appearance. Winches require occasional cleaning and lubrication. Where possible, a maintenance brochure for your winches has been included with this manual. Masthead fittings, halyard sheaves, etc., should be inspected, cleaned, and lubricated periodically. Keep your equipment clean of dirt and salt.

5.7.3 SPARS:

Like all other boat fittings, mast and booms suffer from salt water, air, and spray. These should be kept waxed, where possible and, at least, always hosed down with fresh water. Always see that the halyards are tied off, away from the mast. This will eliminate slapping in the wind and subsequent marking of the mast. Keep tack pin (located on front of boom) well lubricated, as – without proper lubrication – the stainless steel pin may become seized in the aluminum gooseneck casting.

Find a high-pressure nozzle and shoot fresh water to the top of the mast and spreaders. This will help keep your sails clean, too, as they rub on the mast and spreaders.

Inspect spreaders and spreader brackets for signs of fatigue. See that ends of spreaders are wired and well covered with tape to prevent wear on the sails.

5.8 SAIL MAINTENANCE:

Sails should never be put away wet. If they are wet after sailing, leave them in loose bundles and dry them at your first opportunity.

For most problems such as common dirt, dried or caked salt, etc., try scrubbing the surface with a soft bristled brush and liquid detergent. Avoid harsh powder detergents and stiff brushes, as they may damage the finish or stitching. This approach should work nicely for most applications. More severe stains can be taken care of by the following:

***IMPORTANT: For white sails only.**

Blood: Soak the stained portion for 10-20 minutes in a solution of bleach (Clorox) and warm water; generally 10 parts water to 1 part bleach. Scrub and repeat, if necessary. Rinse thoroughly – particularly nylon – and dry completely.

Oil, Grease, Tar, and Wax: Warm water, soap, and elbow grease seem to be effective. On hard stains, Propriety Stain Remover and dry cleaning fluids should do the trick. Be careful to remove all fluids, as they can soften the various resinated coatings on sailcloth.

Rust and Metallic Stains: These types of stains are very often the most frustrating and difficult to remove. First, scrub with soap and water, and then apply acetone, M.E.K., or alcohol. As a last resort, you might try a diluted

mixture (5%) of oxalic acid soaked for 15-20 minutes. Hydrochloric acid, 2 parts to 100 in warm water, will also work.

Mildew: Hot, soapy water with a little bleach will generally prevail. After scrubbing, leave the solution on the fabric for a few minutes and rinse thoroughly. When using bleach, a residual chlorine smell may be present after rinsing. A 1% solution of Thiosulphate (photographer's hypo) should remove all chlorine traces. Here, again, rinse and dry well.

Paint and Varnish: Acetone and M.E.K. should remove most common paint and stains. In most cases, varnish can be removed with alcohol.

Temperkote or Mylar sails are still new and developmental. At this point in time, avoid most solvents, as they may damage the fabric over a period of time. Soap and diluted bleaches should take care of most stains.

Generally speaking, use all solvents with care. Always rinse and dry thoroughly. It should be emphasized that nylon ripstop spinnaker fabrics are less durable and more sensitive than their polyester counterparts. Bleaches and solvents can ruin nylon if not used properly.

Follow the above guidelines, take your sails into your sailmaker for periodical inspection and you will have many effective seasons of racing and cruising pleasure.

5.9 INTERIOR CUSHIONS, FABRIC COVERS:

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.

6.0 OWNER-USER RESPONSIBILITY:

6.1 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; look out for small craft storm 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 the rules of the road. All other sailors will expect that you know them and abide by them. The U.S. Dept. Of Transportation, U. S. Coast Guard, 2100 Second St., S.W., Washington, D.C., 20953 will supply free literature on this. Your local branch or Harbor Patrol office may have it available too.
4. If your boat has a Genoa sail which obscures the helmsman's vision, have a dependable person in the crew keep a sharp lookout under the jib sail for oncoming traffic.
5. When sailing at night, provide safety harnesses for yourself and your crew, and tie these lines to the boat. Use approved harnesses.
6. Purchase all Coast Guard required safety equipment, and learn how to use it before it comes time to use it.
7. Enroll in a Coast Guard 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 other 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 stationary.

6.2 REQUIRED SAFETY EQUIPMENT:

FIRE EXTINGUISHER(S):

It is wise to locate an approved marine use, fire extinguisher, in a convenient, accessible location.

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

LIFE VESTS:

Keep a Coast Guard approved life vest on board for each crew member. Wear them during rough weather and night sailing. Children should wear their vests at all times, no matter how much 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 three (3) day/night flares.

6.3 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 supplies for yourself and crew members' specific needs. First aid kits are available at most marine stores. Consult your physician for his recommendations, if you are planning a voyage away from medical facilities. A first aid procedure book is a necessity.

TOOLS:

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

6.4 SAFETY PACKAGE, FACTORY OPTION:

Package Includes	Description
1 EA	West Marine TR-8 Anchor
20 Ft.	Acco 1/4" Galvanized Proof Coil Chain
1 EA	New England 3/8" x 150' Anchor Line
2 EA	5/16" Galvanized Anchor Shackle
2 EA	Taylor 5.5" x 20" Hullguard Fender
14 FT	New England 3/8" Fender Line (2x7')
1 EA	Sterns USCG White Throwable Cushion
1 EA	Aluminum Folding Radar Reflector
1 EA	Orion Star Tracer Meteor Flare Kit
1 EA	Orion Red HH Flare-3 pack
1 EA	Admiral Hornblower Horn
2 EA	Kidde 10BC Fire Extinguisher
1 EA	"Cruiser" First Aid Kit
1 EA	Eveready Halogen Flashlight
6 EA	Kent USCG Type II Lifejacket
1 EA	Chapman's Piloting & Small Boat Handling
4 EA	New England 5/8" x 25' Dock Line
1 EA	Brass Bell 6"
1 EA	Beckson Yacht Log Book
1 EA	Safety Whistle 2 pk

6.5 ANCHORS, ANCHORING, AND MOORING:

The anchor manufacturer suggests an anchor in the 8 to 13 pound range, to be used as a bow anchor in ordinary conditions. This anchor will only be effective with at least 6 feet of 1/4 inch or heavier gauge chain, and at least 3/8 inch or heavier nylon line.

Under adverse weather conditions, as much as an 18 pound bow anchor could prove necessary and, possibly, a plough-type anchor might be required.

Inquire in you local area about anchoring procedures relative to the place you plan to visit. Get opinions from several experienced people and always play it on the safe side in "making up" your anchor as well as in using it. Do not forget to wire all shackle pins so they cannot come loose under water.

REMEMBER: Lighter anchors are made more effective by increasing the scope: i.e., the ratio of length of line and chain to depth of water. A 7:1 ratio is recommended. This means using 7 feet of anchor line for each foot in water depth.

6.6 LIGHTNING PRECAUTIONS:

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.
- B. The American Boat & Yacht Council (ABYC) recommends straight-line wire runs. This 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.

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 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 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 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 (21.2mm²) 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 (21.2mm²) 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 (13.3mm²).

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 (13.3mm²) 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 (13.3mm²) 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 (21.2mm²) 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 (0.1m²) 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 (21.2mm²) conductor.

NOTE: A solid stainless steel whip antenna or equivalent, that has a conductivity less than a #4 AWG (21.2mm²) 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 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 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

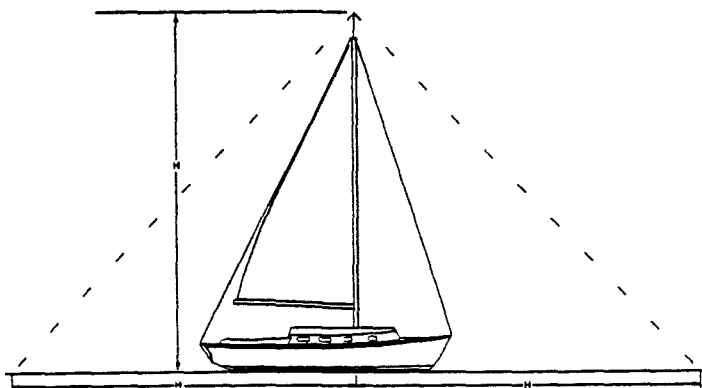


FIGURE 2 - BOAT WITH MAST NOT EXCEEDING 50 FEET (15M) ABOVE THE WATER

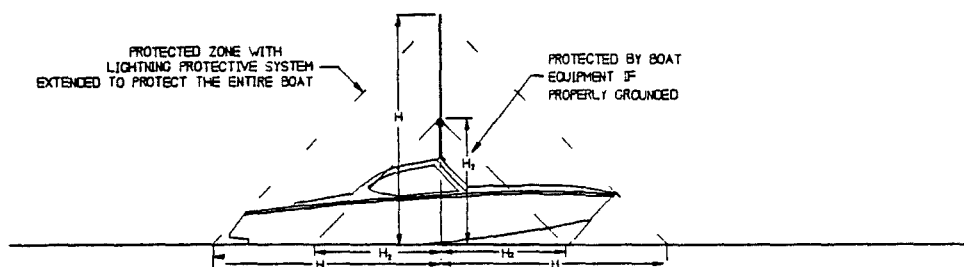
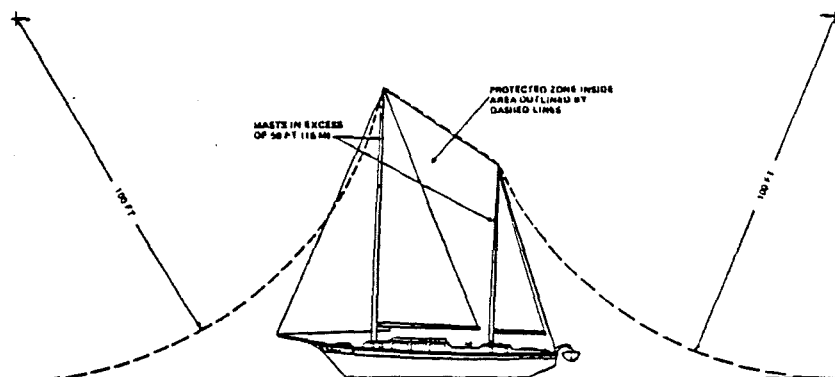


FIGURE 3 - BOAT WITH MASTS IN EXCESS OF 50 FEET (15M) ABOVE THE WATER - PROTECTION BASED ON LIGHTNING STRIKING DISTANCE OF 100 FEET (30M)



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 (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 (8.39 mm^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 (21.2 mm^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.

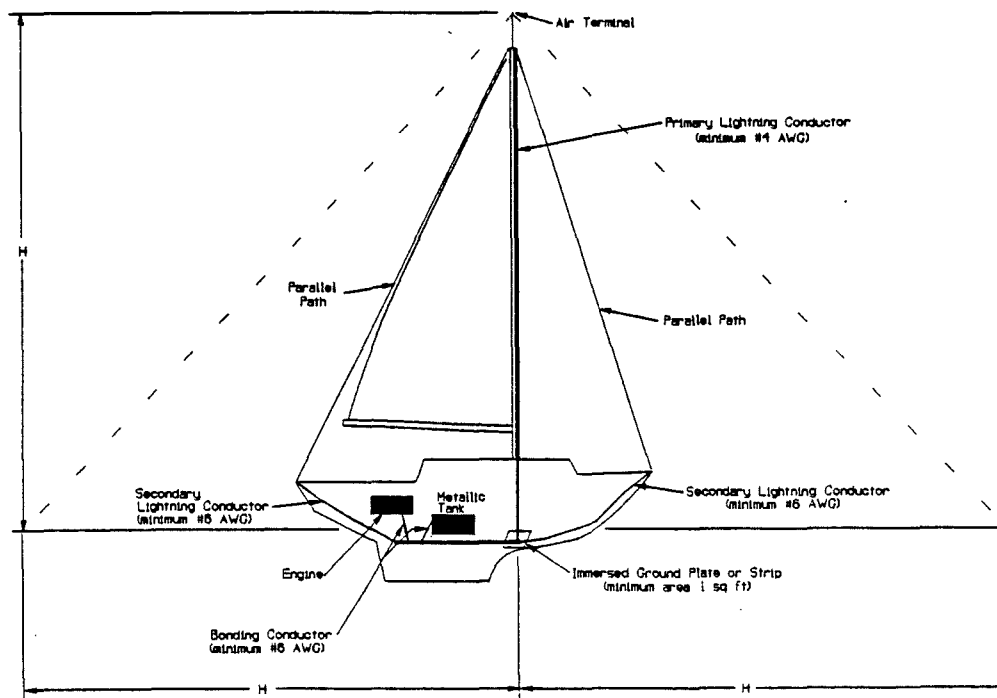
2. Non-conducting antenna masts with spiral wrapped conductors are not considered suitable for lightning protection purposes.

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 (13.3mm²) 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.