2009 SOLING 50 CONSTRUCTION GUIDE

By…Stan Ogden, Soling 50 Class Secretary, January, 2008 (Updated 5-10-09)

Email: SOgden@bak.rr.com • BMYC Website: http://www.sailbakersfield.com • Soling 50 Class Website: http://www.modelyacht.org/soling50.html

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I. INTRODUCTION

The Soling 50 (50" long) is a radio-controlled one-design model sailboat of the Olympic Class Soling, which is a 27-foot, 3-man, keelboat designed by Jan Herman Linge of Oslo, Norway in 1964. It is a great boat for racing or just leisurely sailing and easily transported with optional removable keel and detachable sail rig weighing a minimum of 17 lbs. Radio equipment is a 2 or 3 channel surface radio. The Soling 50 Class offers close and competitive sailing in all kinds of winds and water. The keel's design helps to minimize pickup of seaweed and refuse in the water. They are currently being sailed all over the U.S., especially in California, where over 150 boats are currently active.

This Construction Guide is designed primarily to help the novice model boat builder. Those more experienced modelers know most of what's included here. My goal was to put it all together in one document with lots of photos, so the Soling 50 Class would have a documented guide for those skippers interested in building and joining a dynamic growing class of R/C model yachts.

If you study each Soling 50 Class model yacht you will find that each one is a little different. Accordingly, the Class Rules establish the defined parameters for the hull, deck, keel, rudder, mast size and sail plan, but virtually everything else is left to the ideas and desires of the builder/skipper. The following manual is a result of several years of experience I have had as Class Secretary, plus the experience of local builders/skippers here in Bakersfield, California in building a number of Soling 50s. Others in the Class have different ideas and approaches to building a Soling 50, and that's great. There is lots of room for innovations and experimentation within the Class Rules. It's part of the attraction of the Soling 50 Class as a beautifully designed and extremely responsive and satisfying one-design R/C model yacht for either casual sailing or racing.

The very first thing a builder/skipper should do is to obtain a copy of the 2009 Soling 50 Class Rules for reference…and be sure you stay within them if you plan on racing your boat.
(http://www.modelyacht.org/soling50.html).

II. APPROVED SOLING 50 MANUFACTURES

Three (3) manufacturers are currently approved suppliers of the Soling 50 Hull. Kits are supplied with just the Hull and/or Deck, or complete Ready-To-Sail boats are available from these manufacturers. Only these companies posses and utilize tooling that produce the approved dimensions and shape of the original Vortex Engineering design of the Soling M of 1971, now called the Soling 50.

Loyalhanna Dockyard, Hartman Model Boats
7527 Gilbert Road, Bergen, NY 14416
Phone: (585) 494-0027, Fax: (585) 494-1369
Web: www.loyalhannadockyard.com, Email: lhdockyard@aol.com

GRP Model Yachts
22C Roache Road, Freedom, CA 95019
Phone: (831) 724-7000, Fax: (831) 722-7108
Web: www.modelyachting.com , Email: adrian@modelyachting.com

Ludwig Manufacturing
429 E. Wright Blvd., Universal City, TX 78148
Phone: (210) 724-3827
Web: www.LarryLudwig@LudwigRCYachts.com , Email: larry@ludwigrcyachts.com

III. BASIC CONFIGURATION

As an amateur builder, at the outset, I wanted to include some features in my boat (Soling 50 #1887 Scout VI) that I have found advantageous in the past in my other Soling 50s. All of these items are within the Soling 50 Rules and are optional features that a skipper may or may not choose. I urge you to choose your own options and ideas for your Soling 50 for casual sailing or competitive racing.

A. A gel-coated fiberglass hull. I chose gel-coated fiberglass. The gel-coat is just an added bonus because it's resistant to scratches and doesn't need to be painted.

B. A "traveler" for the jib sheet. This is not a necessity, since a simple sheet exit guide on the center-line of the deck would suffice. I prefer a wire traveler so the jib is sheeted down toward the deck, rather that toward the center of the deck.

C. Step the mast directly over the front keel bolt. This is just my personal opinion. The vector forces resulting from the wind on the sails is transferred directly to the keel and the forward movement of the boat. Whether this helps in improved speed is not proven.

D. Single side stays with no spreaders on a rigid carbon fiber mast. Any more than one side stay on each side of a rigid carbon fiber mast is redundant for most conditions. However, you may want to use additional side stays if you consistently sail in high wind areas. Spreaders look nice, but in my opinion, are totally unnecessary on the Soling 50 with rigid carbon fiber spars.

E. A low pivoted jib boom. Our local sailors like to keep the jib as low as possible to the deck. This keeps the heeling moment of the boat to a minimum and thus should contribute to better speed through the water.

F. Flat carbon fiber booms. Carbon fiber arrow shafts are commonly used for booms, but I prefer a flat carbon fiber material, since the vertical bend is kept to a minimum. The boom is more rigid and lends itself to built-in bowsies, attached outhauls, downhauls, sheets and pivots, and the boom-vang.

G. A gear-driven servo with a double-throw sail arm. This is where you will find the most variable of methods used to control sails in the Soling 50, ranging from single throw sail arms, double-throw sail arms to rotating sail winches. I have used the gear-driven, double throw arm servo successfully in the Soling 50 for several years. It's just my preference.

H. All-in-one, easy to install, unit-built Servo Tray over the keel. Efficient & neat.

I. A lead-alloy cast keel. I had access to a cast keel here in Bakersfield, CA.

J. The best sails available. "Black Sails" made by Chuck Black from San Diego, California are highly recommended. Email address: rcmdlboat@aol.com.

IV. HULL PREPARATION

The Soling 50 Hull must be obtained from an approved manufacturer. The hull for this manual was purchased from Ludwig Mfg. and the deck was from Hartman Fibreglass R/C. The Deck however, may be from either an approved manufacturer, or home-made of fiberglass, ABS Plastic or wood material as the builder so chooses. This Construction Guide deals with fiberglass only.

A. Protect Hull - Apply masking tape from the outside edge of the hull down at least 2" all around and cover the rest of the hull outside with butcher-paper or newspapers to protect the hull from excess glue or scratching, especially if it's a gel-coated hull. Do not remove this covering until the Deck and Hull are bonded.

B. Sheer Supports

1. Cut 3/16" X 3/8" wooden (hobby plywood) sheer strips and fit all around inside edge of hull.
2. After sanding and cleaning the fiberglass bonding surfaces thoroughly, use a good grade of 30-minute epoxy (The longer the cure time the stronger the bond). (See Fig.1)
3. Use an ample number of close pins or small clamps to hold while epoxy is setting.

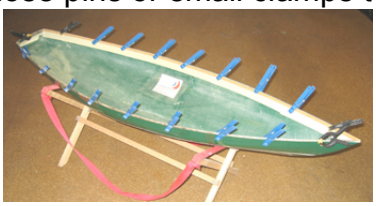


Figure 1

C. Deck Supports & King Plank

1. Rig temporary brace to hold the widest beam of the hull to 12". (You can use several strips of strapping tape from beam to beam)
2. Cut three Cross Bracings (3/16" X ¾" wooden beams) with a ½" wide notch on the center top for the King Plank and notched on the end to fit into the Sheer Supports. In addition, sand a smooth curve on the top of the Cross Bracings so the Deck will have a gentle convex curve from beam to beam. On the rear Cross Brace install a ¼" eye bolt about 2" from the starboard side. (See Fig. 3) Install the Hull Cross Bracing with epoxy at approximately 14", 21- ½" and 38- ½" measured from bow. (See Figure 2)
3. Cut 3/16" X ½" wood for the forward and aft King Planks, cut to length so they will be clear of the hatch opening in the deck, and install with epoxy.
4. Cut 3/16" X ¾" wooden pad for positioning the mast brace pad and glue in place. This pad will prevent mast brace from moving sideways, but allow the brace to be removed when removing keel. (See Fig. 4 & Fig. 5)


Figure 2


Figure 3

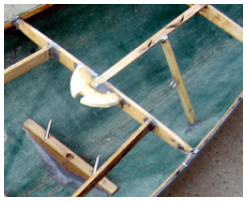


Figure 4


Figure 5


Figure 6

5. Cut 3/16" X ½" wood piece and glue in place about 16" from the bow for the Jib Sheet Turn-Around. Be sure to attach a ¼" eye-bolt about 2" below level of Deck. (See Fig. 4)
6. Cut two (2) 3/16" X ¾" wooden strips for Hatch Opening Supports. Place them so they will be just outside of (and clear of) the hatch opening. These supports will add reinforcement to the deck and allow you to pick up the finished rigged boat with sails without breaking or cracking the hatch opening. (See Fig. 6)

D. Keel Saddle Supports

1. Two (2) Keel Saddle Supports are required to be made of a good quality ½" X 1- ½" hard wood X 12" long overall. Cut and shape to follow the dimensions on drawing "Keel Support Saddle", shaping the bottom to fit inside the hull at approximate dimensions of 22- ¾" and 27" from the bow.

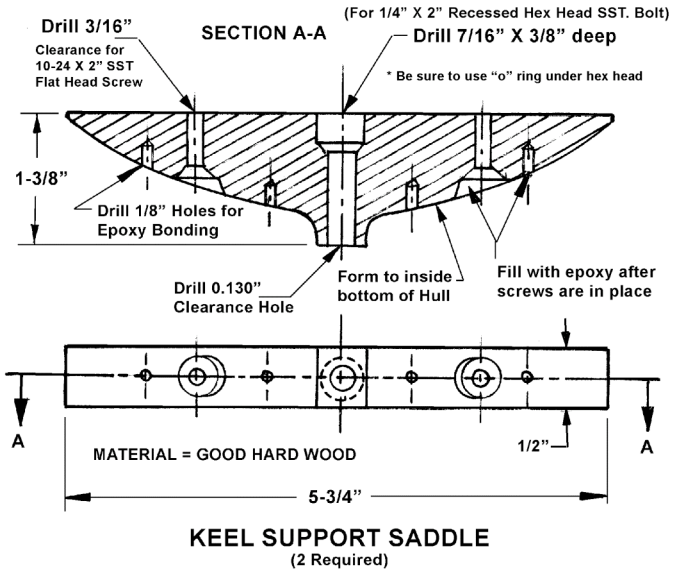
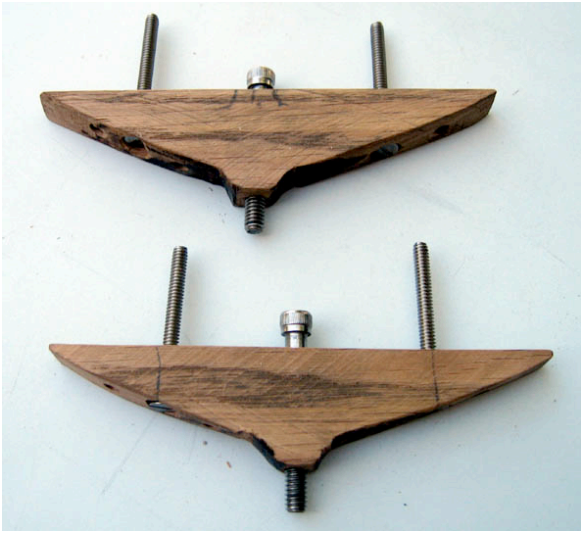


FIGURE 7



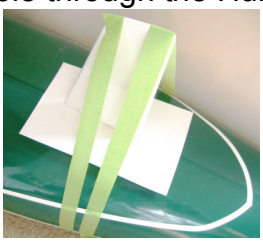
2. The actual location of the Keel Saddle Supports will be determined by the location of the Keel and the Keel bolts. IMPORTANT - These dimensions must match the Keel bolt locations. Assuming the Keel bolts are the preferred ¼" X 2" long stainless steel recessed hex-head cap-screws, then drill ¼" holes through the keel recess in the bottom of the fiberglass hull to match the location of the Keel-mounting bolt holes.
3. Install the 10-24 X 2" long SST Flat Head Machine Screws and epoxy in place so they are pointed in the up direction for later mounting of the Servo Tray. (See Fig. 7)
4. I prefer to glue the Keel Saddle Supports into the Hull after the Deck is bonded to the Hull. (See Section VIII. KEEL INSTALLATION below)

E. Rudder Thwart

1. Cut a piece of wooden cross bracing, 3/16" X ¾" wood X 8- ½' long. Shape the ends to fit inside hull horizontally. (See Fig. 8)

2. Drill a ¼" hole through the bottom of the fiberglass Hull exactly 9" from the bottom end of the transom as well as through the center of the wooden Rudder Thwart.
3. Cut a 2" long X ¼" O.D. X 0.014" wall brass tube and de-burr both ends. This tube will give you 0.035" clearance for the Rudder Shaft's rotation.
4. Insert the brass tube into the Rudder Thwart and the hole through the Hull.

Figure 8 

Figure 9 

5. Place the Rudder & Rudder Shaft into the bottom of the tube, flush with the Hull and use masking tape from one side of the Hull to the bottom of the Rudder and back up the other side of the Hull to hold the Rudder in a vertical position while allowing the epoxy to set up. Position the Rudder so the rear of the Rudder is perpendicular to the Hull. Be sure to cover the top end of the Rudder with masking tape so it doesn't become bonded to the hull during the gluing operation. Remove Rudder after bonding Rudder Thwart. (See Fig. 9)
6. Grind or sand a flat spot on the upper end of the Rudder Shaft on the forward side of the shaft about 1" long. This will help secure the set-screw on the Rudder Arm to the shaft without twisting.

V. DECK PREPARATION

The Soling 50 Deck as provided by an approved manufacturer has the hatch opening and all details of the splash guard and various other features as provided and molded on the original Soling 50 made in the 1970s. You can buy a hatch cover in fiberglass or a clear plastic hatch cover to fit the pre-formed hatch opening in the deck. You can also make your own deck. Approved materials would be either fiberglass, ABS Plastic or wood. This Construction Guide deals with a fiberglass pre-molded Deck from an approved manufacturer.

Inspect the deck carefully and grind or sand off any fiberglass fibers or roughness on the underside, especially sand where the cross bracings will be glued to the Deck. Also sand all around the underside edge of the deck where it will be bonded to the Hull. Make sure the Deck fits the hull shape from bow to stern and will contact all of the cross-bracing installed in the Hull. Fill any holes or re-enforce with "Bondo" any thin sections in the fiberglass, especially under and around the hatch opening. (See Fig. 10)

Figure 10

VI. BONDING DECK TO HULL

Perhaps the hardest part of building a Soling 50 is getting the fiberglass hull and deck bonded together tightly and permanently. There are several steps that are necessary to make this bonding a satisfactory process.

Make sure all joints for the fiberglass bonding are clean and free of dirt using Acetone or a suitable cleaner. IN MY OPINION, THIS IS THE TRICKIEST PART OF THE WHOLE BUILDING PROCESS. Use a 30-minute epoxy so you have plenty of time to adjust the alignment of the two parts after putting together. Mix the epoxy in relatively small batches, so they will not heat up and set too fast for convenient use. Apply the epoxy to all of the Cross Bracing and all around the Sheer Supports. Fit the Deck on the Hull as quickly and as tightly as possible using strips of masking tape. As soon as possible turn over the Hull so the Deck is in the down position and apply more tape as necessary. (Fig. 11 & 12 shows hull without the protective covering for clarity)

Figure 11

Figure 12

After the epoxy is set up, let it stand for at least 24 hours, before removing tape. The next and final step in the bonding is to add additional epoxy to the Deck/Hull joint from the inside using a long brush and reaching in fore and aft as far as possible, especially along the areas where the side stays will be attached. I do each side separately to allow the epoxy to flow to cover and strengthen the Hull/Deck joint, first on the starboard side and finally on the port side. The final step is painting or finishing the joint between the deck and the hull.

VII. KEEL PREPARATION

My keel is a solid cast lead-tin-alloy made by a local Soling 50 owner. It can be shaped and sanded to achieve the desired size, weight and dimensions to match the Soling 50 Class Rules. The goal of building a competitive Soling 50 is to keep all component weights above the keel at a minimum weight and have the keel weigh a maximum, so the total weight of the ready-to-sail Soling 50 is close to the 17 pounds MINIMUM. I weighed each component of this boat as it was completed so I knew how much the keel should end up weighing at the end. My final building operation was finishing and painting the keel. Check the Weight Chart in Section XVII. APPENDIX of this manual. My unfinished keel started off weighing 12 lbs. 3 oz. and ended up weighing 11 pounds 5.8 ounces after drilling several large cross holes through the fin to lighten and filling with “Bondo”, plus finishing the sanding, priming and painting. The maximum weight of a Soling 50 Keel is 11-3/4 lbs.

VIII. KEEL INSTALLATION

A. Install the Keel Saddle Supports and make sure the bolt-holes are aligned and fit with the Keel and that the Keel is aligned on the raised form on the bottom of hull. If all are aligned

properly, glue the Saddle Supports in place using 30-minute epoxy. After epoxy has set, remove Keel and Keel-mounting bolts and allow epoxy to cure. (See Figure 13)

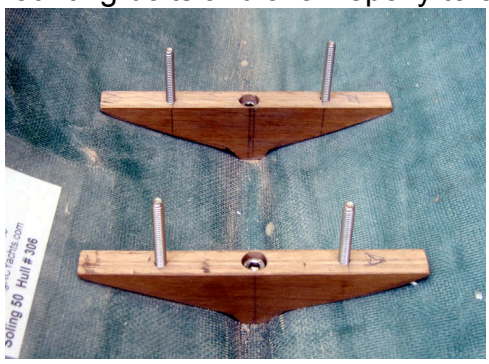
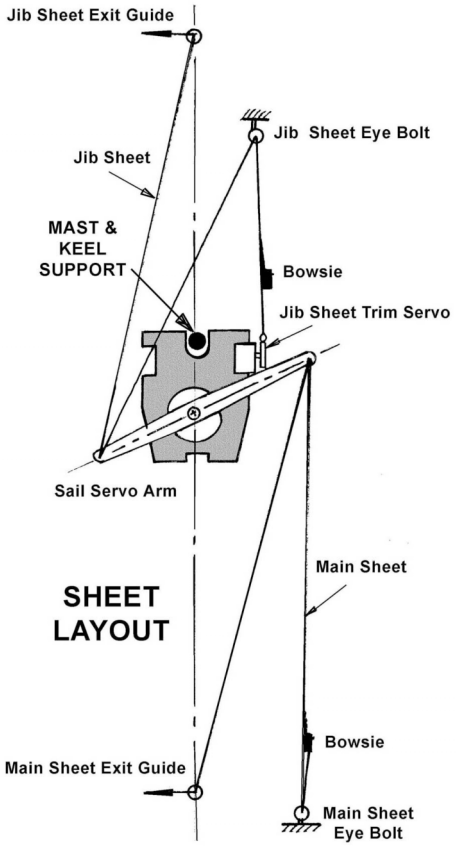


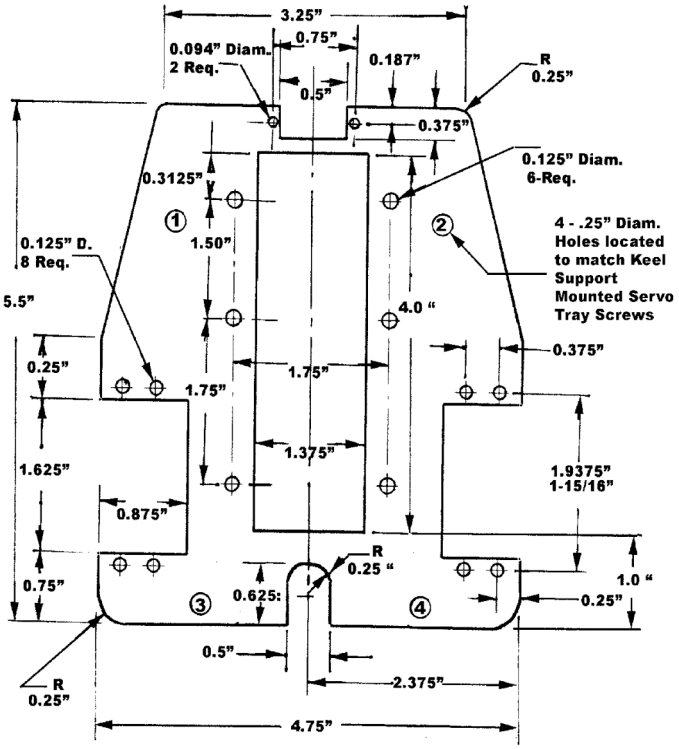
Figure 13

B. Install the Keel using two (2) ¼" X 2" stainless steel recessed hex-head cap screws. Note: Be sure to add small ¼" "o" rings to each cap screw so you will have a water-tight seal in the saddle hole when keel is finally installed. You may remove the Keel at any time to refinish, sand and paint.

IX. SERVO TRAY DESIGN AND FABRICATION

The design of the Servo Tray is dependent upon the configuration of the sheeting for a double-throw sail arm. Here is a layout of how the sheets will be set up using the double throw sail arm. (See Sheet Layout) (Not to Scale)





SERVO TRAY DIAGRAM

Material = "Lexan" Plastic - 3/16" Thick

The Servo Tray design is an all-in-one unit with all 3 servos and on-off switch on one tray with the receiver installed under the tray, off of the bottom of the bilge, away from water. It is easy to fabricate, machine, drill and polish "Lexan" material without cracking or breaking like acrylic or other rigid and brittle plastics.

A. Fabricate the Servo Tray from a sheet of 3/16" clear "Lexan" plastic material using the Servo Tray Diagram. The last four holes to drill would be the mounting holes to match the location and dimensions of the Keel Saddle Supports already installed in the bottom of the Hull. (See Servo Tray Diagram & Fig.14)

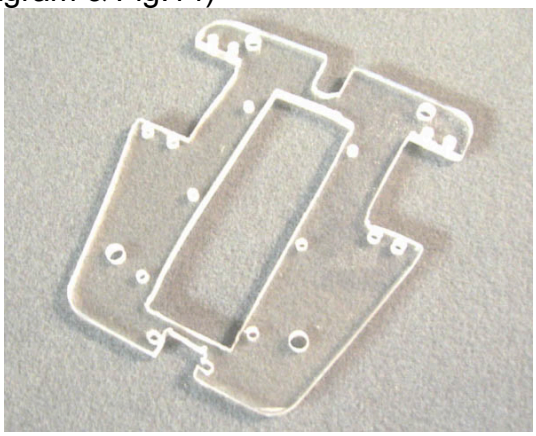


Figure 14

B. Radio components & servos used with this construction:

Sail Servo: Hytec HS-645-MG (Universal Connector)
Gearbox: Robot Zone Standard Servo Power Gearbox (Hitec 5:1)
(http://www.servocity.com/html/servo_power_gearboxes.html)
Assembled: (http://www.servocity.com/html/spg645_power_servo.html)
Rudder Servo: Futaba S3004
Jib Adjuster Servo: Futaba S3004
(http://www.servocity.com/html/s3004_standard_ball_bearing.html)
Manual Water Proof Switch
Receiver: * Futaba FP-R127DF Dual Conversion FM 7 Channel
Or equivalent Futaba DCX FM RX #24275 3 Channel
(http://www.servocity.com/html/dcx_fm_rx.html)
Transmitter: * Futaba Skysport 6 FM 75MHz T6YG
Or DX6 modified** with third channel knob for Jib Adjuster**.

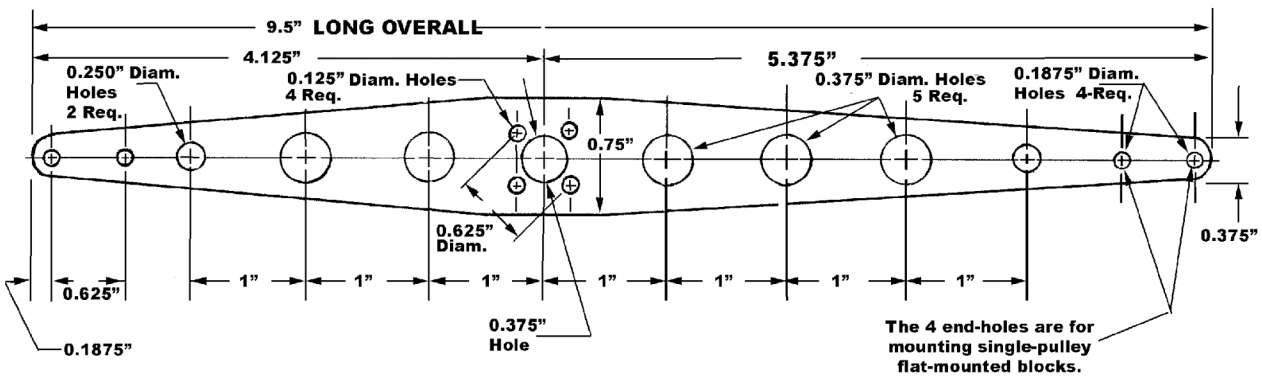
** Note: Some transmitters and receivers have been discontinued, but equivalents may be available.*
*** The Spektrum DX6 Transmitter may be modified to include a third channel knob.*
See AMYA Model Yachting Magazine, Issue 149, Fall 2007.

NOTE: It is not necessary to have a separate Jib Adjustment Servo as an extra 3rd channel. The Soling 50 will sail well with only 2 channels, one for the rudder and one for the two sails together.

C. Gear Box may be purchased assembled for $30.00 more. It is worth the extra cost. It is not necessary to trim some of the main spur gear teeth off as shown in the photo (Fig. 16). If the teeth on the main spur gear get worn or deformed, you can rotate the spur gear 180 º.

X. SAIL ARM DESIGN AND COMPLETED SERVO TRAY

A. Fabricate the Sail Arm from 3/16" clear "Lexan" plastic as per Sail Arm Diagram. To reduce friction in the Main and Jib Sheets, use pulley blocks on each end of the Sail Arm. (See Fig. 15). Or you may opt to just run your sheets through well-chamfered and polished 3/16" holes at each end of the Sail Arm.



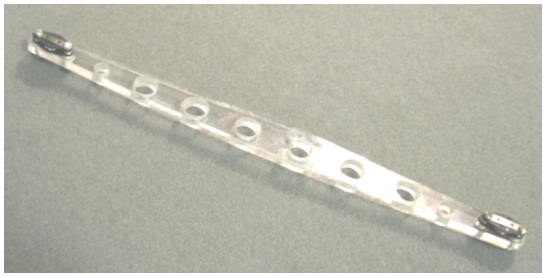


Figure 15

B. Cut a Plastic Shield 6" diameter X .025" thick out of rigid clear plastic and fit it between the sail arm and the top of the gears. This is to prevent your sheets from getting tangled in the servos or gearbox while in use. (See Fig. 16)

C. Assemble the Servo Tray with sail arm, servos, switch and receiver. Coil up and fasten the wiring together and place the receiver on the underside of the tray with Velcro. After testing for the proper channel connections in the receiver, the completed unit is now ready to install on the four screws of the Keel Saddles. (See Fig. 17)

D. Install Completed Servo Tray on CF or aluminum stand-offs using stainless steel washers and locknuts. Tape the receiver antenna to the port side under-deck area all the way to the stern and then around the rudder thwart. I my opinion, you don't have to run the antenna up the backstay to have good reception.

E. Make a Jib Adjuster Servo Guard out of a cut piece of 0.025" clear plastic to act as a guard over the servo affixed to the hull with Velcro. (See Fig. 17)

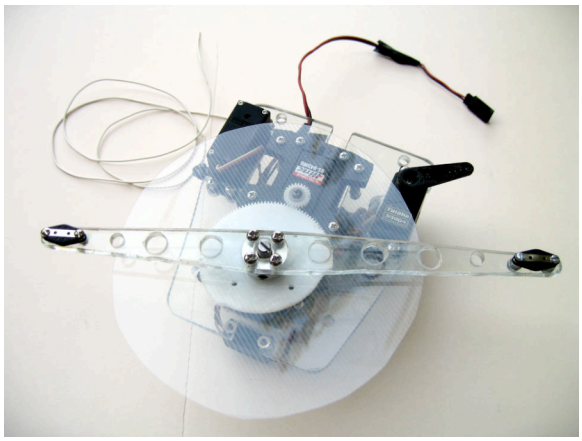


Figure 16

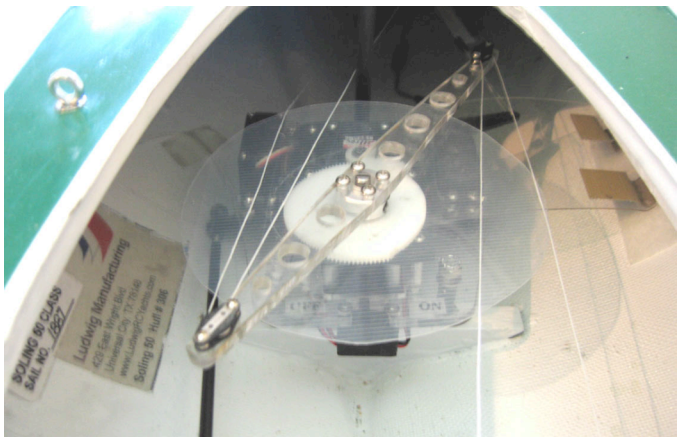


Figure 17

XI. RUDDER FITTINGS

A. **Install Rudder** through Rudder Tube in hull.

B. **Install a rudder arm** (Fig. 18) with a brass insert on the Rudder shaft with the arm on the port side of the boat, perpendicular to the center line of the boat. Be sure you have a small flat spot on the forward side of the shaft for locking in the set-screw on the Rudder Arm. Secure rudder arm perpendicular to center line of boat with an Allen wrench.

C. **Make a Rudder Push Rod** from a 16" length of 6mm carbon fiber tubing. If you prefer, you can use a small arrow shaft instead. To reinforce the Push Rod, insert into each end of the tubing a 6" length of 4/40 threaded rod with about 1" extended from each end.

D. **Install a 4-40 Spring Steel Kwik-Link** (Fig. 19) on the Rudder-end of the Rudder Pushrod for attaching to the Rudder Arm.

E. **Install a 4-40 Ball Link** (Fig. 20) on the Servo-end of the Rudder Pushrod with the ball-end attached to the servo's arm. This allows for a quick disconnect when removing the Servo Tray and/or the Keel assembly. Adjust the overall length for maximum rudder movement.

Figure 18

Figure 19

Figure 20

XII. DECK FITTINGS & MAST SUPPORT

At this point you should be ready to install the deck fittings and mast support tube, or at least locate and mark where all of the deck fittings should go, before you finish painting the deck.

A. Mast Support Tube

1. Drill a 7/32" hole through the Deck directly over the forward Keel Bolt.
2. Cut a mast support from a 8mm carbon fiber tube to fit snugly between the top of the forward forward Keel bolt on the Support Saddle and the underside of the Deck.
3. Place a ¼" brass tubing insert (for use with polyethylene tubing) inside of a 3/8" brass tubing insert through the Deck to lock the CF tube in place. The small 0.135" diameter hole in the small insert will allow a mast fitted with a 1/8" pin to locate itself on the Deck on top of the mast support tube. Do not glue the inserts in place, so they may be removed if you want to remove the keel in the future. (See Fig. 21)

Figure 21

B. Jib Sheet Exit Block – Deck Mounted

1. Drill a small 1/8” hole through the deck on the centerline at approximately 9“ from the bow. Enlarge the hole to a rectangular shape to mount the Sheet Exit Block (Pulley). (See Fig. 22 & Fig. 23) This is a pulley to direct the jib sheet from under the Deck and then through the deck and back to the Jib Traveler.
2. **NOTE**: As an alternative, you can simply mount a round Sheet Exit Guide (See Fig. 24) through the deck near where the jib sheet will be attached to the jib boom, approximately 16 ½” from the bow. This would not require a Jib Traveler.

Figure 22

Figure 23

Figure 24

C. Jib Traveler

1. Obtain a wire spoke from any good bicycle shop. This is a stainless steel wire, 0.077” diameter about a foot long or so. It has a special thread on one end for attaching the spoke to a wheel.
2. Cut this wire to a length of 6 ½” long and have the bicycle shop thread the other end for you. Have them thread several pieces while you’re at it for some backup pieces! The threads are about 3/8” long and they have screw nuts to fit for securing the traveler under the deck. I modified the nuts by adding a knurled knob so they can be attached by hand.
3. With a 6” long spoke, bend the wire so there is about 4 ½” straight piece in the middle with legs about 3/4” long. Bend the 4 ½” lengths into a smooth curve to match the swing of the Jib Boom. Locate the penetration points on the deck, drill two holes and mount. (See Fig. 25) NOTE: You can use any rigid stainless steel or brass wire with some way of securing the ends with nuts so they won’t pull out. Don’t use any washers or standoffs to hold the traveler above the deck, so it is clean and free for the jib sheet to move freely.

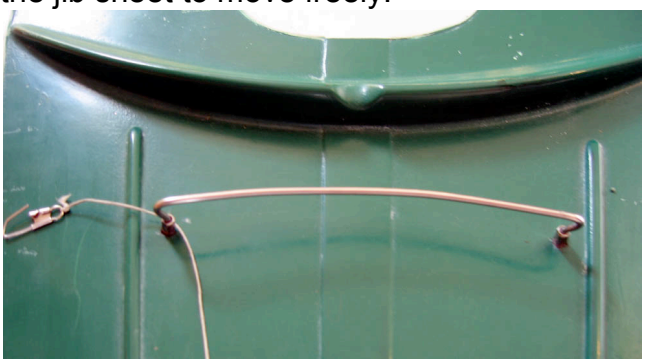


Figure 25

D. Chain Plates (Eyebolts) for Side Stays

1. Cut some small pads of wood 1/8” thick X 1” to 1 ½” square to glue under the deck where the eyebolts will be installed for reinforcement. Epoxy in place and let cure.
2. Install port and starboard eyebolts ½” in from the sides and lined up ¼” to the rear of a perpendicular line to the mast. (See Fig. 26)

3. If you plan on using lower Side Stays for heavy winds, position another set of eyebolts about ½" behind the Upper Side Stay eyebolts.

Figure 26

Figure 27

E. Jib Swivel Attachment Plate & Cleat

1. Drill a 0.087" diameter hole 4 ½" from the bow on the centerline of the deck. This is a drill size for a 4-40 thread. You can tap the hole with a 4-40 tap to accommodate the 4-40 threaded eyebolt (See Fig 26) through the fiberglass and wood underneath.
2. Chamfer the eyebolt hole so there is smooth surface with no rough edges.
2. Install the through-deck eyebolt so that the eyebolt will screw tightly into the deck. Due to lack of reach, you will not be able to put a washer and nut inside the hull, so screw it in tightly through the fiberglass and wood and use CA glue or epoxy to keep it from turning out.
3. Use this eyebolt to hook the swivel from the Jib Boom, or in my case I just run a line from the Jib Boom through the eyebolt and attach the line to a deck-mounted cleat. This method will allow you to accurately control the height of the jib above the deck using a piece of line for the swivel. (See Fig. 28)

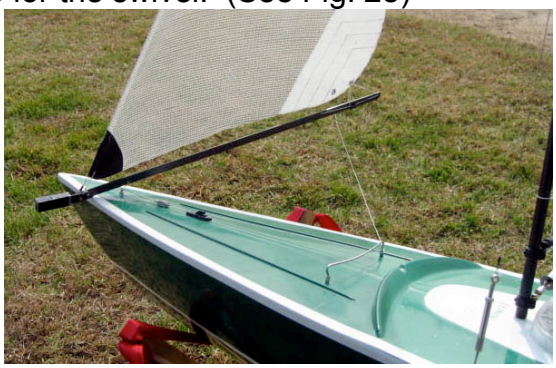


Figure 28

F. Backstay Attachment

Use a simple tang screwed into the transom for the backstay attachment. (Fig. 29 & 30)

Figure 29

Figure 30

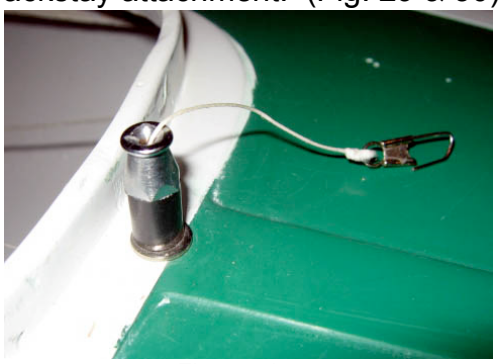


Figure 31

G. Main Sheet Exit Guide

Install a Sheet Exit Guide just behind the cockpit on the centerline of deck. (Fig. 31)

H. Lifting Hook

1. In some lakes or ponds that are lined with a curb you cannot walk the boat into the water. You have to reach way down to set the boat into the water, since you can't pick up the boat (17+ pounds) by the mast alone. If you are like me, who can't easily bend over so far, you can install a small eyebolt through the deck in a balanced position to allow a hook to lower the boat into and raise it up from the water.
2. Use a ¼" eyebolt installed through the deck about 28" from the bow on either side, whichever side is the most convenient for launching and retrieving the boat. (Fig. 32)


Figure 32


Figure 33


Figure 34

3. Epoxy a 1/8" thick wooden reinforcement pad on the underside of the deck where the eyebolt will be placed.
4. Fabricate a hook from a length of plated rod with a handle on one end (Fig. 33) and a hook on the other end to catch the eyebolt. (Fig. 34)

XIII. FINISH PAINT

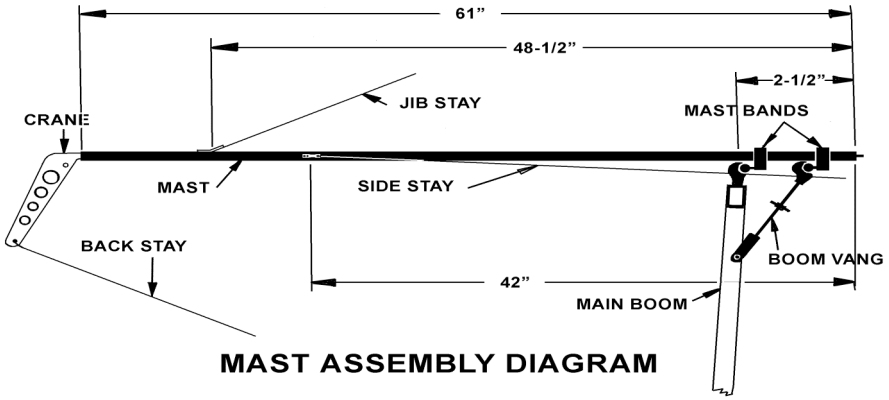
If your hull is gel-coated fiberglass, you have no painting to do on the hull. Just clean and polish it with a good non-wax rubbing compound. Like wise with the deck. You will, however have to paint the keel and rudder. I also paint inside of the hull with a light or white paint so everything is easier to see. I use a good automotive spray paint, such as Krylon® "Fusion" or Plasti-kote®.

XIV. RIGGING & SAILS

Here is where the Soling 50 Class boats differ the most. Everyone has their own ideas on what is the best, easiest, lightest, strongest, fastest, etc., etc. Following is what I have done for Soling 50 #1887 Scout VI.

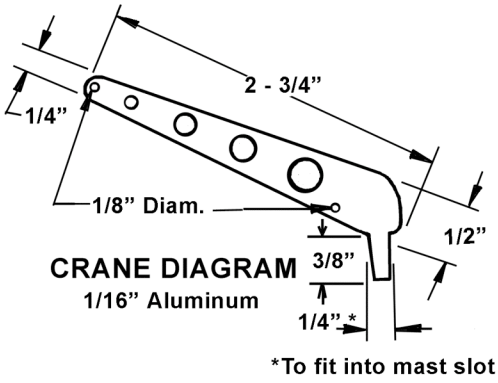
A. Mast

1. **Carbon Fiber material** is the best solution. It's strong and stiff. I use 'Part CT3930 - Carbon Tube Pultruded '3930' (10mm diameter), 60 inches long. Black. From Hang-em High Fabrics (http://ecom.citystar.com/hang-em-high/ushop/index.cgi), or Goodwin Kites (http://www.goodwindskites.com/merch/list.shtml?cat=framework). The cost is less than $20.00, including shipping from either source. You may want to order two (2) pieces, one as a back up, since the maximum overall mast height is 61 ¼" off of the deck. Typically the mast height is 61", so I splice on a 1" piece at the base of the mast with an internal plug to get the length needed.



MAST ASSEMBLY DIAGRAM

2. **Fabricate a Crane** for the top of the mast out of 0.060" aluminum or carbon fiber sheet. You can make it straight or curved. (See drawing for shape & Fig. 35) A small 1/16" wide X 3/8" deep slot in the mast top would allow the Crane to fit down into the mast, where it should be permanently glued in place. It is recommended to add a metal band or wrap the end of the mast with fishing line and epoxy to prevent the carbon fiber from splitting. Drill the necessary small holes for attaching the Main Halyard and Backstay.



CRANE DIAGRAM
1/16" Aluminum
*To fit into mast slot


Figure 35

2. **The Backstay** is attached to the Crane through the small hole at the rear. Use a Nylon coated woven stainless steel fishing line (40 lb test) with a short 4"-5" length of braided Dacron fishing line (30 lb test) with a bowsie for adjustment. (Sevalon "Sevenstrand" line from "Pure Fishing", Huntington Beach, CA or equivalent) The 40 lb test stainless steel line needs #A3 crimps for securing the ends. End the Backstay about 6" from the transom and add a bowsie loop attachment to the tang on the stern. This is your adjustment for backstay tension.
4. **For the Mast Pin**, make a plug for the bottom of the mast out of hardwood or plastic with a 1/8" diameter stainless steel rod X 1" long in the center. Extend the pin 1/8" beyond the base end of the mast. Epoxy in place to make it permanent. In case you ever loose the mast in a big wind, the short pin will allow the mast to fall over without breaking anything, yet hold it in place while upright on the deck.
5. **For the Gooseneck**, use 2 (two) "Mast Bands" (See Fig. 38) for a 10mm tube to form the swivel for the main Boom and Boom Vang. Position the top Band so the center-line of the Boom will be exactly 2 ½" above the deck. Position the bottom Band so it is just high enough to clear the Hatch Cover when swinging, about 3/8".


Figure 37


Figure 38

4. **The Boom Vang** may be purchased as a complete unit (As shown in the accompanying photos – Fig 41) or fabricated using a 4-40 turnbuckle with a quick-link on the boom-end and a ball-link (Fig. 37) on the mast end. The ball link should fasten to a ball mounted on the mast band. I glue a small wheel to the turnbuckle so it can be easily turned and adjusted by hand. (See Fig. 39)

Figure 39

6. **Side Stays** are attached to the mast at approximately 42" above the deck using 2 (two) tangs screwed into the mast. If you want to add Lower Side Stays for heavy wind conditions, affix these to the mast at about 30" above the deck. Us the 40 lb. test stainless steel fishing line with A3 crimps with an adjustable Rigging Screw for each Side Stay. (Fig. 40 & Fig. 41)

Figure 40

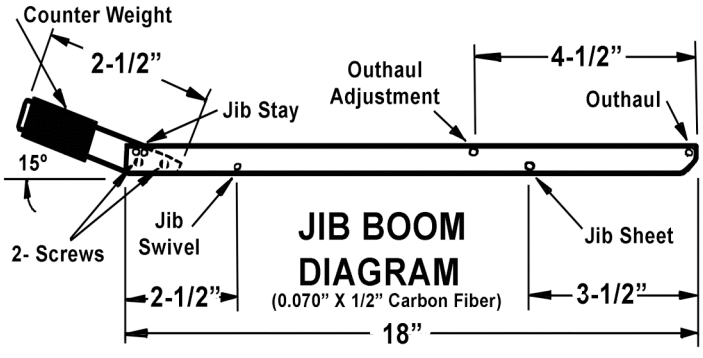
Figure 41

7. **Jib Stay** is also attached to the mast using a mounted tang exactly 48 ½" above the deck. Use the same stainless steel line as for Side Stays. (See Mast Assembly)

B. Booms

1. **Material for the booms** is flat carbon fiber 0.070" thick X 0.436" wide X 48" long. Goodwinds Kites (http://www.goodwindskites.com/merch/list.shtml?cat=framework). For about $12.00 including shipping, one piece will be enough for both Jib Boom and Main Boom. For good stability, these booms will not bend vertically.
2. **Jib Boom** should be about 18" long, with a 2" extension in front to hold a Jib Counter Weight. Drill cross-holes through the CF material to accept the Jib Swivel attachment, Jib Outhaul and Outhaul Attachment with bowsie, and Jib Sheet attachment (aligned with the Sheet Exit Guide or Traveler). There is no specific length requirement. (See Jib Boom Diagram & Fig. 42)

Figure 42



3. **Jib Counter Weight** to be added later. The optional weight is helpful to allow the Jib to wing-out going down wind in very light wind. The amount of the weight is left up to the builder. It should be enough weight to balance the Jib on it's swivel when the boat is held on it's side with the sails in a horizontal position.
4. **Main Boom** should be about 17" long, plus a 1" long length of CF tubing to attach the Main Boom Swivel Ball Joint. Drill cross-holes through the Main Boom to accept the Main Outhaul & adjustment point with bowsie, Main Sheet and the Boom Vang. There is no specific length requirement. (See Main Boom Diagram and Fig. 43)

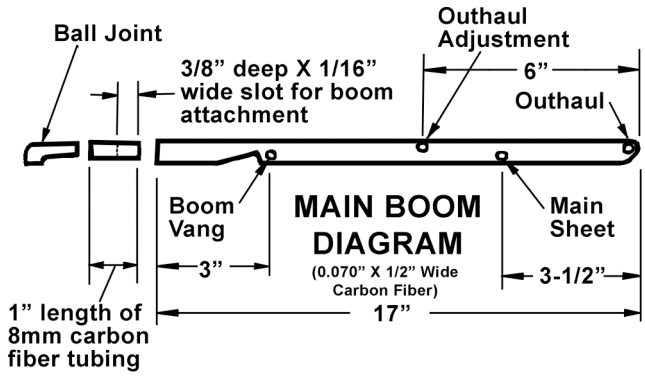


Figure 43

C. Sails

1. **I recommend "Black Sails"**, made by Chuck Black, San Diego, CA. Reach him at: (619) 263-0809 or email at: rcmdlboat@aol.com. Order your sails for attachment with "luff ties" and specify the color of your corner reinforcing.
2. **Attach main sail** to the mast using short lengths of Dacron fishing line (luff ties). Allow about 1/8" clearance so the sails move freely about the mast.
3. **Attach jib sail** using stainless steel 40 lb test with A3 crimps to the fore part of the Jib Boom, through the jib sail's luff pocket and then to the forepart of the mast with a 4"-5" bridge length of fishing line and bowsie for adjustment.

D. Sheets

1. Install Main Sheet and Jib Sheet following diagram of Sheet Layout on Page 7. I recommend using "Dyneema", Braided Cord, White, 0.4 mm, 30 Kg test. It is flexible and strong enough for it's use.
2. Use small hand-lockable hooks on the ends that will not snag or get caught on any lines, etc. (See Page 11, Figures 23 & 24)

XV. TUNING

This section should easily require a separate manual in itself, but I will provide the basics as I know them. Practice and more practice looks like the ultimate answer to consistently winning races. So following are my suggestions for a fast Soling 50 model sailboat.

You can accomplish some of the following adjustments with the boat set in a cradle on land leaning to leeward with the wind in the sails, simulating a closed-hauled position.

A. Sails & Sail Shape

The wind is your fuel. The sails are your engine. The sail shape and their relative position is your throttle. For competition, use the best-paneled sails you can buy. Ideally, you want your Soling 50 to be balanced so well, that it sails close-hauled to windward almost by itself, without undue rudder control, except perhaps a slight "kick"

occasionally to keep it in the “groove”. Your rudder is the biggest drag on your boat, so use it sparingly. Sailing downwind is simply presenting as much sail area to the wind as possible. Achieving the “groove” going upwind at maximum speed is a matter of adjustments, and it’s all related to getting your best sail shape. The following adjustments will help you achieve that ideal “sail shape”.

B. Mast Rake & Position

“Weather Helm”, or the amount that a boat pulls up into the wind while sailing close-hauled to windward, is controllable and adjustable. Slanting (raking) the angle of the mast aft increases the “Weather Helm”. Raking the mast forward creates the opposite effect, which you don’t want, a “Lee Helm”. You want to achieve a balance when closed-hauled so you have a very slight “Weather Helm”. Jib Sheet tension also adds to this balance. A tighter Jib Sheet reduces Weather Helm and vice versa.

C. Side Shrouds

Tension on the side stays should be snug, but not “drum tight”. They simply keep the mast in the upright position. With carbon fiber masts, they offer no control as to shape. To make sure the mast is straight, lay your rigged boat on it’s side. Measure the distance from the ground to the tip of the mast. Turn the boat over and do the same on the other side. Adjust the side stays so the mast is straight.

D. Jib Stay & Jib Boom Adjustment

The mast at the outset should be almost vertical. The adjustment fore and aft is made with the bowsies on the Jib Stay and Jib Halyard, together with the Backstay. In my opinion, the Jib Swivel Attachment on the Jib Boom should be as low as possible, ½” to the deck fitting, but many use stainless steel swivels and are only 1” above the deck.

E. Back Stay Tension

Adjust the backstay so there is a very slight tension using the bowsie. In light airs, the backstay should be quite loose to let the jib leach match the curve of the mainsail while under sail. In heavier winds, tighten the backstay, which tightens the jib leach to match the curve of the mainsail.

F. Downhaul Tension

Adjust the mainsail’s halyard tension to just remove any wrinkles in the sail’s luff. In heavier winds, this tension may have to be increased.

G. Outhaul Tension

Adjust the outhaul tension on both the jib and mainsail so there is a nice curvature to the sail…or “camber”, which is the space between the sail’s foot and boom. The mainsail should have about 1 ½” (two fingers) of camber and the jib slightly less.

H. Main Sheet Position

Adjust the mainsheet, when close-hauled, so that the end of the main boom lines up with the stern corner of the transom. In heavier winds, the mainsheet should be loosened slightly, compared to the jib, to keep the boat from heeling too much, thus keeping the boat more upright…and faster.

I. Jib Sheet Position

When close-hauled, the aft end of the Jib Boom should be about 2 ½" in from the side of the boat. The "traveler" suggested in this manual, controls this position and allows the jib to be sheeted down toward the deck, rather than in toward the center of the boat. This setting should produce a nice "Slot" between the jib and the mainsail. (See Fig. 44 & Fig. 45) The "Slot" is crucial for keeping a good airflow over the surfaces between the sails. In very light winds, the slot should be opened up slightly to keep the boat moving to windward.

Figure 44

Figure 45

Figure 46

J. Boom Vang – Adjusting Sail Twist

The Boom Vang is used for adjusting the "Sail Twist" of the mainsail. With your Soling 50 on it's stand and the sails close-hauled and filled with wind, walk about 10 feet to the rear of your boat. The lower batten should point slightly to windward, the middle battens about parallel to the boat and the upper batten should point to leeward. The amount the upper batten (or leach of the sail) points to leeward is called the "twist". You need twist in your sail, even in light air. The more wind you have, the more twist you need. Adjust the twist with the Boom Vang. (See Fig. 46)

K. Jib Boom Topping Lift

A jib boom topping lift is a line attached to the end of the jib boom with the other end attached to the jib stay fitting on the mast and a bowsie for adjustment on one end. This topping lift can adjust the twist in the leach of the jib to match the curve in the luff of the mainsail without any backstay adjustments. I personally don't use a topping lift because it "fixes" the amount of twist in the jib, when it should automatically twist off as the wind increases. Some skippers like to use a Jib Boom Topping Lift, but It can frequently get tangled, especially if using spreaders.

L. Jib Boom Counter Weights

The Jib Boom counter weight is to balance the jib boom and allow it to wing-out freely while going down wind in very light airs. Add just enough weight on the fore part of the Jib Boom to balance the jib to a center position on the boat while holding the Soling 50 in a horizontal position. (See Page 17, Jib Boom Diagram and Figure 42)

M. Hull Condition

Whether your Soling 50 is painted or gel-coated, it should have a smooth polished surface, free of any scratches, nicks or dirt. Never wax your hull. Wax only repels water and disturbs the laminar flow of water across your hull and causes turbulence, which slows you down. Use a #1000 or #2000 wet-or-dry sandpaper with a small amount of soapy water and finish with an extra-fine wax-free rubbing compound commercially available for automobiles.

N. Two-boat Testing

It's fun to sail a Soling 50 by your self. But it's even more fun to sail with somebody else. If you want to compete, you must find someone to sail "against" to hone your skills and test your tuning. Two-boat testing is sailing side-by-side with another Soling 50 to see which one is faster. Trade transmitters and do it again. Make rigging adjustments and try it again. Go through all of the adjustments to improve your speed until your boat is up to speed.

O. Practice-Practice-Practice

Even with a perfectly built and tuned Soling 50, you will need practice. Your two thumbs and your awareness of wind and water conditions play the biggest part in winning or losing a sailboat race. Learn to start a race on time and in a good position and win the first leg to windward, and you will do fine. Good sailing!

XVI. APPENDIX

WEIGHTS OF SOLING 50 COMPONENTS – SCOUT VI #1887

ITEM	POUNDS	OUNCES	MANUFACTURER
Hull, Untrimmed (Gel-coated)	1	13	Ludwig Mfg.
Hull, Untrimmed (Fiberglass – Raw)	1	11.4	Hartman Fibreglass R/C
Hull, Trimmed (With Keel Saddles, Rudder Thwart & Deck Supports)	2	9.0	Ludwig Mfg.
Deck, Untrimmed	0	14.1	Hartman Fibreglass R/C
Hull & Deck – Bonded (Trimmed, Painted and Deck Fittings Installed)	3	13	
Hatch Cover, Clear	0	2.1	Ludwig Mfg.
Keel, Finished (With 2-Keel Bolts, painted)	11	5.8	Staiger
Rudder, Finished (Painted)	0	3.5	Hartman Fibreglass R/C
Radio Servo Tray (Gear Box, Servos, Receiver, Switch & Batteries)	1	4.0	Ogden
COMPLETE SOLING 50 (Without Rigging and Sails)	16	12.4	Ogden

Rigging & Sails Complete	0	9.6	Black's North PX Sails - Rig "A"
Rigging & Sails Complete	0	8.9	Black's Tri-Spi 25 Sails - Rig "B"

(With complete mast, booms, sails and all rigging)

Complete 'RTS' Boat	17	6.0	With Rig "A"
Complete 'RTS' Boat	17	5.3	With Rig "B"

TOP SOLING 50 CLASS SKIPPERS AND MODEL YACHTS OF 2007

George Pedrick, Alameda, CA – 1st Place
2007 Soling 50 National Championships

Chris Staiger. Bakersfield, CA – 2nd Place
2007 Soling 50 National Championships

Ty Beach, San Diego, CA – 3rd Place
2007 Soling 50 National Championships

Filippo Busalacchi, San Diego, CA – 4th Place
2007 Soling 50 National Championships

John Castelli, Yorba Linda, CA 5th Place
2007 Soling 50 National Championships

Ken Covey, Bakersfield, CA - Winner
2007 J.D. Vincent Craftsmanship Trophy

MANY, MANY THANKS *to two great and very generous Bakersfield model boat skippers,* ***Chris Staiger and Ken Covey****, for all of their help in showing me the right way to do things in building and tuning this Soling 50 Class model sailboat.*

END END