

CDI

Cruising Design, Inc

Mainsail Reefing System - MR4/6

(For sailboats 25-40')

Installation/Operating Instructions



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SPECIFICATIONS

Boat Size	Approx. 40 feet maximum length
Existing Mainsail Luff Length	39 feet maximum
Mainsail Maximum Size	400 Square Feet
Ball Bearings	Supplied as standard equipment
Wire Size	3/16" (supplied w/ system)
Fitting Size	3/8' diameter (supplied w/system)
Furling Line	1/4" braid-on-braid dacron.
Outhaul Line	3/8" braid-on-braid dacron

OPERATION WARNINGS & SAFETY CHECKLIST:

1. After completing the Mainsail Reefing System installation, make sure the furler rotates freely.
2. Never winch the unit without checking for jams or snarls. Winching against an obstruction can cause hidden damage to the mainsail furler internal stay.
3. Keep all unused halyards clear of the Mainsail Reefing System and under slight tension.
4. If the unit becomes hard to reef or furl, investigate and correct the cause. Failure to do so can lead to the failure of the Mainsail Reefing System or other systems on the boat.

USAGE WARNINGS:

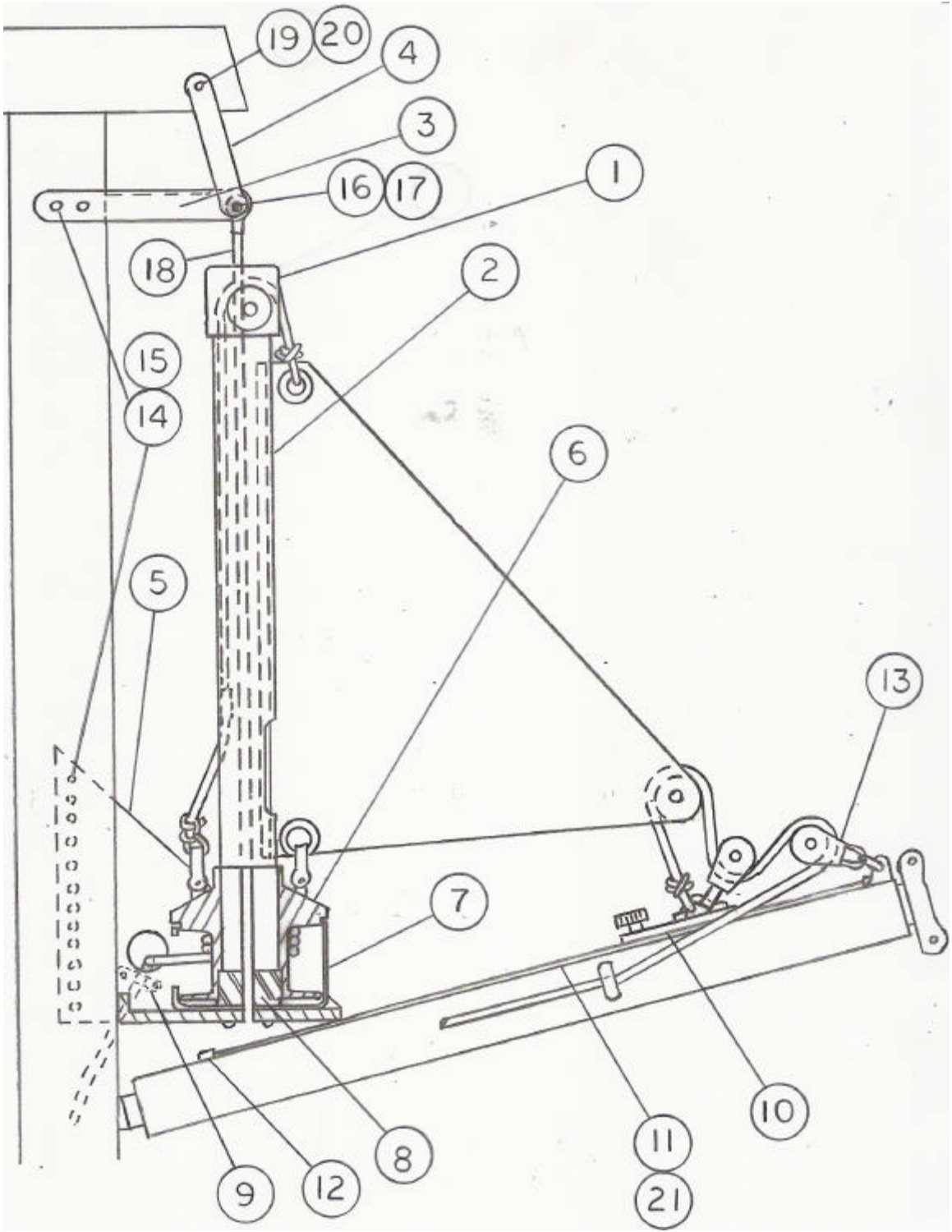
The CDI Mainsail Reefing System is intended to reef and furl mainsails or mizzen sails easily and safely.

The Mainsail Reefing System is NOT designed to be used while the boat is in the water with the mast tipped forward while passing under low clearance obstructions (bridges, power lines, etc.). Lowering the mast in this manner is dangerous even without a furler attached, and can be further complicated by the additional weight of the furler and sail.

“This product is intended for use only on sailboats having the masts fixed vertically at all times while the boat is in the water, wherein the mast may only be lowered in accordance with the manufacturer’s instructions when the boat is on land. **Any other use of the product constitutes misuse, and may result in damage to the product, and/or serious injury to the user.**”

NOTICES RELATING TO THE MISUSE OF CDI FURLERS

INDEMNIFICATION. *UPON PURCHASING THIS PRODUCT, THE PURCHASER AGREES TO HOLD HARMLESS AND INDEMNIFY CDI AGAINST ANY LAWSUIT, CHOSE IN ACTION, OR CAUSE OF ACTION ARISING OUT OF THE USE OF THIS PRODUCT OTHERWISE THAN ON SAILBOATS HAVING MASTS FIXED IN PLACE AT ALL TIMES WHILE THE BOAT IS IN THE WATER, WHEREIN THE MAST MAY ONLY BE LOWERED IN ACCORDANCE WITH THE MANUFACTURER’S INSTRUCTIONS WHEN THE BOAT IS ON LAND.*



MAINSAIL REEFING SYSTEM PARTS LIST

Ref	Description	Part Number
1	Halyard Top Fitting Assy	MR4005
	Halyard Top Fitting	MR4004
	Sheave	1937
	Pin	1046
	Halyard	MR4033
2	Luff	LFF6
3	Mainsail Top Brkt Assy	MR4007
4	Mainsail Top Strap (2)	MR4008
5	Mainsail Lower Brkt Assy	MR4006
6	Mainsail Spool Assy	MR4009
	Mainsail Spool	MR4010
	Clevis Pin (2)	1936
	Shackle (2)	1935
7	Cup, Stainless Steel	1806
8	Ball Bearing	BB4/6
	Screw, Mounting, 10-32 x 7/16	MR4032
9	Lower Brkt Reefing Sheave	MR4011
	Mounting Screw, 10-32x.50 (2)	MR4023
	Nylok Nut, 10-32 (2)	MR4024
10	Reefing Car	MR4012
11	Reefing Track	MR4013
12	Reefing Track Stop (2)	MR4014
13	Boom Reefing Block (2)	MR4015
	Shackle (1)	1935
14	Mounting Screw, 1/4-20 x 3/8 (22)	MR4016
15	Fixture Screw, 1/4-20 x 1 1/2 (2)	MR4017
16	Clevis Pin, 3/8 x 1 7/8	MR4018
17	Cotter Pin	MR4027
18	Inner Stay Assy	MR4028
	Inner Stay	MR4031
	Stay-lok Eye Fitting	MR4029
	Double Jaw Toggle	MR4030
	Nut, 3/8-24 (3)	MR4026
19	Bolt, 3/8-16 x 3	MR4021
	Bolt, 3/8-16 x 4	MR4020
20	Nut, 3/8-16, Nylok	MR4022
21	Screw, 10-32 x 1 1/2 (23)	MR4025

UNCOILING THE LUFF EXTRUSION – READ WARNINGS AND UNCOILING INSTRUCTIONS BEFORE UNCOILING !!

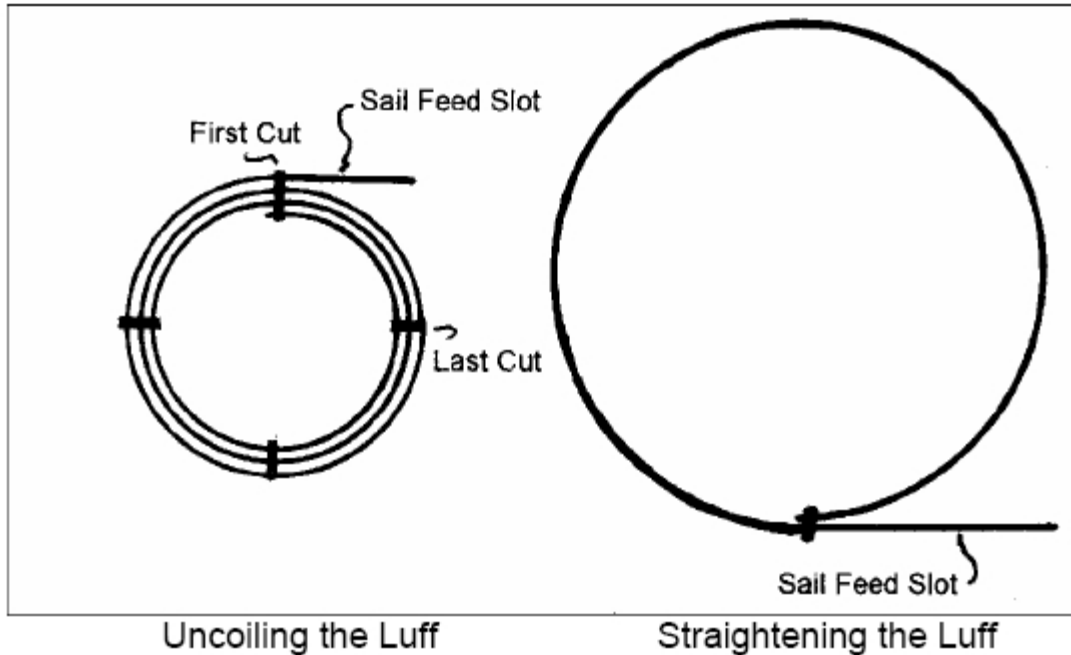
WARNINGS:

- *Be careful !!* Coiled luffs have a lot of stored energy. Careless cutting of the tape bands that restrain the luff can cause sudden and uncontrolled uncoiling resulting in injury especially to the face and eyes.
- *Wear face and eye protection*
- *Read instructions completely before cutting the tape.*
- *Never cut all the bands at once!!*
- *Uncoil the luff extrusion as soon as practical after receipt.* If uncoiled promptly, the luff extrusion will straighten much more easily than if left coiled for any length of time.

UNCOILING INSTRUCTIONS

Follow the instructions posted on the shipping box and:

1. Lay the extrusion on the ground.
2. Stand on the inside of the luff to avoid having the luff spring at you and strike you when the tape band is cut.
3. Start at the band of tape that is closest to the tail of the luff extrusion. Cut this outer tape band while holding the straight portion. Gently uncoil to the next tape band.
4. Continue to hold the un-taped portion, and carefully cut the next band of tape.
5. Repeat until you reach the last tape band. **STOP** before cutting the last band of tape.
6. Be sure you have enough people to prevent the remainder of the luff from springing open. While standing inside the final coil, cautiously cut the last band of tape and allow the luff to assume its natural curve.



STRAIGHTENING INSTRUCTIONS

- Holding the luff flat on the ground with weights and/or using a hair dryer **DON'T WORK** and will void the warrantee. Follow the instructions below.
 - One person needs to be stationed every 8 feet along the length of the luff. Do not let the luff sag and avoid twisting it.
 - Note that one end of the luff is straight (it was straight in the box) while the other end is curved.
1. Again, following the instructions posted on the shipping box, Recoil the luff in one large loop in the opposite direction of its natural curve.
 2. Tape the end that was curved to the other end at the point where the luff begins to curve.
 3. Let the luff rest laying flat on the ground for at least 3 hours. After that time, test to see if it is straight by carefully un-taping it.
 4. If it still has significant curvature, re-tape it in the same configuration and give it more time. Warmer temperatures will speed the process.
 5. The luff need not be perfectly straight, as the forestay tension will straighten a gentle bend.

Removing Kinks: If your luff has been stored improperly, coiled or bent for a long time, the best technique is to place the entire luff inside a pipe or tube

and let it sit outside in direct sunlight for 1-2 weeks in the summer. NEVER try to straighten the luff by using a hair dryer or by laying it on the ground and weighting it down along its length. These techniques DON'T WORK and will void the warranty.

INSTALLATION

1. Check the parts list carefully.
2. Read all the instructions carefully before beginning the installation. If you have any questions, call Cruising Design at 607-749-4599 or e-mail your questions to sailedi@verizon.net
3. Install the upper brackets, which consists of 2 Top Straps and Top Bracket Assembly.



- a. Form the mounting arms on the Top Bracket Assy to closely match the shape of the mast.
- b. Depending on the width of the existing masthead, the Top Straps may need to be formed slightly wider, or narrower to transition between the width of the existing masthead and the Top Bracket Assy. Bend each strap equally.

- c. Install Top Straps by removing the backstay pin (or Main Halyard sheave pin). Install the Top Straps outside the existing masthead using one of the 3/8" dia. bolts provided (3", or 4" long as necessary). Secure with 3/8" dia. Nylock nut.
 - d. Connect the Top Straps and the Top Bracket assy with the 3/8" dia. X 1 7/8" long clevis pin.
 - e. Swivel the Top Bracket Assy until its stop is against the mast. Center the Bracket assy on the mast slot. Drill and tap through the Top Bracket Assy into the mast and fasten with 1/4-20 x 3/8" long screws.
4. Install the Lower Bracket Assy that consists of the Lower Bracket and the Reefing Spool Assembly.



- a. Form the lower bracket mounting surfaces to the approximate width of the mast. If the mounting surfaces on the bracket need to be closer together, place the bolting flanges in a vise and carefully squeeze them together equally as necessary to match the mast width.
- b. Locate the bottom surface of the Lower Bracket 2 1/4" above the top of the boom, centered on the mast slot. **Locate the**

bracket cup surface perpendicular to the mast. If the bracket is not perpendicular to the mast, the bearings will not rotate freely and the system will always be difficult to turn. Locate the bracket stop flange against the mast. Drill and tap through the bracket mounting holes and fasten with $\frac{1}{4}$ -20 x $\frac{3}{8}$ " long screws. Two longer fixture screws have been provided. They may be used to draw the bracket close enough to the mast that the $\frac{3}{8}$ " long screws will mount into the mast. Install each screw as its hole is drilled and taped. This will ensure hole alignment of all the holes and screws.

- c. Determine if the Mainsail reefing line is to be mounted on the port or starboard side of the boat. Mount the reefing line sheave on the lower bracket in the appropriate location for routing the reefing line. If the reefing line exits the port side of the lower bracket, the UV shield should be sewn onto the starboard side of the foot and leech of the sail. If the reefing line exits the starboard side of the lower bracket, the shield will need to be on the port side of the sail.
5. Assembly of the mainsail reefing system internal stay.
 - a. Measure the distance between the *centerline of the lower pin in the Double Jaw Toggle part of the top bracket assembly* and the bottom surface of the lower mounting bracket. Add $1\frac{1}{2}$ ". That will be the length of the internal stay, from the center of the top eye to the end of the threaded stud. Cut the unfinished end of the stay and assemble the stay-lok eye in accordance to the stay-lok instruction sheet.
 6. Installation of the reefing system.
 - a. Cut the luff to the length of the internal stay (as calculated above in step 5a) minus $9\frac{3}{4}$ ".
 - b. Install a $\frac{1}{4}$ " reefing line through the sheave on the side of the lower mounting bracket, through the hole in the side of the bracket, and up through the hole in the spool. Tie a stopper knot in the end of the furling line.



- c. Install the spool with reefing line attached onto the bearing mounted inside the stainless steel cup located on the lower mounting bracket. Before raising the mainsail, wrap about 20 turns of the reefing line around the spool.
- d. To assemble the halyard top fitting onto the luff extrusion, first feed the decored end of the halyard down the luff groove opposite the sail feed slot. Insert the stainless steel ferrule down inside the groove.



Inserting FF4 ferrule into top of luff

Push the halyard Top Fitting over the top of the luff and secure with the locking screw. Make sure the OTHER end of the halyard (the end without the ferrule) exits the halyard top fitting on the same side as the sail feed slot and slides freely.

- e. Tie a messenger line approx. the length of the extrusion, to the decored end of the halyard. This will be necessary to raise the sail. Pull the other end of the halyard until the ferrule is hard against the halyard top fitting. Cut the halyard so that when the head of the sail is tied to the halyard, the head of the sail is just below the sail feed slot in the extrusion. Melt the end of the line to prevent fraying.



Rope halyard fed into HTF
(bottom view)



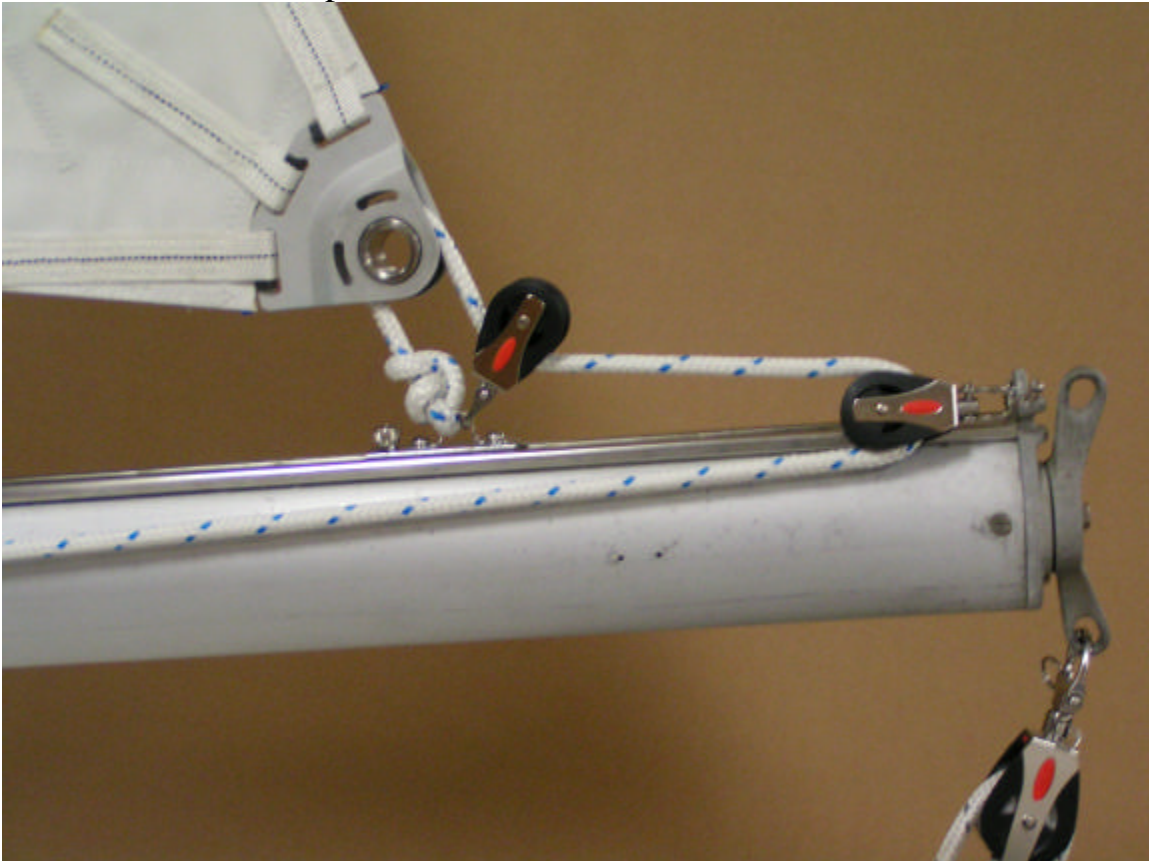
Rope halyard fed thru HTF
& sheave (side view)

- f. Insert the bottom end of the mainsail stay through the halyard top fitting, through the luff, through the spool, then finally through the lower bracket. Place the bottom end of the luff extrusion into the spool.
 - g. Insert the Top Bracket internal stay pin into the eye at the top of the stay.
 - h. Assemble three 3/8-24 nuts* on the lower threaded end of the internal stay, under the lower mounting bracket. Use two nuts as jam nuts to hold the stay while tightening the tension on the stay with the third nut. Tighten the stay snug, but not to the point of bending the mast. Loosen the jam nuts and jam them against the nut already tightened onto the stay.
7. At this time, measurements can be taken accurately for the new mainsail. The exposed luff track is the maximum sail luff for the new

* **Important:** Before installing the nuts to the internal stay under the spool (6h), apply a light coating of oil to the threads on the lower end of the stay to prevent galling of the stainless steel threads and the stainless steel nuts.

mainsail. The foot of the new sail will be the measurement from the luff sail track along the sail foot slot to the end of the boom – minus 6". *After measuring for the new sail, the new Mainsail Reefing system can be removed from the mast, the old sail reinstalled, and the boat can be sailed until the new sail arrives. After the new sail arrives, continue the installation.*

8. Install the reefing track on the top of the boom.
 - a. Locate the reefing track at the outboard end of the boom.
 - b. Drill and tap through the mounting holes 10-32 threads into the boom down through the former mainsail foot rope groove. Mount the track with 10-32 x 1 ½" long screws as each hole is drilled and tapped.
 - c. Install the reefing car onto the track.
 - d. Install the track end stops.
 - e. Install Boom Reefing Block with Shackle 1935 to outboard end of boom.
9. Install whatever lead blocks are appropriate to lead the ¼" dia. reefing line to the cockpit.



10. Attach 3/8" dia outhaul line to the loop on the reefing car. Route the outhaul line from the reefing car up through the clew block on the sail,

then through the block on the reefing car, through the block attached to the outboard end of the boom, then forward along the boom to the mast. Install whatever lead blocks are appropriate to lead the 3/8" dia. outhaul line along the boom to the mast, and then to the cockpit. The outhaul line will need to be approximately 3 times the length of the boom plus the length required to lead to the cockpit plus 3 ft.

11. Lines led to the cockpit should be routed to the most convenient place. Use as few fairleads and take as few turns as possible as the increased friction will make it more difficult to operate.
In most cases, at least one winch should be used to assist in pulling the sail in and out. Often the main halyard winch can be removed and used for this purpose. If only one winch is used, a pair of jam cleats or cam cleats should be positioned in front of the winch.
12. In most cases the main will not operate as easily as the jib reefing system due to increased friction. It is proper to use a winch to assist, but be careful nothing is binding or lines caught on an obstruction.

HOISTING THE MAINSAIL

1. Attach the halyard to the head of the sail.
2. Pull up the sail by pulling down on the messenger line attached to the decored end of the halyard while feeding the luff tape into the sail feed slot.
3. When the sail is fully hoisted, remove the messenger line and make the decored end of the halyard fast to the halyard anchor shackle.
4. Tension the luff of the sail with the tack tension line, passing two or three parts through the downhaul shackle on the reefing drum and grommet on the sail. Finish off with some half hitches.
5. Add or eliminate furling line on the furling drum as necessary. When the sail is furled tightly, there should be 5 to 10 turns left on the furling drum.

LOWERING THE MAINSAIL

1. Cast off the halyard tension line. Tie a messenger line (approximately the length of the mast) to the decored end of the halyard.
2. Lower the mainsail.

SAILING WITH YOUR MAINSAIL REEFING SYSTEM

Luff Tension. The mainsail requires enough tension to remove the wrinkles along the luff of the sail. This tension may be quite low (perhaps 50 pounds) because modern sails are quite stiff, requiring little stretching. The luff tape also prevents scalloping often encountered with sail slides. This allows the sail to be set up for the entire season without the need for adjustments before and after each use.

Foam Tape / Shape Tape. Because modern sails are quite stiff, the draft can be controlled with small changes in luff tension. If you are sailing to windward frequently in heavy weather and reef a lot, it may be appropriate to have a foam shape tape installed on the luff which will help remove the belly in a reefed sail. We suggest you consult your sailmaker.

Furling & Reefing. To furl the mainsail, ease the outhaul line and pull in the reefing line.

To reef the sail, ease the outhaul line, pull in the reefing line until you have reached the desired sail size and cleat off the reefing line. Move the reefing car to a position slightly beyond the clew of the sail. Pull the outhaul line tight and cleat it off. Failure to adjust the position of the reefing car on the boom will lead to poor sail shape.



To unfurl or unreef the sail, ease the reefing line, move the reefing car to the end of the boom, and trim in the outhaul line. Always keep some tension on the reefing line to insure a smooth wrap of the reefing line on the drum.

When sailing to windward, releasing the mainsheet will cause the sail to luff, making the sail to be much easier to reef or unreef. Changing sail size when running or broad reaching is always a challenge. Often, by turning the boat to be directly downwind and sheeting the mainsail hard onto the centerline of the boat, wind can be spilled from the sail and sail size changing will be slightly easier. **Each boat will handle differently when reefing or furling the sails. On a light air day, practice and try different techniques for changing sail size to determine the method that works best for you and your boat before you face the need to reef in dangerous growing wind conditions.**

In certain conditions, you may wish to use a winch to get the reefing started. Be careful that there is no extraneous ship's halyard wrapped in the reefing system while you winch as this could eventually jam the reefer. Always look at the top of the furler while you winch and stop to clear any snarls. Reefing should not get more difficult as the sail is brought in. It should get easier. If it gets harder, stop and determine why.

Always keep unused halyards clear of the reefing system and under slight tension.

TRAILERING WITH YOUR CDI MAINSAIL REEFING SYSTEM

Your Cruising Design Mainsail Reefing System is designed to take a lot of abuse. However if you plan to trailer your boat, there are some precautions that will help avoid problems not normally experienced while sailing.

When trailering your boat, you can leave the mainsail Reefing System installed on the mast. Do not arrange the mast on the boat/trailer in a position where the luff extrusion is carrying the weight of the mast. Support the length of the luff extrusion to prevent it from sagging (tie rope loops around the mast/luff extrusion every few feet).

MAINTENANCE & STORAGE

The Cruising Design Mainsail Reefing System is a set-it-and-forget-it furling and reefing system. No routine maintenance is required, but an

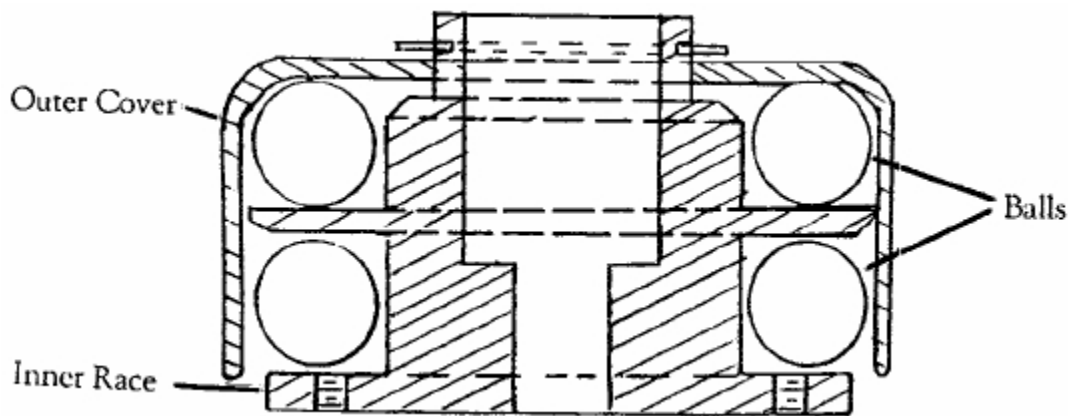
occasional rinsing with fresh water is a good idea. We do not recommend the use of wet lubricants (grease) as such lubricants can trap wear causing dirt particles in the bearing area. Dry lubricants (Teflon sprays, etc.) are fine to make the furling easier.

When storing for prolonged periods, it is best to leave the reefing system attached to the mast. Support the luff extrusion along its length to prevent sagging. Luffs must be stored flat and straight, or the warranty is void.

Do not expose the reefing system to temperatures above 140 degrees F. Such temperatures may frequently occur in warm climates under a boat cover. The higher the temperature, the faster a bend becomes permanent.

To clean the luff, use a rag soaked in paint thinner. For deep scratches and ground in dirt, rub with a rag soaked in acetone. Acetone actually dissolves the luff, so even deep scratches can be removed.

BALL BEARING MAINTENANCE



The ball bearing should be rinsed occasionally with fresh water. To do so, direct a stream of fresh water through the opening in the cup (facing the mast). Direct the spray between the bottom of the spool and the bottom of the cup. If the bearing is hard to turn, disassemble for a more thorough cleaning. To do so:

1. Remove the mainsail from the reefing system.
2. Remove the nuts providing tension to the internal stay from under the lower bracket.

3. Remove the lower bracket containing the spool assembly from the mast. Set the lower end of the luff extrusion on the boom and lash it to the mast to keep it from falling.
4. Lift the drum out of the lower bracket assembly.
5. Hold the assembly over a box so when the balls fall out, which they inevitably will, they won't roll into oblivion.
6. Remove the snap ring at the top of the bearing race in the bottom of the stainless steel cup. Pull the outer race up off the inner race. (this is where the balls fall out)
7. Clean all the balls and both races. Fresh water is usually sufficient, although grease must be removed if present.
8. Reassemble the bearing by placing 12 of the balls in the outer race (which you turned upside down). Using a small amount of shaving cream or by swirling the outer race, get all the balls to the outside of the outer race and insert the inner race.
9. Carefully raise and cock the inner race so you can just insert the remaining 12 balls in the unfilled race. When all the balls are in place, push down on the outer race. Replace the snap ring.
10. If you used shaving cream during the assembly, rinse the bearing with fresh water.
11. Reassemble the system by inserting the internal stay through the spool, bracket assembly. Reinsert the luff into the spool. Remount the lower bracket onto the mast and retighten the internal stay nuts to tension the system again.
12. Reinstall the sail.

SAILMAKER'S AND RIGGER'S INSTRUCTIONS

Luff tape required is #6.

Maximum sail luff length is the length of the exposed luff extrusion sail track.

We recommend the use of short webbing at the head and tack of the sail instead of metal grommets. This allows the sail to reef and furl more evenly.

For most installations, the sail will require no battens, which means, no positive roach in the sail.

The sail must be loose footed, with a 5 degree up slope to the foot.

We recommend a clew block at the clew of the sail. It is not necessary, a sheave can be shackled to the clew of the sail, but a clew block will allow a slightly larger sail to be installed.

Installation of luff foam will enhance the sail shape of a reefed sail.

If a UV sail shield is to be sewn onto the new mainsail:

If the reefing line exits the port side of the lower bracket, the UV cover should be sewn onto the starboard side of the foot and leech of the sail. If the reefing line exits the starboard side of the lower bracket, the cover will need to be on the port side of the sail.

FOR MAXIMUM PERFORMANCE

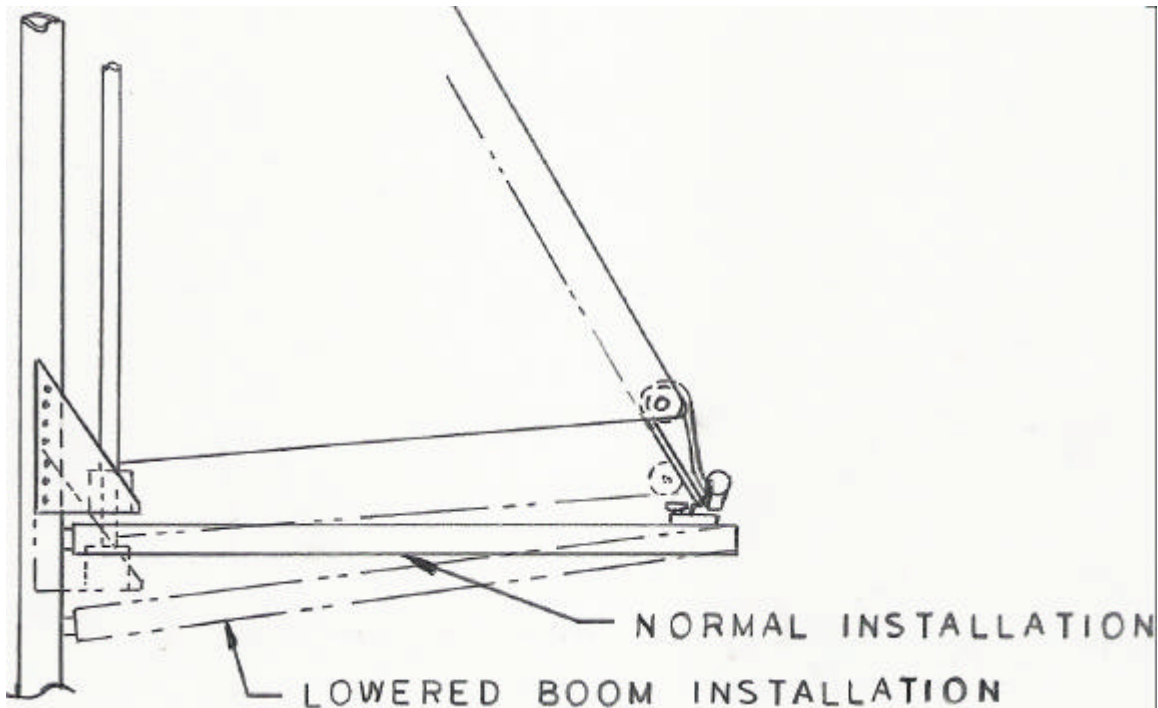
The Cruising Design Mainsail Reefing System is not intended to necessarily improve the sailing performance of the boat. It is intended to minimize the effort required to sail the boat and to enable a shorthanded crew to use the mainsail when they might otherwise feel use of the mainsail was not worth the effort, such as in light air conditions. The Mainsail Reefing System is also intended to enable a shorthanded crew to easily reef and furl the mainsail under changing sailing conditions from the safety of the cockpit.

However; there are several installation options that can maximize the sailing performance of the boat with the mainsail Reefing System Installed.

1. At the sailmaker's discretion, vertical battens can be installed in the mainsail. Vertical battens will allow the sail to employ a

positive roach – increasing sail size. Because the system is mounted outside the mast, the usual problem of battens getting caught inside the mast has been eliminated.

2. Because the mainsail will be loose-footed and tapered up to the clew, if the boat does not have a dodger or bimini, and none are being considered, the boom can be lowered at the mast before installation of the reefing system. This will allow a longer luff, larger area mainsail. This option will complicate the installation of the new Mainsail Reefing System and should be approached with caution. Careful measurements must be taken before committing to lowering the boom to ensure that cockpit comfort (headroom under the boom) is not compromised.



LIMITED 6-YEAR WARRANTY

The Cruising Design Mainsail Reefing System is warranted to remain functional for 6 years from the date of purchase. You must be the original purchaser of the unit. If, during this period, any part becomes non-functional, CDI will repair or replace it, free of charge, except for freight.

This warranty covers:

At Sea: All hazards as sea, including winching against obstructions, unseamanlike use, and dismastings.

Other: This warranty remains in force for charter and other commercial operations. No maintenance is required to keep the warranty in force.

The warranty does not cover:

At Sea: Shipwreck, collision and acts of God. The warranty is void if the mast is not fixed in place vertically at all times while the boat is in the water. Tipping the mast forward to pass under bridges, power lines, or other low clearance obstructions voids the warranty.

On Trailers: Damage caused by collision or being dragged on the ground.. Improper storage resulting in kinks, bends, and twists. Damage due to the luff not being supported along its entire length.

Storage: Any damage caused by improper storage or handling when not at sea. Luffs must be stored flat and straight, or the warranty is void. Kinks, twists, bends, and breakage due to the luff not being stored flat and straight are not covered. Coiling or twisting the luff either to remove kinks and bends, or for transport and storage in other than a flat and straight condition voids the warranty.