Thanks for buying a Harken Jib Reefing and Furling System. It will give you reliable service with minimal maintenance, but it does require proper assembly and basic care. This manual is an important part of the total reefing system. Please take the time to read it carefully before assembling or using your furling system. These instructions may look intimidating, but they are very simple and use photos and drawings throughout to make assembly easy. Many sections will not apply to your boat or to your installation. If you have questions which cannot be answered by the manual or your dealer, please feel free to give us a call. We’ll be happy to do anything we can to make your sailing safer and more fun.

Preparation For Assembly — Pages 4 to 14
This section tells how to measure headstays, prepare wires and cut foils to length if they have not been supplied ready to assemble.

Assembly — Pages 15 to 27
Assembly of the unit is explained in this section.

Commissioning — Pages 28 to 30
Commissioning covers how to install the assembled unit on the boat and make it operational.

Operation — Pages 31 to 34
This section explains system use. It also discusses tensioning the headstay and converting to racing.

Troubleshooting and Repair— Pages 35 to 37
The Assembly and Operation Trouble-Shooting guides explain how to correct problems. Your seven-year limited warranty is explained in simple language on page 37.
**Sizing Check**

Order a Harken stud to match headstay wire or rod size.

Unit #1 uses a $\frac{1}{2}''$ (12.5 mm) clevis pin. If your boat uses a different size, contact Harken. In many cases bushings are available or special toggles. Harken does not recommend drilling the chainplate or the integral toggle.

Check to make sure the lower drum assembly will fit inside the bow pulpit. If there is an anchor locker, check to see if the drum assembly will clear. If necessary, use a toggle or link plates to raise the unit. See page 37.

**Headstay Terminal Stud**

<table>
<thead>
<tr>
<th>Wire or Rod Size</th>
<th>Swage Part No.</th>
<th>Sta-Lok/Norseman Part No.</th>
<th>Rod Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{1}{4}''$</td>
<td>817</td>
<td>821</td>
<td>—</td>
</tr>
<tr>
<td>$\frac{9}{32}''$</td>
<td>818</td>
<td>822</td>
<td>—</td>
</tr>
<tr>
<td>6 mm</td>
<td>873</td>
<td>880</td>
<td>—</td>
</tr>
<tr>
<td>7 mm</td>
<td>874</td>
<td>822</td>
<td>—</td>
</tr>
<tr>
<td>8 mm</td>
<td>879</td>
<td>881</td>
<td>—</td>
</tr>
<tr>
<td>-8 (5.72 mm)</td>
<td>—</td>
<td>—</td>
<td>823-8</td>
</tr>
<tr>
<td>-10 (6.35 mm)</td>
<td>—</td>
<td>—</td>
<td>823-10</td>
</tr>
</tbody>
</table>

*Type 316 Stainless Steel Only*
You should have at least two boxes: a long box with foils and a rectangular box containing the drum and miscellaneous components. You may also have a third box containing the headstay.

- The foil box contains:
  - 7' (2.13 m) Foil Extrusions. A standard kit has six foils, but one may have been pre-cut for use as your top foil. If your headstay is longer than 45'8" (13.92 m) order one extra foil extrusion, Part #807.
  - 1 24" (610 mm) Special Bottom Foil Extrusion.
- The main components box contains parts packaged on the display card plus a smaller parts box.
### Miscellaneous Parts

1 Bag of 17 **Connector Wedges**, and 3 **Extra Wedges**.
1 Bag of three **Torque Tube Screws**.
1 Bag of 30 **Foil Screws**. Contains 6 extra screws.
1 **Locking Collar**
1 **Locking Split Cylinder**. Used only with swage terminals. Norseman®, Sta-Lok and rod installations do not use this.
1 **Instant Adhesive**.
1 **Loctite®** (Blue).
1 **Loctite®** (Red)
1 Bag of **Spare Screws**. Contains one spare screw for every application. They are not required for installation.
1 **Prefeeder** with line.
1 4 mm **Allen Wrench**
1 5 mm **Allen Wrench**
1 6 mm **Allen Wrench**

### Rigger Components

These parts are placed on the headstay before assembly and may be “missing” as the parts may have been placed on your headstay in advance.

1 **Top Foil Trim Cap**.
1 8½" (225 mm) **Bottom Connector**.
6 7" (178 mm) **Regular Connectors**. If your headstay is longer than 46'4" (14.122 m) you will need one more connector. Order part #810.

**IMPORTANT**

Note: headstay terminal is sold separately. Be sure that you have ordered the correct size for your boat.

**Packed loose in the box**

1 **Furling Line**. 60' (18.3 m) of 5/16" (8 mm) Dacron braid.
1 **Owner's Package**. Contains the instruction manual, warranty card and other information.
**Sail Type**
The Harken furler will work with conventional sails or sails with built in shaping devices such as Aeroluff™, Pirini Luff™ or foam luff.

**Luff Length**
Note offsets above and below the sail.

If a toggle or link plates are used below the furler to raise the drum (see page 8), make sure you deduct this from the sail luff length.

If the luff of the sail is not long enough to put the halyard swivel near the top of the sail, make sure a pendant is added, see page 30.

**Tack Setback**
Note setback for the tack shackle and cut the sail accordingly.

**Luff Tape Size**
Unit #1 requires number 6 (7/32" or 5 mm) luff tape.

**Luff Tape Length**
Cut off the top of the luff tape so it is 18 to 24" (450 to 600 mm) below the head of the sail. This will allow the head to lag behind the rest of the sail to help flatten the sail. It will also help the head to roll more smoothly.

Note feeder height and extend the bottom of the luff tape downwards so it is below the feeder. This will prevent the luff tape from catching in the feeder as the sail is lowered. *The 32" (813 mm) minimum pertains to shortened bottom foil installation, see page 13. Other installations will have a minimum feeder height of 37½" (953 mm).*

**Tack and Head Shackles**
If you’re using shackles, make sure they fit the sail rings. The minimum inside dimensions of the standard head and tack shackles are:
(A) 1½" (27 mm) and
(B) ½" (13 mm).

**Suncover**
Suncovers may be installed on either side of the sail. However, make sure you match other sails in the customer's inventory. Note: make sure the torque tube is installed in the correct position to match the suncover. There is one position for the port-side and another for starboard-side suncover. See page 25.
Adhesive Alert: Foil assembly requires red Loctite adhesive. Loctite cures properly in temperatures above 60° (10° C). Surfaces must also be dry. If you assemble your unit at lower temperatures, use a heat gun like a hair dryer or hand held butane or propane torch to gently warm the parts for about 5 minutes after assembly. Loctite primer is available for lower temperatures, ask your local Loctite dealer or Harken.

Red Loctite only cures when no oxygen is present. Excess adhesive on the surface of the foils will remain sticky and will not cure. This does not mean that the adhesive inside the joint has not cured.

- **You will need these tools to build your system**
  - Screwdrivers – Flat blade 1/8" (3 mm) and 1/4" (6 mm) wide
  - Screwdriver – Phillips #2 Head
  - Tube of polysulfide marine sealant – for Norseman or Sta-Lok units only. Do not use silicone marine sealant.
  - Hacksaw
  - File, sandpaper or emery cloth
  - Roll of paper towels or disposable rags
  - Wire cutters – only needed if you are cutting your own headstay wire
  - Heat gun – only needed if you will be working during cool weather (see above)

**Work Area**
Select a flat work area longer than the headstay and free from gravel, dirt or sand. Generally, the best work area is the dock next to the boat. **Your furling system is designed to be assembled on the ground and must not be assembled with the headstay in a vertical position.**

**Norseman, Sta-Lok or Rod Headstay Installations**
The assembly instructions show assembly of a swaged wire headstay. Norseman, Sta-Lok and rod headstay installations differ slightly in a few areas. Differences are noted at the bottom of each page in shaded boxes.
Pin-to-pin headstay length is a measurement which is used in many steps of assembly and also for measuring sails. After determining the length of your headstay, write the length on the outside back cover of this manual for easy reference in the future.

All headstays are measured from the center of the pin holding the headstay to the masthead toggle to the center of the pin holding the headstay assembly to the stemhead chainplate. Be sure that the turnbuckle is set to the correct length before measuring. The measurement should include all turnbuckles and toggles at the lower end, but should not include the masthead toggle. All headstays must be secured to a toggle at the masthead.

■ Additional Stemhead Toggles

Your furling system has an integral toggle at the lower turnbuckle fitting. An additional toggle is not required at the lower end but may be fitted if the headstay wire is too short, or if it is desirable to mount the drum higher off the deck than normal, say to provide more clearance for an anchor.

Should an additional toggle be fitted to the headstay, be sure to subtract the pin-to-pin length of the toggle from the overall length of the headstay.

Some boats with very narrow bows or with bowsprits may find that the furling drum, in its normal position, will not fit inside the pulpit. It may be necessary to use a toggle to raise the drum to avoid these problems.

The system is designed to keep the sail as close to the deck as possible. While it may be necessary to raise the drum to provide clearance for an anchor or to fit inside a pulpit, do not mount the drum higher than required. Raising the drum reduces sail luff length and increases heeling. If you need better visibility under your genoa, mount the drum as low as possible and see the instructions on page 30 of the manual.

Furling units should not be mounted above turnbuckles or long link plates. If you are considering this, discuss your installation carefully with Harken before proceeding.

■ Isomat Masts

Isomat type masts have an unusual fitting at the top of the headstay. This “stemball” must be cut off and a special stemball adapter placed on the upper end of the headstay. This adapter, Harken part #941, may be purchased from your Jib Furling dealer or distributor. You will also need a standard marine eye which can be purchased from your rigger. This marine eye will be swaged to the upper end of the headstay.

When measuring headstay length, use the center of the new eye on the wire as the upper measurement point.

■ T-Ball Fittings

Some boats have T-ball swage fittings as the upper terminal. They do not require an additional toggle. Use the elbow in the fitting as the upper measurement point. See diagram.
**Preassembly**

**Cutting Headstay to Length • Reusing Existing Headstay Wire**

- **Reusing Existing Headstay Wire**
  Your system is designed to allow use of your existing headstay wire. Examine your headstay carefully to be sure that it is in good condition before you reuse it. Look for corrosion and cracks at swage fittings and for abrasion or damage to the wire itself.

  Wire condition will vary depending upon climate and use, but as a general rule do not reuse wire which has been in saltwater for more than four seasons or any wire which is more than six years old.

  Replacing a headstay wire before assembling a unit is far easier, less expensive, and safer than using a questionable wire.

- **Cutting Headstay to Length**
  Before cutting headstay wire to length, be sure that you have determined pin-to-pin headstay length and written it on the outside back cover for easy reference.

  To determine the cut point of a wire, measure up from the lower measurement point of the headstay.

- **Swage fittings**
  Subtract 18 1/4" (465 mm) from your overall headstay length and cut the wire at that point.

**Tip: Remember the old adage, "measure twice, cut once."**

When the headstay is shortened 18 1/4" (465 mm) the turnbuckle will be one half to two thirds open, allowing adjustment of the headstay length.

If necessary, you may shorten your headstay up to 20" (508 mm), but shortening a wire more than 18 1/4" (465 mm) will limit headstay adjustment.

Use only swage fittings provided by Harken to insure that the length and threads are correct.

Have the wire swaged by a reputable rigger. Improperly applied swage fittings are prone to failure and bent or “banana” swages cause difficulty with furling.

**Length Check:** Check the length by slipping the swage stud on the wire. The distance from the center of the eye at the top of the wire to the end of the swage stud should be equal to headstay length less 9" (230 mm).
Preassembly

■ Norseman and Sta-Lok Fittings
Subtract 13 3/4" (337 mm) from your overall headstay length and cut the wire at that point.

When the headstay is shortened 13 3/4" (337 mm) the turnbuckle will be one half to two thirds open, allowing adjustment of the headstay length.

If necessary you may short your headstay up to 15" (380 mm), but shortening a wire more than 13 3/4" (337 mm) will limit headstay adjustment.

If the length of the turnbuckle being removed is over 15" (380 mm) a toggle must be used to compensate. Be sure to change the headstay length measurement to reflect the use of this toggle.

Use only Norseman or Sta-Lok fittings provided by Harken to insure that the length and threads are correct.

Length Check: Check your length by opening the terminal, removing the "cone", and placing the fitting on the wire. The distance from the center of the eye at the top of the wire to the end of the stud should be equal to the headstay length less 9" (230 mm).

■ Rod Fittings
Subtract 13 3/4" (337 mm) from your overall headstay length and cut the rod at that point.

If the cut point is on the upper part of your turnbuckle, but below the actual rod, tap the turnbuckle up the rod to free the coldhead from the turnbuckle and cut the rod at the correct point.

When the headstay is shortened 13 3/4" (337 mm) the turnbuckle will be one half to two thirds open, allowing adjustment of the headstay length.

If necessary you may short your headstay up to 15" (380 mm), but shortening a rod more than 13 3/4" (337 mm) will limit headstay adjustment.

If the length of the turnbuckle being removed is over 15" (380 mm) a toggle must be used to compensate. Change the headstay length measurement to reflect the use of this toggle.

Use only rod fittings provided by Harken to insure that the length and threads are correct.

Length Check: Check your length by placing the rod fitting alongside the rod with the nosepiece in its proper position. The distance from the center of the eye at the top of the headstay to the end of the stud should be equal to the headstay length less 9" (230 mm).
### Preassembly

<table>
<thead>
<tr>
<th>Pin-to-pin Length of Headstay (As Described on Page 7)</th>
<th>Number of 7&quot; (178 mm) Connectors Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>24'8&quot; to 25'4&quot; (7.518 m to 7.722 m)</td>
<td>3</td>
</tr>
<tr>
<td>25'5&quot; to 32'4&quot; (7.747 m to 9.855 m)</td>
<td>4</td>
</tr>
<tr>
<td>32'5&quot; to 39'4&quot; (9.88 m to 11.989 m)</td>
<td>5</td>
</tr>
<tr>
<td>39'5&quot; to 46'4&quot; (12.014 m to 14.122 m)</td>
<td>6</td>
</tr>
<tr>
<td>46'5&quot; to 52'7&quot; (14.148 m to 16.027 m)</td>
<td>7</td>
</tr>
</tbody>
</table>

(One additional connector required order Part #810)

### How Many Connectors?

Use the chart at left to determine the proper number of 7" (178 mm) connectors for your headstay.

Every unit uses one 8½" (225 mm) bottom connector in addition to the number of 7" (178 mm) connectors shown at left.

### How Many Foils?

Use the chart at left to determine the proper number of 7" (2.13 m) foils for your headstay.

The variable length top foil is cut from one of the 7" (2.13 m) foils and is used in addition to the number of foils shown at left.

### Stringing Connectors

After the headstay has been cut to length, but before the lower terminal is attached, the proper number of connectors must be placed on the headstay in the correct order.

- Every unit uses a top foil trim cap.
- Every unit uses a number of 7" (178 mm) connectors which varies according to the length of the headstay and is determined by consulting the chart above.
- Every unit uses one 8½" (225 mm) bottom connector

Slide the trim cap onto the stay so that the open end faces down.

Slide the proper number of 7" (178 mm) connectors onto the headstay.

Slide the 8½" (225 mm) bottom connector onto the headstay so that it is closest to the bottom of the headstay.

Have the wire swaged by a reputable rigger.

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**Norseman/Sta-Lok Instructions**

Because Norseman and Sta-Lok terminals are applied to the headstay wire after the foil is built, it is not necessary to place the connectors or trim cap on the wire at this time. Norseman and Sta-Lok units require the same number of foils and connectors as shown above. Identify the parts you need and set them aside at this time.

---

**Rod Instructions**

Rod installations are identical to swaged wire at this point except that the rod fitting is "coldheaded" to the rod rather than swaged on.

If you ship a rod headstay to a service center do not coil tighter than 200 times the rod's diameter.

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Unit #1 MKII

11
Preassembly

Adjusting Foil Length
The length of the furling system is matched to the headstay length by adjusting the number of 7' (2.13 m) foil extrusions used and by cutting the top foil to length from one of the 7' (2.13 m) foils provided. In some cases the bottom foil is also shortened.
Consult the chart on page 10 to determine how many full length 7' (2.13 m) foils you need and save these. You should have an additional 7' (2.13 m) foil to be used for the top foil which will be 7' (2.13 m) or less.

Foil Length – Special Considerations
The top foil is designed to ride over the shank of the upper swage fitting and to within 1½" (38 mm) of the center of the pin holding the headstay to the masthead toggle.
On some boats this is not possible – for example, a Norseman, Sta-Lok or rod upper terminal. If for any reason your foil cannot ride within 1½" (38 mm) of the pin center, shorten the foil length to compensate. Treat your pin-to-pin headstay length as if it were shorter by the 1" (25 mm) or so that you need to shorten your foil. Note: This does not change the cut length of your headstay.

Find Your Headstay Length on Page 13 or 14 and follow procedures below as necessary.

WARNING
If you make any cuts in the foils be sure to carefully clean all shavings from inside the foils. Failure to deburr or clean the inside of the foils may cause them to seize to the connector during installation.

All Installations

Roughing up Top Foil for Trim Cap
Rough up the top ½" (13 mm) of the top foil with a file or sandpaper.

Most Installations

Deburr the Foil
After cutting foil, clean all shavings from inside the foil. Failure to deburr or clean the inside of the foil may cause it to seize to a connector when it is being installed.

Some Installations

Cutting and Drilling Bottom Foil
Consult the chart on page 13 to see if you need to shorten the special bottom foil. If you do, use a hacksaw to shorten the special bottom foil by 5½" (140 mm). Make sure you cut the end nearest the existing holes. Deburr the foil after cutting.

Tip: there are three dimples in the bottom foil. The upper dimple is a guide for cutting the foil. Wrap tape evenly around the foil so the top edge of the tape runs through the center of the upper dimple. Line the hacksaw blade up with this edge of the tape. The side of the blade facing the lower part of the foil should run through the center of the dimple.

Drill two holes using a 15/64" (6 mm) drill bit. Use the dimple in the foil as a guide. The center of the dimples will be at 2½" and 3¼" (63.5 mm) and 82.5 mm) from the cut end of the foil.
## Preassembly

### Foil Length Instruction

**If your headstay length is one of the dimensions shown below, your unit does not need a special length top foil. A full length 7' (2.13 m) foil is used as the top foil.**

<table>
<thead>
<tr>
<th>Headstay Length</th>
<th>Foil Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>24' 8&quot; (7.518 m)</td>
<td>31' 8&quot; (9.652 m)</td>
</tr>
</tbody>
</table>

- You will use a recessed top connector (page 16)
- Do not cut 24" (610 mm) bottom foil.

**If your headstay length is shown below, use a hacksaw to cut a special length top foil from a 7' (2.13 m) foil.**

<table>
<thead>
<tr>
<th>Headstay Length</th>
<th>Foil Length</th>
<th>Cut Top Foil to This Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>24' 9&quot; (7.543 m)</td>
<td>31' 9&quot; (9.677 m)</td>
<td>38' 9&quot; (11.811 m)</td>
</tr>
<tr>
<td>24'10&quot; (7.569 m)</td>
<td>31'10&quot; (9.703 m)</td>
<td>38'10&quot; (11.836 m)</td>
</tr>
<tr>
<td>24'11&quot; (7.595 m)</td>
<td>31'11&quot; (9.728 m)</td>
<td>38'11&quot; (11.862 m)</td>
</tr>
<tr>
<td>25' 0&quot; (7.620 m)</td>
<td>32' 0&quot; (9.754 m)</td>
<td>39' 0&quot; (11.887 m)</td>
</tr>
<tr>
<td>25' 1&quot; (7.645 m)</td>
<td>32' 1&quot; (9.779 m)</td>
<td>39' 1&quot; (11.913 m)</td>
</tr>
</tbody>
</table>

- You will not use a recessed top connector (Page 16)
- Shorten the bottom foil 5½" (140 mm) and drill screw holes as described on page 12.

**If your headstay length is shown below use a hacksaw to cut a special length top foil from a 7' (2.13 m) foil.**

<table>
<thead>
<tr>
<th>Headstay Length</th>
<th>Foil Length</th>
<th>Cut Top Foil to This Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>25' 2&quot; (7.671 m)</td>
<td>32' 2&quot; (9.804 m)</td>
<td>39' 2&quot; (11.938 m)</td>
</tr>
<tr>
<td>25' 3&quot; (7.696 m)</td>
<td>32' 3&quot; (9.830 m)</td>
<td>39' 3&quot; (11.963 m)</td>
</tr>
<tr>
<td>25' 4&quot; (7.722 m)</td>
<td>32' 4&quot; (9.855 m)</td>
<td>39' 4&quot; (11.989 m)</td>
</tr>
</tbody>
</table>

- You will not use a recessed top Connector (page 16)
- Do not cut 24" (610 mm) bottom foil.

**If your headstay length is shown below use a hacksaw to cut a special length top foil from a 7' (2.13 m) foil**

<table>
<thead>
<tr>
<th>Headstay Length</th>
<th>Foil Length</th>
<th>Cut Top Foil to This Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>25' 5&quot; (7.747 m)</td>
<td>32' 5&quot; (9.881 m)</td>
<td>39' 5&quot; (12.014 m)</td>
</tr>
<tr>
<td>25' 6&quot; (7.772 m)</td>
<td>32' 6&quot; (9.906 m)</td>
<td>39' 6&quot; (12.040 m)</td>
</tr>
<tr>
<td>25' 7&quot; (7.798 m)</td>
<td>32' 7&quot; (9.931 m)</td>
<td>39' 7&quot; (12.065 m)</td>
</tr>
<tr>
<td>25' 8&quot; (7.823 m)</td>
<td>32' 8&quot; (9.957 m)</td>
<td>39' 8&quot; (12.090 m)</td>
</tr>
</tbody>
</table>

- You will use a recessed top connector (page 16)
- Shorten the bottom foil 5½" (140 mm) and drill screw holes as described on page 12.

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Unit #1 MKII
<table>
<thead>
<tr>
<th>Headstay Length</th>
<th>Top Foil Length</th>
<th>Cut Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>7' 1.0&quot; (2.13 m)</td>
<td>30'-9&quot; (9.982 m)</td>
<td>30'-0&quot; (9.144 m)</td>
</tr>
<tr>
<td>7' 2.0&quot; (2.16 m)</td>
<td>33'-0&quot; (10.012 m)</td>
<td>33'-0&quot; (10.012 m)</td>
</tr>
<tr>
<td>7' 3.0&quot; (2.19 m)</td>
<td>36'-0&quot; (10.964 m)</td>
<td>36'-0&quot; (10.964 m)</td>
</tr>
<tr>
<td>7' 4.0&quot; (2.22 m)</td>
<td>39'-0&quot; (10.805 m)</td>
<td>39'-0&quot; (10.805 m)</td>
</tr>
<tr>
<td>7' 5.0&quot; (2.25 m)</td>
<td>42'-0&quot; (12.814 m)</td>
<td>42'-0&quot; (12.814 m)</td>
</tr>
<tr>
<td>7' 6.0&quot; (2.28 m)</td>
<td>45'-0&quot; (13.724 m)</td>
<td>45'-0&quot; (13.724 m)</td>
</tr>
</tbody>
</table>

- You will use a recessed top connector (Page 16)
- Do not cut 24" (610 mm) bottom foil.

**WARNING**
If you make any cuts in the foils be sure to carefully clean all shavings from inside the foils. Failure to deburr or clean the inside of the foils may cause them to seize to the connector during installation.
In this step, the top connector is recessed into the top foil to serve as a bushing and the trim cap is attached.

Lay the wire out straight on a clean work area such as a dock.
Slide the trim cap and one connector to the top of the headstay.
Note: If the top foil is less than 13" (330 mm), slide all of the connectors to the bottom of the stay.

Slide the rest of the connectors to the bottom of the stay.

Secure the connectors at the bottom of the headstay with tape as shown.

_Norseman/Sta-Lok Instructions_
Because the lower end of the wire is open, you will not place the connectors on the headstay until needed so you should ignore references to taping the connectors at the bottom of the headstay.

_Rod Instructions_
Rod installations are identical to swaged wire at this point. You may find that the rod is difficult to lay flat and two people may be required to hold the rod straight while foils are slipped up the headstay.

_Tip: Leave at least 1" (25 mm) between each connector. Wrap enough tape on the wire so that the connectors cannot pass over it._
Assembly

See details on pages 12, 13 and 14 for cutting the top foil to length. Do not confuse the top foil with the special bottom foil.

Check the top foil for burrs or shavings at the cut end.

Remove and save the red stud protector for use later.

Slide the top foil extrusion over the threaded stud and connectors, to the top of the stay. The screw holes on top foil must face the bottom of the stay.

Tip: Do not force the foil over the connectors. If you feel resistance, check the foil and connectors carefully for burrs and dirt. The best way to see dirt or burrs is to look into the foil while pointing it towards a light source. Be sure that the connectors are spaced with enough room to align properly inside the foil section with the circular mold mark towards the connector.

Coat the top connector with red Loctite®. Place a plastic wedge in each indentation with the circular mold mark towards the connector and push the connector into the top foil until it is recessed about 4" (100 mm).

Note: If the top foil is less than 13" (305 mm) use a joiner connector instead of a recessed connector and ignore this step.

Tip: This connector must be recessed sufficiently to allow the foils to ride over the shank of the swage fitting at the top of the wire. Use your screwdriver to compare the depth of the recess to the length of the swage shank.

Use Instant Adhesive to secure the trim cap to the roughened surface of the top of the foil.

---

Norseman/Sta-Lok Instructions
For installations where there is a Norseman or Sta-Lok eye, recess the top connector only 1" (25 mm) into the top foil.

Rod Instructions
The curves in the rod may make it difficult to slide extrusions over the connectors. The straighter the rod can be held, the more easily foils will pass over the connectors. Check to see if the shank of the rod fitting on your stay will fit into the top foil. If it does, recess the top connector as far as needed to clear the shank of the terminal. If it does not fit into the top foil, recess the top connector 1" (25 mm).
In this step, the first foil connector is inserted into the top foil and secured using wedges, adhesive and screws.

Free one connector and slide it towards the top of the stay. **Completely remove the tape. Tape can jam or damage the unit if left on the wire.**

Coat the top half of the connector and the indentation with red Loctite. Place a plastic connector wedge in the indentation closest to the top foil.

**Tip:** Proper use of the adhesive is the most important element of proper foil assembly. **USE PLENTY OF ADHESIVE.**

Push the connector into the foil until the screw holes in the connector line up with the holes in the foil.

Coat two foil connector screws with red Loctite and screw them into the connector until they are tight.

---

**Norseman/Sta-Lok Instructions**

Because the lower end of the wire is open you will not “free” a connector, but will simply slip one onto the wire and to the top of the headstay.

**Rod Instructions**

Rod installations are identical to swaged wire at this point.
In this step, the first main foil extrusion is slipped onto the headstay and connected to the top foil.

Select a 7’ (2.13 m) foil and slide it onto the headstay over the threaded stud and connectors and up to the top foil piece.

**Tip:** Do not force the foil over the connectors. If you feel resistance, check the foil and connectors carefully for burrs and dirt. The best way to see dirt or burrs is to look into the foil while pointing it towards a light source. Be sure that the connectors at the bottom of the wire are spaced with enough room to align properly inside the foil section.

Coat the exposed half of the connector with red Loctite. Place a plastic wedge in the indentation on the front of the connector.

Push the foil over the connector until the holes align. Coat connector screws with red Loctite. Insert into the connector and tighten.

**Tip:** The connector screw holes should align with the foil holes when the foil is pushed tightly against the foil above. If the foil does not slip onto the connector easily, check the alignment of the joint. It may be necessary to hold the 7” (2.13 m) foil up to achieve proper alignment.

---

**Norseman/Sta-Lok Instructions**
Because the lower end of the wire is open you will simply slide the foil onto the stay and assemble as described.

**Rod Instructions**
Rod installations are identical to swaged wire at this point. You may find that the rod is difficult to lay flat and two people may be required to hold the rod straight while foils are slipped up the headstay. The curves in the rod may make it more difficult to slide extrusions over the connectors. The straighter the rod can be held, the more easily foils will pass over connectors.
In this step, you complete assembly of the main body of the headstay foil using the techniques learned in Steps 2 and 3.

Free one connector and slide it towards the top of the headstay.

Attach this connector to the foil above using red Loctite, a plastic wedge, and screws as described in Step 2.

Slide a 7" (2.13 m) foil over the threaded stud and connectors and to the top of the headstay.

Attach this foil to the connector above using red Loctite, a plastic wedge, and screws as described in Step 3.

Repeat this process until all of the 7" (178 mm) regular connectors have been used.

Attach the 8 7/8" (225 mm) long bottom connector and the short bottom foil in the same manner.

Tip: The bottom foil is either the standard 24" (610 mm) bottom foil, or a shortened 18 3/8" (470 mm) bottom foil. See pages 13 and 14. There are no foil grooves in the bottom foil.

When the bottom foil is properly attached a 1 7/8" (48 mm) gap will remain between the bottom foil and the first 7" (2.13 m) foil extrusion.

Norseman/Sta-Lok Instructions
Because the lower end of the wire is open you will simply slide the foils and connectors up to the top foil and assemble as described. DO NOT secure the bottom foil to the exposed long connector until after the Norseman or Sta-Lok terminal has been assembled.

Rod Instructions
Rod installations are identical to swaged wire at this point. You may find that the rod is difficult to lay flat and two people may be required to hold the rod straight while foils are slipped up the headstay. The curves in the rod may make it more difficult to slide extrusions over the connectors. The straighter the rod can be held, the more easily foils will pass over connectors.
In this step, the halyard swivel, feeder and torque tube are attached to the foil.

Slip the halyard swivel onto the foil and up past the $1\frac{1}{2}$" (48 mm) gap in the foils.

The halyard swivel has a "top" and a "bottom" and must be placed on the foil with the longer half facing up.

Tip: When positioned correctly, the small Harken label will be right side up.

STOP
NORSEMAN, STA-LOK OR ROD – refer to special instructions below before proceeding.

Attach the feeder to the gap in the foils. Use blue Loctite on the screw. The end of the feeder with the screw should be at the bottom of the gap.

Tip: The feeder uses a "loose hinge." Place the half with the pin sockets into place on the exposed connector, slip the half with the pins into the sockets and snap it shut.

Remove the two torque tube screws and slip the tube onto the foil narrow end up and secure it by inserting the red stud cap against the flat side of the foil. Alternatively use duct tape.

Norseman/Sta-Lok Instructions
After the swivel and torque tube have been placed on the wire you must install the Norseman or Sta-Lok terminal. See pages 26 and 27 for details. For easier installation, push the bottom foil completely over the bottom connector to expose as much wire as possible. After the terminal is attached, secure the bottom foil as described in Step 4.

Rod Instructions
After the swivel, feeder and torque tube have been attached per the above instructions, you must attach the rod adapter to the wire. See page 27 for details.
In this step, the drum is attached and the unit is readied for installation on the boat.

Slip the locking collar onto the stay over the threaded stud with the threaded end of the collar down.

Slip the plastic locking cylinder onto the threaded stud and into the locking collar, split end first.

Thread the drum assembly onto the stay until the colored mark on the threads does not show.

The coloring on the threads warns of insufficient thread engagement. It is provided only for your convenience and may wear off. The only positive means to insure proper thread engagement is to measure the exposed threads. At no time should more than 2" (50 mm) of thread be exposed at either the top or the bottom of the turnbuckle.

Norseman/Sta-Lok and Rod Instructions
Do NOT use the plastic locking cylinder.

Thread the locking collar onto the drum assembly as far as it will go.

Thread the drum assembly onto the stay until the colored mark on the threads does not show.
In this step, the unit is raised into position on the boat.

Clean excess Loctite and dirt from the foils. Be sure that the adhesive has cured before raising the foil. See page 7.

**Tip:** Be careful to clean Loctite from inside the foil grooves – it may stain your sail.

Raise the unit and attach to the masthead toggle and stemhead chainplate.

**Tip:** The foils are not fragile and will not collapse under their own weight. Don’t let the unit catch under deck fittings or scrape along the dock. Place the lower end of system inside the lifelines before the headstay is attached to the mast.

If the headstay is not long enough to reach the chainplate, check to be sure that the upper and lower studs are open to the marks but **do not open the turnbuckle past the marks on the studs.** A toggle must be added to lengthen the headstay.

**At no time should more than 2" (50 mm) of thread be exposed at either the top or the bottom of the turnbuckle.**

**Tip:** A headstay that looks short may be long enough after the turnbuckle is tensioned to remove sag and stretch.

---

**Norseman/Sta-Lok Instructions**

Norseman/Sta-Lok installations are identical to swaged wire at this point.

**Tip:** To check amount of exposed thread, with Norseman/Sta-Lok, measure from top of *hub extension which is even with top of the turnbuckle.*

**Rod Instructions**

Rod installations are identical to swaged wire at this point.

**Tip:** To check amount of exposed thread, measure from top of *hub extension which is even with top of the turnbuckle.*
In this step, the headstay tension is adjusted.

Loosen the nut on the lower stud to allow the restraining washer and notched locking washer to fall away from the bottom of the furling unit.

*Tip: Sometimes the notched locking washer "hangs up" on the pins on the bottom of the furling system. Gently turn the stainless basket to free the washer or gently pry it free with a pen knife or screwdriver.*

Raise the foils as high as possible. Place a Vise-Grips type pliers on the stud to hold them up.

*Tip: Use a rag under the Vise-Grips to prevent damage to the stud. The Vise-Grips serve two roles: 1) they hold the foils out of the way; 2) they prevent the wire from turning during adjustment.*

Hold the Vise-Grips to prevent the wire from turning.

Turn the line guard and cowling to adjust the headstay to normal sailing adjustment. To prevent slippage of the line guard, make sure the screw below the guard is tight. The system tightens when turned counterclockwise when you are looking down at the drum.

The headstay must be **tight** for proper operation of the furling unit.

*Tip: For easiest adjustment, completely release tension on the backstay, mainsheet and vang before adjusting the headstay.*

---

**Norseman/Sta-Lok and Rod Instructions**

There is no need to hold the foils up out of the way. During tensioning hold the terminal to prevent it from turning.

**Norseman/Sta-Lok Installation**

**Rod Installation**
After the headstay is tensioned, align the opening with the furling line lead by turning the line guard and cowling.

**Tip:** Adjustments can easily be made to the position of the opening when installing the furling line.

Slide the notched locking plate up the lower stud until the notches slip over the three pins on the bottom of the furling unit. It may be necessary to turn the drum slightly to align the pins with the notches.

Slip the restraining washer up the stud until it rests against the notched locking washer.

Thread the locking nut up the lower stud and tighten it against the restraining washer with a 1 1/16" (27 mm) wrench.

**Tip:** The locking nut is special. Check to see that it is on the stud with the "up" arrow facing up.

Thread the locking collar down onto the top of the drum assembly. Tighten with a 7/8" (23 mm) wrench while holding the swage stud with the Vise-Grips pliers.

---

**Norseman/Sta-Lok and Rod Instructions**

Secure the lower locking device as described above. To lock the upper terminal, thread the locking collar UP until it touches the terminal body, then tighten it firmly while holding the terminal.

**Norseman/Sta-Lok Installation**

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Unit #1 MKII

August 15, 1994
In this step, assembly is completed by attaching the torque tube and raising and clamping the foils.

Refer to the chart and diagram below and install the torque tube. Point the slot at the top of the tube to either the "Harken" or the "USA" on top of the plastic spool.

Use 4 mm allen wrench to secure to the drum assembly using the three screws provided.

<table>
<thead>
<tr>
<th>Suncover on</th>
<th>Furling Direction</th>
<th>Point Slot to</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Starboard</td>
<td>Harken</td>
</tr>
<tr>
<td>B</td>
<td>Port</td>
<td>USA</td>
</tr>
</tbody>
</table>

**Tip:** Insert all three screws BEFORE tightening.

Raise the foil so the top rides over the swage fitting at the top of the headstay wire and is within 11/2" (38 mm) of the pin holding the stay to the masthead toggle.

**Tip:** Walk away from the boat and check the height by looking at the top of the foils with binoculars. Failure to raise the foils will result in considerable friction while furling. Raising foils too high may prevent the foils from rotating.

Insert the torque tube screws and use the 5 mm allen wrench to securely clamp the foils in a raised position.

*Norseman/Sta-Lok Instructions*

Norseman/Sta-Lok installations are identical to swaged wire at this point.

*Rod Instructions*

Rod installations are identical to swaged wire at this point.

August 15, 1994

Unit #1 MKII
Norseman/Sta-Lok terminal assembly

In this step, the Norseman or Sta-Lok terminal is secured to the headstay and the bottom foil is secured to the headstay.

When the bottom foil is slipped onto the headstay wire, do not Loctite or screw it to the bottom connector. Push bottom foil up, closing the gap in the foils to allow more wire to project beyond the foil.

Make sure halyard swivel and torque tube have been slipped on the foils.

**Slip the washer provided with your unit onto the wire before assembly of the Norseman or Sta-Lok fitting.**

Be sure that the wire is cut cleanly.

Slide the socket head of the terminal onto the wire, open end down.

Unlay the outer strands of wire to expose the core for a distance slightly longer than the "wedge".

**Tip: In most cases you will expose the core for a distance much greater than the length of the core. This is okay.**

Slip the "wedge" over the core, narrow end first, until the core protrudes 3/32" (2 mm) beyond the "wedge".

Reform the wire around the "wedge", using care to keep the "wedge" in position with 3/32" (2 mm) of core protruding. Slip the socket down the cable and over the "wedge" during this process to prevent the cable from unlaying.

Check to see that the strands are evenly spaced around the "wedge" and that none are in the slot.

On Sta-Lok terminals insert the "former" into the threaded stud. Norseman fittings do not use a "former".

Thread the stud onto the socket head and tighten firmly with a wrench to form wires. Even when properly assembled, a few threads will show. Disassemble the terminal and check to make sure strands are evenly spaced around the "wedge" and 3/32" (2 mm) of core is protruding below the wedge. **Make sure none of the outer strands are in the slot in the wedge.**
Special Assembly

Place a drop (about the size of a marble) of polysulfide marine sealant (such as BoatLIFE's, Life Calk) onto the end of the wire. **Do not use silicone marine sealant.** Apply three drops of red Loctite to the threads and reassemble the terminal.

After the terminal is assembled, attach the bottom foil to the long bottom connector using red Loctite, a plastic half wedge and screw as described on page 19.

Attach the feeder as described on page 20.

Norseman and Sta-Lok terminals may be opened for inspection. Always reassemble with fresh polysulfide marine sealant, red Loctite and a new “wedge”. **Do not reuse** the “wedge” after you’ve sailed with your furling unit.

**Rod Terminal Assembly**

In this step, the rod terminal is attached to the nosepiece and secured with red Loctite and cotter pins.

Make sure halyard swivel and torque tube have been slipped on the foils. Then apply a few drops of red Loctite to the threads of the nosepiece.

Screw the terminal onto the nosepiece until the flats align with the two cotter pin holes in the terminal body.

**Tip:** The flats will align with the holes when the threads of the nosepiece are flush with the top of the terminal body. Slowly turn the nosepiece while easing a cotter pin into one hole. The cotter pin will slip through the terminal when the holes align with the flats.

Insert the two cotter pins and spread Clean excess Loctite from the terminal body using special care to insure that no red Loctite is present on the threaded stud.
The furling line is attached to the drum and led to the cockpit in five steps.

Use Harken bullet blocks for the forward and intermediate lead blocks. Use a #019 little Hexaratchet or other ratchet for the aftermost lead block. Harken part #266 is a lead block kit with three #166 bullet blocks; four #061 stanchion mount bases; one #019 ratchet block; and a 3" (75 mm) cleat. Use the lead block kit or choose the best configuration of blocks for your needs.

1 Pass the rope through the hole in the hub of the drum and use a screwdriver or pliers to pull the line out the bottom. Tie a small overhand knot and pull it up under the drum assembly. To prevent binding, make the knot as small as possible and push the knot securely up into the drum assembly. “Charge” the system by turning the foils to wrap line on the drum.

2 Loosen the line guard screw and align the opening in the basket so the furling line leads properly at all times. The angle at which the line exits the basket changes as the amount of line on the drum changes. Check for chafe with varying amounts of line on the drum before locking the unit.

The furling line may be led down either side of the boat.

3 Position the forward block so that the line enters the drum at right angles to the headstay and is centered vertically in the opening. Move the block fore or aft to adjust the line vertically in the opening.

Improper positioning will result in chafe or cause line to wrap unevenly on the drum. In many cases, proper placement cannot be achieved by using a stanchion mount lead base and the forward lead block must be attached to a pad eye mounted on the deck.

4 Mount a #019 little Hexaratchet (or other configuration of ratchet block) as the after lead block to insure proper drag on the furling line to prevent line overrides in the drum.

Position a standard horn cleat in a convenient location in the cockpit.

5 Lead the line through the forward and after lead blocks. The after block should be a little Hexaratchet. If the line has been led correctly you should hear a clicking sound. Then, position the intermediate blocks to keep the line clear of the side decks to insure a fair lead.

Tip: When line is wrapped clockwise on drum the opening will look “off center” to starboard. The opposite is true for counterclockwise.

Tip: The position of the suncover on the sail determines the direction of rotation: Suncover leeward – “charge” by turning clockwise. Suncover to port – “charge” by turning counterclockwise. Keep tension on the line while “charging”.

The #061 stanchion mount bases provide an ideal attachment method for furling line lead blocks. The ball joint socket accepts most small boat swivel blocks, including ratchet blocks.

Intermediate lead blocks hold the line near the gunwale. The number and placement of these leads depends on your boat length and configuration. All four lead blocks must be a Harken little Hexaratchet to provide the proper line drag while furling. This block should be placed to lead the line to a cleat in the cockpit. If the line has been led correctly you should hear clicking when you pull the line. If not, the ratchet switch may not be engaged or you must realign the line through the block in the opposite direction.

Unit #1 MK II

August 15, 1994
The most serious problem with furling systems occurs when the jib halyard wraps around the headstay foil. Halyard wraps will prevent furling or unfurling and may cause serious damage to the furling system and the halyard. In severe cases, halyard wraps may cause loss of the headstay.

Halyard wraps are prevented by the halyard swivel which allows the foils to turn while the halyard remains stationary. To prevent wraps, the halyard must exert a slight pull to the rear.

To prevent halyard wraps:
- The halyard swivel should be within the top 4" (100 mm) of the foil.

**Tip:** With the sail raised, walk away from the boat and look at the masthead with binoculars. Use the halyard swivel as a measurement reference. 4" (100 mm) is 1/2 the length of the swivel. There should be less foil exposed above the swivel than 1/2 length of the swivel.

- The halyard must pull slightly to the rear.

- The halyard must be snug but not too tight.

If a halyard wraps, do not force the unit to turn. Attempt to open the sail by alternately pulling the sheets and the furling line. If the sail can be unfurled, lower the sail by releasing the jib halyard. Severe halyard wraps can only be cleared by going aloft and freeing the halyard. If the sail will not furl or unfurl, it may be possible to remove the jib sheets and manually wrap the sail around the headstay.
Pendants

If your sail is not long enough to position the halyard swivel properly, you must add a pendant to the sail. Pendants should be plastic coated wire permanently attached to the sail so that whenever the sail is raised the height will be correct. Adjustable length pendants are not acceptable as they may not be adjusted correctly during a sail change.

To Install a Pendant

1) Raise the sail, but do not attach the tack shackle.
2) Position the halyard swivel correctly near the top of the headstay and secure the halyard.
3) Secure a piece of rope to the tack of the sail. Lead the line through the tack shackle on the furling drum and tension the sail.
4) Measure the distance from the tack shackle to the tack of the sail and have a pendant of this length permanently attached to the head of the sail.
5) Repeat this procedure for every jib.

Tip: Pendants are most properly used at the head of the sail. Short pendants may be added at the tack when necessary to improve visibility under the genoa but remember that visibility is already improved by positioning the tack of the sail on the furling drum. Tack pendants increase heeling moment by raising the sail plan. You may install pendants at both the head and tack of the sail, if desired.

Halyard Restrainer

To prevent wraps, the jib halyard must pull slightly to the rear. On most boats, the halyard lead angle is acceptable if the halyard swivel is raised to the top of the foil.

On some boats the halyard sheaves are located too close to the headstay and a halyard restrainer must be used.

Halyard restrainers should be used only when they are required by the masthead geometry. Restrainers tend to limit sail luff length and may cause problems if not properly installed.

If your boat needs a halyard restrainer, use Harken part #944.

The restrainer should be mounted as high as possible on the face of the mast. Position the restrainer so that the foils will not hit it when under load.

The restrainer should deflect the halyard as little as possible or you may experience difficulty in tensioning the sail luff, friction in furling, and possible damage to the foils. To decrease deflection angles, shorten the luff of the sail.

Tip: Boats which are used in charter service should consider use of a halyard restrainer, regardless of masthead geometry.

Halyard Tension

The jib halyard should be firm, but not too tight.

Tip: The luff foil system supports the sail along its entire length so halyard tension is required only to shape sails, not to support them. Use only enough halyard tension to remove some of the wrinkles along the luff of the sail. Do not tension the halyard enough to cause vertical wrinkles in the luff of the sail. Use halyard tension to adjust the position of the draft of the sail to suit the conditions in which you are sailing. Your halyard should be firm but not tight. If in doubt release halyard tension. To protect the sail, ease the halyard when the boat is not in use.
Spinnaker Halyards
Spinnaker halyards occasionally cause problems with furling.
On many boats it will not be possible to attach the spinnaker halyard to the bow pulpit or it may be "sucked" into the jib when you are furling.
On some boats the spinnaker halyard lays across the headstay and will catch on the halyard swivel, foils or jib halyard. It may be necessary to install a masthead bail to move the spinnaker halyard block forward and to one side to prevent problems.
Many boats with external halyards will find it necessary to flip both ends of the spinnaker halyard behind the spreaders to prevent fouling with the furling system.

Headstay Tension
A furling system will work best if the headstay is tight.
A loose headstay is difficult to rotate and can cause unusual wear on the foil joints.
To adjust headstay tension, remove the sail and furling line from the unit. Remove the two screws at the top of the torque tube and remove the three screws at the base of the torque tube. Secure the torque tube up near the feeder. Refer to pages 22 through 25 for detailed instructions for tensioning and relocking your turnbuckle.

Tip: Before adjusting headstay tension, completely slack the backstay, mainsheet and vang.

Backstay Adjusters
Backstay adjusters allow headstay tension to be varied to change sail shape to match the conditions. They permit a very tight headstay to be eased when the boat is not in use. For best performance, consider adding a backstay adjuster, either a block and tackle, a mechanical adjuster like those offered by Harken, or a hydraulic adjuster.
Remember to keep the headstay tight for best performance when furling or reefing.
If your boat is fitted with an adjuster be sure that it is tensioned before the halyard is tensioned. If not, the backstay adjuster may adjust halyard tension and could damage the sail or furling system.
Racing boats often slack the headstay completely when sailing downwind. Check to be sure that the foil does not jam against the upper headstay terminal when the backstay is released. It may be necessary to shorten the foil slightly to prevent this.
Raising Sails

1) Install the prefeeder by securely tying the end of the line to a deck fitting or to the toggle below the furler.

2) Align the tack shackle so it is directly below the groove at the top of the torque tube. Shackle the tack of the sail to the drum. See page 25 for torque tube alignment.

3) Secure the genoa sheets to the clew.

4) Attach genoa halyard to the halyard swivel.

5) Pass luff tape through the prefeeder and feeder into the foil groove.

6) Attach the head of the sail or the pendant at the head of the sail to the halyard swivel.

7) Hoist the sail.

Tip: New sails are often stiff and may hang up on the prefeeder during raising. Do not force sails when they hang up – lower them and remove the twist. Sails "break in" with use and will become easier to raise.

Storm Sails

Most people will use one multi-purpose genoa for all of their sailing, but it is not good seamanship to go offshore without storm sails.

Heavy air working jibs and storm sails may be used with your unit. These sails need to have luff tape added to allow them to be raised in the headstay foils.

These sails will generally require pendants to insure that the halyard swivel is properly positioned at the top of the headstay. See page 30.

Remember that heavy air working jibs and storm jibs may be reefed and furled like any other sail.

Furling and Reefing

To furl or reef, ease the jib sheets and pull the furling line.

In very light air, it may be necessary to place some tension on the jib sheet to insure a tight furl.

In a breeze, you must completely luff the sail by totally slacking the jib sheets before furling.

The furling line should pull readily. The amount of force required is related to the amount of wind, but a Unit 1 should never require the use of a winch to furl. If the sail will not furl, or if furling requires a great deal of effort, there is a problem with the system. Consult the Troubleshooting Guides on pages 35 and 36. Do not use a winch to force a system to turn.

You may use a winch to make furling easier, if you are certain that the system is operating properly.
Reefing

A sail may be partially furled before you resume sailing. This is known as reefing.

Many sailors find it helpful to place marks on the foot of the sail so that they can reef to a variety of predetermined jib sizes. This allows marks to be placed on the jib lead tracks or toe rail so that lead block position can be changed to correspond to the reefed jib.

Your system is provided with a "locking" device that can be used to lock the unit while reefed or when leaving the boat unattended at the dock or mooring. To lock the unit in a reefed or furled configuration, align the holes in the bottom of the drum and basket and insert a shackle or pin. Use of the lock removes tension from the furling line and prevents accidental release of the line which could expose a full sized genoa to heavy winds.

Use of the lock while reefed requires that you go onto the foredeck after reefing and again before the sail can be reefed further or unreefed. Since one purpose of a reefing system is to allow you to change sail size while remaining in the safety of the cockpit, many people will choose not to use the locking device. Use of the locking device is not required during reefing.

Sails are generally reefed to balance the boat and to reduce heeling moment. Sails may also be reefed to improve visibility or to slow the boat while sailing in congested areas or while entering or leaving harbors.

Leaving Your Boat

When furling prior to leaving your boat in the slip or on the mooring, be sure that you get a tight furl and to continue furling the system until the sheets wrap around the rolled sail two or three times. Some people like to secure the sail with shock cord or sail ties. Be sure to securely cleat the furling line to a standard horn cleat.

You may also lock your system by aligning the holes in the bottom of the drum and the basket and inserting a shackle or padlock.

Be sure that mooring lines are not placed across the furling line where they may cause chafe.
**Operation**

**Conversion to Racing**
For racing, lower the halyard swivel below the feeder and remove the line guard, cowling and drum and basket from the headstay. This allows use of both grooves for sail changes and to tack genoas on the deck for maximum luff length.

**Lowering the Halyard Swivel**
To lower the halyard swivel, remove the feeder and lower swivel unit until it rests on the torque tube. Replace the feeder. Use blue Loctite on the screw.

**Drum Removal**
For serious racing you may want to remove the halyard swivel.
1) Remove the sail and unwind the line from the drum. The line can remain attached to the drum.
2) Use the 6 mm Allen wrench provided to loosen the screw on the bottom of the guard. Lower the guard and cowling.
3) Use a Phillips screwdriver to remove the four screws on the side of the guard. Separate and remove the guard and cowling.
4) Use a 5 mm Allen wrench to loosen the four screws in the plastic drum and remove.

**Halyard Swivel Removal**
Note: It is not possible to remove the halyard swivel on a unit with Norseman/Sta-Lok or rod adapter stud unless you disassemble the terminal stud. Make sure you use a new Norseman/Sta-Lok wedge to reassemble a Norseman/Sta-Lok fitting.
1) Remove the drum assembly.
2) Rig a secure, temporary headstay.
3) Loosen the backstay, mainsheet and vang so that the headstay goes slack.
4) Remove the clevis pin holding the furling unit to the chainplate.
5) Open the torque tube to release the upper locking collar (see page 25). Thread the drum off and slip the torque tube and halyard swivel off.
6) Slip the torque tube back on the foils and re-attach the lower unit.
7) Re-attach the headstay to the boat.

**Storage – Mast Down**
In areas where it freezes, do not store the system where water can accumulate in the foils. When the water freezes it will rupture the aluminum. Store the foils under cover, with grooves facing down or on an angle so water will run out.

**Storage or Transporting**
Do not store or transport the system with the lower unit extending beyond the mast. Remove the masthead clevis pin and shift the furler up so the lower unit can be strapped securely to the mast. Some people remove the drum assembly and halyard swivel for storage and transport.

**After Storage or Transport**
After storing or transporting the unit, clean thoroughly including ball bearings. See instructions on next page.
Cleaning and Lubricating

Keep the unit clean. When you wash the boat, flush the unit with soap and fresh water. Occasionally lower the sail and flush the halyard swivel with soap and fresh water.

At least twice a year the unit should be cleaned more thoroughly by opening the torque tube and flushing the bearings with soap and fresh water. After the unit has dried, apply a dry spray lubricant such as dry Teflon® or silicone spray.

Foil may be cleaned by washing with soap and water. A scrap of luff tape may be run up the foil to scrub inside the grooves. Foil may be sprayed with dry Teflon or silicone lubricants to reduce friction during sail changes.

Inspection

Inspect the unit for signs of chafe, wear or damage.

Inspect the locking devices below the drum and inside the torque tube for signs of loosening. Check headstay tension for signs of loosening.

Inspect the swage fitting and lower toggle for signs of stress corrosion.

Inspect the Norseman or Sta-Lok terminal or rod terminal for signs of loosening.

Inspect all screws on the unit to be sure they have not loosened.

Inspect the foil to make sure that it has not dropped into the torque tube. Periodically inspect wire for signs of wear or unravelling.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector Missing</td>
<td>Piece was not secured at stud and was carried up inside of a foil</td>
<td>Check for missing connector inside of foil extrusions. If connector is not inside extrusion call Harken for a special slot top connector</td>
</tr>
<tr>
<td>Too many connectors</td>
<td>Too many strung on wire</td>
<td>Leave extra connector loose inside last 7&quot; (213 mm) foil</td>
</tr>
<tr>
<td>Foil will not slip past threaded stud</td>
<td>Dirt or burrs in foil or on connector</td>
<td>Clean connector and foil. Deburr as needed</td>
</tr>
<tr>
<td>Connectors too tight on wire</td>
<td>Connectors too tight on wire</td>
<td>Return stay to distributor. <strong>Do not attempt to straighten swipe!</strong></td>
</tr>
<tr>
<td>Connector will not fit into foil extrusions</td>
<td>Dirt or burrs in foil or on connector</td>
<td>Tape connectors again leaving 1&quot; (25 mm) between connectors</td>
</tr>
<tr>
<td>Warning color shows on threads at turnbuckle when rig is tuned or more than 2’ (51 mm) of thread is exposed at the top or bottom of the turnbuckle</td>
<td>Stay is too short</td>
<td>Add a toggle to the headstay to increase length. <strong>Do not sail</strong> with colored portion or more than 2’ (51 mm) of threads exposed</td>
</tr>
<tr>
<td>Foil too long</td>
<td>Measurement error</td>
<td>Minor errors up to 6’ (152 mm) may be corrected by shortening the bottom foil extrusion</td>
</tr>
<tr>
<td>Foil too short</td>
<td>Measurement error</td>
<td>Errors of up to 14’ (356 mm) can be corrected by removing the 24’ (610 mm) bottom foil extrusion and replacing with a longer piece of foil</td>
</tr>
</tbody>
</table>

August 15, 1994

Unit #1 MKII

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<table>
<thead>
<tr>
<th>Problem</th>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sail will not furl or is difficult to furl</td>
<td>Jib halyard is wrapping around headstay because angle between mast and halyard is too shallow</td>
<td>See installation instructions regarding optimal halyard angle. It may be necessary to mount a halyard restrainer on the front of your mast to hold the halyard to the rear.</td>
</tr>
<tr>
<td></td>
<td>Jib halyard is wrapping around the headstay because the halyard swivel is too low</td>
<td>See installation instructions regarding optimal halyard swivel height. A wire pendant may be needed at the head of the sail to raise the halyard swivel to the proper height.</td>
</tr>
<tr>
<td></td>
<td>Jib halyard too tight</td>
<td>Ease jib halyard</td>
</tr>
<tr>
<td></td>
<td>Foils riding on locking collar</td>
<td>Raise foils per Assembly Step 9</td>
</tr>
<tr>
<td></td>
<td>Foils too high, binding on swage eye</td>
<td>Lower until 1 1/2&quot; (38 mm) from pin or until clear</td>
</tr>
<tr>
<td></td>
<td>Spare halyard is wrapping in sail as it furls</td>
<td>Secure spare halyards away from the furling headstay, possibly by flipping halyard behind spreaders</td>
</tr>
<tr>
<td></td>
<td>Salt or dirt in bearings</td>
<td>Flush bearings with fresh water and lubricate</td>
</tr>
<tr>
<td></td>
<td>Furling line is tangled in drum</td>
<td>Overrides are best prevented by using a #019 little Hexaratchet block as the last furling line lead to maintain proper drag on line while unfurling.</td>
</tr>
<tr>
<td></td>
<td>Bent or banana swage stud</td>
<td>Consult professional rigger</td>
</tr>
<tr>
<td></td>
<td>Sail full of wind</td>
<td>Luff completely before furling or reefing</td>
</tr>
<tr>
<td></td>
<td>Jib sheets are not free</td>
<td>Free jib sheets</td>
</tr>
<tr>
<td></td>
<td>Foil out of torque tube</td>
<td>Reinstall foil in torque tube and tighten clamp</td>
</tr>
<tr>
<td></td>
<td>Torque tube loose from drum</td>
<td>Replace 3 screws holding torque tube to drum</td>
</tr>
<tr>
<td></td>
<td>No wraps of furling line on drum</td>
<td>Remove sheets. Rotate stay to wrap as much furling line on the drum as possible</td>
</tr>
<tr>
<td></td>
<td>Line through #019 backwards</td>
<td>Rerun line</td>
</tr>
<tr>
<td></td>
<td>Halyard swivel installed upside down</td>
<td>Remount swivel correctly</td>
</tr>
<tr>
<td>Sail will not unfurl or will not unfurl completely</td>
<td>Jib halyard is wrapping around headstay because angle between mast and halyard is too shallow</td>
<td>See installation instructions regarding optimal halyard angle. It may be necessary to mount a halyard restrainer on the front of your mast to hold the halyard to the rear.</td>
</tr>
<tr>
<td></td>
<td>Jib halyard is wrapping around the headstay because the halyard swivel is too low</td>
<td>See installation instructions regarding optimal halyard swivel height. A wire pendant may be needed at the head of the sail to raise the halyard swivel</td>
</tr>
<tr>
<td></td>
<td>Foils riding on locking collar</td>
<td>Raise foils per Assembly Step 7</td>
</tr>
<tr>
<td></td>
<td>Foils too high, binding on swage eye</td>
<td>Lower until 1 1/2&quot; (38 mm) from pin or until clear</td>
</tr>
<tr>
<td></td>
<td>Jib halyard is too tight</td>
<td>Ease jib halyard</td>
</tr>
<tr>
<td></td>
<td>Spare halyard is wrapping in sail as it furls</td>
<td>Secure spare halyards away from the furling headstay, possibly by flipping halyard behind spreaders</td>
</tr>
<tr>
<td></td>
<td>Salt or dirt in bearings</td>
<td>Flush bearings with fresh water and lubricate</td>
</tr>
<tr>
<td></td>
<td>Furling line not free</td>
<td>Free furling line</td>
</tr>
<tr>
<td>Sail will not furl completely</td>
<td>Insufficient furling line on drum</td>
<td>Remove sheets. Rotate stay to wrap as much furling line on the drum as possible</td>
</tr>
<tr>
<td></td>
<td>Too much line on drum</td>
<td>Adjust amount of line on drum or change position of forward block to allow line to roll evenly on drum</td>
</tr>
<tr>
<td></td>
<td>Spare halyard catching in sail as it furls</td>
<td>Move halyards away from furling headstay as above</td>
</tr>
<tr>
<td>Headstay rotates in jerks or elliptically</td>
<td>Insufficient tension on headstay</td>
<td>Tighten headstay and/or backstay to eliminate sag in headstay</td>
</tr>
<tr>
<td>Sail does not stay furlled</td>
<td>Sail not furling tightly on stay</td>
<td>Maintain drag on sheets while furling</td>
</tr>
<tr>
<td></td>
<td>Furling line not secure</td>
<td>Secure furling line</td>
</tr>
<tr>
<td>Sail will not go up</td>
<td>Luff tape will not go into groove</td>
<td>Check luff tape for fraying</td>
</tr>
<tr>
<td></td>
<td>Sail catching at prefeeder</td>
<td>Check luff tape size</td>
</tr>
<tr>
<td></td>
<td>Dirt in groove</td>
<td>Flake sail more loosely on deck</td>
</tr>
<tr>
<td></td>
<td>Clean groove</td>
<td></td>
</tr>
<tr>
<td>Sail will not raise completely or luff will not tension</td>
<td>Halyard swivel is hitting end stop</td>
<td>Luff of sail is too long and must be recut</td>
</tr>
<tr>
<td></td>
<td>Angle between halyard and mast is too sharp and halyard is pulling too much to the rear</td>
<td>Hayward must be routed from a point higher on the mast. This may require that any halyard turning blocks aloft be replaced or the sail shortened</td>
</tr>
<tr>
<td>Sail will not come down</td>
<td>Halyard is wrapped on headstay</td>
<td>Angle between headstay and halyard is too shallow and must be optimized per the installation instructions</td>
</tr>
<tr>
<td></td>
<td>Halyard swivel off foil</td>
<td>Foil too short or low and must be lengthened or raised</td>
</tr>
<tr>
<td>Ultraviolet cover rolls up inside of sail</td>
<td>Furling line is wrapped on drum in wrong direction</td>
<td>Remove sheets. Pull line to remove all furling line from drum. Turn stay to rewind line on drum in opposite direction. Line guard and cowling alignment may need to be adjusted</td>
</tr>
</tbody>
</table>