NORTH SAILS

The art of Rig Tune and Bend

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Prepared for the 2011 US Sailing One Design Symposium. This hands on seminar will show you the proper steps of tuning a mast and also how to use mast bend to your advantage.

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Rig Tune-

The art of rig tune is a process that involves several steps. This process is very crucial to your boats performance. Each boat varies in rig tune but the first few steps in this process will remain the same no matter what boat you are sailing on.

Step 1- Preparation

Before you step your mast it is very important that you inspect it.

- Terminal fittings
- Sheave boxes
- Goose neck
- Spinnaker pole attachments
- Standing rigging
- Running rigging

You are looking for signs of rust, corrosion, and stress cracks or fractures. Make sure your halyards show no signs of chafe and UV damage. Your standing rigging is very critical, inspect and make sure there are no kinks in the wire and that your terminal fittings show no signs of rust and or corrosion. We all want to be safe on the water and taking the time to inspect your mast in these critical areas is very important.

Maintenance-

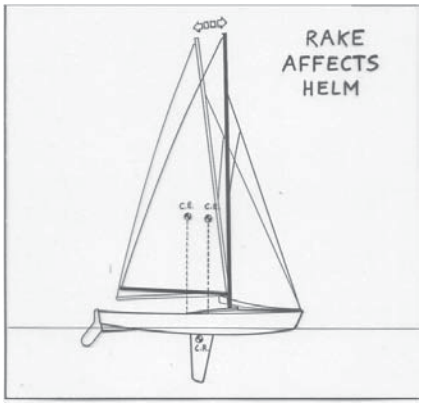
Listed below are several items that help to maintain the integrity of your mast and all of its parts.

- Harken Mclube- Dry Teflon based lubricant. Use on areas that you do not want penetration such as salt water.
- T-9- A grease lubricant used on moving parts such as Sheave boxes and spinnaker pole tracks.
- Haken One Drop- Another grease lubricant that can be used on moving parts
- Tefgel- Used on turnbuckles to prevent corrosion and also aid in lubrication.

Step 2- Mast Butt Placement

Before you can step the mast you need to make sure that your mast butt is the correct position. Your mast butt controls your rake.

Mast Rake- The angle of the mast in the boat controls the position of the center of effort over the center of resistance. Too much rake aft, or shortening the distance between the top of the mast and the back of the boat will generate weather helm, too little mast rake, or moving the mast tip forward will generate lee helm.



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Pros for mast rake aft-

- Generates weather helm which will aid in your pointing ability
- Depowers the sail plan by changing the position of the center of effort in relation to the CB or keel.

Pros for mast rake forward-

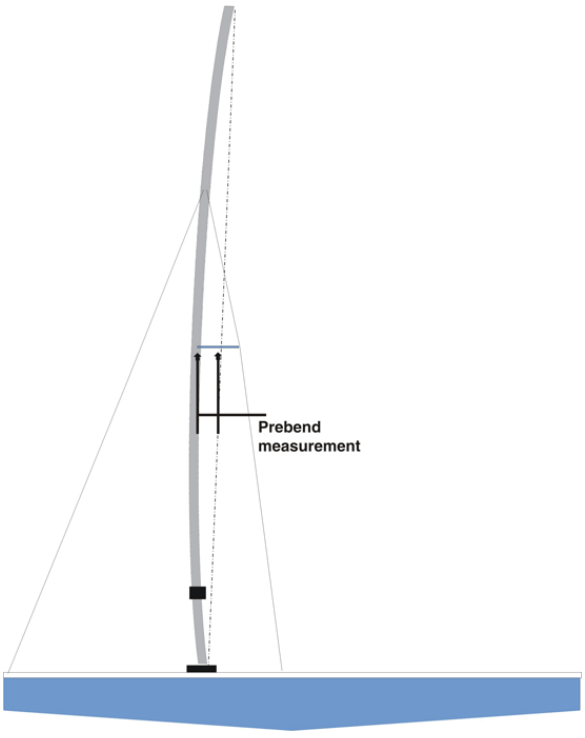
- Increases lee helm which will aid in acceleration as it prompts you to keep the bow down
- Increases the over power of the sail plan by changing the position of the center of effort over the CB or keel

Measuring and placing the mast butt varies on the boat you sail. Some boat builders or sail makers will give you a measurement from the CB pin or a bulkhead, others might have you measure all the back from the bow stem inside the boat. Its best to contact your sail maker for the proper position of your mast butt. Overall you want to position your mast butt so that in a 8-12 knot breeze you have a neutral helm.

Your forestay length will also change your mast rake. When main sheet tension is applied or backstay tension is applied you are in turn tightening your forestay, the looser the forestay the further aft you are pulling the mast.

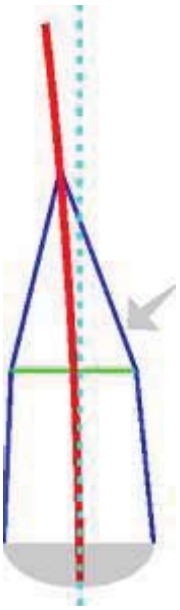
Pre-bend-

Your mast butt position will also affect your masts pre-bend or static bend when the rig is under pressure. Mainly this applies to boats that have a keel stepped mast or like the lightning has partners at the deck level. Moving the mast butt aft on the keel step will induce pre-bend or blocking the mast forward at the deck level.



Step 3- Centering the Mast

Once you have stepped the mast it is now time to start the process of centering the top of the mast with the keel or CB. This will ensure that you perform equally on boat tacks.



Before you start to center the mast you will need to find a position on each side of the boat that of equal distance fore and aft and side to side.

1. Measure from the bow stem aft equally on both sides placing a mark on the rail.
2. Measure from center line of the boat equally to that mark

Centering the mast-

1. Hand tighten the rig to remove any slack in the upper shrouds (cap shrouds)
2. Attach a tape measure to a sail slug that is attached to your main halyard (see photo below)
3. Pull the slide and tape measure to the point of where the upper shrouds attach.
4. Applying equal tension to the tape measure both sides and tension the upper shrouds to center the mast.

Pro tip- Another way to ensure that you applying equal tension the tape measure is to use a bucket of water attached to the sail slug. Hang the bucket of water over the edge of the boat and mark the line and compare to the other side. You can also use a fish scale attached to the sail slide.

Step 4- Sighting the mast

Once you get the mast straight in the boat and centered over the keel, it is now time to sight up the track and make sure that your mast is straight. You use the lower shrouds in this process.

1. Get low and sight from the goose neck straight up the track to the top of the mast
2. Tension the lower sides to align the center of the mast with the top and bottom

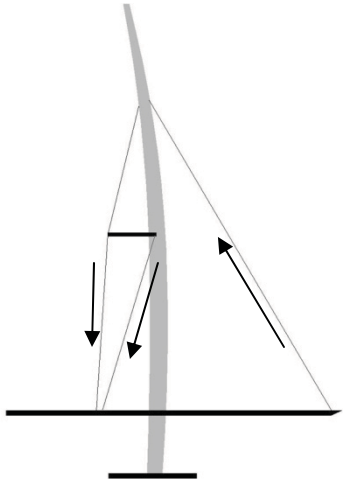
It is always a good idea to check your side to side measurement again once you get the mast straight to ensure that nothing has changed.

Step 5- Rig Tension

The rig tension varies from boat to boat and it's best to consult with your sail maker and their tuning guides for your boat.

Upper Shrouds- Your upper shrouds control a few things. By tensioning your upper shrouds you can induce pre-bend by compressing the mast with rig tension, you also increase forestay tension.

Lower shrouds- The lower shrouds are used to control the amount of pre-bend in the mast, but more importantly they control the lateral position on the middle of the mast, what sail makers refer to as sag or spoon.



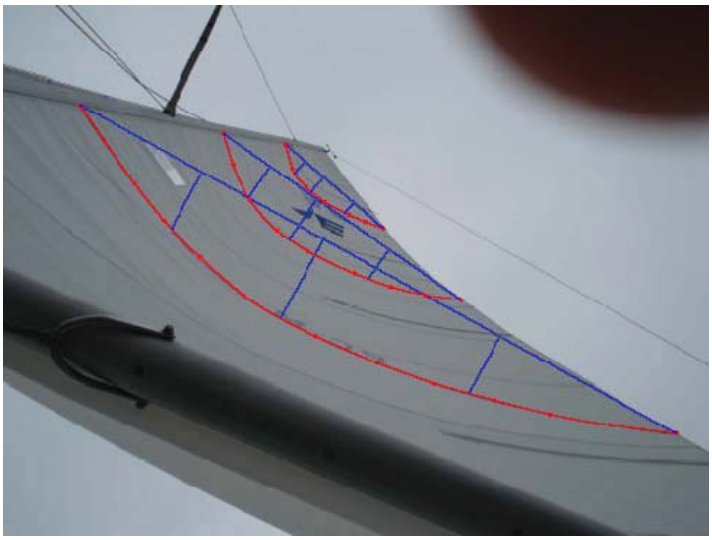
When you apply Rig tension it is very critical that you tension each side equally, also checking your side to side measurement throughout this process. Occasionally you will run into a situation where you have more tension on one side over the other. There are a few things that can cause this. One being your

mast step being uneven creating more pressure on one side of the mast, the other is your mast might not be straight to begin with, take your mast down and sight down the track to make sure your mast is straight.

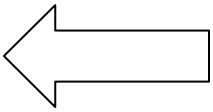
Mast Bend-

The art of mast bend is ongoing. Sail makers and mast builders are always experimenting with bend and deflections. Using mast bend you can drastically change a sails shape. There are many different ways to control mast bend, from your mast butt position, to your shroud tensions and forestay length.

Pre-bend- We now know that your mast butt placement and your upper shroud tension controls pre-bend. Pre-bend is the static bend your mast gets through compression. If you carry a lot of pre-bend your mainsail shape will appear flatter and as you apply boom vang, backstay or more rig tension the sail will get even flatter. Less pre-bend will result in a deeper main sail shape.

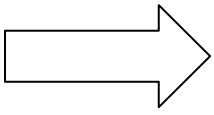


Less Prebend

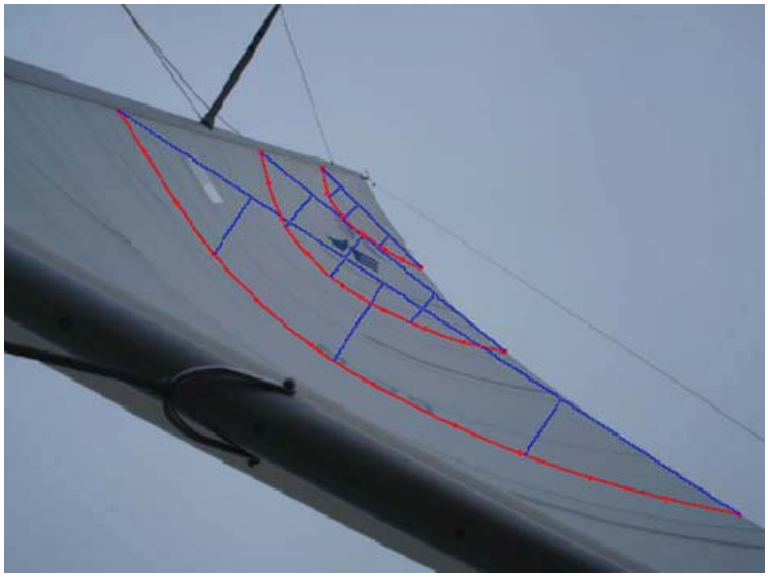


Fuller sail Shape

More Prebend



Flatter sail shape



Leeward sag (spoon) - This is method of mast bend is used to increase the depth of the middle of the sail. This can only be used on certain boats, such as J22, Tartan Ten, J24, and so on. Boats that carry a larger sail plan or need more power in certain conditions. By allowing the middle of the mast to sag to leeward you are creating a false shape in the main sail. Imitating a deeper profile.

Backstay- Your backstay is a very easy tool to use to control mast bend. But what does it actually do? By applying backstay you are increasing your mast bend and in turn flattening out the main sail as a whole profile from top to bottom. It also flattens out your headsail by tensioning the head stay and twisting the leech of the jib.

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Boom vang- By applying boom vang tension going upwind you are pulling the boom into the mast creating lower mast bend. This is a great tool to use when you do want to completely depower both the main and jib.

Following the process of getting you mast tuned, and understanding how the mast bends and what will bend the mast, you will be able to improve your performance and also sail safer.

For questions and comments please contact-

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Thank you!