# C&C 99 Tuning Guide

This guide has taken a number of years to develop and as such accounts for both the carbon and alloy rigs. At this time the following was used in Key West 2006 and has not changed.

Note: Only use Metal Measuring Tapes

Forestay Length

Apply tension to the backstay, between 1/4 and 1/2 of maximum tension. The exact amount has little significance. You just need enough tension to be able to measure the forestay length with out forestay sag. The class rules has a maximum forestay length of 47.73 +/- .0625 feet pin to pin, consequently the maximum allowable length is 47.79 feet or 14.567 meters. Set the forestay to this maximum allowable length 47.79' (14.567m).

Mast Butt Position

For the ALLOY rig position the mast in the step to the AFT most placement ( the bolts in the mast step slots will be all the way forward ). For the CARBON rig position the mast in the step to the FORWARD most placement as such the bolts in the mast step slots will be all the way aft.

Mast Position at the Partners

Position the mast at the partners so that the masts forward face is 3/8" or 1cm aft of the forward most position. Use wedges fore and aft to hold this position. We will adjust the mast port to starboard when we adjust the side stays.

Shearline Reference Marks

These Shearline Marks will be used to center the mast. I strongly suggest that these marks become permanent as you will use these marks each and every time you adjust or set up your rig. To make these marks permanent ( others will have better ideas ) I use a knife and make a cut in the shearline. This cut is not deep its more akin to a imperfection, something you can find with your thumb nail.

Attach a measuring tape to the furling drum shackle (make sure the drum can swivel freely) and measure from the furling drum shackle in a straight line to the shearline on both port and starboard sides a distance of 15.0 feet or 4.572m and mark this point. These are your Shearline Marks.

Side Shroud Placement at Deck

The Cap, Upper Shroud (for this guide we will call it V1) is in the forward most chainplate hole.
The Mid Shroud (for this guide we will call it D2) is in the mid chainplate hole.
Lastly the Lower Shroud (for this guide we will call it D1) is in the aft most chainplate hole.

Note; before tensioning ... we want to make sure all turnbuckles are clean and lubricated and that the threads are even on both ends of the barrel. Unfortunately I have often found myself tuning rigs in a rush only to find that one end of the turnbuckle has bottom out before the rig is set up. This work can be done at the dock. With all six stays in place and hand tensioned it is safe to completely unscrew a turnbuckle ONE AT A TIME, clean, lubricate and even out the threads.

Tensioning the Side Shrouds at the Dock

From your sailmaker obtain a slug or slide that is congruent with your mast. Attach this fitting to the main halyard and measuring tape (by want ever means possible) and hoist the fitting in the mast track via the main halyard to the top and cleat it. Release all backstay tension. At this point all shrouds are to be hand tight. Measure to the shearline marks on both sides and start tightening the V1's until both sides are of equal length at 2000 lbs (the tension meter I use is Loose Gauge Model # PT-2). Retension the D2 and D1 to hand tight. Lower the main halyard to the top spreader and cleat it, its exact height is not important, by eye is good enough. Measure to the shearline marks on both sides, and adjust the D2's to have equal distance at 1150 lbs. Lower the main halyard to the bottom spreader and adjust the D1's to have equal distance to the shearline marks with 780 lbs.

We now want to measure the athwartship position of the mast at the partners. To make sure that this is consistent from side to side. Place the free end of the tape measure on the centerline of the mast at the gooseneck, level the tape and measure to the V1. Repeat for the other side. Place mast wedges athwartships to equal the distance.

Hoist the main halyard with the tape measure (as done before) and tension the backstay to 1/2 load. Now measure the tension on the V1 you will see that you have less than 2000 lbs. This is because as the mast bends the rig height shortens thus losing tension. With the backstay at 1/2 load, measure to the shearline marks and adjust the V1's to have equal distance on each side at 2000 lbs. Lower the main halyard to the top spreader (as done before) and adjust the D2's to equal distance at 1155 lbs. Lower the main halyard again to the bottom spreader (as done before) and adjust the D1's to equal distance at 780 lbs.

Pin the V1 turnbuckles as you will hopefully not need to adjust this again. As for the D2 and D1 shrouds, just tie them together with a short line, as adjustments will most likely need to be made on the water.

While this set up has preformed well and won races ... we need to fine tune the on the water to get our best results.

Tuning Under Sail

Note; I often place masking tape on both sides of the mast so I can write down the adjustments to be made on the respective side. To get the most out of our mast tuning sailing we need flat water and a wind speed that will heel the boat to 20 degrees. We need the crew on the rail and sails trimmed for upwind sailing.

Set the boat up on the wind and check the tension of the leeward cap shroud. It should just be firm and not slopping around at 20 degrees of heel. If at 20 degrees it is to slack, tighten one or maximum two turns. Then tack and tighten exactly the same amount of turns on the opposite side (which is now the leeward side). Never try to adjust any windward shroud. Pin the V1 shrouds, as we will not need to adjust them again. The rest of our tuning will deal with the D1's and D2's. Our goal is to get the mast straight athwarships. Sight up the backside of the mast athwarships and see what is happening at the lower spreader. If that section is going to leeward we must tighten the D1. Should that section be pulled to windward the D1 is to tight. This also goes for the upper spreader as well in conjunction with the D2. Tack back and forth adjusting the D's until the mast is straight.

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Remember while sighting the mast what you see may not be what is happening. For example, the top of the mast may look like it is falling to leeward... this is not what is happening. It is that the D's are too tight and as such pull the middle of the mast to windward. You know that the masthead is in the center of the boat by the past work you have done. If the masthead looks as if it is being pulled to windward ... then the D's are to loose and as such allow the middle of the mast to fall to leeward.

All this said, mast tuning is on going and every boat has its sweet spots. Keep a log of your adjustments and never stop tuning.

A few other points;
We only use two halyards forward (1 Genoa & 1 Spinnaker) the 3rd halyard is removed. (Topping lift for the pole stays remains).
The Spinn halyard and Spinnaker pole topping lift should exit the mast on the Starboard side. The Genoa halyard exit mast on port side. Doing this may well cross the halyards inside the mast...but not a problem.
We have no reef lines lead nor mainsail topping lift.
The vang and foreguy should be lead to both sides.
We use no spinnaker tweakers until the TWS is 20+
Unless the seas are dangerously large, we only fly the spinnaker from forward hatch.
Sailing downwind we pull the masthead forward by attaching the genoa halyard to the bow (releasing all backstay tension) and pulling the genoa halyard very hard with a winch.

Hope this helps, I can be reached at 416-690-9182 or by e-mail **brian@ukhalsey.com**

Regards, Brian Chapman

## C&C 99 VMG TARGETS

| | Upwind | | TWS | | Downwind | |
|---|---|---|---|---|---|---|
| TWA | B Speed | VMG | | TWA | B Speed | VMG |
| 45 | 5.95 | 4.21 | 8 | 145 | 5.68 | 4.65 |
| 43 | 6.48 | 4.74 | 10 | 150 | 6.27 | 5.43 |
| 40 | 6.63 | 5.08 | 12 | 160 | 6.8 | 6.39 |
| 40 | 6.91 | 5.29 | 14 | 170 | 7.18 | 7.07 |
| 40 | 7.12 | 5.45 | 16 | 170 | 7.7 | 7.58 |
| 40 | 7.2 | 5.52 | 18 | 173 | 8.12 | 8.06 |
| 40 | 7.26 | 5.56 | 20 | 175 | 8.43 | 8.4 |