



## J-24 Tuning Guide



## Introduction

Congratulations on the purchase of your new Quantum J-24 sails. Quantum sincerely appreciates the opportunity to provide you with the first new J-24 sail designs in over a decade. We started with a clean sheet of paper, some of the most successful sail designers in the world, and the best J-24 sailors to help us evaluate and test our work. Two things stood out when we looked at the problem. First designs had changed little in recent years. Most changes were cosmetic. Second, durability was restricted by the use of simplified “one design” construction techniques. We have tried to combine elements of the latest thinking in shaping from other areas of the sport, in an effort to speed the designs up and broaden their range. We have also tried to build with a level of quality and sophistication usually reserved for big boat Grand Prix sails in an effort to make the sails last longer.

While the sail shapes had not changed all that much, J-24 sailing has undergone dramatic evolution in twenty five years. This tuning guide provides the information on preparation, tuning, and technique necessary to be competitive in today’s top J-24 fleets. It represents two decades of accumulated knowledge as passed down to, and refined by, the best of the current generation of J-24 sailors. Unfortunately, there is no magic elixir. Performance is the sum of incremental gains. In a game of inches, an extra 1% here, 2% there, will add up, and in the end will provide you with the difference ultimately critical to success. As you read this guide, keep this thought in mind. A 1% increase in speed (from 5 to 5.05 knots) over a 10 mile course is equivalent to 7 seconds per mile, or 1.2 minutes over the course.

## Boat Preparation

This is well-trodden, but critical, ground. The great thing about better preparation is you don’t have to be a four time intercollegiate all American to seize the advantage. Preparing the boat itself can be broken down into four sections: Bottom, Keel, Rudder, and Mast. Imagine racing a car with only three wheels. It just doesn’t roll as well. In the same way, you will put yourself at a disadvantage if you race your J-24 without each of the four parts of the boat optimized.

The primary goal of preparation in all four areas is to create weather helm in light to moderate conditions to help improve the boat’s upwind performance. The secondary goal is to reduce drag, which helps on every leg of the course.

If you start racing your J-24 in under 10 knots of breeze without paying attention to these four areas, you will get that mushy, sick, feeling of leeward helm.

## Bottom

The operative words are smooth and fair. The class rules specifically say that you can remove factory imperfections, but you cannot modify hull shapes. In other words, you can fill to fix voids and hollows, but you can't grind gel coat. Use battens to check fairness, and sand with long boards. One area that will need special attention is the center seam, particularly from behind the keel to the transom. This seam is typically uneven and not very smooth.

Wet or dry sanded, a hard finish paint must be used so wet sanding is possible. Our boat is drysailed with a VC Underwater Epoxy wet sanded up to 600 grit sandpaper. For boats kept in the water, Interprotect 2000 barrier coat has proven to be a good alternative.

Either way, wetsand to 600 grit. Regardless of what you cover the bottom with, a hard, sandable finish is what you need. A great bottom (including keel and rudder) can easily have two hundred hours of labor in it.

## Keel

There have been lots of changes in opinion over time about what is the best keel shape. Instead of guessing, we had the keel shape reviewed by Nelson/Marek. His recommendations affirm what has become widely accepted. The keel should be:

- a.
  - o Maximum forward at the top and at station #4.
- b.
  - o Maximum permissible chord length and maximum depth.
- c.
  - o Minimum thickness.

Templates are required to get the keel right. While newer keels are better, the process usually involves cutting area from the trailing edge and building up the forward sections (to move the keel forward and insure max fore and aft length); then reshaping primarily via grinding to slim down and match the keel shape to templates.

## Rudder

There are five things to check for:

- a.
  - o Minimum length
- b.
  - o Minimum thickness\*
  - o Minimum weight (total minimum weight including hiking stick, tiller and rudder is 13.5 kilograms)
- c.
  - o Trailing edge should be as thin as allowable.

- d.
  - o Rudder should be parallel with the transom of the boat.

\*Be careful, if you fair too thin, (particularly on boats manufactured prior to 1986), they can break. New rudders take less fairing but tend to be heavy. Once again, templates are required, and the final product should be sanded to a 600 grit finish.

## Mast

Three goals in this department: minimum length and mast butt forward to induce and create rake, spreader angle to control mastbend and match mainsail luff curve, light and clean.

- a.
  - o Shorten mast to within 3mm of class maximum \*
- b.
  - o Set headstay length at class maximum \*
- c.
  - o Set spreader deflection at 155mm (see diagram) \*\*
- d.
  - o Remove extra jib halyard and foil system (older masts).
- e.
  - o Remove windex entirely or replace with dinghy version.
- f.
  - o Remove steaming light and all electrical wiring

\*Refer to class rules for lengths and methodology. Confirm with a class measurer if possible.

\*\*Our AP main is designed with less luff curve and requires a spreader deflection of 155-160 mm. Reducing deflection allows for a tighter headstay in a breeze because the center section of the mast is straighter, and a mainsail that projects more sail area up high in the leech. There are two methods of controlling spreader deflection. The most commonly used is the thru-bar kit. This guarantees an accurate 155mm setting because the bar is pre-cut at the 155 angle. The second method of controlling spreader angle is spreader brackets. These can be mounted to the spreaders and they adjust the fore and aft sweep. Regardless of bracket type, make sure that the spreaders cannot move while sailing.

## Stepping and Tuning

Fortunately, this is not like tuning a Stradivarius. Important items to check:

- \_ Mast Butt (step) positioned so that the pre-bend measures 2.5 inches when the shroud tension measures 20 on the uppers and 15 on the lowers.
- Head stay must be measured and set at max length. At the 20-15 shroud setting the head stay should measure negative 2.5-3 fingers on the loose gauge.

- \_Set the mast at the partners so that forward face of mast at the bottom of the black band is at maximum J dimension (2925mm).<sup>2</sup>
- \_Center the mast in the boat.<sup>3</sup>
- \_Set rig tension for conditions.

<sup>1</sup> Measure from the side of the third bolt down on the stem fitting 2740mm aft to the I-beam. Make a permanent mark. From this point measure 115 mm to the front of the mast, not the front of the mast step! This is a good starting point. The ultimate goal is to get the proper pre-bend. At 20- 15 on your shroud settings you are looking for 2.5" of pre-bend. If you need slightly more pre-bend to get to 2.5", move the mast back in 1/8 in increments until you get there. If you need less move the butt forward. Pre-bend is measured by pulling the main halyard down from the top of the mast to the black band at the goose neck. The distance from the back of the mast at the spreaders to the front edge of the main halyard is the pre-bend.

<sup>2</sup> The J measurement is taken from the sheerline/stem intersection at the bow, to the front of the mast. You will probably have to modify your partner blocks to allow the mast to sit this far aft.

<sup>3</sup> To center the mast, attach a tape measure to the tack shackle at the bow and measure back an equal distance on each side to a point perpendicular to the forward face of the mast. Place mark on both the starboard and port side at the toe rail. Measure from these points to the center seam of the mast at the deck to insure that the mast is in the middle of the boat at the partners. It may not be centered in the partners themselves! Tighten the upper shrouds to 20 on the Loos Tension gauge, ( Model B). Attach a tape measure to the genoa halyard. Pull the halyard up to the 2 foot mark on the tape, (or any even number). Check side to side to the two fixed points on the toe rail to confirm that the distance is the same. With the upper sections centered, use the lowers to bring the bottom in line. (Sight up the luff groove to check straightness).

## **Shroud Tension**

Shroud tension controls headstay tension and mast bend. It's simple. Add rig tension with increases in velocity, loosen with decreases. Another way of thinking about it is that the uppers control headstay tension, and the lowers mastbend. The balance shifts between the two with velocity. In light air the lowers are looser than the uppers. As the breeze increases and more overall rig tension is used, the lowers gradually get tighter relative to the uppers.

| True Wind | Pre-Bend | Uppers | Lowes | Backstay |
|-----------|----------|--------|-------|----------|
| 0-5*      | 2.5"     | 18     | 12    | 0        |
| 4-8       | 2.5"     | 20     | 15    | 0        |
| 8-13*     | 2.25"    | 24     | 21    | +6       |
| 12-16     | 2"       | 27     | 24    | +6       |
| 16-19     | 1.75"    | 29     | 29    | +6       |
| 19+       | 1.5"     | 30     | 31    | +2       |

\*Indicates four basic settings. Other ranges offer subtle changes when you get stuck in between.

\*\* All turns on rigging are measured in half turn increment

## Deck Layout / Crew Tasks

There is only one approach, keep it as simple as possible and minimize the clutter on deck. By doing this you will make the boat easier to handle, leaving you more time to race. While each crew will have their own preferences, the standard deck layout modifications are illustrated in the diagram which follows.

### Driver

- a.  Steer
- b.  Mainsheet
- c.  Traveler
- d.  Backstay
- e.  Fine tune genoa sheet

We like a custom weather sheeting traveler system with separate cleats for two reasons: First, when tacking in light air it allows you to be able to roll the boat and pull the traveler to weather at the same time. This is not possible with the Harken weather sheeting car because the car relies on being unloaded to move across the cockpit. The helmsman cannot roll-tack the boat. Second, when racing in a breeze it is nice to be able to adjust the traveler without having to reach over your legs. Having the cleat forward allows adjustment of the traveler with the front hand. One other subtle change to simplify the driver's life: there are two winch handle pockets, so that the driver does not have to carry the handle through the tack

## Genoa Trimmer

- a.  Genoa trim
- b.  Spinnaker trim\*

\*Some crews have the tactician trim downwind. This is a matter of preference and the strength and skill of the genoa trimmer.

## Tactician

- a.  Strategy
- b.  Traffic control
- c.  Tracks wind direction
- d.  Calls puffs downwind
- e.  Monitors relative boatspeed
- f.  Feeds spinnaker on sets / gathers on douses
- g.  Keeps spinnaker packed and sheets organized
- h.  Assists with guy in heavy air

Not much responsibility here! Best place to stand downwind is in the companionway facing aft. Tactician also funnels communication between front and back of the boat, making sure the front of the boat is in the loop and knows what is coming.

## Balance

Always thought to be the position with the fewest responsibilities. Au contraire!

- a.  Clears weather genoa sheet in tacks
- b.  Twings\*
- c.  Topping lift
- d.  Vang, outhaul, cunninghams
- e.  Holds the guy and gathers during douses
- f.  Calls puffs upwind

\*With the sheets and twings led outside, the balance person can get double amount of roll on the boat. The twings are positioned just behind the shrouds with a direct lead to the cleat. As the boat is turning into the jibe, uncleat the old twing, stand up, and pull as hard as possible on the new twing. This helps roll the boat through the gybe.

## Bowman

- a. ○ Call starting line
- b. ○ Call waves
- c. ○ Watch for starboard tackers upwind
- d. ○ All spinnaker pole work
- e. ○ Genoa halyard up & down

A Note on Crew Weight: Every crewperson is responsible for boat balance. Always be conscious of position of weight. Do every job with weight in the right place as much as possible. Minimize unnecessary movement.

## Sail Trim

With the boat setup and the crew positions defined, it's time to go sailing. Rig tension (as detailed in the preceding table) provides the gross tune. Genoa halyard tension, main and genoa sheet tension, and backstay are your primary adjustments. Jib lead, mainsail cunningham, and outhaul are secondary. The table below provides guidelines and initial settings. However, remember that trim is dynamic. It is the constant shifting to reflect changes in velocity, waves, boat performance, tactical situations, etc. that make the difference. A discussion of this process follows the table.

| True wind            | 0 to 5                 | 4 to 8                   | 8 to 13                  | 12 to 15                | 15-19                        | 19+                          |
|----------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------------|------------------------------|
| Upper tension        | 18                     | 20                       | 24                       | 27                      | 29                           | 31                           |
| Lower tension        | 12                     | 15                       | 21                       | 24                      | 29                           | 31                           |
| Genoa Scallops       | 3/4"                   | 1/2"                     | 1/4"                     | 1/4"                    | Smooth                       | Smooth                       |
| Leech off Spreader   | 4"                     | 3"                       | 2"                       | 3.5"                    | 4-8"                         | 8-16"                        |
| Foot of Shrouds      | 5"                     | 4"                       | 2"                       | 2-4"                    | 2-5"                         | 4-6"                         |
| Main Top Batten      | Parallel to 5 deg open | Parallel to 5deg. Closed | Parallel to 3 deg closed | Parallel to 5 deg. open | Open to depower as necessary | Open to depower as necessary |
| Traveller            | 11" up                 | 7" up                    | 2" up                    | 0-2" up                 | 0-2" down                    | 0-6" down                    |
| Backstay Below Plate | 8"                     | 10"                      | 12-16"                   | 14-22"                  | 22-32"                       | 22-32"                       |
| Outhaul              | Eased 2"               | Eased 2"                 | Eased 1"                 | Max                     | Max                          | Max                          |
| Jib Fom Spreader Tip |                        |                          |                          |                         | 3" inside                    | Tip to 4" outside            |

## Mainsail Trim

Let's break trim down into light, medium and heavy air, and look at some of the dynamics.



## **Light Air (0-7 Knots)**

In light air the main is set with the traveler to weather to keep the boom on or just above center line. For the best combination of speed and pointing the top batten is parallel with the boom. The outhaul is eased 2" from the black band to power up the bottom sections and round up the lower leech. The top telltale on the leech will be streaming 80% of the time. This setup is for straight line speed. In a point mode, the boom will be pulled up some 3" to weather of centerline, and the mainsheet will be sheeted harder until the top batten is closed by as much as 6 degrees (sight up the middle of the sail using the boom as a guide for the top batten). The top telltale will be stalled about 50% of the time and the boat will point higher but go slower. To build speed out of tacks, through waves, or if the boat is slow for whatever reason, ease mainsheet so that the top batten is parallel and drop traveler till boom is on the centerline. Ultimately, traffic, tactical considerations, and moment to moment assessment of boatspeed relative to the competition will dictate your set up with regard to the relationship traveler and sheet tension. When in doubt err on the side of speed, and keep the leech of mainsail open.

## **Medium Air (8-14 Knots)**

This is serious power-up pointing mode, especially at the bottom end of the range. At the bottom end of this range the outhaul is set 1" from the black band. The crew is fully hiked. What we are looking for is maximum load on the keel to create lift. Sheet tension is the secret. In 8-11 knots, we sail with the top batten hooked 5 degrees for straight line and 7 degrees for point mode. The difference in tension is 2 clicks on the ratchet block. At 10-14 knots we begin to de-power. The outhaul is maxed to the black band, and a combination of backstay, traveler, and mainsheet is used to flatten the sail and keep the boat on it's feet. The first adjustment is traveler down. Boom position will vary from centerline to leeward of center. If this is not enough the next adjustment is backstay. As backstay comes on the mainsail is flattened and the leech is twisted open. This will de-power the boat, but will also twist the leech. The more open leech will create pointing problems. Add mainsheet whenever backstay is added. One click in on the mainsheet will keep the boat pointing.

## **Heavy Air (15+ Knots)**

Hike Hard! The outhaul is max, the backstay is on hard. The traveler is close to being all the way down, and chances are the main is flogging. In this range switch from traveler sheeting to vang sheeting, particularly if it is puffy. The new 8:1 purchase on the vang makes it easy to get all the vang tension that is necessary. The traveler is positioned three quarters of the way down, and the

sheet is played for balance.

## Genoa Trim

This sail must cover a very wide range (0-18 knots). Also, when in doubt about sail selection, we usually choose the genoa. As a result, it requires some creative and relatively extreme conditions of halyard, lead position, and sheet tension.

### Light Air (0-7 Knots)

The halyard is kept very loose, with large three quarter inch scallops between hanks. The lead is set one or two holes forward of the 8 knot median settings.\* The sheet is played constantly. In this range, the helmsperson will have to steer too much to keep up with changes in velocity and direction if no change is made to the sheet. Steer straight and make changes very gradual; keep the telltales flying by adjusting the sheet. Try to work back to the median (4-6" off the spreader setting) for this condition. A constant dialogue between trimmer and driver is helpful. The trimmer tells the driver how far off the leech is, and driver describes if he is working up or down, and whether or not the sail can be sheeted harder or it needs to stay eased to build speed.

### Medium Air (8-14 KNOTS)

Luff tightened gradually (halyard or cunningham) so that just a hint of scallops are showing. Lead position moves aft to median or as much as two holes aft of median. Sheet tension changes little in this range. Trimmer hikes and trim changes only for big sets of waves (ease sheet), or in a tactical situation (trimming harder to point, or easing to foot).

### Heavy Air (15+ Knots)

Luff tension up tight to smooth all wrinkles. Lead back between three and seven holes. The sheet and lead position are set largely as a function of boat balance. Trim the genoa relative to how the mainsail is being setup to keep the boat upright. If the mainsail is flogging constantly, move the lead back. If this is not enough, ease the sheet slightly so that both sails are luffing evenly. In the light spots, the sail can be trimmed harder, and/or the lead moved forward. In flat water you can usually sheet harder and de-power with the lead aft. In choppy water, it is important to ease the sheet.

\*A Note On Lead Position: Drill genoa tracks out so that there are two holes between every factory hole. Median lead position is determined in 8 knots of breeze. In this condition, trim the genoa so that it touches the tip of the spreader

and the chain plate at the same time. From here maximum forward will be two holes and maximum aft will be seven holes. Moving the lead aft increases the distance of the leech off the spreaders, and brings the foot in on the chainplates. (See sail trim chart for distances off of spreader and chain plate).

## Jib Trim

We designed the blade to overlap the genoa. This enables lighter teams to compete with heavier teams at the upper end of the genoa's range. The blade's range is 17+ knots. Halyard/cunningham tension is always set to keep the luff smooth. (To get maximum tension, sail the boat downwind with the backstay completely off. With two people, pull as hard as you can.) The median lead position is set by placing the plunger of the jib lead directly perpendicular to the lower shroud. This is the position that you will use about 80% of the time. With the lead at median, mark the jib sheet at a point just in front of the block, so that when the sail is trimmed to this mark the middle batten is parallel with the centerline of the boat, and the upper leech is about 3" inside the spreader tip. This provides a point of reference. The leech of the sail will be trimmed from a point 3" inside the spreader tip to as much as 3" outside the spreader tip as the breeze builds. In more than 24 knots, slide the lead back one inch to de-power. If you get caught in a situation where the boat is overpowered and you cannot adjust the lead, (or it is already back), ease the sheet an inch or two, (or whatever it takes to balance the boat). This will quickly de-power the head of the sail and the boat will drive off the bottom of the sail.

## Spinnaker Trim

Standard rules of spinnaker trim apply, though because of the rule's effect on sail geometry, and because the sail design is geared more towards windward/leeward courses, reaching trim requires some exaggeration of normal technique. A couple of thoughts to keep in mind:

In 0-14 knots sail with the pole on the lower ring. In 14+ knots use the upper ring. In windier conditions, if you are tight reaching, the outboard end of the pole should be a foot lower than perpendicular to the mast. This will slide the draft forward in the sail and open up the leech to de-power the boat. Keep the pole 3-6" off the headstay. When broad reaching and running in all conditions, the tack should be slightly lower than the clew. This, coupled with the pole being squared, will help project maximum sail area. When broad reaching and running, always work to square the pole as far back as possible. Ease the sheet to maintain a curl, but make sure the bottom of the sail is underneath the top. The luff should run straight from tack to the point of curl. If the head can be eased to weather of the straight line, the pole is undersquared.

## Parting Words of Wisdom

Like all tuning guides, the numbers and settings are just that, guides, not gospel. They have been developed to help you find the sweet spots and get you in the right ballpark. Superior athletes in every sport often have slightly different styles or techniques which work for them. Always keep in mind that trim is dynamic. You can't just set it and go. Try to understand what tuning and trim controls do. This way you can react and make changes in response to your actual performance at a given moment. Do not be afraid to experiment! Let us know what works, and if you have any questions, be sure to call.

Above all enjoy your J-24 racing. To paraphrase that famous west coast credo, remember that Fun is Fast!

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