Viper 640
One Design Sportboat

RONDAR RACEBOATS LTD

Setup and Critical Tuning Guide for the Viper 640 Rig

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Welcome to the Designer's Tuning guide on setting up your Viper 640. The Viper has been around for approximately 12 years now, and many believe it to be the best true one design small sportboat in existence. It is a lightweight, high performance boat with emphasis on ease, simplicity, value, pure sailing enjoyment, and great one design racing.

If set up to the parameters below, you will find the Viper 640 rig responsive and reliable through the practical wind range of 0 – 25 Knots. I advise that these concepts and settings be considered strongly as they are developed with the Viper's specific rig concept and engineering in mind.

Brian Bennett

The Fundamentals of the Viper 640 Rig

The Viper utilizes a high aspect non-backstay rig with stainless 1 x 19 wire shrouds and headstay, on a round carbon mast.

The critical rig controls are as follows:

1. Mast Step
2. Mast Gate (Partners) with associated blocking or control system
3. Headstay (Forestay)
4. Upper shrouds
5. Lower shrouds
6. Spreaders/spreader bracket (and associated geometry)
7. GNAV (Vang)
8. Mainsheet and Bridle
9. Cunningham

Because the Viper rig has no backstay, and carries a reasonably large roach in the main, there are some fundamental considerations that need to be accepted as part of set up and sailing, **particularly in conditions over 16 Knots of wind**.

These fundamentals are:

a. The mainsail leech/roach is your downwind backstay.

b. The rig requires **a minimum of 114mm (4.5") of prebend**, as the spreader engineering and geometry dictate. This prebend balances the inversion loads exerted on the rig from the asymmetrical spinnaker and to some degree, the mainsail (when trimmed too far out – see "c" below).

c. **When sailing downwind in breeze above 16 knots, the mainsail must not be eased out to the shrouds. It should be trimmed with the boom no further out than to a point approximately 16" from the shrouds,** or with the boom directly over the aft spinnaker sheet turning block. This is not only fast but will keep the mainsail acting as your backstay. Letting the mainsail out beyond this point may produce detrimental flow, and structural conditions that are undesirable. All three sails, when correctly trimmed downwind, produce a slot effect where there is harmonic flow between the sails.

d. **GNAV pressure is also of primary importance relative to mainsheet/ boom position**. This is because the GNAV is the only element that links the mast tip to the boom to the mainsheet, by controlling leech tension. When trimmed correctly (as described above) the leech of the main works in concert with the mainsheet and the GNAV to provide a support structure for the masthead, supporting the tip aft. Essentially, the mainsail leech (roach) should be working to keep the loads pulling aft on the mast tip.

Baseline Rig Settings

The following are baseline recommended settings for the critical rig controls on the Viper 640 (where appropriate), and discussion of the impact that these settings will have on rig tune and safety. For detailed rig tune adjustments appropriate to each wind range, please refer to the rig tune and trim setting tables at the end of this document.

1. Mast step: Putting the mast in the appropriate location on the mast step, combined with the appropriate headstay length (see below), will yield the correct baseline setting for optimum helm balance. In new Rondar boats, the mast should be positioned against the bolt in the second hole from the rear of the step. The forward bolt should prohibit any forward movement. The aft face of the mast step should measure 3730 mm (146 7/8") from the turn of the transom at the cockpit floor, measured at the side of the Rudder post.

2. Mast gate (Partners): The mast gate control system (presently chocks/ purchase) controls pre-bend and limits inversion (when the mast is held forward). Marginal chocking in front of the mast helps to contain pumping in a seaway, and has some benefit in the overall control of headstay tension when used appropriately in conjunction with the lower shrouds. **It is important to support the minimum 114mm (4.5") prebend by not chocking aft beyond this point.** The forward puller should be rigged to keep the mast in (or forward of) this position.

3. Headstay (Forestay): Baseline setup suggests that for optimum helm balance (assuming the mast step is positioned as described above), the headstay (forestay) length should be 7571mm/298" (from the bearing point of the "T" tang to the bearing point of the lower pin).

Note: On Bennett built boats (hull #s under 69), the headstay chainplate is 20mm (.75") further aft. The above headstay measurements should be reduced by 8mm (.3") to compensate.

Measurement Tip - An easy method for measuring the headstay:
Detach the headstay from the bow chainplate. Take to the front of the mast, and pulling tension down, mark the bottom of the lower white measurement band on the mast onto the headstay with a fine tip marker. Reattach the Headstay. The measurement from this mark to the center of the headstay pin should be 1320 mm (52").

4. Upper Shrouds: These provide the gears to your rig. When correctly tensioned they compress the spreaders into the mast, and provide the correct pre-bend and geometry to take your sails through the wind range. Minimum pre-bend is 114mm (4.5"). The Rig Tune Table at the end of this document provide more detailed settings for performance within each wind range.

5. Lower Shrouds: The lower shrouds are provided as an instrument for containing mast bend, with a benefit that when used correctly, they help to keep the mast in "Column" in conditions over 10 Knots. They are a key device for controlling headstay tension as the conditions increase. They limit the amount of compression bend as the upper shroud tension is increased. As with the upper shrouds, refer to the Rig Tune Table at the end of this document for lower shroud settings appropriate to each wind range.

6. Spreaders: These come from the factory pre drilled with correct geometry.
When installing the Upper wires/ spreader tips, install the pin with two holes showing. This should give you an outside swage to outside swage measurement of 1227mm (48.3"). The correct spreader angle will result in a distance of no less than 311mm (12.25") measured from the aft face of the mainsail track to a line connecting the shrouds at the spreaders.

7. GNAV: The GNAV is engineered to push down on the boom and forward on the mast, controlling mainsail leech tension. The Aluminum GNAV tube should be of max length permitted by the class, 1280mm (50.4"). With a maximum length GNAV, the point of loading is moved aft along the boom, decreasing boom compression loads and gooseneck sheer loads, while maintaining optimum mainsail leech tension. A Harken or Ronstan ball bearing car system further improves efficiency.

8. Mainsheet:

a. *Boom limits:* Critical for downwind mainsail leech control (above 16 knots wind speed). With the mainsail hoisted, ease out the mainsheet until the boom is 16" from the shroud. Mark your mainsheet with a contrasting color (whipping or Vivid marker) as a reference for maximum ease. (This point also places the boom directly over the quarter Asymmetric turning block as a reference.)

b. *Upwind Mainsail sheeting and Bridle tuning*: The key to efficient upwind trim is to have the ability to sheet the mainsail hard on centerline and simultaneously find the apex of the bridle. The ideal amount of mainsheet tension at the point of maximum trim will vary depending on the wind conditions and crew weight (the mainsail is likely to be trimmed harder in 8 – 13 knots than at any other time). Ideally, you should set up the bridle length so that the mainsheet will "2 block" (blocks touching between the bridle and the boom) just at the point of maximum desired mainsheet tension for the conditions. If the mainsheet "2 blocks" before you are at max trim, you should shorten the bridle. If there is still a gap between the blocks when you are at max mainsheet tension for the conditions, you should lengthen the bridle. In essence, with an adjustable bridle, you will likely lengthen it for lighter air in order to keep the boom on centerline.
I advocate using the smallest possible blocks (35mm) in order to keep the boom as close to centerline as possible for upwind sailing. In addition, be sure to have one or two straps or have your sailmaker fabricate a ½ sock to keep the mainsheet up under the boom, rather than strangle you during a jibe.

c. *A word on aft sheeting vs. fwd sheeting:* This comes down to preference. Forward sheeting allows for a traditional (J 24/ J 22/ Sonar) style of tacking, where the tiller may be rotated aft. The aft bridle requires Laser style tacking procedure where you need to pay more attention to the passage of the tiller extension. The aft bridle has a slight performance advantage in that leech control is better maintained (mainsheet loads are carried more directly to the leech.)

9. Cunningham: The cunningham assumes its typical mainsail shaping role in wind speeds to the mid-high teens. It takes on a special role downwind in heavy air, when combined with the vertical luff panels in your mainsail, the cunnigham helps produce and maintain prebend in the mast. Therefore, when turning downwind in heavy air, the upwind cunnigham tension should be held on as it will help to produce and maintain prebend.

For rig tune and trim recommendations across the wind range, please see the attached Rig Tune and Trim Tables. Obviously, settings may vary between sailmakers, but please keep the above Viper 640 rig fundamentals and baseline rig tune settings in mind when applying your own and your sailmaker's recommended adjustments.

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Viper 640 rig setup / tuning

	Wind speed	Headstay	Upper Shrouds	Lower shrouds	Mast gate
Light	0 - 9 Knots	7571mm/298" bearing point to bearing point (-8mm for hull #'s < 69)	minus 2 turns	minus 2 turns	pull mast forward 20mm to 5 knots
Base	10 - 14 knots		30 on LOOS PT-1 (US or metric)	Snug only - no tension	No chocks
Medium - Heavy	15 - 19 knots		plus 2 turns	same as Base	med chocks - pull mast fwd to maintain prebend
Heavy	20 + knots		plus 3 turns	minus 2 turns	med chocks - pull mast fwd to maintain prebend

Viper 640 suggested trim settings

	Wind speed	Outhaul	GNAV-upwind	GNAV - downwind	Jib Halyard	Jib track	Jib Barber Haul	Jib sheet	Mainsheet upwind	Mainsheet downwind	Main Cunningham
Light	0 - 9 Knots	soft - med	none	none to light	soft	plus 1 fwd	25mm in	soft	soft	trim for best VMG	none to soft
Base	10 - 14 Knots	med	light	light to med	soft - med	even break in telltales	10-20mm in	firm	med - firm	trim for best VMG	soft to med
Medium - Heavy	15 - 19 Knots	med-full	med-full	med	med	even break minus 1	none	firm	firm - slight ease in puffs	Ease only to safety trim position	med to hard
Heavy	20+ Knots	full	full	full - up to 10% ease	full	minus 2 - 3	none	ease in puffs	ease in puffs	Ease only to safety trim position	hard - do not ease downwind

Revision History

Revision	Date	Changes
1.0	04/02/2009	First publication
1.1	04/11/2009	a. Added Main Cunnigham tuning data to main document and to Trim Settings table. b. Added Revision History table.

For the latest version of this document, please visit the Viper 640 Class Association at:

http://www.viper640.org/the-viper-640/rigging-a-tuning/197-tuningguide