SCANMAR INTERNATIONAL

US $20.00

MONITOR WINDVANE™

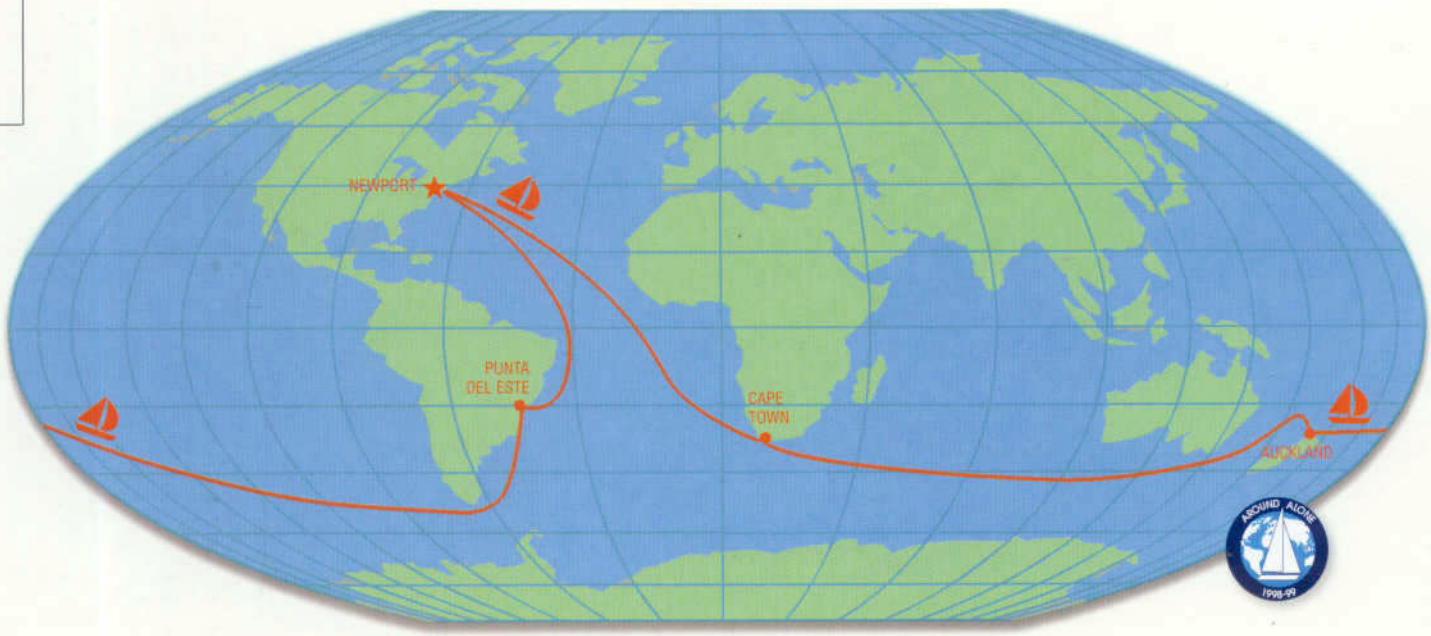
MANUAL

Installation

Operation

Maintenance

INTRODUCTION



This third edition of the MONITOR Manual was published just in time for year 2000. The first MONITOR was made in 1975 and the first decent manual was published in 1982. To the untrained eye a MONITOR that is more than twenty five years old looks just about the same as a current MONITOR. However, the MONITOR's successful participation in three consecutive BOC single-handed, around the world races, and one AROUND ALONE, has given Scanmar unequaled testing possibilities for the gear, and we think we have put the experience to good use. Our BOC/AROUND ALONE experiences, together with the feedback from thousands of regular cruising sailors who have crossed the oceans for two and a half decades, have resulted in many improvements and design changes. Today we feel that we are building a truly perfected product.

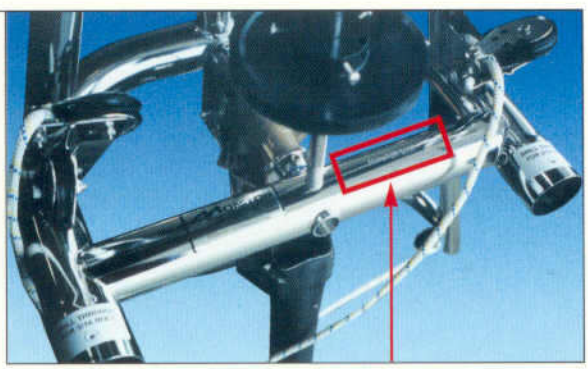
The real challenge in the redesign and modification process has been to produce new parts and designs that would fit all the older MONITORs that are still sailing the Seven Seas. We have succeeded in this objective, but, **to make sure that we always deliver compatible parts, the following message is important:**

When contacting the factory for spare parts or advice for your MONITOR always include the SERIAL NUMBER. You will find it on the main frame crossbar between the attachment of the two upper mounting tubes.

Meanwhile, we wish you great cruising and fair winds.

Sincerely yours,

Hans Bernwall
President
SCANMAR INTERNATIONAL



Location of serial number on the MONITOR.

Printed on 15% Post-Consumer Waste Recycled Paper with Soy Based inks

ADDENDA FOR MONITOR MANUAL - March 2008

BEFORE BEGINNING YOUR MONITOR INSTALLATION -

- READ THE INSTALLATION PROCEDURE COMPLETELY THROUGH -
- IF YOU HAVE ANY QUESTIONS, CALL SCANMAR BEFORE BEGINNING!
- NOTE THAT THE MANUAL MOUNTING INSTRUCTIONS ARE FOR A BASIC MOUNT. *MOUNTING BRACKET LOCATION DIMENSIONS AND INSTRUCTIONS SPECIFIC TO YOUR BOAT WILL BE FOUND ON YOUR MOUNTING DRAWING. THEY TAKE PRECEDENCE OVER THE BASIC MOUNTING DIMENSIONS!*

THE MONITOR AIRVANES

Both the large and small airvanes are now made of 8mm Lexan Thermoclear, reinforced with plastic rod inserts. They are not affected by dampness. The airvane sizes once were called 'standard' (the small one) and 'light-air' (the large one). The larger airvane will give a better signal to the Monitor when you are sailing in light winds, and also when it is fairly breezy and you are sailing downwind or on a reach. In those conditions the apparent wind is light and the larger airvane will do a better job. Do not be afraid to use it in strong winds. Some sailors use one or the other for given conditions, which vary from boat to boat. Experiment - see what's best for your boat. You may find that you use the larger vane over 80% of the time!

LENGTH OF SAFETY TUBE (Paragraph 3.2.3*)*

The standard safety tube length is 14" - the manual misprints the length as 12". The safety tubes come in lengths of 12"(-2), 14"(standard), 16"(+2), 18"(+4), and 20"(+6). The appropriate safety tubes for your mount will be supplied.

WHEN REPLACING A SAFETY TUBE BE SURE TO TIGHTEN BOTH BOLTS SO THERE IS ABSOLUTELY NO FREE PLAY!!!

STANDARD INSTALLATION (Paragraph 3.3.1, (17))

The first paragraph should begin with "Insert the two long spacer tubes…." instead of "..the two short spacer tubes.."

WHEEL INSTALLATION (Paragraph 3.5.3)

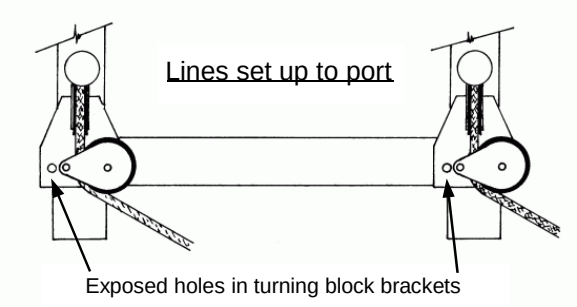
- The lines supplied on the wheel adapter are 1/4" [6 mm] , not 3/16".
- After installing the wheel adapter, cover the ends of the stainless steel clamps with the supplied "Clamp-Aid" caps.

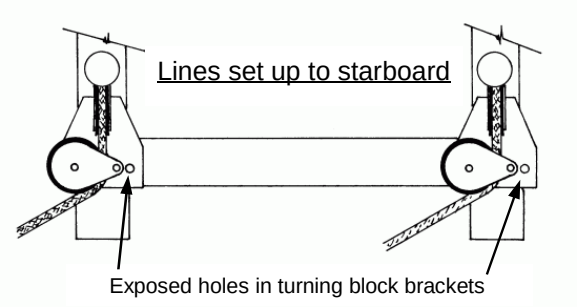
(over)

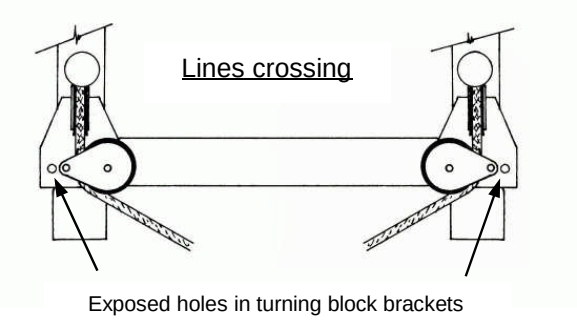
ADDENDA FOR MONITOR MANUAL - March 2008 (continued)

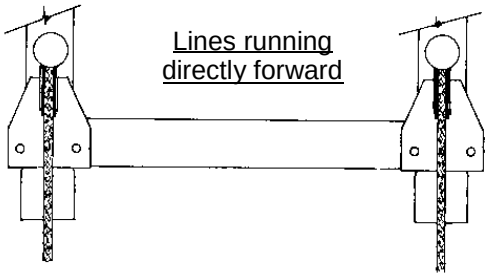
INSTALLING THE PENDULUM SHEET LINES (Section 3.5)

Note that new Monitors are shipped with their turning blocks set up to lead the lines to port for a wheel-equipped boat, and with the lines crossing for a tiller-equipped boat. If you are shifting a Monitor from one boat to the other, switch the turning blocks to match the new installation. Note that wheel-equipped boats can have the lines set up both to port, both to starboard, or one on each side, as preferred. Tiller-equipped boats must have the lines crossing to opposite sides - see instructions. When moving the turning blocks, set up their mounting bolts so the lines have a straight run from the interior blocks to the turning blocks, without an offset 'jog' which will cause binding and chafe.









MRUD INSTRUCTIONS (Section 7.1)

The wooden wedge described in the manual has been replaced by a stainless steel bracket. Refer to the MRUD brochure or the MRUD section on the Scanmar website www.selfsteer.com for instructions.

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4 SAILING WITH THE MONITOR

5 MAINTENANCE AND PROBLEM SOLVING

6 MAKING REPAIRS

7 MRUD– The MONITOR Emergency Rudder Conversion Kit *(optional equipment)*

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WELCOME ABOARD

1

Welcome to the ranks of MONITOR sailors. We hope you will be as satisfied with the MONITOR as we are. The MONITOR is built to give you years of excellent performance and to take the kind of punishment the sea sometimes delivers.

Many yachtsmen are still unfamiliar with windvane self-steering gears. They view vane gears as oddities used by single-handed race heroes and circumnavigators. The truth is that a good vane gear, such as the MONITOR, is a useful piece of equipment even on short passages of no more than an hour or so. Once the freedom of sailing with the MONITOR has been experienced, this will be fully appreciated.

In order to enjoy the experience of self-steering, the vane gear must, of course, work. Unfortunately, windvane self-steering is not a push button phenomenon. Knowing how to sail and how to balance your boat on different points of sail is necessary to get the most from the gear. Even experienced ocean racing sailors have confessed that vane sailing has taught them some things they did not know about balancing and trimming a boat. Windvane self-steering is an extension of sailing itself.

This is no excuse for inferior performance. The MONITOR is built with absolutely no corners cut and the greatest consideration for performance and durability.

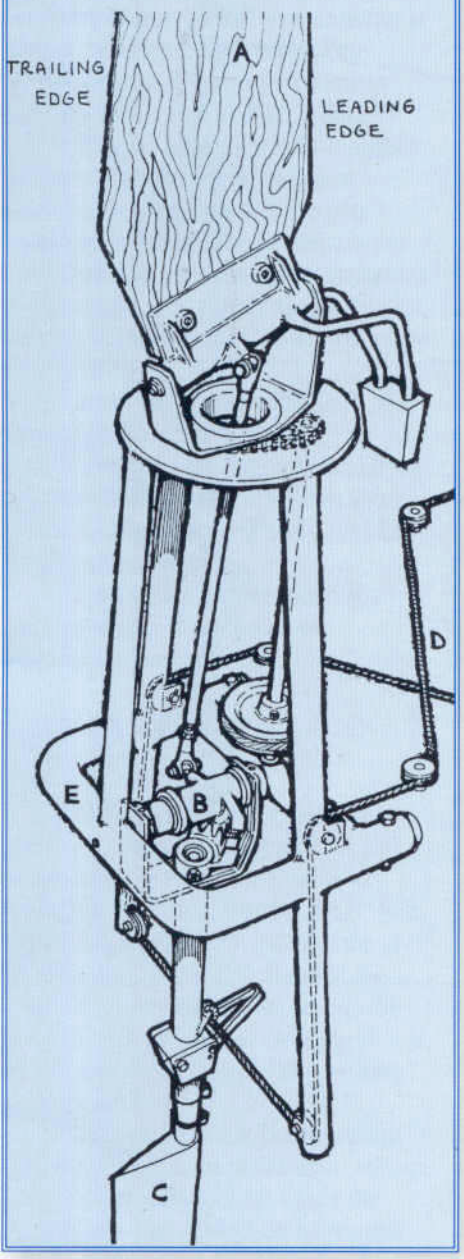
This extensive manual is necessary because windvane self-steering requires you to learn about it before you become a perfect operator. Proper installation and proper operation are essential, and we hope the number of pages in this manual will not keep you from reading it.

HINTS FOR USING THIS MANUAL:

Important information and tips about your MONITOR will be HIGHLIGHTED in ***bold, italic type***. References to key parts are followed by a number, which refers to the official "***MONITOR Diagram and Part List***". This is a separate fold-out, inserted in the pocket of the back cover of this Manual. This Parts Diagram is printed on water and tear resistant paper.

To see a boat being steered perfectly by a MONITOR will amaze the most experienced sailors the first time. It might actually be a bit intimidating.

Illustration of an early MONITOR. Vintage 1975



Servo-pendulum Principle – HOW THE MONITOR WORKS 2.1

The MONITOR is a servo-pendulum type self-steering gear. This vane design was first developed by Colonel "Blondie" Hasler for the early single-handed transatlantic races.

The signal from an airvane is always comparatively weak and usually not, in itself, powerful enough to correct the course of the boat. The intermediate mechanism of the servo-pendulum provides enormous amplification of the force of the airvane's signal. It uses the boat's own speed through the water as a power source.

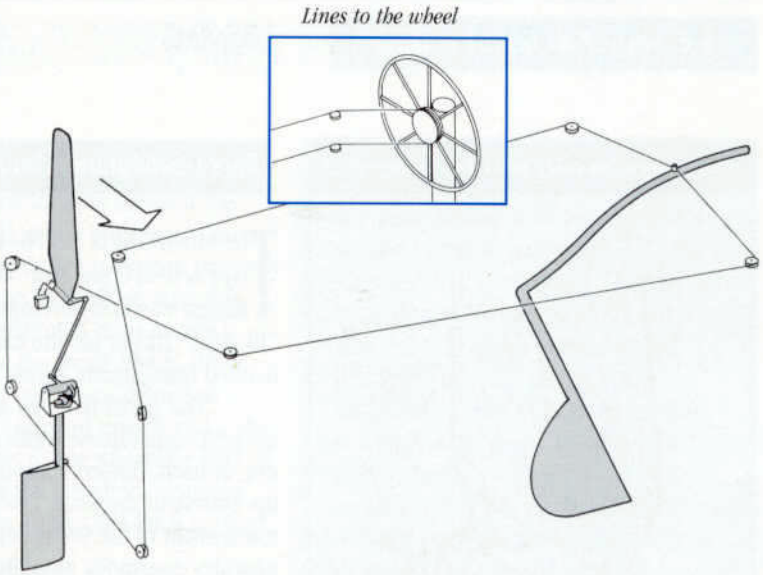
The MONITOR consists of: (A) an AIRVANE which registers whether the boat is on or off a desired heading; (B) a CONNECTING ROD and GEAR LINKAGE through which the signals from the airvane control the angle of the blade of the servo-paddle; and (C) the SERVO-PADDLE which is positioned in the water.

When the boat wanders off course, the airvane gives a signal, which rotates the blade of the servo-paddle, causing the blade to be hit on its side by water rushing past. The water forces the paddle to swing to the side and a considerable leverage is created through the pendulum shaft.

The servo-paddle is connected through (D) LINES and BLOCKS to the tiller or wheel of the boat, and the resulting movement of the boat's rudder returns the boat back on course.

The airvane, pendulum, and control lines are held together in the (E)VANE FRAME, which is installed on the stern of the yacht.

HOW THE MONITOR WORKS *2.1*

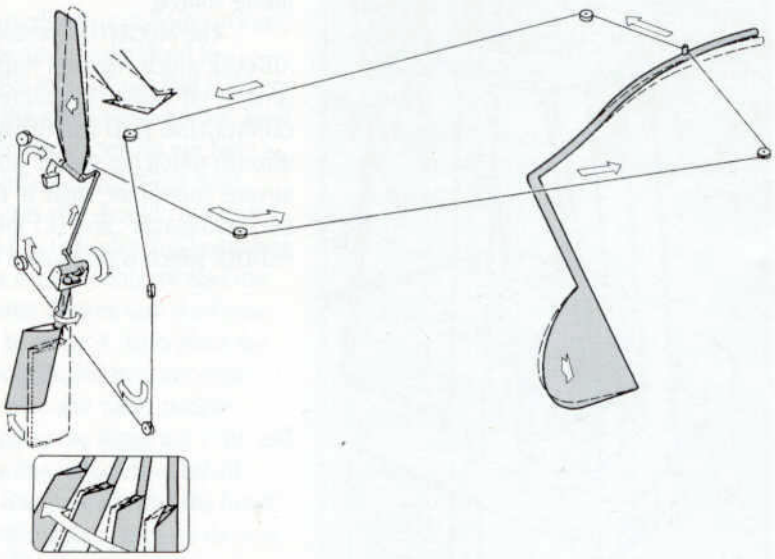


With the boat trim and on course, and the airvane/counter weight into the wind, the airvane stands upright...

and the linkage and gears are centered.

In this attitude, the pendulum watervane is aligned with the hull...

and the tiller or wheel and rudder are in the on-course position.



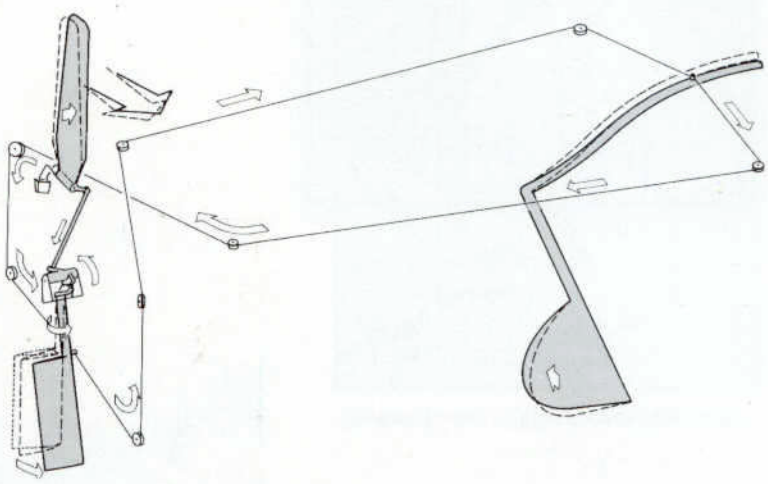
As the boat yaws to port, the apparent wind, as sensed by the airvane, changes, pushing the airvane aft.

The movement of the airvane rotates the master gear slightly...

which rotates the pendulum watervane in the direction the rudder must turn. Water pressure against the pendulum swings the watervane to port, pulling the port control sheet...

which pulls the tiller to port causing the boat to move to starboard and back on course.

As the watervane swings out of its neutral position to make the correction, the mesh of the gears rotates it back toward alignment with the hull. The force of the water on the watervane reduces progressively and the course correction is thus smooth and with no apparent over-correction.



If the boat yaws to starboard, the opposite situation occurs. the airvane "reads" a change in apparent wind...

depressing the linkage and rotating the master gear.

The master gear turns the pendulum to starboard, the direction the boat's rudder must turn, causing the watervane to swing in that direction...

pulling the starboard control sheet...

which pulls the tiller to starboard and moves the boat to port and back on course.

The Airvane 2.2.

The MONITOR is delivered with two airvanes, the standard and the much larger light airvane. (See paragraph 4.5.1 for details about the light airvane.)

The standard airvane (1) of the MONITOR is made of 4 mm, 4-ply of the finest Finnish birch plywood. This material may not be ideal from the standpoint of aerodynamic shape and weight, but its durability and ease of replacement in remote areas outweigh this.

The airvane pivots around an inclined horizontal axis, rather than around a vertical axis like the flag-type vanes seen on some other gears. The horizontally pivoting vane is more efficient under all circumstances. Tilting the axis slightly away from straight horizontal causes the airvane to gradually feather into the wind as it flips to the side. This provides a feedback system, which prevents over-correcting.

The horizontally pivoting vane should be adjusted with its leading edge facing into the wind when the boat is on the desired heading. The leading edge is the edge on the side of the lead counterweight (the high side of the tilted horizontal axis). When this edge is turned into the wind, the equal wind pressure on either side of the vane blade will keep the vane upright. If the boat wanders off course, the wind hits only one side of the airvane, causing it to pivot.

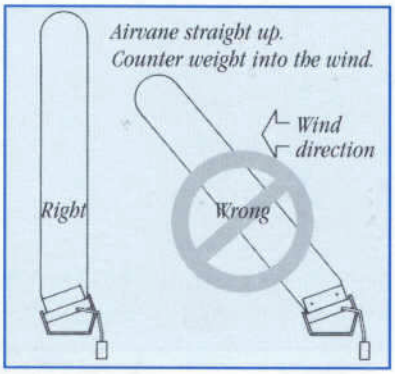
It is important to remember which edge is the leading edge and which is the trailing one. It is possible to bring the vane upright by turning the back edge into the wind, but this will produce completely reversed reactions in the vane gear, taking the boat further off course instead of bringing it back to the desired heading. To avoid mistakes we have a label on the airvane:

THIS SIDE TOWARDS LEAD WEIGHT WHICH POINTS INTO THE WIND. STORE WHEN NOT IN USE.

The airvane is adjusted and kept in position by a course control line, which turns the airvane through a pulley (79), chain (18) and sprocket drive (40). There is a small hole close to the label for a safety line. We suggest that you tie or clip it to the counterweight tube (5).

Again, the airvane has very little power even under the best of conditions. To get maximum performance, the MONITOR airvane pivots on specially made ball bearings consisting of Delrin balls in stainless steel races.

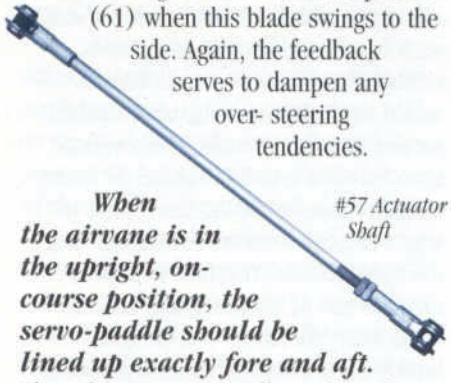
The counterweight under the airvane balances the vane. Ideally, it should barely be able to keep the vane upright when there is no wind. The airvane must not be top heavy. An airvane which is too heavy will not work at all in light air because the airvane will send faulty signals. The factory airvanes are carefully balanced. If you have to make a replacement vane using material available in a foreign port, be very careful to make a vane that is as large as possible but not too heavy. (See paragraph 6.7.)



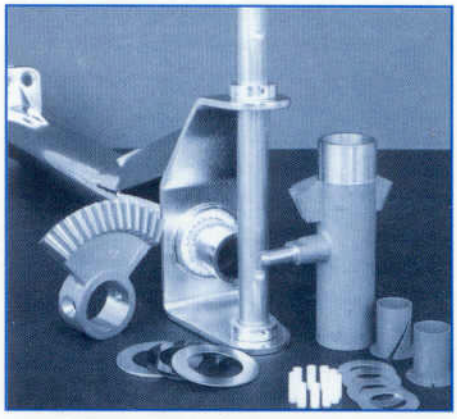
Actuator Shaft & Gear Linkage 2.3

The pivoting of the airvane is transferred through an actuator shaft (57) and a bronze master gear set (36 & 37) into a rotation of the watervane paddle (61). This linkage in the MONITOR is strong, direct, and relieved of friction through Delrin bearings (54) in the connecting rod and through Delrin roller bearings (31) in the pinion gear (36) and the pendulum strut (26). The strength and freedom from slop and friction in the airvane-to-pendulum linkage is one important key to the superior performance of the MONITOR.

Through the design of the bronze gear set, a second feedback is provided, as the gear will gradually neutralize the rotation angle of the watervane paddle (61) when this blade swings to the side. Again, the feedback serves to dampen any over- steering tendencies.



When the airvane is in the upright, on-course position, the servo-paddle should be lined up exactly fore and aft. This adjustment is initially made at the MONITOR factory. If, for some reason, it has to be repeated, it is performed by releasing the locknut (56) at the lower end of the connecting rod (57) and by adjusting the length of the rod. (See paragraph 6.2.2.)



The Servo-pendulum *2.4*

The MONITOR pendulum is hinged in the frame on a solid ¾" stainless steel watervane support shaft (33). The upper half consists of an outside strut (26) with Delrin roller bearings (31) at each end for friction-free rotation of the pivot shaft (43) inside it.

Below the strut, the pendulum shaft ends in a ⅜"-thick hinge block (43), which is part of the latch mechanism (47) that allows the water paddle (61) to be easily taken out of the water. The design also allows the water paddle to be easily put back into the water and locked automatically in this position.

The MONITOR latch is self-energizing. It engages harder under increased pressure. The latch is designed not to open in case of an overload, since such conditions also could occur in extreme hard weather conditions. It would be disastrous if the latch opened surfing down a big wave. True overload situations like a violent broach or hitting a log are handled by the safety tube (67), which is located between the hinge and the water paddle. This tube is weaker than the rest of the pendulum and can bend in any direction. It is designed to buckle upon a severe impact that would otherwise cause more extensive damage to the gear.

Below the safety tube is the watervane (61) or the servo-paddle itself. This paddle is the powerhouse of the MONITOR.

The MONITOR paddle has been given a NACA high-lift profile, and its leading edge has been moved forward of the center of rotation to semi-balance the blade. This allows the airvane to rotate the paddle with a minimum of force, improving the light air performance of the gear.

The paddle has a stainless steel skin welded to a stainless inside shaft. Its hollow part has been filled with polyurethane, closed cell foam. The end result is an extremely strong and rigid servo-paddle.

Lines and Blocks *2.5*

The MONITOR is delivered with 35'–50' of ¼" custom-made Spectra line. The inside core is straight Spectra to minimize stretch, and the outside is braided polyester to resist wear and chafing. After the ropes leave the main frame, you will probably use two to four blocks. The type of blocks varies from one installation to another. Consult a block catalog and/or your local yacht chandler. We recommend good low friction bearing blocks with approximately 2" diameter sheaves. Good blocks will minimize friction and improve performance at low wind and boat speed. This is not the place to try to economize. As will be discussed later, paying some extra attention to the installation of the pendulum sheet lines can often improve the performance of the MONITOR.

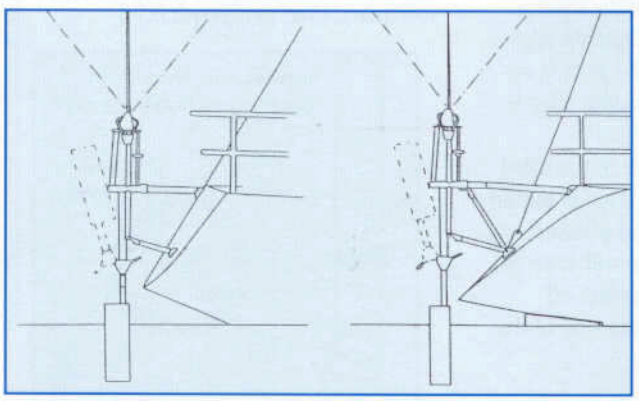
Vane Frame & Hull Attachments *2.6*

The MONITOR vane frame (58) forms a very strong, integrated unit. The pendulum lines are normally led through the "legs" of the frame. The pendulum lines are attached 18" away from the pivoting point. This gives the MONITOR a powerful one-to-one purchase. Other vanes with shorter pendulum arms routinely have to have a complicated block arrangement in order to achieve the required line movement when the boat is wheel steered. The MONITOR method offers simplicity and great strength.

The frame is attached to the hull by means of two larger upper tubes (89), which slide into sockets on the frame, and two lower tubes (88), which attach to the bottom of the frame legs through end fittings (82). The tubes are fitted with U-shaped brackets (83) at their ends for through bolting to the hull. Each bracket is attached with two bolts. The MONITOR four-point attachment is universally adaptable to all kinds of stern configurations. It is the easiest and strongest attachment of any vane gear of this kind, and the four attachment points distribute the load on the boat. This strength makes possible the use of the optional Emergency Rudder (MRUD) discussed later in this Manual. (See paragraph 7.)

Same-side diagonal tubes are often added on boats requiring extra-long mounting tubes. Boats with outboard rudders or reverse transom boats with extreme rake are such boats. The diagonals will form triangulation and the mounting will be extremely strong. The diagonal struts are normally fastened to the existing bolts on the U-brackets. No extra drilling should be necessary.

If the MONITOR has to be removed, only the four bolts holding the mounting tubes to the U-shaped brackets have to be removed. The MONITOR mounting system also offers another a bonus feature – it will also serve as an emergency swim ladder. As long as you can get to the back of the boat, you should be able to use the water paddle and the mounting system to climb back on board.



Regular *Diagonals from lower hull brackets*

Diagonals from bottom of legs

INSTALLING THE MONITOR

Attaching the Frame 3.1

Important alignments 3.1.1

Generally the MONITOR is attached to the stern with two upper and two lower mounting tubes. These are bolted to the boat by means of universal U-shaped brackets (83), which will fit any angle or curvature of the hull when rotated. Each bracket has two 5/16" holes for stainless steel bolts, which will be through bolted.

The gear has to be mounted on the centerline of the stern, vertically and horizontally. The vane gear should not be tilting forward, aft, or to one side.

Off-center mounting is not recommended. It would possibly work going dead down wind when the boat is not heeled. When reaching or going against the wind the boat is heeled and on one tack the servo-paddle would be out of the water and on the other tack it would be far too deep in the water. With the exception of multihulls, which do not heel very much, we are strongly against off-center mounting unless we are only talking about a few inches. Also see 3.2.5

Installing afloat or hauled 3.1.2

It is generally much easier to install the vane gear with the boat afloat, especially with the stern backed into a floating dock and spring lines holding the boat steady. When the boat is in the water it is floating on its lines and when you want to check the inside of the boat, after drilling a bracket hole, it is a lot easier to take a step from the dock than running up and down a ladder. Take great care not to drop vane, parts or tools into the water. Use of safety lines is recommended.

If you mount the MONITOR when hauled, make sure that you know exactly where the water line is. Mark it before taking it out of the water.

Reinforcement of transom 3.1.3

We estimate that more than 90% of the MONITOR installations are made without any strengthening of the transom – no backing plates, only the washers that we include. The reason is that the MONITOR is a servo-pendulum gear with a fairly small water paddle, which can swing to the side in an overload situation like a broach. The pendulum lines also have a little bit of give. This is quite contrary to a rigid auxiliary rudder type self-steering gear, which will experience higher loads and need transom reinforcement.

Stevens 47– MONITOR side view

As we pointed out earlier, the MONITOR distributes the load to four mounting brackets. Most of the time the brackets get located close to the corners or joints of the transom, hull or deck. This is where the boat is very strong. The weakest part would be in the middle of the transom but no attachment is used in this area with the MONITOR.

You should consider backup plates on an ultra light racer with extremely thin fiberglass or boats with a foam or honey come core. Marine plywood would be an excellent material for this reinforcement.

These guide lines have worked well in the past for MONITOR installation but it is up to the individual owner to decide if strengthening of the boat is necessary or not.

Determining the Proper Height of Installation 3.2

Factory assistance 3.2.1

All new MONITOR vane gears are delivered with custom factory designed and fabricated mounting systems together with an installation drawing for each individual boat. This valuable service is included in the price of the MONITOR and when in doubt you should contact the factory for advice. The factory has the experience and feedback from many thousands of installations.

Height from waterline 3.2.2

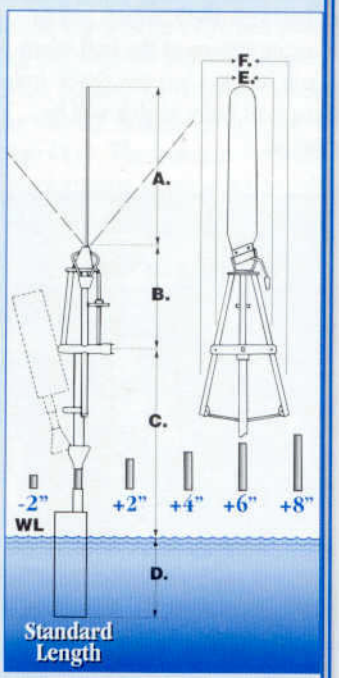
The vane gear should, if possible, be located so that about 6" of the top of the paddle are out of the water when the boat is stationary and loaded for cruising. This puts the main frame (58), into which the large diameter upper mounting tubes (89) are inserted, within the range of about 40"–50" (1016–1270 mm) above the water, depending of the length of the safety tube (67). The height of the freeboard of the yacht will determine if the upper tubes will be mounted on deck or on the stern.

Keep in mind that the boat may float differently when loaded for cruising (e.g. full water and fuel tanks plus supplies). As a rule of thumb, the average cruising boat will ride one inch lower for every 1000 pounds of added weight.

MONITOR WINDVANE™

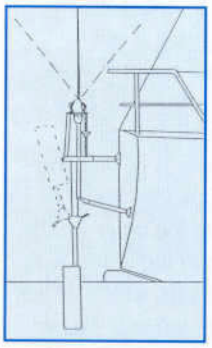
The Monitor factory will solve this dilemma for you and provide an installation drawing for each individual boat. Together with the manual you should have no problem to mount and use the Monitor.

		inches	mm
A.	standard airvane	37	940
	light air vane	45	1143
	mizzen air vane	26	660
B.		23½	597
C.	varies with length of safety tube		
	Standard length	42	1067
	- 2	40	1016
	+ 2	44	1118
	+ 4	46	1168
	+ 6	48	1219
	+ 8	50	1270
D.	watervane with 6" out of the water	18	457
E.	center of upper mounting tubes	15	381
F.	center of leg to center of leg –at bottom	23½	597

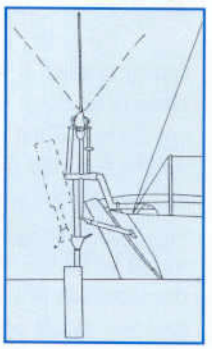


Length of safety tube 3.2.3

A standard 12" safety tube is delivered with most MONITORs, but boats with very low or very high freeboard at the stern may require a shorter or longer pendulum than standard. Shortening or lengthening the safety tube (67) varies the length of the MONITOR pendulum shaft. With a standard safety tube, the upper mounting tubes (89) should be located approximately 42" (1067 mm) from the waterline. Tubes sized –2", +2", +4", +6" and +8" are available from the factory to meet special design needs. No shorter tube than –2" should be used since no room would be left for the tube to buckle in an overload situation. The standard rule of leaving 6" of the paddle blade out of the water still applies, although the frame itself will now be mounted higher or lower depending on the variance in safety tube size. For boats over 45-foot LOA, we normally design the mounting system allowing the use of a longer safety tube. The increased leverage gives more power, which often is required on the larger boats.



Boat with high freeboard uses a +6 Safty Tube



Boat with low freeboard uses a -2 Safty Tube

Importance of the boat's wake *3.2.4*

The level indicated above is a rule of thumb, which is subject to much variation. The proper location of the vane gear, up or down, should be determined by the dynamic waterline which is created when the boat is moving at different speeds on different points of sail.

Each boat is different, and its owner best knows its characteristics. However, with the experience from years of installations and proper records we feel that our recommendation and installation drawing in general can be considered correct if proper measurements have been given to us in the first place. However, here are some additional guidelines to be used in determining proper mounting height.

The paddle at the end of the servo-pendulum is the power source of the vane gear. As long as a part of the paddle is immersed in the wake behind the boat, the vane gear will operate as designed. It is very unlikely that the servo-paddle will lift out of the water occasionally, but it could possibly happen to a yacht with very long overhangs in choppy seas or a boat with an extremely wide transom. This will not seriously interfere with the efficiency of the gear. However, if the paddle remains out of the water for long periods, the performance of the vane will be affected.

Nothing is gained by mounting the vane gear so low that not only the paddle but also the pendulum shaft is covered by the wake. The strains on the welds and mountings multiply without any improvement in the functioning of the gear.

From this it follows that ***the MONITOR should be mounted so that the water paddle is always immersed to some degree yet the pendulum shaft and hinge are immersed as little and as seldom as possible.***

Some boats have very different waterlines at the stern when they are still versus when they are moving fast. Yachts with long overhangs generally have water all the way up under the transom when sailing downwind at cruising speed. The wake can result in the water being much higher on the transom than when the boat is still or moving slowly. Double-ended hulls tend to squat, especially going downwind, and, if the stern is fine, with little buoyancy, the wake can sometimes climb very high. In these cases, the vane gear must be mounted as high as possible while still keeping the paddle immersed, to some degree, at slower speeds and on different points of sail. This is especially important if the boat is large and fast or uses an extra long pendulum shaft, which also increases the loads on the gear.

IN SUMMARY: You are pretty safe following the factory installation drawing that we have provided. If it is a popular boat we probably have had lots of sisterships with MONITOR and the drawing is based on plenty of feedback. ***Six inches of the paddle out of the water, on a stationary boat, fully loaded, at the dock, is correct in most cases.*** Sometimes it might be a good idea to observe the wake of the boat on different points of sail and in various conditions. This could be done, for example, by using a clearly marked yardstick to assess the level of the wake. If this level varies much, there will be times when the safety tube and even the pendulum shaft are immersed to some degree. There is no cause for panic as the MONITOR is built to withstand great loads. However, there is no point in increasing these loads unnecessarily, and we have found that the tendency is always to mount the vane gear too low rather than too high.

If in doubt, always mount the MONITOR HIGHER rather than lower unless you already have the maximum +6" or +8" safety tube. We rarely see the MONITOR mounted too high, but sometimes we see installations that are too low. If you mount the MONITOR too high, the paddle can be lowered by a longer safety tube, which we would supply. The longer tube gives your MONITOR more leverage, which yields more power.

There are too many variables to always sail with the perfect submersion of the water paddle at all times. Big crew in the cockpit or on the foredeck, upwind or down wind, full or empty fuel and water tanks, lots of supplies or no supplies are only a few factors that will influence the waterline. Through the years we have seen a few severe mounting mistakes but it really does not seem to matter. The reason for this whole discussion about the waterline is that we are simply trying to get the mounting as correct as possible for a variety of conditions.

Two more observations:
All cruising boats seem to put more supplies and more weight on board than expected, and all boats seem to really squat under power.

Name boards & swim ladders *3.2.5*

Some owners let the position of a name board or swim ladder, etc., dictate the location of the vane gear. This, definitely, is a faulty order of priorities if you intend to make serious use of your self-steering gear. The MONITOR tirelessly performs the work of several crewmembers. Its importance can only be appreciated by sailing a passage with the gear and one without it. The correct positioning of the vane is of greater importance than that of convenience and embellishment. Usually the MONITOR attachment tubes can be bent or welded so that the vane gear can be correctly mounted without disturbing name boards, ladders and even open transoms.

Ladders can often be relocated on the transom to the side of the MONITOR. A welder can easily modify a wide ladder and make it narrower. We also like to point out that, traditionally, the best location for the swim ladder has been midships. ***DO NOT let your swim ladder dictate the location of your windvane.*** Also see 3.1.1.

Standard Frame Installation Checklist 3.3

Read the ENTIRE procedure before beginning installation. Follow the steps outlined in paragraph 3.3.1 to mount the standard vane gear. (Special instructions for MONITORs with bent upper tubes or diagonal tubes are found in paragraphs 3.3.2 and 3.3.3.)

Mark off the "completed" box after each step, then go on to the next step. The following tools are needed:

- ***Variable speed*** drill with ¼" and 5/16" drill bits. We recommend the best bits available such as cobalt tipped.
- Two ½" (13 mm) wrenches, pliers, small wire cutter, screwdriver, mallet (or hammer & block), and tape measure. Adjustable wrenches or socket sets also come in handy,
- Suitable bedding compound (e.g. Boatlife, Sikaflex or the like), masking tape, marking pen and pencil.

Standard installation 3.3.1
(straight upper tubes)

(1) Locate the centerline of the boat on the stern and measure 7½" athwartships, making a reference mark that will be used to center your frame. The backstay is usually a good reference point since it is located on the centerline of the boat.

☐ **Completed**

(2) Put masking tape on the hull brackets (83.2 and 83.4) to prevent scarring the hull. Insert the large mounting tubes (89) all the way to the bottom of the sockets of the main frame (58). Using a marker or tape, mark the tubes when they are all the way in.

☐ **Completed**

(3) Use two ropes tied to your pulpit and to each side of the frame to support the vane gear at the right level above the water. On ketches you might hang the MONITOR from the mizzen. On single masted boats, you could possibly rig up a spinnaker boom to protrude behind the boat or use the main halyard. Center the tubes on the marks made previously, then rotate the tubes until the upper brackets (83.2) fit flush against the hull or deck. ***Check inside the hull*** where the bracket bolts will be through bolted to make sure that there are no problems with the location. ***MAKE SURE THAT YOU ARE SATISFIED WITH THE LOCATION – once you drill the first hole you are committed to both height and sideways mounting.***

Use the bracket hole as a template and drill one 5/16" hole. You should first drill the hole that is not covered by the tube. Insert a bolt (84.4) in the hole, and drill the second hole for the bracket. Bolt bracket on ONE SIDE of the hull. (Nuts should only be loosely tightened at this point to allow further adjustment.)

☐ **Completed**

New U-shaped mounting brackets with smaller foot print and only two holes per bracket

(4) Level the gear athwartships making sure that it is not tilting to one side. The easiest way to do this is to lie down on the dock and align the aft support tube of the MONITOR with the mast on the boat. Drill one 5/16" hole and attach the bracket on opposite side with one bolt. (Again, drill the hole that is not covered by the tube first.) Secure the location with a bolt and drill the second hole.

☐ **Completed**

(5) With both upper tubes temporarily attached, use the ropes to level the MONITOR in a fore-aft direction. When gear is level, rotate the airvane 360 degrees. Check at different settings around the full circle for clearance of the airvane and counterweight relative to the backstay and pulpit or other obstacles. Be sure to flip the vane as far as possible to each side when checking the clearance around the full circle.

☐ **Completed**

(6) ***Try to mount the vane as close to the hull as possible while maintaining clearance for the airvane counterweight and pendulum.*** The distance between the MONITOR paddle (61) and the edge of the main rudder should be at least 12", in general. Establish the shortest possible length of the upper mounting tubes (89) which still give clearance. If clearance is excessive, remove the gear and cut tubes accordingly with a hack saw. Do not hesitate to cut the tubes. With a good hacksaw blade it is very easy to cut the stainless steel tubing right on the dock. The closer mounting will look better and it will also be easier to service the MONITOR and to dock the boat.

☐ **Completed**

(7) After cutting, reinsert the mounting tubes and make a final check for clearance and alignment. If you have cut one tube longer than the other, the vane will mount crooked. When the upper tubes are completely in the sockets, mark them again with masking tape or a marker at the edge of the socket to make sure that they do not slide out without your noticing it.

☐ **Completed**

(8) Attach end fittings (82) to the bottom of the "legs" of the frame with bolts (86.1). Do not tighten the bolts very hard at this time. Then insert the lower tubes (88) in the end fittings. The telescoping end fittings for the lower mounting tubes permit easy adjustment for the vertical installation of the main frame The ability to rotate the lower mounting tube inside the end fitting also makes it easy to adjust the U-shaped brackets (83.4) to the curvature of the transom.

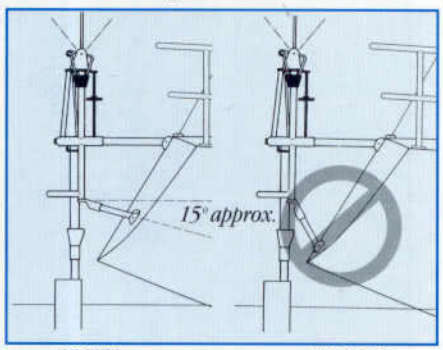
If we do not have exact measurements or records, our general policy is to deliver all mounting tubes on the long side, rather than delivering the tubes without any margin for error. It is very easy to shorten the thin wall tubes with a fresh hacksaw. Make sure that the lower mounting tubes are inserted at

Standard Frame Installation Checklist 3.3 *(continued)*

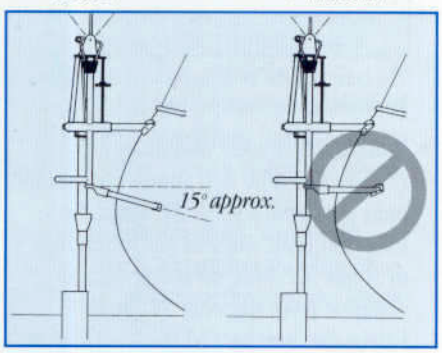
least 1" past the pilot hole in the end fitting. Use a marking pen and masking tape to show the connection and make sure that the tubes remain in the correct position. Taking the vane frame as a starting point, ***the lower tubes should slope down about 10–15 degrees from a horizontal line from the vane and spread out about 10–15 degrees from a straight line to the hull.***

The installation drawing for a boat with open transom, swim steps or swim platform often specify an angle different than 10–15 degrees. In those cases the installation drawing will take precedence. IF IN DOUBT, contact the factory!

☐ **Completed**



RIGHT *WRONG*



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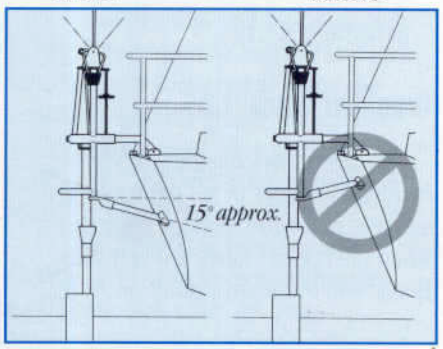
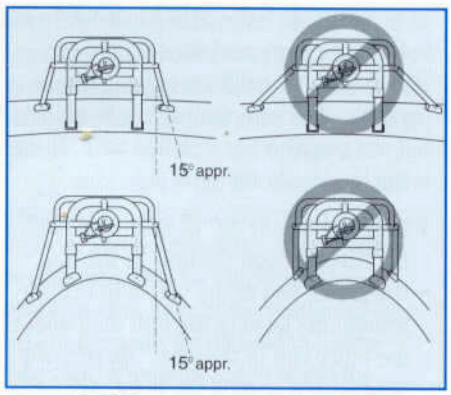


RIGHT *WRONG*



RIGHT *WRONG*

(9) With the MONITOR level fore and aft, rotate the lower tubes (88) until brackets (83.4) are flat against the hull. The angle of the end fittings (82) can easily be bent up or down if minor changes are necessary. Just secure the end fitting with the bolt to the bottom of the leg and bend by hand.

Check where the lower tubes should attach to the hull, measure length, and cut the tubes if necessary. Before you cut, check inside again to be sure that there are no obstacles to through bolting in the area where the lower brackets will be attached.

☐ **Completed**

(10) Locate the hole in the lower bracket that is not covered by the tube. Drill a 5/16" hole through the stern using the bracket as template. Insert the bolt and fasten. Mark the location of the bracket. Remove tube from bracket and drill second hole. Repeat the procedure on the opposite side.

☐ **Completed**

(11) Check again that the MONITOR is level in all directions and that both upper and lower brackets are drilled and bolted. At this point it is not necessary to tighten the nuts hard. You only want to make sure that they stay in place while you once again check that the holes to the end fittings of the lower tubes are properly marked and taped.

☐ **Completed**

(12) Remove all bolts from the upper brackets (83.2). Loosen the ropes that hold the vane gear and lean it backwards so you can get to the underside of the brackets. The vane gear is now hanging on the ropes and the lower tubes. Remove the masking tape and apply suitable bedding compound to the underside of the brackets. Reattach the upper mountings with all the bracket bolts and washers.

☐ **Completed**

(13) Tighten up on the ropes and then unbolt the lower brackets (83.4). Tighten further on the ropes to bring the lower brackets clear of the hull. Remove masking tape, apply bedding compound, and reattach with all bracket bolts and washers.

☐ **Completed**

(14) Check leveling again. With lower tube end fittings loose, fine adjustments can be made. Also, the upper tubes can be moved slightly in their sockets. Once satisfied, tighten all bracket bolts to the boat.

☐ **Completed**

(15) After final leveling, locate the pilot hole on top of and ¼" from the edge of the main frame sockets. Use the pilot hole to start the drill. Drill a 5/16" hole on each side through both the socket and the upper mounting tube inserted into it.

Drilling through stainless is easy if you do it right. ***You should use the absolutely SLOWEST possible speed.*** The slower you can run, the better your variable speed drill will cut. ***Put lots of weight on the drill and DO NOT USE DULL BITS. Use oil to improve the cutting.*** Dull bits and high speed will not cut, but will work-harden the stainless making it extremely tough to get through. Take care not to upset the leveling by leaning too hard on the frame when drilling.

☐ **Completed**

Standard Frame Installation Checklist 3.3 *(continued)*

(16) Loosen the ropes again and make the vane frame slide back in order to bring the upper tubes out of their sockets.

☐ **Completed**

(17) Insert the two short spacer compression tubes (85.1) into the upper mounting tubes and align spacers with the 5/16" holes. Use a fast drying bedding compound or sealant to hold both ends of the spacer tubes in place. This will prevent the loss of these spacers if you remove the MONITOR from your boat in the future and have forgotten about them. The compression tubes will prevent the tubes from collapsing when the bolts are tightened.

☐ **Completed**

(18) When the frame is in position, insert 5/16" bolts through sockets, tubes, and spacers. Tighten bolts with lock washers and nuts on the underside of frame.

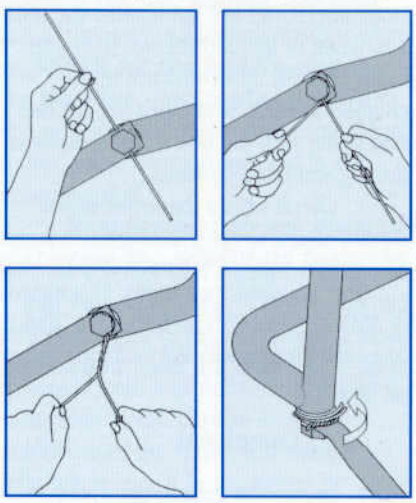
☐ **Completed**

(19) It is now time to secure the lower tubes to the end fittings. Insure that the vane is still vertical. Using the predrilled 1/4" hole in the end fitting (82) as a starter hole, drill 5/16" holes from both sides through the lower mounting tube (88). You might prefer to take the tube and end fitting off and do the drilling on the dock. Repeat the procedure on the other side. Insert a compression tube (85.2) in the end of each mounting tube that goes into the end fitting and secure them with fast drying sealant. Insert 5/16" bolts and secure with lock washers and nuts.

☐ **Completed**

(20) Make final check of alignment and tightness of all bolts. You might consider applying Locktite on the mounting bolts, especially the bolts at the bottom of the legs. These bolts (86.1) hold the end fittings for the lower mounting tubes. The enclosed safety wire should be used to secure these bolts. The heads of these bolts have been pre-drilled. There are also two additional bolts in your spare parts kit. The wire that we use is Monel but you can also use stainless wire. Here is one way to do it:

- Start with about 20" of wire. Put half of the wire through the hole in the bolt.
- Grasp one end of the wire and bend it around the head of the bolt then under the other end of the wire. Be sure the wire is tight around the head.
- Twist the wire a minimum of 10 times to make a nice "pigtail" and cut off the excess. Then wrap the wire around the MONITOR leg or end fitting. Bend the



ends and place them so you cannot cut yourself or puncture your inflatable if it bumps the MONITOR.

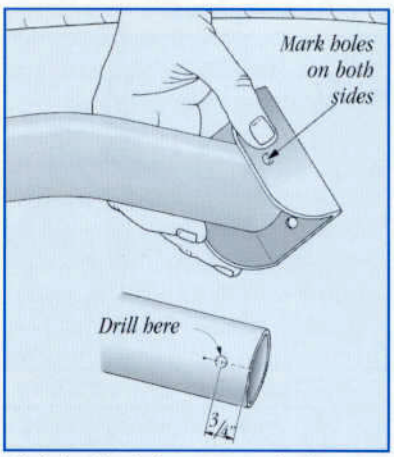
☐ **Completed**

Congratulations, your frame installation is done! You are now ready to link your MONITOR to your tiller or wheel. (See paragraph 3.5.)

Bent upper tubes *3.3.2*

With straight upper tubes you simply rotate the tubes till the angle of the bracket fits the angle of the transom. Bent upper tubes require one more step as it is not possible to install the U-shaped brackets at the factory. We do not know the angle that will give it a flush fit, and the holes for the brackets have to be done at the installation, as follows:

- Insert the upper tubes (89) in the frame (58) and place the MONITOR correctly with the help of lines, as explained earlier. Check if the vane gear can be brought closer to the boat and still have sufficient clearance for both airvane and counterweight. If this is possible you should shorten each tube equally. Check the position again at the proper vertical level and let the upper mounting tubes touch the boat in the location where they should be bolted to the bracket.



The holes for the bent upper tubes have to be drilled at the installation.

- Hold the U-shaped mounting bracket (83) to the tube and rotate the bracket until you have a flush fit. Mark the holes on both sides of the tubes and drill one 5/16" hole on either side 3/4" distance from the edge of the tube. Fasten the brackets to the boat and the tubes to the bracket as explained in paragraph 3.3.1.

Diagonal tubes *3.3.3*

Sometimes diagonal tubes are included in order to get the necessary stiffness in the installation, especially when the regular tubes are very long. Boats with outboard rudder or severe

rake on the transom are typical boats that need diagonal tubes.

When it is impossible to follow the standard rule for the lower tubes (10–15 degrees out and 10–15 degrees down), we also use diagonal tubes, which will make the installation very rigid. The diagonal tubes are always on the same side. Do not attempt to cross them from starboard to port and vice versa. The diagonal tubes are attached to existing bolts and no extra drilling should be necessary. They can start at the bottom of the legs on the MONITOR and go to the upper tube mounting bracket but they can also start at the main frame and go down to the lower tube bracket. We normally select the method with the shortest distance. Placement of the diagonal tubes will be specified on the installation drawing for the specific boat. Also see 2.6.

On boats with open transom, the diagonal tubes often form a "V" with the open end of the "V" attached to the bolts that connect the upper mounting tubes to the main frame. The tubes are then attached to a single bracket at the bottom.

V-style diagonals

Non-Standard Frame Attachments *3.4*

The procedures described in the checklist apply to standard installations. Boats with boomkins and other structures at the stern may necessitate special arrangements.We try to deliver mounting tubes and modifications to make the installation easy. Generally the procedures as outlined above still apply or they will be modified in the installation drawings provided for the specific boat.

The finished installation should be rigid and the gear should easily be able to take the weight of a large man without twisting.

Installing the Pendulum Sheet Lines *3.5*

General Hints – pendulum lines *3.5.1*

Each boat has its own individual characteristics, which affect the proper installation of the pendulum lines. It is not possible to treat in detail each of the many ways which the pendulum lines can be connected to the boat's steering. Instead, we will speak in ***general guidelines***.

Having pendulum lines leading into the cockpit is the most common objection to the servo-pendulum type of windvane steering. This argument seems to disappear once the windvane starts working since the helmsman's position is not very comfortable once your MONITOR is doing the steering. You will find that it is preferable to sit under the dodger if the spray is flying or maybe on the foredeck if you are running. You will also find that you can spend more time at the navigation station, in the galley or taking a nap in your bunk. Some planning and extra care can yield sheet leads that are efficient, hardly noticeable, and require a minimum of service.

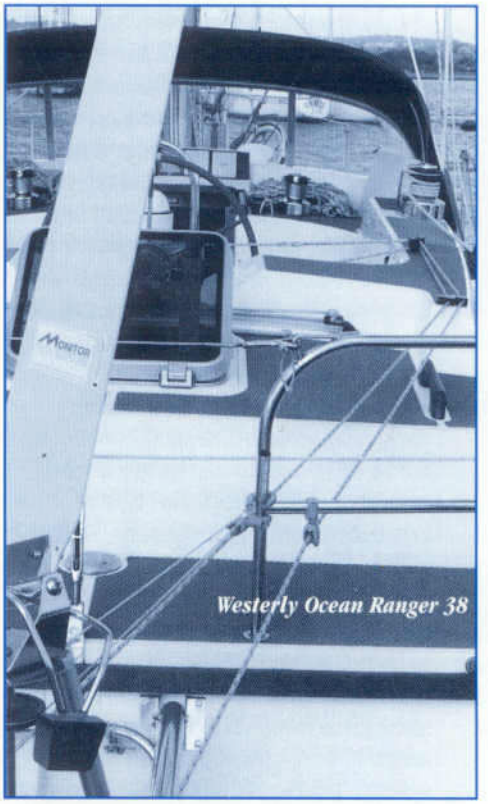
Aside from neatness and unobtrusiveness, your main priority when installing the pendulum sheets should be ***minimum friction, chafe and slack*** combined with ***maximum ease of inspection. The PRIORITY should be PERFORMANCE.***

Leads that include many turns and blocks negatively affect all of these aspects. ***The STRAIGHTEST lead is the best.*** Most experienced sailors seem to favor having the lines easily visible rather than inside the lazarette and lockers.

Fixed blocks give less slack and should be preferred, but great care has to be taken in mounting the blocks so that the leads are fair and chafe is avoided. Fixed blocks are also quieter in light air conditions.

It might be better if the blocks on either side of the tiller were mounted loosely to allow them to move to compensate for different angles of the pendulum lines. These angles are created as the tiller moves from side to side.

Excessive slack wastes the corrections of the windvane. However, ***the pendulum lines SHOULD NOT be over tightened***, a very common mistake. Over tightening makes the blocks unwilling to turn and will negatively affect light air performance. The pendulum lines will also wear quicker.



Very long sheet leads are sometimes necessary with center cockpits but with our ⅛" Spectra line stretch is kept to a minimum. Our custom made Spectra rope has minimum stretch, is extremely strong and works well through blocks in a repeatable fashion.

Installing the Pendulum Sheet Lines 3.5 *(continued)*

After thousands of miles, the lines of even the best installations will eventually wear. It is actually an advantage of the pendulum system that most of the strain and wear are absorbed by relatively cheap and easily replaceable rope.

A good practice to avoid having to change the entire line is to ***leave some extra rope at the forward end***. By slipping the line a few inches through the leads and tying a new figure eight knot at the pendulum, the chafe points are changed and you can get much longer service and actually sail all the way around the world with the same rope.

Your pendulum lines should also have a tensioning system, which is explained in paragraph 3.5.3.

In both tiller and wheel installations ***it is useful to mark the pendulum lines*** with tape or a dye marker against a benchmark on the boat ***so that you KNOW when the pendulum is centered between the frame legs***. If you engage the gear with the pendulum off-center, it will be unable to give proper and equal corrections on both sides of the desired course.

In order to avoid lines in the cockpit some sailors suggest hooking up the MONITOR to an emergency tiller instead of to the wheel. This type of installation seems to make sense, but in general we advise against it. The exception is when the boat has hydraulic steering. On such boats it is the only way to hook up a servo-pendulum gear since the hydraulic system normally has too many turns from left to right and there seems to be a slow slippage in these systems. If a bypass valve is installed on the hydraulic system and the MONITOR is hooked up to the emergency tiller you have an excellent system.

However, if the boat has a cable and quadrant, rack and pinion, worm gear or any other 2-3-4 turns mechanical wheel steering system, the vane gear would have to drag around this entire mechanism if you attempt to steer the boat through the emergency tiller. To test the resistance, try to move the emergency tiller by hand when the boat is at the dock. You will probably find that you have to use a lot of force to move the tiller. This means that the windvane will have a very tough time steering unless it is very windy and the boat has considerable speed to overcome this added friction.

If the steering wheel itself is removed the flywheel effect of the wheel will disappear and it is easier to move the emergency tiller. The vane now works much better, but the steering wheel would have to be removed and stored. There would be more space in the cockpit, but most sailors would not feel comfortable with such an arrangement. However, in an emergency you can always disconnect the MONITOR at the emergency tiller and hand steer with the tiller until the danger is over or the wheel has been put back on the pedestal.

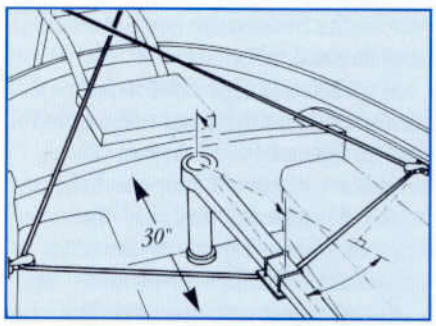
For the reasons above we, in general, prefer to hook up the MONITOR to the wheel if the boat is equipped with a mechanical wheel steering system.

Tiller installation *3.5.2*

It is possible to lead the pendulum lines to the tiller BACKWARD in which case the MONITOR will not work at all.

The pendulum lines must be CROSSED before connecting them to the tiller. This is usually best done directly at the vane frame. The MONITOR starboard line is led to the port side of the tiller and vice versa.

When the lines leave the frame they pass two blocks that are mounted on adjustable brackets which make it easier to lead the lines so they do not chafe when they cross. Exactly where the pendulum lines should be connected to the tiller depends on the boat's characteristics. However, 20"–30" from the rudder shaft is a working rule of thumb. The blocks that lead the pendulum lines to the tiller should be mounted in the radius of the swing of the tiller. This gives the least slack as the tiller moves from side to side.

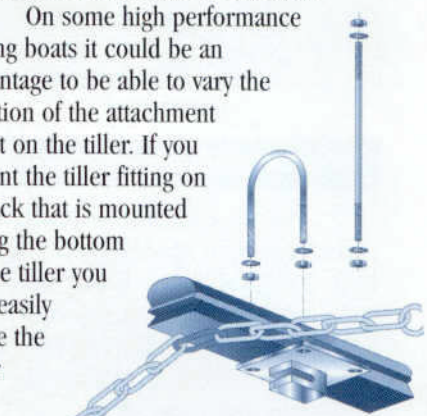


The pendulum lines are connected to the tiller by means of a stainless chain that locks into a slot on a stainless plate that is attached under the tiller. The reason for the stainless steel chain is not that it is stronger. You will find that if the boat has weather helm it is very easy to pull the chain out and move it a link or two. We have found this system to be more practical than a cam or jam cleat system.

Bend the two threaded rods to fit the shape of the tiller and attach the plate with washers and hex nuts. If the tiller is very wide, the plate should be fastened to the tiller by through bolting or long wooden screws rather than using the threaded rods. You can also modify the tiller plate by making it narrower and drilling new holes.

It is advantageous to mount the tiller plate on the underside of the tiller. When you pull the pendulum line chain out of the slot it is then hanging underneath the tiller and out of the way. Also, the tiller will not be scratched.

On some high performance racing boats it could be an advantage to be able to vary the location of the attachment point on the tiller. If you mount the tiller fitting on a track that is mounted along the bottom of the tiller you can easily move the tiller



Tiller Attachment Kit

Installing the Pendulum Sheet Lines 3.5 *(continued)*

fitting in or out. With the plate mounted further forward on the tiller, the movement of the rudder will be less, since the swing of the pendulum is limited. Mounted further aft on the tiller, the rudder will move further, but it will take more power to move the tiller.

Moving the lines further forward along the tiller can sometimes give better downwind performance, preventing the vane gear from oversteering. Moving the lines aft, closer to the rudder shaft, will give you greater rudder movements and could be desirable when reaching. On most cruising boats this arrangement is absolutely not necessary. ***In general, we prefer to mount the tiller plate at about 30" from the rudderpost*** (rather than 20").

If the boat's rudder shaft fitting for the tiller is modified so the tiller can face forward or backwards, the backwards position could be used when the vane is engaged – the forward when hand steering. ***The pendulum lines should NOT be crossed if the MONITOR is hooked up to a tiller facing backwards.*** This arrangement will give the boat more cockpit space. A shorter tiller can be used if a 2:1 purchase system is introduced but in general we prefer the standard 1:1 purchase.

Wheel installation *3.5.3*

The wheel adapter drum is fastened with the clamps to the spokes of the wheel. It will fit wheels with 3,4,5,6 and 8 spokes. The MONITOR wheel adapter can be mounted either on the aft side or the forward side of the wheel, if there is enough room between the pedestal and the wheel. If this is not the case, or if the boat has or will have a pedestal mounted autopilot, the MONITOR wheel adapter has to be mounted on the outside, aft of the wheel.

If the adapter cannot be clamped onto the wheel, which can be the case on wooden wheels, it can always be bolted on by separating the fixed inner part from the moving drum. You then have to drill holes and through bolt the fixed part to the wheel. After this, the adapter is reassembled.

In general, the locking pin should be lined up with the rudder center mark on the boat's wheel as nearly as possible.

As with a tiller, it is possible to lead the pendulum lines BACKWARDS onto the wheel adapter. This makes the MONITOR inoperable.

With wheel steering, the lines SHOULD NOT be crossed. It is possible to lead both pendulum lines on either the starboard or port side, as well as leading the port line on the port side and the starboard line on the starboard side. Normally, both lines would go to one side only and leave the other side open for passage. Access to space under the seats and other cockpit arrangements often determine the side. Lines from both sides could be preferred on boats with a cockpit traveler.

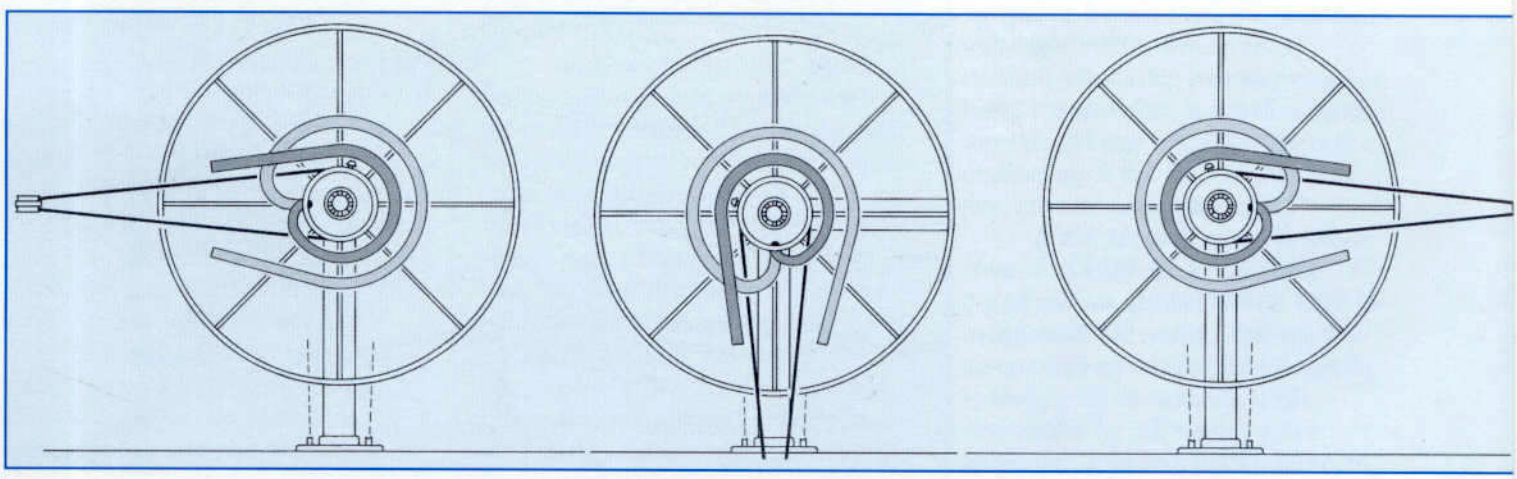
If both lines are led on the STARBOARD side of the boat, the STARBOARD SHEET SHOULD PASS OVER THE TOP of the wheel adapter drum and the PORT SHEET UNDER the drum.

If both lines are led on the PORT side of the boat, the PORT SHEET SHOULD PASS OVER THE TOP of the wheel adapter drum and THE STARBOARD SHEET UNDER the drum.

If the pendulum sheets are led from BOTH sides, BOTH SHEETS SHOULD PASS OVER THE TOP of the drum.

The brackets that hold the blocks where the pendulum lines leave the MONITOR frame are adjustable in the up and down direction. These brackets each have four holes for the two bolts holding each block. The holes allow change of the block position to port, starboard or straightforward direction.

In order to avoid overrides and jamming, sheets should not go more than



Both lines from port *Both lines from below* *Both lines from starboard*

Installing the Pendulum Sheet Lines 3.5 *(continued)*

three-quarters of the circumference of the drum (one full turn if the lines are led from both sides) before passing through the holes inside the drum. The wheel can now turn half a turn to port and a half turn to starboard. When the pendulum is straight down and centered between the frame legs, the two holes in the inside face of the drum should be midway between the pendulum lines. ***If the holes are on the opposite side, away from the pendulum lines, the MONITOR will work somewhat but the wheel will only be able to turn a quarter turn each way.***

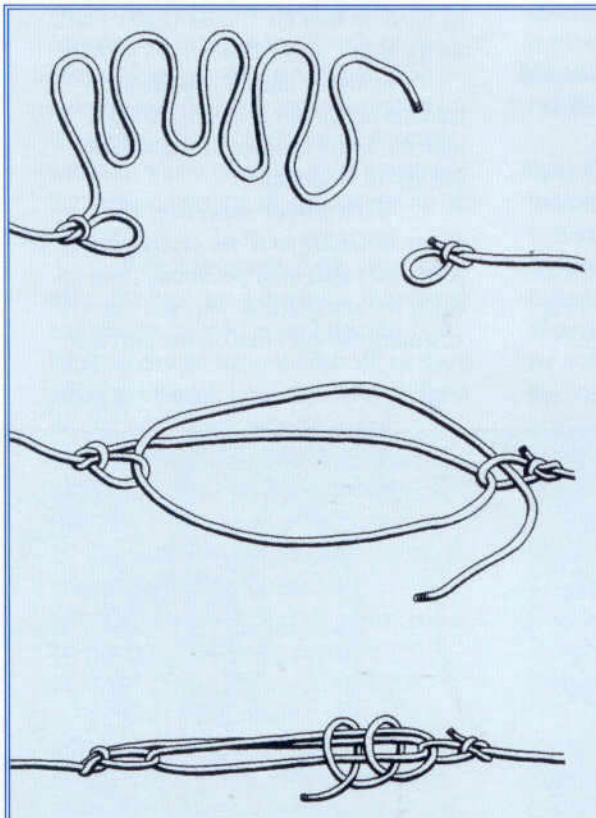
The MONITOR Wheel Adapter is delivered with two 6' lengths of 3/16" Spectra line secured to the drum with stopper knots. These lines should be tied to with the Pendulum lines from the MONITOR using a detachable knot, which will allow you to tension the lines while the MONITOR is in use or untie them, when needed. (If you expect to be in an anchorage for a couple of weeks or longer you will also be able to untie them easily to free up the cockpit. You would add this to the routine, just like coiling your main and jib sheets.)

We recommend both lines be joined to the pendulum line with a "MONITOR Special" knot. (See the illustration.) Determine where the lines are to be joined. On most installations the lines will go between the Wheel Adapter to the coaming and then back to the vane. In such cases the lines are usually joined halfway between the wheel and coaming – usually where you have the longest run without blocks. You need a minimum of 12"–18" on either side of the "MONITOR Special" knot to allow for the back and forth movement of the lines as the servo-pendulum on the MONITOR moves from side to side.

It is easy to experiment with the tension even in high speed when there is a lot of pressure on the lines as the lines jams themselves slightly. However, ***make sure not to over tighten the lines.*** This is the most common mistake in the early days of MONITOR sailing.

The 3'–4' tail should be in the line coming from the MONITOR. The extra line will come in handy when you want to change chafe points on the pendulum line. (See paragraph 3.5.1.)

SUMMARY: There are many arrangements used to lead the lines to the wheel adapter. The principles outlined above should be adapted to whatever arrangement you use. We recommend that you, at least initially, use the MONITOR "Special" knot to join these lines. After using the MONITOR to the point you are completely satisfied with your arrangement, eye splices, snap shackles or other systems can be incorporated into your system.



Do not over tighten!

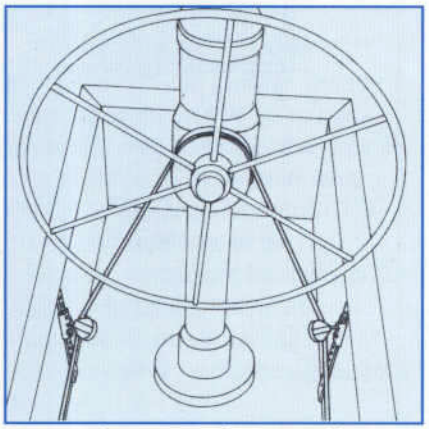
The "MONITOR Special" Knot
(it is not a truckers hitch).

Make a bowline in the wheel end and a bowline with a 3'–4' tail ("the bitter end") in the other end. Leave a gap of about 12"–18" between the two loops. The tail can now go through the first bowline and back to the second and then again back to the first before being locked with a half hitch. You have now made a block and tackle arrangement without using any hardware.

Pendulum lines to blocks at the bottom of legs *3.5.4*

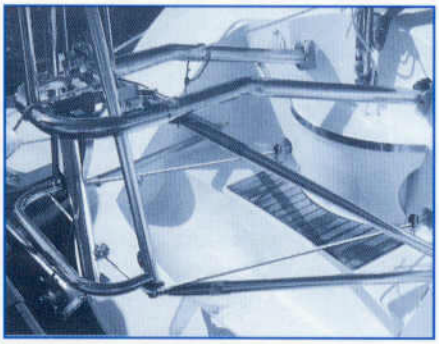
For boats with open transom or with the cockpit floor more or less at the same level as the bottom of the MONITOR frame legs, a special custom arrangement might be preferred. The pendulum lines normally exit the MONITOR at the level of the upper tubes. If you bypass the blocks inside the frame you can instead install blocks at the bottom of the legs. The blocks that are normally mounted on the brackets outside the frame can be used, but the bushing has to be drilled out to make room for a 5/16" bolt. The bolts should also be longer (1½") and the head should be drilled to permit a safety wire. The blocks are located between the legs and the end fittings of the lower tubes. These blocks with larger center holes and 1½" long, 5/16" drilled bolts are available from the factory.

The pendulum lines will now go to the blocks at the bottom of the legs and then straight forward to two blocks at the bottom of the pedestal. Only four blocks are used. Friction is minimized and the lines are hardly visible, especially if they go under a teak crating.



Tension adjustment can be arranged by mounting the blocks at the bottom of the pedestal on an adjustable track or similar.

For boats with a regular transom, not open, we suggest using glassed-in, large-diameter PVC tubing through the lazarette, between the cockpit and the hull. By using large diameter you



The pendulum lines go through existing cockpit drains on this boat

Blocks at the bottom of the legs

minimize the problem with chafe but more importantly, you add two large cockpit drains. You cannot have too many cockpit drains and they cannot be too large.

If there is not enough room for a "MONITOR Special" knot, tension can be arranged by mounting a block on a track.

Installing the Airvane Course Control Line *3.6*

The airvane is remotely controlled by means of a thin (approximately 1/8") dacron line around the pulley mounted on the vane control shaft. An endless line with ONE FULL TURN around the pulley is preferred to prevent slippage.

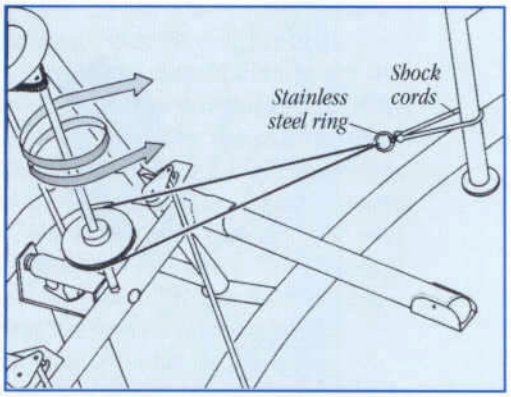
This line MUST BE INSTALLED and kept UNDER TENSION when you are using the vane gear.

Otherwise, the airvane may gradually change its setting and take the boat off the desired course.

The pulley can be adjusted to the proper level on the vane control shaft by adjusting the screws (77). Make sure that the pulley is below the counterweight. The control line can be led practically anywhere on the boat to manipulate the airvane for a course adjustment.

In general, the line is led so that it can be easily worked from the helmsman's position or all the way to the companionway. The latter method makes it possible to control the MONITOR without going on deck which might come in handy on an ocean passage when you are down below and do not feel like putting your foul weather gear on to go on deck to make a minor course adjustment. Use fairleads instead of blocks since you want to have some friction in this line.

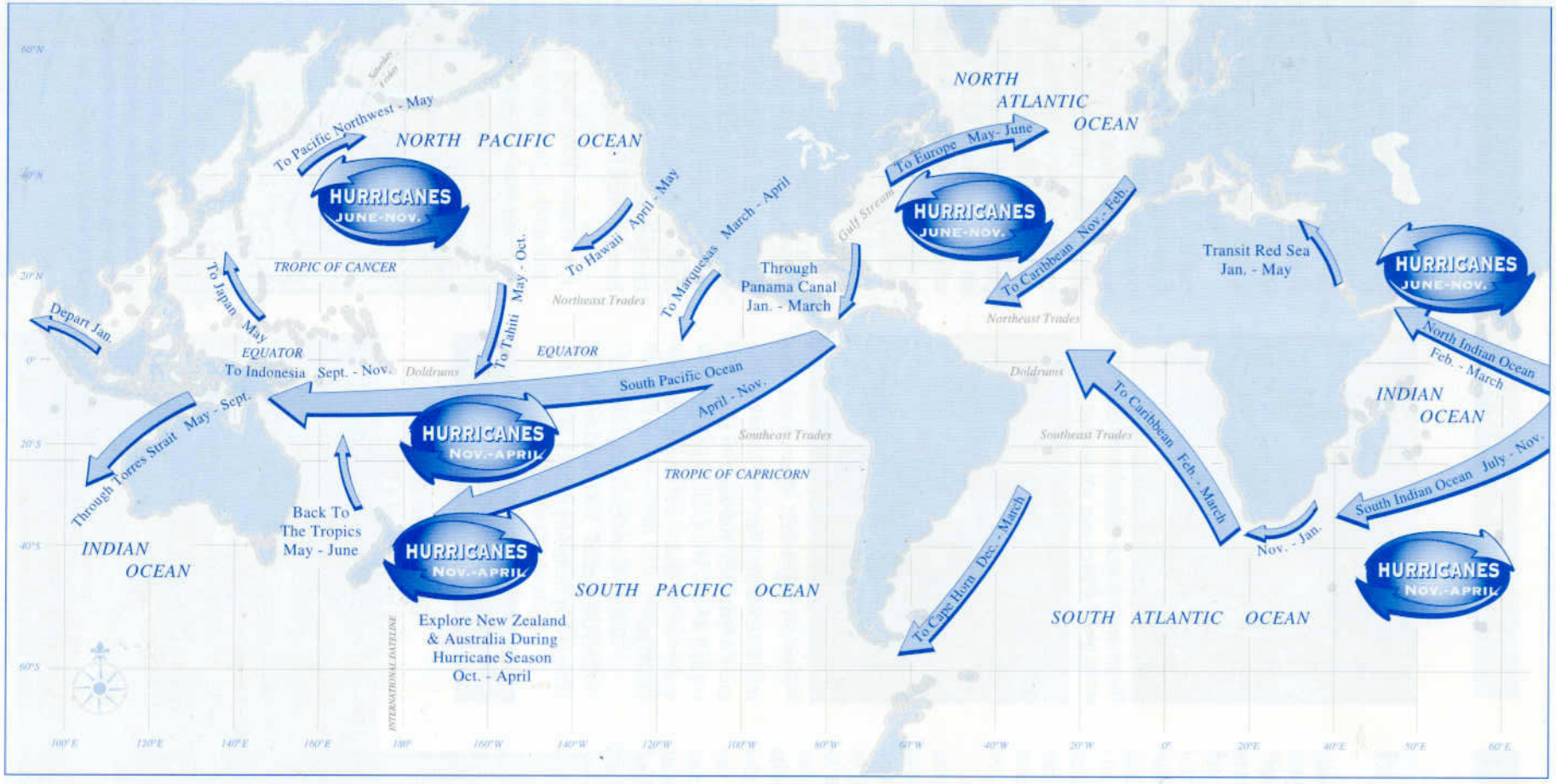
We recommend that the control line be either spliced or sewn together to form an endless loop. Before the splice is made, the line should go through a stainless steel ring attached to the boat with a piece of shock cord. By adjusting the shock cord you will adjust the tension of the control line. A stainless steel ring is cheaper and better than a block because here you want friction.



An endless line twice around the pulley, a stainless steel ring rather than a block and a shock cord for tension makes a basic arrangement for the coarse control line.

WORLD CRUISING PLANNER

for safe passage making



Now is all the time you won,
The past a golden link,
Go cruising now my brother
It is later than you think.