



ComNav Marine Ltd.
#15 - 13511 Crestwood Place
Richmond, BC
Canada V6V 2G1

Phone: 604-207-1600
Fax: 604-207-8008
E-mail: sales@comnav.com
Web: www.comnavmarine.com

Stand Alone Rudder Angle Indicator System

Part No. 94253

Installation Instructions
Manual Part Number 75088
Revised September 27, 2000



Rudder Follower Installation:

The rudder follower should be mounted in the stern of the vessel, close to the rudder post. A mounting base may have to be fabricated to position the rudder follower properly. Mount the rudder follower in a location clear of any bilge water and where the possibility of damage from any equipment stowed in the area is minimized.

With the rudder follower supplied you will find a rudder post arm. Mount the rudder post arm on the rudder post using a stainless steel band clamp (not supplied). Bolt the ball joint to the hole in the rudder post arm corresponding to the diameter of the rudder post in inches, making sure the ball is facing upwards. Mount the rudder follower so that the rudder follower arm is the same height as the rudder post arm.

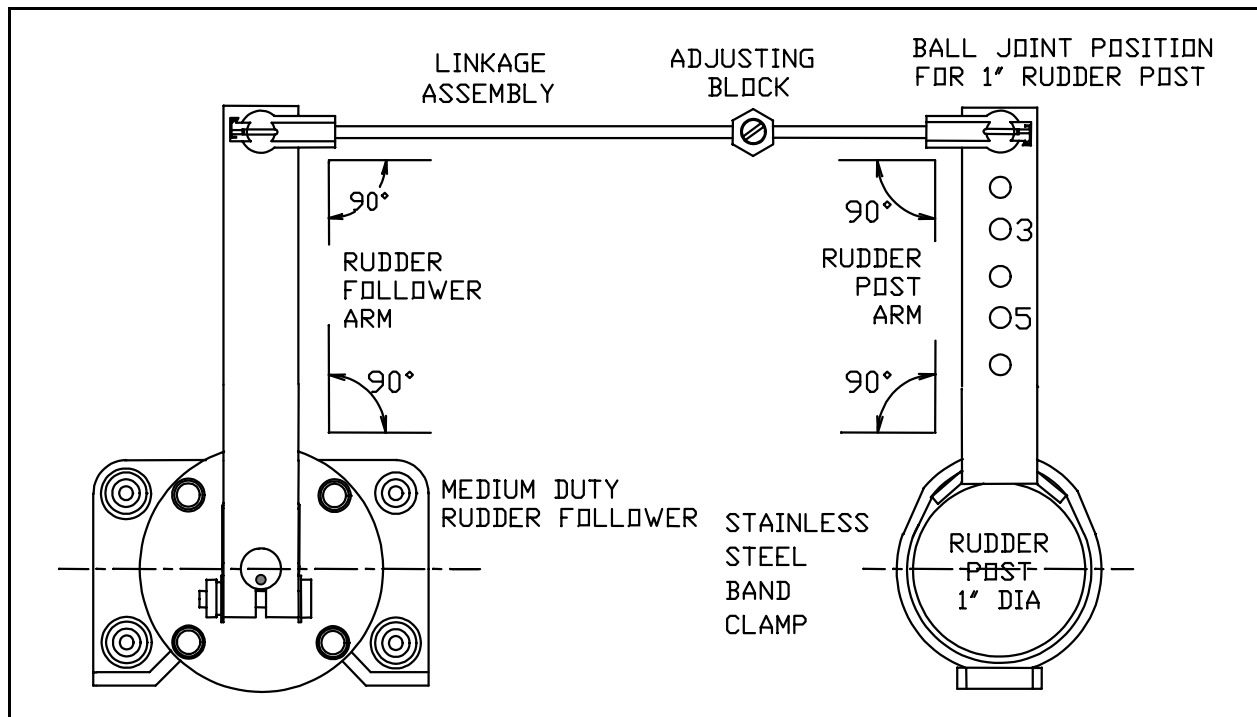


Figure 2 Correct Geometry When Rudder Dead Ahead

On any rudder follower, the distance between the center line of the rudder post and the rudder follower must not exceed 24 inches. Make sure that the ball joints on the rudder post arm and the rudder follower arm are facing upwards as shown in Figure 3. Snap the rod assembly onto the ball joints. Be sure to close the release clamps on each socket. Refer to Figure 2 or 4 and adjust the length of the rod to get the correct geometry with the rudder dead ahead.

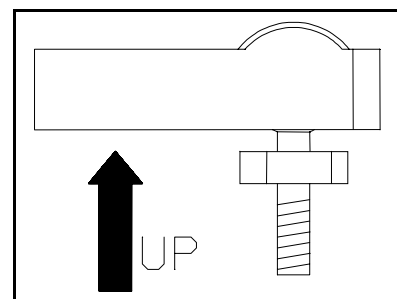


Figure 3 - Correct Orientation

If the locking screw in the rudder follower arm has been loosened, or the arm removed from the rudder follower, re-attach the arm and check the potentiometer centering. When the rudder is dead ahead, the electrical resistance between the Black and Green wires and the White and Green wires should be equal (approx. 600 ohms each). The potentiometer can also be centered mechanically by aligning the notch on the follower shaft (see figure 4).

Be careful to check the installation for any mechanical obstructions or binding of the linkage, and correct it now, before it becomes a problem.

The rudder follower is supplied with 50 feet of cable. Run the cable from the rudder follower towards the electronics box, ensuring that it is protected by hose or conduit wherever it passes through fish or cargo holds, or any other area where it could be damaged. If the length of cable supplied is too short to reach all the way to the distribution box, obtain a terminal strip and sufficient additional cable from your dealer. Mount the terminal strip in a convenient DRY location. Connect the rudder follower cable to the terminal strip and then the additional length of cable. Connect the rudder follower cable to the terminal strip and then the additional length of cable. Match wire colours as closely as possible. Strip the wires, and attach them to the 3 position terminal strip in the electronics box.

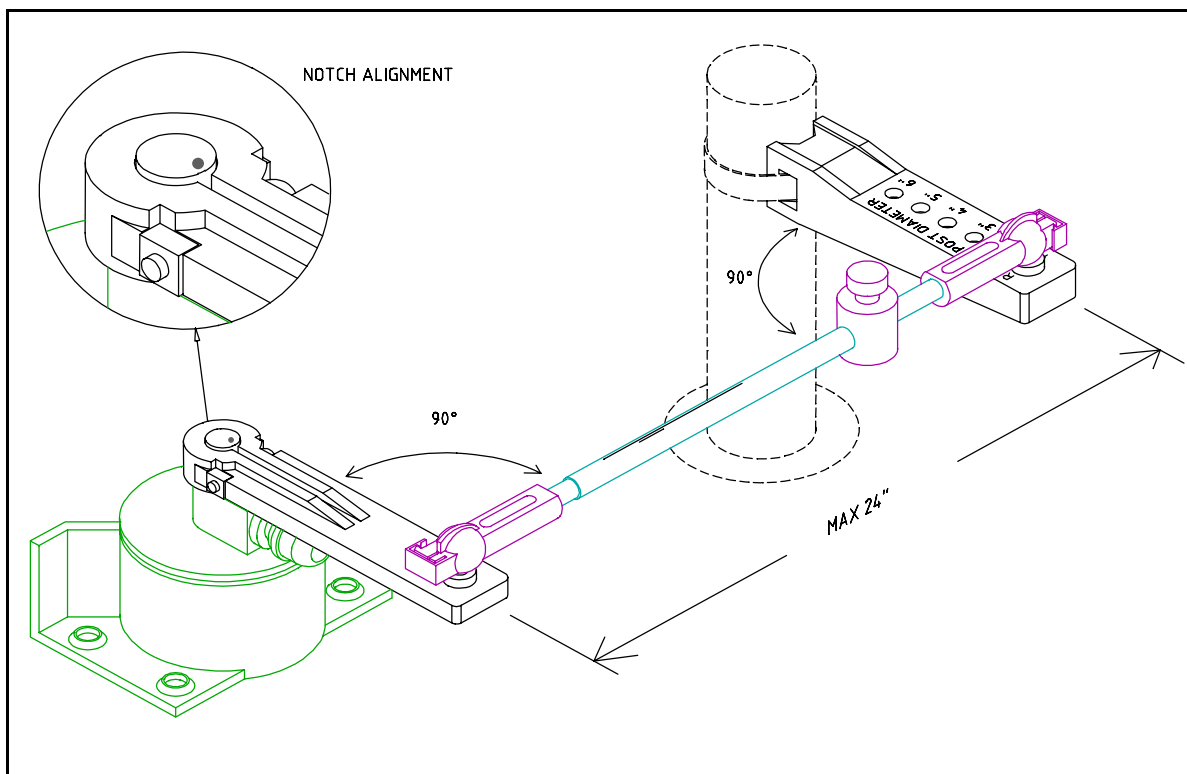


Figure 4

Notch Alignment

RAI Distribution Box Installation:

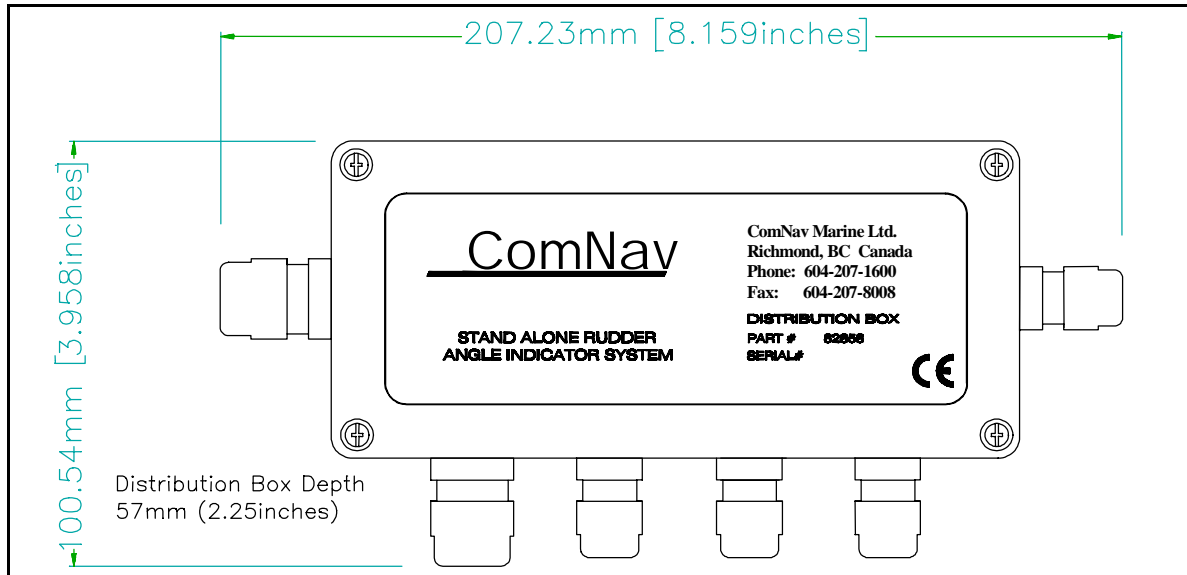


Figure 5 RAI Distribution Box dimensions

Remove the cover from the distribution box. Mount the box in any convenient dry location using four #6 screws through the holes outside the "O" ring seal. The "O" ring seal and cable glands are splash and drip proof when properly compressed. Make connections to the RAI distribution box by threading cables through the appropriate size watertight glands, then stripping the insulation and inserting the copper wires into the terminals as shown in Table I (see next page). Twist the stranded wires tightly and insert them into the terminal socket, being careful that no strands miss the opening and short to another wire or circuit components. Use a small screwdriver to depress the wire clamp inside the terminal socket. This style of terminal is considered to be more reliable than the common screw type terminal as it applies a constant, pre-set pressure even if the wire compresses or deforms. Conversely, a screw type terminal can easily be over tightened and flatten the wires making them susceptible to vibration and cause intermittent operation. After each wire in the cable has been connected, tighten the cable gland.

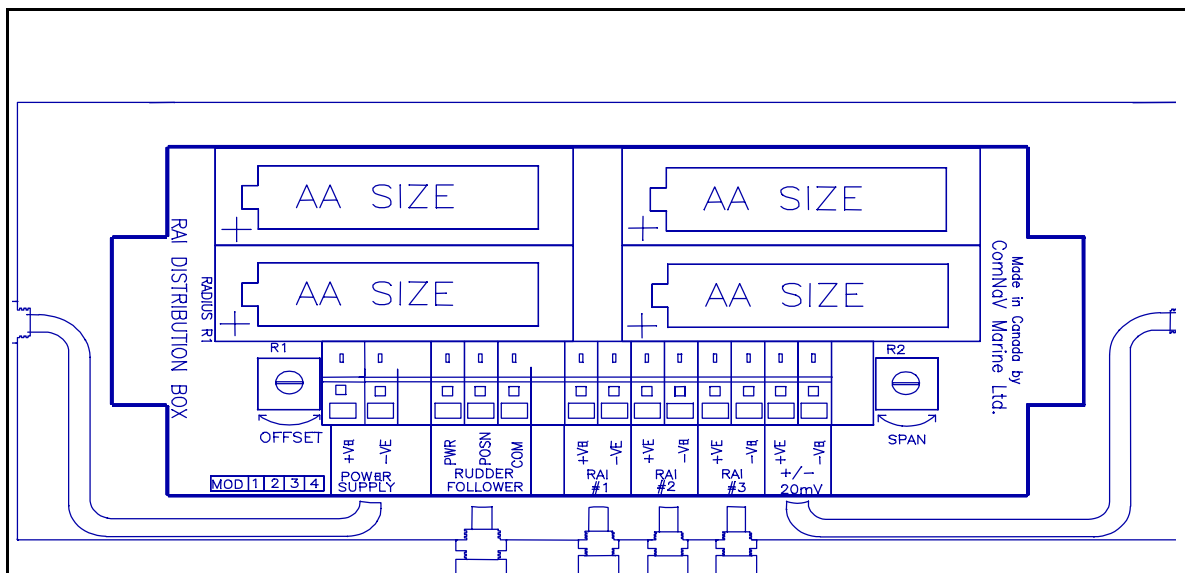


Figure 6 RAI Distribution Box terminal layout

Table 1: RAI Distribution Box Connection Table:

Terminal #	PCB Label	Wire
1	+VE	Positive (10VDC to 40VDC)
2	-VE	Negative Ground (10VDC to 40VDC)
3	-	No Connection
4	PWR	Rudder Follower White Wire (+5 Volts Power)
5	POSN	Rudder Follower Green Wire (Wiper Position)
6	COM	Rudder Follower Black Wire (Common Ground)
7	-	No Connection
8	+RAI 1	Indicator Group 1 (positive/signal)
9	-RAI 1	Indicator Group 1 (negative/return)
10	+RAI 2	Indicator Group 2 (positive/signal)
11	-RAI 2	Indicator Group 2 (negative/return)
12	+RAI 3	Indicator Group 3 (positive/signal)
13	-RAI 3	Indicator Group 3 (negative/return)
14	+20 mV	20 millivolts per degree output (positive)
15	-20 mV	20 millivolts per degree output (return)
16	-	No Connection

Note:

A voltage output is provided on terminal 14 that can be fed to any suitable ships monitoring system for display or control purposes. It is scaled to 20 millivolts per degree, positive for Port and negative for Starboard as referenced to terminal 15. Terminal 15 is a floating reference with over 200K ohm impedance. It is nominally 2.5 volts but can swing +/- 1.0 volt. This provides an accurate output and excellent isolation between systems in the presence of voltage differences and noise on the power supply ground lines.

After all indicators are operating and calibrated and batteries installed, re-install the distribution box lid checking for anything in the "O" ring groove or on the sealing lip of the lid that could prevent sealing. Check glands for sufficient but not excessive compression of the rubber seal on the cable jacket.

RAI Meter Installation:

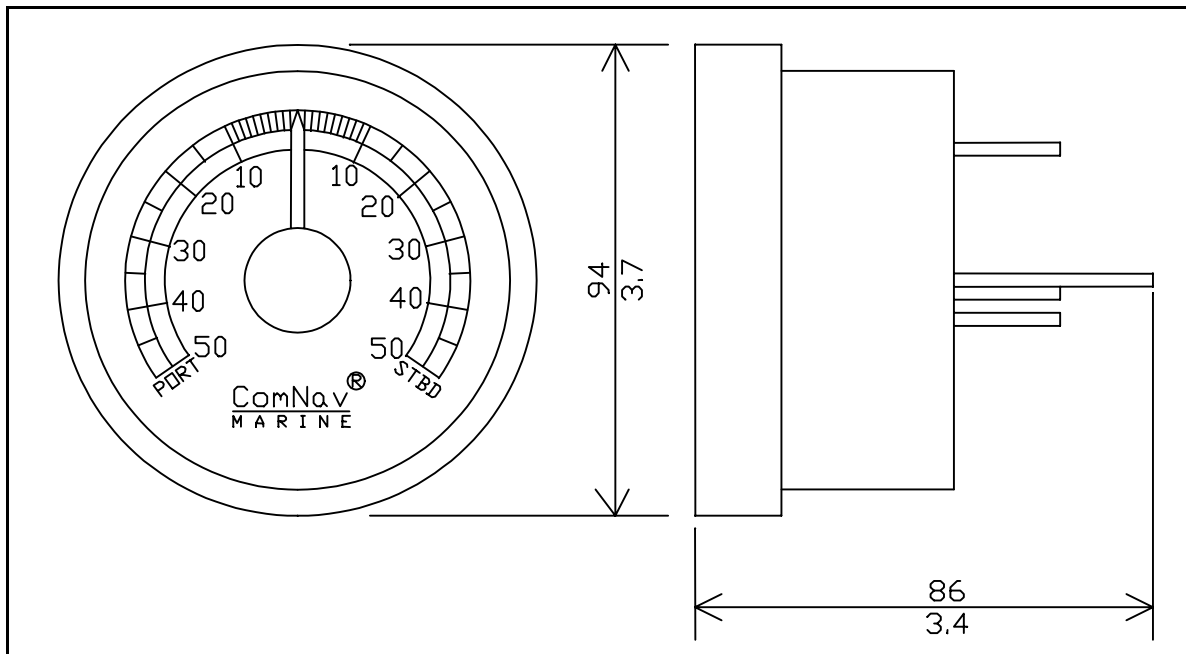


Figure 7 Rudder Angle Indicator meter dimensions

NOTE: RAI P/N 94249 supplied with system. The bottom scale RAI P/N 94244 can also be used with the Stand Alone Rudder Angle Indicator System.

The RAI meter can be mounted in several ways. The meter by itself can be flush mounted simply by drilling an 85 mm (3-5/16 inch) hole and securing with supplied mounting bracket.

Flush mounting can also be done by using the optional Bezel Kit (part #94338).

For dash mount or deck head applications, use the optional Dash Mount kit (part #94285).

For weather proofing, use the optional Watertight Kit (part #81911).

Up to 15 Rudder Angle Indicator meters can be wired to the three sets of terminals in the RAI Distribution Box labelled +RAI 1/-RAI 1, +RAI 2/-RAI 2 and +RAI 3/-RAI 3 but with a few minor restrictions;

1. RAI meters must be a 500uA, zero center type.
2. At least one RAI meter must be connected to the terminals labelled +RAI 1 and -RAI 1.
3. No more than 5 RAI meters can be connected in series.
4. The RAI 2 and RAI 3 terminals must have an equal number of RAI meters of the same type.

For example:

If seven RAI meters are to be used, connect three meters in series to terminals +RAI 1 and -RAI 1, two meters in series to +RAI 2 and -RAI 2 and two meters to +RAI 3 and -RAI 3.

Testing:

After wiring the rudder follower, RAI meters and power supply and then checking that all wiring conforms to what is shown in Table 1, switch on the master switch or breaker supplying power to the RAI System. Move the rudder to determine if the RAI meters move in the correct direction. If all RAI meters move in the wrong direction, reverse the black and white wires coming from the rudder follower to the RAI Distribution Box terminals. If one RAI group of meters goes in the wrong direction, reverse the wires going to that group's respective terminals in the RAI Distribution Box. If any one RAI meter is going in the wrong direction, reverse the wires going to the meter's own terminals.

If any RAI meters differ in readings, check the connection rules given previously. RAI meters of the same type and wired in series should agree to within two degrees as verified from the factory final tests. If the system has larger than 3 degree errors, please consult with your Dealer or with ComNav Marine factory service personnel.

Adjustments:

Move the rudder to the "dead ahead" position. If the "dead ahead" position is precisely known and the RAI meter indication is off, loosen the clamp screw on the Rudder Follower arm and adjust the shaft position with a slotted screwdriver to give proper indication. Move the rudder to hard over Port and Starboard and check that the indication is as expected.

Two factory pre-calibrated trim controls are provided on the RAI Distribution Box circuit board.

1. The offset control allows some adjustment of the "dead ahead" rudder indication, making it easier to adjust the system while on sea trials. If the indication is more than 10 degrees off, adjust the follower linkage rather than the offset trim control.
2. The span control allows some adjustment of the RAI meter indication at the hard over rudder positions. This RAI System is calibrated at the factory to be accurate within 3 degrees if installed as per instructions. If the Rudder Follower linkage geometry is not correct (i.e., rudder and follower arms not equal, parallel or link rod is not 90 degrees when centered), indication of the hard over positions will be off. It is better to correct the linkage but, if this is not possible, the span control can be used. Making a large correction for linkage problems by using the span control can introduce errors in indication at the half deflection position and unequal indication at the hard over position. The span control can also be used to accommodate RAI meters with higher current movements of up to 1.0 milliamp.

Power Failure Indication:

This indicator system has a built-in power failure back-up feature which provides up to one half hour of operation from internal batteries as well as automatic shut-off. This provides compliance with some maritime regulatory bodies that require emergency operation of the complete steering system after failure of the ship's power source. This feature can be activated simply by inserting four "AA" cells as shown on the RAI Distribution Box circuit board layout. All of the RAI meters will continue to operate and show rudder angle any time the power source fails or is turned off. The batteries should provide years of trouble free service without being replaced.

Loss of the ship's main power supply to the RAI Distribution Box will cause a Power Failure condition and will be indicated on each RAI meter. The RAI meter needle will "flick" a few degrees every second and the system will get it's power from the batteries. Poor battery condition is also evident whenever the main power source is disconnected. If the rudder angle indicated changes by more than one degree (while hard over) when the power is turned off, the four "AA" cells should be replaced.

Technical Assistance:

Should you have any difficulties installing and commissioning this equipment, it is best to contact the ComNav Dealer where equipment was purchased. Failing that, please feel free to contact ComNav Marine's service department at;

Outside of Canada and the U.S.A.

Phone: 1-604-207-1600

Fax: 1-604-207-8008

In Canada or the U.S.A.

Phone: 1-800-428-0212

Fax: 1-800-470-9611

On the Internet

E-Mail: sales@comnav.com

Web Site: <http://www.comnavmarine.com>

CE COMPLIANCE

This product has been tested and is in compliance with the Electro-Magnetic Compatibility (EMC) standards of the European Community and bears the CE label. It has been tested according to the applicable sections outlined under;

Technical standard #IEC945/EN60945

Marine Navigational Equipment

General Requirements

Applicable sections for methods of testing and required test results are;

Section 4.5.4: Radiated interference

Section 4.5.4: Immunity to electro-Magnetic Environment

Annex A, Section A.3: Immunity to conducted audio frequencies

Annex A, Section A.4: Immunity to earth lead coupling

Annex A, Section A.5: Immunity to conducted radio frequencies

Annex A, Section A.6: Immunity to radiated interference

Test results and a declaration of conformity are on file at the ComNav plant;

ComNav Marine Ltd

#15 -13511 Crestwood Place

Richmond, BC V6V 2G1, Canada