



# System Manual

**Panoramic Rudder Angle Indicator System  
Model: RAI 204 & UNIVERSAL FOLLOW-UP**



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This manual is subject to change without prior notice.



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# 1 INTRODUCTION

## 1.1 Description

The WAGNER rudder angle indicator system consists of the following:

- A three faced panoramic rudder angle indicator (RAI 204)
- RAI 204 power supply
- UNIVERSAL FOLLOW-UP Rudder feedback unit (RFU)
- Feedback linkage assembly.

### **RAI 204**

The RAI 204 accurately shows the position of the rudder on three large scale analog displays. A built-in dimmer allows for adjustment of the backlight.

The RAI 204 operates on an input voltage of 24 VDC.

The RAI 204 is designed to be deckhead mounted at any convenient location in the wheelhouse.

### **RAI 204 Power Supply**

The RAI 204 Power Supply operates on an input voltage of 12-24 VDC and outputs 24 VDC to the RAI 204.

The RAI 204 Power Supply also features an output voltage adjuster.

### **UNIVERSAL FOLLOW-UP (RFU)**

The RFU is connected to the tiller arm through the linkage assembly and follows the rudder through its motion. This supplies the RAI 204 with an accurate rudder position.

The RFU comes with a high impact, waterproof housing.



## 2 INSTALLATION

### 2.1 Mounting the Rudder Angle Indicator

NOTE: Refer to Figure 1 for RAI overall dimensions and mounting details.  
Refer to Figure 3 for standard wiring information.

- a) Select a suitable location in the wheelhouse and bolt the RAI onto the deckhead with six 3/16" (5mm) bolts.
- b) Ensure that the dimmer knob faces forward and that the cable entry into the deckhead is at the same location as the RAI cable gland.

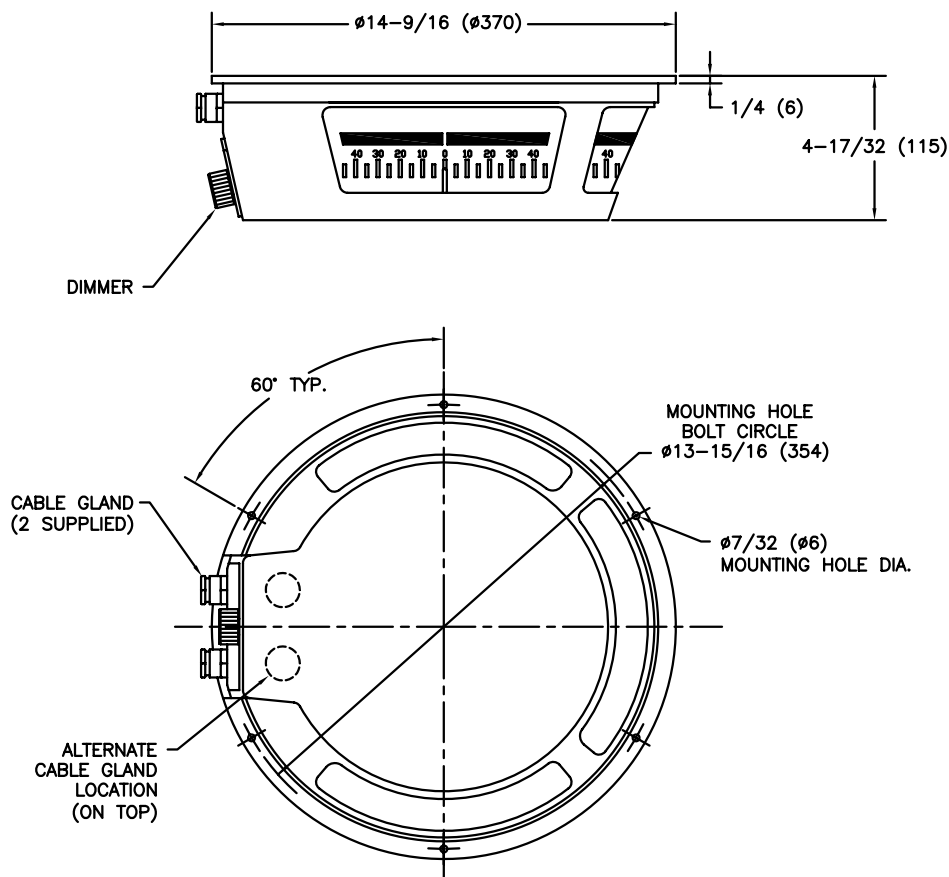


Figure 1 – RAI 204 Overall Dimensions



## 2.2 Mounting the Rudder Feedback Unit

NOTE: Refer to Figure 2 for overall dimensions and mounting arrangement.

- Attach the swivel ball to the rudder stock clamp. Be sure it is secure.
- Attach the swivel with the brass rod onto the swivel ball.
- Mount the RFU on a horizontal surface at an elevation that will keep the brass rod level. A mounting base may need to be built to mount the RFU properly.
- Place the other swivel ball in the RFU arm drill hole that will maintain the 90° mounting arrangement shown in Figure 2.
- Insert the brass rod into the brass block. Adjust the length of the linkage in order to achieve the correct mounting geometry and tighten the screw on the brass block securely. The complete RFU and linkage assembly should be checked to ensure it can swing through the full rudder travel without interference or binding.

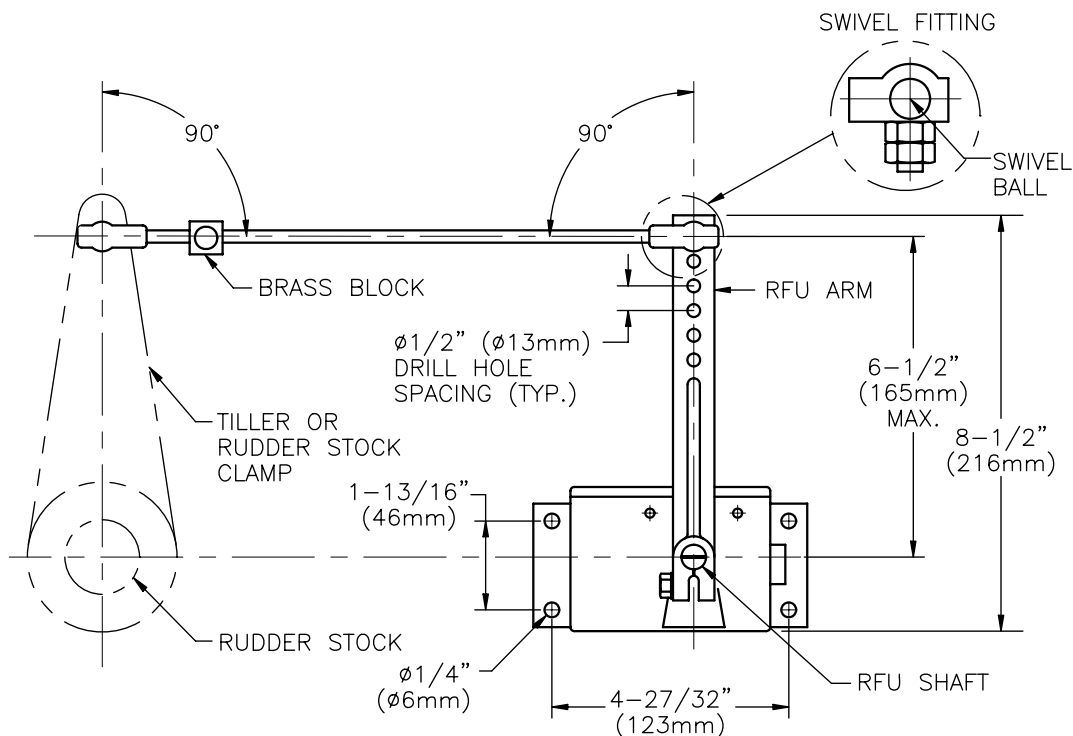
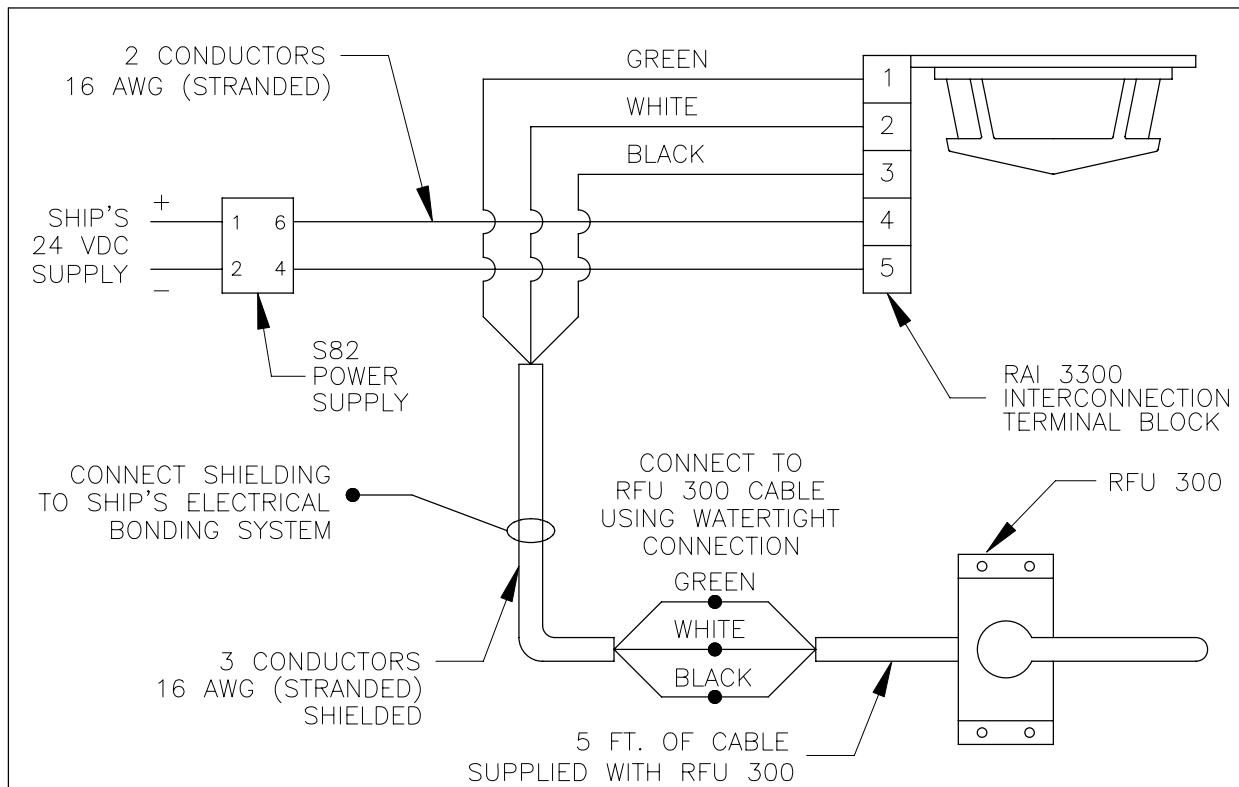


Figure 2 – UNIVERSAL FOLLOW-UP (RFU) Mounting Arrangement



## 2.3 Wiring Connections



**Figure 3 – RAI 204 Standard Wiring Diagram**

Run the cable from the RFU to the RAI, using 3-conductor, 16 AWG, shielded cable. Refer to Figure 3 for wiring. Ensure that the cable shielding is grounded to the ship's electrical bonding system. The cable should be protected by conduit wherever it passes through any area where it could be damaged.

**WARNING: DO NOT RUN CABLES IN CLOSE PROXIMITY TO RADIO FREQUENCY TRANSMITTING EQUIPMENT OR HIGH CURRENT OR HIGH VOLTAGE DEVICES.**



### 3 SETUP AND TESTING

**WARNING: ALL SET UP AND TESTING PROCEDURES MUST BE PERFORMED WHILE THE VESSEL IS STATIONARY AND NOT UNDERWAY.**

- a) Bring the rudder to midship position.
- b) Switch power ON.
- c) Refer to Figure 2 and loosen the clamping bolt on the RFU arm.
- d) Use a screwdriver to adjust the RFU shaft until the RAI indicator pointers point to zero.
- e) Re-tighten the clamping bolt.
- f) Turn the rudder back and forth and check that the rudder angle indicator pointers move in the correct direction. If the RAI moves in the wrong direction, reverse black and white leads coming from the RFU.
- g) Bring the rudder to hard-over position.
- h) Adjust the RAI's internal potentiometer so the RAI indicator pointers reflect the hard over position (35 or 45 deg.)
- i) Bring the rudder to the opposite hard-over position and verify that the pointers are showing the correct indication.
- j) Move to midship position and confirm zero degrees. Small adjustments can be made to offset the indicator needles by turning the screw-head on the bottom of the RAI 204 housing.
- k) Switch power OFF.
- l) Switch power ON again and verify that the indicator pointers move to the present rudder position.



## 4 TROUBLESHOOTING

**WARNING: FAILURE TO CORRECT ANY PROBLEM CAN CAUSE MISLEADING OR WRONG RUDDER ANGLE INDICATION.**

The chart below gives some general solutions for simple problems. If a problem cannot be resolved, contact the factory.

SYMPTOM	CAUSE	CORRECTION
System will not operate.	Power not supplied.	Check wiring and fuses.
	Power supply wired backwards.	Reverse polarity.
	Incorrect wiring.	Check wiring between RFU and indicator.
Indicator pointers move in the wrong direction.	Reversed indicator wiring.	Reverse black and white leads from RFU.
Indicator pointers jump from zero to hardover when rudder is turned.	RFU shaft is centered incorrectly.	Turn RFU shaft until another zero position is found. (Usually 180 deg.)
The indicator pointers port and starboard hardover angles are not the same.	Rudder's hardover angles are not the same.	Check the mounting geometry according to Figure 2 and correct.
	Mounting geometry is incorrect.	
Indicator pointers show too little or too much deflection	Full scale adjustment incorrect	Adjust gain at potentiometer