NMEA2000® RUDDER ANGLE ADAPTOR
Part Numbers: 3165
USER MANUAL

Revision 2.0.0

1 INTRODUCTION

The Oceanic Systems NMEA2000® 3165 Rudder Angle Adaptor is designed to adapt commercially available resistive rudder angle senders to the NMEA2000® network to be displayed on suitable display. It is user settable to either the 10-180 Ohm European Standard or the 240-30 Ohm American standard rudder angle senders without needing any display menu setups. It is designed to work within the normal marine environment. It is very important that it is installed and set up correctly according to this manual. Please read and follow the installation and setup instructions carefully to achieve the best results.

1.1 FIRMWARE REVISION

The information in this manual corresponds to firmware revision 2.0.0

2 PRODUCT FEATURES

The NMEA2000® 3165 Rudder Angle Adaptor has the following features:

- Adapts 10 — 180 Ohm European standard Rudder Angle Senders
- Adapts 240 — 30 Ohm American standard Rudder Angle Senders
- Has Port/Starboard indicator LEDs for easy setup
- Indicator LEDs for each active input
- Switch settable Rudder Instance
- Operating Voltage: 9 to 32V
- No display unit setup required
- Standard NMEA2000® Interface

3 INSTALLATION

3.1 IN THE BOX

You should find the following items in the 3165 shipping box:
1 x 3165 NMEA2000® Rudder Angle Adaptor
1 x NMEA2000 drop cable
1 x 3165 User Manual (This document)

3.2 MOUNTING THE UNIT

The unit is designed to be cable tied either onto a suitable location or into the main cable harness.

3.3 CONNECTING THE NMEA2000® CABLE

The NMEA2000® interface cable should be connected to a nearby NMEA2000® Tee connector (part number 3802). The male end of the cable should be inserted into the female Tee connection noting the position of the keyway in the plug and the socket. Ensure that the locking ring is securely tightened so that the connection remains waterproof and sound.

3.4 CONNECTING THE RUDDER ANGLE SENSOR CABLE

Resistive rudder angle senders have two terminals, the sensor terminal may be marked with an “S” or a “G” and the other marked with a ground or “-“ mark. If they are not marked the ground or “-“ may be the terminal which is connected to the metal housing and the sensor terminal will be insulated from the metal housing.

Ensure that there are NO other cables connected to the rudder angle sender and then connect the 2 metre 2 core gray cable to those terminals according to the following table.

Sender Terminal	Wire Colour
Sensor (S or G)	Red
Ground (-)	Black

4 CONFIGURATION

Configuring the unit does not require any external displays or tools. All options can be set with the rotary switch and a small magnet.

4.1 DEVICE / RUDDER INSTANCE

The unit has a small rotary switch that is used to set the Rudder Instance from 0 to 15 as per the following table:

Switch	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Instance	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

4.2 SENDER TYPE

The unit is shipped pre-configured for a European standard 10-180 Ohm sender but can easily be configured for an American standard 240-30 Ohm sender by the following actions:

1. Note the Rudder Instance Number set in the unit.
2. Set the Rudder Instance temporarily to “A”
3. Apply a small magnet to the marked area of the unit label for 2.5 seconds then remove the magnet.
4. The LEDs will then flash normally configured for the correct sender type.
5. Return the Rudder Instance to it’s original position noted in 1 above

Note that the unit will flash the red Port LED if the unit is set to the European standard or the green Starboard LED if the unit is set to the American standard and the sender wire is temporarily disconnected.

If it is desired to return the configuration to a European Standard then repeat the above substituting “E” in point 2 above.

4.3 DEFLECTION ANGLE

From software version 2.0.0 it is possible to configure the maximum deflection angle for the sender. The 3165 default deflection angle is 45 degrees, but this can easily be changed using the rotary switch and magnet.

To adjust the deflection angle:

1. Note the Rudder Instance Number set in the unit.
2. Set the Rudder Instance temporarily to one of the values in the table below
3. Apply a small magnet to the marked area of the unit label for 2.5 seconds then remove the magnet.
4. Return the Rudder Instance to it’s original position noted in 1 above

Switch Setting	Deflection Angle
7	35 Degress
8	45 Degrees
9	60 Degrees

4 CONFIGURATION

4.4 MANUAL CALIBRATION

Some senders have a nominal resistance outside of the standard ranges. For this reason, it is possible to calibrate the “Hard to Port” and “Hard to Starboard” positions manually. For senders that are in the standard ranges of 10-180 or 240-30 ohms, this operation is not required.

To manually calibrate:

1. Note the Rudder Instance Number set in the unit.
2. Set the Rudder Instance temporarily to 4 for “Hard to Port” or 5 for “Hard to Starboard”
3. Apply a small magnet to the marked area of the unit label for 2.5 seconds then remove the magnet.
4. Return the Rudder Instance to it’s original position noted in 1 above

5 ALIGNMENT

The unit is equipped with red and green LEDs that are designed to allow the physical alignment to the Rudder Angle Sender to be adjusted easily.

When the rudder is midships simply adjust the physical connection between the rudder and the rudder sender so that BOTH LEDs flash as the unit is sending the midships NMEA2000® value to the network.

When the unit is reporting a Port value the red LED will flash and when it is reporting a Starboard value the green LED will flash.

This is designed to make the installation as easy as possible.

6 MAINTENANCE

- Clean the unit with a soft cloth
- Do not use chemical cleaners as they may remove paint or markings or may corrode the enclosure or seals
- Ensure that the unit is mounted securely and cannot be moved relative to the mounting surface. If the unit is loose, tighten the mounting screws
- Check the security of the cables connected to the NMEA 2000 connector, tighten if necessary
- Check the security of the cables connected to the Spade connectors, ensuring a tight fit to the Rudder Angle Sender to be adjusted easily.

7 TECHNICAL SPECIFICATION

As Oceanic Systems are constantly improving their products specifications are subject to change without notice. Oceanic System's products are designed to be accurate and reliable however they should only be used as aids to navigation and not as a replacement for traditional navigation aids and techniques.

7.1 CERTIFICATIONS

Parameter	Comment
NMEA2000®	2.101 Level B
Maritime Nav and RadioComm Equipment	IEC60945
CE and FCC	Electromagnetic Compatibility

7.2 NMEA2000® Parameter Group Numbers (PGNs)

Type	PGN No.	PGN Name
Monitor	PGN127245	Rudder
Protocol	PGN126464	Tx/Rx PGN List
	PGN126996	Product Information
	PGN059392	ISO Acknowledge
	PGN059904	ISO Request
	PGN060928	ISO Address Claim
	PGN126208	Command/Request Group

7 TECHNICAL SPECIFICATION

7.3 ELECTRICAL AND MECHANICAL

Parameter	Value	Comment
CAN Operating Voltage	9 to 32 Volts	
Power Consumption	<50mA	Average Operating
Load Equivalence Number	1	LEN
Reverse Battery Protection	Yes	Indefinitely
Load Dump Protection	Yes	SAE J1113
Size	37 x 97 x 32	mm
Weight	175	grm

7.4 Environmental

Parameter	Value
IEC 60954 Classification	Protected
Degree of Protection	IP67
Operating Temperature	-20˚C to 50˚C
Storage Temperature	-50˚C to 70˚C
Relative Humidity	93%RH @40˚ per IEC60945-8.2
Vibration	2-13.2Hz @ ±1mm, 13.2-100Hz @ 7m/s2 per IEC 60945-8.7
Electromagnetic Emission	Conducted and Radiated Emission per IEC 60945-9
Electromagnetic Immunity	Conducted, Radiated, Supply, and ESD per IEC 60945-10
Safety Precautions	Dangerous Voltage, Electromagnetic Radio Frequency per IEC 60945-12

7 TECHNICAL SUPPORT

7.5 TECHNICAL SUPPORT CONTACT DETAILS

If you require technical support for any Oceanic Systems products you can reach us using any of the following ways:

- Tel (UK): +44(0)1425 610022
- Tel (USA): (844)898 6462
- Fax: +44(0)1425 614794
- Email: support@osukl.com
- Web: www.osukl.com
- Post: Oceanic Systems (UK) Ltd
  Unit 10-11 Milton Business Centre
  Wick Drive, New Milton, Hampshire BH25 6RH

8 WARRANTY

Oceanic Systems warrants this product to be free from defects in materials and workmanship for one year from the date of original purchase. If within the applicable period any such products shall be proved to Oceanic Systems satisfaction to fail to meet the above limited warranty, such products shall be repaired or replaced at Oceanic Systems option. Purchaser's exclusive remedy and Oceanic Systems sole obligation hereunder, provided product is returned pursuant to the return requirements below, shall be limited to the repair or replacement, at Oceanic Systems option, of any product not meeting the above limited warranty and which is returned to Oceanic Systems; or if Oceanic Systems is unable to deliver a replacement that is free from defects in materials or workmanship, Purchaser's payment for such product will be refunded. Oceanic Systems assumes no liability whatsoever for expenses of removing any defective product or part, or for installing the repaired product or part or a replacement therefore or for any loss or damage to equipment in connection with which Oceanic Systems products or parts shall be used. The foregoing warranties shall not apply with respect to products subjected to negligence, misuse, misapplication, accident, damages by circumstances beyond Oceanic Systems control, to improper installation, operation, maintenance, or storage, or to other than normal use or service.

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8 WARRANTY RETURN PROCEDURE

To apply for warranty claims, contact Oceanic Systems or one of its dealers to describe the problem and determine the appropriate course of action. If a return is necessary, place the product in its original packaging together with proof of purchase and send to an Authorized Oceanic Systems Service Location. You are responsible for all shipping and insurance charges. Oceanic Systems will return the replaced or repaired product with all shipping and handling prepaid except for requests requiring expedited shipping (i.e. overnight shipments). Failure to follow this warranty return procedure could result in the product's warranty becoming null and void.

Oceanic Systems reserves the right to modify or replace, at its sole discretion, without prior notification, the warranty listed above.

9 TROUBLESHOOTING/FAQ

Please note that below are some FAQ/Troubleshoot Questions. If none of these help or apply, then please don't hesitate to contact Technical Support.

Symptom	Actions
No Rudder Angle Output	1. Check power correctly applied to NMEA2000® network 2. Check correct terminating resistors attached to each end of the network back bone cable. 3. Check display is set to match rudder instance.
Inaccurate Rudder Angle output	1. Check that unit aligned correctly so both LEDs flash when rudder is at midships 2. Check that unit configured to match the rudder angle sender type ie whether it is a European or American Sender. 3. Check resistance of sender matches values listed below

Resistive Sender Values

Position	European Sender	American Sender
45° Port	180 Ohm	30 Ohm
Midships	95 Ohm	145 Ohm
45° Starboard	10 Ohm	240 Ohm

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