

**AUTONAUT
WAVE PROPELLED
UNMANNED SURFACE VESSEL (USV)**

RUDDER CALIBRATION PROCEDURE

5M AutoNaut – Spektrum V2 Rudder System



1 INTRODUCTION

This document is provided to enable operators to change rudder parameters and re calibrate the steering system after maintenance.

The AutoNaut uses a high torque servo system that has been modified specifically for the AutoNaut and is controlled by an independent motor controller.

The motor controller is a COTS item from RoboteQ and can be sourced from a number of locations. Additionally, the technical manual for the controller can be downloaded directly from the manufacturers web site.

The Controller is a RoboteQ SDC2130. This unit can be used for 2 channel operation, however in AutoNaut only the first channel is used.

The motor controller used the position of the potentiometer within the rudder servo to determine the zero position in software, however due to the mechanical coupling on the rudder it is possible to install the rudder at a different angle. To remedy this the rudder motor controller needs to be re calibrated.

1.1 Preparation

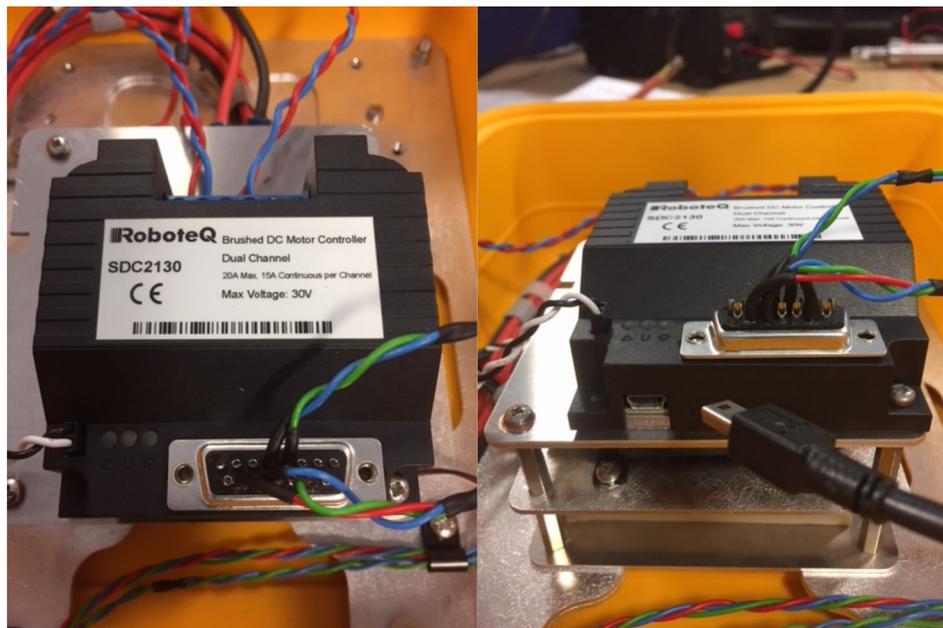
For this activity the boat will need to be fully assembled and powered. You will also need the micro USB cable supplied in the build up box and a laptop / PC with the RoboRun software installed.

AutoNaut supply a default settings profile for the controller should you require a basic setup to be installed.

2 Connecting to the Motor Controller

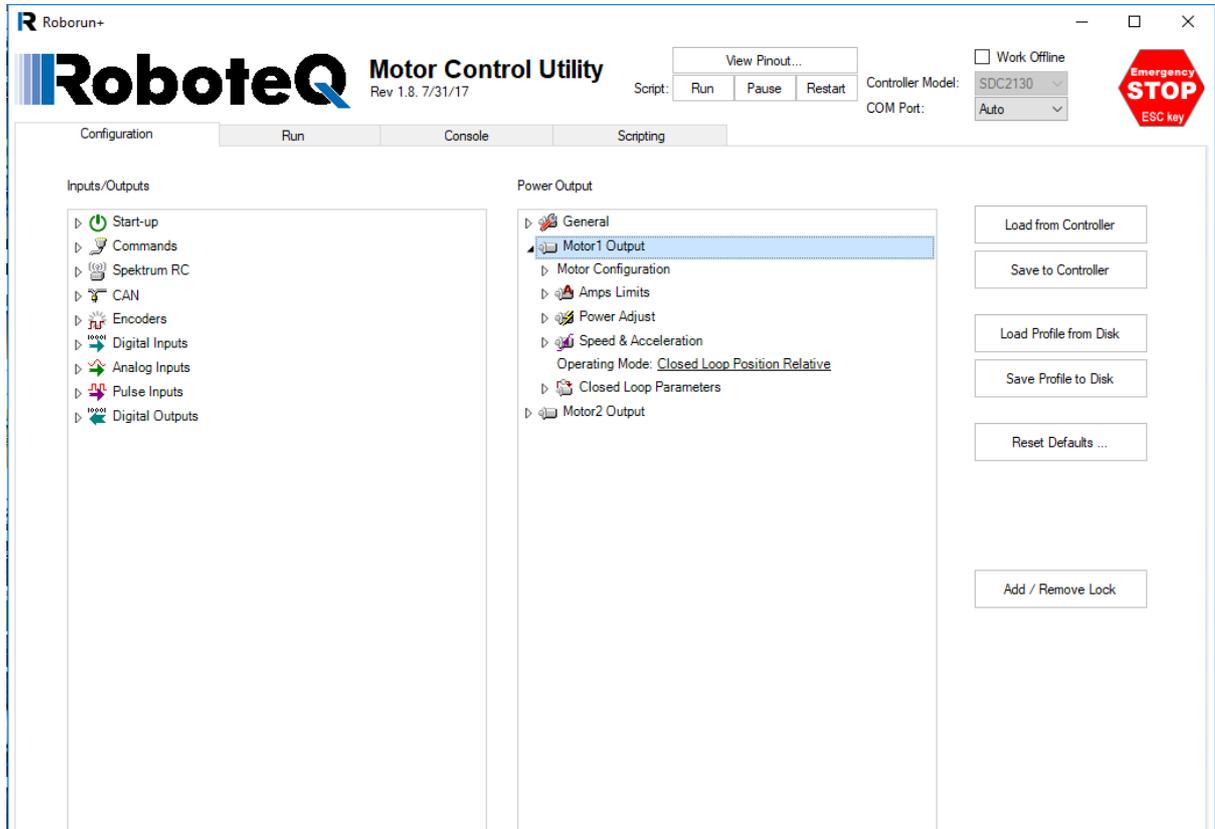
The motor controller is housed inside the PDE enclosure, you will need physical access to this enclosure with the boat assembled and powered in order to complete the calibration. Follow the steps below in sequence in order to re calibrate either the rudder feedback or the steering input to the controller:-

1. With the boat assembled and powered Disconnect cable into PDE05. This removes the motor power from the servo but maintains position feedback allowing you to manually articulate the rudder over its operating range.
2. Carefully open the PDE enclosure and identify the motor controller as shown in the Figure below
3. Attach the USB cable to the motor controller as shown and plug the other end into a laptop or PC with the RoboRun Software installed and open.



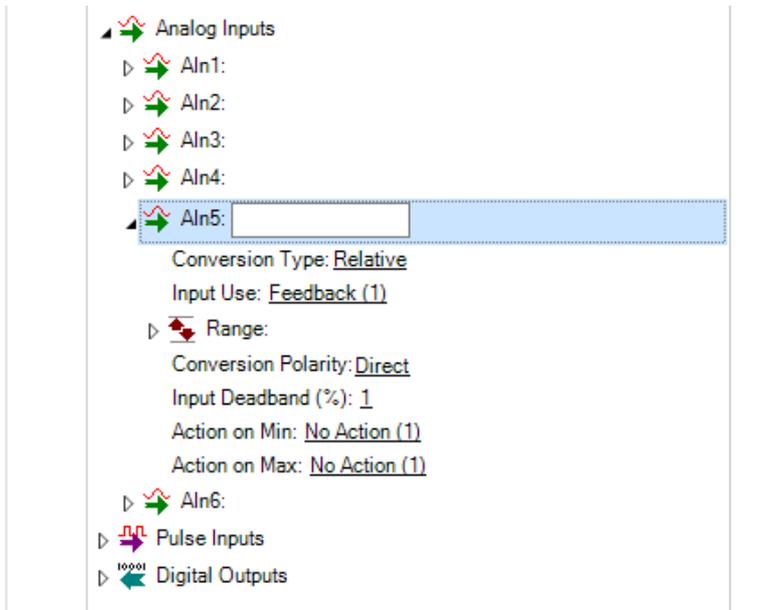
4. When the software detects the controller it will automatically request download of the settings from the controller, accept this request.

5. Click on the "Configuration" tab.



3 Recalibrating The Rudder

1. Select "Analogue Inputs".
2. Select "Aln5", this is the position feedback channel and will expand a drop menu.



3. Select "Range", this should expand the Range drop menu.

▶ Digital Inputs

▶ Analog Inputs

▶ Aln1:

▶ Aln2:

▶ Aln3:

▶ Aln4:

▶ Aln5:

Conversion Type: Relative

Input Use: Feedback (1)

▶ Range: Calibrate

Input Min (mV): 1253

Input Center (mV): 2220

Input Max (mV): 3296

Conversion Polarity: Direct

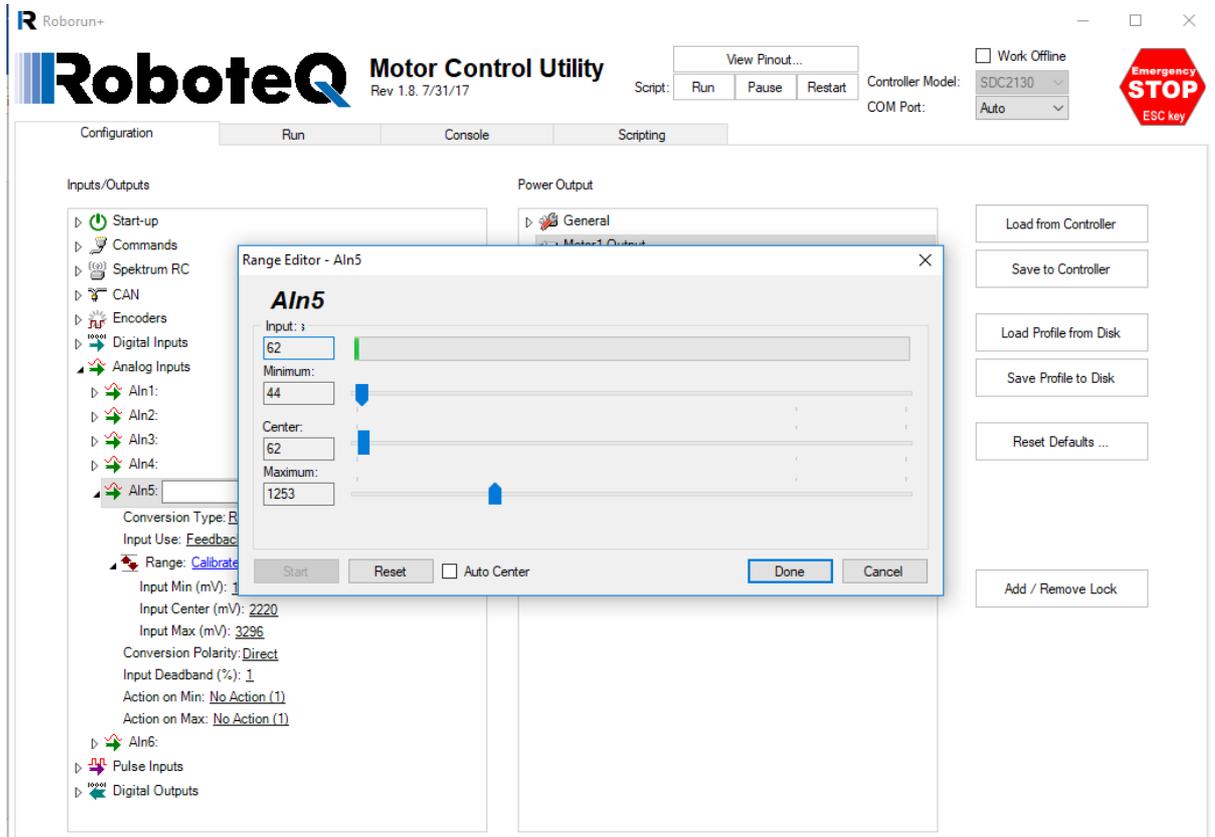
Input Deadband (%): 1

Action on Min: No Action (1)

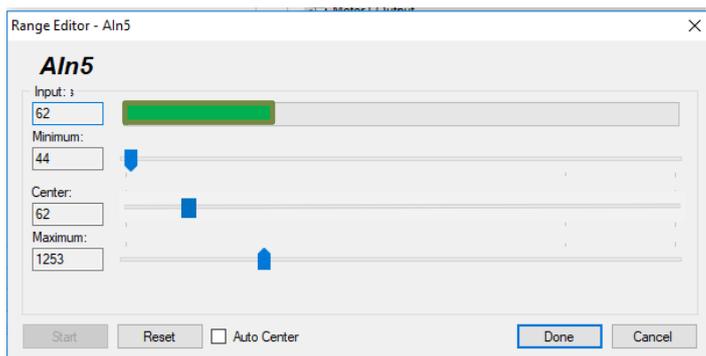
Action on Max: No Action (1)

▶ Aln6:

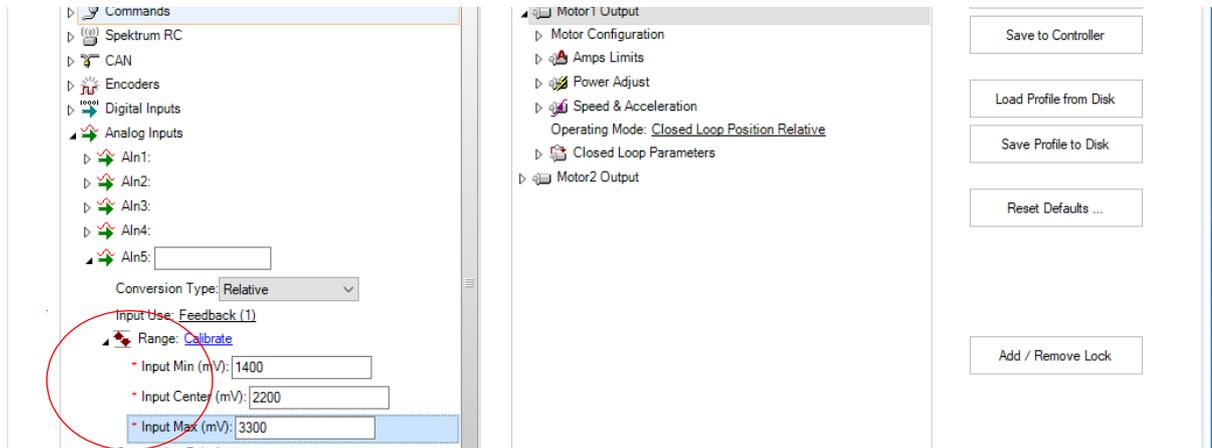
- Select "Calibrate", the calibration page should open.



- Select "Start", Then manually exercise the rudder through its range of 45 degrees to starboard and 45 degrees to port. The min and max limiters should move to the minimum and maximum points achieved.



- Center the rudder to amidships and select “Done”. This has updated the calibration settings in the software but not downloaded them to the controller yet. You should see a small red star next to each setting that has changed.

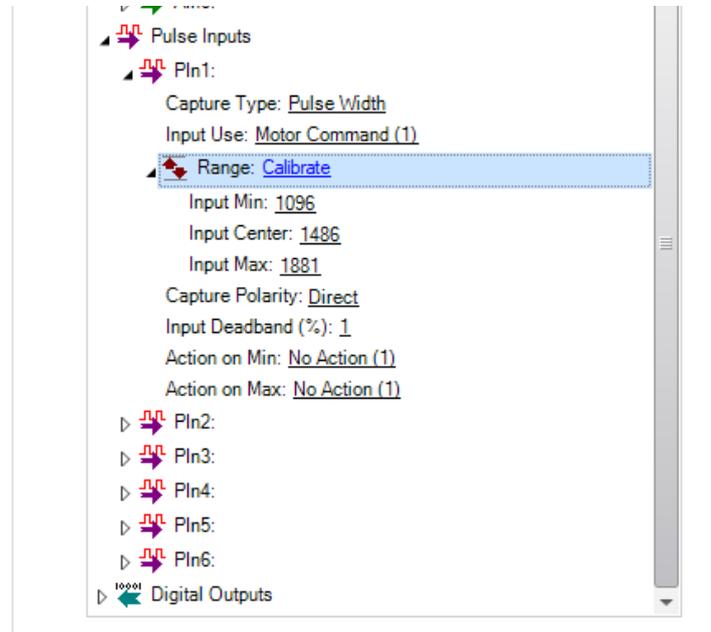


- Select “Save to Controller”. This will save the settings to the controller and the red stars should disappear from the configuration page.

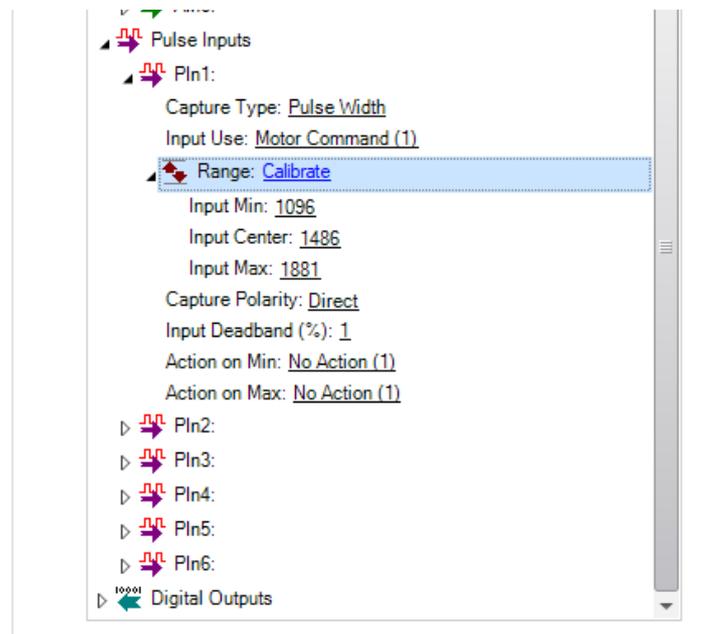
You can now plug PDE05 back in and exercise the rudder.
It is wise to save a copy of the configuration file for reference later.

4 Calibrating the Rudder Demand

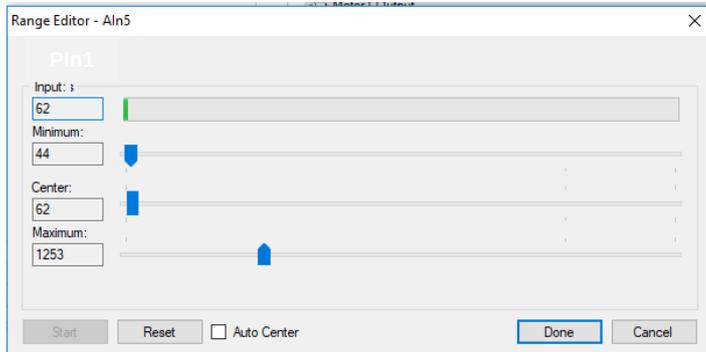
1. Select "Pulse Inputs".



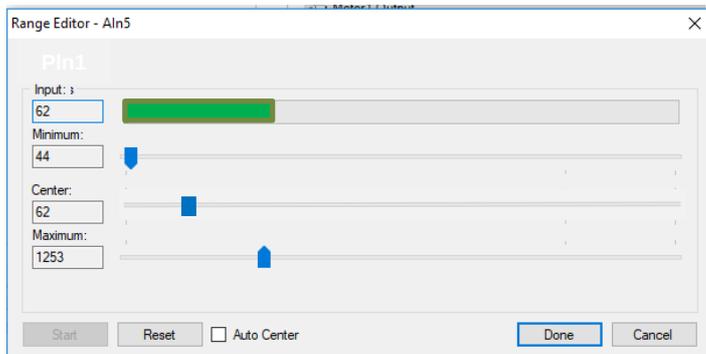
2. Select "Pin1", this is the PWM input channel and will expand a drop menu.
3. Select "Range", this should expand the Range drop menu.



4. Select "Calibrate", the calibration page should open.



5. Select "Start", Then using the controller demand maximum left and right rudder. The min and max limiters should move to the minimum and maximum points achieved.



6. Return the demand to zero(rudder amidships) and select “Done”. Again, this will have updated the calibration settings in the software but not downloaded them to the controller yet. You should see a small red star next to each setting that has changed.
7. Select “Save to Controller”. This will save the settings to the controller and the red stars should disappear from the configuration page.

You can now plug PDE05 back in and exercise the rudder.
It is wise to save a copy of the configuration file for reference later.

5 General Controller Settings

The RoboRun software allows the user to change a number of other settings for the rudder motor and it is possible to tune the closed loop characteristics.

Extreme caution should be taken if attempting to change other settings as it is possible to permanently damage the steering system. The current limits and closed loop parameters have been carefully selected in order to promote smooth running and provide the maximum life for the system.