#### Pelagic Autopilot Installation and User Guide

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#### System Overview

Congratulations on the purchase of your Pelagic Autopilot. The Pelagic is a sophisticated nine (9) axis, gyro-controlled autopilot designed to deliver top performance in a variety of conditions. Advanced features allow custom tuning for optimum performance whether cruising or on the racecourse.

The Pelagic Autopilot is comprised of three (3) components; the Control Head, Motor Drive Box and actuator. The modular nature of the Pelagic system allows support for many different applications including:

- Tiller steered boats (large and small)
- Use of Pelagic electronics with below decks RAMs (electrical or hydraulic)
- Use of Pelagic actuators with other manufacturer's obsolete electronics
- Use with popular windvanes, including the Monitor and Aries.

The Control Head provides the autopilot control functions and is typically mounted in or adjacent to the cockpit. As the Control Head contains the electronic compass and gyro sensor, it needs to be located a minimum of 6" from metal objects, including the deck compass. The unit also has an internal USB port to receive software updates. There are two (2) important concepts that need to be understood when installing and using the Pelagic; Orientation and Calibration.

- Orientation This is the process of orientating the Pelagic sensors. Because the Pelagic uses a gyro sensor(s), it needs to be oriented correctly so that as the boat pitches and rolls the feedback to the rudder is in the appropriate direction. Orientation is specified at time of ordering and preset at the factory. While Orientation can be changed by the user, it's important to install the unit as ordered or change the Orientation prior to use.
  - Stern facing example Control Head is mounted on bulkhead with control buttons facing aft (see below)
  - Bow facing example Control Head is mounted on transom with control buttons facing forward
  - Port or Starboard facing are also available options



Typical Stern Facing Installation

- Calibration This is the process of calibrating the compass. Initial calibration is performed at the factory and there is no need to recalibrate onboard unless the boat puts out strong magnetic interference.
- The Motor drive box provides power to the Pelagic system and should be installed below decks out of the elements. Two versions of the Motor drive box are available; a standard version for the Pelagic actuators and a heavy electronics version to meet the demands of large actuators and below decks drives.
- The Pelagic actuators are designed to steer small to mid-displacement vessels, by direct attachment to the tiller or windvane. The actuators are ruggedized to provide longer service life.

## System Features

- Controls most 12 volt steering systems
  - Tiller wands & wheel steering systems
  - Windvane steering control (low power)
  - Hydraulic actuators
  - Linear actuators above and below deck.
- Internal electronic tilt compensated compass
- Gyro controlled steering
- Wind following via NMEA0183
- Optional RF (wireless) Remote control
- 9 Sensor feedback sea state and enable internal compass + gyro steering
- Software upgradable

- Adaptive adjustment for sea state to minimize power
- No rudder sensor required for tiller systems
- Motor stall detection and power reduction
  - Automatic stall retry
- User calibration of key parameters
- Low power in standby: less than 0.1 amps
- No battery voltage boost module necessary, operates as low as 9 volts DC (actuator reduced power)
- Housings are IP67 rated

#### The Pelagic System – Tiller, Quadrant, Wheel, or Windvane Pelagic Components in blue **Control Head** Optional Gyro/Compass Wireless Enclosure Remote (White box) Mount above or below deck **NMEA0183** Wind Option Two wire Actuator **Tiller Drive Actuators** Motor **Electronics** - OR -Enclosure Below deck linear & (Black box) 12V hydraulic drives, wheel drives Motor or Hydr. Two wire, Pump high current 3 Wire Rudder Sensor Option (not used in standard above deck Batterv tiller installations) Clutch (not used in above deck tiller installations)

# Typical Tiller Pilot System Layout



## Tiller Wand Installation on J92 "Rag Time"



#### System Components: Standard Tiller Actuator



#### System Components: Heavy Tiller Actuator



# The System Controller

Essentially the brains of the Pelagic system, it provides the user interface for operation of the autopilot. Connects to the motor drive box via the data cable.

- IP-67 rated enclosure for above deck installation
- Contains 9 attitude sensors and compass implementation
- White button: Standby / Autopilot Mode
- Red button: Adjust course -2°, hold to tack
- Green button: Adjust course +2°, hold to tack
- Optional Wireless Remote Control allows course adjustments of 10° and 25°
- Controller also used to adjust:
  - Gain (Responsiveness)
  - Calibration
  - Orientation
  - Advanced Settings
- Contains internal USB port for system updates
- Apply Butyl tape or similar product to the back of the unit to allow for easy removal for software upgrades. Avoid using permanent or semi permanent adhesives.
- For ease of installation, the data cable has both a straight connector and a 90° connector. Either end can be used on the controller or black drive box.





Application of Butyl tape outlined in red

# The Motor Drive Box

Provides electrical connections for operation of the autopilot. Connects to the Controller via the data cable.

- Installed below deck
- Inline fuse
- Connections to actuator or a below decks systems motor (depending on configuration)
  - Clutch (below decks system)
  - Rudder sensor (below decks system
- NMEA 0183 interface for wind data



## Standard Linear Actuator

- Ruggedized construction
- Attaches to tiller 18" (457mm) forward of rudder axis
- Deck mount 24 7/16" (621mm) from tiller, using center hole
  - 2<sup>nd</sup> generation bracket allows for some adjustability
  - Extensions available
- Tiller pin = 1/4" stainless
- Fixed pin = 0.375" drops into brass deck socket
- Connects to Bulgin deck socket
- To extend the life of the actuator, consider placing a Sunbrella sleeve or plastic bag over the unit when at sea or not in use



## Heavy Tiller Actuator

- Ruggedized construction
- Attaches to tiller 18" (457mm) forward of rudder axis
- Deck mount 24-5/16" to 24-11/16" (614mm to 627mm) from tiller
  - Rod end allows for about ½" (13mm) of adjustability in/out
- Tiller pin is 5/16" stainless pin with Nylock nut and quick release hitch pin
- Rod end has M8 thread with locking nut
- Bracket through bolts onto deck
- Actuator connects to Bulgin deck socket
- To extend the life of the actuator, consider placing a Sunbrella sleeve or plastic bag over the unit when at sea or not in use



Distance: 24-5/16" to 24-11/16" (614mm to 627mm) (with tiller extended halfway)



Rod End Assembly

## Heavy Actuator Base Bracket

- Anodized Aluminum construction
  - Attaches to actuator with stainless shoulder bolt (provided)
- Bracket should be through bolted to deck to support high loads
- To remove the actuator for storage, simply remove the shoulder bolt connecting the actuator to the bracket.
  - The bracket remains permanently installed.



## Water Resistant Wireless Remote

- See Summary of RF Remote Operation for usage instructions
- Buttons Sealed with Polymer Panel under Keys
- Easy Battery Replacement



Starboard 2° or 90° Push A+B simultaneously To engage or disengage Autopilot steering

### System Components for Windvane Steering

- All windvane systems utilize standard Pelagic electronics
- Physical connectors and brackets vary by windvane model





### Small Linear Actuator for Windvane Steering

- Attaches directly to the windvane
- Components vary depending on mfg
- Ball and socket joint used for quick connect/disconnect
- Small actuators are used for Monitor and WindPilot
- The larger standard tiller actuators used for Aries and Hydrovane



Small Actuator Used With Monitor

# Installation Procedure For Above Deck Tiller Systems

# Typical Tiller System Layout



## Material Required for Tiller Installations

- Four (4) #8 mounting screws or nuts/bolts for mounting the Motor Drive box
- Two (2) #8 mounting screws or nuts/bolts for mounting the Control head
- Wire, #16 gauge or larger to connect from the Motor Drive box to:
  - The breaker/fuse on the vessel's 12V power distribution panel (2 wires)
  - The deck outlet for tiller actuator (2 wires)
  - Optional Wind Data connection (2 wires)
- Butyl tape or sealant for the hole required to pass the control head cable. Use non-permanent sealant that will allow for easy removal for software upgrades
  - Butyl tape works best
  - Do not use 5200 or semi permanent adhesives
  - Note that the control head itself is in an outdoor rated enclosure
- If installing a heavy-duty actuator, you will need bolts of sufficient length to through bolt the base bracket onto the deck

For a clean installation, we recommend maintaining the color code of the wires coming off the Drive Box as shown on the Drive Box Connections page. For example, Red to +, Black to -, Green and Yellow to the deck outlet. This will assist in the installation and in any subsequent troubleshooting.

## Electrical Connections For Tiller Steered or Windvane Systems

- Power should come from a breaker/fuse panel
- A 10 amp inline fuse is provided
- Maximum current is 15 amps
- A 20' control cable (provided) connects the Control Head with the Motor Drive Box.
- The actuator motor has a two-wire connection. If mounting the actuator on the starboard side, the green goes to black and yellow to red on the Motor Drive box.
  - For a Port side installation, the wires are reversed.
- There is a NMEA0183 input for wind steering. A gateway can be used to interface with NMEA2000. See page on Wind Steer Mode.

### Installation of Above Deck Tiller Systems

- Prior to beginning the installation, spend a few minutes to determine suitable locations for the major components of the Pelagic system. Consider the following when planning the installation:
  - Keep the Controller box a minimum of 8" away from metal objects, including wires carrying charge loads, compasses radios, radio mics, speakers etc.
  - Just because something looks stainless does not mean it is stainless. Dodger/spray hood fittings are often magnetic, as are screws, nuts and bolts. When in doubt check with a magnet.
  - The controller needs to be mounted firmly to the boat and free from vibration associated with the motor, prop etc.
    - Placing a foam pad behind the unit can help reduce vibration
  - The Control box has an internal USB port to receive software updates, so it needs to be accessible (do not glue/epoxy in place)
    - We recommend butyl tape or similar as shown
  - Cable lengths provided:
    - Cable connecting the Control and Motor boxes is 20'
    - Cable length of standard Pelagic actuator is 5'
    - Cable length of small Pelagic actuator (for windvane installations) is approximately 5'
    - 10' extension cable available
  - Keep the harness from the Motor Drive box (black) to the deck plug less than 2 meters to avoid interference
- Mount the control head level to the boat's lines both forward/aft and port/starboard and with the display pointing in the direction specified at time of order. This initial orientation is preconfigured at the factory. Note Skyward facing is not an option!
  - Stern facing example Control box is mounted on bulkhead with buttons facing aft
  - Bow facing example Control box is mounted on transom with buttons facing forward
  - Port facing example Control box is mounted on coaming with buttons facing towards Port side
  - Starboard facing example Control box is mounted on coaming with buttons facing towards Starboard side
  - Should the installation require a change in the orientation, it can be changed by following the procedure described in "Changing Orientation"
- Mount the Motor Drive enclosure below deck out of the elements with wire outlets facing downward. Use a drip loop to help keep moisture out.



Application of Butyl tape outlined in red

### Wiring Connections for Tiller Systems

#### Connecting the black box

- Refer to the photo on the next page for help in identifying the drive box wires
- Turn power off to the wires from the vessel switch panel that will provide power to the Pelagic.
- Connect the large red wire coming from the motor drive box to +12 volts, noting the presence of the inline fuse.
  - Depending on the system, the fuse will be either rated at 10 or 25 amps
- Connect the large black wire coming from the motor drive box to ground.
- Connect the data cable to the white control head and the black motor drive box.
  - If necessary, to pass through a bulkhead, the cable can be cut and respliced.
- Switch on the power. The control head will go through a boot sequence and then enter Standby Mode, shown by a slow flash of the RED LED.
- Press AUTO and confirm you see 2 or 3 green LEDs and a solid RED LED, indicating the system is in AUTO mode.
  - The number of green lights will depend on the GAIN set at the factory.
- Turn off power to the unit.
- Extend and connect the yellow and green wires from the motor drive box to the Bulgin deck socket connector and secure.
  - Wire extensions are customer supplied
  - Keep length to 2m maximum
  - Pelagic tiller actuators come prewired with a Bulgin connector, assuming they will be mounted on Starboard.
  - If the tiller actuator is mounted on the port side the yellow and green wires must be reversed.
- The other wires coming out of Motor box are tied off and not used in a typical above deck tiller application.
  - When installing and bundling the wires, we suggest creating a drip loop to avoid moisture running down the wires and onto the black box

## Drive Box Connections for Tiller Installations

Connector for cable to Control Head

10 amp fuse for standard tiller, 25 amp for below decks systems Bundled wires not used except for Wind Steering

-Black to ground +Yellow to actuator plug -Green to actuator deck plug

+12V RED to power source on panel

## Installation of Above Deck Tiller Actuators

#### Standard actuator:

- Determine which hole in the actuator base bracket to insert bracket bolt and nut
  - Center hole is
- Install bronze deck fitting for actuator 24-7/16" (621 mm) from the tiller pin, with tiller centered
  - This is measured from the middle hole on the 2<sup>nd</sup> generation bracket (shown)
  - Bracket allows distance to be adjusted in 1/2" increments
  - Depending on configuration of boat, an actuator extension may be necessary to provide necessary reach
- Install tiller pin in tiller located 18 inches (457 mm) from the axis of the rudder.



Example of tiller bracket available from Raymarine and Simrad



Heavy actuator:

- Thread the 8M rod end assembly onto end of actuator and secure with lock nut
- Once your installation is tested, we suggest securing with Loctite.
  - Install deck bracket for actuator 24.3125" (614 mm) from the tiller, with tiller centered and actuator extended halfway. Note that the rod end assembly allows the unit to be extended by an additional 3/8" (10mm) if necessary.
- Install tiller pin onto tiller. Note that the method for attaching this will vary depending on the type of tiller. The hitch pin can be used to secure it onto the actuator rod end. There will be significant loads placed on the pin, so plan accordingly.
- A wide variety of tiller brackets are available off-the-shelf from Raymarine and Simrad (shown above). You may need to drill out the bracket hole to accommodate the actuator's ball joint, but they come in a variety of sizes to fit most applications.

## **Deck Connections**

Mount the 3-pin deck socket within 4' of the actuator mounting bracket

- You will need to provide screws or nuts/bolts
- Thread one of the mounting screws through the dust cap provided

Connect yellow and green wires from the Drive Box to the back of the deck socket (see below)

• You may need to extend the wires to provide sufficient length

The 3-pin male connector on the actuator connects to the deck socket providing power to the actuator

• Note that on new, complete actuators, the connector is factory installed



#### Deck Socket



When mounting the actuator on Starboard:
+ Yellow from Motor box connects to terminal "N"
+ Green from Motor box connects to terminal "L"
Note that these wires are reversed when mounting the actuator on Port

#### The Bulgin Dust Cap/Moisture Cover Serves as a tool to open up the 3 pin plug attached to the tiller actuator



can be unscrewed with the dust cap.



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### Initial Testing of Tiller Systems

- Confirm successful installation of the unit by performing the following operations.
  - Power on the Pelagic system and allow it to boot up. This process takes approximately 12 seconds and will result in a slow, steady flashing of the RED LED indicating that the system is in Standby Mode.
  - While in Standby Mode, press the Green STAR button. If installed correctly, this will result in the actuator moving outward, which if attached to the rudder, would result in the vessel turning to starboard.
  - While in Standby Mode, press the RED PORT button and the actuator should retract, affecting a turn to PORT.
  - If the direction of the actuator arm results in the rudder being turned in the wrong direction, then the actuator wires (Green and Yellow) need to be reversed. These can be reversed at the actuator plug, inside the deck outlet or at the black box.
    - The actuator motor has a two-wires exiting the back of the unit, red and black. If mounting the actuator on the starboard side, the black wire goes to green and red to yellow on the Motor Drive box.
    - For a Port side installation these wires are reversed (green to yellow and yellow to black)
- You are now ready for a sea trial.
  - Before proceeding familiarize yourself with the operation of the system as described in System Operation
- The Pelagic Autopilot is calibrated at the factory and unless the boat has a strong magnetic field, it's not necessary to recalibrate. This can be determined during the on-water testing described below.
- For initial on-water testing, engage the autopilot in a controlled situation (calm conditions, open waters, no boats nearby) to confirm basic operation including:
  - Engage/disengage the autopilot while under motor and then under sail
  - Holding a course
  - Small course corrections
  - Test on a variety of headings
  - Failure to hold a course on different headings indicates magnetic interference, or vibration.
    - Check for metal objects within 8" of Control head and relocate if necessary
    - Recalibrate the Pelagic
      - We suggest you call or email first to discuss the installation before recalibrating

# Installation Procedures For Below Deck Systems

# Material Required for Below Deck Installation

- Four (4) #8 mounting screws or nuts/bolts for mounting the Motor Drive box
- Two (2) #8 mounting screws or nuts/bolts for mounting the Control head
- Wire, #16 gauge or larger to connect from the Motor Drive box to:
  - The breaker/fuse on the vessel's 12V power distribution panel (2 wires)
  - The below decks RAM (2 wires)
  - The clutch mechanism (2 wires)
  - The rudder sensor (3 wires)
  - Optional Wind Data connection (2 wires)
- Sealant for the hole required to pass the control head cable. Use nonpermanent sealant that will allow for easy removal for software upgrades
  - Butyl tape works well
  - Do not use 5200!
  - Note that the control head itself is in an outdoor rated enclosure

For a clean installation, we recommend maintaining the color code of the wires coming off the Drive Box as shown on the Drive Box Connections page. For example red to +, black to -, Green and Yellow to the RAM. This will assist in the installation and in any subsequent troubleshooting.

## Below Deck Systems Overview

- This section describes the installation of the Pelagic System for below deck applications. These include:
  - Installation of Pelagic Heavy-Duty Electronics and Pelagic H-Drive Hydraulic Linear Actuators
  - Installation of Pelagic Heavy-Duty Electronics and third party below deck RAM with a resistive type rudder sensor
- Prior to beginning the installation, spend a few minutes to determine suitable locations for the major components of the Pelagic system. Consider the following when planning the installation:
  - Keep the Control box a minimum of 6" away from metal objects, including wires carrying charge loads and the deck compass
    - Just because something looks stainless does not mean it is stainless. Dodger/spray hood fittings are often magnetic, as are screws, nuts and bolts. When in doubt check with a magnet.
    - Avoid locating adjacent to compasses, radios, radio mics, speakers etc.
  - The Control box has an internal USB port to receive software updates, so it needs to be accessible (do not glue/epoxy in place)
    - We recommend butyl tape or similar
  - Keep the wiring run from the Motor Drive box (black) to the RAM less than 2 meters to avoid interference
  - Cable lengths provided:
    - Cable connecting the Control and Motor boxes is 20'
    - Cable length of standard Pelagic actuator is 5'
    - Cable length of small Pelagic actuator (for windvane installations) is approximately 5'
- Position and mount the control head level to the boat's lines both forward/aft and port/starboard and with the display pointing in the direction specified at time of order. This initial orientation is preconfigured at the factory.
  - Stern facing example Control box is mounted on bulkhead with buttons facing aft
  - Bow facing example Control box is mounted on transom with buttons facing forward
  - Port facing example Control box is mounted on coaming with buttons facing towards Port side
  - Starboard facing example Control box is mounted on coaming with buttons facing towards Starboard side
  - Should the installation require a change in the orientation, it can be changed by following the procedure described in "Changing Orientation"
- Position and mount the Motor Drive enclosure below deck out of the elements, preferably in a location with air flow.
  - Do not mount in the engine compartment due to excessive heat
- Familiarize yourself with the wire harness coming from the motor drive box on the next page.

# Installation of Pelagic H-Drive RAMs

- Below decks RAMs are very powerful and require a solid mounting platform capable of supporting the loads associated with steering the vessel.
- Pelagic offers two (2) hydraulic linear RAMs, each with different mounting specifications. While the mounting brackets for the units is the same, the overall dimensions are different. Be sure to follow the specific mounting instructions for your unit.
- Proceed with installation of the Pelagic RAM per the mounting instructions included with your unit
- Once the RAM is installed, attach the linear rudder sensor per the instructions included with the unit
- Proceed to electrical connections

## Drive Box Connections Below Decks System Installation



Note: Any of the small black wires can be used for Clutch, NMEA or Rudder Sensor connections

# Electrical Connections for Below Deck Systems

#### Connecting the Motor Drive and Control Head

- Turn power off to the wires on the vessel's switch panel that will connect to the autopilot power.
- Connect the large red wire coming from the motor drive box to +12 volts.
- Connect the large black wire coming from the motor drive box to ground.
- Connect the data cable to the white control head and the black motor drive box.
  - If necessary, to pass through a bulkhead, the cable can be cut and respliced.
  - If the cable is too long, it's best to coil up and secure any excess
- Switch on the power and confirm that the control head steps through a boot sequence and then settles into a slow, steady, flashing sequence of the RED LED.
- Press AUTO and confirm you see 3 green LEDs and a solid RED LED, indicating that you are in AUTO steering mode with a gain setting of 3.
- Press AUTO to return to STANDBY mode.
- Turn off the power to the system.

#### Connecting the Below Deck Actuator to the Motor Drive

- Turn off the power to the system.
- Wiring of the below deck actuator depends on the orientation of the actuator relative to the tiller arm that it is attached to.
- Refer to diagram on the following page to determine which of the four (4) possible orientations you have and the corresponding wiring configuration.
- Connect the Yellow and Green wires from the motor drive to the corresponding +/- wires on the actuator per the orientation of your actuator as noted above.
- Turn power on and allow the system to boot. On completion of the boot sequence and with the system flashing the RED LED, press the GREEN button momentarily, then repeat with the RED button.
  - Pressing the GREEN button should push the actuator out a small amount
  - Pressing the RED button should retract the actuator
  - If the movement is the opposite of what it should be, reverse the wires and retest
- Turn off the power to the system.
- The next slide describes clutch and rudder sensor connection.

### Connecting the Actuator

Wiring of the below deck actuator depends on the orientation of the actuator relative to the tiller arm that it is attached to.

Refer to diagram below to determine which of the four (4) possible orientations you have and the corresponding wiring configuration.

Connect the Yellow and Green wires from the motor drive to the corresponding +/- wires on the actuator per the orientation of your actuator as noted below.



# Connecting the Below Deck Clutch

- Turn off the power to the system.
- The linear motor will have two, small diameter wires, typically labeled "clutch", "bypass", "coil", or "magnetic clutch".
- Connect one of these two wires to the small YELLOW wire and the other to one of the three small BLACK wires coming from the motor drive box. YELLOW is +.
- When connecting to the Pelagic H-Drive, connect the small yellow wire from the motor drive box to Pin 1 and a black wire to Pin 2 as shown
   Pelagic H-Drive Clutch Connection
  - Use ring connectors to make the connection


# Connecting the Rudder Sensor

- The rudder sensor is an important safety component of the Pelagic autopilot system, enhancing performance and protecting the boat and autopilot from damage that can occur when the steering system is pushed beyond it's limits
- The Pelagic will operate without these connected but there is risk of driving the actuator and rudder to a mechanical limit and causing damage to a component or the boat.
- The small RED, ORANGE, and one small BLACK wire coming from the motor drive box are the rudder sensor inputs.
- ORANGE senses the rudder position and the small RED and BLACK wires provide power to the sensor.
- These connections are explained in the next several slides.
- If you purchased a Pelagic H-Drive Actuator with integrated sensor, proceed to the slide titled "Connecting the H-Drive Linear Rudder Sensor"

## **Rudder Sensor Connections**

A rudder sensor is an important safety component of your below decks autopilot. The Pelagic system requires that a resistive type sensor be used. Wiring of the sensor varies by manufacturer and the orientation of the RAM in relation to the rudder post as illustrated on the following page.

Examples are provided for the Pelagic H-Drive sensor, the Raymarine M81105 and for Alpha Marine sensors in subsequent pages.

If your sensor is different, you can use a Digital Voltmeter (DVM) to determine how to connect to the Pelagic wires to the sensor.



Using a DVM for testing:

- Set the scale to 20K ohms
- Use the red and black test leads
- Resistor reading should be between 2000 and 20000 ohms.
- B to A or C will always be lower in value then A to C. Once B is identified, it should connect to the orange wire on the Pelagic.

### Connecting the H-Drive Linear Rudder Sensor

- Wiring of the sensor depends on the orientation of the actuator relative to the tiller arm that the actuator is attached to on which the sensor is mounted
- Refer to diagram below to determine which of the four (4) possible orientations you have

Towards Bow

• Refer to wiring table on next page



## Connecting the H-Drive Linear Rudder Sensor

- The Pelagic H-Drive comes with a linear rudder sensor sized for the H-Drive RAM
- Attach the rudder sensor to the RAM per the instructions included with the sensor unit.
- Connect the wires per the orientation on the prior page as follows:

Pelagic Motor Drive Box	Starboard Actuator	Port Actuator	Starboard Actuator Tiller Arm Rear Facing	Port Actuator Tiller Arm Rear Facing
Red	Black	Red	Red	Black
Orange	Yellow	Yellow	Yellow	Yellow
Black	Red	Black	Black	Red



### Connecting a Raymarine Rudder Sensor

- The Pelagic system is compatible with the Raymarine M81105 rotary rudder sensor
  - The Pelagic is compatible with many other models too. Contact us to confirm.
- The Alpha rudder sensor typically has three (3) small wires; red, white and green
- Connect the wires per the orientation on the prior page as shown below
- Test to confirm that wiring is correctly configured prior to using the autopilot

Pelagic Motor Drive Box	Starboard Actuator	Port Actuator	Starboard Actuator Tiller Arm Rear Facing	Port Actuator Tiller Arm Rear Facing	
Red	Red	Green	Green	Red	
Orange	Blue	Blue	Blue	Blue	
Black	Green	Red	Red	Green	



The Raymarine M81105

### Connecting an Alpha Marine Rudder Sensor

- Most Alpha Marine linear drives have an integrated rudder sensor. See example below.
- The Alpha rudder sensor typically has three (3) small wires; red, white and green
- Connect the wires per the orientation on the prior page as shown below
- Test to confirm that wiring is correctly configured prior to using the autopilot

Pelagic Motor Drive Box	Starboard Actuator	Port Actuator	Starboard Actuator Tiller Arm Rear Facing	Port Actuator Tiller Arm Rear Facing
Red	Red	White	White	Red
Orange	Green	Green	Green	Green
Black	White	Red	Red	White





Rudder sensor wires

#### Rudder Sensor Mode Visual Display

- When in Rudder Sensor mode, the GREEN LEDs show the sensor position in 1 of 9 positions
- The movement of the lights allows for confirmation that the sensor is wired correctly
  - Moving the rudder to Port will result in decreasing lights
  - Moving the rudder to Starboard will increase the number of lights
  - If the reverse is true, i.e., more come on while moving to port, the rudder sensor RED and BLACK wires are reversed.
- Note that the LEDs only indicate rudder position when in rudder calibration mode, not during normal operation of the autopilot



MOVING RUDDER TO STARBOARD GREEN LIGHTS TURN ON

IF THEY PROGRESSIVELY TURN MOVING TO PORT, THE RUDDER SENSOR CONNECTIONS NEED TO BE REVERSED



Reset to factory settings:

- 1. Enter Rudder Sensor Mode as above.
- 2. Exit to Standby by holding AUTO for 3 seconds
- 3. This will return to factory settings without recording a PORT or STBD setting.

### Rudder Sensor Troubleshooting

- See "Rudder Sensor Connections" above for an explanation of how rudder sensors work.
- Be sure to back off ¼ turn in each direction before saving rudder position
- If the actuator appears stuck to one side, you may have the sensor wired backwards.
- To re-center the actuator, disconnect the ORANGE sensor wire and do the following:
  - In standby, press the RED or GREEN button to position the actuator back towards center.
  - Reverse the small RED and BLACK sensor wires to the sensor.
  - Reconnect the ORANGE wire and try recalibrating.
- To return to factory default settings:
  - Power off the Pelagic system
  - Power on and navigate to rudder calibration mode
    - Press and Hold STAR and AUTO During Power Up
  - Without touching the red or green buttons while in calibration mode, exit by pushing the AUTO button for 3 or more seconds

# Final Check for Below Deck Systems

- Check connections and provide power to the system.
- Once powered up and the boot process completed, the Control box will flash a Red LED at the rate of one flash per second
- Successful installation of the unit can be confirmed at this time by pressing the Green button. If installed correctly, this will result in the actuator moving outward, which if attached to the rudder, would result in the vessel turning to starboard. The actuator arm can then be retracted by pressing the Red button.
  - If the direction of the RAM arm results in the rudder being turned in the wrong direction, then the GREEN and YELLOW wires from the motor drive box to the RAM may need to be reversed.
  - For a Port side installation these wires are reversed (green to RED and yellow to black) CORRECTED
- Refer to System Operation for operational guidelines
- The Pelagic Autopilot is calibrated at the factory and unless the boat has a strong magnetic field, it's not necessary to recalibrate. This can be determined during the on-water testing described below.
- For initial on-water testing, engage the autopilot in a controlled situation (calm conditions, open waters, no boats nearby) to confirm basic operation including:
  - Engage/disengage the autopilot
  - Holding a course
  - Small course corrections
  - Test on a variety of headings
  - Failure to hold a course on different headings indicates magnetic interference
    - Check for metal objects within 8" of Control head and relocate if necessary
    - Recalibrate the Pelagic
- For those concerned with optimal performance, a set of sophisticated Dynamic Parameters are available to fine tune the Pelagic system. These are typically used by racers and beyond the scope of the typical user. They can be found in Advanced Features Settings.

# Final Check for Below Deck Systems

- Check connections and provide power to the system.
- Once powered up and the boot process completed, the Control box will flash a Red LED at the rate of one flash per second
- Successful installation of the unit can be confirmed at this time by pressing the Green button. If installed correctly, this will result in the actuator moving outward, which if attached to the rudder, would result in the vessel turning to starboard. The actuator arm can then be retracted by pressing the Red button.
  - If the direction of the RAM arm results in the rudder being turned in the wrong direction, then the GREEN and YELLOW wires from the motor drive box to the RAM may need to be reversed.
  - For a Port side installation these wires are reversed (green to yellow and yellow to black)
- Refer to System Operation for operational guidelines
- The Pelagic Autopilot is calibrated at the factory and unless the boat has a strong magnetic field, it's not necessary to recalibrate. This can be determined during the on-water testing described below.
- For initial on-water testing, engage the autopilot in a controlled situation (calm conditions, open waters, no boats nearby) to confirm basic operation including:
  - Engage/disengage the autopilot
  - Holding a course
  - Small course corrections
  - Test on a variety of headings
  - Failure to hold a course on different headings indicates magnetic interference
    - Check for metal objects within 8" of Control head and relocate if necessary
    - Recalibrate the Pelagic
- For those concerned with optimal performance, a set of sophisticated Dynamic Parameters are available to fine tune the Pelagic system. These are typically used by racers and beyond the scope of the typical user. They can be found in Advanced Features Settings.

## Installation Procedure For Windvanes

# Installing with a Windvane

Except for how the actuator is mounted, the installation of the Pelagic autopilot for windvanes is like the standard tiller system.

The type and mounting location of the actuator varies depending on the windvane being used. For example:

- The Monitor uses a small actuator that mounts on the D-ring and connects to the Monitor's gearset
- The Aries uses a standard tiller actuator mounted on a vertical leg, connecting to a specialized bracket in lieu of the airvane
- For CapeHorn and Hydrovane, our standard tiller systems can be used. In these installations, the actuator bracket mounts on the boat (not the windvane) and will vary boat to boat.

Before beginning the installation of the Pelagic electronics, we recommend mounting the actuator onto the windvane to determine the best location for the Bulgin deck connector. This connector provides power to the actuator and needs to be in proximity for the actuator cable to reach.

- Note that the cable from the actuator is approximately 59" in length.
- If necessary, the length of the actuator wire can be extended by splicing additional wire onto the end.
  - Add additional wire to the end of the wire with the male Bulgin connector. DO NOT attempt to add wire by opening up the actuator motor housing.

Install the Pelagic control head and motor drive box in accordance with the installation procedure for a standard Pelagic Tiller system and the actuator per the instructions for your brand of windvane.

### Setting Parameters for Windvane Steering

The Pelagic Autopilot is preconfigured from the factory to perform well on most boats in a variety of conditions. If ordered for windvane steering, your Pelagic Autopilot is preconfigured from the factory with the following settings:

Gain 2

If you are already using the Pelagic for traditional tiller, wheel or below decks steering and are now connecting it to your windvane, you may find it necessary to adjust the Pelagic's parameters for optimal performance.

Even minor changes to the parameters can make a big difference in the overall performance of your system. When adjusting the parameters make small, incremental changes and document the results. You will likely end up with two configurations; windvane steering and traditional steering.

### Installing the Actuator on a Monitor Windvane

The Pelagic system for the Monitor windvane is comprised of three (3) major components:

- The Controller
- Motor drive box
- Actuator mount including:
  - Small actuator
    - Polarity (ships with polarity set for starboard mounting)
    - Shipped out partly extended to aid in hook up
  - D-Ring Palette assembly (plate, u-bolts and lanyard)
  - Gearset bracket assembly

Because the Pelagic is steering the boat through the Monitor windvane, things can get a bit confusing. A simple way to test the functionality of the system is as follows:

- With Actuator installed on Starboard side of Monitor
  - Pressing the Port button while in Standby Mode should extend the actuator. Likewise pressing STAR, will retract the actuator
    - If not, reverse the wires to the actuator.

## Installed Monitor Brackets Quick pin and ball joint allows quick release



Frame Bracket Installed

Pinion Bracket Ball Joint Connection



### Using With a Monitor Windvane

#### To use the Pelagic with the Monitor windvane:

Remove the airvane from the Monitor

Attach the actuator to its base bracket and connect the ball joint at the end of the actuator RAM to the receiver on the Monitor gear set

- Power on the Pelagic Autopilot
- Remove the airvane from the Monitor
- Attach the actuator to the gearset bracket
- Hand steer to desired course
- Lower water paddle going  $\leq$  4 kts
- Center the waterpaddle
  - You will find the remote control useful for this
- Make sure the control lines to the helm are tight
- Engage the autopilot by pressing the AUTO button

#### To disengage the Pelagic from the Monitor windvane:

- Disengage the Monitor's control lines from your wheel or tiller and you are now hand steering
  - Note the waterpaddle is still in the water and may affect your maneuverability
- Disengage the Pelagic by pressing the AUTO button
- Raise and secure the Monitor's waterpaddle when safe to do so

#### **Helpful Hints:**

Eliminate as much friction from the Monitor system as possible

- Make sure blocks on Monitor turn freely
- Make sure blocks leading the control lines to wheel/tiller are running free
- Start out with the Pelagic Gain set to 2 and adjust from there

The Monitor is a servo-pendulum system and derives its power from the force of the water passing the waterpaddle. This requires the boat to be moving fast enough to generate the necessary force and will vary depending on many factors including current, wind and type of boat.

## System Operation

### Operation

BUTTON	Auto-push	Port-push	Star-push	Auto-3sec hold	Port-3sec hold	Star-3sec hold	Port-6sec hold	Star-6sec hold
Standby mode (red LED slow flash)	Go to Auto Mode	Rudder to PORT	Rudder to STAR	Wind Mode enable/disable	Go to GAIN adjust	Reserved For Future Use	DIM Display Flashes at each level	Reserved
Auto mode (red LED solid )	Go to Standby	Turns 2° to Port 10° and 25° turns require use of remote control	Turns 2° to Starboard 10° and 25 turns require use of remote control	Wind Mode enable/disable	Tack to PORT	Tack to STAR	DIM Display Flashes at each level	Reserved

Feedback Adjustments: Hold the AUTO button at power up as the boot sequence completes. Orientation mode: Hold the PORT button at power up as the boot sequence completes. Compass Calibration: Hold the STAR button at power up. (see main manual for detail).

#### **Quick Reference Guide**



### **Controller Front Panel Operation**



#### **Remote Control Operation Summary**



### Summary of RF Remote Operation

BUTTON	Push A & B	Port push (A)	Star push (B)	Hold A & B 3 sec	Port 3sec Hold	Star 3sec Hold	Port 6sec Hold	Star 6sec Hold	RF Remote PORT & STAR Simultaneously
Standby mode (red LED slow flash)	Go To Auto mode	Rudder to PORT	Rudder to STAR	Wind mode enable/disable	Go to GAIN adjust	Reserved	DIM Display It will each DIM level		Go To Auto mode (same as pushing AUTO button)
Auto mode (red LED solid )	Go To Standby	Turn 2° to Port	Turn 2° to Starboard	Wind mode enable/disable Port -	Tack to PORT 2°, Tack Starboard +	Tack to STAR 2°, Tack	DIM Display It will flash at each		Go to Standby
Release 6	0 addendu	m:					DIM		
<ul> <li>Pressing C or D will move rudder 10°</li> <li>Press and hold C or D for 3 seconds to</li> </ul>									
move rue	dder 25°					Port -2	25°, 95°		

### The Gain Setting

GAIN is an important parameter setting that determines how aggressively the autopilot responds to conditions to keep the boat on course. The Pelagic system uses its compass, gyros and steering algorithms, individually and in combination, to keep the boat on course. When and to what extent it uses these is determined by the GAIN setting.

Typically, a lower GAIN setting is recommended for calm conditions and a higher GAIN setting for rough conditions. However, many factors including boat type, rudder design and sea state will determine how your boat will perform at a particular GAIN setting in calm or rough conditions.

We strongly suggest that you experiment with different GAIN settings in a variety of conditions, to determine the optimal GAIN setting(s) for your boat. For optimal performance, you should be prepared to alter the GAIN setting to match the conditions. Also, as the Pelagic uses more power at higher GAIN settings, setting the GAIN to match conditions will also help conserve power.

The Pelagic leaves the factory with a GAIN setting of three (3). This is a good starting point to begin your on-water testing.

The GAIN adjustment procedure is explained below.

## **GAIN** Parameter Settings

The Pelagic leaves the factory with a GAIN setting of three (3), a good starting point to for most boats. Depending on the GAIN setting, the Pelagic system may use the compass, gyros and steering algorithms to steer the boat. This is illustrated in the table below.

SETTING	SEA CONDITIONS	FEEDBACK
1 /2 LAMP	Light Conditions – Motoring	Compass
1 LAMP	Light Conditions - Motoring	Compass
1 ½ LAMP	Light – Moderate - Motoring	Compass
2 LAMP	Moderate – Small Chop	Compass, Light Gyro
2 ½ LAMP	Moderate – Light Gusts	Compass, Light Gyro
3 LAMP	Moderate - Medium Gusts	Compass, Medium Gyro
3 ½ LAMP	Moderate – Larger Seas – Moderate Power	Compass, Medium Gyro
4 LAMP	Heavy – Larger Seas – High Power	Compass, Gyro and Roll
4 ½ LAMP	Heavy - Gusty, large sail area – Very High Power Power level in large seas could overheat motors	Compass, Gyro and Roll

#### Adjusting the GAIN

The GAIN is displayed whenever the Pelagic is placed into Auto mode, with the GAIN setting equal to the number of green LEDs illuminated. These can be shown in both solid and flashing states. For example, a GAIN of 3 is displayed as 3 solid green lights, whereas a GAIN of 3-1/2 is displayed as 3 solids and a flashing green.

The Pelagic is preset at the factory with a GAIN setting of 3. In general, a GAIN setting of 3 is suggested for boats with fin keels and spade rudders. A GAIN setting of 2 is suggested for full keel cruising boats.

To set the GAIN while in Standby mode:

- 1. Power up the Pelagic system
- 2. When in standby mode, press and hold the red PORT button for approximately 3 seconds. The red light will flash and the current gain setting will be displayed.
- 3. To increase gain, press the green STBD button repeatedly until the desired level is reached.
- 4. To decrease gain, press the red PORT button repeatedly until the desired level is reached.
- 5. To save the setting, press the AUTO button for 1 second.
- 6. The new gain setting will be displayed the next time the Pelagic is placed in Auto mode.



### Tack Angle Adjustment

Adjusting the tack angle requires making changes to the autopilot's parameters while underway. Make sure adequate precautions are taken during this time to avoid collisions with other vessels or property.

The tack angle is pre-set at the factory to tack the boat 90°. However, the boat's ability to complete a tack at this setting depends on several factors including hull design, location of the actuator pin on the tiller (if so equipped), sail plan in use at the time, and sea/weather conditions to name a few. If the boat is going too far over or under during a tack, the preset factory tack angle can be adjusted accommodate these variables.

The factory tack angle can be increased up to 105° or down to 80° in 2° increments via the following procedure:

- While in AP Mode, press the GREEN button for 3 seconds initiating a Starboard tack Be sure conditions permit a safe tack to starboard!
- During the tack, a five (5) second adjustment window will open in which you can increase or decrease the tack angle
  - Increase the tack angle in +2° increments by pressing GREEN
  - Decrease the tack angle in -2° increments by pressing RED
- To save the new tack angle, press AUTO button within the 5 second adjustment window Note that you may not be able to reach your desired tack setting during a single five (5) second adjustment window. Likewise, you may find the need to increase or decrease your newly established tack angle. Simply repeat the adjustment process until the desired angle is achieved.

### Tack Angle Adjustment



#### Wind Mode Feature for Steering to an Apparent Wind Angle

The Pelagic can adjust the steering angle based on the apparent wind direction

To enable the Wind Steer feature, the Pelagic needs to receive wind input directly from the NMEA 0183 network or from an NMEA 2000 network via a gateway

The sentence "xxMWV" or "xxVWR" is used as the basis for computing the apparent wind angle, with "xxMWV" taking precedence if both are present in the system, as "xxVWR" is used for legacy systems.

Connect the small Green (+) and Black (-) wires from the Drive box to your NMEA output, using OUT+ and OUT- on your NMEA output port. Note various manufactures may use slightly different terms for the NMEA0183 inputs and outputs. These wires are located in the unused bundle of wires coming out of the back of the Drive box, with the ends wrapped in heat shrink tubing.

- Carefully cutaway the heat shrink tubing and identify the Green and black wires
  - Note that there may be 3 black wires, in which either can be used as NMEA ground



#### Notes on Steering with the Wind Mode Feature

Many factors affect the overall performance of the system when in wind mode, including the configuration and speed of the NMEA network which can vary from vendor to vendor. The data rate of the installed wind instruments, and the damping rate of the same is often adjustable. Those rates impact the performance of the Pelagic Wind Mode. It is worth spending some time to understand your NMEA network before opting to use the wind mode feature.

If wind data is not present on the NMEA network the Pelagic will not go into Wind Mode. Lack of wind mode data can be the result of several things including:

- 1. NMEA network is not creating/sending "xxVWR" or "xxMWV" sentences
  - Make sure that instruments are generating and sending xxVWR or xxMWV sentences over the network
- 2. The NMEA network is overloaded with extraneous data (clutter) and the Pelagic's search is timing out
  - Filter out data not required on the network
- 3. The Pelagic input wires are improperly connected to the NMEA network
- 4. The NMEA2000 to 0183 gateway is not configured correctly
- 5. Not entering Wind Mode correctly on the Pelagic Control head
  - Press and hold the Auto button for 3 seconds while in Standby mode
  - When done correctly, the Standby light will go from flashing red to a short flash followed by 2 longer flashes

Performance tuning of wind data is available. Like the GAIN setting, this allows the user to adjust the sensitivity of the Pelagic system with respect to the NMEA network. The higher the sensitivity the more active the rate will be. Likewise, the lower the sensitivity, the lower the rate. See Wind Data Smoothing.

Important notes on tacking while in Wind Mode:

- 1. When a tack command is entered, wind mode is turned off for 60 seconds and the boat turns through the set tacking angle.
- 2. When the tack is complete, the boat will be on a new heading. The apparent wind angle associated with the that new heading will become the new course for steering in Wind Mode.
- 3. The boat does not resume the previous wind angle.

#### WIND MODE (Apparent Wind Angle)

Enter Wind Mode by pressing the AUTO button for 3 seconds while in Standby Mode



WIND MODE: The Pelagic adjusts the steering angle based on the apparent wind angle. The relative wind angle is received from the NMEA-0183 data bus. The sentence "xxMWV" or "xxVWR" or is used as the basis for computing the apparent wind angle, with "xxMWV" taking precedence if both are present in the system, as "xxVWR" is used for legacy systems.

TACKING: When a tack is commanded, wind mode is turned off for 60 secs. The boat turns thru the set tacking angle. When the tack is complete, and the WINDTACKPERIOD has passed, the new steering angle is the wind angle that the boat is on after the tack. The boat does not resume the previous wind angle. It is assumed after a tack a new apparent wind angle will be required.

#### Wind Data Smoothing

The Pelagic uses Wind Data Smoothing to filter the wind data to provide more consistent wind input system. This can result in a steadier course and less power used.

- When racing, the response rate would typically be turned up to respond to each wind shift, no matter how small.
- If cruising, you may prefer a lower, less responsive setting.

When in wind mode, the health and performance of the boat's NMEA network will also play a role in the overall performance of the autopilot. For example, the data rate of the installed wind instruments and the damping rate of the same is often adjustable. Those rates impact the performance of the Pelagic wind mode.

The Pelagic's Data Smoothing and the damping adjustment of the wind instruments work in tandem to arrive at a wind shift response speed. Also, the speed of the NMEA network, often only 1 wind sentence per second, can impact wind shift reaction time. See your wind instrument manual to understand how those adjustments are made.

#### Wind Data Smoothing



With Wind Data Smoothing, the Pelagic system filters the wind data to provide more consistent wind input. This can result in a steadier course and less power used.

When racing, the response rate would typically be turned up to respond to each wind shift, no matter how small. If cruising, you may prefer a lower less responsive setting.

Each boat will behave differently and the health and performance of the boat's NMEA network will also play a role in the overall performance of the system when in wind mode.

The number of green lights will reflect level of wind response rate

• More green means faster response (more actuator movement), fewer green slower response (less actuator movement)

# Orientation of Compass and Gyro

- Orientation is the process of orienting the compass and gyros correctly, so that as the boat pitches and rolls, the feedback to the rudder is in the appropriate direction.
- Initial orientation of the Pelagic is specified by the customer when ordering and is preconfigured at the factory. Unless the final installation is different, there is no need to reorient the unit.
  - Stern facing example Control box is mounted on bulkhead with buttons facing aft
  - Bow facing example Control box is mounted on transom with buttons facing forward
  - Starboard facing example Control box is mounted on port side of cockpit with buttons facing starboard
  - Port facing example Control box is mounted on starboard side of cockpit with buttons facing port
- Should the installation require a change in the orientation, it can be changed with the following procedure. Note that reorientation of the system requires recalibration of the compass.
  - Power on, then press and hold the PORT (red) button until the bootup process completes.
  - The RED LED will flash three long flashes when in Orientation Mode and one or more of the 4 GREEN LEDs will be lit, indicating the current orientation.
    - A GREEN LED lit on the far right side indicates Stern facing orientation
    - A GREEN LED lit on the far left side indicates Bow facing orientation
    - The two GREEN LEDs lit on the far left indicate Port orientation
    - The two GREEN LEDs lit on the far right indicate Starboard orientation
  - Pushing the PORT button will move the lit GREEN LED to the port or starboard side.
    - The 4 GREEN lights will flash 3 times during the transition
  - Once orientation setting is correct, push AUTO for approximately 3 seconds to store setting and return to standby mode or push STAR for approximately 3 seconds to store setting to enter calibration mode
  - Recalibrate the system before using the Pelagic autopilot

### **ORIENTATION SELECTION (Orienting the control head)**



Note: At the end of the calibration process, one GREEN LED will end up being displayed nearest starboard rail of the boat.

- If bow facing, the illuminated GREEN LED should be nearest the flashing RED LED
- If aft facing, the illuminated GREEN LED should be furthest from the RED LED
- If port facing, two GREEN LEDs will illuminate nearest the RED LED
- If starboard facing, two GREEN LEDs will illuminate furthest from RED LED
### Calibrating the Compass - Overview

- The electronic compass is located inside the Pelagic control head
- Initial calibration of the Pelagic is performed at the factory and it is typically not necessary to recalibrate the unit.
- However, if there is magnetic interference from foreign objects on the boat, or if orientation is changed, then it will be necessary to recalibrate on the vessel. This allows the Pelagic to compensate for the boats unique magnetic signature or change in orientation.
- Best done in calm conditions
- Can be performed under motor, under sail or at the dock.
- Compass calibration can be performed with the control head mounted in place or unmounted. If unmounted, place on a flat surface onboard, away from magnetic interference
- The process involves rotating the control head clockwise around 8 points of the compass
  - The 4 cardinal points and 4 intercardinal points of the compass
  - The starting point depends on orientation of control head
- If you fail to save the calibration prior to powering down the unit, calibration will not be saved and will revert to prior values.
- If the calibration process is not successful, when the system reboots, the far-right GREEN LED will turn solid and the port RED LED will flash rapidly, indicating a poor calibration.



#### Calibrating the Compass

- If calibrating the compass with the control head mounted on the boat, begin the process with the boat facing north and follow the instructions for your unit's orientation. A stern facing example is provided on the next page.
- If calibrating the compass with the boat in its slip:
  - Print out the compass diagram on the next page
  - Unmount the control head and with data cable connected, place it on the compass diagram in accordance with the orientation of the unit. This considers the stern, bow, starboard or port facing orientation of the unit. Examples are provided in subsequent pages.
- Begin the process by entering Compass Calibration Mode
  - Press and hold STBD button through entire boot process
    - This is approximately 14 seconds
    - Initial lights indicating boot process will disappear entirely and then come back
    - Solid RED will return followed be the flashing of all Green LEDs
    - Red LED will flash rapidly indicating Calibration Mode



- If the calibration process is not successful, when the system reboots, the far-right GREEN LED will turn solid and the port RED LED will flash rapidly, indicating a poor calibration.
  - If this occurs, reboot holding the STBD button through the entire boot process (approx. 14+ sec) until the green light disappears and the system comes up in calibration mode as described above
  - Repeat calibration process until successful
- To return to factory calibration settings, enter calibration mode as described above and without making any changes, press and hold the GREEN button for 3 seconds. The Green LEDs will flash repeatedly. This will restore the factory calibration settings.

#### Compass Calibration Example – Stern Facing

- Starting point for stern facing example is shown below. Refer to next page for other examples.
- Turn to starboard in 45° increments around 8 compass points.
- Hold each heading for approximately 10 secs before pressing AUTO for 1 second and moving on to next point.
- Lights progress at each calibration point, starting with a single flashing Green to 4 solid Green LEDs on completion
- Press and hold AUTO for 3 seconds to store settings



#### **Compass Calibration**

- The starting point for compass calibration depends on orientation of control head
  - Stern, Bow, Starboard or Port facing



#### **Compass Calibration**

NOTE: If calibration process is not successful, the right GREEN LED will turn solid and the port RED LED will flash rapidly the next time the system reboots, indicating a poor calibration.

#### Red LED flashes this sequence Red LED flashes this sequence Sail a circle to starboard POWER UP UNIT Hold STAR until boot completes

degrees

RESET: If you exit this process by powering down prior to the last step, the compass calibration values are reset to factory settings and are not saved.



#### **Confirming Compass Calibration**

The Red LED flashes this

sequence when entering

compass CAL mode

Hold STAR

until boot completes

You are now in

**Compass Cal** 

Mode °

The Pelagic system automatically checks the validity of the compass calibration at system start up. If it determines that the compass calibration is unacceptable, the far-right Green LED will remain light after the start up sequence completes. It is also possible to confirm the calibration with the following procedure. This is useful in the following scenarios:

- 1. While the units leave the factory with preset calibrations, boats can have magnetic fields that can affect the calibration. For example, when installing a system on a steel hull, the system will pass the automatic calibration check, but magnetism associated with the steel hull can interfere with the system's performance.
- If the system orientation is changed, the system will need to be recalibrated. This tool is useful to verify that both the orientation and calibration were done correctly.

This diagnostic tool checks calibration within a +/- 3° window of each cardinal heading, allowing you to verify that a calibration was performed correctly. If correct, the Green LEDs will display a light sequence specific to each cardinal heading as shown below.



### Advanced Features

The Pelagic Autopilot is preconfigured from the factory to perform well on most boats in a variety of conditions.

Nevertheless, there may be situations where additional tuning is required, particularly with high performance boats.

For those concerned with optimal performance, the Pelagic system can be fine-tuned to accommodate the demands of highperformance boats through a series of advanced features called Dynamic Parameters.

Given the number of options available and complexity of the system, it is strongly recommended that you familiarize yourself with the operational characteristics of your Pelagic autopilot before attempting to change the Dynamic Parameters. Dynamic Parameter Adjustment – Enable at Power Up (when in this mode the GAIN is preset to 3)

- Power up and hold the AUTO button until boot process completes.
- The RED led will flash a long-short, long-short pattern.
- The STAR/PORT buttons are pressed to select the parameter to adjust as indicated by which green LED is lit
- The AUTO button switches to autopilot steering and then allows adjustment of the selected parameter while in AUTO mode.
  - Pressing AUTO again takes you back to parameter selection.
- Pressing and HOLDING AUTO for 3 seconds will save the new settings and reboot the autopilot.

## Dynamics Parameter Settings

#### GAIN set to 3

- Full keel boats (starting settings):
  - Low Speed Course Correction (KISub) = 0
  - Course Correction (KI) = 1.5
  - Yaw Suppression (KP) = 3
  - Yaw Damping (KDI) = 0
  - Yaw Acceleration Rate (KYDD) = 3.5
- Wind Vane control
  - Low Speed Course Correction (KISub = 0
  - Course Correction (KI) = 1.5 second,
  - Yaw Suppression (KP) = 3.5 Gyro feedback start going up, if bad, go down
- Yaw Damping (KDI) = 0 O LIGHTS Reserved Yaw Acceleration Rate (KYDD) = 3.5 Last Gyro feedback last
- 1 KI
- 2 KP
- 3 KYDD
- 4 KD Reserved

## Adjustment of Dynamic Parameters

Light OFF: Reserved for future use Light 1: Course correction Light 2: Yaw suppression Light 3: Yaw damping (similar to continuous course correction but uses Rate Gyro) Light 4: Yaw rate of change damping adjustment (helps with gusting winds/seas) (KYDD)

Green lights from left to right

O LIGHTS Reserved 1 KI 2 KP 3 KYDD 4 KD Reserved



actively steering the boat



## Optimization Adjustment Method Listed in order of green LED, left to right

Adjust settings in mild conditions, flat water.	Parameter Selection
Low speed course correction (DONT CHANGE)	0000
Course correction: (3rd) if the boat reacts too slowly in light conditions try increasing. If it starts getting snake-ie reduce or go up 1 step	• • • •
Yaw Rate Suppression: (1st Start here) if your boat is snaking around try increasing this.	$\circ \bullet \circ \circ$
High speed course correction: (4th) Adjust this up or down to enhance yaw reaction, decrease if you find yaw reaction causes course overshoot, i.e. too much rudder for the amount of yaw.	0000
Yaw Rate Damping: (2nd) this could refine the snaking if it is an issue. Try increasing or decreasing.	000

In rough conditions, the 2nd and 4th parameters are likely all you can adjust and make sense of the results, as the other settings might get lost in the sea state noise.

Parameter Adjustment (when in this mode the GAIN is preset to 3)

- 5 settings exist for calibration
- They are accessed at power up by entering Calibration mode. (Hold the AUTO BUTTON during power up/boot until the display stops counting. The RED LED with flash LONG-SHORT LONG-SHORT)
- Calibration mode has two states:
  - Parameter selection
  - Adjust parameter
- Selection:
  - Green LEDs are on one at a time.
  - No LEDs = parameter 1
  - 4 LEDs = parameter 5

- Setting Adjustment
  - Red flashes fast when in AP mode.
    - Boat is in autopilot mode.
  - 9 levels are available for each parameter.
  - Green LEDs are parameter indicators
  - Red button lowers setting.
  - Green button increases setting.
  - Adjust for best boat response.
  - When finished holding the AUTO button locks the settings in memory.

## Dynamics Parameter Adjustment

The 4 green LED's display the parameter value.

0 = no green LEDs lit.

1/2 = LED 1 flashing

1= LED 1 solid

1 1/2 = LED 2 flashing

2 = LED 2 solid

2 1/2 = LED 3 flashing

3 = LED 3 solid

3 1/2 = LED 4 flashing

4 = LED 4 Solid

4 1/2 = All LEDs flashing

## **Typical Parameter Settings**

Parameter	Wind Vane/Full Keel	Fin Keel/Spade Rudder
Low speed course correction	0 = 0 0 0 0	0=0000
Course Correction	1.5 = @ X O O	2= @ @ O O
Yaw Rate Suppression	2.5 = @ @ X O	3.5= @ @ @ X
High Speed Course Correction	0 = 0 0 0 0	0=0000
Yaw Rate Damping	3.5 = @ @ @ X	3.5= @ @ @ X

@ = ON, X = FLASHING, O = OFF

## **Technical Notes**

# ActiSense NGW-1

Connections for NMEA 2000 to NMEA 0183

#### ActiSense Wiring



# Unit Dimensions

## **Control Head Dimensions**

Units Shipped after May 2017



#### Motor Drive Box





Note box dimension does not show mounting flanges

## **Tiller Actuator Dimensions**



#### **Tiller Actuator Mounting Specifications**

- Standard distance from actuator deck pin to tiller pin is 24-7/16" (621mm)
  - This can vary slightly by mfg. and model
- The Pelagic actuator bracket allows the deck pin and actuator LOA to be adjusted by approximately 1-1/2" either way
  - Allows Pelagic to be drop-in replacement for older units
- Deck/Rail pin diameter 0.375" (9.53 mm)
- Tiller mounted pin diameter 0.25" (6.35mm)
- Rudder axis to mounting pin 18" (457mm)



Deck rail pin

Mounting bracket may vary With date of manufacturing.



# Remote Controls

#### Remote Controls







Original remote. Shipped prior to September 2019

#### Actuator Connector as Shipped for Starboard Mounted Actuator

Reverse green and yellow for port side actuator mounting





Dimensions – Thru deck hole size: 1 5/16" (33.3mm) From Motor Drive box Rear view of female deck flange with screw terminations.

### Deck Connector

When mounting the actuator on the port side, the green and yellow wires are reversed as shown



## Bulgin Male Plug Assembly



### Windvane Kits

Monitor Wind Vane installation on "Owl", Pacific Seacraft 37. Shown testing a prototype revision of the wind vane steering.



### Windpilot Attachment Kit



- 12 Volt linear motor push rod, 75 mm span.
- 2 6mm quick release ball joints
- 50mm Down tube attachment brackets
- Bulgin IP68 rated electrical plug and socket
  - Buccaneer Standard Series 3 pin.
  - Socket cover for deck socket.

#### 6mm ball joint

6.5 mm spacer

M6x1-75mm length threads into the end Of the WP's universal joint, replacing the existing 6mm bolt.

### Windpilot Pacific Actuator and Parts



#### SailOMat attachment kit & photo of attach points



6 mm allen key required for 6 mm cap screws in 3" bracket



Pelagic Software Updates Upgrading System Software

## Upgrade Requirements

- A Windows PC running Windows 7 or later.
  - Or An Apple PC running a recent version of IOS.
- A mini-B USB cable that fits into the computer USB port.
  - The mini-B side connects to the Pelagic control unit



- A small Philips screw driver to open the case of the Pelagic control head.
- You do not need to provide power to the Autopilot during the upgrade process.
### Receiving Software via Email from Pelagic Help Desk

- This is the standard method of distributing the Pelagic software updates.
- There are several files associated with the software and each will need to be downloaded individually.
- Create a new folder, like "PelagicSW", or pick a name.
- Click on the individual links in the email to download the files into the directory you created.
  - If you are running a Windows system, you do not need to download the Apple .dmgx file
  - If you are running an Apple IOS system, you do not need to download the Windows .exex file
- Make sure the .hex, .elf and either .exex or .dmgx, files are all inside the same folder.
- Rename the .exex file to a .exe file, removing the last "x". These files are sent as an .exex extension because many spam filters will not allow a .exe file to be downloaded, assuming it is a virus.
  - If using IOS (Apple) remove the last "y" from the .dmgx file, renaming it .dmg

# Receiving Software via Email

- Create a new folder, "PelagicSW", or pick a name.
- Download, or move, the ZIP file into the directory created.
- Open the folder containing the ZIP file with windows explorer.
- Right-click on the ZIP file and select "Extract All". This will decompress the files into a new folder.
  - Make sure the .exex, .dmgx, .hex, and .elf files are all inside the folder together. The loader will not work if you try to run it from the .ZIP folder, make sure they are extracted.
- Rename the .exex file to a .exe file, removing the last "x". These files are sent as an .exex extension because many spam filters will not allow a .exe file to be downloaded, assuming it is a virus.
  - If using IOS (Apple) remove the last "x" from the .dmgx file.

# Loading the New Software

- Power off and remove the Pelagic control unit.
- Using a small-head Philips screw driver, open the autopilot control head by removing 6 screws on the back.
  - Note the original model has 4 screws on the face.
- With the serial number on the far side of the unit, carefully lift the cover and slide it towards the back of the unit, exposing the Mini-USB connector. Be careful NOT to push on the sensor.
- Connect the USB cable to the computer.
- Locate the USB Mini-B connector on the raised processor board as shown. The connector is at one end and the other end has a push button.
- Insert the Mini-USB USB cable into the socket.
- Run the Teensy.exe program (.dmg on IOS) which will open the Teensy loader window (note, it's very small)
  - It will automatically recognize the Pelagic system





# The Teensy Loader for Windows PC

This is the Teensy loader window. It will appear when you run the teensy.exe file

Click on Verbose Mode under the Help button to view status of the download. If no errors appear it has loaded successfully.

Program Load Reboot	Auto Button	Log   12:04:50: flash, block=200; b3=250; duto=0   12:04:50: flash, block=284, bs=256, auto=0   12:04:50: flash, block=285, bs=256, auto=0   12:04:50: flash, block=287, bs=256, auto=0   12:04:50: flash, block=287, bs=256, auto=0   12:04:50: flash, block=289, bs=256, auto=0   12:04:50: flash, block=289, bs=256, auto=0   12:04:50: flash, block=290, bs=256, auto=0   12:04:50: flash, block=291, bs=256, auto=0   12:04:50: flash, block=292, bs=256, auto=0   12:04:50: flash, block=293, bs=256, auto=0   12:04:50: flash, block=293, bs=256, auto=0   12:04:50: flash, block=294, bs=256, auto=0   12:04:50: flash, block=295, bs=256, auto=0   12:04:50: flash, block=297, bs=256, auto=0   12:04:50: flash, block=297, bs=256, auto=0   12:04:50: flash, block=299, bs=256, auto=0   12:04:50: flash, block=299, bs=256, auto=0   12:04:50: flash, block=299, bs=256, auto=0   12:04:50: flash, block=300, bs=256, auto=0   12:04:50: flash, block=301, bs=256, auto=0   12:04:50: flash, block=302, bs=256, auto=0   12:04:50: flash, block=304, bs=256, auto=0   12:04:50: flash, block=304, bs=256, auto=0   12:04:50: flash, block=303, bs=256, auto=0   12:04:50	×
			,

# Loading New Software (continued)

Mini B - USB connector



Press Button

- Make sure the small AUTO button on the TEENSY loader is GREEN. Click on it to change the state. If this does not happen go to the file button on the TEENSY screen and click on "Open Hex file". Proceed to open the file.
- With the cable connected to the PC and the control unit, press the small button on the micro computer. The TEENSY load progress will show program load data for about 7 secs.
  - If software doesn't load automatically, you can click on the "Program Load" button shown on prior slide
- To view status of the download, you can click on Verbose Mode under the Help button. If no errors appear, it has loaded successfully.
- Once it completes, the Pelagic will reboot and come up in standby mode, with the red-light flashing.
  - If the unit doesn't reboot automatically, you can click on the "Reboot" button shown on prior slide
- There is no other action required. All your previous settings, including calibration, orientation and gain will be intact.
  - Note that the light sequence during boot up will likely be different than the prior release.
- Close the case, be sure to snug down the case screws as they create the watertight seal.
  - They should be tight but not so tight as to crush the seals. Tighten in a cross-case order and then retighten the screws.

# Control Head Models – Access to the USB connector.





Current Model: USB Connector is exposed by removing 6 screws on the back of the control head. Original model: The USB connector is exposed by removing 4 screws on the front panel and then the circuit board by removing the 3 screws holding it in place.

# Troubleshooting

### **Trouble Shooting**

#### Symptom

- System reboots intermittently
- After system start up, the panel displays a solid Green LED for about 8 seconds, then goes away
- Actuator is moving tiller in wrong direction
- Pelagic Steers better at low gain
- Steers well in flat water conditions, not rolly
- System steers erratically, sometimes intermittently

### Solution

- Check wiring for loose connections, reseat fuse(s)
- This indicates a bad calibration. Recalibrate.
- Polarity is reversed. Switch Yellow and Green wires going from black motor drive box to actuator
- Check orientation and change to reflect installation. Recalibrate afterwards.
- Check orientation and change to reflect installation. Recalibrate afterwards.
- Check for metal objects or energized circuits near the white control unit and relocate if necessary

# Requesting Tech Support

- You can open a trouble ticket directly from our website. Go to:
  - Contact Us
    - Product Support
- When opening a ticket please provide as much information as possible. You can also attach a short video and/or photos of your installation.
  - Type, length of boat
  - Type of Pelagic system installed (standard tiller, below deck etc.
  - Serial number of your system components
  - Orientation of control head
  - Side that actuator is installed on (port or stbd)
  - Description of the technical issue