

Northstar NS3300 Pilot System

Reference Manual

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Congratulations on choosing the Northstar NS3300 Pilot Autopilot. For maximum benefit, please read this manual carefully before installation and use. This manual describes how to use and set up the NS3300 Pilot and the associated equipment. This manual also explains how to operate the NS3300 Pilot effectively and provides troubleshooting and performance tips.

Important Notice:

- It is the owner's sole responsibility to install and use the instrument and transducer(s) in a manner that will not cause accidents, personal injury or property damage. The user of this product is solely responsible for observing safe boating practices.
- It is vital to the performance of the Autopilot that the transducers are installed in the best location. Please follow the installation instructions very carefully.
- The choice, location, and installation of all components in any autopilot system is critical. If installation is not correct, the unit can not perform at its designed potential. If in doubt, consult your Northstar dealer.
- Ensure that any holes that are cut are in a safe position and will not weaken the boat's structure.
- **If in doubt, consult a qualified boat builder.**

Using the NS3300 Pilot:

- The NS3300 Pilot is intended to aid a helmsman from having to steer for long periods of time, not as the main means of steering the boat.
- The NS3300 Pilot is not intended for use in extreme weather, in adverse conditions or in water near other boats, dangerous waters or land.
- The NS3300 Pilot can not control the boat better than a helmsman. In adverse conditions steer the boat manually.
- Never leave the helm unattended. Keep a watch at all times. The helmsman should always monitor the course of the boat and the NS3300 Pilot and be ready to resume steering the boat manually.
- The performance of the NS3300 Pilot can be affected by the failure of a part, environmental conditions, improper installation and use.

Note: The User is to be aware that when the autopilot is powered on, the Control Dial and Dodge keys are active and can operate the rudder at any time (see Power Steering modes 1-1-3)

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Northstar is continuously improving this product; we retain the right to make changes to the product at any time which may not be reflected in this version of manual. Please contact your nearest Northstar office if you require any further assistance.

Governing Language: This statement, any instruction manuals, user guides and other information relating to the product (Documentation) may be translated to, or has been translated from, another language (Translation). In the event of any conflict between any Translation of the Documentation, the English language version of the Documentation will be the official version of the Documentation.

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1 Introduction

The NS3300 Pilot is a superior quality, high performance autopilot display head. The Northstar autopilot system has the flexibility to be used with power or sail boats.

The NS3300 Pilot has dedicated performance keys and a large 3.8" Color TFT display. This provides the user with exceptionally easy to use controls.

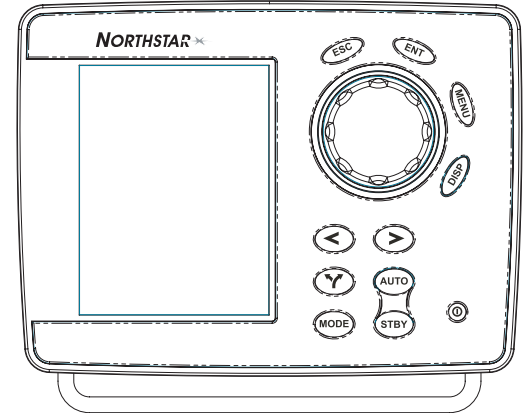
The NS3300 Pilot is part of the Northstar family of instruments for boats, which includes instruments for speed, depth, wind and repeaters. These instruments can be connected together to form an integrated data system for a boat. The autopilot's performance is enhanced if it is connected to a boat speed instrument such as a Northstar MULTI 3100 or a GPS instrument.

Using this manual

This manual describes how to operate the NS3300 Pilot. Refer to the separate NS3300 Pilot Installation Manual for information on how to install and setup the NS3300 Pilot before use.

For maximum benefit, please read this manual carefully before using the NS3300 Pilot.

Northstar NS3300 Pilot



Cleaning and maintenance

Clean the parts of the NS3300 Pilot with a damp cloth or mild detergent. Avoid abrasive cleaners, petrol or other solvents. Do not paint any part of the NS3300 Pilot except for the cables.

1-1 Autopilot Modes

1-1-1 Operating modes

The autopilot has three operating modes (see sections 3-5 and 3-6):

STBY **STANDBY:** The autopilot **does not** steer the boat (except during jog steer). The **helmsman** steers the boat with the manual helm.

AUTO **AUTO:** The autopilot steers the boat automatically based on selected Steering Mode and course. **Do not** steer the boat manually.

HSTR **HAND - STEER:** The autopilot does not steer the boat, but displays steering information for you to use to manually steer a course. Steer manually using the displayed steering data.

1-1-2 Steering modes

The autopilot has three steering modes (see section 3-7):

Compass: The boat sails at a set compass heading.

The boat sails to a destination along a preset route.

GPS: This mode requires a GPS instrument, such as a Northstar chart-plotter to be connected via NMEA.

WIND: The boat sails at a set angle to the wind.

This mode requires a wind instrument, to be connected via NavBus or NMEA.

Note regarding Jog and Follow-up mode:

The user is to be aware that while in Standby (STBY) Mode, the autopilot can move the rudder at anytime that the Dodge keys or Control Dial is operated.

1-1-3 Power steering modes

When the autopilot is in **STBY** (STANDBY) mode the helmsman must steer the boat manually. However The NS3300 Pilot has two different power steering control modes (see section 3-11).

Jog: Turns the rudder left or right while the key is pressed.



Follow-up: Sets the target position of the rudder. The rudder will turn until it is in the target position.



1-1-4 Turn modes

The NS3300 Pilot can follow a preprogrammed turn sequence. The autopilot has three different turn modes (see section 3-10):

Tack/Gybe: Auto-tacks OR Auto-gybes the boat after a delay period. The tack/gybe angle and tack/gybe delay can be customized.

90° turn: The boat turns through 90°

180° turn: The boat turns through 180°

Note: Not all turn modes are available in all operating modes.

2 Quickstart

2-1 Starting the autopilot system

1. Turn the autopilot system on by pressing .
2. If the autopilot is connected to multi, depth or GPS instruments, turn these on too.
3. If necessary, adjust the backlight so that the display can be easily read (press  briefly and adjust using the Control Dial).

2-2 Using the autopilot to steer the boat automatically

1. Manually steer the boat to open waters before engaging the autopilot to steer the boat.
2. Select the desired steering mode by pressing  then use the control dial to highlight Compass, GPS or Wind then press .
3. If using GPS mode, start navigating to a waypoint using the GPS instrument.
4. Engage the autopilot by pressing the  key.

2-3 Changing course during a voyage

In Compass mode and Wind mode it is possible to change course during a voyage:

1. Turn the Control Dial in the direction of the intended course change, for example:
 - To change course 10° to starboard, turn the Control Dial 10 clicks clockwise.
 - To change course 30° to port, turn the Control Dial a whole turn counter-clockwise.

2-4 Changing steering mode during a voyage

It is possible to change the steering mode during a voyage, for example:

- Change from GPS mode to Compass mode at the end of a route, or,
 - On a sailing boat, change from Wind mode to Compass or GPS modes when changing from sailing to motoring.
1. Press  then use the Control Dial to highlight the desired steering mode then press .

2-5 Regaining manual control

1. Press . The autopilot is now disengaged and you have complete steering control. The  key can be pressed at any time.
2. Manually steer the boat using the boats steering helm.
3. To re-engage the autopilot, press the  key.

2-6 Action in an emergency

To regain control of the boat in an emergency situation:

1. Press the  key. The autopilot is now disengaged and you have complete steering control.
2. Manually steer the boat.

Alternatively:

1. Press  or  to make an immediate course change to port or starboard.
2. After a period of time, press  to resume original course, or press  to continue on the alternative course.

2-7 Manually steering the boat from the boats helm

To manually steer the boat:

1. Press the  key. The autopilot is now disengaged and you have complete steering control.

2-8 Manually steering the boat using power steering

To manually steer the boat using the autopilot to move the rudder:

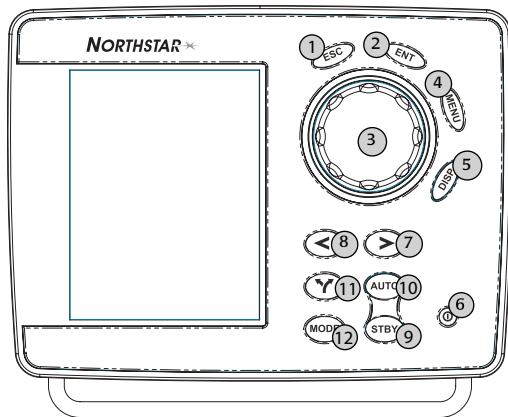
1. Ensure the autopilot is in STBY by pressing the  key.
2. Press and hold  or  to turn the rudder to port or starboard. Pressing Both will center the rudder
3. Release the button when the rudder is in the desired position.

Alternatively:

1. Ensure the autopilot is in STBY by pressing the  key.
2. Turn the Control Dial until the on-screen rudder indicator is in the desired position.
3. The autopilot will turn the rudder until it is in the target position.

3 Autopilot operation

	Button		Function
①	ESC		Step back a menu level or return to selected pilot screen
②	ENT		Selects highlighted items or brings up Parameters menu when in Pilot display mode
③	Control Dial		Use to scroll through menus, increment or decrement selected values, follow-up rudder control and to make course changes.
④	MENU		Shows context sensitive Options menu, press twice to show the Setup menu.
⑤	DISP		Opens display menu to change between pilot screens
⑥	POWER		Press and hold to turn instrument off. Single press shows backlight control
⑦	Dodge Right		Dodge to Starboard key (repeated presses increments values) Initiates tack/gybe, 90° turns and 180° turns
⑧	Dodge Left		Dodge to Port key (repeated presses increments values) Initiates tack/gybe, 90° turns and 180° turns
⑨	STBY		Places autopilot into standby mode
⑩	AUTO		Places autopilot into auto mode
⑪	Turns		Key opens turn menu to access tack/gybe, 90° turns and 180° turns
⑫	MODE		Invokes steering mode menu



3-1-1 **AUTO key**

Press to engage **AUTO** mode. The autopilot is now steering the boat based on the selected steering mode. Press and hold for 2 seconds to engage **H-STEER** mode.

3-1-2 **STBY key**

Press to disengage **AUTO** mode and set **STBY** mode. The autopilot is not steering the boat – the helmsman must steer the boat using the manual helm.

3-1-3 **Dodge keys**

Press  or  to trigger an immediate dodge to port or starboard. Repeated presses of the same key increments dodge angle.

STBY mode: Jogs the rudder left or right while the key is pressed

AUTO mode: Activates a dodge. Causes the vessel to deviate from the set course by a preset angle.

3-1-4 **Turn key**

Press to display the turn menu. The boat follows a preprogrammed turn sequence. Select an item from the menu then press  or  to activate the turn in the corresponding direction.

Tip: Repeated pressing the  key will cycle through the menu selection.

3-1-5 **MODE key**

Press to select steering mode.

Tip: Repeated pressing the  will cycle through the menu selection and will automatically select after 1 second.

3-1-6 **Control Dial**

When using menus and adjusting settings, use to scroll through items and increment or decrement values.

STBY mode: Moves the rudder to port or to starboard half of a degree per click.

AUTO mode: Changes the set course by one degree per click.

Note: In GPS mode, the set course can not be adjusted as the course is controlled by the navigation instrument.

3-1-7 **ESC key**

When using menus and adjusting settings, press to step back one level without saving changes.

When no menus or settings are displayed, press to jump back to the most recently used autopilot display screen.

3-1-8 **ENT key**

When using menus and adjusting settings, press to choose selection or save setting.

Tip: When the showing the Basic, Pilot or Compass screen, pressing  opens the Parameters menu.

3-1-9 **MENU key**

Press to show the Options menu (where applicable).

Press twice to show the Setup menu.

3-1-10 **DISP key**

Shows the Display menu.

Tip: Repeated pressing the  key will cycle through the menu selection and will automatically select the highlighted entry after 1 second.

3-2 Turning the NS3300 Piloton

- Briefly press the  key.
- If there are no other autopilot display heads on the system, The NS3300 Pilot will turn on and enter **STBY** (Standby) mode.

Note: If the autopilot was switched off while still in **AUTO** mode, a warning message will be

displayed to alert the user that there may have been a power interruption.

Note: When the autopilot is powered on, the Control Dial and Dodge keys are active and can operate the rudder at any time (see Power Steering modes 1-1-3)

3-3 Turning the NS3300 Pilot off

When in **STBY** mode:

- Press and hold the **Ⓢ** key. A pop-up box will appear and start a 3 second count-down. The unit will turn off when the timer reaches 0.
- Releasing the **Ⓢ** key during this time will resume normal operation.
- Any settings you have made are retained by the unit.

When in **AUTO** mode:

- Press and hold the **Ⓢ** key. A warning pop-up box will remind you to enter **STBY** mode before the unit can be turned off. Press **ENT** to close the pop-up.

3-4 Backlight

Briefly press the **Ⓢ** key. The Backlight pop-up will appear.

Repeating this action will toggle from day to night mode

Use the Control Dial to increase or decrease the display and keypad backlighting.

- The NS3300 Pilot has a choice of white background 'Day' and black background 'Night' backlighting modes. Either mode can be selected using the Control Dial.
- The Backlight pop-up may also be selected: *Menu > Setup > System > Backlight* menu.
- Backlighting on all other Northstar instruments that are connected and on the same NavBus backlighting channel will also change.

3-5 Engaging autopilot

Select **AUTO** mode by pressing the **AUTO** key. The autopilot is now steering the boat based on the selected steering mode.

3-6 Disengaging autopilot

Select **STBY** mode by pressing the **STBY** key. The autopilot is not steering the boat – the helmsman must steer the boat using the manual helm.

3-7 Setting the steering mode

For a power boat

- For a boat without GPS, or for a boat with GPS but you do not want to navigate to a waypoint, choose Compass mode. The autopilot steers the boat at a set compass heading.

Select Compass mode by pressing **MODE**, choose Compass and press **ENT**.

- To use the autopilot with a GPS to navigate to a waypoint or along a route, choose GPS mode. The autopilot steers the boat using navigation data from the GPS.

Select GPS mode by pressing **MODE**, choose GPS and press **ENT**.

For a sailing boat

- To steer to a set compass heading, choose **Compass** mode.

Select Compass mode by pressing **MODE**, choose **Compass** and press **ENT**.

- To navigate to a waypoint or along a route, choose **GPS** mode.

Select **GPS** mode by pressing **MODE**, choose **GPS** and press **ENT**.

Tip: It is possible to change steering modes while in AUTO mode. For example it is helpful to use Compass mode to control the boat when setting up a GPS route, then change directly to GPS mode.

- To sail, tack and gybe at a set angle to the wind, choose **Wind** mode.
- Select **Wind** mode by pressing **MODE**, choose **Wind** and press **ENT**.

Note for sailing boats:

- The autopilot is not recommended for use in light, changeable or gusty winds.
- Take care when running downwind to avoid an accidental gybe.
- Wind mode requires the wind instrument to be accurately calibrated.

Note: To select GPS mode, the autopilot must be receiving data from a compatible GPS instrument, otherwise the GPS selection will not be available.

To engage the autopilot in GPS mode, the GPS must be navigating to a waypoint or along a route; otherwise the NS3300 Pilot will display an error message. If the boat is too far from the plotted course, the NS3300 Pilot will display a warning message.

Select **'OK'** to engage **AUTO** mode anyway. Select **'Cancel'** to remain in **STBY** mode.

To select **Wind** mode, the autopilot must be receiving data from a compatible wind instrument, otherwise the Wind selection will not be available.

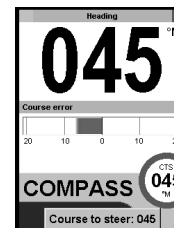
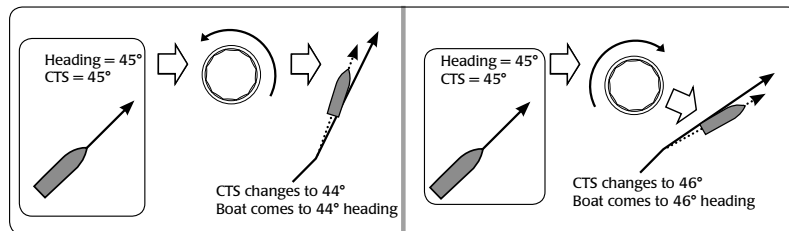
3-8 Changing course

3-8-1 Changing course in compass mode

To change course in 1° steps, turn the Control Dial.

- turn the Control Dial counter-clockwise to change course to port
- turn the Control Dial clockwise to change course to starboard

Example



3-8-2 Changing course in GPS mode

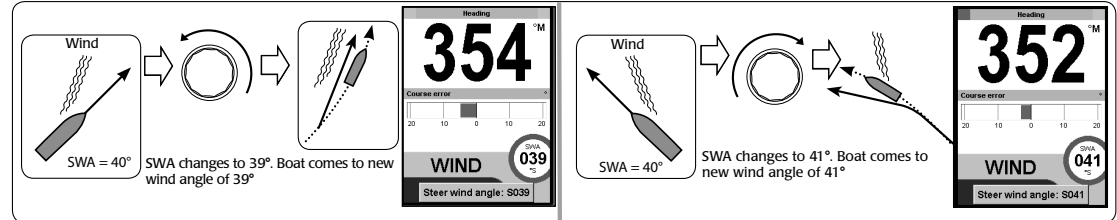
The course maintained by the autopilot is controlled by the GPS device that is navigating to a waypoint. To change course in GPS mode, select a different waypoint on the GPS device.

3-8-3 Changing set wind angle in wind mode

To change set wind angle (SWA) in 1° steps, turn the Control Dial.

- turn the Control Dial counter-clockwise to change course to port
- turn the Control Dial clockwise to change course to starboard

Example



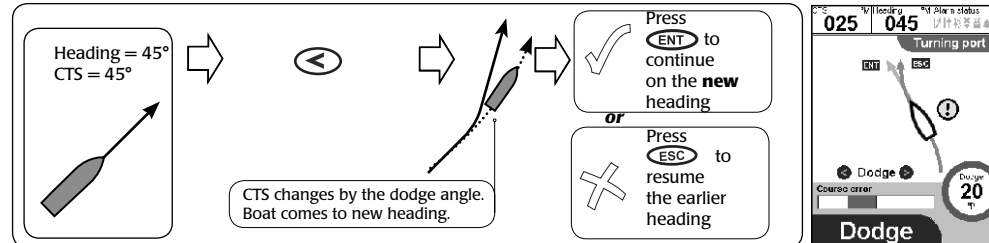
3-9 Dodge

A dodge is a sharp change of course, usually to avoid an obstacle.

- press to dodge to port by the dodge angle.
- press to dodge to starboard by the dodge angle.

The boat will change course by a preset dodge angle. To dodge further, press or more times. To view or change the dodge angle, go to *Dodge angle* in the Options menu (see section 6-3).

3-9-1 Dodging in compass mode

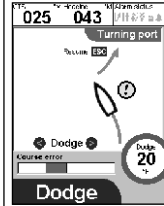


3-9-2 Dodging in GPS mode

Press (ESC) to resume the earlier heading

CTS changes by the dodge angle.
Boat comes to new heading.
The NS3300 Pilot beeps.

WARNING: The NS3300 Pilot will steer back to the GPS plotted course. Make sure there are no obstacles or dangerous waters in the way.

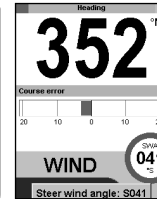


3-9-3 Dodging in wind mode

Press (ESC) to resume the earlier wind angle

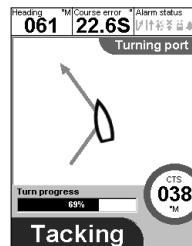
SWA changes by the dodge angle. Boat comes to new wind angle.
The NS3300 Pilot beeps.

WARNING: The NS3300 Pilot will steer back to the GPS plotted course. Make sure there are no obstacles or dangerous waters in the way.

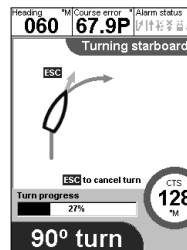


3-10 Turn modes

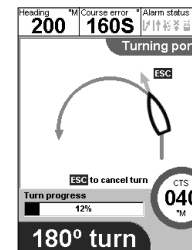
The NS3300 Pilot can follow a preprogrammed turn sequence. The autopilot has three different turn modes:



Tack/Gybe: Auto-tacks the boat after a delay period. The tack angle and tack delay can be customized. Gybes can be disabled.



90° turn:
The boat turns through 90°



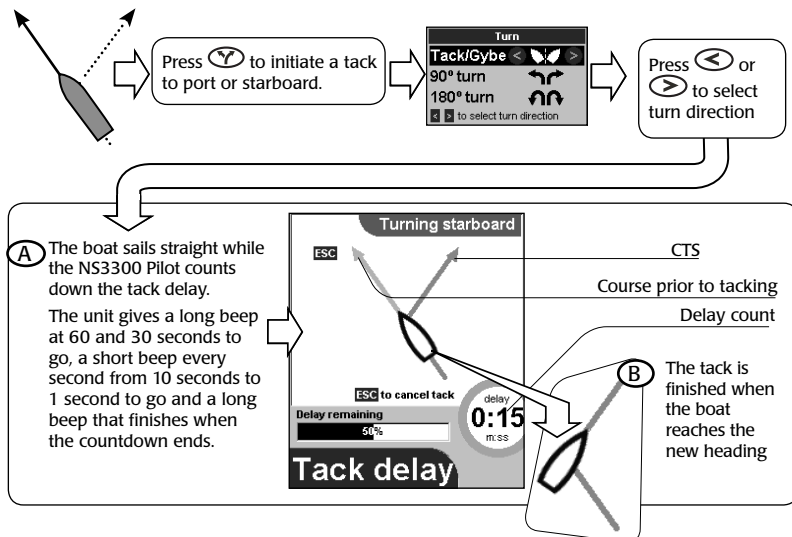
180° turn:
The boat turns through 180°

	Availability:Compass	GPS	Wind
Tack/Gybe	yes	no	yes
90°	yes	no	no
180°	yes	no	no

3-10-1 Auto tacking in compass mode

Auto tacking is intended to tack a sailing boat. The course to steer changes by the tack angle.

- press **Y** select Tack/Gybe then press **<** to tack to port by the tack angle
- press **Y** select Tack/Gybe then press **>** to tack to starboard by the tack angle.



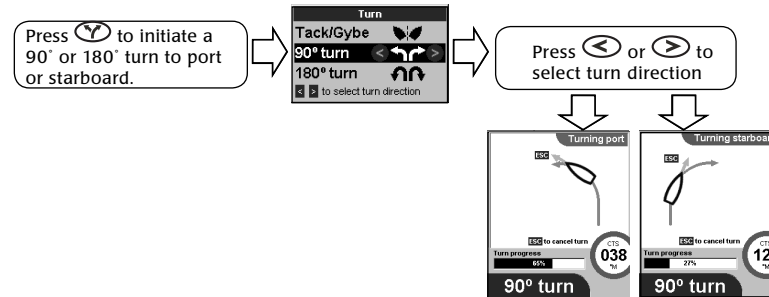
3-10-2 Turns in compass mode

To change course by 90°

- press , select 90° turn then press  to turn to port by 90°
- press , select 90° turn then press  to turn to starboard by 90°

To change course by 180°

- press , select 180° turn then press  to turn to port by 180°
- press , select 180° turn then press  to turn to starboard by 180°



Warning: In Compass mode auto tack, the course to steer changes by the tack angle. The autopilot does not use data from any wind instrument. It is possible for the boat to gybe or to end in irons (head to wind).

Note: To tack to a fixed wind angle, use the autopilot in Wind mode (see section 7-3). To view or change the tack angle or the tack delay, go to tack mode, tack angle or tack delay in the Options menu (see section 6-3). Gybe angle is not used in Compass mode.

3-10-3 Auto tacking or gybing in wind mode

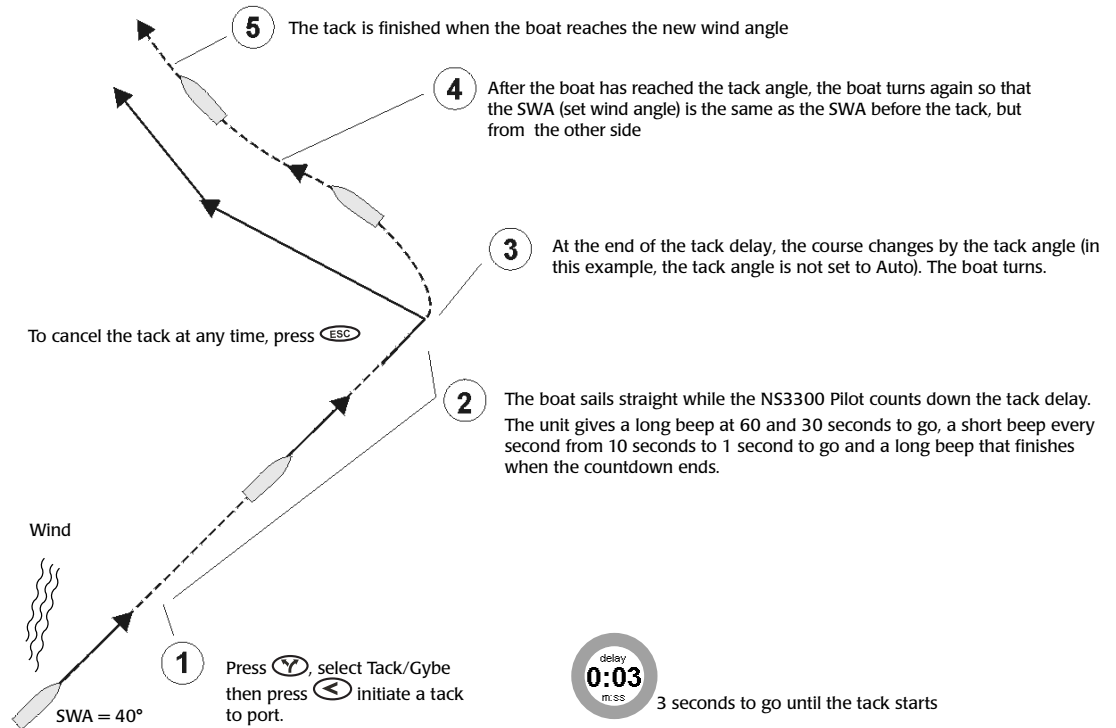
If the set wind angle (SWA) is 90° or less, the boat tacks, if the SWA is more than 90° the boat gybes. After the tack or gybe, the SWA is the same as the SWA before the tack or gybe, but from the other side.

- press , select Tack/Gybe then press  to tack or gybe to port
- press , select Tack/Gybe turn then press  to tack or gybe to starboard

Example:

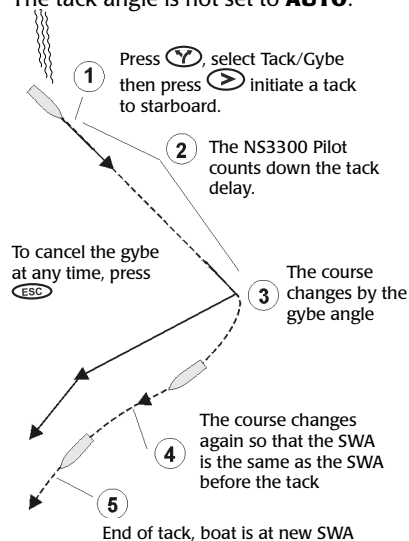
SWA is 40° , so the boat will tack, not gybe. If the tack angle is not set to Auto, the boat changes direction twice:

- first by the tack angle
- second so that SWA is the same as before the tack or gybe, but on the other side:

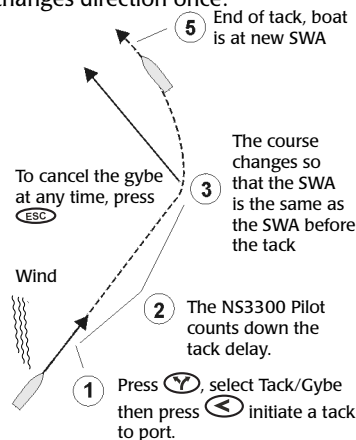


Example:

SWA is 120°, so the boat will gybe.
The tack angle is not set to **AUTO**:

**Example:**

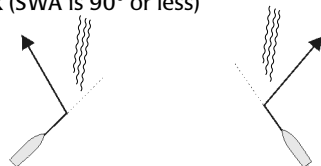
SWA is 40°. The tack angle is set to **AUTO** so the boat changes direction once:



If SWA is more than 90° and the gybe angle is set to **AUTO** then the boat will change direction once during a gybe, so that the SWA is the same as the SWA before the gybe.

There are four possibilities for auto tacking or gybing:

Tack (SWA is 90° or less)



Press select Tack/Gybe then press to tack to port.

Press select Tack/Gybe then press to tack to starboard.

Gybe (SWA is more than 90°)



Press select Tack/Gybe then press to gybe to port.

Press select Tack/Gybe then press to gybe to starboard.

An error message is displayed if you attempt other tacks or if the tack will end with the boat in irons.

Note: To view or change the tack mode, tack angle, gybe mode, gybe angle or tack delay, go to the Options menu (see section 6-3).

3-11 Power steering

When the autopilot is in **STBY** mode the helmsman must steer the boat manually. However the autopilot has power steering control modes available while in **STBY** mode:

To Jog Steer to port:

- hold down  to turn the rudder to port

To Jog Steer to starboard:

- hold down  to turn the rudder to starboard

Follow-up steering:

- turn the Control Dial to set the desired position of the rudder (this function is disabled until the rudder feedback unit and the compass have been calibrated [see section 6-8])
- a popup window will appear at the bottom of the screen indicating the desired position and the current position of the rudder

- the rudder will move to the desired position
- To stop the rudder turning, press ,  or 

To centre the rudder:

- press and release  and  together to turn the rudder to amidships (this function is disabled until the rudder feedback unit and the compass have been calibrated [see section 6-8])
- To stop the rudder turning to amidships press ,  or 

Warning: Until the rudder feedback unit is calibrated, there is no rudder limit and the user must ensure that the rudder is not driven onto an end stop when using jog steering (damage may occur).

3-12 Alarms

There are several alarms that monitor the condition of the autopilot system, these alarms can not be adjusted. There are also alarms that can be enabled to automatically detect certain conditions, such as low battery. Alarms that are enabled are shown as black icons in the alarm status box on the NS3300 Pilot header.

When an alarm is triggered:

- the beeper sounds
- the external alarm sounds or lamp illuminates (if connected)
- the bezel backlight on the NS3300 Pilot flashes
- the alarm window is displayed
- and the alarm status icon is shown in the color corresponding to the severity of the alarm.

Press  or  to acknowledge and reset the alarm. This action does not disable the alarm.

- Alarms can be set: *Menu > Setup > Alarms* menu (see section 6-5).

Severity	Alarm tone	Color	Description
Info	Single beep	Blue	Information message, does not affect autopilot operation.
Warning	Moderate beeping	Black	A low priority event has occurred.
Caution	Slow beeping	Yellow	An event has occurred that may require corrective action.
Severe	Rapid beeping	Orange	An important event has occurred requiring immediate attention.
Critical	Rapid beeping, low tone	Red	A critical problem is preventing the autopilot from controlling the boat, manual steering is required immediately.

3-12-1 The alarm window

The alarm window shows a list of the latest active alarms. The most severe alarms appear at the top of the list.

Turn the Control Dial to stop the NS3300 Pilot from beeping.

Select '*Details*' to jump directly to the Active alarms screen.

Select '*OK*' to acknowledge the displayed alarms.



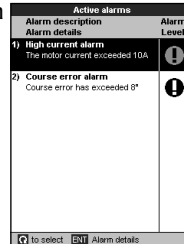
3-12-2 Active alarms

The Active alarms screen shows a list of the currently active alarms.

To show the Active alarms screen:

- Select '*Details*' from the alarm window or,
- Select '*Active alarms*' in the Display menu or,
- Go to *Menu > Setup > Alarms > Active alarms*.

Turn the Control Dial to select an alarm in the list and press **ENT** to see the Alarm details.



3-12-3 Alarm history

The NS3300 Pilot keeps a record of alarms. The Alarm history screen shows a list of up to 18 recorded alarm events.

To show the Alarm history screen:

- Go to *Menu > Setup > Alarms > Alarm history*.

Turn the Control Dial to select an alarm in the list and press **ENT** to see the Alarm details.

3-12-4 Alarm details

The alarm details window shows extra detail on an individual alarm.



3-13 Keylock

When keylock is activated, the NS3300 Pilot will ignore most key presses.

- To turn keylock on:

Press and hold the **DISP** key for 2 seconds. A '*Keys locked*' message will appear and a small lock icon will appear on the lower right-hand display.

- To turn keylock off:

Press and hold the **DISP** key for 2 seconds. A '*Keys unlocked*' message will appear and the keys are re-enabled.

3-14 Simulate mode

If the word '*Simulate*' flashes on the display, then the unit is in simulate mode.

- **Simulate** mode allows you to become familiar with the unit off the water.
- **Simulate** mode can be turned on or off: *Menu > Setup > Simulate menu*.

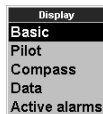
Simulate

Warning: Do not use simulate mode while at sea.

4 The displays

Tip: Repeated pressing **BISP** will cycle the menu selection and will automatically select after 1 second.

Press **BISP** to show the Display menu, select a display option using the Control Dial and press **ENT**.



4-1 Display > Basic

Displays a standard autopilot display with just the essential autopilot data.

Display area	Function
① Drive indicators	Left and right boxes light up to indicate when the autopilot is driving the rudder
② Heading	Large digits show the heading of the vessel
③ Info panel	This panel can be configured to display different data items. Default: Automatically switches between Rudder angle, Course error and Cross track error.
④ Set course	STBY mode: shows '---' since the set course is not valid in standby mode AUTO mode: digits show the current course to steer (CTS), except for WIND mode: digits show the current set wind angle (SWA) The colored ring is yellow in STBY mode, green in AUTO mode, magenta in H-STEER mode and red when there is a critical alarm
⑤ Steering mode panel	Shows the steering mode (COMPASS, GPS, WIND)
⑥ Operating mode panel	Shows the operating mode (Standby, Auto, H-Steer). Panel changes to blue when in AUTO mode.



Basic displays

Options menu:

Data setup - Selects what data is displayed in the info panel.

Auto Rd/CE/XTE – Automatically switches the displayed data between rudder, course error and cross track error depending on the operating mode.

Course error – Shows a course error bar in the info panel.

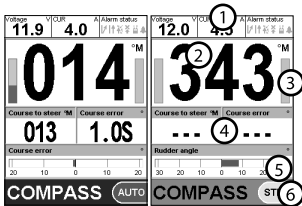
Rudder angle – Shows a rudder angle gauge in the info panel.

XTE – Shows a cross track error bar in the info panel.



4-2 Display > Pilot

Displays an advanced autopilot display with essential autopilot data.



Pilot displays



Display area	Function
① Data Header	Customizable data cells. Each display page has a separate header configuration. Default: Voltage, Current, Alarm Status (see section 5).
② Heading	Large digits show the heading of the vessel
③ Drive indicators	Left and right boxes ‘fill up’ to indicate when the autopilot is driving the rudder and how much power is being used by the drive system
④ Numerical data panels	Customizable data cells. Default: Course to steer, Course error.
⑤ Bar data panels	Customizable indicator bar. Default: Automatically switches between Rudder angle, Course error and Cross track error.
⑥ Mode panel	Left hand side: shows the steering mode (COMPASS, GPS, WIND) Right hand side: shows the operating mode (Standby, Auto, H-Steer) inside a colored tab. Panel changes to blue when in AUTO mode. The colored tab is yellow in STBY mode, green in AUTO mode, magenta in H-STEER mode and red when there is a critical alarm.

Options menu:

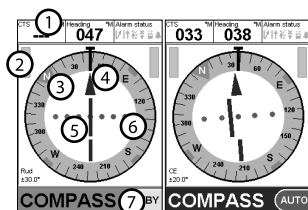
Header Menu for configuring the data header in this display (see section 5).

Data setup Enters the data set-up mode. Use the Control Dial to highlight a data cell, press **ENT** to display a list of data types that can be displayed in that cell.

4-3 Display > Compass

Displays a standard autopilot display with just the essential autopilot data.

Display area	Function
① Data Header	Customizable data cells. Each display page has a separate header configuration. Default: Course to steer, Heading, Alarm Status (see section 5).
② Drive indicators	Left and right boxes 'fill up' to indicate when the autopilot is driving the rudder and how much power is being used by the drive system
③ Compass card	Compass card rotates to show the heading of the vessel under the lubber mark.
④ Course arrow	STBY mode: points to the current heading AUTO mode: points to the set course, except for: GPS mode: points to the bearing to waypoint
⑤ Deviation bar	Moves laterally to show course information. Note: This bar can be configured to display different items. Default: Automatically switches between Rudder angle, Course error and Cross track error.
⑥ Deviation scale	Indicates what data the deviation bar is currently showing and the magnitude
⑦ Mode panel	Left hand side: shows the steering mode (COMPASS, GPS, WIND) Right hand side: shows the operating mode (Standby, Auto, H-Steer) inside a colored tab. Panel changes to blue when in AUTO mode. The colored tab is yellow in STBY mode, green in AUTO mode, magenta in H-STEER mode and red when there is a critical alarm.



Compass displays

Options menu:

Deviation bar Selects what data is displayed by the deviation bar.

Auto Rd/CE/XTE – Automatically switches the deviation bar between rudder, course error and cross track error depending on the operating mode.

Course error – Shows course error using the deviation bar.

Rudder angle – Shows a rudder angle gauge using the deviation bar.

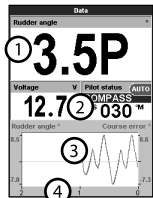
XTE – Shows a cross track error bar using the deviation bar.

Header – Menu for configuring the data header in this display (see section 5).

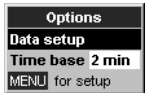


4-4 Display > Data

The data display shows one large data cell, two smaller data cells and a data history graph. Each of these items can be configured to display a range of data types. The graph is useful for analyzing the performance of the autopilot.



Data display



Display area	Function
① Big data cell	Customizable data cell. Default: Rudder angle.
② Small data cells	Customizable data cells. Default: Voltage, Pilot Status.
③ History graph	This graph plots data of a period of time. There are two graph series that can be configured, red and green. Default: Rudder angle, Course error.
④ Time base	The time base of the graph can be set from 2 minutes to 1 hour. This is the amount of time it takes for new data to scroll from the right hand side to the left hand side.

Options menu:

Data setup Enters the data set-up mode. Use the Control Dial to highlight a data cell, press **ENT** to display a list of data types that can be displayed in that cell.

Time base - Selects the time base of the history graph. Select 2 min, 4 min, 10 min, 20 min or 1 hour

4-5 Display > Active alarms

Shows a list of the currently active alarms (see section 3-12-2).

5 Data headers

Data headers are available on the Pilot and Compass screens. A data header is a customizable feature that can be used to display up to 6 different data items, such as boat speed or alarm status. The Pilot and Compass screens have separate settings for the data header.

Heading	M Course error	Alarm status
060	67.9P	↑↑↑↑↑↑

Header menu:

Data Turns the data header completely on or off.

Data setup		
Voltage	V CUR	A Alarm status
11.8	3.5	↑↑↑↑↑↑

Data setup

Enters the data set-up mode. The Data header expands to display all 6 possible data cells. Some data cells may be blank. Use the Control Dial to highlight a data cell, press **ENT** to display a list of data types that can be displayed in that cell.

Size

Selects the size of the data header items. Select Small, Medium or Large.

6 Menus

Many of the NS3300 Pilot features and functions are operated through menus.

- To scroll through menu items, scroll through items in a list or change data use the Control Dial. Clockwise scrolls across/down or increments data.
 - To select a menu item press **ENT**.
 - To go back to the previous menu press **ESC**.
 - To accept changes press **ENT**.
 - To discard changes press **ESC**.
- Occasionally items in the NS3300 Pilot menus utilize checkboxes.
- If the box is 'checked' (contains a check or tick), then that function is selected (enabled) or ON.

- If the box is 'un-checked' (does not contain a check or tick), then that function de-selected (disabled) or OFF.
- To select or de-select a checkbox, highlight the menu item using the control dial and press **ENT**. The change will happen immediately.

The main menu for configuring the NS3300 Pilot is the Setup menu. Press **MENU** until the Setup menu is displayed (normally twice).

The Setup menu and options are summarized in this chapter. The factory default settings are shown where applicable. Each Setup menu option is explained in the following sections.

6-1 Setup > System



Tip: In case you can't read the current language, the language setting is the first item in the system menu.

Language

Select the language for the display. The options are: English, Italian, French, German, Spanish, Dutch, Swedish, Portuguese, Finnish and Greek.

Backlight

The backlight pop-up is displayed (see also section 3-4).

The bar setting represents the current level of backlighting.

Night Mode – Allows low contrast Night mode.

Auto – allows night mode to be selected in backlight pop-up

On – night mode is active all the time

Off – night mode is not available

Key beep

Enables or disables an audible beep when a key is pressed or Control Dial is rotated.

Auto power off

Select to have the autopilot power off automatically every time the boat's ignition is switched off. This applies only if the display unit is wired for Auto Power (see installation manual).

About

Displays information about the unit.

Factory Reset Resets all settings to the factory default settings. A warning box asks: Are you sure? Select Yes and press **ENT** to confirm, or No or **ESC** to cancel.

Main control unit – Resets the MCU's settings

Head unit – Resets just this head unit's settings

Both – Resets the MCU's settings and this unit's settings

6-2 Setup > Profiles

Profiles	
Profile	User 1
Edit name	
Parameters	▶

Profiles are used to store a range of autopilot settings for different sea, environmental and vessel conditions. Up to 5 user profiles may be configured (see section 8-2).

Profile

Select the current profile to use.

Edit name

Use to edit the name of the currently selected profile (see section 8-2).

Parameters

Opens the Parameters menu (see section 8-1).

6-3 Setup > Options

Options	
Dodge angle	20 °
Tack mode	Auto
Tack angle	
Gybe mode	Auto
Gybe angle	
Tack delay	30 s
Turn rate	10 °/s

Options can be selected to set autopilot operating limits:

Dodge angle

Sets size of the dodge angle steps in degrees.

Minimum = 5°; maximum = 30°

Tack mode

Auto – vessel tacks to the same set wind angle but on the opposing tack.

Set angle – vessel tacks through an angle set in Tack angle, then steers to the same set wind angle but on the opposing tack.

Tack angle

Set tack angle if Set angle is selected in Tack mode.

Minimum = 50°; maximum = 160°

Gybe mode

Off – gybing is disabled.

Auto – vessel gybes to the same set wind angle but on the opposing tack.

Set angle – vessel gybes through an angle set in Gybe angle, then steers to the same set wind angle but on the opposing tack.

Gybe angle

Set gybe angle if Set angle is selected in Gybe mode

Minimum = 40°; maximum = 140°

Tack delay

Set delay that the autopilot will use from the time a Tack is requested to the time a Tack is carried out by the autopilot.

Minimum = 0; maximum = 120 (seconds)

Turn Rate

Set the maximum turn rate you want the autopilot to use.

Minimum = 3; maximum = 20 (°/second)

6-4 Setup > Vessel

Vessel	
Vessel type	Sailing
Drive type	Motor
Wind features	☒

Vessel type can be selected to alter the performance characteristics of the autopilot depending on the vessel hull type:

Vessel type

Select Planing, Displacement or Sailing.

Warning: Changing the vessel type causes the steering parameters to be reset to default values in the current profile.

Drive type

Configures the autopilot to drive the type of steering system. See installation manual for details.

6-5 Setup > Alarms

Alarms	
Course error	Off
XTE	Off
Waypoint akn	☐
Wind shift	Off
Low battery	Off
High current	10 A
Active alarms	
Alarm history	

Some of the autopilot alarms are user configurable. Alarm trigger settings can be defined to suit the boat and individual preferences as follows:

Course error

The alarm will sound if the vessel strays from its intended course by more than the set error. Set OFF or a value in degrees.

Minimum = 1°; maximum = 90°

XTE

Cross Track Error – The alarm will sound if the vessel strays from its intended track by more than the set error. Set OFF or a value in nautical miles.

Minimum = 0.1; maximum = 2.0 (nautical miles)

Waypoint akn

The alarm will sound and ask the user for confirmation, when in GPS mode, when arriving at a waypoint before steering to the next waypoint.

Set ON or OFF.

Wind shift

The alarm will sound if, when in Wind mode, the wind shifts by more than the set angle since engaging AUTO.

Set OFF or a value in degrees.

Minimum = 1°; maximum = 90°

Low battery

The alarm will sound if the vessel battery voltage is below the setting.

Set OFF or a value in Volts.

Minimum = 7; maximum = 14 (Volts)

High current

The alarm will sound if the current drawn from the battery by the rudder drive system exceeds the setting.

Set OFF or a value in Amps.

Minimum = 5; maximum = 20 (Amps)

Active alarms

Displays a list of currently active alarms (see section 3-12-2).

Alarm history

The NS3300 Pilot keeps a record of alarms.

Displays the alarm history list (see section 3-12-3).

Clear alarm history

Allows the alarm history to be cleared.

A warning box asks: *Are you sure?*

Select Yes and press **ENT** to confirm, or No or **ESC** to cancel.

6-6 Setup > Units

Units	
Distance	nm
Compass	°M
Magnetic variation	19°E
Wind	App

Select the units you prefer the autopilot to display:

Distance

All distance readings are displayed in the selected units.

nm (nautical miles), mi (miles), km (kilometers)

Compass

All compass readings are displayed in the selected units.

°T (degrees True), °M (degrees Magnetic)

Magnetic variation

Set the local magnetic variation in degrees.

Minimum = -90(W); maximum = +90(E) (degrees)

Wind

All wind readings are displayed in the selected units.

App (Apparent), True (True)

6-7 Setup > Comms

Comms	
NMEA mode	Input
NavBus group	1

Use this feature when the autopilot is connected to other Northstar instruments through NavBus or any compatible NMEA instrument.

NMEA mode

Select NMEA port mode.

Input – NMEA port can receive NMEA data

Slow – NMEA port outputs heading and rudder angle once per second

Fast – NMEA port outputs heading data ten times per second

NavBus group

Use this when a group of Northstar instruments are connected together using NavBus, to specify a group of instruments for backlighting, if required. Then, if the backlight setting on one instrument in the group is adjusted, the other instruments change automatically. Otherwise, select 0.

6-8 Setup > Calibrate

Calibrate
Compass
Rudder
Align heading
Centre rudder

The calibrate wizard screens are used during the initial autopilot installation stage or if any previously installed autopilot transducers have changed or moved.

It is vital to the performance of the autopilot that the transducers are installed in the best location and carefully calibrated.

Compass

Use this calibration wizard to calibrate the compass.

Follow the on-screen instructions:

- Slowly turn boat 2.5 times, observing the turn rate indicator
- Align heading – press **ENT** and dial in the current heading
- Accept calibration
- Calibration complete

Rudder

Use this calibration wizard to calibrate the rudder.

Follow the on-screen instructions:

- Center the rudder
- Turn rudder to Maximum Port
- Turn rudder to Maximum Starboard
- Set angle – press **ENT** and dial in the current rudder angle
- Center the rudder

- Stand clear of the rudder and linkages so the autopilot can test the limits.
- Testing limits – press **ESC** at any time to abort the calibration
- Accept calibration
- Calibration complete

Align heading

Use to align the compass to the actual boat heading. If a compass calibration has recently been performed, it is not necessary to align the heading again.

Use the manual helm to sail a straight course and ensure the boat heading does not change during this procedure. Use an accurate reference compass or external GPS to find the actual boat heading. If you are using an external GPS, sail as fast as convenient to ensure the heading is accurate.

Enter the actual course heading.

Minimum = 0°; maximum = 359° (degrees)

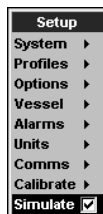
Center Rudder

Use to set the rudder center position. If a rudder calibration has recently been performed, it is not necessary to set the rudder centre position again. Ensure the rudder is in the center position and that there is no cross-wind or tidal current affecting the rudder.

Select OK and press **ENT** when the rudder is centered.

6-9 Setup > Simulate

Switches simulate mode on and off (see section 3-14).



7 Steering modes



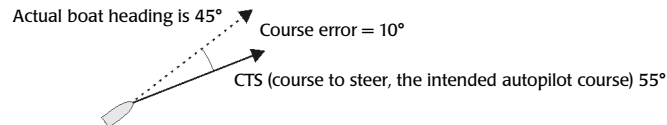
Important:

- The autopilot cannot control the boat better than a helmsman. The autopilot is not intended for use in extreme weather, in adverse conditions or near other boats, dangerous waters or land. In these conditions, disengage the autopilot and steer manually.
- Never leave the helm unattended, keep a watch at all times and be ready to resume steering the boat manually.
- Do not try to turn the rudder by hand when the autopilot is engaged.
- Local variations in magnetic field can affect the accuracy of the compass heading. Such variations are the responsibility of the user.

7-1 Compass steering mode

The autopilot has three ways of steering the boat, compass, GPS and wind. To select an appropriate mode, see section 3-7. In Compass mode, the autopilot steers the boat to a set course, called CTS (Course to steer).

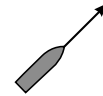
7-1-1 Compass steering data



7-1-2 Engaging and disengaging the autopilot in compass mode

Manually steer the boat to open waters. Sail straight on the intended course.

For example:



Heading = 45°



To engage AUTO,
press **AUTO**



AUTO:



The Pilot steers the boat automatically.

To engage H STEER,
hold **AUTO**



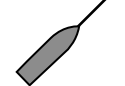
HANDSTEER:



Steer the boat manually. Display CTS in the info data or course error in the bar data and use these to steer by.

The NS3300 Pilot sets CTS (course to steer) to the current heading, in this example 45°, and starts steering on this course.

Heading = 45°
CTS = 45°



To disengage the Pilot, press **STBY**



The Pilot returns to **STBY** mode. Steer the boat manually.

7-2 GPS steering mode

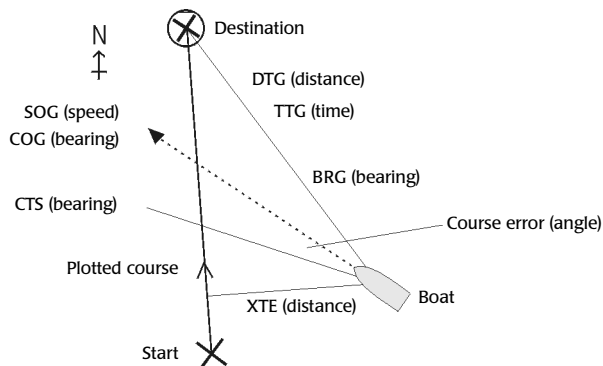
The autopilot has three ways of steering the boat, compass, GPS and wind. To select an appropriate mode, see section 3-7. In GPS mode, the autopilot uses data from a GPS to steer the boat along a route or to a waypoint.



7-2-1 GPS navigation data

Navigating to a waypoint:

The boat is sailing from the start to the destination and has moved off the GPS plotted course from the start to the destination:



BRG	Bearing to destination The bearing to the destination from the boat.
COG	Course over ground Direction in which the boat is moving over the ground.
CE	Course error The difference between CTS and the boat heading.
CTS	Course to steer Optimum course to steer to return to the plotted course.
DTG	Distance to go Distance from the boat to the destination.
SOG	Speed over ground The current boat speed over the ground. This is not necessarily the same as the boat speed through the water nor the speed at which the boat is approaching the destination.
TTG	Time to go The estimated time to reach the destination.
XTE	Cross track error The distance from the boat to the nearest point of the plotted course. XTE may have a letter: R means steer to the right to return to the plotted course, L means steer to the left.

7-2-2 Engaging and disengaging the autopilot in GPS mode

Manually steer the boat to open waters. Start the GPS navigating to a waypoint, either a waypoint on a route or a single waypoint.

GPS plotted course to a waypoint

BRG (direction of GPS course)

XTE (distance to GPS course)



To engage AUTO, press **AUTO**

To engage HAND STEER, hold **AUTO**

AUTO:



The Pilot steers the boat automatically.

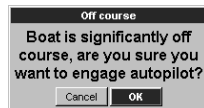
HANDSTEER:



GPS plotted course

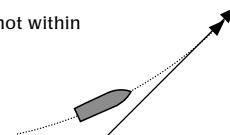
Steer the boat manually. Display CTS in the info data or course error in the bar data and use these to steer by.

When the NS3300 Pilot is engaged, if the XTE is more than 0.05 nm or the boat heading is not within 30° of BRG then the NS3300 Pilot displays a warning:



Press **ESC** to return to **Compass** mode or press **ENT** to have the NS3300 Pilot steer the boat to the course.

When the NS3300 Pilot is engaged, it uses data from the GPS to steer the boat along the plotted course to the waypoint.



To disengage the Pilot, press **AUTO**

The Pilot returns to STBY (standby). Steer the boat manually.

7-2-3 Arriving at waypoints

If the GPS is following a route and the boat reaches an intermediate waypoint:

If the Waypoint Acknowledge alarm (see section 6-5) is off, the autopilot automatically starts steering to the next waypoint in the route. If the Waypoint Acknowledge alarm is on, the autopilot shows the following alarm:



The autopilot continues steering on the old course. Select OK to start steering to the next waypoint.

When the boat reaches the final waypoint, the autopilot shows the following alarm:



The autopilot continues steering on the old course. Select OK to change to Compass mode and continue sailing at the current heading.

Press **STBY** to return to **STBY** mode.

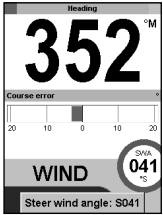
Note: To return to the last waypoint if the boat has passed the waypoint, restart the GPS device navigating to the waypoint.

7-2-4 GPS gain

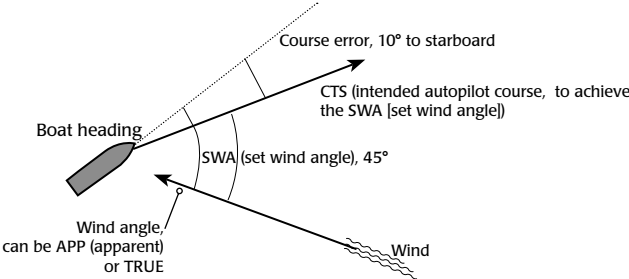
In GPS mode, The GPS gain determines how much correction is applied to remove cross track error. A high setting will cause the autopilot to steer quickly back towards the track. A low setting will cause the autopilot to steer very gently back towards the track.

7-3 Wind steering mode

The autopilot has three ways of steering the boat, compass, GPS and wind. To select an appropriate mode, see section 3-7. In wind mode, the autopilot steers the boat to a set angle to the wind, called SWA (set wind angle).



7-3-1 Wind steering data



APP	Apparent wind angle	The apparent wind angle at the boat. P in front of the angle means the wind is from port, S means that the wind is from starboard.
CTS	Course to steer	The course to steer to maintain the SWA (set wind angle).
	Course error	The difference between APP (wind angle) and SWA (set wind angle).
SWA	Set wind angle	The desired wind angle.
TRUE	True wind angle	The true wind angle at the boat. P in front of the angle means the wind is from port, S means that the wind is from starboard.

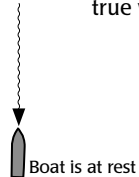
7-3-2 True and apparent wind speed and direction

Apparent wind speed and direction are the values measured on the boat. True wind speed and direction are the values after allowing for boat speed through the air.

If the boat is moving, then the apparent wind speed is different to the true wind speed and the apparent wind direction is different to the true wind direction, as shown below.

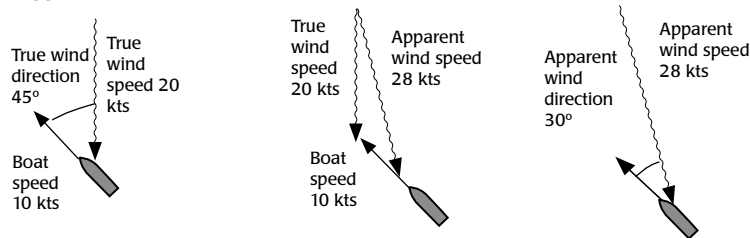
Boat at rest

True wind speed is the same as apparent wind speed and true wind direction is the same as apparent wind direction



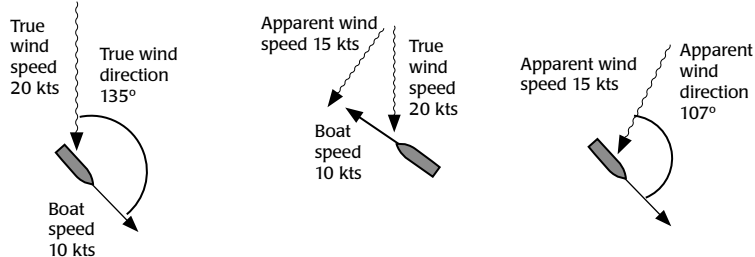
Boat moving upwind

Apparent wind speed is greater than true wind speed and apparent wind direction is closer to dead ahead than true wind direction



Boat moving downwind

Apparent wind speed is less than true wind speed and apparent wind direction is closer to dead ahead than true wind direction

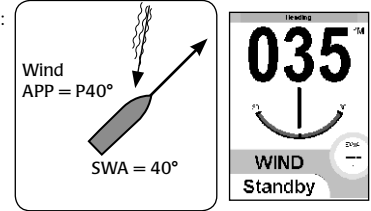


7-3-3 Engaging the autopilot in wind mode

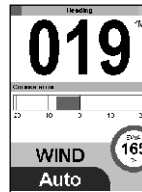
Manually steer the boat to open waters. Sail straight at the intended wind angle.

The NS3300 Pilot info data can display TRUE (true wind angle) or APP (apparent wind angle) (see section 3-4)

For example:



To engage AUTO,
press **AUTO**

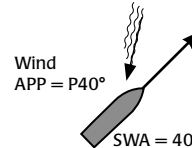


To engage HAND STEER,
hold **AUTO**



GPS
plotted
course

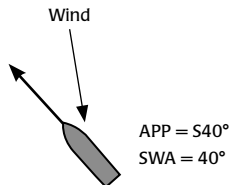
The NS3300 Pilot sets CTS (course to steer) to the current heading, in this example 40°, sets SWA (set wind angle) to the current wind angle and starts steering at this wind angle.



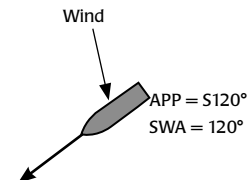
To disengage the Pilot, press **AUTO**

The Pilot returns to **STBY** (standby). Steer the boat manually.

The NS3300 Pilot can also be engaged on the starboard tack, for example:



or when running, for example:



7-3-4 Wind gain

In GPS mode, The wind gain determines how much correction is applied to reduce any difference between the set wind angle and the actual wind angle. A high setting will cause the autopilot to be strongly affected by changes in the wind. A low setting will cause the autopilot to be very mildly affected by changes in the wind.

8 Optimizing steering performance

8-1 Steering parameters

The autopilot has seven steering parameters which can be adjusted to optimize steering performance. Select the Advanced checkbox to view all parameters.

These parameters can be adjusted using the Parameters menu. To adjust the parameters, go to *Menu > Setup > Profiles > Parameters* (see section 6-2). From the Basic, Pilot or Compass screens, press  to open the Parameters menu directly.

Adaptive

This is an adaptive response setting where the autopilot adjusts how far the boat can move off course to maintain a constant rate of rudder corrections. The adaptive setting eliminates the need to set the response according to varying weather conditions.

- The range is A1 (adapts slowly) to A5 (adapts quickly).

Response (dead band)

How far the boat will be allowed to fall off course before it makes a correction.

A lowest response setting lets the boat fall very far off course before the autopilot corrects.

The highest response setting corrects for every boat movement

- The range is 1 (broad course keeping) to 10 (tight course keeping).

Ratio (gain)

How far the rudder moves relative to the degrees of course error

- The range is 1 (small corrections) to 10 (large corrections).

Trim

Trim gain -(Integral gain) Watches if the boat is off course consistently in one direction (Ex. Due to a strong wind, or poor weight distribution).

Trim Gain causes the pilot to slowly apply extra rudder in the opposite direction to correct for the course error.

- The range is 1 (trim slowly) to 10 (trim quickly) and 0 (OFF no trim effect).

C-rudder

Counter rudder gain – (derivative gain) At the end of the turn, counter rudder will steer in the opposite direction to help stop the turn at the desired heading. If the boat is turning quickly towards the set course, the autopilot will start to apply rudder in the opposite direction to prevent the boat steering past the desired direction, this is called counter rudder. Counter rudder gain sets how strong this effect is.

- The range is 1 (low: Most often used with a planing boat) to 10 (high : Most often used with a sail boat or displacement boat) and 0 (OFF no counter rudder effect).

GPS gain

In GPS mode, this determines how much correction is applied to remove cross track error.

- The range is 1 (steer gently back on track) to 10 (steer quickly back on track).

Wind gain

In wind mode, this determines how much correction is applied to reduce any difference between the set wind angle and the actual wind angle.

- The range is 1 (slowly affected by wind change) to 10 (sensitive to wind change).

Optimum steering

Change the values of the steering parameters for optimum steering performance.

Generally:

- For calm seas, increase response; for rough seas (or to save power) decrease response.
- For higher boat speeds, decrease ratio; for lower speeds, increase ratio.
- In case of cross-winds or weather-helm, increase trim; In case of balanced steering, decrease trim.
- For large displacement boats and boats with insensitive steering, increase counter rudder; for lightweight boats and boats with responsive

- steering, decrease counter rudder.
- For higher boat speeds and large GPS routes, decrease GPS gain; for lower speeds and tight GPS routes, increase GPS gain.
- For higher and/or more stable winds, increase

wind gain; for lower and/or unstable winds, decrease wind gain.

Ideally, in **AUTO** the autopilot should steer the boat to the course without the rudder moving too often.

8-2 Profiles

The autopilot provides five configurable steering profiles that can be quickly recalled to alter the autopilot's performance based on changing sea, environmental and vessel conditions.

- To change a profile go to: *Menu > Setup > Profiles > Profile* menu.

Each of the five profiles can be individually named and configured with different steering performance settings, and recalled as needed.

To name the currently selected profile, go to *Menu > Setup > Profiles > Edit name* then:

- Use the Control Dial, **ENT** and **ESC** keys to edit the name of the profile.
 - Rotate the control dial to select numerical and upper and lower case alphabetical characters.
- Maximum number of alphanumeric characters is 8.
- Repeatedly press **ENT** to finish editing.

Note: When using more than one NS3300 Pilot, profile names are not transferred between units. So when naming profiles, be sure to name the profile on each NS3300 Pilot.

How to use profiles:

1. When the autopilot is installed, the steering parameters in all the profiles are set to their default values.
2. Select User 1, and adjust the steering parameters for optimum steering in typical conditions.
3. If the conditions change and the steering is no longer optimum, select another profile and adjust the steering parameters again
Repeat this step as required to adjust the parameters in each profile.
4. When using the autopilot to steer, select a profile suitable for the current conditions. For example different profiles can be configured for rough conditions and calm conditions, sailing or motoring.

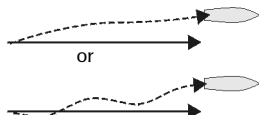
8-3 Adjusting the steering parameters

Problem: rudder turns too frequently



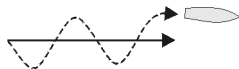
This causes wear on the steering linkage and uses power.
Decrease response.
Reduce ratio.
Reduce counter rudder gain.

Problem: drifts off course to one side



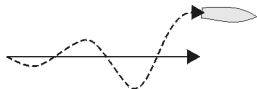
Increase ratio.
Increase trim gain.
Increase response.

Problem: boat moves too far off course closely before the rudder turns to correct the course



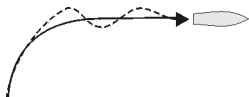
Decrease ratio.
Decrease counter rudder gain.
Decrease trim gain.

Problem: oscillations from side to side build up



Decrease ratio.

Problem: after a large course change, boat overshoots and oscillates before settling to new course



Increase counter rudder gain

Problem: after a large course change, boat takes too long to settle to new course

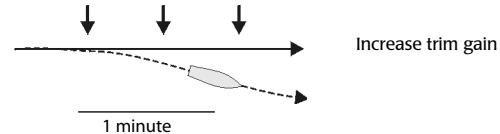


Decrease counter rudder gain

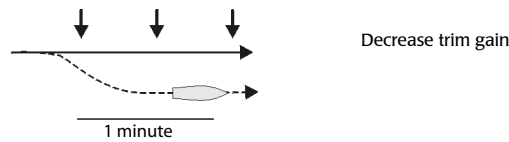
Problem: after a sideways current or wind, the correction is applied too quickly or too slowly

If the boat encounters a sideways force, then it will move off course sideways. The Pilot will automatically bring the boat back to the correct heading by applying a few degrees of rudder, called trim. Trim gain sets how quickly the trim is applied. Trim gain should be adjusted to trim the boat in about one minute. Getting the Trim gain setting right can be difficult for your specific boat and it is easy to alter the Trim gain too much. Change the settings slowly and conservatively at first, until the right settings are known.

- a Boat takes much more than one minute to trim
Sideways force starts



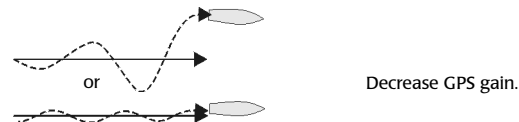
- b Boat takes much less than one minute to trim
Sideways force starts



Problem: drifts off GPS course



Problem: boat oscillated around GPS course



9 Troubleshooting

This troubleshooting guide assumes that you have read and understood this manual.

It is possible in many cases to solve difficulties without having to send the unit back to the manufacturer for repair. Please follow this troubleshooting section before contacting your nearest Northstar dealer.

There are no user serviceable parts. Specialized methods and testing equipment are required to ensure that the unit is reassembled correctly.

Repairs to the unit must only be carried out by a service centre approved by Northstar.

Users who service the unit themselves will void the warranty. More information can be found on our Website: www.NorthstarNav.com.

1 Unit will not turn on:

- a Fuse blown or circuit breaker tripped.
- b Battery voltage is outside the range 10.5 to 30.5 V DC.
- c Power/data cable damaged.

2 Autopilot makes too frequent course corrections:

The value of response is too low (see section 8-1).

3 When sailing a straight course, the boat drifts from side to side of the course:

- a The boat should drift from side to side of the course when the autopilot steering is optimized.
- b Change to a profile suitable for boat speed and sea conditions (see section 8-2).
- c If the boat drifts too far from the course, adjust response, ratio, counter rudder gain, GPS gain (if autopilot is in GPS mode) or wind gain (if autopilot is in wind mode) (see section 8-1).

4 When sailing a straight course, the boat drifts off course:

- a Change to a profile suitable for boat speed and sea conditions (see section 8-2).
- b Adjust response, ratio, counter rudder gain, GPS gain (if autopilot is in GPS mode) or wind gain (if autopilot is in wind mode) (see section 8-1).

5 When making a large course change, boat does not follow the expected course:

- a Change to a profile suitable for boat speed and sea conditions (see section 8-2).
- b Check turn rate is not too low (see section 6-3).
- c Adjust counter rudder gain (see section 8-1).

6 Boat turns too sharply:

Reduce turn rate (see section 6-3).

7 The word SIMULATE flashes on the display, values displayed are unexpected:

Unit is in simulate mode (see section 3-14).

8 The display fogs:

- a Moist air has entered the breathing tube at the rear of the unit. Air the boat or run unit with backlight fully on.
- b Water has entered the breathing tube. Return unit for service.

10 Specifications

Electrical

Supply voltage: 10.5 to 30.5 V DC.

Supply current (at 13.8 V):

Without backlighting: 160 mA.

With full backlighting: up to 390 mA.

Other optional instruments: refer to the instrument's operation manual.

Interfaces

NavBus: connection to MCU and other Northstar instruments.

Standards compliance

EMC compliance:

USA (FCC): Part 15 Class B

Europe (CE): IEC 60945:2002 Clause 9 & 10.

New Zealand and Australia (C Tick):

IEC 60945:2002 Clause 9.

Environment:

IPx6 and IPx7 - completely waterproof.

NS 3300 Display unit power/data cable wires:

Black connector - Power		
Pin	Wire color	Signal
5	Red	Power positive, 10.5 to 30.5 V DC
1	Black	Power negative
6	Orange	NavBus +
4	Blue	NavBus -
7	Yellow	Factory use (isolate, do not cut)
3	White	Factory use (isolate, do not cut)
8	Green	External alarm, switched to ground, 30 V DC and 250 mA max.
2	Brown	+9V out
Green connector - NavBus expansion		
Pin	Wire color	Signal
5	Red	Factory use (isolate, do not cut)
1	Black	Power negative
6	Orange	NavBus +
4	Blue	NavBus -
7	Yellow	Factory use (isolate, do not cut)
3	White	Factory use (isolate, do not cut)
8	Green	Factory use (isolate, do not cut)
2	Brown	+9V out