B&G

H3000

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CONTENTS

GFD MENU STRUCTURE

GFD MAIN MENU

SETUP

UNITS

CALIBRATION

OPERATING FUNCTIONS

INSTALLATION INFORMATION

HALCYON GYRO PROCESSOR

NMEA 0183 INTERFACING

H-LINK™ COMMUNICATIONS

DIAGNOSTICS

ROUTINE MAINTENANCE

H3000 SYSTEM CALIBRATION RECORD

B&G

NOTIFICATION

The information contained in this document is subject to change without prior notice.

Navico Holding shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance or use of this document.

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LIABILITY AND SAFETY WARNINGS

Navico Holding accept no responsibility for the use and/or operation of this equipment. It is the user's responsibility to ensure that under all circumstances the equipment is used for the purposes for which it has been designed.

Warning: Electrical Hazard

This equipment uses high voltage electrical power. Contact with high voltages may result in injury and/or loss of life.

Warning: Calibration

The safe operation of this equipment is dependent on accurate and correct calibration. Incorrect calibration of this equipment may lead to false and inaccurate navigational readings placing the yacht into danger.

Warning: Operational Hazard

The H3000 system is an Electronic Navigation aid and is designed to assist in the navigation of your yacht. It is not designed to totally replace conventional navigation procedures and precautions and all necessary precautions should be taken to ensure that the yacht is not placed into danger.

The Pilot is an aid to steering the vessel. It is the users responsibility to ensure the safe control and movement of the vessel at all times.

Caution: Electrical Supply

This equipment is designed for use with a power supply source of 12V dc. The application of any other power supply may result in permanent damage to the equipment.

Caution: Cleaning

The use of alcohol or solvent-based cleaners will damage this equipment and any warranty in force will be invalidated.

Caution: Display Installation

Displays installed into locations manufactured from conductive materials (e.g. Steel, Carbon Fibre etc.) should be insulated from the structure to prevent damage to the casings as a result of the effects of electrolysis.

Caution: Processor Installation

All B&G Processors should be installed below decks in a dry location protected from water and moisture.

Power Off Disclaimer

When in standby mode the H3000 system continues to consume power. To conserve the vessel's battery life switch off power at the main breaker.

ABOUT B&G

B&G has welcomed the constant challenge to develop new electronic solutions for every sailor's need. Harnessing technical developments and providing proven solutions has continued to be the focus that keeps B&G on the leading edge of advanced marine electronics.

Proven in the world's most testing environments, B&G offers the most accurate and reliable systems used by blue water cruisers, single-handed racers and record breakers alike, firmly establishing ourselves as one of the leading innovators of the most highly advanced marine electronics. B&G is renowned for tried and trusted solutions and is ever evolving to offer the best technology to the customer.

B&G's Promise.

"Uncompromising performance, precision and reliability from both our products and our people".

ABOUT THIS HANDBOOK

Instructions in this handbook describe the controls and calibration of your H3000 system. You can also use the controls on the RemoteVision.

The H3000 Central Processing Unit is the core of the system and has Hydra, Hercules, Hercules Performance and Motion level software all in one box.

All functions described in this handbook refer to the standard Hydra processor settings unless indicated with a Hercules, Performance or Motion logo as shown below.

HERCULES

Indicates that the information listed relates to Hercules processor functionality which includes Hydra functions.

PERFORM

Indicates that the information listed relates to Performance processor functionality which includes Hercules and Hydra functions.

MOTION

Indicates that the information listed relates to Motion processor functionality which includes Performance, Hercules and Hydra functions.

Please contact your local dealer if you wish to upgrade your processor. A list of B&G approved dealers can be found at www.bandg.com

SYSTEM INTRODUCTION

H3000 is the successor to the leading Hydra 2000 and Hercules 2000 instrument and Pilot systems from B&G.

Hydra and Hercules 2000 and its predecessors have been used and depended upon by the world's serious cruising and racing fraternity for fifty years, during which time the systems have been constantly evolving to provide the most dependable instrument and autopilot systems available.

At the heart of every H3000 System is the Central Processor Unit (CPU). Depending upon your system choice, this will either have Hydra, Hercules, Hercules Performance or Hercules Motion software enabled.

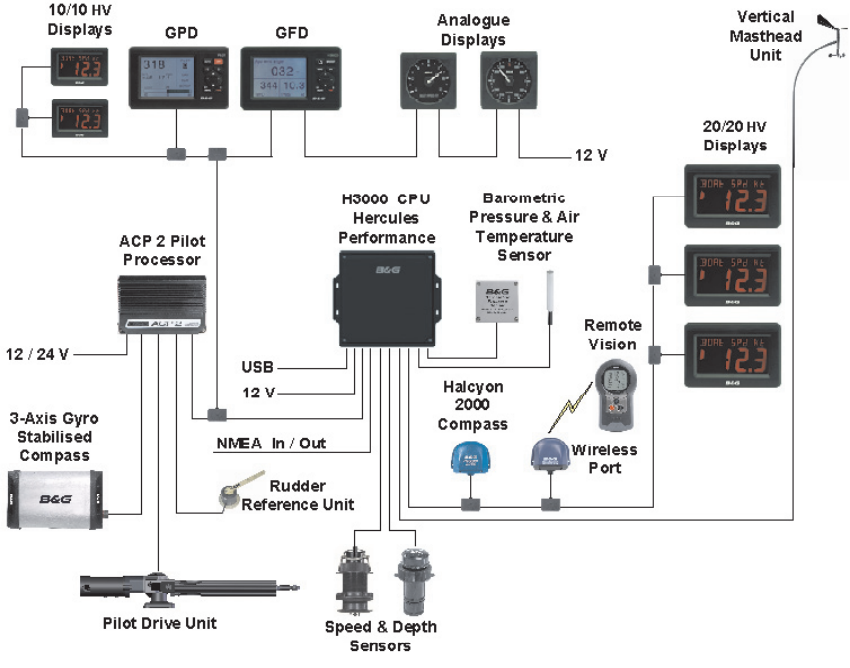
The CPU integrates raw data from sensors and makes them available on a choice of displays anywhere in the yacht. The modular design allows you to progress from a standard system, adding new units or software as required.

This manual describes the standard system and then describes how the system can be expanded.

The system is connected together by the Fastnet communication network, which handles all of the data that travels between devices: including the CPU, analogue displays, Graphical Display (GFD), Pilot Display (GPD) and HV Displays. Analogue displays are connected to a GFD via the Simnet network.

These combined with the wind speed and angle, compass heading, boat speed and depth sensors make up the standard system.

H3000 SYSTEM EXAMPLE



Above is an example of a typical H3000 system. At the centre of the system is the Central Processor Unit (CPU).

All sensor information is fed back to the CPU and can be easily controlled and configured via the Graphical Function Display (GFD).

PROCESSORS

CENTRAL PROCESSING UNIT (CPU)

The CPU is the core of the H3000 system, taking the majority of sensor inputs and using a dedicated processor to rapidly calculate and calibrate further functions and distribute them to display units and external devices.

The new enclosure enhances ease of installation with its plugged connections. The CPU is function upgradeable to enable the purchase of upgrades for additional functionality. This means upgrading your system is straightforward.

As well as sensor inputs there is also a USB interface that allows straight-forward connection of a PC for either NMEA communications or the H-Link™ communication protocol used by software packages such as Deckman.

The H3000 CPU is supplied with powerful software functions that include easy to use, highly accurate AutoCal calibration tools to bring the established power of the H3000 system calibrations to all users.

There are four software levels available:

Hydra

Hydra provides class leading performance and is ideally suited for cruising applications:

Multiple sensor inputs for external sensors (Barometer, Air and Sea Temperature etc.)
AutoCal routines to simplify otherwise complex calibration procedures

Up to 4Hz update rates
True Wind Corrections
USB interface for interfacing NMEA data to a PC
NMEA 0183 input and output
Alternative use of SOG as boat speed

Hercules

A software level designed specifically to meet the requirement of racing and advanced cruising applications. Hercules adds the following:

Up to 6Hz update rates
Dynamic Damping
Wind data corrected for Heel angle
Advanced TWS calibration
Secondary Pulse input for additional boat speed sensor
Boat speed linearity/heel angle correction

Hercules Performance

Designed to further enhance the H3000 range, the Hercules Performance level software integrates B&G's Tactical Navigation software, Deckman, along with several advanced features:

Deckman™ Tactical Navigation software
H-Link™ communications (USB or RS232), USB lead included
Polar tables
Polar related performance functions (e.g. Target Boat Speed)

Hercules Motion

Hercules Motion uses technology from B&G's grand prix level systems to calculate and correct wind data for the errors induced by the motion of the yacht. This includes all features and functions from Hercules Performance. Additional features include:

Performance Wind Filter (PWF)
Pitch and Roll measurement
Wind Motion Correction

EXPANSION PROCESSOR

The Expansion Processor provides 12 additional linear/analogue sensor inputs.

HALCYON GYRO PROCESSOR

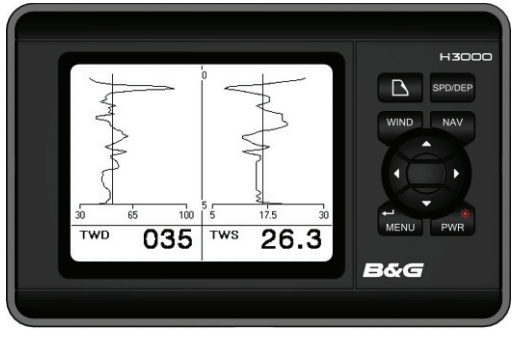
The Halcyon Gyro Processor is an interface between the Halcyon Gyro Stabilised Compass and the B&G Fastnet network. It also outputs NMEA heading information at a rate of 10Hz for use with other marine instruments and AD10 for use with Radar.

The Halcyon Gyro Processor accepts NMEA data from your position fixer for magnetic variation information to allow display and output of True referenced heading.

The Halcyon Gyro Processor can also be used as an interface to output NMEA heading and AD10 from a B&G system compass, or to accept NMEA heading information from an external compass for use on the H3000 system.

DISPLAYS

GRAPHICAL FUNCTION DISPLAY (GFD)



The high-resolution graphical display allows the use of both graphical data representation and a very intuitive user interface.

The GFD has a simple easy to learn key configuration that gives the user the confidence to set-up and configure the H3000 system hassle free.

As well as shortcut navigation keys to display important data at the touch of a key, all data can be reviewed and displayed in a variety of on screen configurations to suit the users requirements.

You can choose up to seven pieces of data to be displayed at any one time. As well as having a variety of graphical screens that gives you a clear visual interpretation of the data provided.

Index matched bonded display technology is used to give the dual benefits of increased display clarity in all lighting conditions and complete elimination of the possibility of condensation obscuring the display.

Use of exceptionally high quality materials such as die-cast alloy, fibre reinforced plastics and tempered glass ensures a hugely reliable and durable display.

HV DISPLAYS

The HVision range of displays are lightweight, single-line data units incorporating B&G's unique HV technology. HV technology ensures the maximum contrast, perfect backlighting and no possibility of condensation. HV displays are the clearest displays available.

There are four displays in the HV range, each with their ideal application:

10/10 HV

The 10/10 is a compact display that allows data to be positioned where it is needed, rather than where it fits. Its compact dimensions allow the 10/10 to be installed almost anywhere – typical installation areas are the base of winch pedestals, alongside hydraulic control panels, steering pedestals or as a companionway display on the smaller yacht.

20/20 HV

The latest generation of the classic 20/20 mast display. The 20/20 is the de facto standard for mast displays on yachts up to 70' (21m). The 20/20 is also ideal for use as a cockpit, saloon or bridge display.

30/30 HV

The 30/30 is designed as a mast display for yachts in the range 60-90' (18-27m) LOA. Providing these larger yachts with the perfect size of display. The 30/30 is also the ideal display for deck or bridge displays on super yachts.

40/40 HV

The 40/40 is the largest instrument display available. Designed specifically for mast mounting applications on super yachts, it also is the ideal display for forward beam mounting on maxi-multi hulls or as a deck or helipad display on large motor yachts.

HV displays store 14 pages which can be configured to show almost any system function. The display can be controlled or configured from any GFD or GPD (Pilot) display or with a RemoteVision.

The pre-set functions are as follows:

Boat speed
Depth ft
Apparent Wind Angle
True Wind Angle
Heading
Bearing to Waypoint*
Speed Over Ground*
Depth m
Apparent Wind Speed
True Wind Speed
Velocity Made Good
Timer
Course Over Ground*
True Wind Direction

Note: *Functions marked * are NMEA Functions and are available only when a suitable Position Fixer is interfaced with the system.*

Remote Button

If a Remote Button is connected to an HV Display any one of the 14 pre-set functions may be selected by pressing and holding down the button.

The Display will then cycle through the functions. When the required function is displayed, release the button.

If the button is held down too long and the required function is missed, press and hold down the Button again. The Display will then cycle though the functions in reverse order. When the required function is displayed, release the button.

ANALOGUE INDICATORS

There is a wide range of analogue indicators available, all listed below:

Operation of the analogues is self-explanatory however the display back lighting is achieved by pressing the light key on any of the GFD or RemoteVision.

Apparent Wind Angle

True Wind Angle

Magnified Apparent Wind Angle

Apparent Wind Speed

True Wind Speed

Boat Speed 12.5 or 25 Knot

Depth 200 Meters

Depth Ft/Fathom

Heading

Rudder

REMOTEVISION

The RemoteVision is a wireless link to your H3000 system, as well as a Pilot control, all in the palm of your hand. The lightweight, palm sized unit is linked to the instruments and pilot through a small wireless port and using a secure wireless connection, which is suitable for use on both small and large vessels.

For operational details, refer to the RemoteVision Owners Handbook.

SENSORS

PADDLE WHEEL - SPEED SENSOR

The Paddle-Wheel Speed Sensor is designed for both cruising and racing yachts and consists of a paddle wheel, which protrudes through the hull via a hull housing.

To enable regular cleaning of the paddle wheel, the housing is provided with a self-closing valve, which closes automatically when the sensor is retracted.

The H3000 CPU can be configured to monitor two paddle wheel sensors simultaneously.

DEPTH SENSOR

This unit can be either a removable through hull unit, or moulded in hull for reduced drag. The depth datum is fully adjustable and can be set so that depth readings are relative to the waterline, the bottom of the keel or from the transducer.

MASTHEAD UNIT - WIND SPEED AND ANGLE

The Masthead Unit measures the wind speed and angle at the masthead. A choice of units are available; Four sizes of Vertical Masthead Unit, including some available in 'Ocean Specification' for special applications and custom projects. A standard 450mm (17.5") horizontal unit is also available.

HALCYON 2000 COMPASS

The Halcyon 2000 compass is a high performance electronic fluxgate compass. It is designed to connect to H3000 systems through the B&G Fastnet network. The compass has the ability to 'learn' the magnetic effect of the vessel on the compass and automatically apply deviation corrections.

HALCYON GYRO-STABILISED COMPASS

The Halcyon Gyro-Stabilised Compass (HGSC) is a high performance, solid-state compass that provides high quality heading information through the use of 3-axis rate gyros to correct for the motion of your yacht. It also provides high accuracy Heel and Trim data.

The Halcyon Gyro-Stabilised Compass interfaces to the H3000 system via the Halcyon Gyro Processor that transmits this information to the B&G Fastnet network, or via direct connection to the B&G Pilot ACP unit.

The HGSC is an easily calibrated compass that 'learns' the magnetic effects of your vessel on the compass and automatically applies the deviation correction.

GIMBALLED RATE COMPASS (GRC)

The Gimballed Rate Compass (GRC) has been designed to bring the full advantage of a single-axis rate-sensor to the sailing market.

The GRC utilises a gimballed rate-gyro, ensuring that the sensor is always measuring the true yaw rate, independent of any heel and trim effects. The GRC also integrates high-accuracy heel and trim sensors which can supply data via the Halcyon Gyro Processor or ACP Pilot. Heading data is also available via 10Hz NMEA output.

CLINOMETER - HEEL ANGLE SENSOR

The addition of a heel sensor to the system provides display of Heel Angle and increases the accuracy of the following functions:

Apparent Wind Angle
Apparent Wind Speed
True Wind Angle
True Wind Speed
True Wind Direction
Course*
Dead Reckoning
Tidal Set and Drift
Leeway*

Note: * *Sensor required*

CLINOMETER – TRIM ANGLE SENSOR

Provides display of Trim Angle and increases the accuracy of the following functions:

Apparent Wind Angle
Apparent Wind Speed
True Wind Angle
True Wind Speed
True Wind Direction

MAST ROTATION SENSOR

This is essential if your mast rotates, otherwise the wind data will become inaccurate as the mast rotates away from the centreline. The installation of this unit provides two new functions, Wind Angle to the Mast (W/A MAST) and Mast Angle (MAST ANG), which are then used to correct the Measured Wind Angle for mast rotation angle.

RUDDER ANGLE SENSOR

The addition of a Rudder Angle sensor can be very useful, indicating how the yacht is balanced / trimmed.

BAROMETRIC PRESSURE SENSOR

Measures the atmospheric pressure, allowing the CPU to record atmospheric pressure changes over varying periods of time.

SEA TEMPERATURE SENSOR

Measures the seawater temperature. Often integrated with the speed sensor, as standard with the B&G paddle wheel.

AIR TEMPERATURE SENSOR

Measures the air temperature. Allows the navigator to check actual readings against forecast weather data.

MOTION SENSOR

The Dual-Axis Motion Sensor provides accurate measurement of the pitch and roll rates of the yacht, allowing the Hercules Motion CPU software to correct the wind data for errors induced by this motion.

LOAD CELLS

Measures rig loads, typically used on forestay, vang, outhaul, runners, backstay, and mainsheet.

Up to 12 B&G loadcells can be added to the H3000 system via the Fastnet databus (refer to the B&G Loadcell Installation/Calibration Manual). If desired, loadcells may be connected as non-networked devices and wired directly to the linear inputs of the H3000 CPU. These loadcells should provide a linear output voltage in the range of 0 to 6.5 volts.

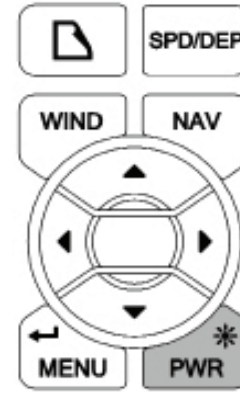
There are a variety of standard sizes of Loadcell available; B&G also offer custom pins to suit any application.

Loadcells are essential for Race tuning, Performance, Monitoring and safety.

GETTING STARTED

GRAPHIC DISPLAY (GFD) KEYS EXPLAINED

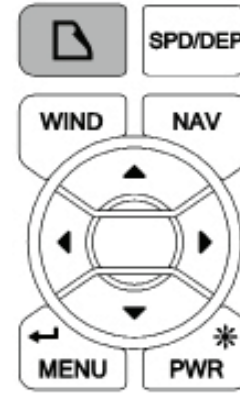
Power / Lights



To power on/off the GFD press and hold the Power key until the unit powers up/powers down. At start up the last page used on the previous operation will be displayed.

A short press of the Power key will provide full background illumination on all system displays. Further short presses of the key decrease the illumination in three stages from full brightness to OFF. The next press of the key enables full illumination. Display lighting can be localised so that the level is adjustable for individual displays.

Page

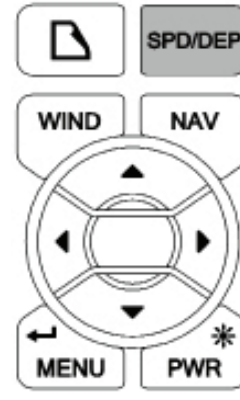


This is a one-touch key that takes you directly to preset data without using the menu. Successive presses of the page key cycles through six pre-programmed pages. These pages are user configurable.

Pre programmed default display data.

- Boat Speed, Velocity Made Good
- Boat Speed, True Wind Angle
- Timer, Boat Speed, True Wind Direction
- Apparent Wind Angle, Apparent Wind Speed, True Wind Angle, True Wind Speed
- Boat Position Data x 7
- Off course Tactical Compass Page

Speed/Depth



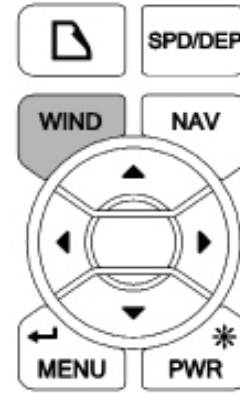
This is a one-touch key that takes you directly to your speed and depth data pages without using the menu.

These factory set pages cannot be reconfigured.

Pre programmed default display data.

- Boat Speed, Depth
- Boat Speed, Speed Over Ground
- Boat Speed, Apparent Wind Angle
- Depth Histogram

Wind



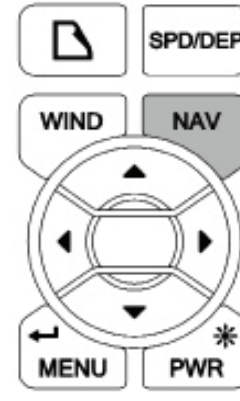
This is a one-touch key that takes you directly to your wind data without using the menu.

These factory set pages cannot be reconfigured.

Pre programmed default display data.

- Apparent Wind Angle, Apparent Wind Speed
- True Wind Angle, True Wind Speed
- True Wind Direction, True Wind Speed
- True Wind Direction, True Wind Speed Histogram

Nav



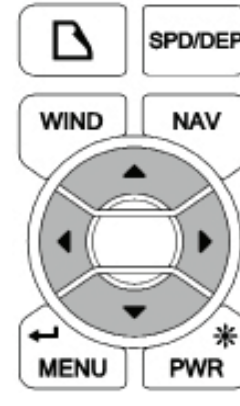
This is a one-touch navigation key that takes you directly to your navigation data without using the menu.

These factory set pages cannot be reconfigured.

Pre programmed default display data.

- Heading, Course Over Ground
- Heading, Boat Speed
- Boat Position Data x 7
- Tide Vector Graphic

Directional Keys



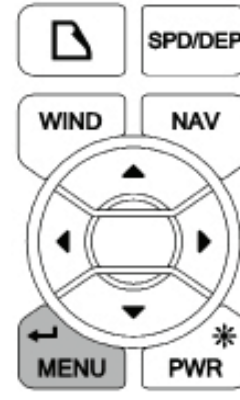
Four-way directional keypad navigates the menus of the GFD.

Up and Down will take you through each menu list. To enter a sub menu press the right directional key or ↵

To return to the previous menu press the left directional key.

Pressing the page key at anytime will return you to the front-page data.

Menu / Enter

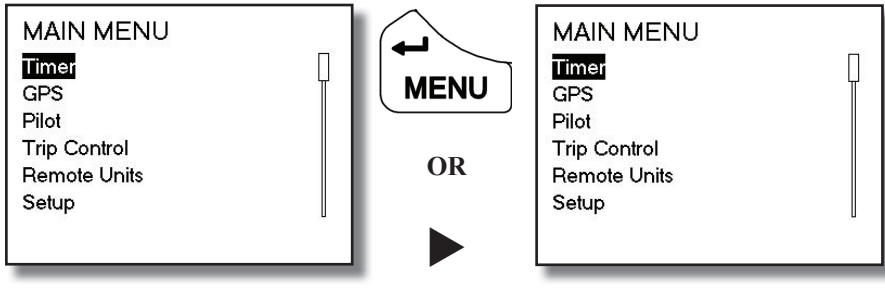


The Menu/Enter key either activates the main menu or actions a menu item.

When the GFD is in normal mode showing a page of instrument data, pressing the menu key (MENU) will bring up the main menu as shown below.

However if the menu item is highlighted then the key acts as an enter key to select that item as shown.

Alternatively this key confirms a parameter value when changing a setting.



GFD MENU STRUCTURE

The central concept to the operation of the GFD is the menu system; once this is grasped operation very quickly becomes familiar.

The idea of structured layers of menus is seen everywhere in modern software, and regular mobile phone / computer users should have a head start.

The principle is that at any one level there is a set of choices that you can scroll through until you find the one you want. Having found the correct menu entry, it is then selected by pressing the Enter (or the right key) the GFD then displays the next menu level.

Here you once again scroll through the available options until you find and select your choice. In many cases this is as far as you will need to go, e.g. to choose a function for display.

To complete some actions such as entering a calibration value, switching on an alarm, and so on, you will need to navigate the GFD menus.

Each menu choice selected will be in CAPITALS.
The page description / contents will be in lower case.

Menu or Select/Enter

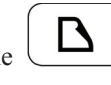
▶ **Scroll right, to enter a sub menu**

◀ **Scroll left, to return to the previous menu**

▼ **Scroll down / Reduce value**

▲ **Scroll up / Increase value**

↵ **Press Enter to confirm an action**

At any time during the navigation of the GFD, press the  key to exit the menu and return to a normal instrument screen.

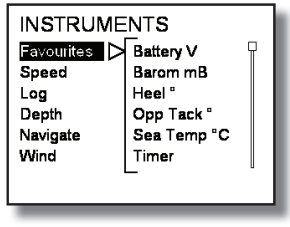
Example 1 ~ To start the countdown timer

TIMER ▶ Start ↵

Example 2 ~ To set an alarm function

SETUP ▶ ALARMS ▶ Select Alarm ▶Input Value ▶ON/OFF

FUNCTION MENU



The Instruments menu has been designed so common functions are grouped under the same menu heading. Below is a list of common functions and their abbreviated shorthand to enable you to quickly access additional information whilst navigating the data pages.

MENU	FUNCTION	ABBREVIATION
DEPTH	Aft Depth	Adep
	Depth	Dep
LOADCELLS	Loadcells	
LOG	Log	Log
	Trip Log	TRIP
MISC	Barometric Pressure	BARO
	Barometric Pressure Trend	BAR t
	Rudder Angle	Rud
	Halcyon	
	Linear 1,2,3 & 4	
	Com Port Configuration	COM CFG
	Base Station	Base STN
MOTOR	Battery Voltage	BATT
NAVIGATE	Heading	Hdg
	Off Course	Off C
	Dead Reckoning	DRD/DRC
	Course	CSE
	Leeway	Lway
	Tide Set and Rate	T SET,T RTE

MENU	FUNCTION	ABBREVIATION
PERFORM	Optimum Wind Angle	OPT WA
	Polar Boat Speed	POL
	Polar Performance	POL %
	Layline Distance	dLL
	Heel Angle	Heel
	Target Boat Speed	TG SPD
	Trim (Fore/Aft)	Trim
	Mast Angle	MST
	Target TWA	TG TWA
	VMG Performance	VMG Perf
SPEED	Boat Speed	BSpd
	Average Speed	AVS
	Velocity Made Good (VMG)	VMG
	Pulse 2	PUL 2
TEMPERATURE	Air Temperature	AIR
	Sea Temperature	Sea
TIME	Local Time	Time
	Time to Layline	tLL
	Timer	Time
WAYPOINT	Bearing To Waypoint	BTW
	Bearing Waypoint to Waypoint	BWW
	Boat Position	POS
	Course Over Ground (COG)	COG
	Course To Steer	CTS
	Cross Track Error (XTE)	XTE
	Distance To Waypoint	DTW
	Speed Over Ground (SOG)	SOG
	VMG to Waypoint (VMC)	VMC
	Time to Waypoint	t WPT

MENU	FUNCTION	ABBREVIATION
WIND	Apparent Wind Speed	AWS
	True Wind Speed	TWS
	Apparent Wind Angle	AWA
	True Wind Angle	TWA
	True Wind Direction	TWD
	Next Leg Apparent Wind Angle	NL AWA
	Next Leg Apparent Wind Speed	NL AWS
	Measured Wind Angle	MWA
	Measured Wind Speed	MWS
	Wind Angle to Mast	WAM
	Heading on Opposite Tack	OppT

GFD MAIN MENU

Pressing the 

key will display the main menu options, as below

TIMER

The timer is designed to provide start or elapsed time; it will count up from zero and will count down to zero if a time value is set.

TIMER ▶▼

SYNC	**↵ Jumps to the nearest whole minute. i.e. 4:45 or 5:07 both become 5:00**
START	**↵ Starts Timer**
SET	**↵ ▼▲ (Set countdown timer value) ↵ To timer menu**

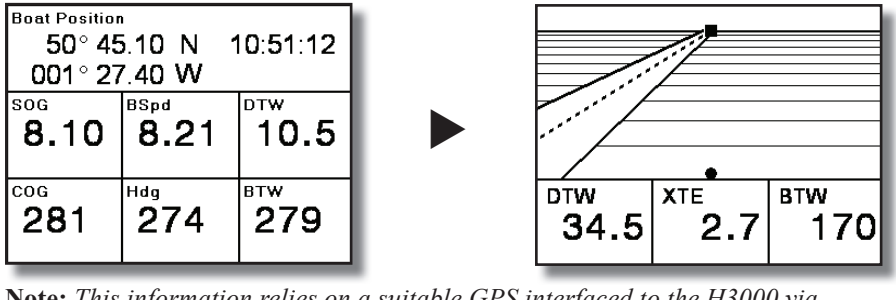
GPS

There are two pages that show GPS data.

Page 1 shows nine pieces of data:
Boat Position – Speed Over ground – Boat Speed – Distance to Waypoint – Course Over Ground – Heading – Bearing to Waypoint - Position – Local Time.

Page 2 has a rolling road with three pieces of data:
Distance to Waypoint – Cross Track Error – Bearing to Waypoint.

GPS ▶ GPS Data Page 1 ▶ GPS Data Page 2



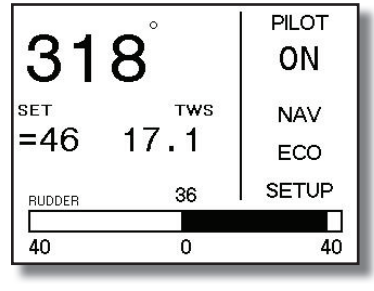
Note: *This information relies on a suitable GPS interfaced to the H3000 via NMEA 0183, or valid data input to the USB port.*

PILOT

The Pilot screen shows pilot data received from the Pilot processor. Use the direction keys to navigate the screen and any of the page keys to exit.

Note: *Only steering mode, response mode, and setup can be configured via the GFD. To utilise the Pilot's full functions you should use the Pilot display and consult the Pilot handbook.*

PILOT ▶ Pilot Data Page



Heading

Current system Heading

Pilot Target

Desired Course, Wind Angle, or Waypoint Bearing - dependant on selected steering mode.

Pilot Status "ON" or "OFF"

Can be controlled by the Pilot display, or RemoteVision. The GFD cannot be used to switch the Pilot on or off.

Steering Mode Indication

COMPASS
APPARENT WIND
TRUE WIND
WAYPOINT
OPTIMUM WIND
POWER STEER

Response Mode

NORM	Normal course keeping and rudder response.
ECON	Economy: The rudder movement is limited; this reduces the overall consumption of the autopilot system.
DWIND	Downwind: More active steering control especially for downwind steering in demanding conditions.

Note: *When a Halcyon Gyro Compass is connected you will also have a performance option - PERF - this function has 4 levels that allow for increase and decrease of steering response. Refer to Pilot Handbook.*

Rudder Angle

A graphic indication, with 1 degree resolution, to Port or Starboard. The numeric value is shown above the graphic.

Instrument Data

Displays one item of data from the H3000 Instrument system.

Setup

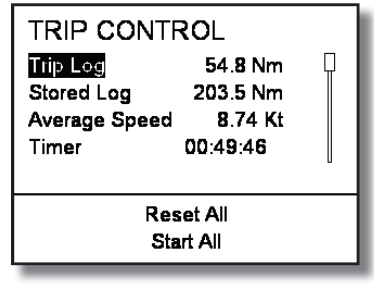
A shortcut to Pilot setup options.

Note: *For full information on Pilot operation please refer to the Pilot Handbook.*

TRIP CONTROL

This page shows all trip functions and stored log in one menu allowing easy access to reset and start operations.

When any trip function is started, all other trip functions that have been reset start simultaneously, except when the timer countdown is started. Under this condition, the other functions start, again if previously reset, when the countdown reaches zero. This is designed for the beginning of races, so that you have DR, log and timer running automatically from the start.



Example 1 ~ Reset Trip Log

MENU **TRIP CONTROL ▶ Trip Log ▶▼ Reset ↵**

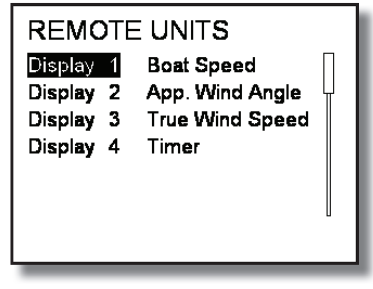
Example 2 ~ Start All Trips

MENU **TRIP CONTROL ▼ Start All ↵**

REMOTE UNITS

This option provides remote control of any HV display. Below is an example of how to change the data shown on display 1.

REMOTE UNITS ▶ Display 1 ▶ Boat Speed ▼▲ Select one of the 14 preset data pages ◀ Scroll left to save the new display data



Note: *When each of the displays are selected as shown above, the remote display will flash so you can reference the display number to the physical display unit.*

Below is an example of how to change any of the pre-set pages to display alternative data.

REMOTE UNITS ▶ Display 1 ▶ Boat Speed ↵

This will display the data menu ▶ Highlight the required piece of data ↵ Will bring you back to the remote units page.

Note: *The selected function data will then be stored in that particular display's preset page memory.*

SETUP

The Setup menu provides access to system alarms, calibration, damping, this display and commissioning.

ALARMS

MENU **SETUP ▶ ALARMS**

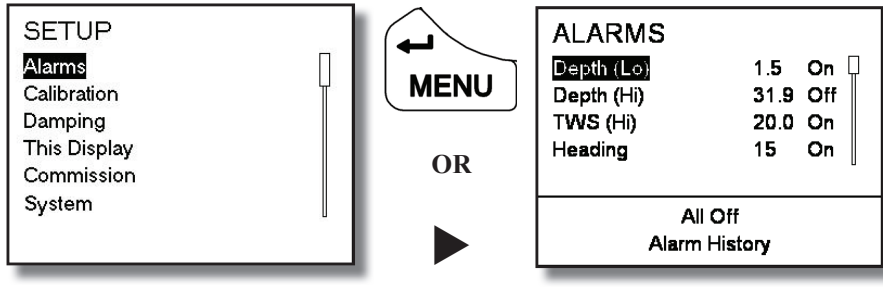
You can preset alarm parameters to trigger a warning when the data exceeds the set limits. This will flash a message on the display to warn you. An audible alarm can also be fitted to raise a sound alarm. Any alarm can be switched on or off.

There are 3 types of alarm: Hi, Low and Sector. The sector alarm is activated if you move outside an agreed sector angle.

When an alarm is on and that alarm is triggered it will send a warning message to all GFDs and GPDs. If you select 'Ignore' then the alarm will be cleared from that individual unit, but will continue to be shown on all other displays.

If you select 'Silent' then the warning screen disappears on all displays and the alarm is de-activated. The alarm will automatically become active again once you move back within the safe parameter.

Each time the alarm zone is reached it will trigger the alarm. You must set the alarm to off to deactivate it automatically. All alarms can be turned off by highlighting ALL OFF in the alarms menu and pressing ↵



Note: *Only the common alarms are listed. For other available alarms go to:*

ALARMS ▶ OTHER ALARMS

Example 1 ~ Setting Depth Lo Alarm

MENU **SETUP ▶ ALARMS ▶ Depth (Lo) ▶ Set ▶ Lo limit ▶ ▼▲ On/Off** ↵

Example 2 ~ Accessing Alarm History

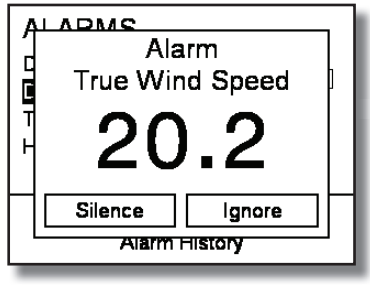
MENU **SETUP ▶ ALARMS ▶ ALARM HISTORY** ↵

Alarm History displays all alarms that have been triggered recently. This information is cleared when the power is switched off.

Example 3 ~ True Wind Speed Alarm

In the screen shot below the True Wind Speed Limit was set to 20 knots.

As the TWS is greater than 20 kts the alarm window has been shown. To remove the alarm window globally from all GFDs select SILENCE and press ' ↵ ' if you wish to remove this warning only from the display you are using, highlight IGNORE and press ↵



▼ **SILENCE** ↵

▼▶ **IGNORE** ↵

Note: *Refer to Operating Functions for further information regarding Alarms.*

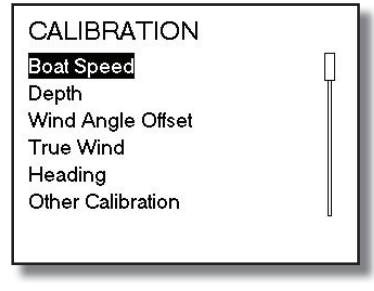
CALIBRATION

MENU **SETUP ▶ CALIBRATION**

It cannot be over stressed the importance of calibrating the system properly, in both the initial stages of the installation and operation and throughout the life of the system.

Calibration is an ongoing process and is something you must be aware of each time you go sailing. This is particularly relevant of the true wind calibration, where constant refining will pay huge dividends in accuracy.

To this end the process has been simplified as far as possible, so that all you require for accurate instrument data is some background knowledge together with a few simple techniques.



Note: *Information regarding calibrating your H3000 System can be found in the calibration section.*

DAMPING

MENU **SETUP ▶ DAMPING**

Another important facility that you need to be constantly aware of is the damping available on certain functions. This allows you to filter signal noise on the function when in unstable or rough conditions.

The damping works by applying a filter over a time period; the longer this time period, the smoother the data readings will be, but the longer it will take to see the effect of any change. Similarly the lower the time period the greater the jumps you will see in the numbers, but the response to any change will be faster.

DYNAMIC DAMPING

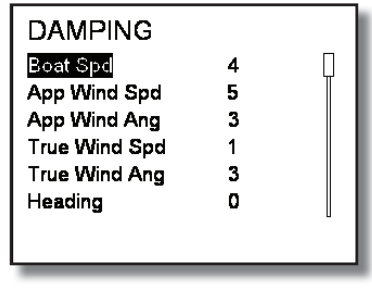
HERCULES

Dynamic Damping adjusts your system to deliver the most accurate and real-time information, e.g. When on a beat, it is essential that the wind angle information is accurate but steady with most noise filtered out, however, when tacking, data needs to be more real-time. With Dynamic Damping the damping value applied will reduce to almost zero during conditions when the data is changing rapidly and then increases again after the tack.

The Damping value is set (in seconds) to a steady state value, the Dynamic Damping is set to a value between 0 (off) and 10 (maximum), the higher the value, the more sensitive the function is to rates of change and the quicker the damping value is lowered in a manouver.

This allows the effects of the change to be more readily seen on the instruments. As the rate of change of the function reduces, so the damping value is allowed to rise to the preset Damping Value to ensure signal noise is filtered out of the data.

Damping should not be confused with the update rate, which is the number of times per second that the function value is sent to the display. The update rate is fixed for all the functions.



Example 1 ~ Set Boat Speed Damping

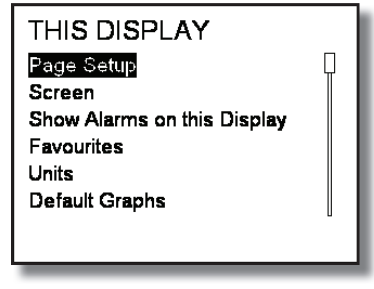
MENU **SETUP ▶ DAMPING ▶ BOAT SPD ▶ Set Value** ↵

THIS DISPLAY

MENU **SETUP ▶ THIS DISPLAY**

This Display menu is where you can modify the general settings of the GFD. Any changes to the default settings will be saved.

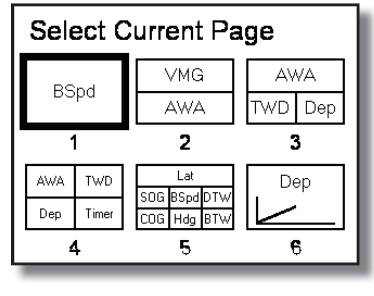
Settings are only applied to the display in use, allowing displays to be configured differently according to their use.



PAGE SETUP

You can re configure the key default pages, and change how each page is configured.

Screen layouts can be selected for each page and configured to display whatever data is required. Once this has been changed it is saved for future use.



Example 1 ~ To change data displayed on page 1

Highlight the page that you want to re configure ↵

Select which page format you desire ↵

Highlight the display pane you wish to re configure ↵

Select the new data you wish to be displayed ↵ (Repeat for all display pains)

Note: *Re-configuring the page key in this manner will permanently change the displayed data.*

Displaying temporary information on any data page

To enable you to quickly access additional information whilst navigating the data pages you can display any data by following the example below.

Example 2 ~ To change the display data whilst navigating the speed and depth pages.

Select the page you wish to change ▼

Highlight the data you wish to change ↵

Select the new data to be displayed ↵

Note: *Any changes in configuration made to the current display page will return to its previous configuration when any other display page is selected.*

SCREEN

Modify Lighting and Contrast settings.

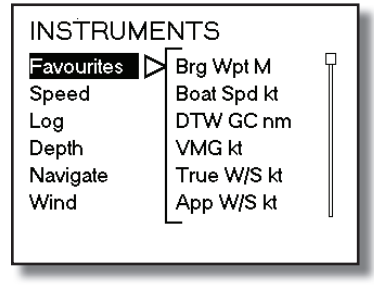
SCREEN ▶▼ Highlight lights control ▶ Select local or system
▼ Highlight colour ▶ Select Red or White
▼ LCD MIN Light ▶ (Set Value) ↵
▼ LCD MID Light ▶ (Set Value) ↵
▼ LCD Max Light ▶ (Set Value) ↵
▼ Highlight contrast bar ◀▶ To modify contrast

SHOW ALARMS ON THIS DISPLAY

Enable or disable alarms appearing on an individual display.

FAVOURITES

Favourites enable you to configure six pieces of most commonly required instrument data. Normally these are six additional pieces of data that are not already allocated to the page keys.



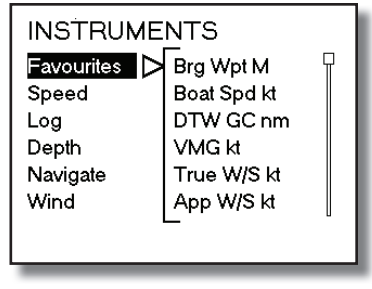
Example 1 ~ Modifying the favourites menu.

FAVOURITES ▶ (Select data header you wish to change) ↵

Highlight top-level data menu heading i.e. SPEED ▶
Select type of data i.e. BOAT SPEED Kt ↵

UNITS

Units allow you to configure the units of measurement used for Heading, Wind Speed, Depth, Boat Speed, and Nav Mode.



Example 1 ~ Changing the Heading from Magnetic to True.

UNITS ▶ HEADING ▶ TRUE-T ↵

GFD UNITS OF MEASUREMENT

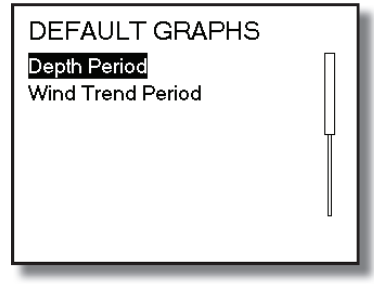
GFD UNITS OF MEASUREMENT			
Type	**Options**	**Abbrev**	**Default**
Heading	Magnetic	M	Magnetic - ºM
	True	T	
Wind Speed	Knots	Kts	Knots - Kts
	Meters/s	m/s	
Depth	Meters	m	Meters - m
	Feet	Ft	
	Fathoms	Fm	
Boat Speed	Knots	Kts	Knots - Kts
	Km Per Hr	KPH	
	Miles Per Hr	MPH	
Nav Mode	Great Circle	GC	Great Circle - GC
	Rhumb Line	RL	

DEFAULT GRAPHS

Allows the user to configure the time period for the graphical time plots available via the SPD/DEP and WIND preset pages.

These time plots can be configured for periods of 5 to 720 minutes (12 hours).

Time Plots are plotted over the set period of time at 60 equal intervals, e.g. if the time is set to 60 minutes it will take a reading every 1 minute, if it is set to 30 minutes it will take a reading every 30 seconds.



Example ~ Configuring the Depth period to 60 minutes

MENU SETUP ▶ THIS DISPLAY ▶ DEFAULT GRAPHS ▶ DEPTH PERIOD ▶ Set time period ▼▲ ↵

To reset display settings to factory default values.

MENU SETUP ▶ SYSTEM ▶ RESET OPTIONS ▶ THIS DISPLAY ▶ Are you sure? Select YES ↵

UNIT INFORMATION

Displays the current software versions operating in your H3000 system

MENU SETUP ▶ THIS DISPLAY ▶ SYSTEM INFO ▶

COMMISSION

From the commission menu you can setup the H3000 system. From here you can decide to use SOG as boat speed, set which compass is being used, commission the pilot, start a compass swing, and setup a second depth input.

SETUP ▶ COMMISSION

USE SOG AS SPEED INPUT

Choose between Boat Speed and SOG (Speed Over Ground) as your speed input. The default setting takes speed input from the paddle wheel sensor.

If you choose to use SOG instead of boat speed this will take data from your GPS input. This can be used in the event of damage/fouling of the paddle wheel sensor and/or on very high-speed vessels where the sensor has limited contact with the water.

Caution: Using SOG as boatspeed affects the accuracy of tidal functions. Tide function information should be disregarded.

Example 1 ~ Use SOG as speed input

COMMISSION ▶ USE SOG AS BOATSPEED ▶ ON (1) /OFF (0) ▼▲ ↵

HEADING

Used to select the source of heading data to be used throughout the system.

For information on how to use this facility see ‘compass calibration’.

PILOT

The Pilot can be commissioned via the GFD. For full detailed instructions on how to do this please refer to the Pilot Handbook.

COMMISSION ▶ PILOT

START COMPASS SWING

Used to start a calibration swing to correct deviation errors on a heading sensor.

For information on how to perform a compass swing see ‘Compass Calibration’

SYSTEM

From this menu you can look up software versions and reset any piece of B&G equipment on the network.

Example 1 ~ Reset Options – How to reset this display

MENU SETUP ▶ SYSTEM ▶ RESET OPTIONS ▶ THIS DISPLAY ▶ Reset this display ▼▼ YES/NO ↵

Example 2 ~ System Versions - How to check the software versions on the current system.

MENU SETUP ▶ SYSTEM ▶ SYSTEM VERSIONS ▶ THIS DISPLAY ▶ Shows current software version for the display in use.

CALIBRATION

INTRODUCTION

This section describes the calibration of your H3000 System via the GFD.

Every care must be taken when undertaking any Calibration Procedure to ensure that the H3000 System is calibrated accurately and correctly. Incorrect calibration could lead to incorrect navigational information and possibly placing the yacht into danger.

There are four sensor inputs to your system that are fundamental to its integrated approach - Boat Speed, Compass Heading, Measured Wind Angle and Measured Wind Speed.

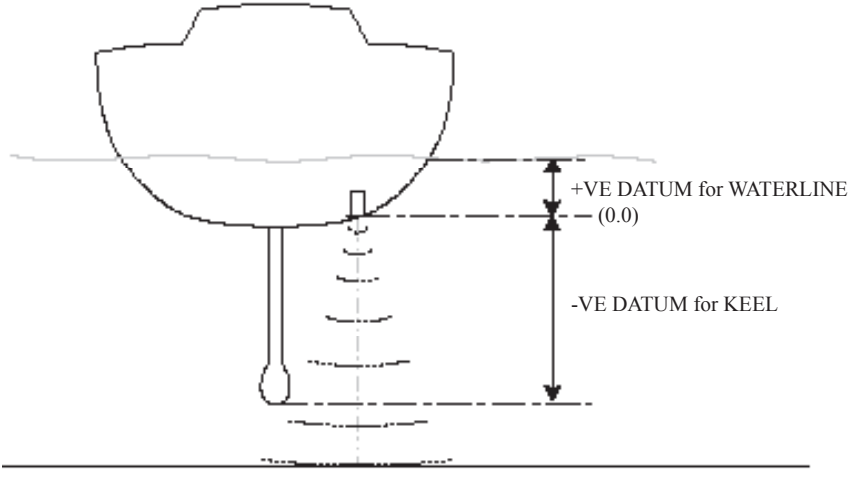
Without these basic inputs you cannot have the more important values of true wind speed and direction and velocity made good, which are calculated from them. As an absolute minimum your system should measure these four parameters.

There are many really useful additional values that the H3000 allows you to measure, but they are not essential to the system's primary function. Nevertheless, these will need to be calibrated as well, but we shall deal with them separately, after we have calibrated the primary functions.

On any yacht after the launch, the calibration of the sensors should have the same priority as making sure that the sails fit. It is crucial to keep a full record of the process. The H3000 System Calibration Record contains calibration tables for this purpose.

DEPTH

A typical transducer installation is through the hull at a suitable position between the water line and the bottom of the keel. A DATUM (offset value) can be set, such that the depth display refers to either the water line or the keel line.



Depth Datum

The datum is entered under:

MENU **SETUP ▶ CALIBRATION ▶ DEPTH DATUM ▶ (Set Datum value) ↵**

Aft Depth

The H3000 has the facility to display NMEA depth data from an auxiliary depth source. Any NMEA depth information input into the NMEA port on the H3000 CPU is displayed on the system as AFT DEPTH.

A depth datum offset is available for the AFT DEPTH function. The datum is entered under:

MENU **SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ DEPTH ▶ AFT DEPTH ▶ DATUM (Set Datum value) ↵**

Additionally it is possible to re-name the function AFT DEPTH by selecting one of the predefined function names. This is done by entering the corresponding number under:

SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ DEPTH ▶ AFT DEPTH ▶ TEXT SEL (Set value as table below) ↵

CAL VAL 2 SETTING - DEPTH	
Text Select Setting	**Function Text Shown**
0	AFT DPTH
1	FWD DPTH
2	MID DPTH
3	PORT DPTH
4	STBD DEP
5	DEPTH 2

BOAT SPEED / LOG CALIBRATION

Principle of Log Calibration

To calibrate the log we must work out the number of pulses per second from the speed sensor that correspond to each knot of boat speed. The boat speed/log calibration value is always shown as Hertz per knot (Hz/Kt).

The H3000 allows for calibration of separate port and starboard sensors, as well as a single unit depending on installation.

There are occasions when you will need to calibrate each tack separately e.g. for dual sensor installations or single sensors installed off the centre line. If you have a single unit which you have calibrated automatically, as we are about to explain, and it shows differences between one tack and the other, then the solution lies in using the manual method of entering percentage offset values through the Tack Correction facility on the GFD. Refer to 'boat speed tack offset correction' for more detail.

In the case of multiple speed sensors the H3000 CPU will always select and use the calibration value for the appropriate sensor; this is determined by the CPU based on Measured Wind Angle, Heel Angle or a combination of the two. The default is Measured Wind Angle.

Preparation for Log Calibration

Before calibrating the log you should ensure that the boat speed sensor is correctly installed as follows:

Sonic Speed: Check that the unit is operating correctly. This is usually indicated by the Boat Speed typically showing between 0.10 and 0.30 kts with slight movements whilst sitting at the dock.

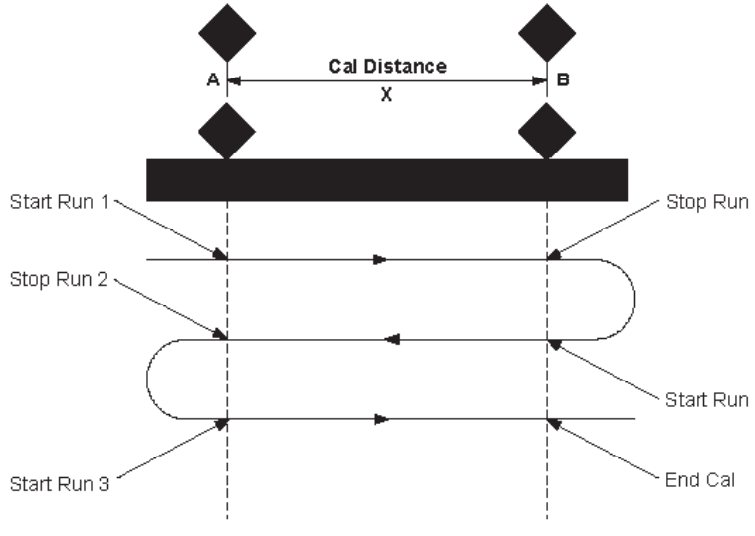
Paddle Wheel: The moulded arrows on top of the unit must be pointing forward along the fore and aft line of the hull. The unit must also be totally free of any weed or other fouling.

Distance Reference

Consecutive runs, under power at a constant speed, should be made along a given course and distance. To eliminate the effect of tidal conditions it is advisable to perform at least two runs, preferably three, along the measured course.

How To Calibrate via Distance Reference

This facility enables the user to calibrate the log accurately and simply. Calculations are performed by the H3000 CPU. Referring to the diagram below, A and B are the markers for each run and X is the actual distance for each run as ascertained from a suitable chart or GPS for example.



Calibration Runs

The user is required to enter the distance X in nautical miles (Cal Distance) and then, as the yacht passes marks A and B on each run, to instruct the system to start (Start Run) and stop (Stop Run) and finally to end calibration (End Cal Runs) after the last run is completed.

Example 1~ Distance Reference

SETUP ▶ CALIBRATION ▶ BOAT SPEED ▶ DISTANCE REFERENCE ↵

SELECT TRANSDUCER

(Choose: Single, Port. Or Starboard sensor) ↵

CAL DISTANCE ↵

(Set required Cal Distance) ↵

(At a steady speed as you cross point A)

START RUN ↵

(Then as you cross point B)

STOP RUN ↵

(Repeat the above for preferably two more runs then)

▼ END CAL RUNS ↵

(Completes Calibration process and automatically stores the new value)

SOG Reference

This is an AutoCal facility that uses SOG from your GPS and compares the average of this against the average boat speed from the speed sensor for the duration of the calibration run.

Note: *This will only work accurately in non-tidal conditions.*

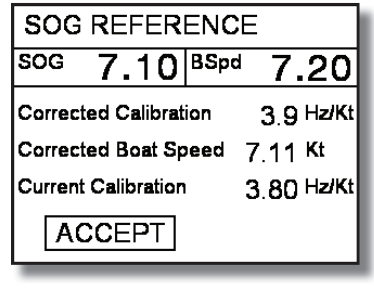
Example 2~ SOG Reference

MENU **SETUP ▶ CALIBRATION ▶ BOAT SPEED ▶ SOG REFERENCE ▶**

The screen below will be shown giving the current SOG and Boat Speed along with other relevant data. Maintain a steady speed for a few minutes then press:

▼ ACCEPT ↵

The new calibration value will now be stored in the CPU.



The above can be repeated at this stage if required by selecting:

▼ START ↵

Then at the end of the run:

▼ ACCEPT ↵

Tack Source Speed Calibration Setting

The Tack Source setting allows you to define how the H3000 determines which is the most appropriate boat speed sensor and calibration value (port or starboard) to use.

The port and starboard boat speed calibration values can be automatically switched from either the Measured Wind Angle or Heel Angle if a suitably installed sensor is connected to the system.

The tack source function can also be used to force the system to select either Port tack or Starboard tack when calibrating boat speed and thus help you to eliminate tack-to-tack boat speed differences.

The force tack options are used to ensure that only one sensor input is measured during calibration. Tack Source selection is done by entering the corresponding number under:

SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶WIND ▶ TRUE DIR ▶ TACK SRC ▶ (Set value as in table) ↵

TACK SOURCE	
Tack SRC Setting	**Description**
0	Tack source uses heel as preference upwind and Measured Wind Angle downwind
1	Heel is always the preferred source.
2	Measured Wind Angle is always the preferred source (Default setting).
3	Force tack to starboard (uses port sensor input)
4	Force tack to port (uses starboard sensor input)

Boat Speed Tack Offset Correction HERCULES

If a difference in boat speed is indicated from tack to tack, it is possible to calibrate out the error using an offset table.

It is necessary to first calibrate the boat speed using one of the methods described previously, then establish which tack is providing the correct boat speed and then apply appropriate corrections to the opposite tack. Do this as follows:

Select tack to correct:

MENU **SETUP ▶ CALIBRATION ▶ BOAT SPEED ▶ ADVANCED CALS ▶ TACK CORRECTION ▶ SELECT TACK** ↵

(Set value 0 = Stbd, 1 = Port) ↵

Select typical heel angle at which correction should apply e.g. 10º deg.

HEEL ANGLE ▶ (Set Heel Angle) ↵

Now set the Boat Speed offset value as a percentage, negative to reduce speed on the selected tack and positive to increase.

TACK OFFSET ▶ (Set percent offset) ↵

The entered percentage offset is applied for angles greater than, and equal to, the entered heel angle and is interpolated to 0% at 0 degrees of heel.

Speed Linearity Correction Table HERCULES

After the Tack correction is applied it is possible to apply both Heel Angle and Linearity corrections to the boat speed data.

The Linearity correction table is provided due to the characteristics of different speed sensors, a paddlewheel sensor (for example) is inherently non-linear so at high boat speeds due to their mechanical nature and hull boundary layer effects they are likely to over-read and require correction.

Heel Angle corrections apply to all types of sensor and are actually due to the change in water flow patterns over the surface of the hull rather than the sensor characteristics.

The procedure to enter correction values is as follows:

SETUP ▶ CALIBRATION ▶ BOAT SPEED ▶ ADVANCED CALS ▶ HEEL CORRECTION TABLE ▶

After a few seconds the table will be loaded and shows as follows:

BOAT SPEED CORRECTION						
Heelº	**Boat Speed (Knots)**					
	5	**10**	**15**	**20**	**25**	**30**
0º	0.0	-2.0	-3.9	-6.0	-7.8	-9.3
10º	-0.2	-2.3	-4.0	-6.5	-9.6	-11.0
20º	-0.4	-3.9	-6.1	-8.5	-11.5	-13.3

Use the ▶◀▼▲ keys to move around each of the cells to adjust

Press ↵ to highlight the cell, use ▼▲ to adjust the value then ↵ to save.

Values are entered as a percentage. All default values are zero.

Repeated presses of ◀ will escape left and exit the table entry mode.

Substituting SOG for Boat Speed

It is possible to substitute Speed Over Ground (SOG) in place of Boat Speed for use throughout the system. This may be desirable for certain applications such as fast planing mono and multihulls where the speed sensor may spend periods of time out of the water. It could also be used in the case of sensor failure.

Caution: *Using SOG for calculated functions has some disadvantages.*

SOG is not the same as Boat Speed as it is referenced to the ground rather than the water, which may be moving due to tidal flows and currents, therefore SOG will not allow calculation of Tide.

Calculation of wind data via SOG will give incorrect data as it is mixing a ground referenced speed (SOG) with boat referenced Heading. Due to this effect wind data will appear inaccurate in strong tidal conditions. SOG is updated less frequently on the network.

The speed source setting is entered under:

MENU SETUP ▶ COMMISSION ▶ USE SOG AS SPEED INPUT ▶ (Set value 0 = Normal speed sensor, 1 = SOG) ↵

Pulse2 Boat Speed Input

HERCULES

The H3000 is able to display boat speed-readings from a second boat speed sensor connected to the CPU. The function PULSE2 can be re-named by selecting one of the pre-defined function names. This is done by entering the corresponding number under:

MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ SPEED ▶ PULSE2 ▶ TYPE ▶ (Set value as in table) ↵

PULSE BOAT SPEED		
TYPE Setting	**Function Text Shown**	**Notes**
0	PULSE2	Default setting. The display will show the input in Hz if present.
1	STBD BS	The second boat speed sensor is declared as the STBD sensor under the SPEED menu. When on port tack, the Boat Speed is derived form the STBD sensor.
2	PORT BS	The second boat speed sensor is declared as PORT under the SPEED menu. When on stbd tack, the Boat Speed is derived form the PORT sensor.
3	BOAT SPD	The primary boat speed sensor is completely replaced by the second boat speed sensor.

Additionally, it is possible to configure the H3000 to use an external speed source and disable the boat speed sensor inputs connected to the CPU. This is done by entering the corresponding number under:

SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ SPEED ▶ PULSE2 ▶ EXT.BSPD ▶ (Set value as in table) ↵

CAL VAL 2 SETTING	
CAL VAL 2 Setting	**Description**
0	Default setting. Uses the boat speed sensor(s) connected to the CPU.
1	Uses an external boat speed source. For example, a paddlewheel sensor connected to a pilot computer or NMEA boat speed decoded by the CPU.

COMPASS CALIBRATION

B&G's AutoSwing compasses contain software that allows them to record the magnetic fields in the yacht that cause deviation errors. It calculates the corrections when the compass calibration is started provided the following conditions are met:

- The 360º turn - Halcyon 2000 and Halcyon Gyro Stabilised Compass is completed in the same direction.
- The rate of change of heading does not exceed 3%; i.e. the turn should take about 2 minutes to complete.
- The rate of change of heading must not fall below 0.2 °/s during the 360° turn, i.e. the turn must not take longer than 12 minutes.
- The rate of change in heading is reasonably constant.
- The compass is installed in a location a safe distance from magnetic interference such as iron keels, engines, loudspeakers etc.
- Consideration should also be given to electrical cables which may carry high currents (e.g. large motors).
- The compass is installed in a location as close to the centre line of the boat as possible. Avoid areas such as the fore peak and the sides of the hull where the effects of pitch and roll are at their greatest.
- On steel hulled vessels, the compass will need to be installed above decks away from the effects of the hull.

Heading Source Selection

The H3000 System can accept heading data from a variety of different sources. These different sources are known as Nodes and allow the system to identify which heading devices are connected to the system.

The list below shows the various sources of heading available with its respective address node:

HEADING SOURCE	
Device	**Node**
CPU (NMEA input)	5
Halcyon Processor (“Halcyon Gyro” input)	15
Halcyon Processor (NMEA input)	15
Halcyon 2000 Compass	16
ACP Pilot (direct “Halcyon Gyro” input)	18
NMEA Input to NMEA FFD	96, 97 ...

Setup the required heading node by following the procedure below:

SETUP ▶ COMMISSION ▶ HEADING ▶ (Set value as in table above) ↵

Note:

- H3000 Pilots will also require the Heading Node to be set to your desired choice. Refer to the Pilot Handbook for further information.
- HV displays will require Heading to be re-selected following Heading node selection. Simply re-select this function. Refer to configuring REMOTE UNITS section earlier in this manual.

Halcyon 2000 Compass Calibration (AutoSwing)

Check for any magnetic devices placed near the compass, especially ones that are out of their normal places.

On a calm day select a stretch of open water with little traffic (so you will not have to take avoiding action which would affect the calibration). The flatter the water and the less the wind the easier it will be to meet the conditions for calibration.

Check for and avoid sailing close to any large steel structures nearby that may cause additional, erratic, deviations.

Now select:

SETUP ▶ COMMISSION ▶ START COMPASS SWING ▶

The display will now show the degrees of turn completed so far. When the full 360 deg turn has completed within the limits described earlier, the display should say "PASS" to indicate a successful swing.

A "FAIL" indication suggest that the turn was not completed within the guidelines or quite possibly that there is too great a magnetic influence close to the sensor. This will require investigation before the swing process is retried.

Now the swing is complete its important to eliminate any constant error in heading due to the physical alignment of the sensor relative to the fore / aft line of the boat.

This is normally checked for by using shore-based transits, once the error is known it can be eliminated by entering the value into the system under:

SETUP ▶ CALIBRATION ▶ HEADING ▶ SET OFFSET VALUE ▶ (Enter new value) ↵

For example, the compass was reading 320º and it should read 316º, then the value to enter would be –4º from the current set value.

Note:

- The first time the system is switched on, or after a system reset, the Heading will alternate with CAL. This is to indicate to the user that the compass must be calibrated. This will disappear after the compass has been swung correctly.

Halcyon Gyro-Stabilised Compass Calibration

This section describes the setup and calibration of the Halcyon Gyro compass connected to the H3000 system via the Halcyon Gyro Processor unit.

The conditions and preparations for performing an Auto Swing are the same as described in the previous section for the Halcyon 2000 Compass.
Once ready to start the swing select:

MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ MISC ▶ HALCYON ▶ START ▶ (Set value to 1 starts swing) ↵

The display will now show the degrees of turn completed so far. When the full 360 deg turn has completed within the limits described earlier, the display should say, "PASS" to indicate a successful swing.

A "FAIL" indication suggest that the turn was not completed within the guidelines or quite possibly that there is too great a magnetic influence close to the sensor. This will require investigation before the swing process is retried.

Now the swing is complete its important to eliminate any constant error in heading due to the physical alignment of the sensor relative to the fore / aft line of the boat.

This is normally checked for by using shore-based transits, once the error is known it can be eliminated by entering the value into the system under:

MENU SETUP ▶ CALIBRATION ▶ HEADING ▶ SET OFFSET VALUE ▶ (Enter new value) ↵

For example, the compass was reading 320 degrees and it should read 316, then the value to enter would be –4 from the current set value.

Halcyon Gyro Processor Setup

Data under the MISC ▶ HALCYON function describes the current mode of the Halcyon Gyro Processor, and are as follows:

GYRO SETUP	
OFF	No heading detected from either a Halcyon Gyro Stabilised Compass sensor or a B&G system compass
GYRO	Receiving data from Halcyon Gyro Stabilised Compass or NMEA input to Halcyon Gyro Processor
SYS	Receiving data from a B&G system compass or NMEA input to NMEA FFD or performance processor
PASS	Calibration swing is complete
FAIL	Calibration swing failed and the compass needs to be re-calibrated
xxx°	Number of degrees turned during calibration swing, indicates calibration swing in progress

Halcyon Gyro Processor NMEA output setup

NMEA sentence output settings determine what sentences are output with respect to which heading source is available.

MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ MISC ▶ HALCYON ▶ NMEA MDE ▶ Set value as table below ↵

HALCYON GYRO COMPASS OUTPUT		
Mode	**Output**	**Details**
0	HDT	From Halcyon Gyro Stabilised Compass or NMEA input to Halcyon Gyro Processor
1	HDM	From Halcyon Gyro Stabilised Compass or NMEA input to Halcyon Gyro Processor
2	HDG	From Halcyon Gyro Stabilised Compass or NMEA input to Halcyon Gyro Processor
3	HDM/HDT	From a B&G system [compass or NMEA input to FFD]
4	HDG	From a B&G system [compass or NMEA input to FFD]

Note:

- Mode 0 is the default value
- Mode 3 will output the correct sentence depending on configuration.
- If Mode 4 is selected and magnetic variation is not available then only the magnetic heading will be output.

WIND SPEED AND ANGLE CALIBRATION

For Hercules Motion systems it is necessary to set the mast height parameter, prior to wind calibration.

MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ PARAMETER ▶ ROLL RATE ▶ MASTLEN ▶ (Set Value) ↵

Two of the greatest problems for an instrument system to overcome, which have not yet been conquered, are wind shear and wind gradient. These effects are at the root of some apparent instrument inaccuracies. The effects themselves are relatively straightforward and are due to the simple fact that as moving air comes into contact with the ground it slows and changes direction.

The slowing creates the effect called wind gradient. The change in direction creates wind shear. Both shear and the wind gradient depend on the amount of mixing of the wind at ground level and the wind aloft; if the wind is well mixed both effects are minimised. The best example of this is the sea breeze, which starts off almost completely unmixed.

Differences of direction of 40º 50º between the wind at the masthead and the wind at the water are not uncommon in an early sea breeze, but as the day goes on and the sea breeze strengthens this will disappear. This creates a problem for the two things we are about to try to calibrate, measured wind speed and measured wind angle. It is easy to see how shear can affect the measured wind angle; no sooner have you set it up than the shear changes and everything is out again.

This can lead to a circular situation if one is not careful, and the best solution is to do your calibration on a day when the shear is minimal, and thereafter leave it as an indicator of the wind angle at the masthead, always remembering that this is not necessarily the wind angle that you are sailing at.

How do you know the shear is minimal? If you are finding it easier to get speed on one tack than the other for no obvious reasons, then there is likely to be shear. A good look at the general weather conditions is also helpful. Do not calibrate in building sea breezes.

Wind gradient is the biggest culprit for getting true wind speeds accused of gross inaccuracy. The problem is that most people use the wind speed as a measure of the pressure, which it is not. It is a measure of the wind speed at the top of the mast, and that is all. If it is 12 knots at the top of the mast and only 4 at the water, then the breeze will feel a lot softer, and provide less power for the rig than if the breeze is twelve knots all the way down to the water.

There are other signs that can help get a feel for the pressure on the rig. One of the most important of these is the heel angle; it is no bad thing to have an idea of how much heel you normally have in any given wind speed. Target boat speeds can also provide valuable information as to the wind gradient.

The target is read from a polar table which only knows about one average wind condition, it does not know if the wind has a strong gradient or none at all. So next time you are having trouble reaching the target speeds, think about the wind gradient and whether or not it is a soft or heavy breeze, and use the input to help sail the boat. The information from the instruments is generally useful - it just needs rather more interpreting than it sometimes gets.

This is why we recommend that the last thing you touch is the Measured Wind Speed. It is calibrated in the factory where wind tunnel calibrated units are available, and apparent inaccuracies are 99% attributable to effects such as wind gradient, rather than to a basic calibration problem.

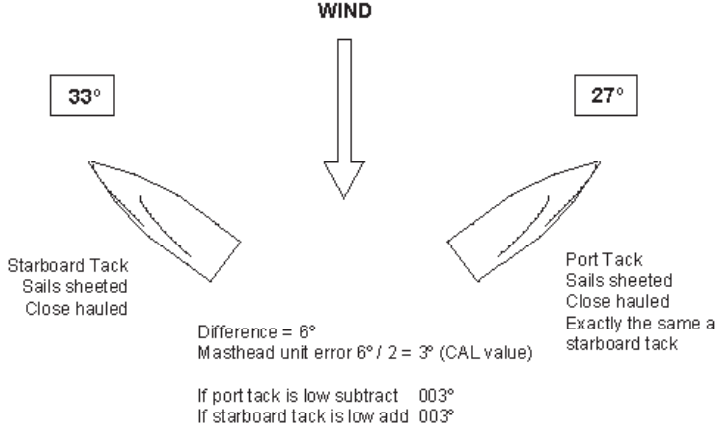
Measured Wind Angle (MWA) Calibration

This provides an offset calibration for any mechanical misalignment of the Mast Head Unit (MHU) at the top of the mast.

To discover the MWA alignment error we can employ one of two techniques. The first is simply to go head to wind and read the value of the Measured Wind Angle. If it reads anything other than 0, you have an error. If the error is greater than 0 (up to 180 degrees), you should subtract the error from 0 and enter this as the calibration value. So if when you go head to wind the measured wind angle reads 4 degrees, then you should enter -4 as the calibration value. If it is less than 0 then the opposite applies.

The before method is not actually very accurate as its quite difficult to hold the boat head to wind steadily whilst you monitor the MWA. The recommended method is therefore described below:

This method involves a sailing trial as depicted below.



Masthead Unit Alignment

MWA AutoCal

The H3000 provides an AutoCal facility for use during this sailing trial and will automatically calculate the MHU alignment correction for you. The process is as follows:

MENU **SETUP ▶ CALIBRATION ▶ APPARENT WIND ▶**

AUTO MHU ALIGNMENT

Get the boat sailing steadily upwind, close hauled with the sails sheeted fully. The helmsman should focus on steering the boat to the sails as opposed to the instruments at this stage.

Now start the AutoCal run as follows:

▼ START RUN ↵

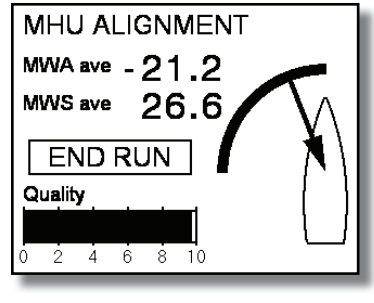
The screen below shows a typical port tack run and is providing the following:

MWA Ave – The average MWA since the start of the run

MWS Ave – The average MWS since the start of the run

Quality – An indicator of the steadiness of the conditions for this run calculated by taking the standard deviation of both MWA and MWS during that run.

Clearly the higher the Quality the better and values in excess of 7 should provide for an accurate calibration.



The calibration run should at least last a few minutes but can be as long as you consider the conditions are settled. When you are happy with the numbers then select:

▼ END RUN ↵

The screen will show the net average data for the Port tack run (in this example) Now tack the boat and establish steady, close hauled sailing conditions with similar sailing and sheeting angles as previous tack. Now press:

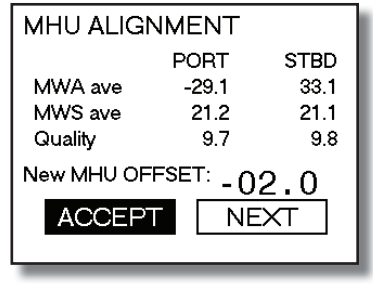
▼ ▼ NEXT ↵ ▼ START RUN ↵

The starboard tack run is now in progress and again sail for a period of time sufficient to establish steady figures with a reasonable Quality value.

When happy with this run, select:

▼ END RUN ↵

The screen (shown below) now gives the average MWA, MWS and Quality values for both tacks and a new value for the MHU offset. You can now ACCEPT this value or keep on doing more runs tack to tack. (by selecting the NEXT option) to achieve more accurate and repeatable results.



The H3000 will continue updating the average values for each tack until you finally ACCEPT the New MHU Offset value, which is then stored in the CPU.

This value can of course be accessed and changed manually by selecting:

MENU **SETUP ▶ CALIBRATION ▶ APPARENT WIND ▶ WIND ANGLE OFFSET ▶ (Enter new value) ↵**

Measured Wind Speed

As previously stated you are strongly discouraged from changing the measured wind speed calibration. However, should you need to do it, then the changes are made in the system menu under:

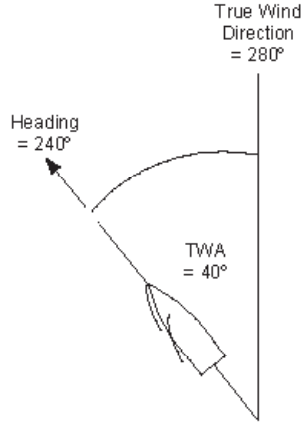
MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ WIND ▶ MEAS W/S ▶ MHU CAL ▶ (Set value as required) ↵

True Wind Correction

Calibration of True Wind Angle and True Wind Speed is vital to achieve consistent and repeatable readings. Furthermore, its important to note that Apparent Wind Angle and Speed (AWA and AWS) are “back calculated” from True Wind, hence once True Wind is calibrated then these corrections will apply to Apparent Wind also.

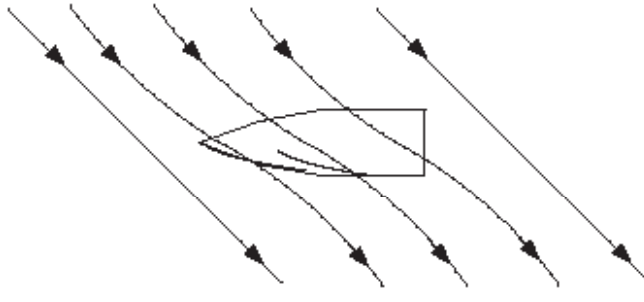
True Wind Direction (TWD)

The need for further calibration of true wind direction will become clear as soon as you go sailing. The true wind may vary in direction from tack to tack, independently of any wind shifts. This phenomenon has come to be known as true wind ‘tacking’. We can see the direct connection between true wind angle and direction on the diagram below.



True Wind Direction

The reason for TWD tacking is a variety of errors that enter into the calculation of true wind angle from measured wind angle.



Upwash

The wind that the instruments measure is actually deflected from the 'real' wind angle. Add to this the various twisting effects of the mast, and we get some idea of the problems involved. The hardest part is that it is easy to see the true wind direction 'tack' as little as 1-2 degrees, which would mean the correction factors being as accurate as 0.5 degree.

For any particular wind speed the correction needed for all these errors have to be different from day to day, not least because of the problems of wind gradient we discussed earlier.

As we have seen the problem stems from the true wind direction 'tacking' as the boat manoeuvres from tack to tack. We need to know the error that the true wind suffers in any manoeuvre, be it tacking upwind, a reach-to-reach tack, or gybing downwind. Once you know the error, and the wind speed you had at the time, then we can enter it as a correction into a table of corrections similar to that shown below.

TRUE WIND ANGLE CORRECTION TABLE (Example only)						
Wind Angle	**True Wind Speed**					
	5	**10**	**15**	**20**	**25**	**30**
Upwind	-7.0	-3.0	-2.5	4.5	6.5	8
Reaching	-2.0	-1.0	0.0	1.0	1.0	1.5
Downwind	4.0	3.0	1.0	-1.0	-1.0	-2.0

The above example shows corrections to TWA at 6 different values of TWS. The CPU calculates the actual correction value to be applied for the specific conditions using a 2 way linear interpolation through the table.

This table can be accessed as follows:

SETUP ▶ CALIBRATION ▶ TRUE WIND ▶ TRUE WIND TABLE ↵

Use the ▶ ◀ ▼ ▲ keys to move around each of the cells to adjust

Press ↵ to highlight the cell, use ▼ ▲ to adjust the value then ↵ to save.

Values are entered as degrees of correction. All default values are zero. Repeated presses of ◀ will escape left and exit the table entry mode.

The above table is by default initialised to all zero in the H3000 CPU memory. There is in fact a base table, which can be pre-initialised and is based on some typical correction figures obtained during sea trials on a conventional, 45ft, fractional rigged yacht.

The values for this are shown in the above table and may well prove a good starting point for your TWA calibration.

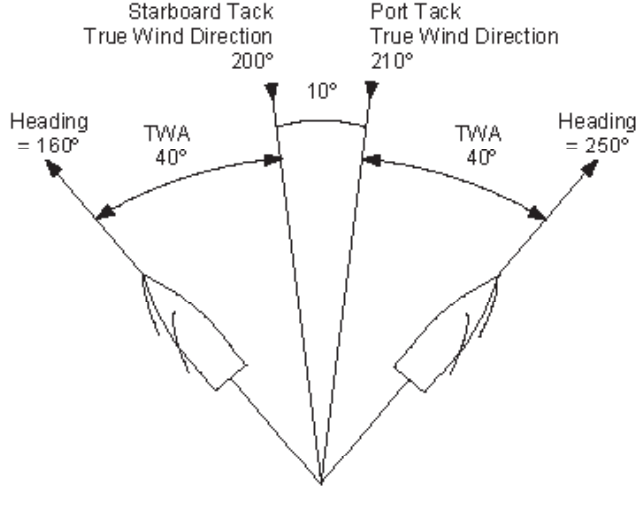
In the diagram below we see a typical situation, sailing on port tack, upwind, in ten knots, the true wind direction reads 210. We tack over onto starboard and settle the boat down, now the true wind direction reads 200. There is a ten-degree error tack to tack.

The true wind direction should read 205 on both tacks. To correct the true wind angle so that the true wind direction reads 205 on both tacks, we need to add 5 degrees to the true wind angle.

General rule:

If you are lifted from Tack to Tack subtract half the difference.

If you are headed from Tack to Tack add half the difference.



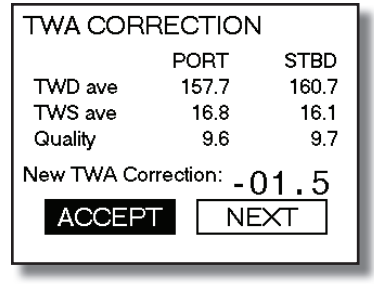
True Wind Direction Error

True Wind Angle AutoCal facility

The H3000 system provides a neat and simple to use, automatic calibration facility to aid the process. It takes all the hard work out of noting down numbers and the associated mental arithmetic.

To access this facility select:

MENU **SETUP ▶ CALIBRATION ▶ TRUE WIND ▶ AUTO TWA CORRECTION ↵**



It is usual to start the TWA calibration process by setting the boat up to do a number of tacks upwind in as steady conditions as possible. The process is similar in concept to the MWA AutoCal facility explained previously.

Now start the AutoCal run as follows:

▼ START RUN ↵

The screen above shows a typical port tack run and is providing the following:

TWD Ave – The average TWD since the START of the run

TWS Ave – The average TWS since the START of the run

Quality – An indicator of the steadiness of the conditions for this run calculated by taking the standard deviation of both TWA and TWS during that run.

Clearly the higher the Quality the better and values in excess of 7 should provide for an accurate calibration.

The three dotted lines in the boat graphic indicate the three calibration points of sailing; close hauled (TWA = 45º), Reaching (TWA = 90º) and Downwind (TWA = 165º).

The arrow relative to boat graphic indicates the current TWA

The calibration run should at least last a few minutes but can be as long as you consider the conditions are settled. When you are happy with the numbers then select:

▼ END RUN ↵

The screen will show the net average data for the Port tack run (in this example)

Now tack the boat and establish steady, upwind sailing conditions again. Now press:

▼▼ NEXT ↵▼ START RUN ↵

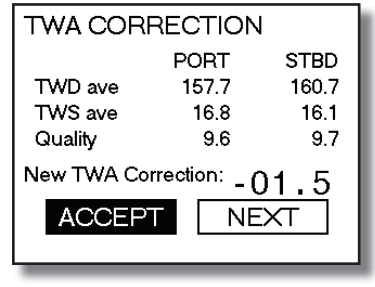
The starboard tack run is now in progress and again sails for a period of time sufficient to establish steady figures with a reasonable Quality value.

When happy with this run, select:

▼ END RUN ↵

The screen (shown below) now gives the average TWD and TWS and Quality values for both tacks and calculated value for TWA correction for Upwind at the current TWS. You can now ACCEPT this value or keep on doing more runs tack to tack (by selecting the NEXT option) to achieve more accurate and repeatable results.

The H3000 will continue updating the average values for each tack until you finally ACCEPT the New TWA correction value, which is then stored in the CPU.



The CPU stores the calculated values in the TWA Correction table as described above. It will do so initially by rounding up / down the average TWS value for the run to the nearest 5 knot TWS increment in the table.

Once the Upwind sector is calibrated for the current TWS band then repeat the TWA AutoCal process for Reaching tack to tack and then gybing downwind. The process of START, END RUN, NEXT etc. is exactly the same for each point of sailing.

As additional TWA cal runs are performed in different TWS ranges, so the table will become further populated. Once two or three TWS ranges are done then the CPU will attempt to extrapolate the data across further wind speed and wind angle bands.

This whole process of TWA calibration can and should be a regular process especially pre start of a race. The TWA AutoCal facility is quick and simple and will help to “fine tune” the numbers.

Finally, the most important thing is to record all these entries in the Calibration Charts provided.

True Wind Speed

The True Wind Speed suffers from another, mainly aerodynamic, problem, where it tends to over-read downwind because of acceleration of the airflow over the top of the main sail. It is possible to correct for this by applying a downwind correction to the true wind speed. This correction is applied at 165 degrees in a Hydra system, or at the user set angle in a *Hercules system, and linearly interpolated to zero correction at 90 degrees true wind angle.

The routine here is to bear away quickly from close-hauled to your usual downwind True Wind Angle and watch the increase in true wind speed. Then the difference is entered as the negative correction. The table will look similar to the one shown in the table below.

This table can be accessed as follows:

MENU **SETUP ▶ CALIBRATION ▶ TRUE WIND ▶ TRUE WIND TABLE** ↵

TRUE WIND SPEED CORRECTION TABLE (Example only)						
Wind Angle	**True Wind Speed**					
	5	**10**	**15**	**20**	**25**	**30**
Correction (kt)	0	0	0	0	0	0
Correction Angle*	165	165	165	165	165	165

The values in each cell are entered in the same way as the true wind angle corrections. It is crucial to keep a full record of the process.

HEEL, TRIM AND LEEWAY CALIBRATION

Calibration of Heel Angle and Leeway is only necessary if a Heel Angle Sensor (Clinometer) or Halcyon Gyro-Stabilised Compass is fitted to the yacht.

Heel Angle

The sensor should be mounted to read zero when the boat is upright. However, small misalignments can be corrected by means of the heel angle calibration.

On a calm day with the boat lying at slack warps in the dock, head to wind, all the gear stowed in its normal place, and anyone onboard standing on the centreline the heel angle should be recorded, under these conditions it should be zero, any error can be taken out by the heel angle calibration, by adding or subtracting the error from the existing calibration.

Heel angle calibration is to be found in the system menu under:

MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ PERFORM ▶ HEEL ▶ OFFSET ▶ (Set Offset value) ↵

When the Heel Angle is displayed there is an H symbol, which will be placed on left indicating heel to port and on the right for heel to starboard. The display will always be shown to 1 decimal point.

Leeway

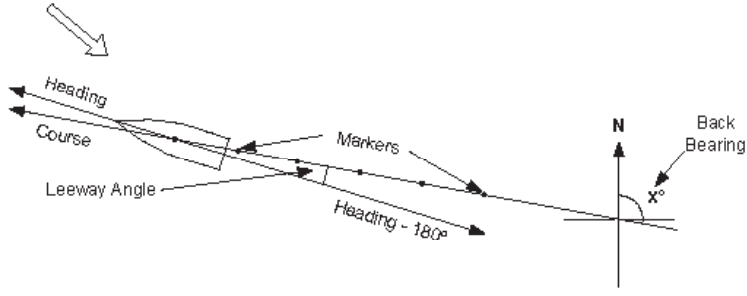
Calibrating leeway is a notoriously difficult thing to do; it may be easier, and as accurate, to consult the yachts designer who may have a theoretical value for leeway coefficient, as it is to try to measure it. Should that not be possible then we can calculate the Leeway coefficient from the following formula:

$$L = \frac{K \times H}{Bs^2}$$

Where:

Bs = Boat Speed
K = Leeway Coefficient
H = Heel Angle
L = Leeway Angle

K then is the constant that needs to be entered, and to establish a value for leeway coefficient we need to measure the leeway angle at a particular heel angle and boat speed shown below.



Leeway Angle Measurement

The idea is to sail on a steady course and drop markers* over the stern at regular intervals, the angle between them and the centreline of the yacht is measured with a hand-bearing compass, and hence leeway angle is measured. Whilst this is happening the boat speed and heel angle should be noted at intervals and an average calculated. These values can then be used to calculate the leeway coefficient from the following expression:

$$K = \frac{L \times Bs^2}{H}$$

Where:

Bs = Boat Speed
K = Leeway Coefficient
H = Heel Angle
L = Leeway Angle

Obviously the flatter the water and the steadier the breeze the more likely this is to be successful. Once you have the leeway coefficient 'k' then it is entered into the system under:

MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ NAVIGATE ▶ LEEWAY ▶ CAL VAL1 ▶ (Set value K) ↵

*Please collect your markers after calibration!

Trim Angle

Calibration of Trim Angle is only necessary if a Trim Angle Sensor (Clinometer) or Halcyon Gyro-Stabilised Compass is fitted to the yacht.

The sensor should be mounted to read zero when the boat is level fore and aft. However, small misalignments can be corrected by means of the Trim angle calibration.

MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ PERFORM ▶ TRIM ▶ OFFSET ▶ (Set Offset value) ↵

When the Trim Angle is displayed there is a U symbol on the left indicating that the bow is up, while a d will be shown indicating bow down. The display will always be shown to 1 decimal point.

BATTERY VOLTS

The H3000 monitors the yacht's battery supply giving a reading in volts. This is calibrated by the manufacturer and should not require adjustment except in exceptional circumstances or after a system reset. If it is necessary to calibrate this function a suitable voltmeter is required. The calibration value is found in the menu under:

MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ MOTOR ▶ VOLTS ▶ CAL VAL 1 ▶ (Set value as explained below) ↵

Using the independent voltmeter, measure the battery supply at the PWR connector located under the bottom cover of the H3000 CPU unit.

Alter CAL VAL1 to match the value from the voltmeter.

SEA TEMPERATURE

If a suitable temperature sensor is fitted, the H3000 will monitor the current sea temperature.

The standard B&G paddle-wheel has a sensor incorporated within it, in this case no further action is required.

If the sensor is a totally independent fitting (B&G part no. 224-00-065) then it is necessary to change the sensor selection value.

This value is found in:

MENU SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ TEMP ▶ SEA TEMP ▶ SENSOR ▶(Set value as explained below) ↵

The default selection value is 1, for the independent sensor we need to change to 2.

Sea Temperature Offset Calibration

To calibrate SEA TEMP proceed as follows:

SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ TEMP ▶ SEA TEMP ▶ OFFSET ▶(Set value as explained below) ↵

This calibration can be carried out on either SEA TEMP ºC or SEA TEMP ºF

The offset value is automatically converted so that both ºC and ºF values are adjusted correctly.

OPERATING FUNCTIONS

This section details the operating functions within the H3000 system. Any reference to key shorthand will be for the GFD; FFD function text and menu locations are listed for each function.

The System Requirements sections advise of any additional requirements over a standard system.

For this purpose a standard system is taken as being a GFD and CPU with Wind, Speed, Depth and Compass sensors.

Where a function is obtained from a NMEA source the update rate published is the maximum, if the incoming NMEA data is slower this will affect the displayed data.

See NMEA interfacing for more details.

Instructions in this handbook describe the controls and calibration of your H3000 system. You can also use the controls on the RemoteVision.

The H3000 Central Processing Unit is the core of the system and has Hydra, Hercules, Hercules Performance and Motion level software all in one box.

All functions described in this handbook refer to the standard Hydra processor settings unless indicated with a Hercules, Performance or Motion logo as shown below.

HERCULES — Indicates that the information listed relates to Hercules processor functionality which includes Hydra functions.

PERFORM — Indicates that the information listed relates to Performance processor functionality which includes Hercules and Hydra functions.

MOTION — Indicates that the information listed relates to Motion processor functionality which includes Performance, Hercules and Hydra functions.

Please contact your local dealer if you wish to upgrade your processor. A list of B&G approved dealers can be found at www.bandg.com

AFT DEPTH

Aft Depth is an auxiliary Depth function which allows the system to display two Depth readings: one from the standard transducer, one from an external NMEA sensor or source.

Aft Depth is declared by the system when a valid source of NMEA data is received from a compatible device. The function name is Aft Depth by default, it can be changed to suit the configuration (e.g. “Fwd Depth”).

Aft Depth is calibrated in the same manner as the standard depth. See ‘calibration’ for more details.

System Requirements	NMEA DBT or DPT input to H3000 CPU
Menu **Function name (default)** **Function name (FFD)**	DEPTH Aft Depth (ADep) Aft Dpth
Units	m, ft, fm
Alarms	High and Low (Shalllow)
Calibrations	Datum (offset) Function Name
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

APPARENT WIND ANGLE

Apparent Wind Angle (AWA) is the angle of the wind relative to the bow of the boat. The value displayed is back-calculated from the True Wind data so as to include True Wind Correction data. Raw wind angle data from the masthead unit is displayed as Measured Wind Angle.

On Hercules systems the Apparent Wind Angle can be corrected for the Heel and Trim angles of the yacht. On Motion systems the data is corrected for wind induced by the boat's pitch and roll motion.

System Requirements	Heel and Trim inputs for correction (Hercules only)
Menu **Function name (default)** **Function name (FFD)**	WIND App. Wind Angle (AWA) APP W/A
Units	Degrees
Alarms	Sector
Calibrations	MHU Offset, Heel correction On/Off AutoCal Offset routine.
Damping	0-99s Dynamic Damping (Hercules only)
Update Rate	4Hz (Hercules), 2Hz (Hydra)
Analogue Displays available	Apparent Wind Angle 360º Apparent Wind Angle Magnified

APPARENT WIND SPEED

Apparent Wind Speed (AWS) is the speed of the wind relative to the boat. The value displayed is back-calculated from the True Wind data so as to include True Wind Correction data. Raw wind speed data from the masthead unit is displayed as Measured Wind Speed.

On Hercules systems equipped with a Heel Angle sensor the Apparent Wind Speed is corrected for the Heel Angle of the yacht. On Motion systems the data is corrected for wind induced by the boat's pitch and roll motion.

System Requirements	Heel input for AWS correction (Hercules only)
Menu **Function name (default)** **Function name (FFD)**	WIND App. Wind Speed (AWS) APP W/S
Units	kt, m/s
Alarms	High, Low
Calibrations	Hz/Kt Speed Offset
Damping	0-99s Dynamic Damping (Hercules only)
Update Rate	4Hz (Hercules), 2Hz (Hydra)
Analogue Displays available	Apparent Wind Speed (0-50kt)

Note: *The calibration values are factory set based on wind-tunnel tested sample units and it is not recommended to change these. The option to change them exists for advanced users who may choose to individually test masthead units to obtain specific calibration data. Both calibration values are set to 1.04 by default.*

AVERAGE SPEED

Average Speed (AVS) is a Trip Function that displays the average Boat Speed [speed through the water] since the Trip Log was started.

In simple terms this can be calculated as:

$$Average\ Speed = \frac{Trip\ Log}{Trip\ Time}$$

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	SPEED Average Speed (AVS) AV SPEED
Units	kt, mph, kph
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

BAROMETRIC PRESSURE

Barometric Pressure displays the current value for atmospheric pressure via the sensor.

A must for the offshore sailor, giving not only the instantaneous value but also the all important trend towards higher or lower pressure that helps position you in a weather system and so predict the next change. There is a calibration if you wish to check your pressure reading against another barometer. CAL VAL1 should be set to the current correct barometric pressure and is found under:

System Requirements	Barometric Pressure sensor and spare linear input channel, refer to 'installation information' for setup information.
Menu **Function name (default)** **Function name (FFD)**	MISC Barometric Pressure (BARO) BAROMETER
Units	mb
Alarms	N/A
Calibrations	Reference (set to known value)
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

BAROMETRIC PRESSURE TREND

Barometric Pressure Trend displays change in pressure measured over a user set period.

If a GFD display is available on the system it is recommended that a time plot is configured for Barometric Pressure rather than using this function, using a graphical plot allows a greater perception of the trend characteristics.

System Requirements	Barometric Pressure sensor Spare Linear input channel
Menu **Function name (default)** **Function name (FFD)**	MISC Pressure Trend (BAR t) PR TREND
Units	mb
Alarms	N/A
Calibrations	Period (1-24h)
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

BATTERY VOLTAGE

Battery Voltage displays the power supply voltage measured internally by the CPU.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	MOTOR Battery Volts (BATT) VOLTS
Units	V
Alarms	High, Low
Calibrations	Offset (set to known value)
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

To calibrate against another voltmeter, measure the supply voltage and then enter this actual voltage into:

▶ OTHER CALIBRATION ▶ MOTOR ▶ BATTERY V ▶ (Input Value)

BEARING TO WAYPOINT

Bearing To Waypoint displays the bearing from the yachts current position (Boat Position) to the current active waypoint.

This function repeats information received from a position fixing device (e.g. GPS) via a NMEA input.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT Bearing To Waypoint (BTW) BRG WPT
Units	ºM, ºT Great Circle, Rhumb Line
Alarms	High, Low
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

BEARING WAYPOINT TO WAYPOINT

Bearing Waypoint to Waypoint displays the bearing of the current leg of a route, from the origin to destination waypoints. The value is constant until the position fixer advances to the next leg.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT Bearing Wpt-Wpt (BWW) BRG W-W
Units	ºM, ºT Great Circle, Rhumb Line
Alarms	High, Low
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

BOAT POSITION

Boat Position displays the current boat position of the yacht. This function is only available on GFD, on FFDs the data is available through the Latitude and Longitude functions in the waypoint menu.

This function repeats information received from a position-fixing device (e.g. GPS) via a NMEA input.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT Boat Position (POS) N/A
Units	dd°mm.mm, ddd° mm.mm
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

BOAT SPEED

Boat Speed displays the speed of the boat through the water. This is probably the most fundamental function of an instrument system, as performance information in its own right and as an input to calculations for other functions such as True Wind, VMG, Tide etc. Accurate calibration of Boat Speed is therefore critical to the overall performance of the system.

The display damping makes a huge difference to the usability of the Boat Speed data for the crew - too low in rough conditions and the speed always seems to be jumping around, too high in calmer conditions and the displays seem unresponsive to changes in trim.

Generally use the lowest damping value that will give numbers stable enough to read comfortably. Hercules users should make use of the Dynamic Damping functionality.

On larger format displays an indicator showing acceleration/deceleration trend is displayed.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	SPEED Boat Speed (BSpd) BOAT SPD
Units	kt, mph, kph
Alarms	High, Low
Calibrations	Distance Reference, known distance SOG Reference, reference speed Hz/Kt, port and starboard and single Tack Offset % (Hercules only) Linearity correction (Hercules only) Use SOG – Select SOG as alternative boat speed source.
Damping	0-99s Dynamic Damping (Hercules only)
Update Rate	6Hz (Hercules), 4Hz (Hydra)
Analogue Displays available	Boat Speed 12.5kt Boat Speed 25.0kt

BOOM POSITION

Boom Position is designed to allow the boom height to be set accurately to allow furling systems to work with optimum efficiency.

Calibration of Boom Position.

Boom Position is an arbitrary value and the value is not used in further calculations, as such an absolutely accurate calibration is not required.

The recommended procedure is as follows:

If Boom Position is not available in the menu structure it is necessary to determine the linear input in use and configure it correctly - See ‘installation information’

SETUP ▶ CALIBRATION ▶ MISC ▶ BOOM POS

Position the boom at the optimum point for furling/reefing, set POINT 1 to be 0.0, the voltage is automatically recorded and can be noted from VOLTS 1 if required.

Position the boom at its highest normal position, set POINT 2 to be 5.0, the voltage is automatically recorded and can be noted from VOLTS 2 if required.

After calibration check that the value displayed for Boom Position is positive if the boom is high of the furling position, zero at the furling position and negative when the boom is below the furling position.

Before furling it is a simple case of adjusting the boom height until Boom Position reads 0.0.

System Requirements	Suitable Boom/Vang position sensor
Menu **Function name (default)** **Function name (FFD)**	MISC Boom Position (Boom) BOOM POS
Units	Arbitrary
Alarms	N/A
Calibrations	Position 1 (known value 1) Volts 1 (automatically recorded) Position 2 (known value 2) Volts 2 (automatically recorded)
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

CANARD ANGLE

Canard Angle is designed to display the angle of a canard or forward rudder.

Calibration of Canard Angle

The recommended procedure is as follows:

If Canard Angle is not available in the menu structure it is necessary to determine the linear input in use and configure it correctly - refer to 'installtion information'.

SETUP ▶ CALIBRATION ▶ MISC ▶ CANARD

Position the canard centrally, set POINT 1 to be 0.0, the voltage is automatically recorded and can be noted from VOLTS 1 if required.

Position the canard at a known angle (e.g. 10º starboard), set POINT 2 to be this angle (e.g. 10.0), the voltage is automatically recorded and can be noted from VOLTS 2 if required.

By convention if the rudder is turned anti-clockwise from the centre the value should be positive.

System Requirements	Suitable position sensor
Menu **Function name (default)** **Function name (FFD)**	MISC Canard (Can) CANARD
Units	Degrees
Alarms	N/A
Calibrations	Position 1 (known value 1) Volts 1 (automatically recorded) Position 2 (known value 2) Volts 2 (automatically recorded)
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

COURSE

Course is a combination of Heading and Leeway and gives a more accurate number on which to base tacking angles etc.

In the absence of a Heel Angle sensor and/or Leeway calibration the Course value will be identical to the Heading.

System Requirements	Heel Angle sensor
Menu **Function name (default)** **Function name (FFD)**	NAVIGATE Course (CSE) COURSE
Units	ºM, ºT
Alarms	N/A
Calibrations	Heading Node
Damping	N/A
Update Rate	4Hz
Analogue Displays available	N/A

COURSE OVER GROUND

Course Over Ground (COG) displays the current course of the yacht relative to land (rather than the water), referenced to North.

COG is used within the system to calculate Tide Set and Tide Rate.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT COG CRSE O/G
Units	ºM, ºT
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

CROSS TRACK ERROR (XTE)

XTE displays the distance the yacht is from the direct route (Great Circle or Rhumb Line depending on the position fixer) between two waypoints. The measurement is a perpendicular distance from the direct route to the yacht.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT XTE CROSS TR
Units	nm
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

COURSE TO STEER

Course To Steer (CTS) is repeated from a position fixer. The function displays a target steering course which the helm can follow if the aim is to stay on the direct route to the next waypoint (Great Circle or Rhumb Line depending on the position fixer). It is not widely used due to the fastest route between two waypoints rarely being direct - due to the effects of tides, local currents, wind patterns etc. It is repeated for convenience.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT Course To Steer (CTS) CTS
Units	ºM, ºT
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

DAGGERBOARD

HERCULES

Daggerboard Position will display a value which indicates the current vertical position of a daggerboard.

Calibration of Daggerboard.

The recommended procedure is as follows, this procedure is designed to display "0.0" when the daggerboard is fully down and a negative value as it is raised. In this example the travel of the daggerboard is 1.2 meters:

If Daggerboard is not available in the menu structure it is necessary to determine the linear input in use and configure it correctly - Refer to'installtion information'.

MENU **SETUP ▶ CALIBRATION ▶ MISC ▶ DAGGERBD**

Position the daggerboard in the fully extended position, set POINT 1 to be 0.0, the voltage is automatically recorded and can be noted from VOLTS 1 if required.

Position the daggerboard at its fully retracted position, set POINT 2 to be a negative value equal to the travel of the daggerboard (in this example -1.2 to read in meters), the voltage is automatically recorded and can be noted from VOLTS 2 if required.

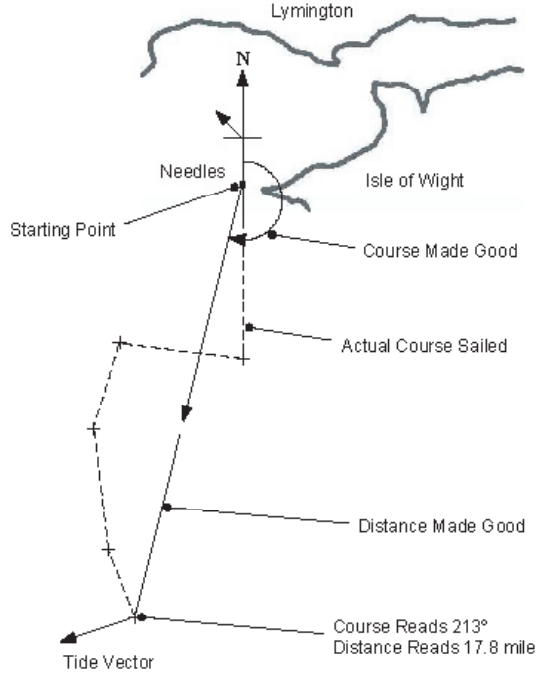
System Requirements	Suitable position sensor
Menu **Function name (default)** **Function name (FFD)**	MISC Daggerboard (Dag) DAGGERBD
Units	As set by calibration
Alarms	N/A
Calibrations	Position 1 (known value 1) Volts 1 (automatically recorded) Position 2 (known value 2) Volts 2 (automatically recorded)
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

DEAD RECKONING

Dead Reckoning provides Course and Distance from a base point, which is set when you start the function running, both the bearing from the start point and its distance in nautical miles can be displayed as separate functions.

D/R, once the mainstay of yacht navigation, now seems slightly unnecessary, however it provides a reliable backup to satellite based systems and can be effective on long offshore legs as an indicator of the net course steered.

It may also be considered for use in Man Over Board (MOB) situations. If the D/R is restarted at this time then the D/R will give a net distance and course (through the water) from the man overboard incident.



Dead Reckoning

D/R calculations are based on the Course function, therefore if a Heel Angle sensor is fitted the D/R data can be corrected for Leeway.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	NAVIGATE D/RCourse, D/RDistance DRD/DRC D/R CRSE, D/R DIST
Units	ºM, ºT, nm
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

DEPTH

Depth calculation is one of the most important functions required for safe navigation. As part of on integrated system, rather than as a stand-alone unit, Depth can be accessed quickly and easily from any display on the boat.

The offset adjustment allows the datum to be moved to give either depth below the keel, below the waterline or from the transducer face.

Depth sounder performance is dependent on transducer type, installation, boat speed, electrical noise, sea state, depth and sea bed conditions among others. There will always be times when a reliable measurement of depth is not possible; in such cases, for instance, following in the wake of large vessels, the display shows four floating bars to indicate a signal problem.

The accuracy of the measurement is dependent on the velocity of sound and the amount the sound penetrates the sea bottom. Changes in the velocity of sound are not normally significant, however, errors up to one foot can result from sound penetration into very soft mud.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT Distance To Waypoint (DTW) DTW GC (Great Circle) DTW RMB (Rhumb Line)
Units	m, ft, fm
Alarms	High (Deep), Low (Shallow)
Calibrations	Datum
Damping	N/A
Update Rate	1Hz
Analogue Displays available	200m Depth 600ft/100fm Depth

DISTANCE TO WAYPOINT

Distance To Waypoint displays the distance from the yachts current position (Boat Position) to the current active waypoint.

This function repeats information received from a position fixing device (e.g. GPS) via a NMEA input.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	DEPTH Depth (Dep) DEPTH
Units	Nm
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

HALCYON

The Halcyon function is declared by the Halcyon Gyro Processor and reports the status of the processor.

Refer to the Halcyon Gyro Processor configuration section for further details.

HEADING

Heading displays the compass heading relative to North (either Magnetic or True reference depending on sensor choice and system setup).

Heading is used in the calculation of many other important functions such as True Wind Direction, time spent setting up and calibrating the Heading sensor is time spent wisely.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	NAVIGATE Heading (Hdg) HEADING
Units	ºM, ºT
Alarms	Sector
Calibrations	Offset AutoSwing (depending on sensor)
Damping	0-99s Dynamic Damping (B&G sensors on Hercules systems only)
Update Rate	2Hz
Analogue Displays available	Heading

HEADING ON OPPOSITE TACK

Heading on Opposite Tack displays the compass heading that the yacht would be following after tacking to the same TWA on the other tack. This function is invaluable for judging laylines when combined with either BTW data or a hand-bearing compass to obtain the actual mark bearing. This function does not take any tidal effects into consideration.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	PERFORM Heading Opp. Tack (OppT) OPP TACK
Units	ºM, ºT
Alarms	N/A
Calibrations	N/A
Damping	0-99s
Update Rate	2Hz
Analogue Displays available	N/A

HEEL ANGLE

The Heel Angle function displays the port/starboard inclination of the yacht. This data is useful to assess the performance of the yacht in varying conditions as it can be used to give an indication of the wind pressure when abnormal shear or gradient is affecting the true wind speed. It can also be checked when going upwind to ensure that the boat is not sailed over the optimum heel angle.

Importantly Heel data is used to calculate other functions including Leeway and Course. Heel Angle is also used by Hercules systems to correct wind data for the change of orientation of the sensor in the airflow.

System Requirements	Heel Angle sensor or Halcyon Gyro-Stabilised Compass
Menu **Function name (default)** **Function name (FFD)**	PERFORM Heel HEEL
Units	Degrees
Alarms	N/A
Calibrations	Offset
Damping	0-99s
Update Rate	1Hz
Analogue Displays available	N/A

KEEL ANGLE

HERCULES

Keel Angle will display a value which indicates the current lateral position of a canting keel system.

Calibration of Keel Angle.

The recommended procedure is as follows, this procedure is designed to display "0.0" when the keel is central with negative values displayed on the port side. In this example the maximum angle attainable by the keel is 40º.

If Keel Angle is not available in the menu structure it is necessary to determine the linear input in use and configure it correctly - Refer to 'Installtion Information'.

MENU **SETUP ▶ CALIBRATION ▶ MISC ▶ KEELANG**

Position the keel centrally, set POINT 1 to be 0.0, the voltage is automatically recorded and can be noted from VOLTS 1 if required.

Position the keel at its maximum travel to starboard, set POINT 2 to be a value equal to the angle of the keel (in this example 40.0), the voltage is automatically recorded and can be noted from VOLTS 2 if required.

System Requirements	Keel Sensor
Menu **Function name (default)** **Function name (FFD)**	MISC Keel Angle (Keel) KEEL ANG
Units	Degrees
Alarms	N/A
Calibrations	Position 1 (KNown Value 1) Volts 1 (Automatically Recorded) Position 2 (Known Value 2) Volts 2 (Automatically Recorded)
Damping	0-99s
Update Rate	1Hz
Analogue Displays available	N/A

LATITUDE/LONGITUDE

Latitude and Longitude are displayed on the GFD as Boat Position (refer to 'operating functions'.

On FFD displays the screen format means that these are selected separately. Both functions can be found in the Waypoint menu.

LAYLINE DISTANCE

If tacking upwind or gybing downwind to a waypoint, some position fixing systems will provide layline information based on a pre-defined tacking angle (usually adjustable).

This function displays the distance of both left and right-hand laylines by alternating the display between the two. An L or R is shown in the right hand digits to signify Left or Right laylines respectively.

This function can be particularly useful when nearing a waypoint. When the value reaches zero, it is time to tack or gybe for the mark. The calculation should be corrected for any tidal offset.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	PERFORM Layline Distance (dLL) LAYLINE
Units	Nm
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

LEEWAY

Leeway is the angle between the compass heading (Heading) and the course through the water (Course). The difference is caused by the sideways slip that the boat has when going upwind, known as Leeway.

Leeway is of great importance in the calculation of other functions e.g. Dead Reckoning, the 3-5º of leeway typical of modern yachts can considerably affect the dead reckoned position.

System Requirements	Heel Angle sensor
Menu **Function name (default)** **Function name (FFD)**	NAVIGATE Leeway (Lway) LEEWAY
Units	Degrees
Alarms	N/A
Calibrations	Leeway co-efficient Turn leeway correction for wind On/Off
Damping	0-99s
Update Rate	1Hz
Analogue Displays available	N/A

LINEAR INPUTS

Linear functions are the default display locations for additional sensors connected to the Linear Inputs on the CPU.

There are three classes of Linear function:

Standard Linear functions (types -2 to 2) display a number under the Linear function header. The data is determined by user set values for the minimum and maximum input voltages.

Fixed Value Linear functions (types 3 to 7) declare new functions with a fixed value for volts/degree (or volts/mb in the case of barometer).

Adjustable linear functions (types 8 and above) declare a new function which can be set by entering two known values.

Note: *After configuring the input type refer to specific function sections.*

HERCULES Linear types 8 - 13 are available on Hercules and higher level CPU software

MOTION Linear types 14 - 15 are available on Hercules Motion CPU software.

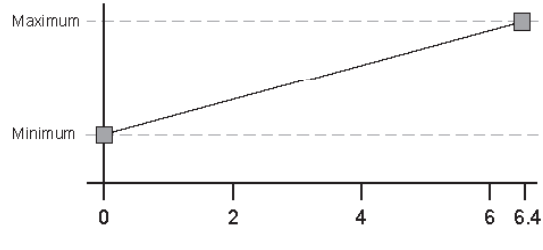
System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	MISC Linear n (LIN n) LINEAR n
Units	N/A
Alarms	N/A
Calibrations	Type (see table below) Minimum (value at 0V) Maximum (value at 6.4V)
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

Calibration of Linear functions

For all linear functions it is necessary to set the Type value (see table below), for linear types 3 and above further calibration is carried out under the relevant function.

Type	Description	Function Declared
-2	0 to 10.00 Linear	None
-1	0 to 1000.0 Linear	None
1	0 to 1000 Linear	None
2	0 to 1000 Linear	None
3	Rotating Mast Sensor	Mast Angle & Wind Angle to Mast
4	Heel Angle (port/starboard)	Heel Angle
5	Trim Angle (fore/aft)	Trim Angle
6	Barometric Pressure	Barometric Pressure & Pressure Trend
7	Rudder Angle	Rudder
8	Keel Angle	Keel Angle
9	Canard Angle	Canard
10	Trim Tab Angle	Trim Tab
11	Daggerboard Position	Daggerboard
12	Boom Position (height)	Boom Position
13	Aux Temperature	Temp
14	Pitch Rate	Pitch Rate
15	Roll Rate	Roll Rate

Note: *Linear types 3 and above can only be configured on one input channel at a time. For types -2 to 2 it is necessary to calibrate the Minimum and Maximum values as well. The Minimum value is the value that the display should read when the input is 0V. The Maximum value is the value that the display should read when the input is 6.4V*



Linear Input Voltage

LOCAL TIME

Displays local time from an interfaced position fixer. Ensure that your position fixer is configured to apply the correct local time offset.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	TIME Local Time (Time) LOC TIME
Units	N/A
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

LOADCELLS

Loadcells are used for measurement and display of rigging loads for safety and performance.

System Requirements	Loadcell with Digital Amplifier
Menu **Function name (default)** **Function name (FFD)**	LOADCELL This depends on loadcell selection. Please refer to loadcell manual.
Units	t, klb
Alarms	High / Low
Calibrations	1 = Units, 2 = Cal Volts, 3 = Internal damping On/Off
Damping	0-99s
Update Rate	1Hz typical
Analogue Displays available	N/A

MAST ANGLE

Mast Angle measurement is required for yachts with rotating masts as the wind sensor rotates with the rig, which introduces errors into the wind calculations. To correct for this issue a mast rotation sensor is fitted to the system, which provides the angle information.

When Mast Angle data is available all wind data is corrected to ensure that all angles are relative to the bow of the boat. In addition a new function, Wind Angle to Mast, is created.

System Requirements	Mast Angle Sensor
Menu **Function name (default)** **Function name (FFD)**	PERFORM Mast Angle (MST) MAST ANG
Units	Degrees
Alarms	N/A
Calibrations	Offset
Damping	0-99s
Update Rate	1Hz
Analogue Displays available	N/A

MEASURED WIND ANGLE

Measured Wind Angle is the angle measured by the masthead unit, no calibrations are applied except the basic offset value for alignment.

Measured Wind is not used whilst sailing, but is a useful function for checking the operation and alignment of the wind instruments before additional corrections are applied to the data during the calculation of the True Wind and Apparent Wind.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	WIND Measured Wind Angle (MWA) MEAS W/A
Units	Degrees
Alarms	N/A
Calibrations	Offset
Damping	0-99s
Update Rate	4Hz (Hercules), 2Hz (Hydra)
Analogue Displays available	N/A

MEASURED WIND SPEED

Measured Wind Speed is the wind speed measured by the masthead unit, no calibrations are applied except the factory set offset and Hz/Kt values.

Measured Wind is not used whilst sailing, but is a useful function for checking the operation of the wind instruments before additional corrections are applied to the data during the calculation of the True Wind and Apparent Wind.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	WIND Measured Wind Speed (MWS) MEAS W/S
Units	Kt
Alarms	N/A
Calibrations	Hz/kt Offset
Damping	0-99s
Update Rate	4Hz (Hercules), 2Hz (Hydra)
Analogue Displays available	N/A

NEXT LEG APPARENT WIND ANGLE PERFORM

Next Leg wind information is a prediction of the conditions of Apparent Wind Angle and Speed that the yacht will experience after altering course onto the next leg.

This data is calculated from the current True Wind and a bearing that you enter for the next leg course. From this information the True Wind Angle on the next leg is calculated, then by using the polar tables the corresponding Boat Speed is given and hence the Apparent Wind Speed and Angle can be calculated.

Should the leg be upwind or downwind, rather than free, the H3000 calculates the data using the Target TWA on the favoured tack, this situation is indicated on the display by the position of a small bar at the top (upwind) or bottom (downwind) of the digits.

The tide calculated by the system can be applied to the calculation if required.

The Next Leg Bearing is entered as a CONTROL option under N/L AWA, found by:

▶ OTHER CALIBRATION ▶ PERFORMANCE ▶ N/L AWA1 ▶ LEG BEAR ▶ (Set value ▼▲) ↵

At the same menu level is the tidal option where entering a 1 applies tide to the calculation, and entering a zero removes tide from the calculation, found by:

▶ OTHER CALIBRATION ▶ PERFORMANCE ▶ N/L AWA1 ▶ TIDE ON ▶ (Set value▼▲) ↵

The tide is calculated by the Processor when a position fixing system is connected.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	WIND Next Leg AWA (NL AWA) N/L AWA
Units	Degrees
Alarms	N/A
Calibrations	Next Leg Bearing Tide On
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

NEXT LEG APPARENT WIND SPEED PERFORM

See Next Leg Apparent Wind Angle for operation information.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	WIND Next Leg AWS (NL AWS) N/L AWS
Units	Kt
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

OFF COURSE

Off Course provides a steering aid to the helm. The value displayed is the difference between actual heading and desired heading.

System Requirements	Only available on GFD
Menu **Function name (default)** **Function name (FFD)**	NAVIGATE Off C OFF CRSE
Units	Degrees
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

OPTIMUM WIND ANGLE

PERFORM

Optimum Wind Angle provides an alternative method of presenting Target TWA data, which some people find easier to use.

For every Target Boat Speed there is a wind angle at which that speed will be achieved (Target TWA). The Optimum Wind Angle is the difference between this angle and that at which you are presently sailing, so keeping the Optimum Wind Angle at zero achieves the Target TWA for Target Boat Speed.

If you are sailing at the optimum wind angle then you will achieve optimum VMG up/downwind for the current wind condition.

Sometimes, particularly downwind, it is easier to try to sail to a wind angle rather than to the Target Boat Speed. The accuracy of this function will depend on how accurate the polar tables are for your boat.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	PERFORM Optimum Wind Angle (OPT WA) OPT W/A
Units	Degrees
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

POLAR BOAT SPEED

PERFORM

Polar Boat Speed is the predicted achievable boat speed for the current wind conditions. Unlike Target Boat Speed, which only applies whilst sailing upwind or downwind (i.e. to Target TWA), Polar Boat Speed applies at all wind angles; it is therefore useful when sailing on a free leg.

The helmsman and trimmers can use this figure as the target to achieve maximum performance independent of any changes in the wind speed. The same data is also available via the Polar Performance % function in terms of Boat Speed as a percentage of Polar Boat Speed.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	PERFORM Polar Speed (POL) POL SPD
Units	Kt
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

POLAR PERFORMANCE

PERFORM

Polar Performance compares the Boat Speed with the Polar Speed obtained from the polar table; this is then displayed as a percentage.

Polar Performance accounts for changes in True Wind Speed (due to it being based on the polar data) so can be a better indication of the performance of the yacht than Boat Speed.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	PERFORM Polar Performance (POL %) REACHING
Units	%
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

PITCH RATE

MOTION

Pitch Rate displays the current value of Pitch Rate as used by Hercules Motion for wind correction. This function is shown for diagnostic purposes only.

Also see Roll Rate.

System Requirements	Motion Sensor
Menu **Function name (default)** **Function name (FFD)**	Parameter Pitch Rate PTCHRATE
Units	Degrees per Second
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	4Hz
Analogue Displays available	N/A

PULSE 2 HERCULES

Pulse 2 is a secondary boat speed input. This allows the CPU to automatically switch between port and starboard Boat Speed sensors based on Measured Wind Angle or Heel Angle, increasing the accuracy of dual sensor installations and removing the requirement for a Gravity Switch.

System Requirements	Additional Boat Speed sensor
Menu **Function name (default)** **Function name (FFD)**	SPEED Pulse 2 (PUL 2) PULSE 2
Units	kt, kph, mph
Alarms	N/A
Calibrations	Transducer Selection 1 = Starboard 2 = Port
Damping	N/A
Update Rate	6Hz (Hercules), 4Hz (Hydra)
Analogue Displays available	N/A (See Boat Speed)

REMOTE N PERFORM

The Remote functions are declared (in the External menu) by the Performance software and are used to display data from an external system (e.g. a PC running B&G Deckman) via the H-Link protocol.

Refer to ‘H-Link communications’ for further details.

ROLL RATE

MOTION

Roll Rate displays the current value of Roll Rate as used by Hercules Motion for wind correction. This function is shown for diagnostic purposes only.

Also see Pitch Rate.

System Requirements	Motion Sensor
Menu **Function name (default)** **Function name (FFD)**	Parameter Roll Rate ROLLRATE
Units	Degrees per Second
Alarms	N/A
Calibrations	MASTLEN PERFWIND (0 = Off & 1 = On) WINDDAMP
Damping	N/A
Update Rate	4Hz
Analogue Displays available	N/A

RUDDER ANGLE

Displays the current Rudder Angle. Useful for assessing the balance of the yacht, especially upwind.

System Requirements	Rudder Angle sensor
Menu **Function name (default)** **Function name (FFD)**	MISC Rudder Angle (Rud) RUDDER
Units	Degrees
Alarms	N/A
Calibrations	Offset
Damping	N/A
Update Rate	1Hz
Analogue Displays available	Rudder Angle

SPEED OVER GROUND

Speed Over Ground (SOG) displays the current speed of the yacht relative to land (rather than the water).

This function repeats information received from a position fixing device (e.g. GPS) via a NMEA input.

SOG is used within the system to calculate Tide Set and Tide Rate.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT SOG SPD O/G
Units	kt
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

STORED LOG

The Stored Log runs continually and records the total distance travelled by the yacht since the system was initially commissioned.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	LOG Stored Log (Log) STD LOG
Units	nm
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

TARGET BOAT SPEED

PERFORM

Target Boat Speed is the Boat Speed at which optimum VMG will be achieved, derived from the polar table.

Target Boat Speed is generally regarded as the most efficient number to steer to when sailing upwind, if the Target is lower than the actual Boat Speed then the boat is travelling “too fast”, generally this is a good indication of the helm footing off at too wide an angle to the wind. Conversely if the Target is higher than the Boat Speed then it is an indication that the helm is pinching and sailing too high. Both circumstances lead to reduced VMG.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	PERFORM Target Boat Speed (TG SPD) TARG SPD
Units	kt
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

The Target Boat Speed is derived from the polar table. The point at which the perpendicular to 0º TWA first touches the curve is the point where the Optimum VMG (upwind in this case), hence optimising speed to windward.

The Boat Speed on the curve at this point is, by definition, the Target Boat Speed for that True Wind Speed, the True Wind Angle at that point becomes the Target TWA. The two combined allow us to calculate VMG performance.

TARGET TRUE WIND ANGLE PERFORM

Target TWA is the TWA at which optimum VMG will be achieved, derived from the polar table.

Target TWA is generally regarded as the most efficient number to steer to when sailing downwind, although Target Boat Speed is also commonly used.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	PERFORM Target TWA (TG TWA) TARG TWA
Units	Degrees
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

TEMPERATURE - AIR

Air Temperature (AIR) displays the current temperature read via the sensor.

System Requirements	Air Temperature Sensor
Menu **Function name (default)** **Function name (FFD)**	TEMP Air Temperature (AIR) AIR TEMP
Units	ºC, ºF
Alarms	High and Low
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

TEMPERATURE - AUX

Displays the current temperature read via the sensor.

System Requirements	Temperature Sensor
Menu **Function name (default)** **Function name (FFD)**	TEMP Air Temperature (AIR) Temp TEMP
Units	ºC, ºF
Alarms	High and Low
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

TEMPERATURE - SEA

Displays the current water temperature. This information can be useful in races crossing permanent current flows which are usually different temperatures - classically this is seen when crossing the Gulfstream, however the effect is still visible when racing coastally.

An external temperature sensor is required if a Sonic Speed or MicroSonic Speed sensor is in use for Boat Speed. These sensors do not have an integral temperature sensor unless implicitly mentioned.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	TEMP Sea Temperature (Sea) SEA TEMP
Units	ºC, ºF
Alarms	High, Low
Calibrations	SENSOR TYPE (1 = Paddle, 2 = External)
Damping	N/A
Update Rate	1Hz
Analogue Displays available	Rudder Angle

Note:

Cal Val 1 = 1 is the standard temp from B&G paddle wheel sensor.
Cal Val 1 = 2 is the B&G standard external sea temp sensor.

TIDE SET AND RATE

The system calculates current flow by comparing the Boat Speed and Course (which are measured relative to the water) to the ground referenced data (SOG and COG) from a GPS. This calculation therefore includes all water motion including both tides and permanent currents.

As the calculation utilises the Course function its accuracy can be enhanced by the use of a Heel Angle sensor and accurate Leeway calibration.

Your position fixer will either supply true or magnetic bearings to the system. If it supplies true bearing and you are using a magnetic heading source you must enter the magnetic variation into the system, this is found under CAL VAL 1:

SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ NAVIGATE ▶ TIDE SETº ▶ MAGVARNº

Some position fixers output the current local magnetic variation on the NMEA 0183 port using either HVD, HVM, RMA or RMC sentences, if this data is available CAL VAL1 on the TIDE SET function will be automatically set to the correct variation.

Note: *If your position fixer sends magnetic bearing, check that the variation is correctly entered (or calculated) in the position fixer.*

Importantly the damping on this function is adjustable, in rapidly changing tidal situations you need to lower the damping down as far as possible to be able to see the changes quickly. However in stable conditions, probably offshore, averaging the data over a longer time will normally give a more stable, accurate figure. In addition note that particularly frequent manoeuvring can produce unreliable figures due to the lag in update from position fixing devices.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	NAVIGATE Tide Set (T SET), Tide Rate (T RTE) TIDE SET, TIDE RTE
Units	ºM, ºT, nm
Alarms	N/A
Calibrations	Magnetic Variation
Damping	0-24minutes, 15seconds increments
Update Rate	1Hz
Analogue Displays available	N/A

TIMER

The system Timer can be used for either countdown, probably for the start of a race, or as a straight-forward stopwatch. When the timer starts from zero, or passes zero in the case of a countdown, all reset Trip Functions (Average Speed, Dead Reckoning, Trip Log) will start.

Note: *If your position fixer sends magnetic bearing, check that the variation is correctly entered (or calculated) in the position fixer.*

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	TIME Timer TIMER
Units	hh:mm:ss
Alarms	Countdown bleep via Audible Alarm
Calibrations	Set countdown period
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

TIME TO LAYLINE

This function is linked to Layline Distance. The information displayed shows the time to go before reaching the appropriate layline. A value of zero indicates that the layline has been reached.

Note that this data is provided by an external device, normally using arbitrary tacking angles, as such it should only be considered an approximation.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	TIME Time to Layline (tLL) TIME L/L
Units	hh:mm:ss
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

TIME TO WAYPOINT

Displays time until arrival at the active waypoint, this data is provided by a position fixer which will normally calculate this value using the current value of SOG. There is no consideration for future changes in speed due to wind, tide etc. however it is a useful approximation.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT Time to Waypoint (t WPT) TTG to WPT
Units	hh:mm:ss
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

TRIP LOG

The Trip Log records the distance travelled through the water. The value displayed is the distance, in nautical miles, travelled from the time the Trip Log was started.

Trip Log also forms part of the calculation for Average Speed which displays the average boat speed since the trip log was started.

If racing the Trip Log can be reset, then when the countdown timer reaches zero the Trip Log (and any other trip functions that have been reset) will start automatically - useful for calculating distance sailed during a race.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	LOG Trip Log (TRIP) TRIP LOG
Units	nm
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

TRIM (FORE/AFT)

The Trim function displays the fore/aft trim angle of the yacht which can be very useful for repeating successful setups. Trim is also a valuable function to data log on external software as, along with Heel, it gives an indication of the attitude of the boat.

Trim Angle is used by Hercules systems to correct wind data for the orientation of the wind sensor.

System Requirements	Trim Angle sensor
Menu **Function name (default)** **Function name (FFD)**	PERFORM Trim TRIM
Units	Degrees
Alarms	N/A
Calibrations	Offset
Damping	0-99s
Update Rate	1Hz
Analogue Displays available	N/A

TRIM TAB ANGLE

HERCULES

Trim Tab Angle is designed to display the angle of an attached trim tab, traditionally this would be attached to the keel, however because this value is not used within the system for further calculation it can be used for any trim tab type device.

Calibration of Trim Tab Angle

The recommended procedure is as follows:

If Trim Tab is not available in the menu structure it is necessary to determine the linear input in use and configure it correctly - refer to 'Installtion Information'

SETUP ▶ CALIBRATION ▶ MISC ▶ TRIM TAB

Position the tab centrally, set POINT 1 to be 0.0, the voltage is automatically recorded and can be noted from VOLTS 1 if required.

Position the tab at a known angle (e.g. 10º starboard), set POINT 2 to be this angle (e.g. 10.0), the voltage is automatically recorded and can be noted from VOLTS 2 if required. By convention if the tab is to starboard of the centreline the value should be positive.

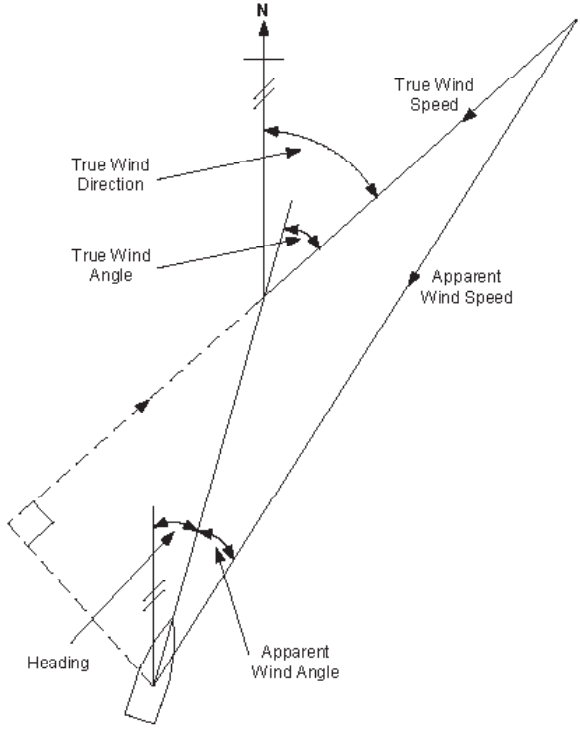
System Requirements	Suitable position sensor
Menu **Function name (default)** **Function name (FFD)**	MISC Trim Tab (Tab) TRIM TAB
Units	Degrees
Alarms	N/A
Calibrations	Position 1 (known value 1) Volts 1 (automatically recorded) Position 2 (known value 2) Volts 2 (automatically recorded)
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

TRUE WIND ANGLE

True Wind Angle is calculated from Measured Wind Speed, Measured Wind Angle and Boat Speed, this data is then combined with True Wind correction and heel angle correction values to create True Wind data. True Wind data is used to back-calculate Apparent Wind data as shown in the vector triangle below.

As with all True Wind functions, True Wind Angle (TWA) is referenced to the water surface - therefore tidal flows affect True Wind measurement. TWA is measured relative to the bow of the yacht, it is the difference between TWD and Heading.

Activating calibration of TWA is vital to ensuring accurate readings for TWD. Please refer to ‘calibration for explanations of this process.



Wind Triangle

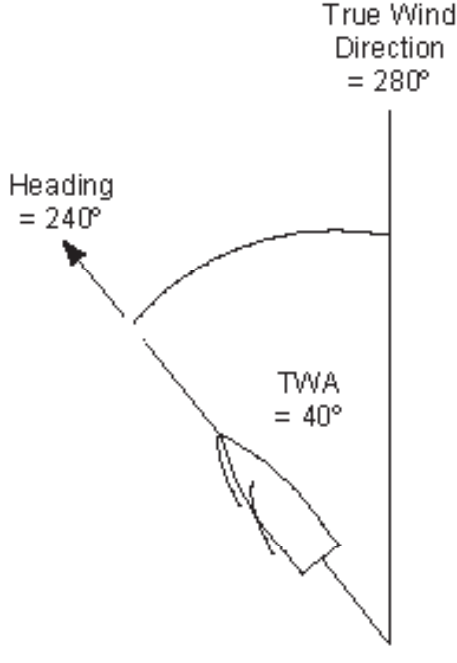
System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	WIND True Wind Angle (TWA) TRUE W/A
Units	Degrees
Alarms	Sector
Calibrations	True Wind Correction Tables AutoCal TWA correction routine
Damping	0-99s Dynamic Damping (Hercules only)
Update Rate	4Hz (Hercules), 2Hz (Hydra)
Analogue Displays available	True Wind Angle 360º

TRUE WIND DIRECTION

True Wind Direction is the compass direction that the wind is coming from. It is calculated from the True Wind Angle and Heading and is therefore corrected for errors induced by aerodynamic effects via True Wind correction tables along with Heel Angle correction if available (Hercules).

As with all True Wind functions, TWD is relative to the water surface so is affected by tides etc.

TWD is the Tactician's greatest ally in the search for wind shifts, accurate data on this function gives great confidence in identifying shifts and making decisions.



True Wind Direction

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	WIND True Wind Angle (TWA) TRUE W/A
Units	Degrees
Alarms	Sector
Calibrations	True Wind Correction Tables AutoCal TWA correction routine
Damping	0-99s Dynamic Damping (Hercules only)
Update Rate	4Hz (Hercules), 2Hz (Hydra)
Analogue Displays available	True Wind Angle 360º

TRUE WIND SPEED

True Wind Speed (TWS) is the speed of the wind measured relative to the water surface.

The system allows you to correct the TWS data for aerodynamic effects via the TW Correction tables. (See 'calibration'). When the boat is sailing downwind it is normal for the airflow to be accelerated as it passes over the rig, the normal effect of this is for the TWS to over-read by 10-15%.

The effect is reduced significantly by utilising a Vertical Masthead Unit which positions the sensor further away from the accelerated airflow, thereby reducing the error - however the effect is still present and should be corrected as required.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	WIND True Wind Speed (TWS) TRUE W/S
Units	kt, m/s
Alarms	High, Low
Calibrations	True Wind Correction Tables
Damping	0-99s Dynamic Damping (Hercules only)
Update Rate	4Hz (Hercules), 2Hz (Hydra)
Analogue Displays available	True Wind Speed, 50kt

UTC TIME

Universal Co-ordinated Time (UTC) is equivalent to Greenwich Mean Time (GMT) and is the time used by all GPS systems. It is also referred to as Zulu Time (z) in some cases.

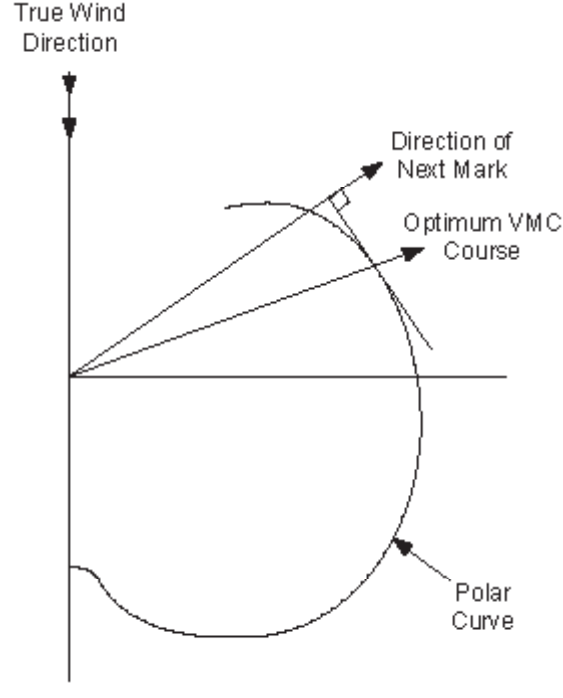
This function repeats information received from a position fixing device (e.g. GPS) via a NMEA input.

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	TIME UTC Time (UTC) UTC TIME
Units	hh:mm:ss
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A

VMG TO WAYPOINT

Velocity Made Good, on Course to Waypoint (VMC) displays the component of your speed in the direction of the waypoint. Normally SOG is the speed reference used as the data is provided by the position fixer.

This can be a very important function on free legs, particularly if you are a long way from the mark, since the greatest VMG to Waypoint (VMC) is not necessarily obtained by sailing straight at the mark.



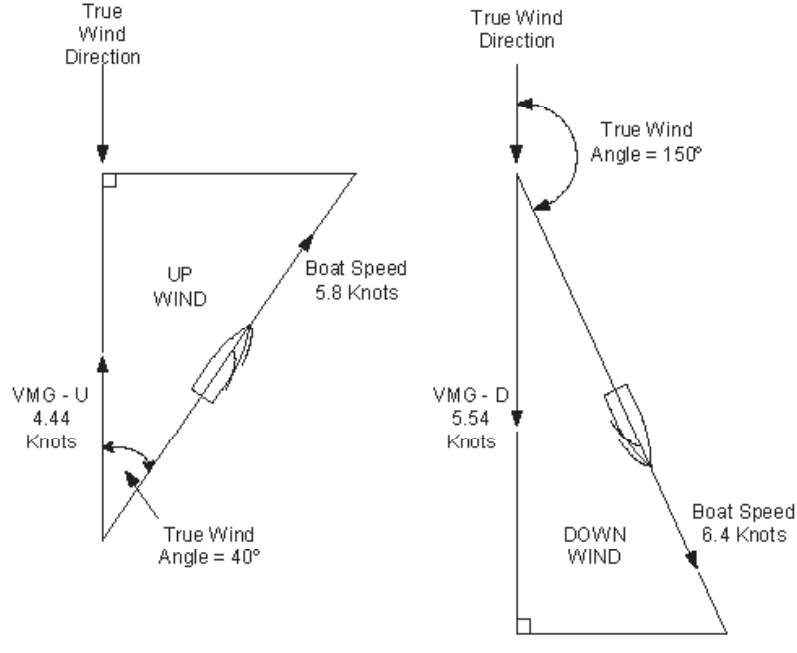
Optimum VMG to Mark

System Requirements	Suitable NMEA input
Menu **Function name (default)** **Function name (FFD)**	WAYPOINT VMG Waypoint (VMC) VMG WPT
Units	kt
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz typical
Analogue Displays available	N/A

VMG

Velocity Made Good (VMG) is the component of Boat Speed in the direction of the True Wind.

VMG is used for monitoring performance of the yacht on upwind or downwind legs as the data considers both Boat Speed and True Wind Angle therefore indicating whether sailing slower, but closer to the wind, is better than sailing faster, but at a wider TWA.



Calculation of VMG

The disadvantage in using VMG is that the boat has significant inertia, meaning that if the helm sails closer to the wind the Boat Speed will only drop off slowly initially indicating a large increase in VMG (closer to the wind, same Boat Speed) this means that the VMG value is NOT a good guide for the helm and it should be monitored by another member of crew, probably the Navigator/Tactician.

By monitoring the VMG value it is possible to get a feel for the Boat Speed attained at the point of optimum VMG, this is effectively the Target Boat Speed and should be used by the helm to optimise the performance of the yacht.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	SPEED Velocity Made Good (VMG) VMG
Units	kt
Alarms	N/A
Calibrations	N/A
Damping	0-99s
Update Rate	1Hz
Analogue Displays available	N/A

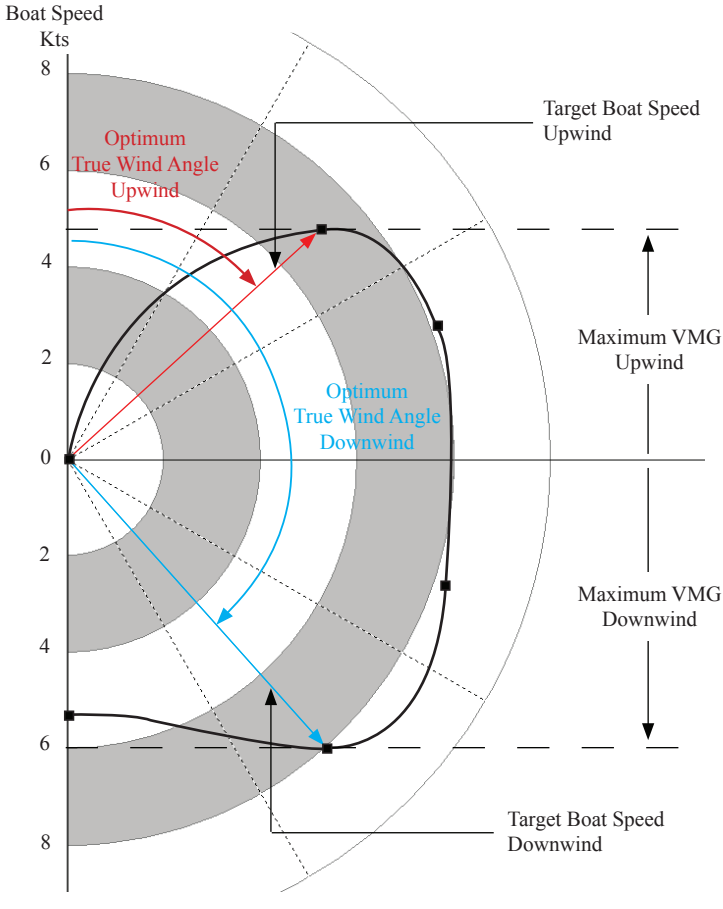
VMG PERFORMANCE

PERFORM

VMG Performance compares the current VMG with the VMG derived from the polar table, this data is then displayed as a percentage, and is corrected for changes in wind speed.

This information is useful for monitoring the performance of the yacht but is not recommended for viewing by the helmsman - VMG data suffers from an inherent lag caused by the inertia of the yacht which precludes its use as a steering aid.

System Requirements	N/A
Menu **Function name (default)** **Function name (FFD)**	PERFORM VMG Performance (VMG Perf) TACKING
Units	%
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	1Hz
Analogue Displays available	N/A



Polar Performance Curve

The Polar Table describes the performance of the boat in all conditions of True Wind Speed and Angle. The Boat Speed is plotted radially against the True Wind Angle for each True Wind Speed in turn. The result is a Polar Performance Curve shown above, this shows the boat speed plotted for just one value of true wind speed.

Polar tables can be derived either by theoretical predictions, e.g. measurement certificates, or by analysing the boat's actual performance via software such as Deckman. The H3000 has one polar table stored in its memory.

WIND ANGLE TO MAST

Wind Angle to Mast gives the Measured Wind relative to the mast of the yacht, effectively giving the angle of attack of the foil specifically for yachts equipped with rotating wing masts (or for non-wing masts to align the rig for minimum drag).

System Requirements	Mast Rotation sensor
Menu **Function name (default)** **Function name (FFD)**	WIND Mast MWA (WAM) W/A MAST
Units	Degrees
Alarms	N/A
Calibrations	N/A
Damping	0-99s
Update Rate	4Hz (Hercules), 2Hz (Hydra)
Analogue Displays available	N/A

YAW RATE

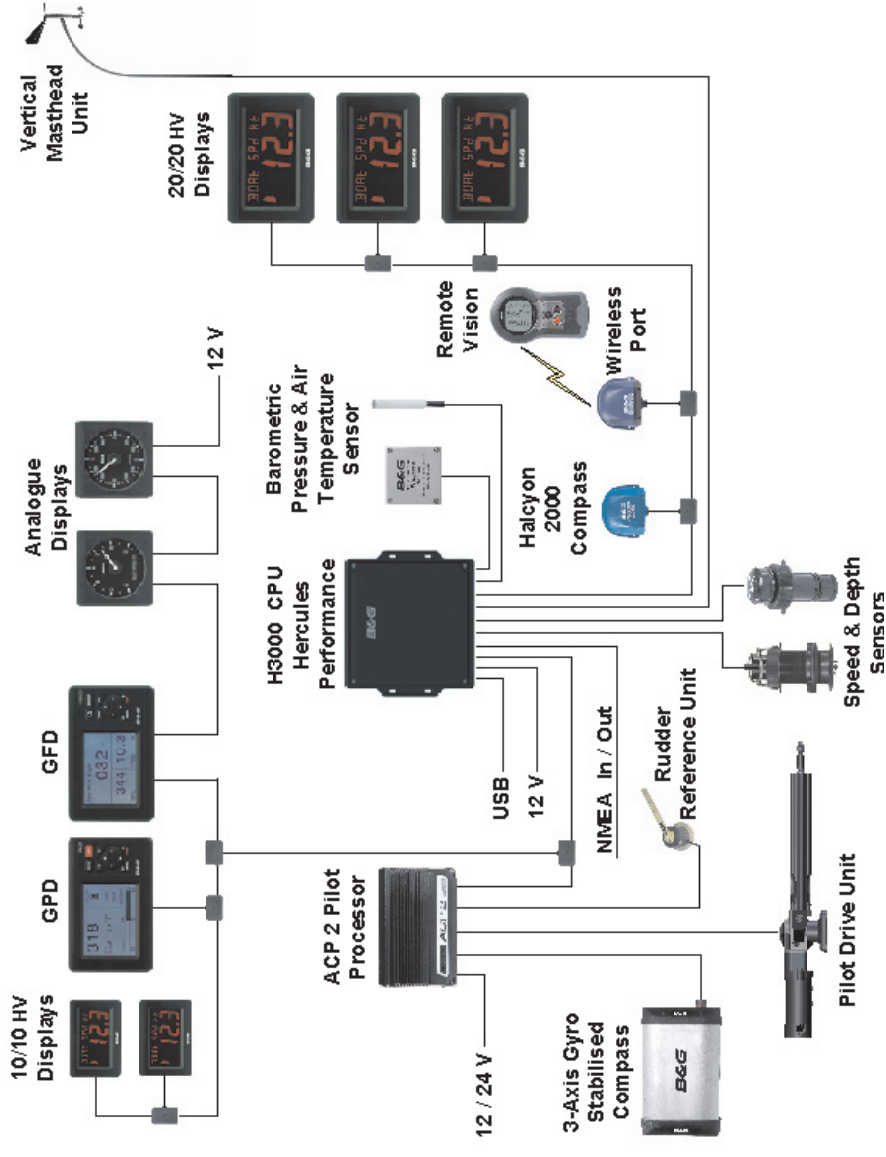
Yaw Rate is the turn rate of the boat in degrees/second.

This data is output from the Halcyon Gyro Processor when a HGSC compass is in use. This data is undamped and is used by the Pilot system to improve steering performance - it is displayed on the system for diagnostic purposes only.

System Requirements	Halcyon Gyro Processor with HGSC
Menu **Function name (default)** **Function name (FFD)**	MISC Yaw Rate (Yaw) YAW RATE
Units	Degrees
Alarms	N/A
Calibrations	N/A
Damping	N/A
Update Rate	4Hz
Analogue Displays available	N/A

INSTALLATION INFORMATION

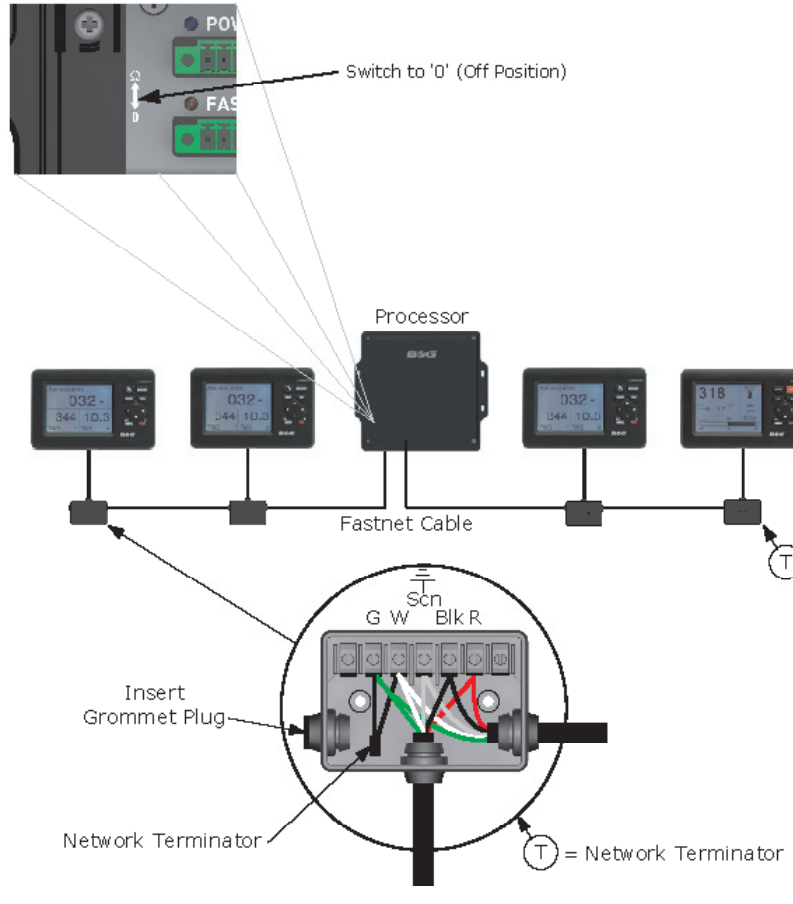
H3000 SYSTEM EXAMPLE



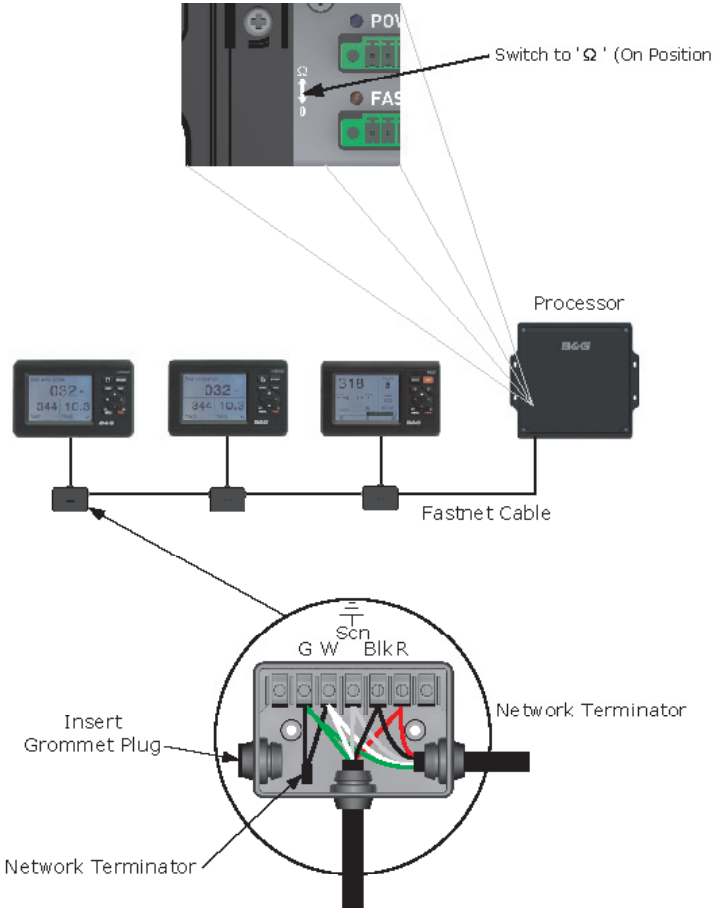
NETWORK INSTALLATION

The Fastnet network installation shown below should be installed in a linear fashion and ideally run in a line from one end to another with short 'spurs' to displays and processors etc. A 'star' network with many network spurs off one point will not work correctly, and must be avoided.

Example 1~ Two network cables. Processor switch to OFF. Terminated in the last junction box at each end.



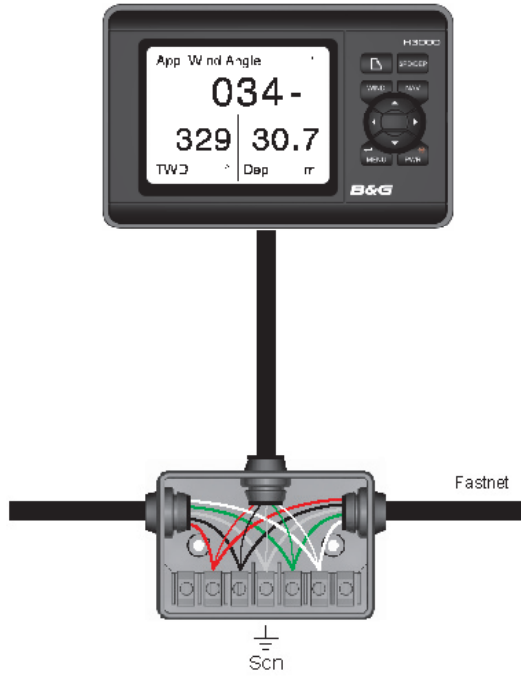
Example 2~ Single network cable. Processor switch to ON. Terminated at processor unit via switch as shown. Add a network terminator to the last junction box at the end.



Note: *A network terminator must be fitted across the green and white network data wires of the last unit or junction box at each end of the network cable.*

When adding more displays or units to the network, ensure that the terminator is moved to the ends of the network cable. Never fit more than two terminators on the network.

GFD INSTALLATION



GFD		
TERMINAL	**COLOUR**	**FUNCTION**
1	GREEN	Network Data -ve
2	WHITE	Network Data +ve
3	SHIELD	Network Cable Shield
4	BLACK	Ground
5	RED	Supply +ve 12V

GFD Installation Notes

• The H3000 system requires at least one GFD.

• A GFD can be connected at any point on the system network.

• Multiple GFDs can be used on the system network. Each can control and enter data into the system processor memory.

• GFDs can be used in combination with all other display types i.e. HV and Pilot displays.

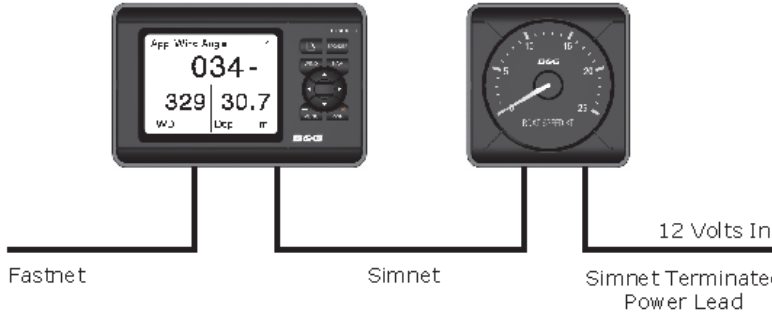
• Screened cables should be connected to their neighbouring screened cable in the junction box.

• Shielded cables are supplied to provide protection against unwanted emissions (EMC) and must be connected in accordance with these instructions.

• Network Termination. If the GFD is the last unit on the system network a network terminator MUST be fitted across the network data wires, i.e. between the green and white wires.

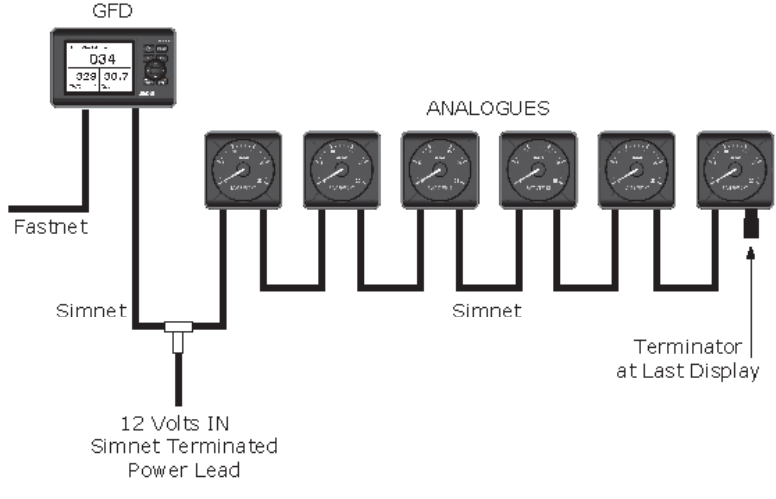
ANALOGUE INSTALLATION

EXAMPLE 1~ H3000 System with up to six displays



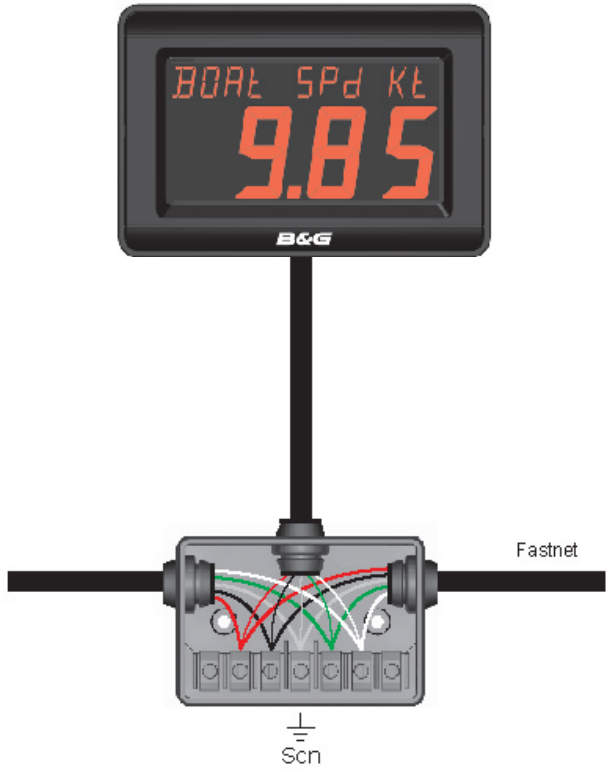
Note: *For systems with up to six analogues a Simnet terminated power lead with 12Volts power should be attached to the last analogue on the network*

EXAMPLE 2~ H3000 System with more than six displays



Note: *For systems with more than six analogues a terminated power lead must be added to the network typically between the GFD and the first analogue. A terminator must be attached to the last analogue on the network.*

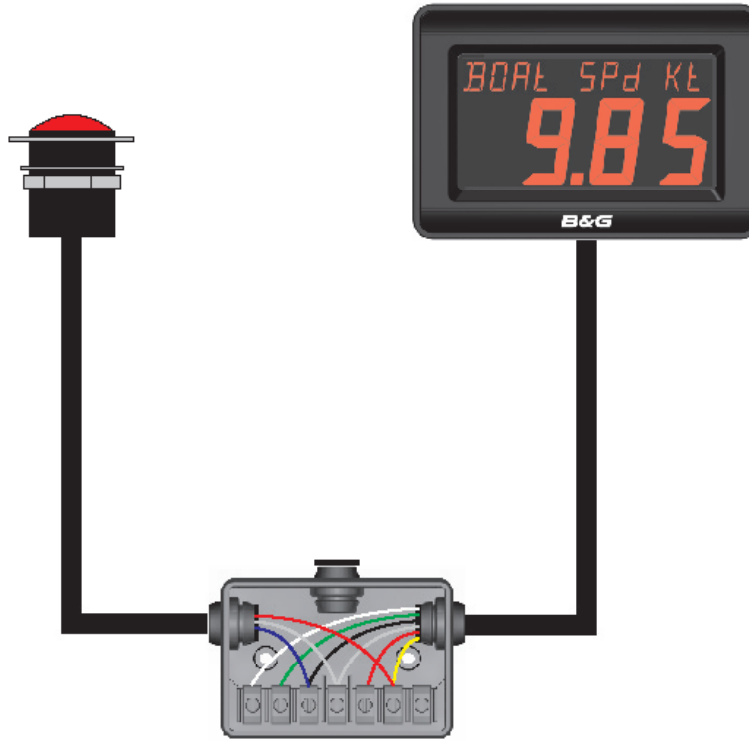
HV DISPLAY INSTALLATION



Note:

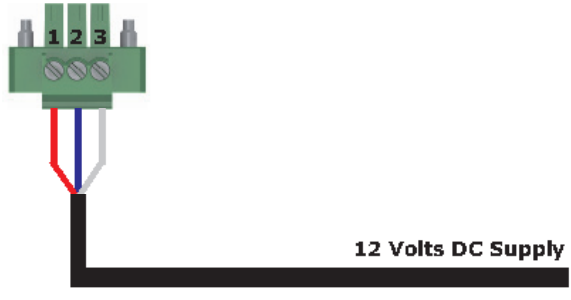
- Above is an example of the installation of an HV Display.
- 10/10, 20/20, 30/30 & 40/40 HV Displays are all be installed identically.
- Wire like colours together in junction box.

REMOTE BUTTON



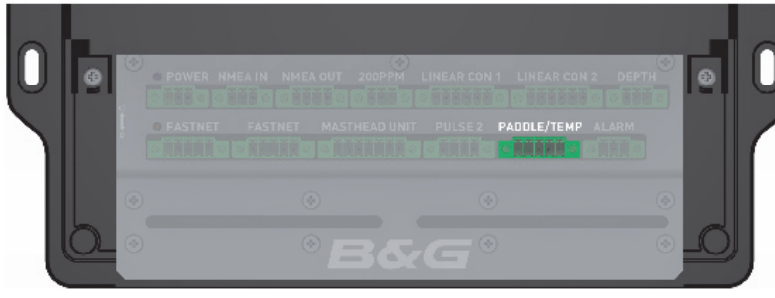
REMOTE BUTTON	HV DISPLAY
-	White
-	Green
Blue	Black
Screen	Screen
-	Red
Red	Yellow

POWER



POWER		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	12 Volts DC Supply
2	BLUE	0 Volts
3	SCREEN	Screen

PADDLE / TEMP

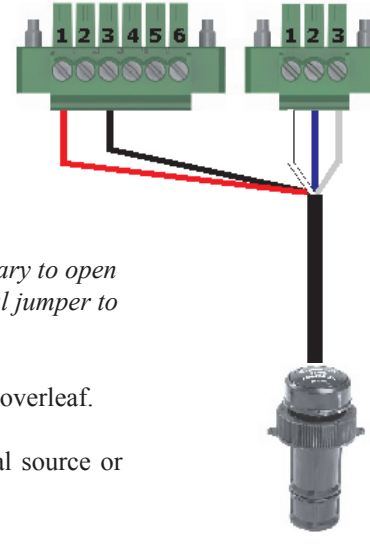


PADDLE / TEMP		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED and WHITE	5 Volts DC Supply
2	BLACK	0 Volts
3	GREEN	Paddle Input
4	YELLOW / RED	Sea Temp Input
5	SCREEN	Screen

DEPTH

DEPTH		
TERMINAL	**COLOUR**	**FUNCTION**
1	BLUE	Sensor +ve
2	BLACK	Sensor -ve
3	SCREEN	Screen

NMEA DEPTH



Note: *To use NMEA Depth it is necessary to open up the processor and move the terminal jumper to bridge a different set of terminals.*

Details of how to do this can be found overleaf.

12V power can come from an external source or from Linear Con 2 as shown.

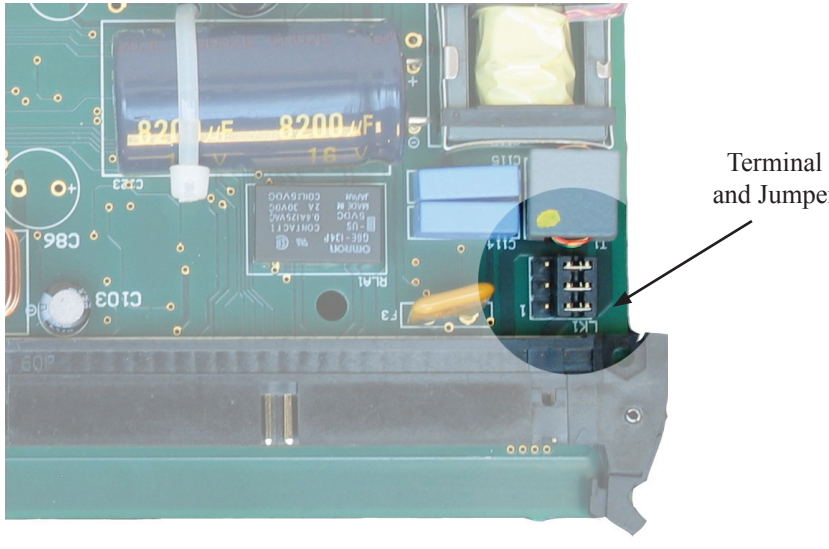
NMEA DEPTH		
TERMINAL	**COLOUR**	**FUNCTION**
1	WHITE	NMEA +ve
2	BLUE	NMEA -ve
3	SCREEN	Screen
Linear Con 2 Term 1	RED	12 Volts
Linear Con 2 Term 3	BLACK	0 Volts

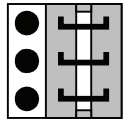
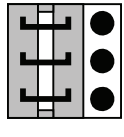
Adjusting the terminal jumper to use NMEA Depth

Caution: *It is recommended that an approved B&G technician performs this operation.*

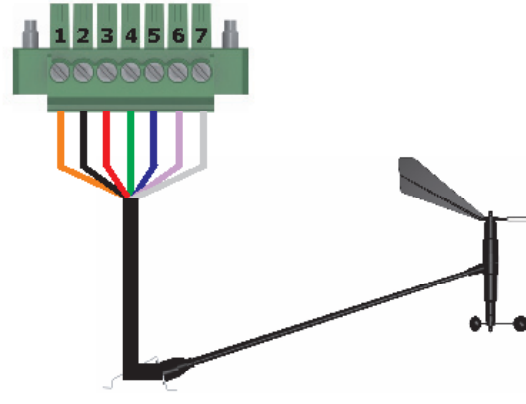
Remove terminal cover – 2 x screws
Remove top case to expose PCB – 4 x screws
Slide off terminal jumper shown below by pulling up.
Replace jumper bridging the terminals shown below by pushing down..

Note: *The jumper is set to the position shown below as the standard depth setting.*



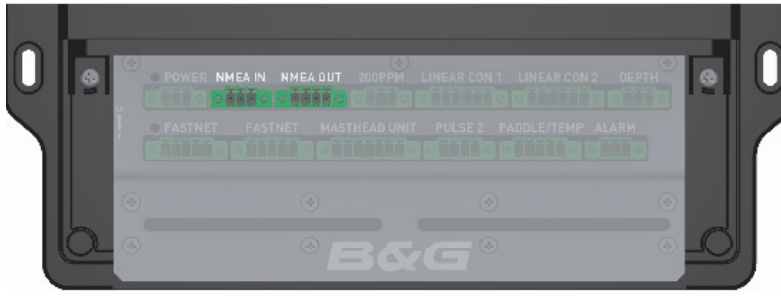
	PASSIVE DEPTH: Terminal jumper as standard bridges between centre and right pins. (Default Setting)
	NMEA DEPTH: Remove terminal jumper and place over centre and left pins

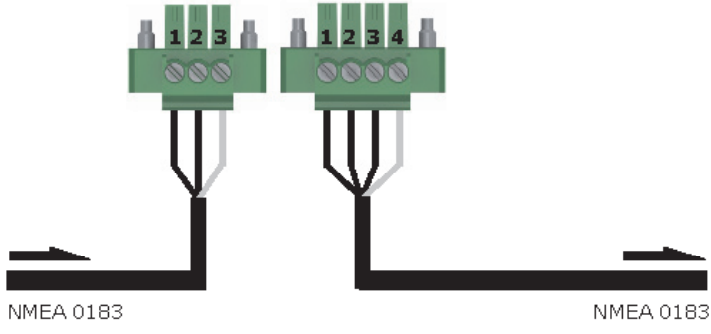
MASTHEAD UNIT



MASTHEAD UNIT		
TERMINAL	**COLOUR**	**FUNCTION**
1	ORANGE	6.4 Volts DC Supply
2	BLACK	0 Volts
3	RED	Red Wind Angle Phase
4	GREEN	Green Wind Angle Phase
5	BLUE	Blue Wind Angle Phase
6	VIOLET	Wind Speed Input
7	SCREEN	Screen

NMEA 0183 INTERFACE

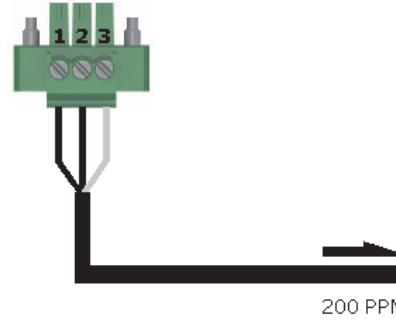




NMEA IN		
TERMINAL	**COLOUR**	**FUNCTION**
1	-	NMEA IN +ve
2	-	NMEA IN -ve
3	SCREEN	Screen

NMEA OUT		
TERMINAL	**COLOUR**	**FUNCTION**
1	-	NMEA OUT +ve
2	-	NMEA OUT -ve
3	-	0 Volts
4	SCREEN	Screen

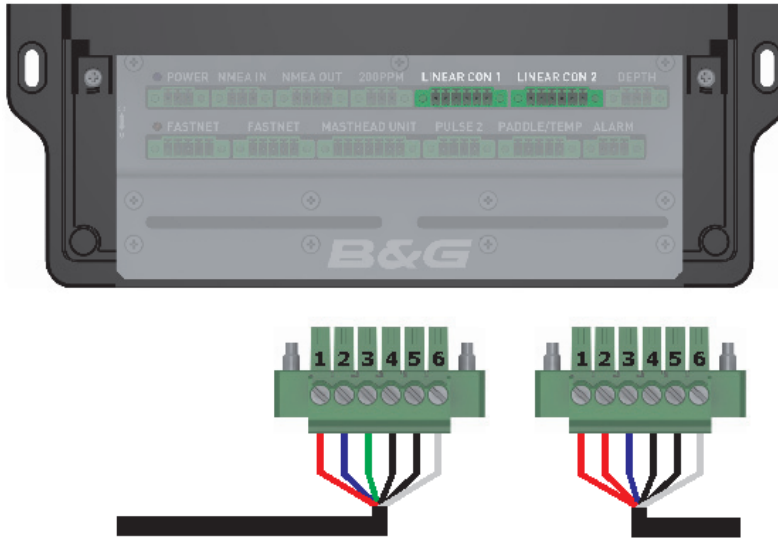
200 PPM



200 PPM		
TERMINAL	**COLOUR**	**FUNCTION**
1	-	200 PPM o/p
2	-	0 Volts
3	SCREEN	Screen

Note: *Open Collector, Active Low*

LINEAR INPUTS

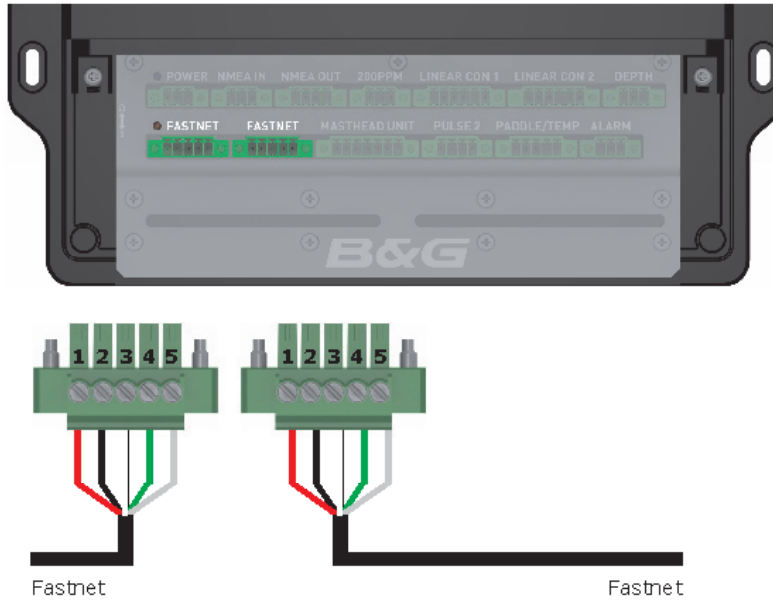


LINEAR CON 1		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	6.4 Volts DC Supply
2	BLUE	0 Volts
3	GREEN	Air Temperature Sensor
4	-	Linear 1 Input
5	-	Linear 2 Input
6	SCREEN	Screen

LINEAR CON 2		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	12 Volts DC Supply
2	RED	6.4 Volts DC Supply
3	BLUE	0 Volts
4	-	Linear 3 Input
5	-	Linear 4 Input
6	SCREEN	Screen

Note: *Any unused linear inputs should be connected to ground.*

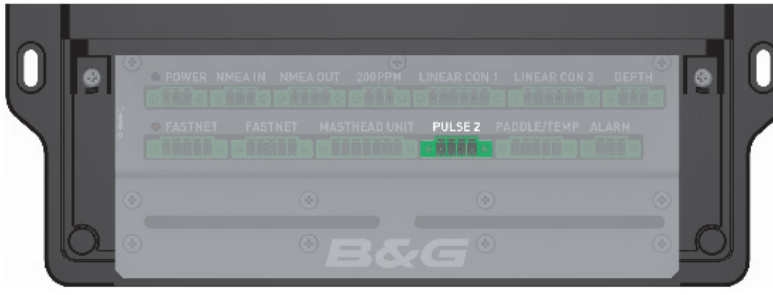
FASTNET

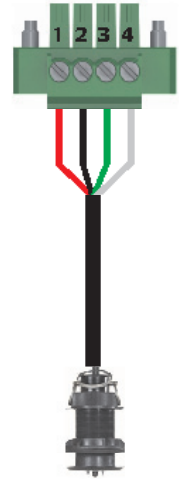


FASTNET		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	12 Volts DC
2	BLACK	0 Volts
3	WHITE	Network Data +ve
4	GREEN	Network Data -ve
5	SCREEN	Screen

Note: *For Termination of the Network see 'network installation'*

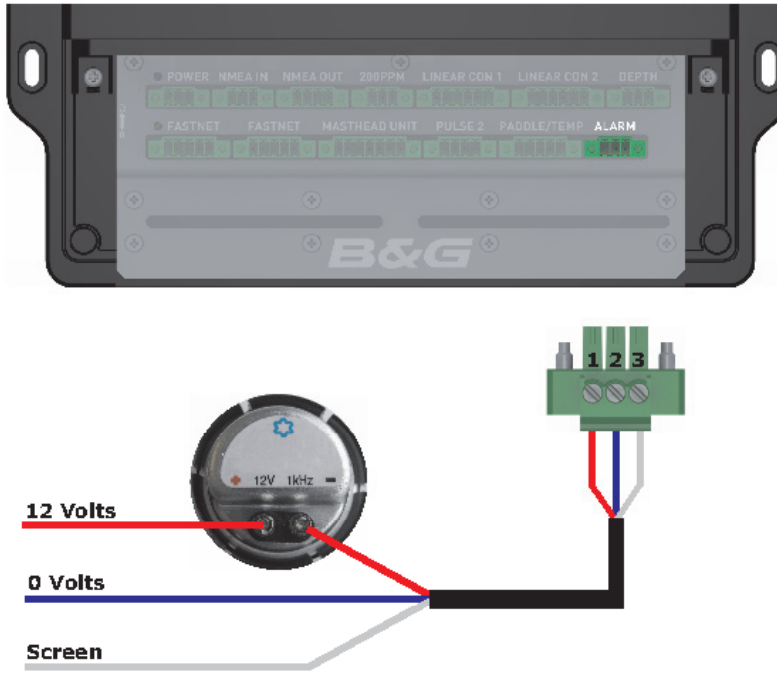
PULSE 2





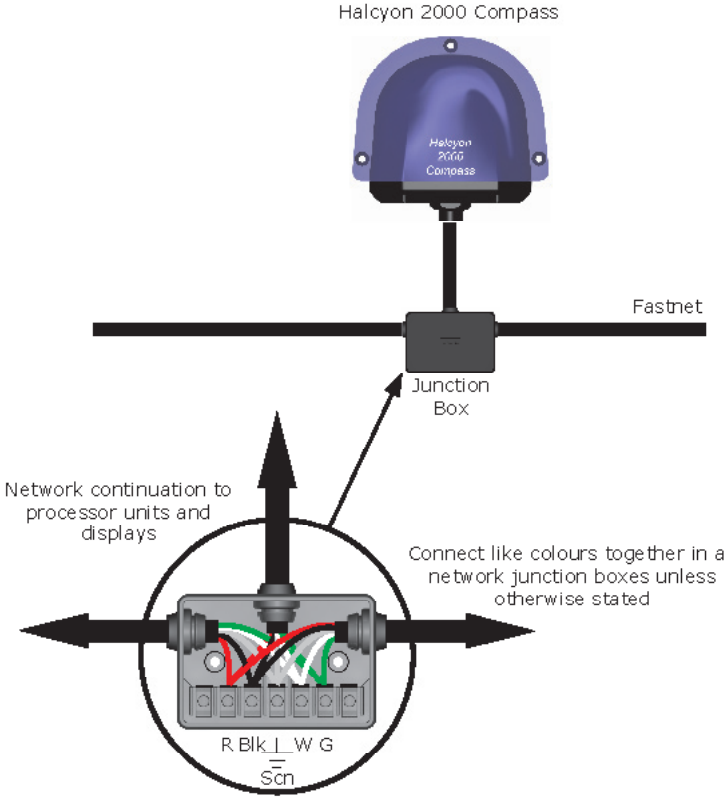
PULSE 2		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	5 Volts DC Supply
2	BLACK	0 Volts
3	GREEN	Pulse 2 Input
4	SCREEN	Screen

ALARM

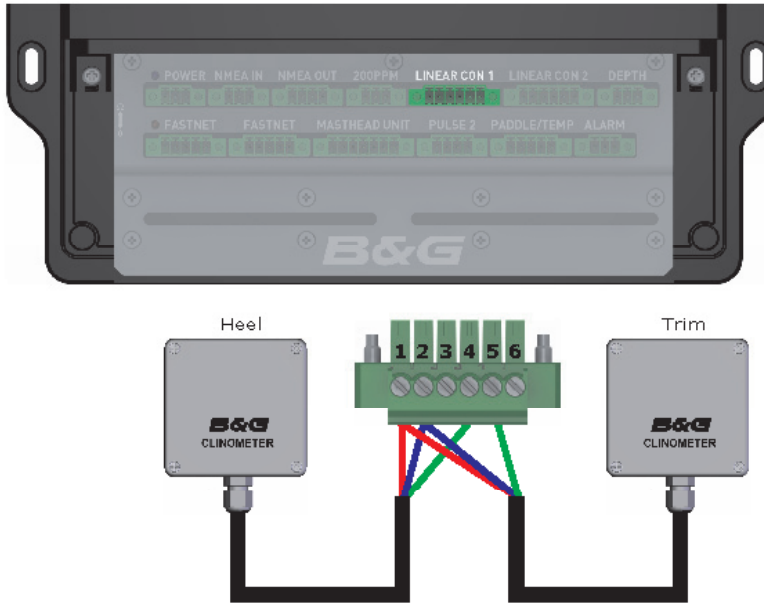


ALARM		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	Alarm +ve
2	BLUE	Alarm -ve
3	SCREEN	Screen

HALCYON 2000 COMPASS



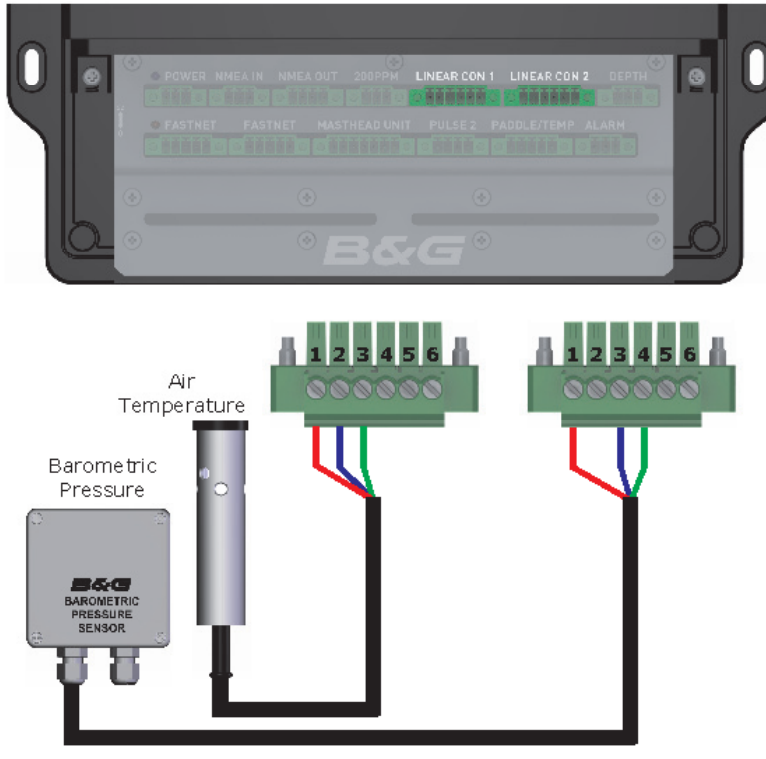
HEEL & TRIM SENSORS



HEEL		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	6.4 Volts DC Supply
2	BLUE	Ground
4	GREEN	Heel Input

TRIM		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	6.4 Volts DC Supply
2	BLUE	Ground
5	GREEN	Trim Input

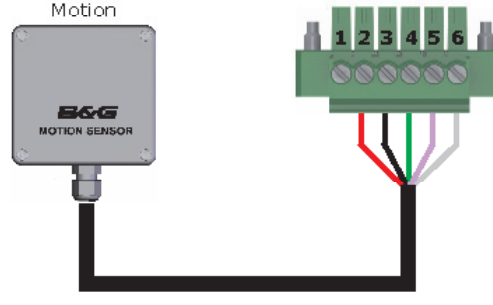
AIR TEMP & BAROMETRIC PRESSURE SENSOR



AIR TEMPERATURE -LINEAR CON 1		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	6.4 Volts DC Supply
2	BLUE	Ground
3	GREEN	Air Temperature Input

BAROMETRIC PRESSURE - LINEAR CON 2		
TERMINAL	**COLOUR**	**FUNCTION**
1	RED	12 Volts DC Supply
3	BLUE	Ground
4	GREEN	Barometric Pressure Input

MOTION SENSOR



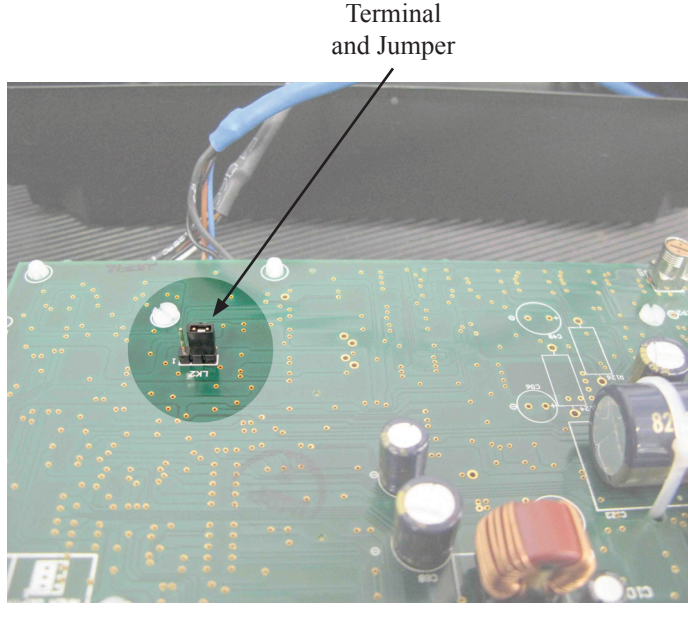
MOTION SENSOR - LINEAR CON 2		
TERMINAL	**COLOUR**	**FUNCTION**
2	RED	6.4 Volts DC Supply
3	BLACK	Ground
4	GREEN	Roll Rate
5	VIOLET	Pitch Rate
6	SCREEN	Screen

Adjusting the jumper to use USB or RS232

Caution: *It is recommended that an approved B&G technician performs this operation.*

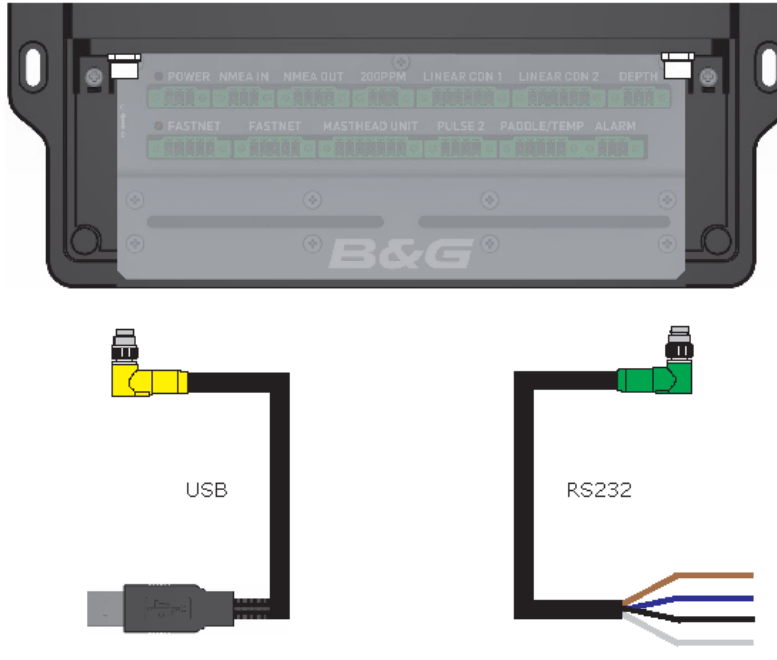
- Remove terminal cover – 2 x screws
- Remove top case to expose PCB – 4 x screws
- Slide off terminal jumper shown below by pulling up.
- Replace jumper bridging the desired terminals as shown below by pushing down.

Note: *The factory default has the jumper set to the position shown below this is the USB position. To change to RS232 move as described.*



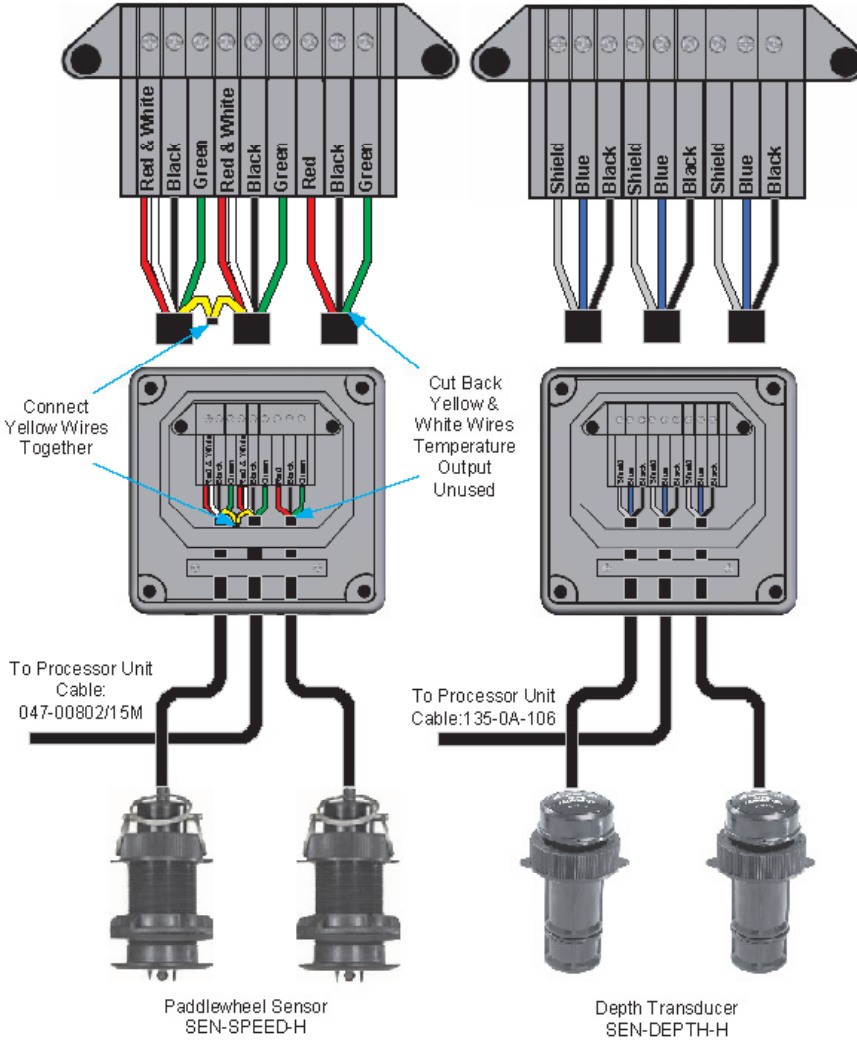
	RS232: Remove terminal jumper and place over centre and left pin.
	USB: Terminal jumper as standard bridges between centre and right pin

USB & RS232



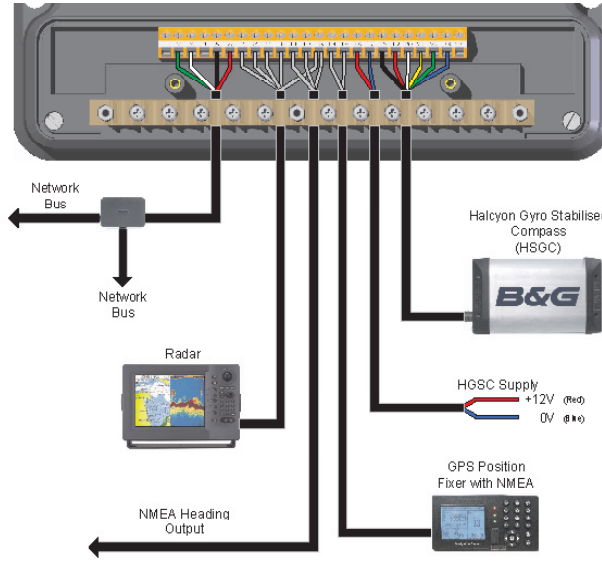
RS232	
COLOUR	**FUNCTION**
BROWN	Tx
BLUE	Rx
BLACK	Ground
SCREEN	Screen

CHANGE OVER SWITCH



HALCYON GYRO PROCESSOR

GYRO PROCESSOR & GYRO STABILISED COMPASS



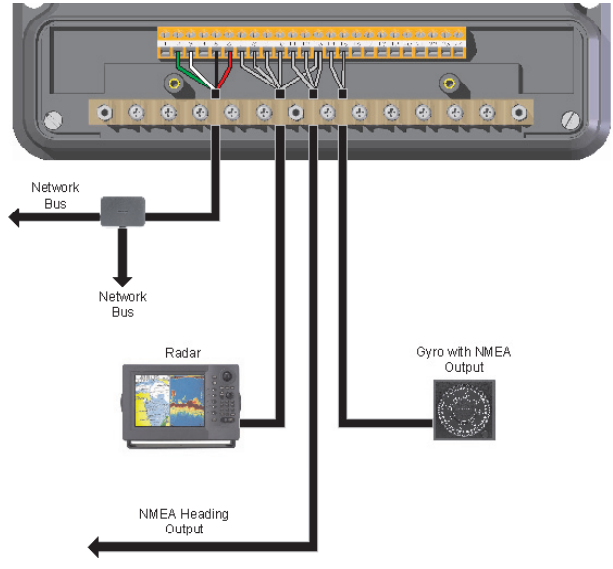
Note:

- All screened wires must have their screen attached to the clamp bar across the front case.

- The Halcyon Gyro Stabilised Compass (HGSC) has a separate supply and does not take power from the Network Bus. The HGSC sensor supply must be taken from a source rated at 2A.

Terminal	Function	Wire Colour	Cable
2	Network Data (-)	Green	135-0A-130 4 Cores/Screen
3	Network Data (+)	White	
5	Supply Ground	Black	
6	Supply +ve (12V nom.)	Red	
7	AD10 Clock Low (-)		
8	AD10 Clock High (+)		
9	AD10 Data Low (-)		
10	AD10 Data High (+)		
13	Ground		
11	NMEA Out - (v2.0)	Blue	135-0A-098 2 Cores/Screen
12	NMEA Out +(v1.5 and 2.0)	Red	
13	Ground	Blue	
14	NMEA In +	Red	135-0A-098 2 Cores/Screen
15	NMEA In -	Blue	
16	HGSC Power in +	Red	135-0A-098 2 Cores/Screen
17	HGSC Power in -	Blue	
18	HGSC Supply -	Black	BGH063001
19	HGSC Supply +	Red	
20	HGSC Data in +	White	
21	HGSC Data In -	Yellow	
22	HGSC Data Out +	Green	
23	HGSC Data In -	Blue	

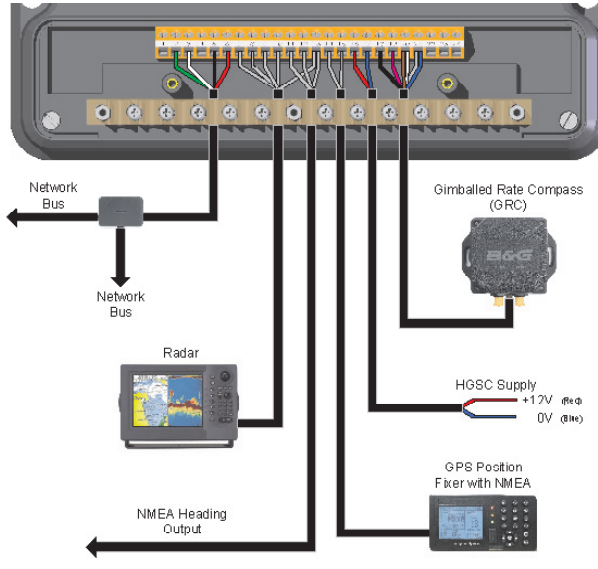
HALCYON GYRO PROCESSOR WITH NMEA INPUT



Note: *All screened wires must have their screen attached to the clamp bar across the front case.*

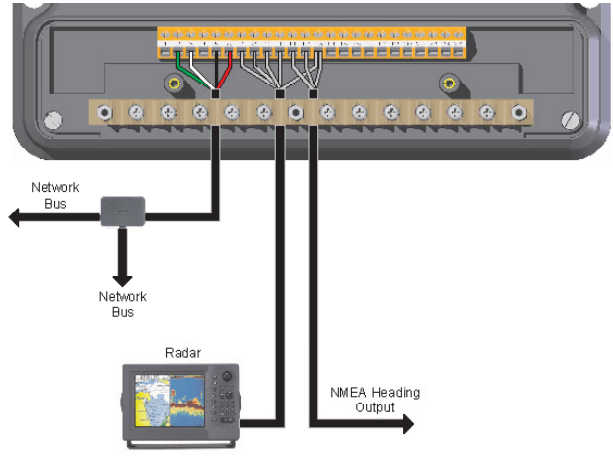
Terminal	Function	Wire Colour	Cable
2	Network Data (-)	Green	135-0A-130 4 Cores/Screen
3	Network Data (+)	White	
5	Supply Ground	Black	
6	Supply +ve (12V nom.)	Red	
7	AD10 Clock Low (-)		
8	AD10 Clock High (+)		
9	AD10 Data Low (-)		
10	AD10 Data High (+)		
13	Ground		
11	NMEA Out - (v2.0)	Blue	135-0A-098 2 Cores/Screen
12	NMEA Out +(v1.5 and 2.0)	Red	
13	Ground	Blue	
14	NMEA In +	Red	135-0A-098 2 Cores/Screen
15	NMEA In -	Blue	

GYRO PROCESSOR & GIMBALLED RATE COMPASS



Terminal	Function	Wire Colour	Cable
18	GRC Supply -	Black	GRC Sensor Cable
19	GRC Supply +	Pink	
20	GRC Data +	Brown & White	
21	GRC Data -	Grey & Blue	

HALCYON GYRO PROCESSOR AS OUTPUT INTERFACE



Note: *All screened wires must have their screen attached to the clamp bar across the front case. Heading source must be either a Halcyon 2000 or B&G autopilot.*

Terminal	Function	Wire Colour	Cable
2	Network Data (-)	Green	135-0A-130 4 Cores/Screen
3	Network Data (+)	White	
5	Supply Ground	Black	
6	Supply +ve (12V nom.)	Red	
7	AD10 Clock Low (-)		
8	AD10 Clock High (+)		
9	AD10 Data Low (-)		
10	AD10 Data High (+)		
13	Ground		
11	NMEA Out - (v2.0)	Blue	135-0A-098 2 Cores/AScreen
12	NMEA Out +(v1.5 and 2.0)	Red	
13	Ground	Blue	

EXPANSION PROCESSOR

The Expansion Unit can be connected to the H3000 system via the Fastnet to provide 12 extra analogue inputs. Once the Expansion processor is connected a new menu will automatically appear on all of the GFDs on the system. Up to 12 linear functions may be displayed numbered LINEAR 5 to LINEAR 16. Initially only LINEAR 5 is shown.

LINEAR 5 has four calibration values, other linear functions have three calibration values found by selecting CALIBRATE on the appropriate linear function. Any one of the Linear inputs 1 – 4 on the Main Processor may be set to the same function as any one of the Linear 5 to 18 inputs.

Calibration value 4 is only available on Linear 5 and this displays a value between 05 and 16. This setting determines the number of linear inputs that are available. For example, changing this value to 10 would display a maximum of 10 linear inputs. The default value is 05.

Note: Extra functions selected and then removed remain in the display menu but with no data shown. These will not disappear until the system is switched off and then back on again. Linear functions will always be shown if selected by CAL VAL 4 on Linear 5. They will show no data if the CAL VAL 1 is set to 1 or 2.

Expansion Processor Wiring

Terminal	Function	Wire Colour
14	Network Data -ve	Green
15	Network Data +ve	White
16	Network Screen	Screen
17	Battery Supply Ground	Black
18	Battery Supply 12V	Red
19	Battery Volts Sense	Link to 18
21	Ground	Blue
22	Sensor Supply +6.5V	Red
23	Linear 5 Input	Green
24	Linear 6 Input	Green
25	Linear 7 Input	Green
26	Linear 8 Input	Green
27	Linear 9 Input	Green
37	Linear 10 Input	Green
39	Linear 11 Input	Green
40	Linear 12 INput	Green
41	+12V Switched Supply	Red
42	Linear 13 Input	Green
43	+6.5V Sensor Supply	Red
44	RPM Input	Green
45	Ground	Blue
46	Linear 14 Input	Green
47	Linear 15 Input	Green
48	Linear 16 Input	Green

Note: *Terminals that are not listed above are not connected.*

Sensor Input Configuration

Additional sensors can be added to the system connecting to one of the four linear inputs on the CPU. 12 extra linear inputs are available with the addition of an Expansion Processor. These can be configured to take many different sensors. If you connect the sensor to the linear input that B&G have anticipated then you need take no action beyond the connection itself, since the default linear input configuration will be the right one.

Note: See Linear Function Table in Functions section of the handbook for default declared functions.

Should you wish to connect one of the other sensors, then you will have to reconfigure the input linear channel that you are connecting it to.

SETUP ▶ CALIBRATION OTHER CALIBRATION MISC (Select Linear 1-4) ▶ Type ▶ Set No. ↵ ◀▼ Minimum (Set Value) ↵ ◀▼ Maximum ▶ (Set Value) ↵

The number you enter to CAL VAL1 should correspond to the sensor you are connecting. (See Linear n, in operating functions)

Note: *Do not select the same number on more than one linear input, otherwise the selection will be ignored (no function can be connected to more than one input except the Normal Linear input which is not limited).*

NMEA 0183 INTERFACING

NMEA OVERVIEW

NMEA 0183 is available via many elements of the H3000 system:

NMEA AVAILABILITY		
Unit (Interface)	**Input**	**Output**
CPU (Dedicated NMEA ports)	Y	Y
CPU (Using H-Link hardware) [1]	Y	Y
CPU (Depth Port) [2]	Y [2]	N
NMEA FFD	Y	Y
Halcyon Gyro Processor	Y [3]	Y [3]

Notes:

[1] Not available if H-Link protocol is in use.
[2] Requires internal CPU jumper change. Depth data only.
[3] Heading data only.

ENABLING NMEA 0183 ON THE USB / RS232 PORT

Whichever physical port is enabled, it is possible to set the port for NMEA0183 input / output data format as opposed to the default H-Link.This is particularly useful when interfacing a PC to the CPU running a navigation program which requires standard NMEA sentence format.

Communication Port Config

The H3000 CPU has two physical port options, USB or RS232 with only one of these being selectable at any one time.

Note: *The default setup is USB, if the RS232 port is required (to connect a Wireless Port for example) then there is a link connector on the main internal PCB that requires switching. An approved B&G technician should carry out this procedure as it requires the CPU case to be opened.*

To enable NMEA data via the USB/RS232 port set the following values via the calibration of Comm Cfg.

NMEA Mode 1 (NMEA output ON, normal 1Hz dataset)
Baud Rate 0 (4800 baud)
NMEA Channel 2 (Both standard NMEA port and USB/RS232 port enabled)

Note: *If the H-Link protocol is in use it is not possible to use the NMEA via this port, NMEA Channel will be set to 1 (standard port only).*

DISPLAYING NMEA FUNCTIONS

Depending on the device connected to the NMEA interface the following functions may be displayed by the H3000 System:

FUNCTION DESCRIPTIONS
Bearing to Waypoint
Bearing Waypoint to Waypoint
Distance to Waypoint
Course Over Ground (COG)
Speed Over Ground (SOG)
VMG to Waypoint
Time to Waypoint
Time to Layline
Cross Track Error (XTE)
Local Time
Universal Coordinated Time (UTC)

In addition there are also a number of functions that can be input through the NMEA interface that duplicate other H3000 functions

The NMEA functions may be called up to display in the same manner as any H3000 function. Most of the NMEA functions are to be found in the WAYPOINT Menu, but the time functions (LOC Time and UTC) are in the TIME Menu.

Only those functions that are received by the H3000 System will appear in the display menu and it may be necessary to wait a while after the NMEA device has been switched on before the menu is complete.

If no data is received for a selected function after 15 seconds then the display will show OFF.

SELECTION OF EQUIPMENT

When planning the purchasing of equipment to interface to the H3000 System, it is most important to check that it is NMEA 0183 compatible and the required data is transmitted or received by it. The NMEA 0183 standard defines data sentences, which are identified by three letter mnemonics.

The NMEA input to the H3000 CPU is designed to version 3.x of the NMEA0183 standard. It does however retain a significant degree of backward compatibility with earlier versions of this standard.

If you have any doubt about your equipment compatibility then please consult your dealer.

CPU NMEA INTERFACING

NMEA Input Summary

CPU NMEA INPUT	
Mnemonic	**Description**
APB	Autopilot format B
BOD	Bearing to destination Waypoint from origin Waypoint.
BWC	Bearing and Distance to Waypoint, Great Circle, measured.
BWR	Bearing and Distance to Waypoint, Rhumb, measured.
BWW	Bearing to Waypoint from Waypoint.
DBT	Depth below transducer, Feet, Meters and Fathoms
DPT	Depth relative to transducer and applied offset
GGA	Global Positioning System Fix data
GLL	Geographical position - Latitude and Longitude.
HDG	Heading (magnetic sensor), Deviation and Variation
HDM	Present Heading, Magnetic
HDT	Present Heading, True
RMB	Recommended minimum implementation sentence, Generic waypoint navigation information.
RMC	Recommended minimum implementation sentence, GNSS specific – Time, date, position, course, speed and variation
VHW	Water speed and Heading - Heading only received
VTG	Actual Track and Ground Speed.
WCV	Waypoint Closure Velocity.
XTE	Cross Track Error, Measured.
XTR	Cross Track Error, Dead Reckoned
ZDA	UTC Time, Date and local time zone
ZDL	Time and Distance to Variable Point
ZTG	UTC and Time to go to Destination Waypoint

Proprietary NMEA Input Summary

CPU Proprietary NMEA Input	
Mnemonic	**Description**
$PBGTTBS	Polar Speed Knots
	Polar Performance %
$PBGTLAY	Distance to Layline (Nm)
	Time to Layline (hh-mm-ss)
$PBGTVMG	VMG Upwind (polar)
	Upwind Heading for best VMG (polar)
	Downwind Heading for best VMG (polar)
$PBGTSTR	Distance to Start Line (meters)
	Time to Start Line (hh-mm-ss)

NMEA Input Prioritisation

The following table shows the order in which the H3000 CPU prioritises incoming NMEA data.

CPU NMEA Input Prioritisation	
Function	**CPU**
Bearing to Waypoint Rhumb	BWR
Bearing to Waypoint GC ºM	BWC, APB
Bearing to Waypoint GC ºT	RMB, BWC, APB
Bearing Waypoint - Waypoint	BOD, BWW
COG ºM	VTG
COG ºT	RMC, VTG
Cross Track Error	RMB, XTE, XTR
CTS	APB
Depth	DBT, DPT
Distance to Layline	ZDL
Distance to WAypoint Rhumb	BWR
Distance to Waypoint GC	RMB, BWC
Heading ºM	B&G, HDG, HDM, VHW
Heading ºT	B&G, HDG, HDT, VHW
Boat Position	RMC, GLL, GGA
Layline Distance	ZDL
Magnetic Variation	RMC
Speed Over Ground	RMC, VTG
Time (UTC)	RMC, ZDA, ZTG
Time (Local)	ZDA
Time to Layline	ZDL
Time to Waypoint	ZTG
VMG Waypoint	RMB, WCV

NMEA Output Summary

CPU NMEA Output	
Mnemonic	**Description**
DBT	Depth below transducer, Feet, Meters and Fathoms
DPT	Depth relative to transducer and applied offset
GGA	Global Positioning System Fix data
GLL	Geographical position - Latitude and Longitude.
HDG	Heading (magnetic sensor), Deviation and Variation
HDM	Present Heading, Magnetic
HDT	Present Heading, True
MTA	Air Temperature, Celsius
MTW	Water Temperature, Celsius
MWD	Surface Wind Direction and Velocity
MWV	Wind Speed and Angle relative to bow
VHW	Heading and Water Speed
VLW	Log Mileage, Water Referenced only
VPW	Velocity Parallel to True Wind, Device Measured (VMG)
VTG	Actual Track and Ground Speed
VWR	Wind Relative Bearing and Velocity
VWT	Wind True Bearing and Velocity
XDR	Transducer measurements, Barometric pressure and Heel angle
XTE	Cross Track Error, Measured

Fast HDM Output Option

The H3000 CPU NMEA output port may be configured independently to output HDM sentences ten times a second for the benefit of other NMEA instruments that may require a rapid heading update.

This option is enabled by setting the NMEA MDE to 2. This will then enable the 10Hz output of HDM sentence.

Note: *No other sentences are output by the CPU in this mode.*

NMEA FFD INTERFACING

NMEA Input Summary

NMEA FFD Input	
Mnemonic	**Description**
APB	Autopilot format B
BOD	Bearing to destination Waypoint from origin Waypoint
BWC	Bearing and Distance to Waypoint, Great Circle, measured
BWR	Bearing and Distance to Waypoint, Rhumb, measured
BWW	Bearing to Waypoint from Waypoint
DBT	Depth Below Transducer
GGA	Global Positioning System Fix data
GLL	Latitude and Longitude
HDG	Heading, Deviation and Variation
HDM	Present Heading, Magnetic
HDT	Present Heading, True
HVD	Magnetic Variation – Derived
HVM	Magnetic Variation Manually Set
MTA	Air Temperature, Celsius
MTW	Water Temperature, Celsius
MWD	Surface Wind Direction and Velocity
MWV	Wind Speed and Angle
RMB	Recommended minimum implementation sentence, Generic navigation info
RMC	Recommended minimum implementation sentence, GPS, Transit specific
VHW	Heading and Water Speed
VLW	Log mileage, water referenced
VMG	Velocity Made Good
VPW	Velocity Parallel to True Wind, Device Measured
VTG	Actual Track and Ground Speed
VWR	Wind Relative Bearing and Velocity
VWT	Wind True Bearing and Velocity

Mnemonic	Description
WCV	Waypoint Closure Velocity
WDC	Next Waypoint Distance, Great Circle
WDR	Next Waypoint Distance, Rhumb
XTE	Cross Track Error, Measured
XTR	Cross Track Error, Dead Reckoned
ZDA	Time and Date
ZDL	Time and Distance to Layline
ZLZ	Local Time Zone
ZTG	Time to Waypoint

Note: *The H3000 system will not necessarily extract data from every NMEA field. This avoids information being duplicated on the system.*

Proprietary NMEA Input Summary

The NMEA FFD also supports the B&G Proprietary Input messages.

NMEA Output Summary

NMEA FFD Output	
Mnemonic	**Description**
DBT	Depth Below Transducer
GLL	Latitude and Longitude
HDM	Present Heading, Magnetic
HSC	Heading Steering Command
HDT	Heading, True
MTA	Air Temperature, Celsius
MTW	Water Temperature, Celsius
MWD	Surface Wind Direction and Velocity
MWV	Wind Speed and Angle
VHW	Heading and Water Speed
VLW	Log Mileage, Water Referenced
VPW	Velocity Parallel to True Wind, Device Measured
VTG	Actual Track and Ground Speed
VWR	Wind Relative Bearing and Velocity
VWT	Wind True Bearing and Velocity
XTE	Cross Track Error, Measured

HALCYON GYRO PROCESSOR NMEA INTERFACING

NMEA Input Summary

Latitude and Longitude (Boat Position) information is only utilised, along with date information, for internal calculation of Magnetic Variation if it has not been received from another source. This input is not required unless utilising True heading references.

The Halcyon Gyro Processor accepts NMEA heading data at 10Hz.

Gyro Processor Input	
Mnemonic	**Description**
GGA	Latitude, Longitude
GLL	Latitude, Longitude
HDG	Heading Magnetic with variation
HDM	Present Heading, Magnetic
HDT	Heading True
HVD	Magnetic Variation
HVM	Magnetic Variation
RMC	Latitude, Longitude, Date and Magnetic Variation
VHW	Heading and Water Speed
ZDA	Date

NMEA Output Summary

The Halcyon Gyro Processor will output NMEA Heading data at 10Hz. The following sentences are output when the relevant data is available.

Gyro Processor Output	
Mnemonic	**Description**
HDG	Heading Magnetic with variation
HDM	Heading, Magnetic
HDT	Heading, True

TRUE/MAGNETIC REFERENCE SELECTION

When a NMEA heading source is used the data may be referenced to either True North or Magnetic North. It is necessary for the user to select the desired reference.

If the display shows anything other than TRUE/MAG it means that there is another heading source on the network. To eliminate the other source, go to the COURSE function (also on the NAVIGATE Menu) and select CAL VAL 1 (HDG NODE). Ensure that this is set correctly, and then restart the instrument system. The unwanted heading source will no longer appear in the NAVIGATE menu.

When the heading reference is changed the text for the HEADING function will automatically be set to show °T or °M as appropriate. A similar change will also be made to other functions that are north referenced: Course, True Wind Direction, Dead Reckoning and Tide Set.

HANDLING OF NMEA ALARM CONDITIONS

Several NMEA sentences contain fields that indicate the validity of the data within the message. For example, GLL, RMA, RMB and RMC contain a data valid or navigation receiver warning flag, and GGA contains a quality indicator.

When input sentences containing these indicators are decoded the status of the indicators is checked, if the message status is invalid then all data within that sentence is marked as invalid when stored within the CPU. When outputting sentences if the sentence contains any data marked as invalid the sentence being output will be marked as invalid.

Caution: *If the input sentence does not contain a status indicator it will be accepted as valid.*

If no valid data has been received for a period of 15 seconds the corresponding B&G function will display ‘OFF’.

NMEA-BASED DATA ON THE B&G NETWORK

Data derived from NMEA sources is normally transmitted on the B&G network once a second. However in the case of True Heading, via the HDT sentence, if the incoming data is being rapidly updated the network data will be sent at up to four times a second. This allows the data to be used by the H3000 Pilot, if fitted.

H-LINK™ COMMUNICATIONS

PERFORM

USB / RS232 INTERFACING

H-Link is B&G's protocol for comprehensive and efficient interfacing of the H3000 Hercules Performance CPU and an external PC, it is typically utilised by tactical software (such as B&G Deckman) or custom software for data monitoring on larger vessels.

H-Link features:

- Output of any available B&G function to PC
- Input of PC generated functions for display on GFD and HV Displays
- Polar table access and control
- Calibration access and control
- Damping access and control
- Alarm access and control
- Editing of function display text
- Control of Trip functions e.g. Timer
- High update rates
- User (software) selected dataset

H-Link is available via either USB (v2.0) or RS232C. The default setting is to use USB as this is supported by almost all current PC hardware.

H-Link uses a series of ASCII commands and responses, the detail of which is described in the following pages.

Communication Port Configuration

The H3000 CPU has two physical port options, USB or RS232 with only one of these being selectable at any one time. The default setup is USB with the following communication parameters set:

Baud Rate	115,200
Parity	None
Data bits	8
Stop bits	1

Note: *If the RS232 port is required (to connect a Wireless Port for example) then there is a link connector on the main internal PCB that requires switching . An approved B&G technician should carry out this procedure, as it requires the CPU case to be opened.*

It is possible to change the port parameters to suit your particular application by accessing the CALBRATE function on COMM CFG in the MISC menu as follows:

SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ MISC ▶ COMM CFG ▶

There are 4 settings:

NMEA MODE

Defines the content of the NMEA output

Value	Description
0	All NMEA Outputs disabled
1	NMEA Output on, Standard dataset, 1Hz [default]
2	NMEA Output on, 10Hz Heading only

BAUD RATE

Defines the Baud Rate used for the USB/RS232 port hardware, this setting does not affect the standard NMEA port which is always 4,800 baud.

Value	Description
0	4,800
1	9,600
2	19,200
3	38,400
4	57,600
5	115,200 [default]

Note: *Parity, data and stop bits are not adjustable.*

NMEA CHANNEL

Defines the output channel(s) in use for NMEA.

Value	Description
0	USB/RS232 Channel only (NMEA port disabled)
1	NMEA port only, USB/RS232 used for H-Link [default]
2	Both channels (NMEA and USB/RS232)

Command Syntax

Commands are input as a string of ASCII characters starting with a $ character and a two-character command mnemonic followed by data fields separated by commas. The command is terminated and execution initiated by a carriage return line feed (CR) (LF).

A command line may not contain more than 88 characters including the start $ and the terminating carriage return (CR). Data parameters may be omitted provided that if a following parameter is needed the separating commas are included.

Before sending commands to the processor ensure that PROG LOCK is set to 10.

MENU **SETUP ▶ CALIBRATION ▶ OTHER CALIBRATION ▶ MISC ▶ COMM CFG ▶ PROGLOCK ▶ 10** ↵

Message Format

The format of a data message will be as below:

Data	*	CS	CR	LF

CS = Checksum
CR = Carriage Return
LF = Line Feed

Checksums

The use of checksums in the message is mandatory.

The checksum shall appear in hexadecimal format at the end of the message directly

after a '*' (asterix) character. The checksum shall be the 8-bit exclusive OR of all characters in the sentence, not including the '*' character.

Example

The message we wish to send: #OV,1,1,73

Exclusive OR of characters: Decimal 18 = Hex 0x12

Transmitted Message: #OV,1,1,73*12<CR><LF>

End of Message

Messages to and from the CPU shall finish with a Carriage Return followed by a Line Feed <CR><LF>

Input and Output of Data

#IV (Input Value), #OV (Output Value)

Almost all data available on the H3000 system in use, along with its associated parameters (Calibration, Damping, Alarms etc.), can be output to a PC by means of the #OV (Output Value) command.

Similarly, a number of externally generated data functions may be input to the H3000 system by means of the #IV (Input Value) command. #IV is also used to input system parameters to H3000.

These two commands are described in more detail as follows:

Input Value: #IV,n,m,f,v[,t]
Output Value: #OV,n,m,f[,o]

<table>
<tr><td>n</td><td>FastNet node number.

If data from a specific node is required include the node number here.

Note: In most cases it is recommended that this field is left blank, H3000 will output the selected or default data stored within the CPU which is the desired data in almost all cases.</td></tr>
<tr><td>m</td><td>FastNet message type:

<table>
<tr><th>Message Type</th><th>Description</th><th>Input</th><th>Output</th></tr>
<tr><td>1</td><td>Function Data</td><td>Yes</td><td>Yes</td></tr>
<tr><td>2</td><td>Function Text</td><td>Yes</td><td>No</td></tr>
<tr><td>211 - 214</td><td>Cal Val 1 to Cal Val 4</td><td>Yes</td><td>Yes</td></tr>
<tr><td>32</td><td>Sector Alarm</td><td>Yes</td><td>Yes</td></tr>
<tr><td>33</td><td>Low Alarm</td><td>Yes</td><td>Yes</td></tr>
<tr><td>34</td><td>High Alarm</td><td>Yes</td><td>Yes</td></tr>
<tr><td>206</td><td>Damping</td><td>Yes</td><td>Yes</td></tr>
</table>
</td></tr>
<tr><td>f</td><td>Fastnet function number</td></tr>
<tr><td>v</td><td>The value to input

Note:If the message type is Function Text [type 2], then the value entered in this field should be the node number of the function.</td></tr>
<tr><td>o</td><td>Other value. This depends on the message type:

<table>
<tr><th>Message Type</th><th>Value</th><th>Description</th></tr>
<tr><td>1 (Function Data)</td><td>None
1
0</td><td>None: outputs value once
Enables data for Streaming (see #OS)
Disables data for Streaming (see #OS)</td></tr>
<tr><td>2 (Function Text)</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>t</td><td>Text string (maximum 8 characters)</td></tr>
</table>

The H3000 CPU will respond to a #OV request as follows:

Vn,m,f,v

Example 1~ To request the current boat speed value:

Boat Speed is function number 65 from node 1 and is a function data message type.

1, as such we send:

#OV,1,1,65<CR><LF>

In this case H3000 will return:

V001,001,065,4.37

This indicates a Boat Speed value of 4.37 kt

Example 2~ To input a new damping value of 3 seconds on Boat Speed:

#IV,1,206,65,3<CR><LF>

There is no response for this message type, if a confirmation is desirable in your application you may use a #OV message to request the relevant data from H3000.

Example 3~ To rename text labels for linears 1 to 16:

#IV,255,2,56,5,(New Linear Label) <CR>

Output Position

#OL (Output Latitude & Longitude)

#OL[,0|1]

The parameter following the #OL has the following options:

Parameter	Description
None	None: outputs value once
1	Enables data for Streaming (see #OS)
0	Disables data for Streaming (see #OS)

The #OS command is used to control the streaming of position data, along with normal instrument data.

Streaming Output Data

#OS (Output Streaming)

The #OS command is used to control the streaming of position data, along with normal instrument data.

Streaming Output Data

#OS (Output Streaming)
The #OS command is used to control the streaming of position data, along with normal instrument data.

Streaming Output Data

#OS (Output Streaming)
This command starts or stops the streaming of function data. Any function data that has been enabled for streaming, by issuing an appropriate #OV or #OL command,

is controlled by the #OS command:

#OS[,0|1]

The parameter following the #OS has the following options:

Parameter	Description
1	Start output streaming for enabled data
0	Stop output streaming (default)

Example~ Configure and start a data stream for multiple functions

Here we will enable several functions for continuous (streaming) output and start the output.

First we enable the data we require, in this case Boat Speed, True Wind Speed, True Wind Direction and Boat Position:

#OV,1,1,65,1
#OV,5,1,85,1
#OV,5,1,109,1
#OL,1

Then we start streaming data:

#OS,1

H3000 will then start to stream data in the standard output format. If we wish to temporarily halt the data we send #OS,0.

Table Viewing and Editing

#TO (Table Output), #TI (Table Input)

The H3000 CPU contains a number of data tables associated with various correction values and, in the case of Hercules Performance, a full polar table for the purpose of calculating the various performance functions.

There is a generic command set described below which allows full upload and download access to all these tables:

Output from Table: #TO[,t[,r[,c]]]
Input to Table: #TI,t,r,c,v

<table>
<tr><td>t</td><td>Table number:
<table>
<tr><th>Table</th><th>Description</th><th>Cols</th><th>Rows</th></tr>
<tr><td>0</td><td>Boat Speed Linearity/Heel Angle Correction</td><td>7</td><td>3</td></tr>
<tr><td>1</td><td>True Wind Angle correction value</td><td>7</td><td>3</td></tr>
<tr><td>2</td><td>True Wind Speed correction value</td><td>7</td><td>1</td></tr>
<tr><td>3</td><td>True Wind Speed downwind angle</td><td>7</td><td>1</td></tr>
<tr><td>4</td><td>Polar Table</td><td>22</td><td>10</td></tr>
</table></td></tr>
<tr><td>r</td><td>Row number</td></tr>
<tr><td>c</td><td>Column Number</td></tr>
<tr><td>v</td><td>The value to input.</td></tr>
</table>

The #TO command response depends on the number of parameters in the input string.

If all three parameters (table, row, column) are in the command then only the specified cell will be output, if two parameters (table and row, or table and column) are in the command then the specified row, or column, will be output.

If only the table parameter is in the command then the whole of the selected table will be output. If no parameters are in the command all the system tables will be output.

When more than a single cell is output, each output sentence will contain as many cell values from a single row of a single table as will fit in the message. At the end of the row a new message will be started, if necessary.
The output format used is:

U,t,r,c1,v1,…,cn,vn

Typical examples of the various tables are detailed over leaf.

Example Boat Speed / Heel correction table – Table #0

		Column						
		0	1	2	3	4	5	6
Row	Boat Spd >	0	5	10	15	20	25	30
0	0º Heel	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	10º Heel	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	20º Heel	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Example True Wind Angle correction table – Table #1

		Column						
		0	1	2	3	4	5	6
Row	TWS >	0	5	10	15	20	25	30
0	40º TWA	0	-7.0	-3.0	-2.5	4.5	6.5	8.0
1	90º TWA	0	-2.0	-1.0	0.0	1.0	1.0	1.5
2	165º TWA	0	4.0	3.0	1.0	-1.0	-1.0	-2.0

Example True Wind Speed correction table – Table #2

		Column						
		0	1	2	3	4	5	6
Row	TWS >	0	5	10	15	20	25	30
0	Correction	0	-0.6	-1.2	-1.8	-2.4	-3.0	-3.6

Example Down Wind Speed correction table – Table #3

		Column						
		0	1	2	3	4	5	6
Row	TWS >	0	5	10	15	20	25	30
0	Down Angle	0	165	165	165	165	165	165

EXAMPLE POLAR TABLE

True Wind Speed	True Wind Angle																				
	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	VMG Up	Targ TWA Down	VMG Down	Targ TWA Up
2.5	1.56	1.87	2.08	2.13	2.19	2.10	2.02	2.00	1.98	1.99	1.97	1.90	1.87	1.84	1.80	1.75	1.70	1.80	40	1.80	157
5.0	2.70	3.04	3.29	3.52	3.75	3.83	391	3.90	3.85	3.76	3.65	3.50	3.25	3.01	2.80	2.60	2.40	2.85	39	2.70	158
7.5	3.57	4.04	4.40	4.67	4.95	5.22	5.40	5.45	5.40	5.26	5.08	4.90	4.60	4.20	3.90	3.65	3.42	3.79	38	3.70	160
10	4.10	4.88	5.49	5.90	6.09	6.18	6.27	6.31	6.39	6.39	6.30	6.00	5.67	5.23	4.80	4.50	4.30	4.34	37	4.80	161
12.5	4.50	5.30	5.99	6.50	6.69	6.79	6.88	7.02	7.10	7.11	7.06	6.87	6.67	6.30	5.80	5.50	5.29	4.69	36	5.70	162
15.0	4.80	5.66	6.54	6.95	7.07	7.22	7.30	7.45	7.59	7.65	7.65	7.51	7.38	7.04	6.60	6.31	6.02	5.00	35	6.20	163
17.5	5.00	5.95	6.78	7.23	7.36	7.48	7.61	7.74	7.87	7.96	8.00	7.96	7.80	7.56	7.20	6.96	6.83	5.23	35	6.80	165
20.0	5.20	5.99	6.87	7.33	7.45	7.58	7.73	7.88	8.03	8.19	8.30	8.21	8.10	7.93	7.70	7.53	7.44	5.33	34	7.40	168
22.5	5.50	6.15	6.86	7.35	7.51	7.67	7.89	8.11	8.30	8.40	8.43	8.36	8.28	8.19	8.05	7.93	7.88	5.37	34	7.80	170
25.0	5.40	6.20	6.75	7.29	7.50	7.72	7.95	8.18	8.39	8.50	8.53	8.48	8.42	8.37	8.27	8.22	8.17	5.32	34	8.10	172

Trip and timer control
#TC (Trip Control)

This command set allows control of the system trip functions, for example Race Timer and Trip Log:

Trip Control: #TC,st,d

st = Sub Type
d = Data

<table>
<tr><th>Sub Type</th><th>Data Options</th></tr>
<tr><td>t</td><td>Race Timer Control
<table>
<tr><th>Data Value (d)</th><th>Action</th></tr>
<tr><td>0</td><td>Start Timer Countdown</td></tr>
<tr><td>1</td><td>Unfreeze (Leaves running if already started)</td></tr>
<tr><td>2</td><td>Freeze Timer</td></tr>
<tr><td>3</td><td>Synchronise Timer</td></tr>
</table></td></tr>
<tr><td>v</td><td>Set Race Timer Start Value (minutes)</td></tr>
<tr><td>l</td><td>The value to input.
<table>
<tr><th>Data Value (d)</th><th>Action</th></tr>
<tr><td>0</td><td>Reset Trip Log</td></tr>
<tr><td>1</td><td>Start Trip Log (Leaves running if already started)</td></tr>
<tr><td>2</td><td>Freeze Timer</td></tr>
</table></td></tr>
<tr><td>d</td><td>Dead Reckoning (D/R) Control
<table>
<tr><th>Data Value (d)</th><th>Action</th></tr>
<tr><td>0</td><td>Reset D/R</td></tr>
<tr><td>1</td><td>Start D/R (Leaves running if already started)</td></tr>
<tr><td>2</td><td>Freeze D/R</td></tr>
</table></td></tr>
</table>

Examples:

Start Countdown Timer:	#TC,t,0
Set New Count Down Time to 5 Minutes:	#TC,v,5
Freeze Trip Log:	#TC,l,2

If the #TC command is sent without any of its parameters the current status of each item (Race Timer, Trip Log, D/R) is reported, in the format.

S,t,l,d

where

0 = stopped
1 = running
2 = frozen

Software Version Reporting

#RV (Report Version)

This command allows remote access to system software versions.

#RV,n

n = Node number of unit

H3000 will return:

RV,n,c,v

n = Node number of unit
c = Checksum of the node
v = String representing the version number

Note: *This command is not implemented in all system units, some units may not respond to the request.*

H3000 Function and Node numbers

Function Description	Function	Node
Air Temperature degrees ºC	29	5
Air Temperature degrees ºF	28	5
Apparent Wind Angle	81	5
Apparent Wind Angle, raw	82	5
Apparent Wind Speed knots	77	5
Apparent Wind Speed m/s	79	5
Apparent Wind Speed, raw	78	5
Average Speed	100	1
Barometric Pressure	135	5
Barometric Pressure Trend	134	5
Battery Volts	141	5
Bearing to Waypoint, G.C. mag.	230	See Note 1
Bearing to Waypoint, G.C. true	229	See Note 1
Bearing to Waypoint, Rhumb mag	228	See Note 1
Bearing to Waypoint, Rhumb true	227	See Note 1
Bearing Wpt to Wpt, mag.	225	See Note 1
Bearing Wpt. to Wpt, true	224	See Note 1
Boatspeed	65	1
Boatspeed, raw	66	1
Boom Position	164	5
Canard Angle	103	5
Course	105	5
Course Over Ground, mag.	234	See Note 1
Course Over Ground, true	233	See Note 1
Cross Track Error (XTE)	238	See Note 1
Daggerboard Position	163	5
Dead Reckoning Course	211	1
Dead Reckoning Distance	129	1
Depth Feet	194	1
Depth Fathoms	195	1
Depth Sounder Receiver Gain	54	1
Depth Sounder Noise	55	1

Function Description	Function	Node
Distance to Waypoint, G.C.	232	See Note 1
Distance to Waypoint, Rhumb	231	See Note 1
Fore / Aft Trim	155	5
Heading	73	See Note 2
Heading, Raw	74	See Note 2
Heading on Next Tack	154	5
Head / Lift Trend	39	48
Heel Angle	52	5
Keel Angle	102	5
Leeway	130	5
Layline Distance	226	See Note 1
Linear 1	56	5
Linear 2	57	5
Linear 3	58	5
Linear 4..	59	5
Linear 5	16	13
Linear 6	17	13
Linear 7	18	13
Linear 8	19	13
Linear 9	20	13
Linear 10	21	13
Linear 11	22	13
Linear 12	23	13
Linear 13	24	13
Linear 14	25	13
Linear 15	26	13
Linear 16	27	13
Local Time	220	See Note 1
Mast Angle	156	5
Next Leg Apparent Wind Angle	111	9
Next Leg Apparent Wind Speed	113	9
Next Leg Target Boat Speed	112	9
Next Waypoint Distance	250	9
Off Course (Pilot)	41	18
Optimum Wind ANgle	53	9

Function Description	Function	Node
Pitch Rate [Motion]	158	5
Reaching Performance	51	9
Remote 0	239	9
Remote 1	240	9
Remote 2	241	9
Remote 3	242	9
Remote 4	243	9
Remote 5	244	9
Remote 6	245	9
Remote 7	246	9
Remote 8	247	9
Remote 9	248	9
Roll Rate [Motion]	60	5
Rudder Angle	11	5
Sea Temperature degrees ºC	31	1
Sea Temperature degrees ºF	30	1
Speed Over Ground	235	See Note 1
Stored Log	205	1
Tacking Performance	50	9
Target Boatspeed	125	9
Target TWA	83	9
Tidal Set	132	5
Tidal Drift	131	5
Trim Tab Angle	104	5
Timer	117	5
Time to Layline	251	See Note 1
Time to Waypoint	237	See Note 1
Trip Log	207	1
True Wind Angle	89	5
True Wind Direction	109	5
True Wind Speed, knots	85	5
True Wind Speed, m/s	86	5
VMG to Waypoint (VMC)	236	See Note 1
Velocity Made Good	127	5
Wind Angle to the Mast	157	5

Notes:

1. The source nodes for these functions are dependent on which port or device the GPS is interfaced to. It is assigned as follows:

- GPS interfaced to CPU – use Node 5

- GPS interfaced through a NMEA FFD then, typically, Node 96. If there is more than one NMEA FFD on the system then Nodes 97, 98 etc. are used for the additional units.

- If in doubt then you can establish the source node by displaying any GPS function (COG, SOG etc.) on an FFD, then select the function SOURCE from the MISC menu on the opposite half of display. This will show the respective source node of the function in question.

2. The source nodes for heading functions are typically as follows:

Heading Functions	Node
Halcyon 2000 Compass connected directly to FastNet bus	16
Halcyon Gyro-Stabilised Compass connected to Pilot ACP	18
Halcyon Gyro-Stabilised Compass connected to Halcyon Gyro Processor	15
External compass interfaced via NMEA	See Note 1

Alternatively, from a software application, the current Heading node can be automatically established by interrogating CALVAL1 on function COURSE by issuing:

#OV,5,211,105<CR><LF>

DIAGNOSTICS

SYSTEM DIAGNOSTICS AND TROUBLESHOOTING

Before getting into a deeper understanding of system diagnostics and trouble shooting there are a few quick and simple items to note:

Depth display flashes CAL – Simply requires that a new Depth transducer offset value (Datum) is entered via GFD into the CPU. This will usually show when the system is newly installed or has been RESET for some reason.

Heading display flashes CAL – Simply requires that the compass sensor requires "Swinging" to remove local magnetic deviation. This will usually show when the system is newly installed or has been RESET for some reason.

The value "OFF" is displayed for some data functions. – This is usually:
Value out of range. Sensor disconnected. Heading node incorrectly set. GPS position fixer not switched on. Missing or incorrectly fitted Fastnet terminator.

GFD DIAGNOSTICS

The GFD contains some basic diagnostic functions which may be useful when trouble shooting for example.

These diagnostic functions are accessed through any GFD connected to the system by holding the MENU / Enter Key pressed when the system is powered on.

The SYSTEM DIAGNOSTICS menu is then displayed on the GFD. Now use the cursor keys to highlight the appropriate Diagnostic function and press Enter to select. The specific Diagnostic functions are described in more detail below:

"System Reset Options"

This option provides the facility to Reset a specific, individual unit on the system or a group of units as appropriate and returns all the settings held on that unit, back to factory defaults.

WARNING

This must be used with extreme care as all the various configuration parameters for that unit will be restored to factory default. In the case of the CPU then this will affect all calibrations, alarm and damping settings and will zero all LOG readings for example. In the case of the Pilot ACP, it will no longer operate correctly until full re-commissioning of the unit is carried out.

This Display

Selecting this option will reset the specific GFD in use. This will reset the various user configurable pages, units selection, alarm status etc. back to factory default. Once complete the display will "reboot" itself to normal default operation.

H3000 CPU

Selecting this option will reset the entire memory of the CPU. It is strongly advised that all current calibrations, alarms and damping settings etc. are noted down separately before performing this operation including any important LOG readings that you may wish to reference later.

NOTE: *There is a set of blank records at the end of this manual for the noting down of all key settings. This will make it much easier for re-entry of all parameters after the Reset operation. Of particular note is the DEPTH DATUM setting. After Reset the Depth will show Depth below the transducer and not reference the keel or waterline possibly as before.*

Pilot ACP

Selecting this option will reset the entire memory of the Pilot ACP unit. The Pilot will no longer function correctly until full re-commissioning has been carried out. Please refer to the separate Pilot Operating Manual for further detail on setting up the Pilot again.

Halcyon 2000 Compass Unit

Selecting this option will reset the entire memory of the Halcyon 2000 Compass sensor. Note that the sensor alignment and magnetic deviation compensation parameters will be reset to zero. The Compass readings and all related functions will no longer be accurate until the Compass unit has be re swung and the alignment value correctly entered.

Halcyon Gyro Processor

Selecting this option will reset the entire memory of the Halcyon Gyro Processor. Note that the sensor alignment and magnetic deviation compensation parameters will be reset to zero. The Compass readings and all related functions will no longer be accurate until the Compass unit has be re swung and the alignment value correctly entered. In addition, the settings which control TRUE / MAG selection, the NMEA input / output communications etc. will also need re-entry.

Expansion Unit

Selecting this option will reset the entire memory of the Expansion unit. All settings which control the additional LINEAR 5 to 16 functions will be reset to default so it is strongly recommended to make a clear note of all CALIBRATE settings on each of the LINEAR functions in use. Additionally if there are any older style H2000 analogue meters connected to the Expansion unit then their drive ports will need re-configuring correctly.

All 2020s / 4040s

Selecting this option will reset all 12 remote display pages on all of the 2020 / 4040 type displays connected, back to factory default.

All Pilot Displays

Selecting this option will reset the various display control parameters on all of the Pilot displays connected, back to factory default.

All GFD Displays

Selecting this option will reset the user configurable pages and the various display control parameters on all of the GFD displays connected.

RemoteVision Base Station

Selecting this option will reset the memory for the RemoteVision base station. The RemoteVision hand set will then require re pairing with the Base Station. Please refer to the separate manual for this product.

Reset Entire System

This option will reset all units connected in the system simultaneously. The affect on each unit will be as detailed above for the individual units.

Reset Specific Unit

This option provides the facility to reset individual, specific units that are referenced directly by their FastNet node address. Note the Node address is entered in hexadecimal form as opposed to decimal.

System Software Versions

Selecting this option will provide a list of the various units connected in the system and their respective software versions. The typical list shown is as follows:

This Display
H3000 CPU
Pilot ACP
Halcyon 2000 Compass
Halcyon Gyro Processor
Expansion Unit

THE FASTNET DATABUS

The Fastnet bus is fundamental to reliable operation of the H3000 system. It is the principal communication channel for the transferring of data between all units connected around the system.

The bus is based on a twisted pair transmit / receive system and requires correct installation to ensure trouble free operation, the key aspects being:

- The use of B&G supplied and approved network cable (100 ohms characteristic impedance)
- Correct termination of the network cable using supplied 100 ohm resistors. The terminators should be at the two ends of a “Linear” network.
- Net resistance measured across green and white bus wires with system switched OFF – 50 ohms
- Nominal supply voltage across red and black – 12 volts (range 10 – 16V)

There are a few different symptoms which may well be caused by faults on the FastNet bus:

- Erratic, slow or non-existent update of data on the various displays (GFD, HV Displays etc.)
- Slow or non existent response to various commands from either GFD for example Timer control, requesting calibration, alarm settings etc. Remote display control.

The above is usually caused by poor network termination, incorrect installation and / or bad contacts in one of the Network junction boxes. In this case the FastNet cable should be traced from one end to the other, carefully inspecting each of the junction boxes for sound contact and continuity with respect the network data pair (Green and white) and the power pair. (Red and black)

Note: *It is also possible to isolate a section of the FastNet bus to help identify the faulty area.*

H3000 CPU

The CPU contains a composite circuit board assembly comprising a larger analogue interface PCB and Depth sounder hardware, plus a small CPU board with removable FLASH memory card.

The CPU is principally responsible for measurement of the following sensors and their associated derived functions.

- Boat Speed (Paddle or Sonic input)
- Depth (Standard B&G 170KHz Passive or NMEA based Active)
- Sea Temperature (usually integral to Paddle wheel)
- Wind speed from the Masthead Unit (MHU)
- Wind angle from the MHU
- Up to 4 Linear analogue inputs – Typical sensors being Heel angle, Trim, Rudder angle, Mast Rotation angle, Barometric pressure, Keel cant angle etc.
- Air Temperature
- System supply voltage measurement.

In addition there are dedicated communication ports for NMEA0183 in / out and USB for H-Link.

The CPU has two indicator LEDs on the front connection panel, underneath the removable cover plate. These signify the following:

- Red LED – This indicates FastNet communications activity and should normally be flickering quite rapidly. Slow flicker may indicate a fault with the FastNet bus interface to the CPU. If the LED is permanently off then there is no FastNet activity between the CPU and the rest of the system. In this case a full trace and inspection of the Network cabling should be carried out.
- Blue – LED. This is permanently lit when there is a good supply voltage to the CPU. If the input supply is less than 10 volts the CPU will fail to operate correctly and this LED will fade / extinguish.

MASTHEAD UNIT (WIND SENSOR)

If there appears to be a problem with wind speed or wind angle values displayed then its important to view the “raw” data values from the sensor on any GFD. The functions MEAS W/A and MEAS W/S are shown in the WIND menu and will display uncalibrated, raw data from the mast head, as opposed to True Wind say which is derived and has a number of calibrations applied.

Next, establish whether it’s the MEAS W/A or MEAS W/S or both which appears faulty, then do the following:

- Locate the mast base junction box where the cable down the mast from MHU meets the cable led back to CPU. This is a 6 core cable – Orange, Black, Red, Green, Blue and Violet. Ensure all cores are securely mated with their respective colour on opposite cable.

- MEAS W/A and MEAS W/S both show 00 and 0.0 respectively – Suggest no signal received by the CPU from the MHU.

- Check for +6.5Volts across Orange and Black above. This is the power supply to MHU from the CPU.

- If supply voltage here is zero or very low then go back to CPU, locate the MHU connector under the bottom connection cover and check again for 6.5 Volts across Orange and black here. If nothing then fault at Processor end.

- MEAS W/A showing wrong values – It is likely that at least one of the three (Red, Green or Blue) wind angle phases have failed either due to faulty connection somewhere, (Connector at Mast Head, Junction box at mast base or at CPU) or at the electronics PCB in the MHU itself. There is also always the possibility that the cable inside the mast has been damaged by stray halyards for example.

- MEAS W/S reads approximately Zero – Suggests no wind speed pulses coming from MHU to CPU. Take purple core from CPU side of Jbox and remove from screw terminal. Ask someone to watch the MEAS W/S display and then tap the purple wire to the black wire rapidly on / off.

- This is the “Tap test” and if the MEAS W/S values change when tapping then the connection between the mast base junction box and CPU is

fully operational.. The problem therefore is likely up the mast cable or possibly the electronics PCB inside the MHU.

- MEAS W/S appears to read slow – The most likely cause here is worn anemometer bearings, more likely if the MHU is a few years.
  old. The bearings of the anemometer can be easily replaced with new ones and are simply removed by gently unscrewing (by hand) the bottom assembly having once removed the plastic cups from the spindle.

Note: *The masthead unit bearings should not be oiled as they are of a sealed pre-lubricated type and additional oil may cause chemical breakdown of the existing lubricant.*

DEPTH SENSOR

Fault finding on the depth sounder is often difficult as depth sounder performance is dependent on many factors: transducer type and installation, boat speed, electrical noise, sea state, sea bed conditions, air and plankton in the water. Indications of problems with the depth sounder normally manifest themselves in one of three ways: display shows four floating bars:

The display locks down showing depths in the range 0 to 1.5m or display shows random deep depths. All of these symptoms can be caused by external conditions so care and additional tests should be performed before concluding the fault lies with the depth sounder.

There are two values output by the depth sounder which can be of assistance in diagnosing problems, these are receiver gain and noise which can be found in the PARAMTR Menu on a GFD.

Yacht Stationary

Symptom: Display consistently shows:

—— —— ——

when well within the range of the sounder when the yacht is stationary in the water. This is an indication that no consistent signal is being received by the depth sounder.

Possible causes:

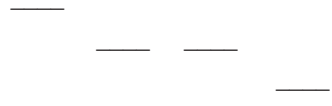
- The transducer is not connected.
- The transducer is not in its housing.
- If sounding through the hull there is not enough oil in the housing or the hull material is not suitable to sound through (wood, composite hulls with core material etc.).
- The transducer is receiving extra reflections off an adjacent pontoon or jetty.
- The transducer is receiving interference from another B&G system located in an adjacent yacht.
- The transducer is faulty or has been damaged. The transducer should be checked for any damage, barnacle growth or thick layers of paint. If it needs cleaning this should be done with a scrubbing brush. The face of the transducer may have a thin coat of anti-fouling applied to it making sure no air bubbles are trapped in the paint. The cable should be checked for damage. The resistance between the BLUE and BLACK cores should be in the region of 0.5 to 5 Ohms and resistance between the screen and the cores should be infinity (Passive sensors only)

Caution: *Resistance measurements should only be made with the transducer disconnected from the Processor Unit.*

- The gain of the receiver has been set too low. It is possible to adjust the maximum gain via CAL VAL1 on gain. This is normally set to 30 and should not be adjusted.

Yacht Moving

Symptom: Display shows pattern below when yacht is moving:



This is most often an indication of difficult sounding conditions, but can also indicate a poorly located transducer.

Possible causes:

- Difficult sounding conditions and/or depth sounder unable to track rapidly changing bottom. If coming into shallow water yacht should slow down and proceed with caution.

- Aeration in the water, most often caused by the wake of another vessel. This can persist in the water for a long period after the passing of the vessel. In some instances the depth sounder will indicate the depth of the aeration layer caused by a large vessel.

- Poorly located transducer. Determine what conditions cause the problem by doing some manoeuvring trials in an area which has a relatively uniform depth, a solid bottom and is clear of the wake from other boats.

First determine the maximum speed at which reliable soundings can be made when travelling in a straight line. Then repeat the tests when turning to port and starboard.

If better results can be obtained when turning it is possible that there is something in front of the transducer causing aeration. This may be a hull fitting like a water outlet in which case the transducer or the hull fitting should be moved.

If there seems little difference whether turning or not, the position of the transducer should be reviewed. It may be coming out of the water at high speed or in rough

water. It is impossible to give specific instructions on where to re-site the transducer as it is dependent on the design of boat; however better results will be obtained nearer the centre line of the boat.

If there is only a problem when heeled, consider fitting two transducers with a changeover switch.

Consistently Shows Shallow Depth

Symptom: Display consistently shows a shallow depth between 0m and about 1.5m.

Possible causes:

Faulty transducer. Transducer rings for too long after the transmit pulse is sent and the ringing is interpreted as a shallow return by the depth sounder. On a deep keeled yacht it may be possible to overcome this problem by increasing the minimum depth to just less than the draft of the yacht. The minimum depth is adjusted by changing CAL VAL1 on NOISE.

The default setting for minimum depth is 0.7 meters.

- Keel echoes. If the transducer has been installed too close to the keel it is possible to get consistent echoes from the keel. The transducer should be re-located further away from the keel. If this is impossible then increasing the minimum depth to just below the keel can solve the problem but may result in poor performance when the bottom is shaded by the keel. Marginal cases are sometimes caused by side lobes from the main beam from the transducer and may be cured by rotating the transducer in the housing.

- Following or crossing the path of another vessel which has left an aerated layer in the water.

Random Deep Depths

Symptom: Display shows random deep depths.

Possible Causes:

- Electrical noise. The depth sounder contains circuits and software to
` reduce its susceptibility to electrical noise, however this can still be a problem if not installed carefully or other equipment is not correctly suppressed. The depth sounder measures the ambient noise and this can be found for display by looking under the PARAMTR Menu. When the boat is stationary electrical equipment should be switched ON and OFF in turn while looking at the depth and noise displays to try and determine the source of the problem.

- Acoustic Interference. Other depth sounders and sonar can cause problems. However this is generally only when very close to other boats for example when moored alongside in a crowded marina. Also acoustic noise can be generated by water flow past the transducer and various bits of mechanical machinery.

- Mid-water echoes. When outside the range of the depth sounder it is possible that random depths are displayed due to mid-water echoes from shoals of fish or aeration layers.

HALCYON 2000 COMPASS

Heading and CAL Flashing

Symptom: Display flashes a Heading value and “CAL”

Possible Causes:

- The memory in the Halcyon 2000 is empty or has been corrupted. This may be due to a System Reset being performed or the first time the compass has been installed and not yet been calibrated. Perform a calibration swing to restore normal operation.

- After a calibration swing the result is always FAIL. There is a source of magnetic deviation near to the Halcyon 2000 compass. Try re-positioning the compass and perform the calibration.

Heading Shows Err

Symptom: Heading display shows “Err” instead of Heading value

Possible Causes:

The signal from the fluxgate sensor is too big or too small. Try re-positioning the compass. If still showing Err reset the compass.

Caution: *If the compass sensor is reset all previous calibrations will be lost. Re-calibrate the compass before use.*

Heading or COMP CAL Shows PHS

Symptom: Heading display shows “PHS” instead of Heading value, this may also be displayed on the COMP CAL function.

Possible Causes:

The compass is in the middle of a reset, the display should show heading and CAL flashing after 20 seconds. A calibration swing will be required.

Two Headings Flashing Alternately

Symptom: The Pilot Display shows two headings flashing alternately

Possible Causes:

The Pilot has not been set to use the Halcyon 2000 as its heading source. Refer to Heading Source selection in your Instrument or Pilot Handbook. If the Halcyon 2000 is not to be the source of heading then it must be unplugged from the system.

TWD, Tide or DR Functions Inaccurate

Symptom: Compass related data such as True Wind Direction, Tide calculation or Dead Reckoning is showing erroneous values.

Possible Causes:

The CPU has not been configured to use the Halcyon 2000 as the main heading source. See above.

ROUTINE MAINTENANCE

GENERAL MAINTENANCE

Through-hull housings

Keep the screw threads of through-hull housings well greased with silicone or water pump grease. Ensure that the outer surfaces of the housing are properly coated with anti-fouling paint.

Boat speed sensor (paddlewheel type)

Use a stiff brush to remove marine growth that may cause the paddlewheel to freeze, and then clean the surfaces with a very weak solution of household detergent. If fouling is very severe, push the paddlewheel axle out by using a small drift, and then very gently, wet sand the surface with a fine grade wet/dry paper.

Inspect the o-rings on both the sensor and the blanking plug and replace if necessary, and then lubricate with silicone lubricant or petroleum jelly (Vaseline®).

Boat speed sensor (sonic type)

Aquatic growth can accumulate rapidly on the transducer surface reducing performance. Clean the surface with a soft cloth and a very weak solution of household detergent. If fouling is severe, use a stiff brush or a putty knife. Take care not to cause scratches on the transducer face. Wet sanding using fine grade wet/dry paper is permissible to remove stubborn deposits.

Surfaces exposed to salt water must be coated with antifouling paint. Use only water-based antifouling paint. Solvent-based paints must not be used. Solvent-based paints contain ‘ketones’ which may attack the plastic surfaces and damage the sensor. Re-apply the antifouling paint every six months or at the start of each boating season.

Desiccators

Should any display window show signs of moisture having penetrated the seals e.g. misting of the glass or condensation, the instrument should be removed and returned to your national distributor for drying.

WINTER STORAGE/LAYING UP

Masthead unit

Storage of the masthead unit when the yacht is laid up afloat will increase the life of the transmitters. It should always be removed from the masthead before the mast is unstepped. It should be stored in its packing box with the vane and cups removed. The exposed socket and connector threads at the top of the mast should be smeared with silicone grease such as MS4 (Midland Silicones Ltd), and then protected with the plastic cap supplied with it.

The contacts in the masthead unit connector should be inspected for cleanliness and sprayed with a water inhibitor such as WD40. The outer casing of the connector should also be smeared with silicone grease.

The masthead unit must never be oiled. The bearings are of the sealed pre-lubricated type and any additional oil may cause chemical breakdown of the existing lubricant. Any scratch marks or corrosion on masthead unit spar should be rubbed clean with a soft cloth and lightly smeared with silicone grease. This should not be necessary if care is taken when hoisting or lowering the masthead unit, to protect it from collision against the rigging.

If the mast is un-stepped, care must be taken to ensure that the cable is not cut through, but disconnected at the junction box below decks. The bare ends of the cable should be smeared with silicone grease.

H3000 SYSTEM CALIBRATION RECORD

System Configuration Record

Function		Default Setting	User Setting
Heading Node		16 (Halcyon 2000)	
Halcyon Mode		0	
Linears	1	4 (Heel)	
	2	5 (Trim)	
	3	6 (Barometer)	
	4	1 (0-1000 Type)	
NMEA Chl		0	
Baud Rate		6	
Sea Temp Type		1	

Basic Calibration Record

Function	Calibration	Value
Meas W/A	Offset	
Meas W/S	Hz / Kt	1.04 (default)
	Offset	1.04 (default)
App W/A	Offset	
	Heel Correction	
App W/S	Hz / Kt	1.04 (default)
	Offset	1.04 (default)
Boat Spd	Single Hz / Kt	
	Stbd Hz / Kt	
	Port H /Kt	
Heading	Offset	
Depth	Datum	
Heel	Offset	
Trim	Offset	
Leeway	Coefficient	
Mast Angle	Offset	
Mast Height	Mast Height	15.0 Meters (default)
Rudder	Offset	

True Wind Speed Correction Table

Function	True Wind Speed					
	5	10	15	20	25	30
Correction º						
Correction Angle						

True Wind Angle Correction Table

Wind Angle	True Wind Speed					
	5	10	15	20	25	30
Upwind						
Reaching						
Downwind						

Boat Speed Correction Table

Heel Angle	Boat Speed (kt)					
	5	10	15	20	25	30
0º						
10º						
20º						

DAMPING RECORD

Function	Damping	Dynamic Damping
App W/A		
App W/S		
Heading		
Boat Spd		
Heel		N/A
Trim		N/A
Leeway		N/A
Mast Angle		N/A
Rudder		N/A
True W/A		
True W/S		
True Dir		N/A
Tide		N/A

SUPPORT RECORD

Date	Notes	Engineer / Dealer