WTP2 User Manual

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Certification

CE

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference, the user is encouraged to try to correct the interference by relocating the equipment or connecting the equipment to a different circuit. Consult an authorised dealer or other qualified technician for additional help if these remedies do not correct the problem.

The Wave Technology Processor 2 (WTP2) meets the requirements for CFR47 Part 15 of the FCC limits for Class B equipment. WTP2 meets the standards set out in European Standard EN 60945: 1997 IEC 945: 1996 for maritime navigation and radio communication equipment and systems.

Trademarks

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Product Liability and Safety Warnings

Brookes and Gatehouse Limited 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: 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: Navigation Hazard

The WTP2 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.

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 and invalidating the warranty.

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.

Preface

This manual is in three parts:

Basic Operation

Chapter 1: is a brief introduction to the WTP2, outlining the way the unit works and some of the differences with other instrument systems.

Chapter 2: contains information about the basic operation of the WTP2 in conjunction with the B&G Deckman software.

Most users should be able to operate the WTP2 from Deckman using the information contained in this section.

Customisation

Chapter 3: outlines the way a PC can be used to upload or download files to or from the WTP2.

Chapter 4: contains information on the use of the data files; these allow you to control the input of variables onto the system and the way these are sent back out to the displays.

Chapter 5: concerns the calibration, damping and settings options available.

These chapters are mainly aimed at more experienced users, who may wish to alter variable inputs and outputs.

Installation and Maintenance

Chapter 6: outlines the installation of a number of different components, and is therefore aimed primarily at those involved with the initial installation of the system; general wiring information is also included in this section.

This section is aimed mainly to assist with the installation or maintenance of the system.

Contents

Chapter 1: Introduction to the WTP2

System Description

The B&G Wave Technology Processor in combination with the B&G Deckman software and range of H2000 displays make for the highest-level yacht racing instrument system in the world today.

Central to this high performance is the WTP2, a powerful processor running a Windows CE™ operating system and a high speed analogue to digital board; such that calculations run some hundreds of times faster than on standard instrument systems. This provides several benefits:

- All of the sensors can be sampled at higher data rates (100 times per second on analogue inputs)
- Wind calculations are improved by the addition of rate-gyro sensors to measure boat motion
- Compass inputs are enhanced using the same sensors
- Ethernet communications are used to allow high-speed communication with one or more PCs running the Deckman tactical software
- The ability for users to create their own variables based on existing data
- Boat performance polars have a simple description and interpolation using cubic splines
- Additional terms are included to improve filtering and calibration (see Chapter 5:)
- Data is written to the display network at high rates (up to 10Hz)
- Users can configure the way information is displayed in menus with intelligent data switching.

Sensors

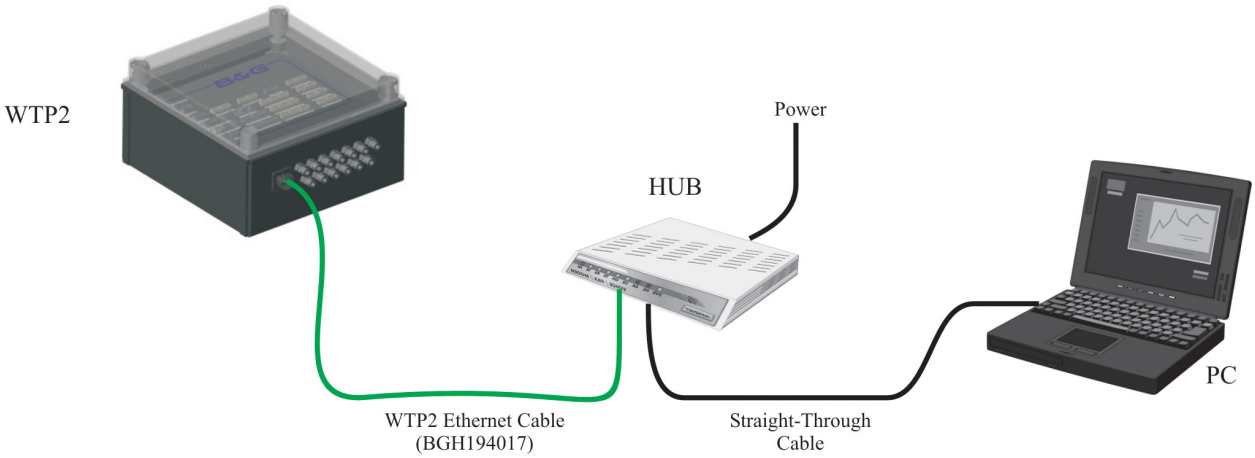
The WTP2 is designed to accept numerous different sensor types to allow the system designer to use the most appropriate device in each application. All of the standard B&G H2000 sensors are compatible except that the WTP2 uses an active NMEA sensor for Depth rather than the passive sensors normally used on H2000.

In addition to the normal sensors the WTP2 system also includes a 3-Axis Rate-Gyro sensor unit for measuring the pitch, roll and yaw motion of the boat. It is this sensor that gives the WTP2 its name because it allows the removal of the wave inertia components from the wind measured at the masthead.

If you have any sensor compatibility requirements that the standard WTP2 does not support please contact the B&G Custom Projects team.

Typical Setup

The WTP2 is supplied with a straight through Ethernet patch cable that allows the WTP2 to be connected to an onboard PC network via a hub or router.



Chapter 2: Basic Operation

The WTP2 is controlled from a PC running Deckman software, however basic control of the display of data around the boat is carried our via the Full Function Display (FFD) units.

WTP2 Menus Seen on the Full Function Displays (FFDs)

When using the WTP2 all the information is contained in menus on the FFDs. The FFD simultaneously displays two functions with accompanying descriptive text. Chapter 4: Data Files outlines how it is possible to customise these menus and the data that is shown. This section simply describes how to navigate these menus and display the data available.

The Keys

Keylock

To prevent accidental changing of the data displayed, two keylock features are available on the FFDs.

- Press the **Enter** and **Lights** keys simultaneously once. All keys except the **Page** key are locked.
- Press the **Enter** and **Lights** keys simultaneously once more. All keys are locked.
- Press the **Enter** and **Lights** keys simultaneously a third time. All keys are unlocked.

Lights Key

This key controls the level of illumination on the displays. One short press of the key provides 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 again**.** This operation at any one FFD invokes the same sequence on all displays connected to the system**.** However, display lighting can be localised so that the level is adjustable for individual displays.

> **Caution**
> Do not press the Light key for longer than one second as this will switch the displays off. Should a user inadvertently power off the displays it will be necessary to re-boot the WTP2 system to ensure that all non-standard functions are displayed on the FFDs correctly.

Page Key

Operation of this single key enables the user to quickly access eight functions of the WTP2 System, by selecting any one of the four pre-set page displays (2 functions per page) with a simple key press**.**

Default Pages:

- True Wind Angle / Opposite Tack
- True Wind Direction / Timer
- VMG to Waypoint / Cross Track Error
- Course Over Ground / Speed Over Ground

Notes

- If you are 'lost' in the system, press the **Page** Key to immediately return to the top-level display.
- The initial four pages can be reconfigured using the remaining keys and the menu system (see **Page Display Configuration** below).
- Successive presses of the **Page** Key displays each page in rotation.
- Holding down the **Page** Key for 2 seconds initiates control of 20/20 and 40/40 displays.

Scroll Keys

Two scroll keys are provided, **Scroll Up** and **Scroll Down,** and are used to scroll through the menus.

When the **Scroll Up** Key is first pressed, the large digits in the upper display are no longer displayed and the name of the current menu flashes in the upper text**.** If the key is held down, then the upper text will scroll through the top-level menu choices. If, when you are scrolling up, the required menu choice is passed then pressing the **Scroll Down** Key will allow you to return to the required choice**.** When the required menu choice is found, the text will flash until selected by pressing the **Enter** Key**.**

Enter Key

The principle use of the **Enter** Key is to activate selections chosen from the menu by the scroll keys**.** As a general rule, when any menu choice is flashing, pressing the **Enter** Key will select that choice.

Speed/Depth (SPD/DEP) Key

Pressing the **SPD/DEP** Key will select the Speed/Depth display**.** After selection of the Speed/Depth functions, successive operations of the **SPD/DEP** Key will display the following information in a fixed order:

- Boat Speed / Depth
- Boat Speed / Speed Over Ground
- Boat Speed / Apparent Wind Angle
- Boat speed / True Wind Speed

Wind (WIND) Key

Pressing the **Wind** Key will select the Wind Display**.** After selection of the Wind Display, successive operations of the **Wind** Key will display the following information in a fixed order:

- Apparent Wind Speed / Apparent Wind Angle
- True Wind Speed / True Wind Angle
- True Wind Speed / True Wind Direction
- Velocity Made Good / True Wind Angle

Navigation (NAV) Key

Pressing the NAV Key will select the Navigation Display. After selection of the Navigation Display, successive operations of the NAV Key will display the following information in a fixed order:

- Heading / Course Over Ground
- Heading / Boat Speed
- Distance to Waypoint / Bearing to Waypoint
- Tide Set / Tide Rate

Examples of Operation

The general principle for operating the FFD will be made clear by the following examples of function and page selection.

Function Selection

Our first example will be to select another function for one of the pages**.** The new function is True Wind Angle and since we want to place this function in the bottom display we will be using the **Scroll Down** Key.

1. Press the **SPD/DEP** Key until the display is showing BOAT SPD in the upper display and DEPTH in the lower display.
2. Press **Scroll Down**, the lower text now shows DEPTH flashing, the upper display is not affected.
3. Press **Scroll Down** until the lower text shows WIND flashing, the upper display is not affected.
4. Press **Enter**, the lower text now shows APP W/A flashing, the upper display is not affected.
5. Press **Scroll Down** until the lower text shows TRUE W/A.
6. Press **Enter** again, the lower display now shows required function, the upper display is not affected.

We are now able to view this function. If we press the **Page** Key, the configured pages will return and True Wind Angle will no longer be displayed**.** If you wish to keep True Wind Angle on a page, then you can configure the page.

Page Display Configuration

The **Page** Key allows the user to configure four pages per FFD depending on the required use at that position.

To store the setting in the previous paragraph as a permanent new page, proceed as follows:

1. Repeatedly press the **Page** key until the desired page you wish to re-configure is shown.
2. Press **Scroll Up** or **Scroll Down** and until the display shows CNFG DSP.
3. Press **Enter**, PAGE is shown in the appropriate display.
4. Press **Enter**, the digital display is blanked and the two functions selected are displayed in the text.

Note at this point, either of the two functions may be changed if required using the **Scroll Up** or **Scroll Down** Keys as per “Function Selection” above.

5. Press **Enter** to accept the new page configuration and restore the digital display.

You are able to configure each FFD on the boat individually to suit the needs of the crew in the immediate vicinity. All page displays are held permanently in the display memory.

NAV Key Configuration

Our second example is configuring the NAV key. The NAV key allows the user to select either Rhumb Line or Great Circle navigation information to be displayed; by default the FFDs show Rhumb Line pages. WTP2 only uses Great Circle waypoint data so we need to modify this page. To select the Great Circle mode, proceed as follows:

1. Press the **Page** Key once.
2. Press **Scroll Up** until the upper display shows CNFG DSP flashing.

3. Press **Enter**, the upper text now shows PAGE flashing.

4. Press **Scroll Up** to select NAV MODE GC (Great Circle).

5. Press **Enter** to select your desired choice. The display will stop flashing and the NAV key will display data in GC.

Lighting Control

The backlight level on system displays is controlled by the **LIGHTS** Key. Use of this key normally controls all the FFDs simultaneously, however the level of illumination on a single FFD can be set to be controlled individually via the menu choice - LIGHTING → LOCAL.

1. Press and hold **SCROLL UP** or **SCROLL DOWN** until LIGHTING appears in the text.

2. Press **ENTER** and use **SCROLL UP** or **SCROLL DOWN** until LOCAL appears in the text.

3. Press **ENTER** again and the original page display appears**.** The FFD is now in local mode.

The **LIGHTS** Key now controls this display only**.** This will enable you to use (for example) very low backlight brightness at the chart table, whilst using a higher backlight level on deck.

To return displays to system lighting control:

1. Select LIGHTING.

2. Press **ENTER** and use **SCROLL UP** or **SCROLL DOWN** to select SYSTEM.

3. Press **ENTER** again, the original page display appears and the lighting has returned to system control.

The lighting brightness is still controlled by successive short presses of the lower right hand key on an FFD in the normal way**.** Displays which have their lighting control set to LOCAL will not be affected by the lighting control input of another display.

The display backlight colour may be altered between RED (default) and GREEN. This is adjusted via the menu choice: LIGHTING → RED or GREEN

1. Press and hold the SCROLL UP or SCROLL DOWN key until LIGHTING appears in the text.

2. Press the ENTER key and use SCROLL UP or SCROLL DOWN to select either RED or GREEN.

3. Press ENTER again and the original page display appears. The FFD backlighting will now be configured to your desired selection.

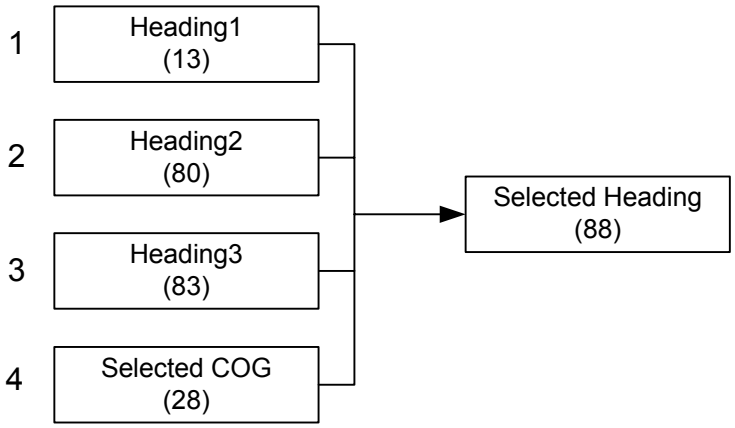
Input Selection via Deckman

Multiple Compass, Boat Speed and GPS Inputs

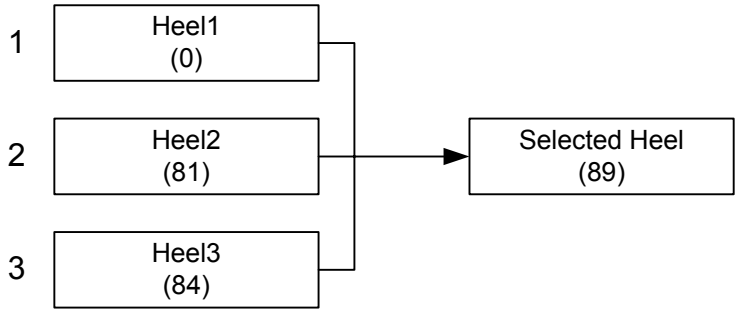
WTP2 is able to handle up to three compass inputs (as well as associated heel and trim values), two boat speed inputs and two GPS inputs. This is useful for testing purposes, to compare different sensors, or as a backup. Variables to handle data from all of these inputs exist on the system.

To select which input you wish to use in the calculations on the WTP2 use the Instrument Control option in Deckman (see ‘Settings’ on page 2.9). Whichever input is selected is then copied into the **SelHdg (88)**, **SelHeel (89)**, **SelTrim (90)**, **SelBoatSpd (91)** or Selected GPS (multiple functions) variables, this is then used in the calculations and output to Deckman and displays as required. This selection is shown below for each of the selectable variables, in each case the standard variable number is shown in brackets.

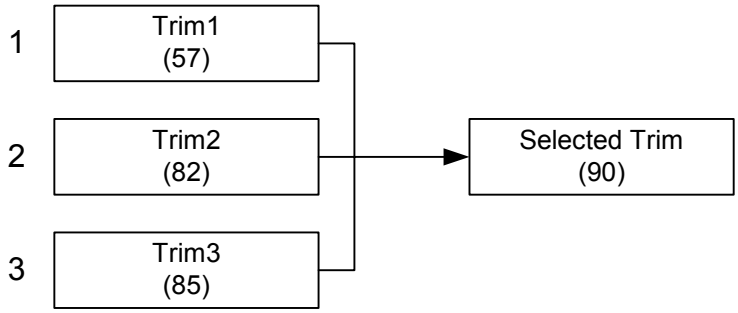
Heading selection



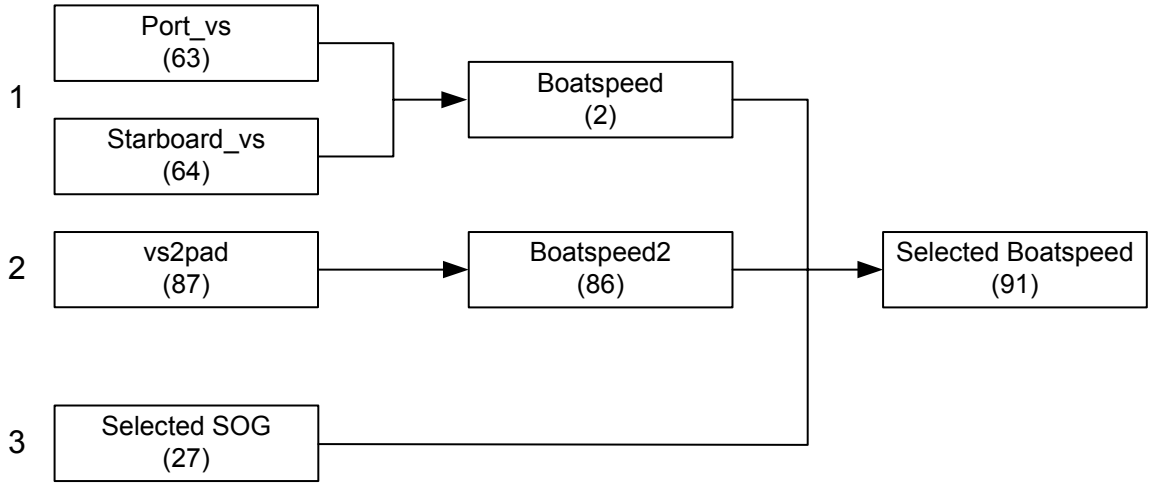
Heel selection



Trim selection



Boat Speed selection

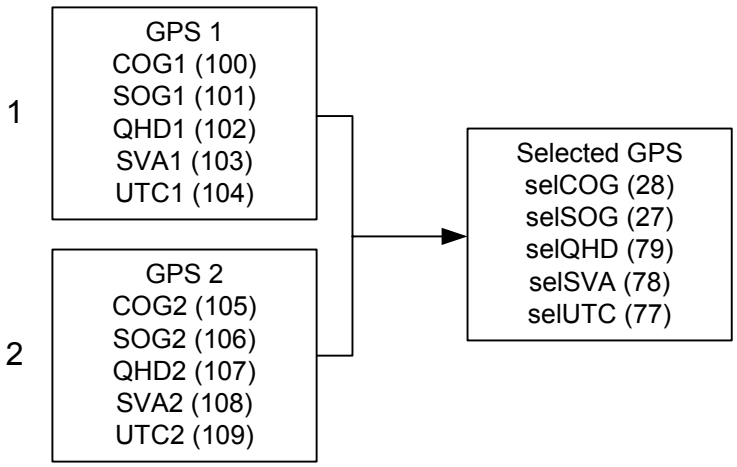


For boat speed there are a couple of extra steps to take account of the damping and the fact that there may be separate port and starboard paddlewheels.

The raw data from the standard port and starboard paddle inputs (63 and 64 respectively) are combined to make **Boatspeed**, the WTP2 uses Heel Angle to determine which of the two inputs to use. The raw data from the second speed sensor is used to make **Boatspeed2** (Note that this stage is necessary in order to filter the raw data from the sensors). Then, if you enter a 1 in **sel_speed** in the **Settings** dialog (see 'Settings' on page 2.9) then **Boatspeed** (2) will be copied into **SelBoatSpd** (91), if you enter a 2 in the dialog then **Boatspeed2** (87) will be copied and if you enter a 3 **SelSOG** (27) will be copied.

By default WTP2 is setup to look at Boatspeed (2).

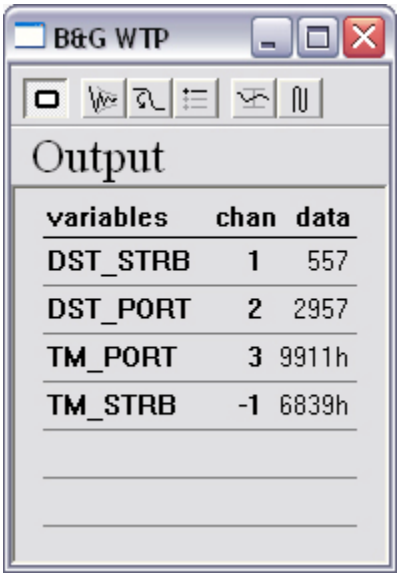
GPS Selection



Deckman Control Facilities

To access the WTP2 control facilities in Deckman, choose **gmenu → instrument control**. You will then see a dialog on the screen. Each box along the top of the dialog accesses a different control facility, as described below.

Output

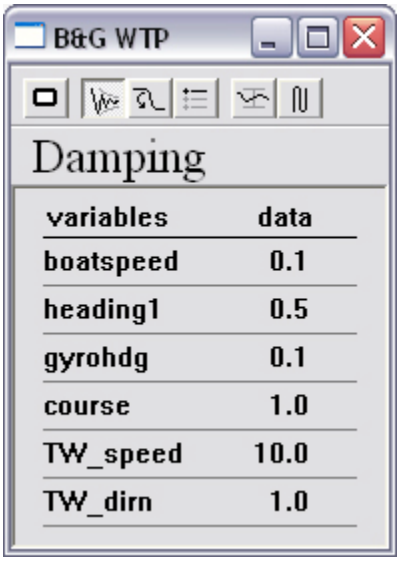


Controls the output of Deckman variables to the WTP2 to be viewed on the displays.

In addition to the standard WTP2 system variables it is possible to output up to nine variables from Deckman to the WTP2 for transmission to displays. As supplied WTP2 declares a Deckman menu containing four functions (remote 1, remote 2…), if more than four Deckman variables are required additional menu items will need to be added to the **usermenu.d** file (see page 4.12).

To output a variable, click on the first blank line of the **variables** column, select the appropriate Deckman variable from the list followed by **OK**. The variable will be displayed on that line, with the **channel** column showing –1 and the current data shown in the final column. The –1 indicates that output of this variable is currently disabled. To enable the output click on the channel number (currently -1) and assign a channel number of either 1,2,3 or 4 (on the standard configuration). If the same channel number is assigned to more than one variable then the data will oscillate between those variables on the displays.

Damping

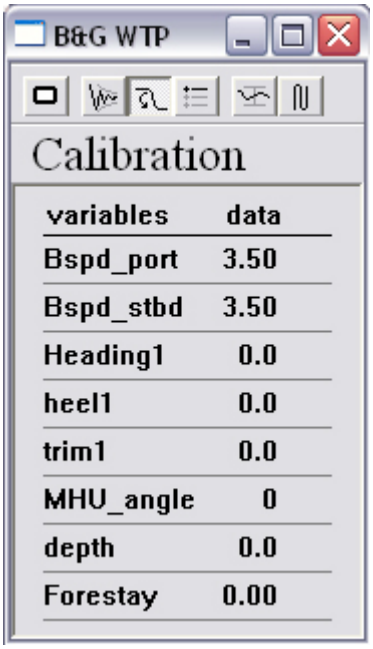


Allows you to alter the damping values on the WTP2. The values are read from the WTP2 and any changes you make are sent as soon as they are entered.

Each of the menu options has a number: this is the damping applied to that instrument data. Generally, because the WTP2 uses a much faster processor and more sophisticated calculations, you will be able to use much lower damping values than with conventional systems, between 0.5 and 5 is suggested for normal variables.

Note: You can modify which variables are listed in this dialogue using the data files. See '**damping.d**' on page 4.19

Calibration



Controls the calibration of variables by allowing you to input a calibration value to a particular variable:

Bspd_port and **Bspd_stbd** are boat speed calibrations for the port and starboard side respectively in Hertz/knot. If you have only one boat speed sensor enter the same value in both port and starboard. If you do not know what these values are, the boat speed can be calibrated using the **cal boatspeed** option, see page 2.11.

Heading1 is the offset value for compass 1. Once you have run the AutoSwing facility on the Halcyon compass (or the normal routines for other types of compass sensor), you still need to align the unit in the boat correctly. The most accurate way to do this is to sail on a known bearing towards a fixed charted object a long distance away. You then use **Heading1** to correct the compass bearing on the instruments until it matches the known bearing of the object. A positive offset will increase the reading of the compass heading.

heel1 is the offset value for the first heel sensor. If the heel angle does not read zero when the boat is sitting upright in the water it is necessary to enter a correction value here. The heel sensor shows positive values when you are heeled to port, as on starboard tack upwind.

trim1 is the offset value for the first trim sensor. If the trim angle does not read zero when the boat is sitting upright in the water it is necessary to enter a correction value here. The trim sensor shows positive values when the bow is trimmed down.

MHU_angle is the offset angle for the masthead unit sensor at the top of the mast. If you enter a positive value, it will decrease the Apparent Wind Angle on starboard tack, and increase the Apparent Wind Angle on port tack.

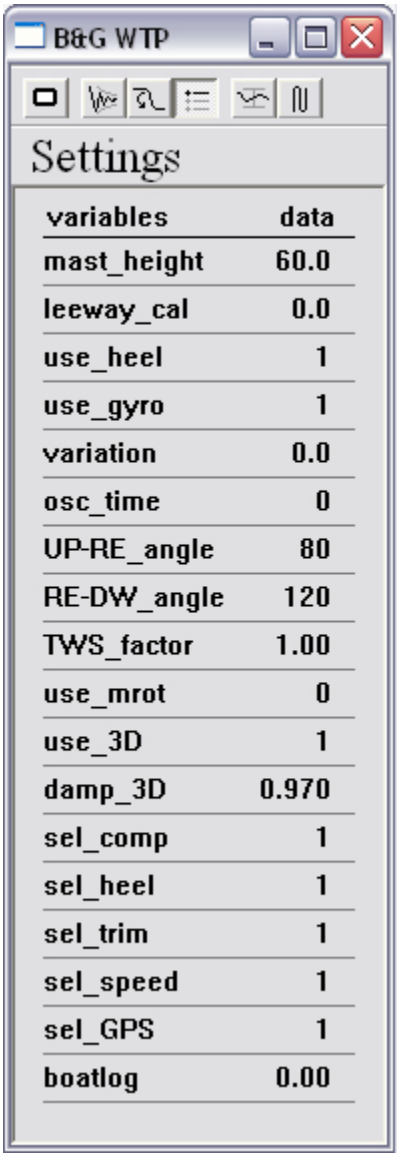
forestay is for the calibration of a forestay loadcell fitting. Wind up the runner or backstay to a known value of tension (perhaps by reading it from the loadcell value if already fitted and calibrated), and then enter this value in the forestay box. Check also that the reading is 0 when there is no load on the forestay.

depth is the offset for adjusting the depth sensor reading from the transducer position to either the keel (negative values) or the waterline (positive values).

Note: You can control which variables you are able to calibrate from this dialogue by adjusting the '**svcals.d**' data file. Please see on page 4.18.

Settings

The settings dialogue controls all the normal items required to setup the WTP2.



mast_height is used for wind calculations involving the rate gyros. This should be set to the distance from the waterline to the masthead sensor in feet.

leeway_cal is the leeway calibration value. A value between 8 and 13 is usually appropriate for most modern boats.

use_heel should be set to **1** if you have a heel sensor and **0** if you do not. A heel sensor is highly recommended to achieve accurate wind data.

use_gyro determines whether or not the system uses data from the rate gyro sensors to correct wind calculations. 1=use gyro data, 0=do not use gyro data. Normally there is no reason to disable this function.

variation is magnetic variation. This is calculated automatically using data from the GPS. If the GPS is not providing this information it can be entered here. It will be overwritten by GPS information if it becomes available. Enter a positive value for East variation, negative for West.

Osc_time, **UP-RE_angle** and **RE-DW_angle** all refer to the switching of variables on displays according to either point of sailing or over time if this is specified in **userout.d** (see Chapter 4: Data Files for more information). The **osc_time** is the frequency with which the displays alternate between showing different variables, units here are $1/10^{th}$ second; **UP-RE_angle** is the angle for the change between upwind and reaching settings; **RE-DW_angle** is the angle for the change between reaching and downwind settings.

TWS_factor will reduce or adjust wind speed by multiplying by this factor; this is used as an adjustment for wind weight.

use_mrot allows the option of using data from a mast rotation sensor. Available settings are 0 (off), 1 (on, using absolute value) or 2 (on, using +/- for fully rotating masts).

use_3D provides the option of using (1) or not using (0) Gyro Heading (compass heading adjusted for rate gyro inputs) when calculating wind information. It is important that this is set to off (0) if the compass input you are using is already rate-gyro corrected.

damp_3D should not be changed under normal use (0.970 is the default value).

sel_comp, **sel_heel** and **sel_trim** control which input is used for heading, heel and trim respectively. Refer to 'Multiple Compass, Boat Speed and GPS Inputs' on page 2.4 for more information.

sel_speed controls which input is used for boat speed. Refer to 'Multiple Compass, Boat Speed and GPS Inputs' on page 2.4 for more information.

sel_GPS controls which set of GPS data is used for position, SOG, COG etc. Refer to 'Multiple Compass, Boat Speed and GPS Inputs' on page 2.4 for more information.

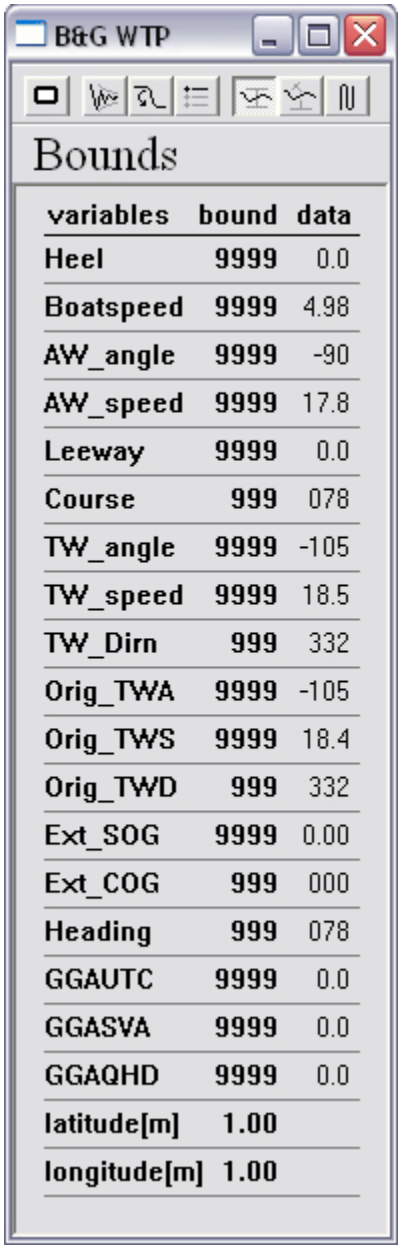
boatlog this allows you to reset the **Log** variable to any value you wish (though zero is likely to be most useful).

Bounds Checking

To prevent errors caused through the loss of characters between the instrument system and the PC WTP2 allows the user to set limits on input values.

The incoming data is checked against the previous values. This display allows you to change the bounds that are used for each incoming variable; smaller values make errors less likely but increase the possibility that the numbers will 'stick' because of dramatic boat manoeuvres.

The values shown in the example should be used unless you are experiencing difficulties with a particular variable.

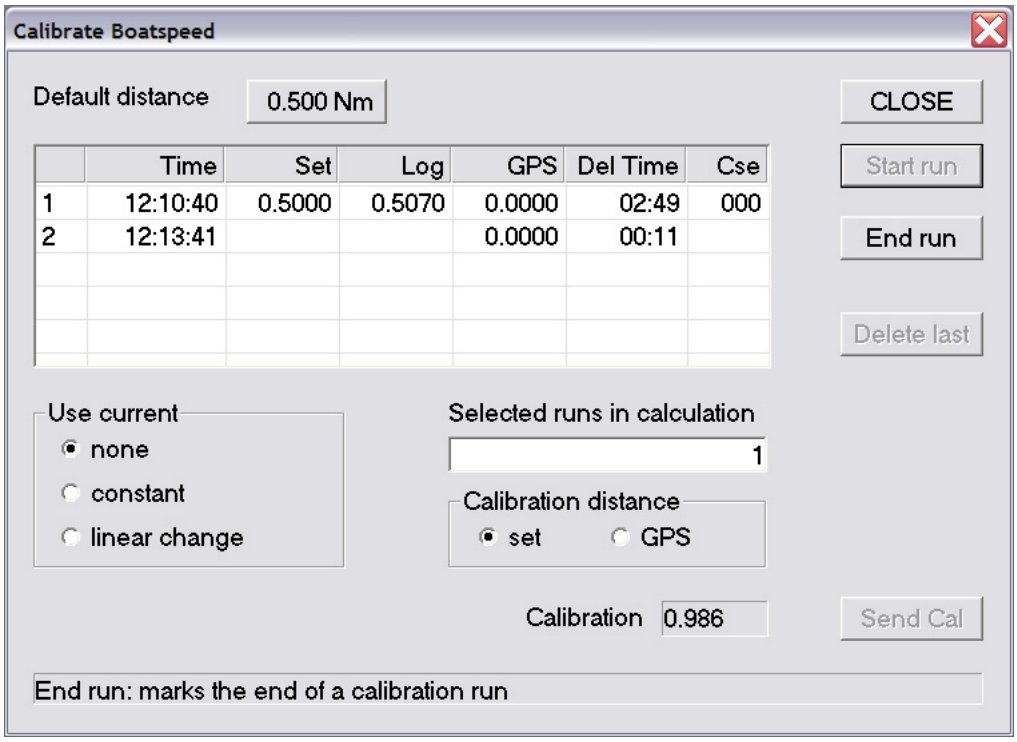


Reset Bounds Checking

Clicking this button will cause the next set of incoming data to overwrite the old, even if it falls outside the error bounds. This is not normally required but may be necessary under some circumstances.

Calibrate Boatspeed

This function helps you to calibrate your boat speed correctly, and works in exactly the same way as the traditional method of measuring the time taken to cover a known distance. Deckman will automatically calculate the calibration values from the tests you select.



Click **Start run** at the beginning of the run, and then **End run** to finish. Details of each run are displayed in the table: the start time of the run, the distances from your input, the log and the GPS are shown, **Del Time** shows the elapsed time for the run, and the course during the run is shown on the extreme right. In the **Use current** box, you can choose what type, if any, of current information to factor into the calculations. In the **Calibration distance** box, you can select whether to use the distance entered by you or that received from the GPS. Click on the runs you wish to use for the calibration to send them to the **Selected runs in calculation** box.

When you have selected runs, a calibration value is then shown in the **Calibration** box. Either choose **Send Cal** to accept the value or do more runs and calculations.

Advanced Deckman Controls

When the **Instruments Control** dialog is open in Deckman, clicking the **menu** button will give you some controls specific to the WTP2. The **Advanced Calibration** or **Advanced Damping** options allow you to access the calibration and damping files described in Chapter 4 below. The **WTP Guru** option allows the advanced user to access system files, do not use this option if you are not familiar with the file level operation of WTP2.

See Chapter 3: Use of a PC for further details on these functions.

Chapter 3: Use of a PC

Introduction

Apart from the normal use of Deckman software to control WTP2 in the normal racing environment there are other times when it is necessary to communicate with WTP2 via a PC. Direct file modifications, software upgrades, file backup, file restore and diagnostics are all carried out via PC using Deckman, FTP or HyperTerminal (or similar terminal program).

Communication Options and configuration

Ethernet

The Ethernet interface allows much faster data transmission than a standard serial (RS232) link and is the recommended method for interfacing Deckman. The Ethernet interface on WTP2 transmits data to PCs running Deckman at 10Hz via the UDP protocol.

Any PC on the Ethernet can control the WTP files, calibrations etc. This is controlled via a TCP/IP protocol so that, in the case of multiple PCs running Deckman, only one copy of Deckman has access to the files at a time.

The Ethernet port is configured by default, it is only necessary to configure the instrument type within Deckman (**gmenu** – **change instruments**) as 'WTP2 Ethernet' and set the network properties on the PCs used to match the WTP2 IP addressing, it is recommended that the fixed IP address is retained (192.168.0.2) and the PC(s) on the network are set to IP addresses 192.168.0.3 onwards. The Subnet Mask on the PC should also be set to match the WTP2 , usually set to 255.255.255.0.

The IP Address of the WTP2 is set in the **fixedIP.txt** file, if this file is not present the WTP2 will attempt to use DHCP for allocation of the IP address. See further advanced information regarding Ethernet Configuration on page 4.19.

RS232

If Ethernet is disabled (via the **ethernet.d**. file, see page 4.19) the Deckman RS232 communication is automatically enabled. This allows communication with Deckman via a serial lead. Note that the RS232 link operates at reduced data update rates compared to the Ethernet link; rates of 1-5Hz are supported via RS232. The standard RS232 communications settings are:

Baud Rate	9600
Data bits	8
Parity	None
Stop Bits	1
Flow control	None

When using RS232 communications the instrument type in Deckman should be set to 'WTP v5.09+'.

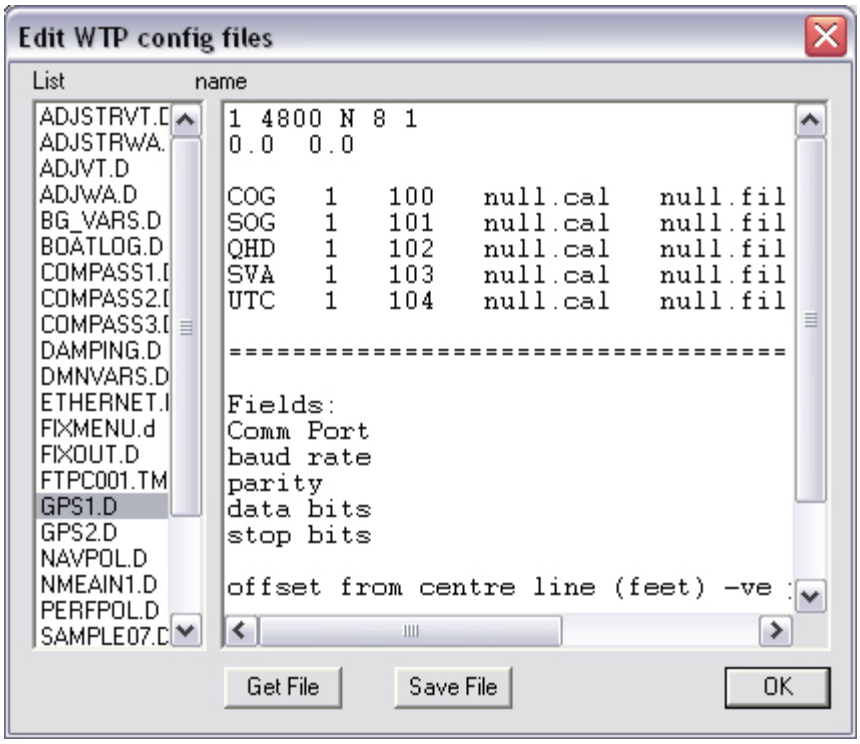
Deckman

Using the **Advanced Calibration**, **Advanced Damping** and **WTP Guru** functions in Deckman the user can directly modify calibration, filter and system files.

Caution: incorrect modification of the WTP2 files (especially system files accessed by the WTP Guru option) can lead to incorrect data values or system instability. Only modify files directly if you are familiar with the file level operation of WTP2. Common settings, calibration and damping can be carried out in the normal Deckman Instrument Control dialogues. It is recommended that regular backups are made of your WTP2 files using FTP.

These functions are accessed via the **menu** button whilst Deckman's Instrument Control function is in use.

Use of the dialogue itself is very straight-forward, simply highlight the file you wish to view or modify in the left hand column by clicking on it with the mouse, and then click the 'Get File' button. The file content will be displayed in the right hand window. At this stage it is possible to make any modifications before clicking the 'Save File' button to save the file back to the WTP2. The 'OK' button closes the dialogue, if you haven't chosen to save the file before clicking 'OK' your changes will be lost.



Advanced file editing dialogue (WTP Guru shown)

Advanced Calibration

The Advanced Calibration function allows file edit access to any of the calibration files stored in the WTP2 /calibs/ directory.

Advanced Damping

Identical operation to Advanced Calibration except by using this option the Filter files (/filters/ directory) are displayed rather than the Calibration files.

WTP Guru

WTP Guru allows access to the system data files that directly affect the configuration of inputs, variables and outputs to Deckman and displays (/data/ directory). Note that if you modify files with WTP Guru you will need to re-boot the WTP2 before they take effect – as such it is often just as easy to use the FTP access to the files for this purpose which allows the backup of the existing files before making changes.

FTP

The WTP2 uses the File Transfer Protocol (FTP) to carry out file management tasks. Windows Explorer in the most recent versions of Windows has FTP functionality – as this is straight-forward and available to most users this is the program we will use for our examples.

Connecting to WTP2

Assuming that the network is correctly configured it is only necessary to open Internet Explorer and type in the following into the address line:

ftp://wtp2/ [or ftp://192.168.0.2 where 192.168.0.2 is the IP address of WTP2]

At this stage it is likely that an error dialogue will appear advising that it is not possible to connect anonymously to the WTP2, at this stage it is necessary to clear the dialogue box and select the 'Login As…' option from the file menu. Explorer should then prompt for a username and password, enter the following:

username	wtp
password	wtp

Note: the username and password are fixed in the operating system and it is not possible to change them. The user is responsible for ensuring that the network in use has satisfactory security for the application.

When the username and password have been accepted the contents of the WTP2 will be displayed and various operations can be carried out, as follows.

Backing up WTP2 files

To make a backup of the WTP2 files simply select all the files and directories and drag them (or copy/paste) to a folder on your PC.

Editing WTP2 files

To edit WTP2 files drag the individual file from the WTP2 to a local folder (e.g. the Desktop), make a backup, then modify it using a suitable text-editing tool (Notepad, supplied with Windows, is recommended). To update the WTP2 select the modified file and drag it back into the relevant WTP2 directory in the Explorer window.

Terminal

The WTP2 has a 'Terminal' connection that allows technicians or advanced users to diagnose operational issues. To view the diagnostic text it is necessary to use a terminal package such as HyperTerminal which is supplied with Windows.

Connect a suitable serial lead to the WTP. The only connections required for diagnostic use are Rx, Tx and Ground.

Configure your terminal program with the following information and then establish the connection (in HyperTerminal this is achieved simply by clicking the 'connect' button – other terminal programs may use different logic:

COM port	The serial port you have connected the lead to on your PC
Baud Rate	38400
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

When the WTP2 is booting or running you will be able to see status messages and characters on the screen, refer to Appendix D: 'Diagnostic messages displayed via Terminal'for full details.

Chapter 4: Data Files

Caution
It is only recommended that advanced users or installers alter the data files directly, as described in this chapter. Most calibration, damping etc. can be controlled from Deckman as described in **'**Deckman Control Facilities', see page 2.7.

The configuration of the WTP2 can be changed to suit individual requirements by using the data files. The data files described below control how data is input onto the WTP2, stored in the variable database and output to Deckman and the displays.

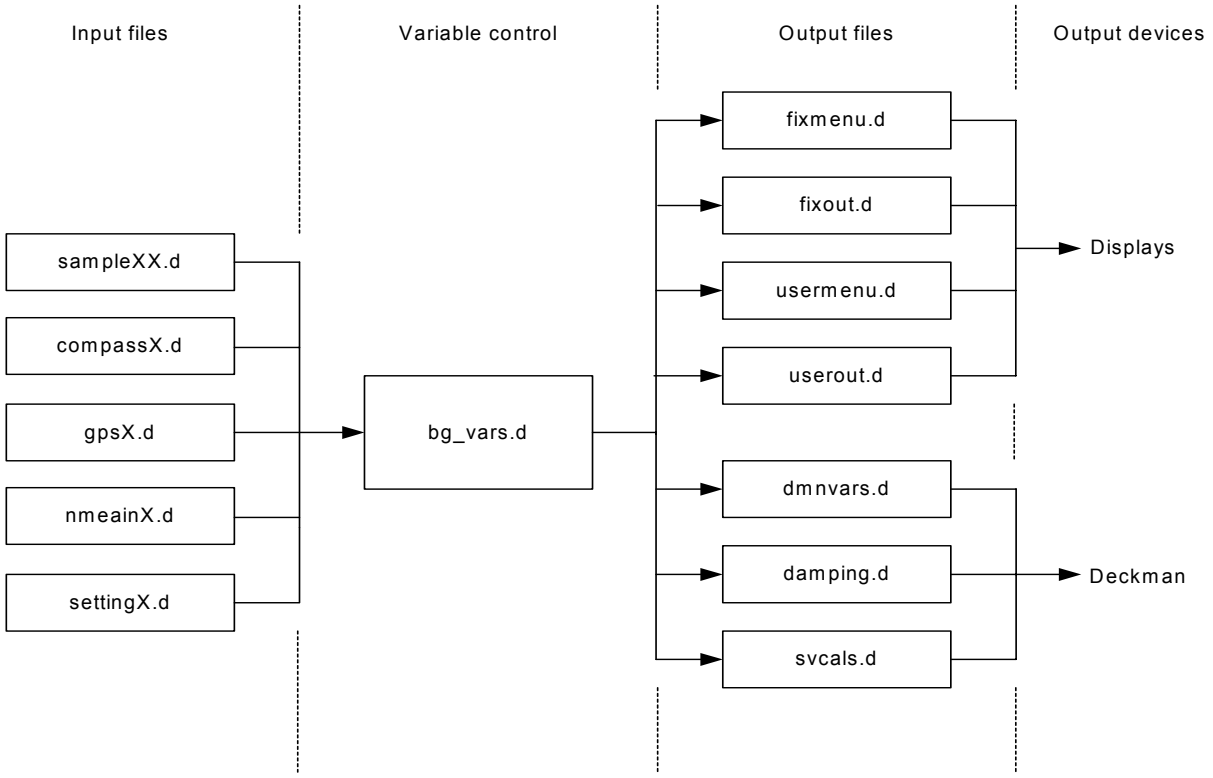
All of the variables in the WTP2 database are listed in the file **bg_vars.d**. Inputs from the various components (masthead unit, paddle wheels, strain gauges and so on) are fed into the WTP2 via the **sampleXX.d**, **compassX.d**, **gpsX.d** and **nmeainX.d** files.

The structure of the menus on the FFDs is controlled by the **fixmenu.d** and **usermenu.d** files and the outputs to these menus are controlled by **fixout.d** and **userout.d**.

Deckman is supplied data values from the WTP2 defined by the content of the **dmnvars.d** file and allows control of WTP2 settings, calibrations and damping values via **settingX.d**, **svcals.d** and **damping.d** respectively.

Occasionally you will see some **rategyro.xx** files within the data directory. These are diagnostic files generated by the WTP2 and should be deleted if they have not specifically been requested by B&G.

There are other files, which are not shown for clarity but are detailed in the following chapter.



The structure of the main data files on the WTP2

There are notes below on the basic workings of each of the data files, followed by an example of what is necessary to get a new variable into the system.

Defining the variables

bg_vars.d

This file is the most important on the WTP2, as it lists all of the variables in the system - if variables are not listed here then they will not be in the WTP2 at all.

```
[variables]
0   Heel1           Hg1     1    1    1
1   dotHeel         dHl     1    1    0
2   Boatspeed       VS      2    0    0
3   dotVS           dVS     2    0    0
4   SmoothVS        sVS     2    0    0

5   MHU_A_R         A_R     4    0    0
6   MHU_A_G         A_G     4    0    0
7   MHU_A_B         A_B     4    0    0
8   MW_angle        MWA     1    1    1
9   MW_speed        MWS     1    1    0

10  AW_angle        AWA     0    1    1
11  AW_speed        AWS     1    0    0
12  Leeway          Lee     1    1    0
13  Heading1        Hd1     0    0    2
14  Course          Cs      0    0    2

15  dotCourse       dCs     1    0    0
16  TW_angle        TWA     0    1    1
17  TW_speed        TWS     1    0    0
18  TW_dirn         TWD     0    0    2
19  VMG             VMG     1    1    0

20  GW_speed        GWS     1    0    0
21  GW_Dirn         GWD     0    0    2
22  Orig_TWA        TA      0    1    1
23  Orig_TWS        TS      1    0    0
24  Orig_TWD        TD      0    0    2

25  MastRot         MRo     1    1    1
26  TWD_Off         TDo     0    0    1
27  SelSOG          SOG     2    0    0
28  SelCOG          COG     0    0    2
29  VMC             VMC     2    0    0

30  Opt_VMC         OVC     2    0    0
31  Cse_OVMC        COC     0    0    2

32  Vs_target       Vt      2    0    0
33  Vs_targ%        Vt%     0    0    0
34  TWA_targ        WAt     0    1    1
35  Vs_perf         PPV     2    0    0
36  Vs_perf%        PP%     0    0    0
37  Vs_nav          PNV     2    0    0
38  Vs_nav%         PN%     0    0    0

39  Brg_o_Mrk       BOM     0    0    2
```

40	Dst_t_Mrk	DTM	2	0	4
41	Tm_t_Mrk	TTM	0	0	3
42	Curr_Rate	CrR	2	0	0
43	Curr_Dir	CrD	0	0	2
44	MCur_Rate	MCR	2	0	0
45	MCur_Dir	MCD	0	0	2
46	DCur_Rate	DCR	2	0	0
47	DCur_Dir	DCD	0	0	2
48	Battery	Bat	0	0	5
49	Rudder	Rud	1	1	0
50	AnSp1	sp1	1	0	0
51	gyro_hl	GHl	1	0	1
52	gyro_dhl	GdH	2	0	0
53	gyro_trm	GTm	1	0	1
54	gyro_dpt	GdP	2	0	0
55	gyro_hdg	GHg	0	0	2
56	gyro_dyw	GdY	2	0	0
57	Trim1	Tm1	1	0	0
58	forestay	frs	0	0	0
59	AnSp2	sp2	0	0	0
60	seatemp	sea	1	0	0
61	airtemp	air	1	0	0
62	Barometer	Bar	0	0	0
63	port_VS	pVS	2	0	0
64	stbd_VS	sVS	2	0	0
65	CMW_angle	CWA	1	1	1
66	CMW_speed	CWS	1	1	0
67	Depth	Dep	1	0	0
68	XTrkErr	XTE	2	0	4
69	TWA_OVMC	AOC	0	1	1
70	VMG_Targ	VGT	0	0	0
71	VMG_Targ%	VGP	0	0	0
72	OppTrkW	OTW	0	0	2
73	OppTrkG	OTG	0	0	2
74	Log	Log	2	0	4
75	pitchRMS	PMS	1	0	0
76	pitchPrd	PPd	1	0	0
77	SelUTC	UTC	1	0	0
78	SelSVA	SVA	1	0	0
79	SelQHD	QHD	1	0	0
80	Heading2	Hg2	1	0	2
81	Heel2	Hl2	1	1	1
82	Trim2	Tm2	1	0	1
83	Heading3	Hg3	1	0	2
84	Heel3	Hl3	1	1	1
85	Trim3	Tm3	1	0	1
86	BoatSpd2	VS2	1	0	0
87	VS2pad	V2p	2	0	0

```
88  SelHdg           SHg     1    0    2
89  SelHeel          SHl     1    1    1
90  SelTrim          STm     1    0    1
91  SelBoatSpd       VSS     1    0    0

92  Hdg2_Heave       Hv2     1    0    0
93  GGBrg            GGB     1    0    2
94  GGRng            GGR     1    0    0
95  HHDiff           HHD     1    0    1

96  MastWnd          MWM     0    0    1
97  AnSp4            AS4     0    0    0
98  AnSp5            AS5     0    0    0
99  AnSp6            AS6     0    0    0

100 gps1cog          cg1     0    0    2
101 gps1sog          sg1     2    0    0
102 gps1qhd          qh1     0    0    0
103 gps1sva          sv1     0    0    0
104 gps1utc          ut1     0    0    0

105 gps2cog          cg2     0    0    2
106 gps2sog          sg2     2    0    0
107 gps2qhd          qh2     0    0    0
108 gps2sva          sv2     0    0    0
109 gps2utc          ut2     0    0    0
```

The lines define the variables, as follows:

Variable Number	The unique identifying number for the variable
Long Name	Descriptive name for the variable (must not contain spaces)
Short Name	Short name for the variable
Decimal Places	The number of decimal places that data is stored with
Absolute Value	Absolute value (1) or not (0), new variables should be set to 0
Data Type	Standard data (0), -180° to +179° (1), 0 to 359° (2), time (3), distance (4)

Input Configuration Files

Defining Analogue Inputs and derived variables

sampleXX.d. Note. XX refers to a two-digit number, such as '08'.

This file lists all the analogue inputs, pulse inputs, derived variables and user variables (see page 4.25) to the WTP2. The variables are split into sections according to the type. The figures in the first line of the file give the number of inputs of each type (figures in brackets refer to the numbers in the example below, note that the number of items in the [uservars] section are not recorded here):

Analogue (16)	data received via the analogue board, e.g. heel angle
Pulse (4)	data received as a pulse direct from a component, e.g. boat speed, and wind speed
Derived (25)	calculated by the WTP2 from other variables. This cannot be changed by the user

The second line tells the WTP2 to use (1) or not use (0) data from the rate gyros (left hand figure) and mast rotation sensor (right hand figure) in wind calculations. These specifications will be overwritten if you alter either of these in the **Settings** dialog in Deckman (see page 2.9).

Each column then defines a particular item: the first column gives the name of the variable (from **bg_vars.d**) and the last three show the variable number (from **bg_vars.d**) and the names of the calibration and filtering files (***.cal** and ***.fil** respectively). For some types of inputs, there are additional columns. In the **[analogue]** section, the second column is the input card number (always '1' unless the Analogue Expansion option is installed) and the third the physical line of the input. In the **[pulse]** section, the second column refers to the physical line of the input.

```
16   4  25

1    0

[analogue]
MHU_A_B   1   0    7  null.cal      null.fil
MHU_A_G   1   1    6  null.cal      null.fil
MHU_A_R   1   2    5  null.cal      null.fil

gyro_dhl  1   3   52  gdheel.cal    gdheel.fil
gyro_dpt  1   4   54  gdpitch.cal   gdpitch.fil
gyro_dyw  1  11   56  gdyaw.cal     gdyaw.fil

rudder    1   5   49  null.cal      null.fil
Battery   1   6   48  null.cal      null.fil
MastRot   1   7   25  null.cal      null.fil
spare1    1   8   50  null.cal      null.fil
spare2    1   9   59  null.cal      null.fil

airtemp   1  10   61  null.cal      null.fil
spare4    1  12   97  null.cal      null.fil
Forestay  1  13   58  null.cal      null.fil
spare5    1  14   98  null.cal      null.fil
spare6    1  15   99  null.cal      null.fil

[pulse]
MHU_VA    0        9  MHUVA.cal     null.fil
portpad   2       63  portpad.cal   portpad.fil
stbdpad   3       64  stbdpad.cal   stbdpad.fil
VS2pad    1       87  vs2pad.cal    vs2pad.fil

[derived]
MW_angle            8  MWA.cal       null.fil
Boatspeed           2  null.cal      boatspd.fil
Orig_TWD           24  null.cal      Orig_TWD.fil
Orig_TWS           23  null.cal      Orig_TWS.fil
TW_dirn            18  null.cal      TW_dirn.fil
TW_speed           17  null.cal      TW_speed.fil
Course             14  null.cal      Course.fil
VMG                19  null.cal      vmg.fil
VMC                29  null.cal      vmc.fil
OptVMC             30  null.cal      OptVMC.fil
CseOVMC            31  null.cal      CseOVMC.fil
TWAOVMC            69  null.cal      TWAOVMC.fil
OppTrkW            72  null.cal      null.fil
OppTrkG            73  null.cal      null.fil
GyroHdg            55  null.cal      GyroHdg.fil
GyroHl             51  null.cal      GyroHl.fil
GyroTrm            53  null.cal      GyroTrm.fil
Leeway             12  null.cal      null.fil
pitchRMS           75  null.cal      pitchRMS.fil
pitchPrd           76  null.cal      pitchPrd.fil
CMWA               65  null.cal      CMWA.fil
```

```
CMWS                66  null.cal      CMWS.fil
Boatspd2            86  null.cal      boatspd2.fil
WindToMast          96  MWA.cal       null.fil
VS_Target           32  null.cal      vstarget.fil

[uservars]

============================================================
```

Compass input

compass1.d; compass2.d; compass3.d

The compassX.d files define the inputs of serial or networked compass sensors and their associated heel and trim sensors (see Appendix C: Supported Compass Types). Two examples of compass configuration files are shown below:

Example A. Using a NMEA serial compass

In this example we are configuring a standard NMEA compass input with heel and trim data, the format is as follows:

```
3 4800 N 8 1

heading1  3   13  heading1.cal  heading1.fil
heel1     3    0  heel1.cal     heel1.fil
trim1     3   57  trim1.cal     trim1.fil
========================================
```

Line 1 defines the COM port settings:

COM Port	WTP2 COM port used
Baud Rate	Baud Rate setting to suit the input
Parity	Parity setting to suit the input (usually 'N' for no parity)
Data Bits	7 or 8 to suit the input
Stop Bits	1 or 2 to suit the input
Compass Type	Identifies special compass types (see Appendix C)

All other lines define variable inputs for heading, heel and trim from this compass:

Variable Name	Name of the variable, for user information only
COM Port	Same port as the first line (above)
Variable Number	Variable number where data is stored (from **bg_vars.d**)
Calibration File	Filename of the calibration file to use
Filter File	Filename of the filter/damping file to use

Example B. Using a B&G networked compass

In this example we are configuring a B&G Halcyon Gyro-Stabilised compass sensor which is present on the B&G Fastnet network (probably attached directly to an ACP Pilot). When using a networked compass there are some specific changes to the serial input file shown above:

1. The COM port is set to "-1" which calls the B&G network port rather than one of the serial ports
2. The baud rate, parity, data bits and stop bits are ignored by the WTP2 so can be left at default values
3. The text "BGGYRO" is added to identify the compass type
4. The value in the variable line which normally shows the COM port is modified to be the function number on the B&G Fastnet bus.

```
-1 4800 N 8 1 BGGYRO

heading1 74   13  heading1.cal  heading1.fil
heel1    52    0  heel1.cal     heel1.fil
trim1   155   57  trim1.cal     trim1.fil

=========================================
```

GPS input

gps1.d; gps2.d

The gpsX.d files define the inputs of GPS units and the location of the antenna relative to the bow of the yacht. An example of a GPS configuration file is shown below:

```
4 4800 N 8 1
0.0  0.0

COG   4   100   null.cal   null.fil
SOG   4   101   null.cal   null.fil
QHD   4   102   null.cal   null.fil
SVA   4   103   null.cal   null.fil
UTC   4   104   null.cal   null.fil

=========================================
```

Line 1 defines the COM port settings:

COM Port	WTP2 COM port used
Baud Rate	Baud Rate setting to suit the input
Parity	Parity setting to suit the input (usually 'N' for no parity)
Data Bits	7 or 8 to suit the input
Stop Bits	1 or 2 to suit the input

Line 2 defines the GPS antenna position:

Offset	GPS Antenna offset from centreline (- Port, + Starboard) in feet
Bow to GPS	GPS Antenna distance from Bow in feet

The additional lines define the variables. Normally this should not be changed though, for example, you may wish to add a link to a filter file for SOG:

Variable Name	Name of the variable, for user information only
COM Port	Same port as the first line (above)
Variable Number	Variable number where data is added to (from **bg_vars.d**)
Calibration File	Filename of the calibration file to use
Filter File	Filename of the filter/damping file to use

NMEA input

nmeain1.d; nmeain2.d; nmeain3.d

This file controls NMEA inputs excluding any that may be for GPS or Compass sensors. A typical use for this file is to define the decoding of Depth and Sea Temperature from an active NMEA sensor.

File example (Depth and Sea Temperature):

```
2 4800 N 8 1

SDDBT   1  67  depth.cal    null.fil
YXMTW   1  60  seatemp.cal  null.fil

====================================
```

Line 1 defines the COM port settings:

COM Port	WTP2 COM port used
Baud Rate	Baud Rate setting to suit the input
Parity	Parity setting to suit the input (usually 'N' for no parity)
Data Bits	7 or 8 to suit the input
Stop Bits	1 or 2 to suit the input

The additional lines control the decoding of the NMEA sentences, as follows:

NMEA Code	NMEA sentence identifier
Input field	Position of the required value in the NMEA sentence
Variable Number	Variable number where data is stored (from **bg_vars.d**)
Calibration File	Filename of the calibration file to use
Filter File	Filename of the filter/damping file to use

Where the NMEA code is all the characters between the $ and the first comma in the NMEA sentence and the input field number is equal to the number of commas before the required value, for example the file above would decode the following input correctly:

```
$SDDBT,32.81,f,10.00,M,5.46,F*hh<CR><LF>
(where "f" is feet, "M" is metres and "F" is Fathoms)
$YXMTW,18.2,C*hh<CR><LF>
```

Special Case: The 'XDR' NMEA sentence is processed slightly differently as a special case due to the possibility of multiple inputs. The following example shows a single pressure sensor input (sensor type code "P"), decoding the following sentence:

```
$IIXDR,P,1.000,B,BARO*hh<CR><LF>
```

```
7 4800 N 8 1

IIXDR  P  2  62  baro.cal   null.fil

====================================
```

Line 1 defines the COM port settings (as in the previous example).

The additional lines control the decoding of the NMEA sentences, as follows:

NMEA Code	NMEA sentence identifier
XDR sensor type code	The 2nd field in the sentence which defines the sensor type
Input field	Position of the required value in the NMEA sentence
Variable Number	Variable number where data is added to (from **bg_vars.d**)
Calibration File	Filename of the calibration file to use
Filter File	Filename of the filter/damping file to use

Note that if a checksum is present on an incoming NMEA sentence it will be checked and the sentence discarded if incorrect, if checksums are not present the sentence will be accepted "as is". It is recommended to implement checksums where possible to avoid incorrect data being accepted.

Display Output configuration files

Fixed Fastnet menus

fixmenu.d

This file controls the configuration of the standard function menus onto the FFD displays – the menu items which are standard parts of the WTP2 system but <u>are not declared normally</u> by the FFD are declared here.

Modifying this file is not recommended. It is suggested that users adjust the **usermenu.d** file to alter network output settings. The format of the file is shown below for completeness.

```
POL_SPD_KT    0102   3  7e  5
TARG_SPDKT    0102   4  7d  5
REACHINGPC    0102   5  7c  5

MEAS_W/A_@    0106   5  5a  5
MEAS_W/SKT    0106   6  57  5
WA_MAST__@    0106   7  9D  5
TARG_TWA_@    0106   8  53  5

HEEL_____@    0107   1  34  5
TRIM_____@    0107   2  9B  5
MAST_ANG_@    0107   3  9C  5
```

```
YAW_RTE_@S     0112   1  44  15
PTCH_RTE@S     0112   2  9E  15
ROLL_RTE@S     0112   3  3C  15
```

The format is:

Menu item name	This name is defined in the menus
Menu number	Defines which menu contains the function (see **usermenu.d** for full list)
Order in chain	The position of the function in the menu
Fastnet Function Number	The Fastnet function number of the function in hexadecimal
Node	The Node number that the menu is declared from (for system compatibility)

Note: The text in the first column (e.g. **POL_SPD_KT**, etc.) is not seen on the displays, and is only to make it easier to recognise what the numbers refer to; if custom titles for the menu items are required then the items should be sent using **userout.d** as described in the next section.

Fixed Fastnet output

fixout.d

This file controls the standard data outputs onto the B&G Fastnet network – variables such as Boat Speed, Wind data, Heading etc. (which are common to all systems) are defined here.

Modifying this file is not recommended. It is suggested that the users' adjust the **userout.d** file if it is necessary to alter network output settings. The format of the file is shown below for completeness.

```
11

4  0  0  5
51  /AWA_____M   10  0
55  /TWS_____KT  17  1
4d  /AWS_____KT  11  1
59  /TWA_____@   16  1

4  0  0  5
57  /MWS_____KT   9  1
5a  /MWA_____@    8  0
49  /HDG_____@M  55  0
4a  /HDGR____@M  55  0

4  0  0  5
4e  /AWSR____KT  11  1
6d  /TWD_____@M  18  0
6e  /TWDR____@M  18  0
52  /AWAR_____@  10  0

3  0  0  1
41  /VS_____KT   91  2
42  /VSR_____KT  91  2
7F  /VMG_____KT  19  2

4  1  0  5
44  /YAW_RTE_@S   56  1
9E  /PTCH_RTE@S   54  1
```

```
3C  /ROLL_RTE@S   52  1
75  /TIMER___MS   -1  0

4  1  1  5
7e  /POL_SPD_KT   35  1
7d  /TARG_SPDKT   32  1
7c  /REACHINGKT   36  1
53  /TARG_TWA_@   34  0

2  9  1  1
C1  /DEPTH____M   67  1
1F  /SEA_TEMP_C   60  1

3  9  3  5
87  /BAROMETRMB   62  1
82  /LEEWAY___@   12  1
9a  /OPP_TACK@M   72  0

3  9  5  9
e8  /DTW_GC__NM   40  1
e6  /BTW_GC__@M   39  0
ee  /XTE_____NM   68  2

4  4  0  5
9C  /MAST_ANG_@   25  0
9D  /WA_MAST__@   96  0
9B  /TRIM_____@   90  1
34  /HEEL_____@   89  1

4  4  2  9
ea  /COG_____@M   28  0
eb  /SOG_____KT   27  1
84  /TIDE_SET@M   43  0
83  /TIDE_RTEKT   42  1

============================
```

Line 1 defines the number of Transmit Groups in the file

The first line of each Transmit Group defines:

Number of variables	Up to a maximum of 5 in each group
Transmit delay*	Effectively sets the update rate (0=10Hz, 1=5Hz, 2=3.3Hz, 4=2Hz, 9=1Hz)
Transmit offset*	Allows spacing of data transmission on network to optimise bandwidth
Transmit Node ID	Allows full system compatibility with other Fastnet devices

*Example of Transmit delay and offset on Fastnet Traffic can be seen in the **userout.d** section.

Further lines in each group:

Fastnet Function number	Must match the number defined in the menu (see **fixmenu.d**)
/Function name	Name displayed on the FFD (not transmitted in **fixout.d**, reference only)
Variable number	From bg_vars.d
Decimal Places	The number of decimal places shown on displays

Note that the **fixout.d** file does not support context switching or time based oscillation of functions – **userout.d** should be used for this purpose.

Defining Custom Fastnet Menus

usermenu.d

This file enables you to either add a function to an existing menu or add a new menu with associated functions.

In the file example shown below we have added two new menus called DECKMAN and SAILS with functions and we have also added two functions to the existing PARAMTR menu. Note that the Deckman functions are all named RemoteX as the Deckman software will send the relevant function text with the function – here we are just defining a placeholder in the menu.

```
DECKMAN      01b1  03
REMOTE1      01b1  01  F0
REMOTE2      01b1  02  F1
REMOTE3      01b1  03  F2
REMOTE4      01b1  04  F3

SAILS        01b2  04
MAIN_POS     01b2  01  A1
JIB_CAR_P    01b2  02  A2
JIB_CAR_S    01b2  03  A3

CWA______@   0112  04  A8
CWS______@   0112  05  A9
```

The file format here is best dealt with by looking at part of the example above:

```
SAILS        01b2  04
MAIN_POS     01b2  01  A1
JIB_CAR_P    01b2  02  A2
JIB_CAR_S    01b2  03  A3
```

The first line creates a new menu called SAILS, format as follows:

Menu name	As is appears on the FFD - “SAILS” in the example above
Menu ID number	New menus use ID numbers 01b1, 01b2, 01b3 etc.
Menu position	Identifies where the menu appears in the FFD - here it is 4th in the chain

The following lines add functions to the menu – here we are adding three functions to the menu, the Mainsheet Traveller position and Jib Car positions (port and starboard). The format is as follows:

Function Name	As is appears on the FFD - e.g. “MAIN_POS” in the example above*
Menu group ID	The ID number of the menu group the function is to appear in (see below)
Function order	The position in the menu the function should appear (simple 01, 02, 03 etc.)
Fastnet Function number	The hexadecimal value of the fastnet function number

* If you wish to display units use “_” for a space, “@” for a degrees sign.

New functions should use Fastnet function numbers a1-a4 and a8-ae. If further function numbers are required please contact B&G.

New menus use ID numbers 01b1, 01b2, 01b3 etc. Existing menus are numbered as follows:

SPEED	0102
LOG	0103
DEPTH	0104
NAVIGATE	0105
WIND	0106
PERFORM	0107
WAYPOINT	0108
MOTOR	0109
TEMP	010a
TIME	010b
MISC	010c
PARAMTR	0112
EXTERNAL	0113

Note: any items added in any of the menu or output files need to be defined correctly in bg_vars.d etc. so that the function exists in WTP2 in the first place.

Defining Custom Fastnet Outputs

userout.d

This file controls how additional "user" data is sent from the WTP2 to the displays and allows you to have different variables shown according to your point of sailing and/or to have oscillating variables on a time basis.

Any variable detailed in this output must have been defined in **bg_vars.d** and a menu item defined using **usermenu.d** to enable you to access the data from a display. The only exception to this rule is remote Deckman outputs that are dealt with automatically by WTP2.

```
2

3  9  7
A1  /MAIN_POS   115 2
A2  /JIB_CAR_P  116 2
A3  /JIB_CAR_S  117 2

2  9  8
A8  /CWA_____@ 65  1
A9  /CWS_____KT 66  1

=====================================
```

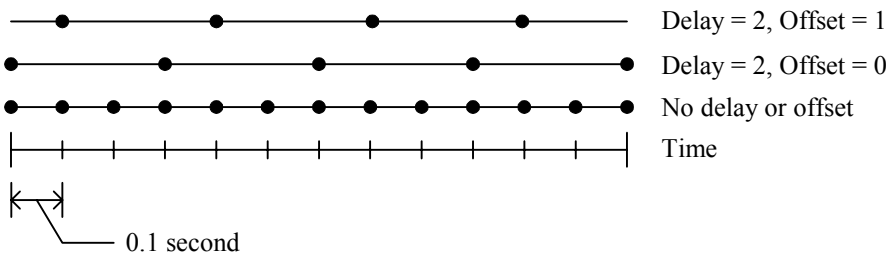
The first line of the file contains a single number which defines the number of transmit groups that follow; in the example above we have 2 transmit groups.

The first line of each group defines:

Number of variables	Up to a maximum of 5 in each group

Transmit delay	Effectively sets the update rate (0=10Hz, 1=5Hz, 2=3.3Hz, 4=2Hz, 9=1Hz)
Transmit offset	Allows spacing of data transmission on network to optimise bandwidth

Example of Transmit delay and offset on Fastnet Traffic:



Further lines in each group:

Fastnet Function number	Must match the number defined for the menu (**usermenu.d**)
/Function name	Name displayed on the FFD once data is transmitted, see below for options
Variable number	From bg_vars.d
Decimal Places	The number of decimal places shown on displays

Variable switching

The **userout.d** file can be configured so that variables oscillate on a time basis or on a context sensitive basis where the variables switch whether the boat is sailing upwind, reaching, downwind or in the pre-start. These options are shown in the modified example below:

```
2

3  1  0
A1  /MAIN_POS   115 2
A2  /JIB_CAR_P  116 2 JIB_CAR_S  117 2
A3  /AWA         10 0  /TWA 16 0  /TWA 16 0  /TIMER -1 0


2  9  8
A8  /CWA_____@ 65  1
A9  /CWS_____KT 66  1

=======================================
```

Here we have two changes:

- The two Jib Car variables oscillate automatically – the time delay is set via the **osc_time** value in Deckman (Instrument Control, Settings)

- We have added an output that switches on the sailing context: AWA upwind, TWA when reaching or downwind and Timer during the start sequence. The True Wind Angles for switching between upwind, reaching and downwind variables are set using the **UP-RE_angle** and **RE-DW_angle** values in Deckman (Instrument Control, Settings).

The format for the context switching is: /upwind section [/reach section] [/downwind section] [/start section], the sections within [brackets] are optional. If information is not specified for all of these sections, the information for the upwind section will be repeated for all missing sections.

It is also possible (though uncommon) to combine these functions, the following line would oscillate the Jib Car variables upwind and display TWA when either reaching or downwind with Timer in the pre-start:

```
A2  /JIB_CAR_P  116 2 JIB_CAR_S  117 2  /TWA 16 0  /TWA 16 0  /TIMER -1 0
```

Note: that all items output from the **userout.d** file are output to the network on Node 10.

Deckman Output configuration files

Data output to Deckman

dmnvars.d

This file defines which variables are output to Deckman.

```
55
18
17
91
2

89
10
11

55
18
17
91
2

22
23
90

77
78
79

55
18
17
91
2

24
16

55
18
17
91
2
```

```
14
12

55
18
17
91
2

28
27
==========================================
```

Each line defines a single variable that is output to Deckman; the operation of this file varies slightly depending on whether the communication with Deckman is serial or Ethernet.

For Serial communications the entire contents of the file, including duplicate items, are sent once per second - so in the example above there are some variables (55, 18, 17, 91, 2) which are repeated five times, these variables are therefore sent five times per second (5Hz), 5Hz is the maximum rate used on the serial output.

For Ethernet communication each unique item in the file is sent at the rate detailed in **ethernet.d** (10Hz by default), additional repeated variables are ignored.

Settings control in Deckman

settingX.d

This file defines the settings which are controllable from Deckman, these values are fixed in the source code so must not be changed. It is not necessary to modify this file directly.

```
mast_height S   0  5  1   60.0
leeway_cal  S   1  4  1    0.0
use_heel    S   2  4  0    1
use_gyro    S   3  4  0    1
variation   S   4  5  1    0.0
osc_time    S   5  4  0   20
UP-RE_angle S   6  4  0   80
RE-DW_angle S   7  4  0  120
TWS_factor  S   8  4  2    1.00
use_mrot    S   9  4  0    0
use_3D      S  10  4  0    1
damp_3D     S  11  5  3    0.970
sel_comp    S  12  4  0    1
sel_heel    S  13  4  0    1
sel_trim    S  14  4  0    1
sel_speed   S  15  4  0    1
sel_GPS     S  16  4  0    1
boatlog     S  17  5  2    0.00

=====================================
```

Each line defines a different setting item. All these items can be modified from within the Instrument Control option in Deckman.

Description of each item:

mast_height	mastheight (feet)
leeway_cal	leeway calibration factor (see Note below)
use_heel	use heel in calculations (0 off, 1 on)
use_gyro	use gyro in calculations (0 off, 1 on)
variation	magnetic variation (+East, -West)
osc_time	time (in tenths of seconds) for oscillating variables (see userout.d)
UP-RE_angle	angle for switch between upwind and reaching variables
RE-DW_angle	angle for switch between reaching and downwind variables
TWS_factor	TWS adjustment factor
use_mrot	use mast rotation (0 off, 1 absolute value, 2 full rotation)
use_3D	use 3D gyro correction in heading (0 off, 1 on)
damp_3D	3D damping parameter (DO NOT CHANGE should be 0.970)
sel_comp	compass select (1, 2 or 3), see page 2.5
sel_heel	heel select (1, 2 or 3), see page 2.5
sel_trim	trim select (1, 2 or 3), see page 2.5
sel_speed	boatspeed select (1, 2 or 3), see page 2.6
sel_GPS	GPS select (1 or 2), see page 2.6
boat_log	total distance travelled

Each line is the same format, as follows:

Item name	As it appears in Deckman
“S”	denotes a Setting item
Item ID	Numeric ID, in sequence (fixed in the application, do not change)
Width of field	Width of display field in characters (inc. decimal point)
Decimal places	Number of decimal places required
Value	The value of the setting item

Note: The standard leeway calculation is:

$$Leeway = \frac{K\ x\ Heel}{Boatspeed^2}$$

where K is the leeway constant, as set in the settingX.d file.

Calibration control in Deckman

svcals.d

This file defines which variables have calibration control available in Deckman. The following format is the default file, it is flexible for the user to add/delete items as required.

```
Bspd_port  K  63  4  2  2
Bspd_stbd  K  64  4  2  2
Heading1   K  13  4  1  0
heel1      K   0  3  1  0
trim1      K  57  3  1  0
MHU_angle  K   8  3  0  0
Forestay   K  58  4  2  0
depth      K  67  4  1  0
==========================
```

Each line defines a separate calibration option, format as follows:

Variable Name	As it appears in Deckman
"K"	Denotes a calibration value
Variable Number	The variable number to calibrate (from **bg_vars.d**)
Width of field	Width of display field in characters (inc. decimal point)
Decimal places	Number of decimal places required
Calibration Type	Sets type: intercept (0), slope (1), inverted slope (2), set value (3)

Note there are no actual damping values in this file - these are stored in the relevant ***.cal** file.

Changing calibration settings through Deckman that are listed in the **svcals.d** file only controls the calibration in the first line of the ***.cal** file. Additional calibration settings within the file (e.g. a table) must be edited directly within the file itself. The way in which the first line of the ***.cal** file is altered by Deckman is controlled by the Calibration Type setting within **svcals.d**. The first line of the ***.cal** file is always a straightforward linear calibration and Deckman can alter this in four ways:

0: Change the intercept - changes the value of the calibrated output when the input is zero but keeps the gradient of the calibration the same. This effectively offsets the output by the amount the intercept is changed by and is commonly used for sensors such as depth, rake or rudder where the zero position may have to be changed.

1 & 2: Change the slope or inverse slope – alters the gradient of the calibration without changing the offset. The inverse slope option is typically used in boatspeed calibration where the slope is normally presented as its inverse in Hz/Knot.

3: Set the value – alters the slope to match the output to the value entered without changing the intercept. This is often used on load sensors where the intercept is known to be zero tonnes at zero volts and then the sensor is attached to a known load for calibration.

Damping control in Deckman

damping.d

This file defines which variables have damping control available in Deckman. The following format is the default file, it is flexible for the user to add/delete items as required.

```
boatspeed  D   2  4  1
heading1   D  13  4  1
gyrohdg    D  55  4  1
course     D  14  4  1
TW_speed   D  17  4  1
TW_dirn    D  18  4  1

=========================
```

Each line defines a separate damping option, format as follows:

Variable Name	As it appears in Deckman
"D"	Denotes a damping value
Variable Number	The variable number to apply damping (from **bg_vars.d**)
Width of field	Width of display field in characters (inc. decimal point)
Decimal places	Number of decimal places required

Note there are no actual damping values in this file - these are stored in the relevant ***.fil** file.

Ethernet Configuration

ethernet.d; fixedIP.txt

fixedIP.txt defines the IP address and subnet used by the WTP2. If it is desired to use IP addresses assigned by an external DHCP server then you should rename this file.

```
IPAddress  192.168.0.2
Subnetmask 255.255.255.0
```

ethernet.d defines the settings for the data transmission on Ethernet.

```
networkON         1
UDPfrequency     10
UDPprotocol       1
multicastaddr   234.1.1.1
multicastport  5602
```

Each line defines a separate item, format as follows:

networkON	Use Ethernet communications (1), or disable Ethernet and use serial (0)
UDPfrequency	Sets the frequency (Hz) that data is sent to Deckman on Ethernet (max 10)
UDPprotocol	1
multicastaddr	The network address that the WTP2 data is sent from (default value shown)
multicastport	The port used for WTP2 data (default value shown)

Note that many PCs will require firewall settings to be altered to allow WTP2 UDP multicast data to be accepted on port 5602.

Polar Tables

navpol.d; perfpol.d

These files contains the polar table information used within WTP2, it is not normal to modify these files directly - they are modified when the table is altered in Deckman to suit your boat.

	v1	a1	v2	a2	v3	a3	v4	a4	v5	a5
2.0	1.45	70	1.48	80	1.48	110	1.29	125	0.58	180
4.0	2.66	60	2.73	70	2.96	110	2.56	130	1.28	180
6.0	5.40	51	6.04	70	6.09	110	5.56	138	3.65	180
7.0	6.57	50	6.78	70	6.91	110	6.34	138	4.16	180
8.0	6.91	50	7.42	70	7.52	110	7.18	138	4.74	180
10.0	7.14	48	8.08	70	8.29	110	8.04	138	5.31	180
12.0	7.53	46	8.42	70	8.80	110	8.43	142	5.95	180
14.0	7.76	45	8.67	70	9.14	110	8.70	146	6.46	180
16.0	7.94	44	8.87	70	9.54	110	8.99	149	6.91	180
20.0	8.23	43	9.20	70	10.32	110	9.46	156	7.74	180
25.0	8.25	43	9.28	70	10.37	110	9.50	157	7.81	180

True Wind Correction Tables

adjwa.d; adjvt.d

These files define the corrections applied to True Wind Angle (**adjwa.d**) and True Wind Speed (**adjvt.d**) data. The format of both files is the same, it is not normal to modify these files directly - they are updated when the table is altered in Deckman.

	v1	a1	v2	a2	v3	a3
2.0	0.0	60	0.0	90	0.0	130
4.0	0.0	60	0.0	90	0.0	130
6.0	0.0	50	0.0	90	0.0	130
8.0	0.0	45	0.0	90	0.0	130
10.0	0.0	40	0.0	90	0.0	130
12.0	0.0	40	0.0	90	0.0	130
16.0	0.0	40	0.0	90	0.0	130
20.0	0.0	40	0.0	90	0.0	130
24.0	0.0	40	0.0	90	0.0	130
28.0	0.0	40	0.0	90	0.0	130
32.0	0.0	40	0.0	90	0.0	130

Log Mileage

boatlog.d

This file simply contains the total mileage travelled, the value can be modified using settings in Deckman's Instrument Control dialogue.

Optional Files (Advanced)

Pre-Start True Wind Correction Tables

adjstrwa.d; adjstrvt.d

These files define the corrections applied to True Wind Angle (**adjstrwa.d**) and True Wind Speed (**adjstrvt.d**) data when the WTP2 is in pre-start mode. The format of both files is the same as the normal correction tables (see page 4.20).

If these files are not present the normal tables will be used at all times (this is the default setting). The pre-start wind files can be loaded and modified in Deckman using the **Adjust start wind angle** and **Adjust start wind speed** options in the Start screen menu.

NMEA output

nmeaout.d

When present this file controls the NMEA output from the WTP2. A typical use for this file is to output wind and other instrument data onto another NMEA enabled device such as a chartplotter. There is a standard set of output sentences that are outputted and these are listed in the file. It is not possible to change the sentences that are used.

```
7 4800 N 8 1

GLL
VTG
VHW
MWD
VWR
VWT
MTW
XDR
HDG

======================================================================
```

Line 1 defines the COM port settings:

COM Port	WTP2 COM port used – this can be shared with a NMEA input device
Baud Rate	Baud Rate setting to suit the input, usually 4800 for NMEA
Parity	Parity setting to suit the input (usually 'N' for no parity)
Data Bits	7 or 8 to suit the input, usually 8 for NMEA
Stop Bits	1 or 2 to suit the input, usually 1 for NMEA

Subsequent lines list the sentences that are output.

Fast Serial Output

fastout.d

This file enables a high-speed serial output containing the variables listed in the file, as an example the file below would output the following string:

```
7 57600 N 8 1

93 x 5 1
94 y 5 1
13 a 5 1
55 b 5 1
80 c 5 1
51 d 4 1
81 e 4 1
53 f 4 1
82 g 4 1
92 h 4 2
16 i 4 0
2  j 5 2

=====================================================

other lines: WTP variate number
             tag character
             numeric field width
             decimal places
```

Line 1 defines the COM port settings:

COM Port	WTP2 COM port used
Baud Rate	Baud Rate setting
Parity	Parity setting to suit the input (usually ‘N’ for no parity)
Data Bits	7 or 8 to suit the input
Stop Bits	1 or 2 to suit the input

The additional lines control the output variables, as follows:

Variable	WTP2 variable number
Tag Character	A unique character to identify the output variable
Field Width	The width of the output field
Decimal places	Number of decimal places required on the output

From the above file, the WTP2 will transmit data in the following format:

```
1140700826.78,18178469,-467165,18178472,-467167
j0.00
i28
h0.0
g0.0
f-9.7
e0.0
d1.1
```

```
c0.0
b8.9
a0.0
y0.0
x0.0
```

The output file is made up as:

timestamp,lat1,long1,lat2,long2
id variable
id variable
etc.

Where:

timestamp	seconds (since 1 Jan 1970)
lat1	GPS1 Latitude (Degrees x 360000), bow position
long1	GPS1 Longitude
lat2	GPS2 Latitude
long2	GPS2 Longitude

Decoded example:

1140700826.78	23/02/2006 13.20
18178469	GPS1 Latitude: 50º 29.744’ N
-467165	GPS1 Longitude: 1º 17.86’ W
18178472	GPS2 Latitude: 50º 29.75’ N
-467167	GPS2 Longitude: 1º 17.861’ W

Serial Loadcell Configuration

loadcell.d

The addition of this file allows the WTP2 to accept serial inputs from loadcell systems which are generally used for large numbers of loadcells. If a small number of loadcells are installed it is normal to use an analogue device and to connect to analogue inputs on the WTP2.

The loadcell input accepted via **loadcell.d** is as follows (additional loadcells increment *n* as their identifier):

U*n*=xxx.xx<CR><LF>

```
6 4800 N 8 1

forestay  1   58  forestay.cal  null.fil

=======================================
```

Line 1 defines the COM port settings:

COM Port	WTP2 COM port used
Baud Rate	Baud Rate setting
Parity	Parity setting to suit the input (usually 'N' for no parity)
Data Bits	7 or 8 to suit the input
Stop Bits	1 or 2 to suit the input

The additional lines control the input variables, as follows:

Variable Name	variable name for reference
Sentence ID	"*n*" in the example sentence above
Variable Number	Variable number where data is added to (from **bg_vars.d**)
Calibration File	Filename of the calibration file to use
Filter File	Filename of the filter/damping file to use

Example on using the data files

Imagine you wanted to add a linear displacement transducer to your system to tell you the forward or aft position of the mast foot. This would give out a voltage that would need to be fed onto the analogue.

Note: If your system requires additional inputs, the WTP2 can be supplied with an analogue expansion card.

In this example we will add a variable called 'mastfoot' which we will input to analogue channel 8.

In **bg_vars.d** we add a line to define the new variable, in this case the next variable number is 110, so we add the following line setting variable 110 to be mastfoot and having two decimal places (for further information on the file format see page 4.2):

```
110  mastfoot  mst  2  0  0
```

In sampleXX.d we need to define the sampling of the analogue channel, so we modify the line for analogue channel 8 to read as follows:

```
mastfoot  1  8  110 mastfoot.cal  mastfoot.fil
```

This defines that the function called 'mastfoot' is sampled on analogue input card 1, channel 8 and mapped onto variable 110 being calibrated and filtered with the listed files.

At this stage we would like to show the variable on the displays, as an example we will add the function 'MASTFOOT' to the PARAMETER menu. First we need to add the menu item in **usermenu.d**, for this we add one line:

```
MASTFOOT  0112  a1  4
```

This new menu item, 'MASTFOOT', would now be displayed in the **'**PARAMETER' menu (0112), using fastnet function number 'a1', the '4' defines the location of the menu item within the item list.

We now need to output the data onto the network so that when you select the item from the menu there is data to display, this is done using the **userout.d** file. In this example we will output the data twice per second, given that there are currently no outputs at this rate we need to add another transmit group to the existing file:

Existing file:

```
1

2  9  7
A8  /CWA_____@ 65  1
A9  /CWS_____KT 66  1

=======================================
```

Modified file:

```
2

2  9  7
A8  /CWA_____@ 65  1
A9  /CWS_____KT 66  1

1  4  1
A1  /MASTFOOT   110  2
=======================================
```

As can be seen, in addition to adding the extra transmit group we have also modified the first line of the file to read '2', which identifies the number of transmit groups that follow.

The final thing to do would be to create new calibration and damping files (**mastpos.cal** and **mastpos.fil**) in the relevant folders with appropriate values, and, if required, add the new variable into **damping.d** and/or **svcals.d** to allow damping and calibration from Deckman (see Chapter 5: Parameters for more information on these). If calibration or filtering of the variable is not required it is normal to use **null.cal** and **null.fil** respectively as the calibration and damping filenames.

User variables

You are able to create your own data variables, taking data from your existing variables and then filter/damp and calibrate them as you wish. There are a number of different facilities for use here, including the possibility of variables being calibrated with respect to another variable. User variables are defined in **sampleXX.d** under the [uservars] section and then can be passed to Deckman or the display network as normal.

New variables are first added to the variable list in **bg_vars.d**. Once the new variables have been created, add the new variables to the [uservars] section in **sampleXX.d**, enter the name of the variable, the WTP identification number of your new variable, followed by the WTP identification number of the variable you wish to base it upon and then calibrate or filter, the name of the calibration file (which must end ".cal") and the name of the filtering file (ending ".fil") as follows:

```
[uservars]

User1      96    2    user1.cal    user1.fil
```

Note: to have no filtering or calibration for a user variable, simply enter null.cal or null.fil in the relevant place.

Example

The new variable we are adding here is a Moving Average for the True Wind Direction, we will call the variable MA_TWD.

In **bg_vars.d** we add a line to define the new variable, in this case the next available variable number is 110, so we add the following line setting variable 110 to be MA_TWD, has zero decimal places and is 0-360 data.

```
105   gps2cog     cg2   0    0    2
106   gps2sog     sg2   2    0    0
107   gps2qhd     qh2   0    0    0
108   gps2sva     sv2   0    0    0
109   gps2utc     ut2   0    0    0

110   ma_twd      mwd   0    0    2

= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
number, long name, short name, decimals, abs val, type
```

Next, we add the new variable to the [uservars] section of **samplexx.d** (this means that the new variable we are creating (represented by WTP variable number 110, in the second column) is using data from WTP variable 18 (third column). WTP variable 18 is True Wind Direction. We have not applied a calibration file (shown by **null.cal**), but we have specified a filtering file named **ma_twd.fil**.

```
pitchRMS           75  null.cal      pitchRMS.fil
pitchPrd           76  null.cal      pitchPrd.fil
CMWA               65  null.cal      CMWA.fil
CMWS               66  null.cal      CMWS.fil
Boatspd2           86  null.cal      boatspd2.fil
WindToMast         96  MWA.cal       null.fil
TargetBSpd         32  null.cal      TargBSpd.fil

[uservars]
MA_TWD      110    18  null.cal      ma_twd.fil

================================================
```

All that remains now is to create the relevant filtering and calibration files.

Example of filter file: **ma_twd.fil**

```
6   100
```

This would take the value of the True Wind Direction variable and create a moving average (filter type 6) over 10 seconds (100/10). No calibration file is used in this example, though you can add one as required.

Chapter 5: Parameters

Note: It is only recommended that advanced users alter the parameter files directly as described in this chapter. Most simple calibration, damping etc. can be controlled from Deckman as described in Chapter 2: Basic Operation.

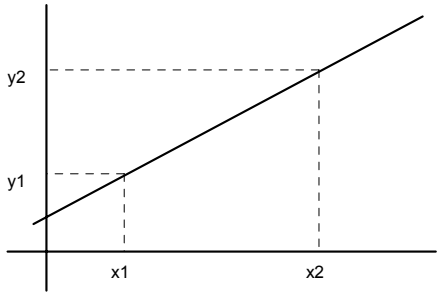
Calibration

Each variable requiring calibration has its own calibration file (**.cal** file extension), all calibration files are located in the **Calibs** directory.

Various calibration functions are available to the WTP2 but most of them are variations on linear as in the diagram.

The first parameter describes the type of calibration:

ID	Calibration Type
0	Null calibration
1	Ordinary linear
2	Linear for 0° to 360°
3	Linear for –180° to 179°
4	Table
5	Table for 0° to 360°
6	Table for –180 to 180°



The next two numbers are *x1*, *y1*; and the final two are *x2*, *y2*. *x* is the independent variable (which is actually a voltage on the AD board, or pulses per second for boat speed and wind speed) and *y* is the dependant variable that we need to calibrate.

We will use the example of calibrating a compass. A possible simple calibration file (**heading.cal**) might look like:

```
2  0  20  5  25
```

This would add a 20° offset, it is unlikely that you would ever have to apply such a large offset to a compass the large numbers are just to illustrate the functionality below.

Functions 4, 5 and 6 are more complicated. The first line of the file is the same as for calibrations 1, 2 and 3; after this you create one or more tables to further calibrate the variable, and these operate on whatever the output is from the first line. The first way that this can be done is with one simple table of corrections.

Advanced calibration example 1

A sample file might look like:

```
5 0 20 5 25

Table -1 +
0     10
180  -10
360   10
```

The first line of the file still works the same as before but the result is then further calibrated from the table. The –1 following the word `Table` indicates that the corrections are applied directly to the output from the initial calibration. Next, the addition sign (+) after the `-1` indicates that the corrections in the table are to be added. Then, the numbers in the left column indicate values of the incoming data, while the right column indicates the correction to be applied, with interpolation for values between the defined values. The table below indicates the result of this two-stage calibration:

Original Data	Result of First Line	Result after Table
0	020	028
90	110	108
180	200	192
340	000	010

You can see the interpolation for headings between those at which the corrections are specified and that the calibrations in the table are applied to the output from the first line of the file rather than the original input.

It is also possible to calibrate your variable with respect to another variable in the WTP2 database.

Advanced calibration example 2

For example, you could enter:

```
5 0 20 5 25

table -1 +
0     10
180  -10
360   10

table  0 +
-20   10
0      0
20    10
```

The first line and first table of this are identical to above, but the outcome of the first table is then further modified by the second table. In the example, the –1 after the word table indicates that the correction was applied to the variate itself. Entering any other number after the word table means that we are calibrating with respect to another variable in the WTP2's database, with the variables referred to by the **bg_vars** identification number (see **bg_vars.d** on page 4.2). In the example above, the 0 refers to the **bg_vars** identification number for Heel. The second table therefore applies corrections depending on the angle of heel: the fist column is the angle of heel and the second is the correction to be applied to the compass. The result of the second table in the above example would be:

Input from 1st Table	Angle of Heel	Result after 2nd Table
50	30	65
50	10	55
50	0	50
50	-20	60
50	-30	65

Here, the offset to the compass heading is altered by the heel angle. Of course, the corrections in the previous table will continue to be applied before the corrections with respect to heel.

Here you can see that, as well as interpolating within the calibration points you enter, the WTP2 will also extrapolate outside them.

Advanced calibration example 3

It is also possible to multiply, subtract and divide in your corrections. For example, a table to alter boat speed with respect to angle of heel might look like:

```
4  0  0  1  1

table 0 *
-40  0.95
-30  0.95
-25  0.975
-20  0.99
-15  1.0
 15  1.0
 20  0.99
 25  0.975
 30  0.95
 40  0.95
```

This table is, therefore, taking the standard input from boat speed (which would be specified in the **bg_vars.d** file) and applying a correction based on angle of heel (**bg_vars** identification number 0 after table). So far, this is operating the same as the example above. Next, however, we have a multiplication sign (*****), which indicates that boat speed is to be multiplied by the values in the table. Then the table works as before for calibrating with respect to another variable: the left column indicates the value at which the calibrations to be applied while the right column is the multiplication factor. The example above would act to reduce boat speed with increasing angle of heel.

Other identifiers and operators

As well as the word `table`, it is also possible to use two other identifiers:

`Variable`	The following number refers to the **bg_vars** number and a mathematical symbol indicates what operation is to be performed.
`Constant`	To specify a constant value to use in the calculation; a mathematical symbol indicates what operation is to be performed.

There are also a number of mathematical operators that you can use:

+	Add
-	Subtract
*	Multiply
/	Divide
=	Assigns a value to the variable you are calibrating

Calibration example 4

The line

```
constant 3.3 *
```

would mean that we are multiplying by a constant value of 3.3.

Calibration example 5

By way of an example we will attempt to recreate the leeway calculation that WTP2 does as standard. The standard calculation is based on the formula:

$$Leeway = \frac{K\ x\ Heel}{Boatspeed^2}$$

Refer to the **settingX.d** file on page 4.16 for more information.

Let us suppose we wish to recreate this but artificially limit heel to 25 degrees and using a leeway constant of 6.4. The file (**leeway.cal**) would look like this:

```
4  0  0  1  0

table 89 =
-30  -25
-25  -25
 25   25
 30   25

constant 6.4 *

variable 91 /
variable 91 /
```

The first line of this is taking the input from **samplexx.d** for Leeway and ensuring it is set to 0, the output of the first line is 0 no matter what the input (refer to example 1 above). The table then takes the value of Selected Heel (**bg_vars** variable 89**)** and the equals signs means that we are assigning values for leeway based on heel. The effect of this table would be that, for Heel values up to 25, the value assigned would be exactly the same as the Heel angle. Above 25, the assigned value will stay at a constant of 25 since when the system will interpolate between 25 and 30 the assigned value remains 25, and beyond 30, the extrapolation will still give the value 25. The next line will multiply by the leeway constant of 6.4 and each of the final two lines will divide by selected boat speed (**bg_vars** variable 91) to complete the formula.

Summary

The following provides a summary of the operation of the calibration tables:

- The calibrations are applied sequentially, so that those specified first in a file will be applied before those specified later.
- Identifiers recognised are `table`, `constant` and `variable`**.**
- Number '`-1`' indicates that the calibrations are applied directly to the variable.
- Any other number indicates that the calibration is with respect to a different variable in the WTP2 database, with the number being the variable number from **bg_vars.d.**

Sensor Calibration

Rate Gyros

During assembly the output of each channel is measured as mV per degree per second. So if, for example, the measured response of the gyro was 111.1 mV/degree/sec then a 1.0 volt input would indicate a pitch or roll rate of 9.0 º/s. A reading from the AD board of 0V indicates a rate of 0 º/s, therefore appropriate calibration values would be 0.0, 0.0) and (1.0, 9.0). There should be no need to change the pre-set values, unless you want to see the effect of removing one or more of the sensors.

Boat Speed

This calibration is expressed as Hertz per knot (Hz/kt) so for a calibration of 3.50 Hz/kt enter (0.0, 0.0) and (3.50, 1.0). Both port and starboard should be calibrated.

```
1  0.00  0.00  3.50  1.00
```

Wind Speed

The B&G systems use W = (1/A)H + B where A is calibration in Hz/kt, H is the anemometer frequency and B is an offset. So for the standard of A=1.04 and B=1.04 the equivalent WTP2 calibration is (0, 1.04) and (10.4, 11.04).

```
1  0.00  1.04  10.4  11.04
```

Mast Rotation

The pre-set value for this is for it not to be used. It is straightforward to use if you have the facility, and is a requirement for accurate wind data if you have a rotating mast.

The options are for mast rotation correction to be off (0), in absolute value mode for mast twist (1) or in mast rotation mode (2) for fully rotating masts.

If the mast rotation correction is used (set to either 1 or 2) then it is necessary to have a suitable input configured for the mast angle information on variable number 25. See page 4.4.

Filtering and Damping

Damping Types

Like calibration, all the variables that require filtering have their own filter file in the **filters** directory.

The various damping functions are specified by the first number in the damping file (ID in the table below).

ID	Damping Type	Notes
1	Ordinary exponential	One parameter: inverse of required damping time in secs/10
2	Exponential, for 360°	One parameter: inverse of required damping time in secs/10
3	Exponential, for 180°	One parameter: inverse of required damping time in secs/10
4	Two term Kalman filter	Refer to B&G
5	Band pass - mainly for rate gyros	Refer to B&G
6	k term moving average	Refer to B&G
7	3rd order Chebyshev low pass; ripple fraction 0.1	One parameter: damping in secs
8	As 7 for 360	One parameter: damping in secs
9	As 7 for 180	One parameter: damping in secs
10	3rd order Chebyshev band pass; fixed coefs	DO NOT CHANGE: used for rate gyros, *see below*
11	Non-linear	See explanation below
12	Non-linear, for 360°	See explanation below
13	Non-linear, for 180°	See explanation below
14	RMS calculation	Root mean square: e.g. for calculating wave amplitude
15	Period calculation	Period calculation: e.g. for calculating time between waves
16	Ordinary exponential dependent damping	Table with independent variable and inverse of required damping time in secs/10
17	Exponential dependent damping, for 360°	Table with independent variable and inverse of required damping time in secs/10
18	Exponential dependent damping, for 180°	Table with independent variable and inverse of required damping time in secs/10

Damping example 1: Exponential Damping

Damping functions 11, 12 and 13 are exponential functions that will cause the data to move more quickly if the difference between the new data and the last value moves outside a bound. The first damping number in the filter file is as for functions 1-3 (i.e. - inverse of required damping time in secs/10); the second specifies the bound - outside this value, the damping becomes less until at 8 times the bound value there is almost no damping at all. These functions are particularly useful for boat speed and heading when coming out of a tack.

For example we might use non-linear damping on our heading so that when it is changing rapidly after a manoeuvre it is less damped than when we are sailing a steady course. A typical filter file would look like:

```
12 0.1 4
```

This gives a damping of 1 second in normal use (inverse of 0.1 divided by 10); however, when difference between the new data and the last value is greater than 4°, the damping gradually reduces until at 32° difference, no damping is applied.

Damping example 2: Dependent Damping

Damping functions 16, 17 and 18 are exponential functions similar to functions 1, 2 and 3 except that the time constant for the damping can be determined with respect to another variable in the WTP2 database.

During a manoeuvre True Wind Direction (TWD) can be unsteady. If we wish to use some damping to display TWD more steadily based upon data from before the start of the manoeuvre then we could filter it based on the value of Yaw Rate using damping function 17 (Exponential 360º). To do this we could create the following filter file (**twd.fil**):

```
17

Table 56
0    0.1
3    0.02
6    0.0125
9    0.01
10   0.01
```

The first line of the file indicates the damping type to be used. In the example, the `56` after the word `Table` indicates that the damping will be calculated with respect to Yaw Rate as 56 is the variable number for **gyro_dyw** (see **bg_vars** on page 4.2). Therefore, in this example, the table controls the time constant for the exponential damping depending on the Yaw Rate of the vessel: the first column is the Yaw Rate and the second is the time constant to be used (as in functions 1,2 and 3 i.e. inverse of required damping time in secs/10). This file would result in the following damping being applied:

Yaw Rate (º/s)	Damping (s)
0	1
3	5
6	8
>9	10

Wind

To fully understand the filtering of the wind functions it is necessary to consider the order in which WTP2 calculates the various functions and where filtering is applied.

When the wind is measured it is initially corrected for masthead unit offset and mast rotation (or twist), then the rate-gyro corrections for pitching and rolling are applied and then the triangulation with Boat Speed is done and Course added to get the Original Wind speed and Wind Direction. The adjustment tables for wind shear and gradient are applied to get True Wind speed and True Wind Direction and then these variables are filtered. From these filtered variables, the True Wind Angle is calculated and a back triangulation is done to calculate Apparent Wind Speed and Apparent Wind Angle. Therefore, the order of wind calculations is:

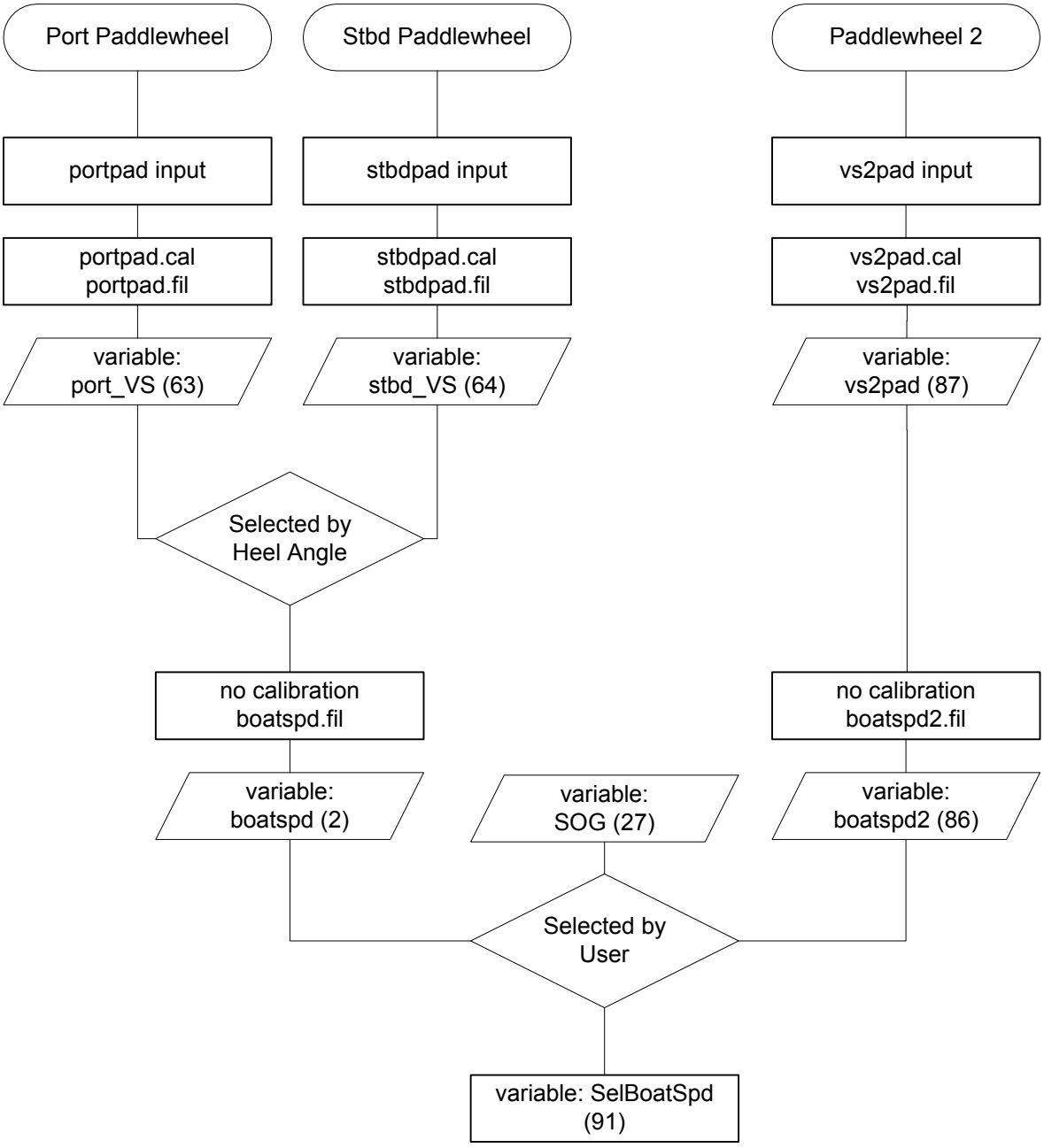
measured wind → corrected wind → original wind → true wind → apparent wind

It is the data from the last two steps of the calculation that you actually see on the displays. The various stages in the calculation can be seen in more detail in Appendix E: Wind Calculation flowchart.

Sensor Damping

Boat Speed

To understand the filtering of the boatspeed functions it is necessary to consider the order in which WTP2 calculates the various functions and where filtering is applied, this is shown in the flowchart below:



Note: when shipped from the factory, Boat Speed is shown to two decimal places. However, due to the extra responsiveness of the WTP2 system, especially when tacking, it may be desirable to change the displayed value to one decimal place in the **fixout.d file**.

Rate Gyros

The rate gyro filters are specified in **gdheel.fil**, **gdpitch.fil** and **gdyaw.fil** for heel, pitch and yaw respectively.

The rate gyros are susceptible to drift and so a band-pass filter used. The values in these files should not be altered. They should read:

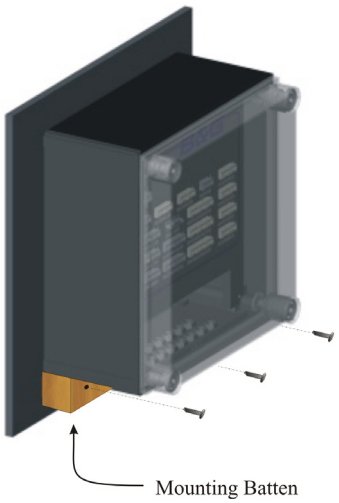
```
5  0.5  .001
```

Whenever the WTP2 is switched on, the measured Pitch and Roll are likely to have values that are well away from zero and it will take 15 minutes or so for the numbers to settle down. This has an enormous effect on wind speed and angle but is perfectly normal. The WTP2 therefore ignores the inputs from the rate gyros for 15 minutes after power on.

Chapter 6: Installation

Physical Installation

Processor



The WTP2 unit should be installed in a dry place with easy accessibility. The enclosure is water resistant but will not survive prolonged immersion.

The engine box is NOT a good place to install your instrument system processors; it is hot and electrically noisy.

The WTP2 unit is fixed to the mounting surface via 4 mounting lugs, it is recommended that the unit is located on a batten to reduce shock loading on the mounting lugs in extreme conditions.

The WTP2 unit does not contain orientation sensitive components so it is NOT necessary to mount the unit vertically, however it is recommended to orientate the unit with all cable exits downwards.

Rate Gyro Box

The Rate Gyro box should be orientated as carefully as possible along the fore and aft axis of the yacht and in the horizontal, with the cable gland facing forwards, as indicated by the arrows. If you do not fix it down initially you will be able to check that the wiring is correct by rotating the box along the fore and aft and athwartships axes and seeing that the roll, pitch and yaw rate values are updated correctly. These rate values are displayed in the 'PARAMETR' menu by default.

Pitch is taken to be positive when the top of the mast is swinging forwards; roll is taken to be positive when the top of the mast is rolling from starboard to port; yaw is taken to be positive when the boat is moving in an anti-clockwise direction (i.e. turning to port).

Heel

Heel should read positive on starboard tack (i.e. with the boat heeling to port). The Heel sensor (B&G part 690-00-004) should be installed on an aft facing bulkhead.

Fastnet Network Installation

General Layout

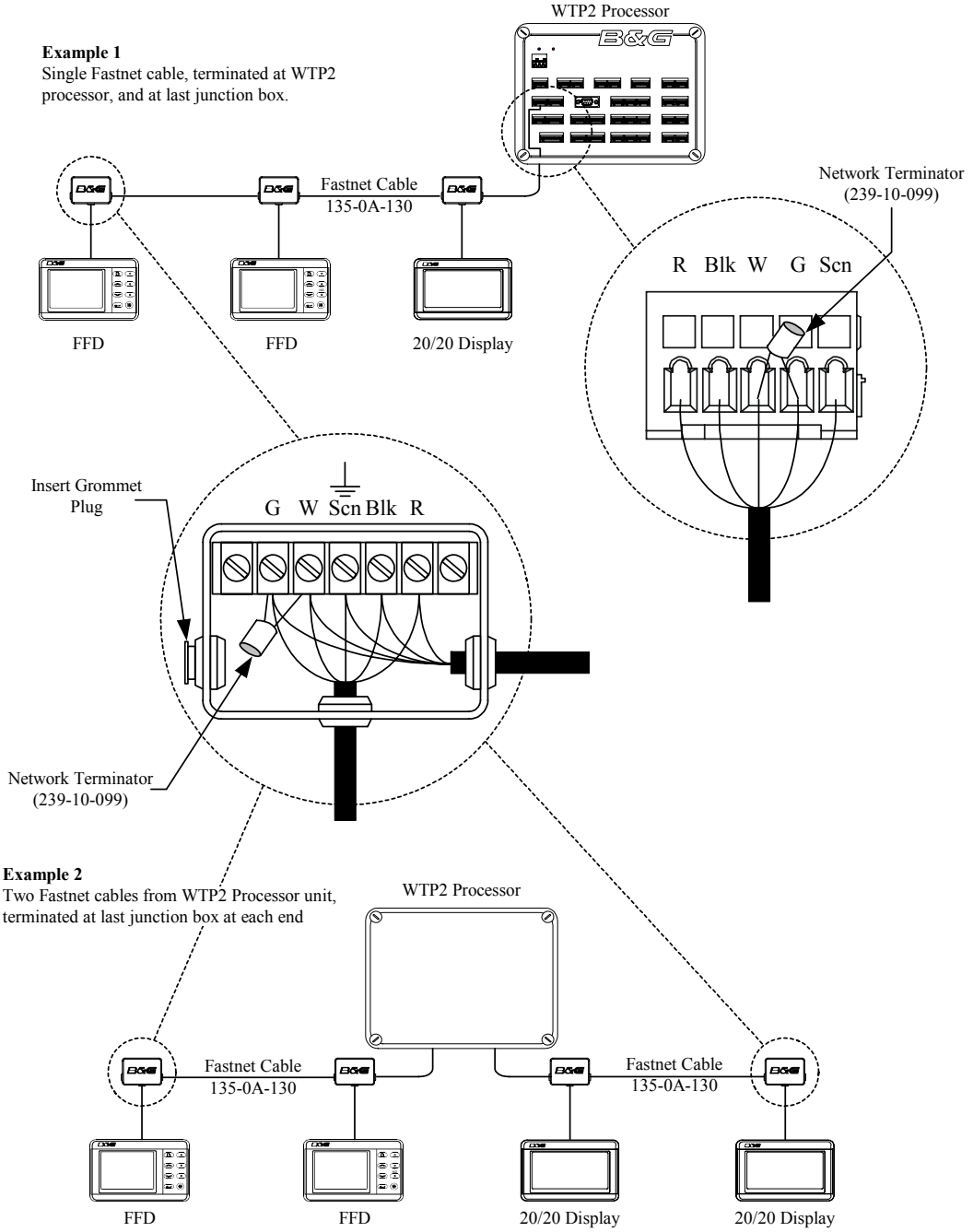
The Fastnet network cabling should be such that the network cable run is predominantly in a linear layout with a definite start point and end point (which are terminated, see page 6.2). "Star" shaped layouts are inefficient, may cause incorrect operation and should be avoided.

Network Terminator

The Network Terminator (B&G part 239-00-099) is a black two-wired component with a resistance of 100 Ohms. Two are supplied with insulating sleeving to prevent shorting of the wires.

A Network Terminator must be fitted across the Green and White Fastnet databus wires of the last unit of junction box at each end of the network cable. (Refer to the examples below)

When adding more displays or units to the system, ensure that the terminator is moved to the ends of the Fastnet databus cable. Never fit more than two terminators to the system. All systems, no matter how large or small, must have two terminators installed across the Green and White wires.

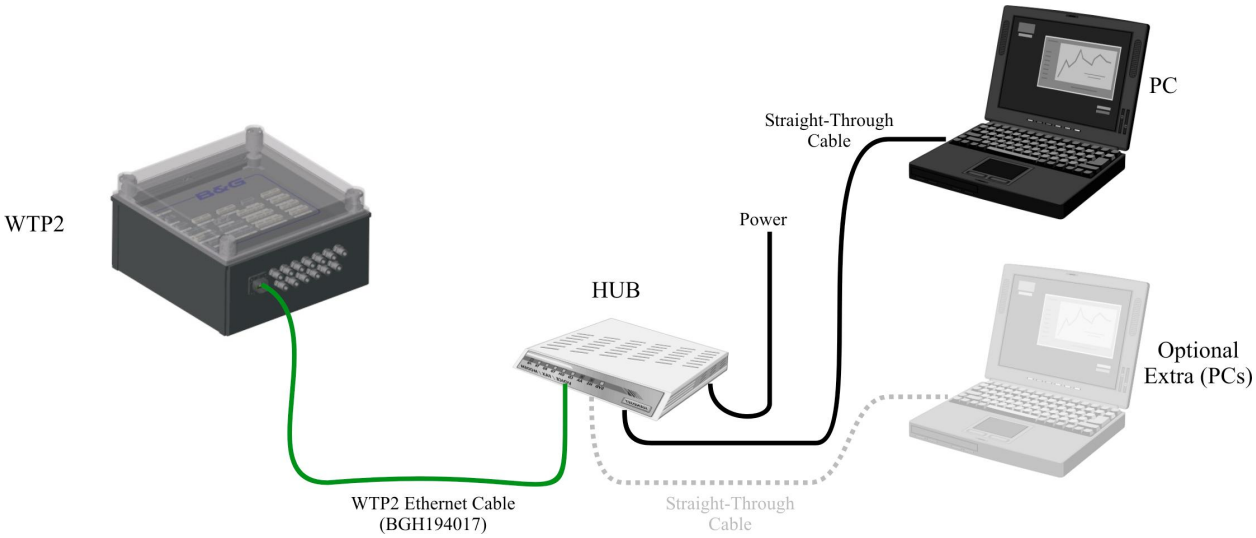


Units and displays may be fitted in any order on the databus

Ethernet

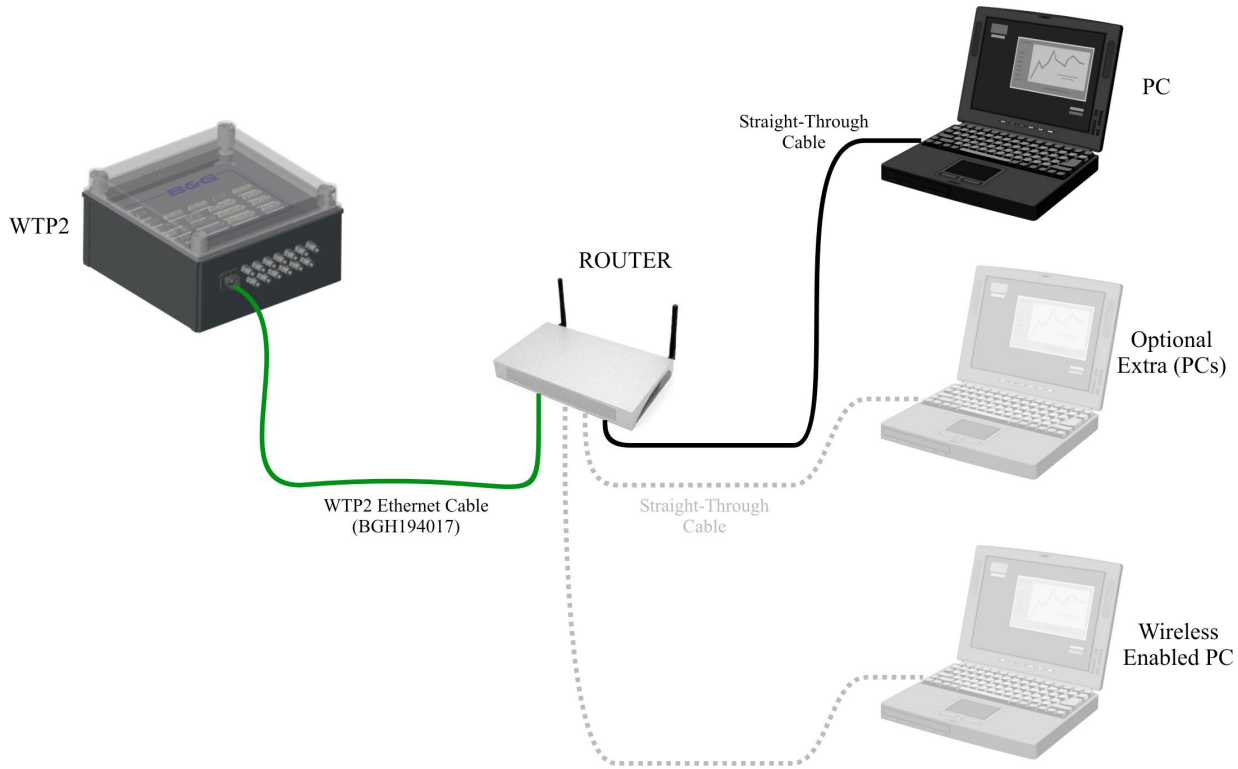
Minimum recommended wired configuration

The Ethernet connection method used will depend on the type of network being installed on the boat. For a straightforward installation comprising a small number of wired PCs we recommend a simple network using a powered hub that allows the PC to be turned off and back on without compromising the Ethernet integrity:



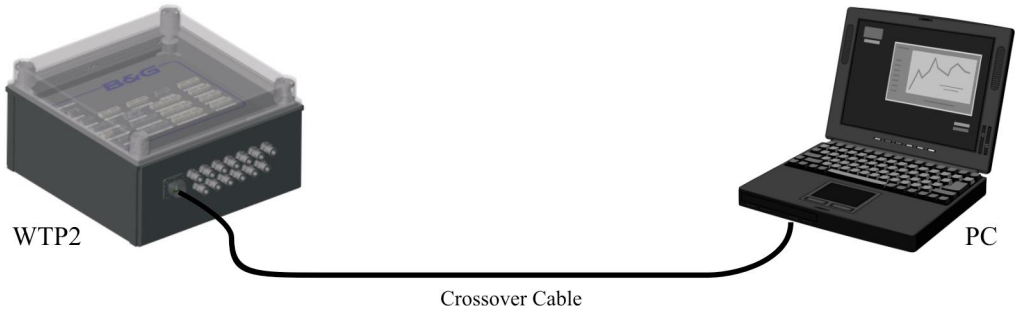
Advanced wired/wireless configuration

This also allows the system to make use of a wireless router, enabling one or more of the PCs on the system to run over wireless LAN (WLAN). In this configuration it is likely that the router will have a DHCP facility and it may be desired to use the router to assign IP addresses throughout the system, to configure the WTP2 to accept DHCP configuration of its IP address it is necessary to rename the **fixedIP.txt** file (see page 4.19)



Simple 'Peer to Peer' configuration

It is possible to connect the WTP2 directly to a PC using a crossover cable (not supplied). In this system it is necessary for the PC to be running (and the network card in the PC enabled) in advance of starting the WTP2 to ensure the IP addresses are assigned, as such this layout is only recommended for service/configuration and not for general use:



NMEA

NMEA inputs usually work without problems when connected directly to the WTP2 RS232 ports. However, in certain circumstances an opto isolator may be necessary. Strictly speaking, an opto isolator is a requirement of the NMEA standard. They work by generating a voltage that is in the correct range for use with the WTP2.

Paddlewheels

Single Paddlewheel

If you only have a single paddlewheel sensor it is necessary to put a link between the boat speed signal wires for both the Port and Starboard sensor inputs. Alternatively it is possible to connect a single sensor to the Speed 2 port, this would need to be selected via the Instrument Control 'Settings' dialogue in Deckman.

Dual Paddlewheels

If you have dual paddlewheel sensors it is necessary to connect to the Port and Starboard sensor inputs. Do not use an external gravity switch. It is also possible to have a spare sensor wired into the Speed 2 input which is available for backup in case of a sensor failure, this is selected via the Instrument Control 'Settings' dialogue in Deckman.

Triple Paddlewheels

For a triple paddlewheel configuration on a trimaran it is recommended to connect the outer hull sensors to the Port and Starboard sensor inputs, with any centre sensor being connected to the Speed 2 input. Therefore the user selections in the Instrument Control 'Settings' dialogue in Deckman selects between either the outer hulls, which automatically switch for Port/Starboard, or the centre hull.

If any additional sensors are required they would need to be switched externally.

GPS

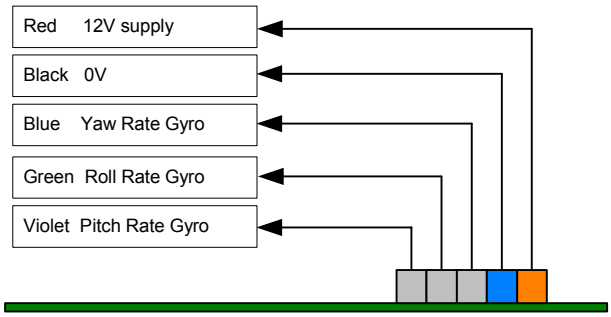
Sometimes, the NMEA signal from a GPS will not work directly with the WTP2. In this case, the GPS input should be fed through an opto isolator (see above).

The sentences normally used by the WTP2 are $xxGGA (for position) and $xxVTG (for COG and SOG). If VTG is not present, the WTP2 looks for RMC for COG and SOG. On start-up, the WTP2 also looks for WBD, BWC or BWR (for range and bearing to a waypoint) from the GPS. The WTP2 will put range and bearing from one of these

sentences into the BTW GC °M and DTW GC NM until a waypoint command from Deckman is received, when it will start to calculate its own range and bearing.

Rate Gyros

The Rate Gyro sensor is supplied pre-wired from the factory, however if it is necessary to rewire the unit the connections are detailed below:



Rate Gyro sensor; internal connections

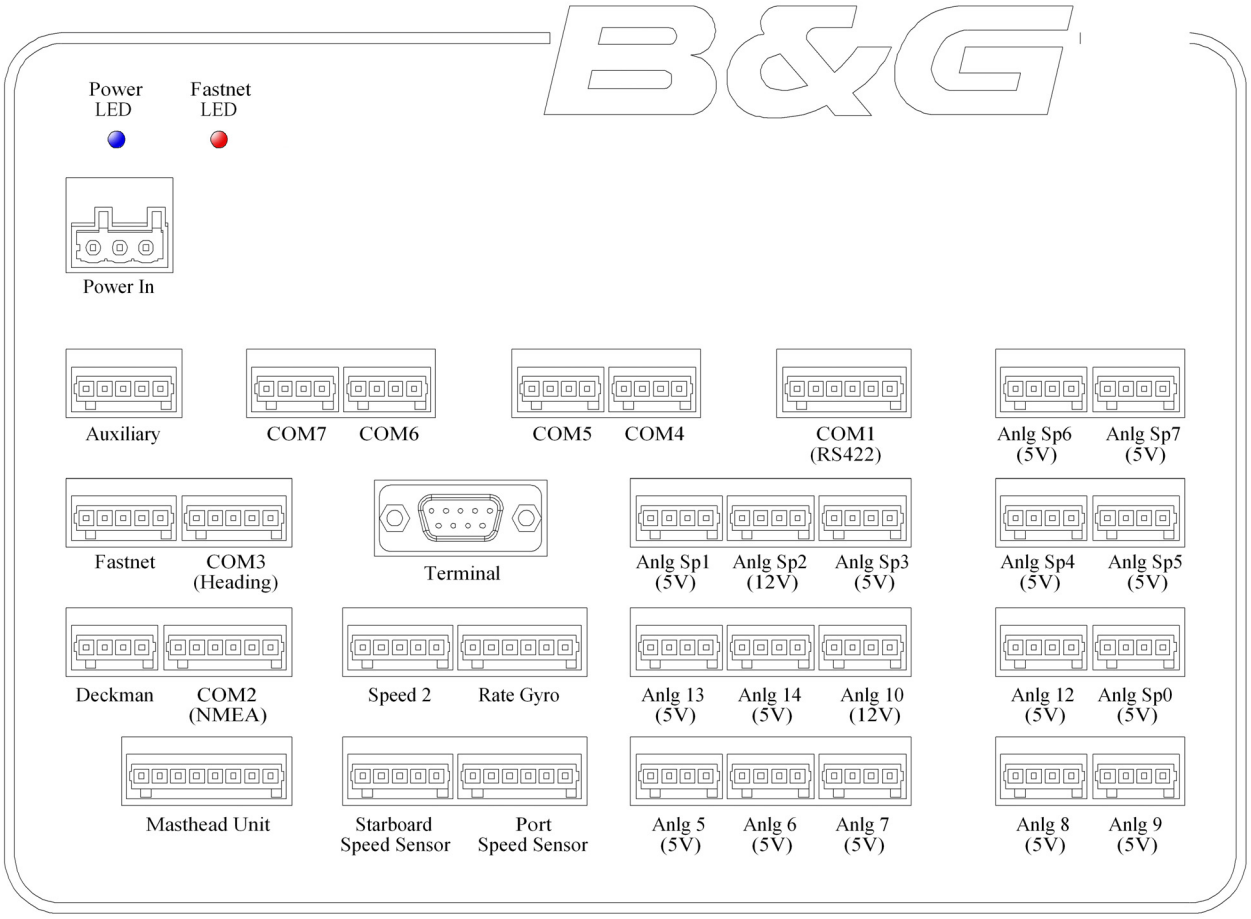
Depth

A NMEA depth transducer is used. A **nmeainX.d** file is required to instruct the WTP2 to decode the depth information. This file allows you to specify the settings for the depth transducer. Refer to page 4.8 for more information.

WTP2 connector wiring

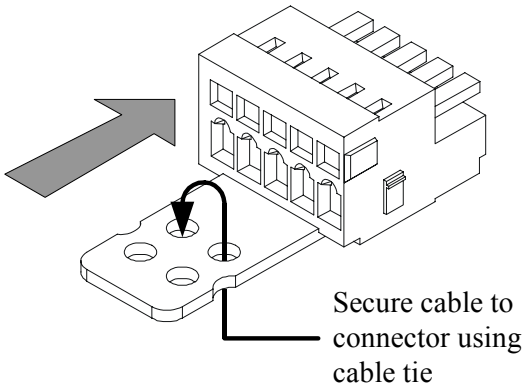
This section contains technical information that may be required to assist with the installation of the WTP2, for diagnostics and for advanced users who wish to alter the standard inputs.

Terminal Layout

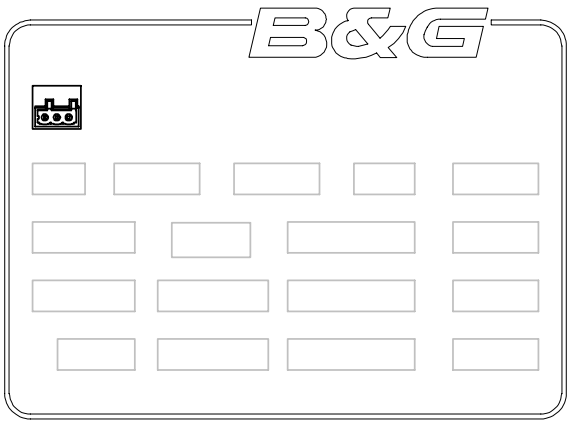


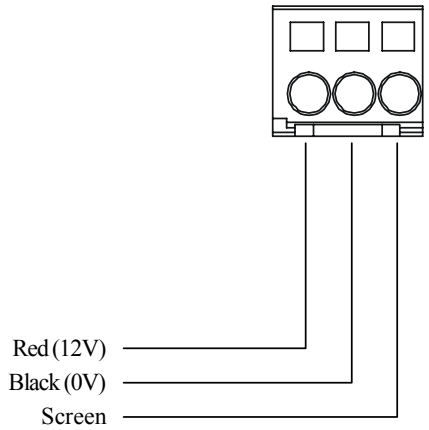
Connector wiring

Wiring is shown when looking into the rear of connector.

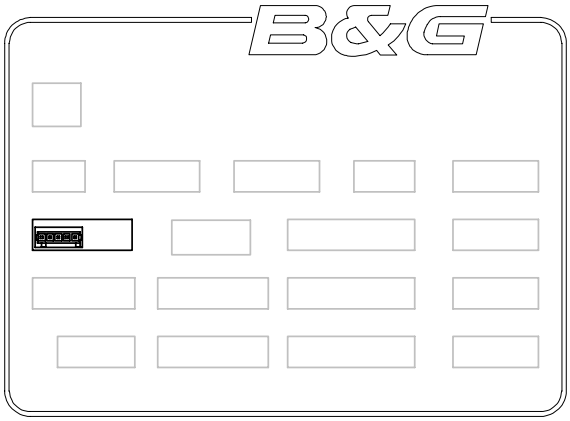


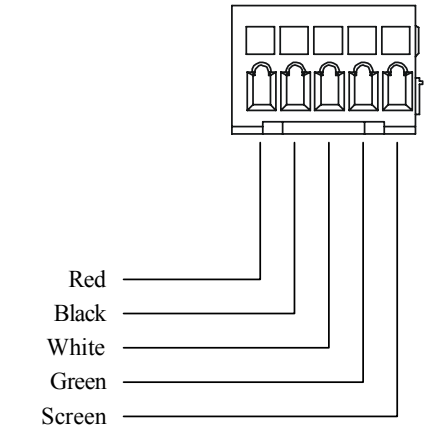
Power





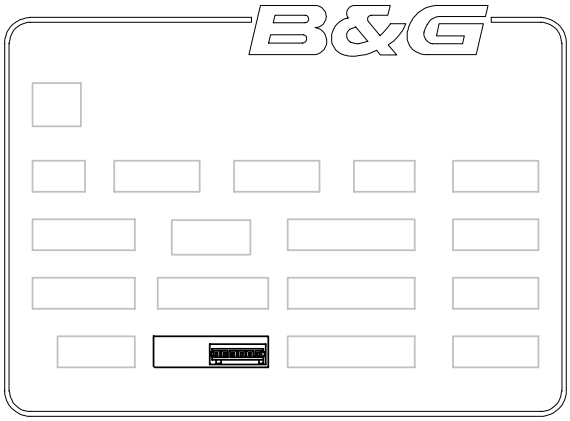
Fastnet

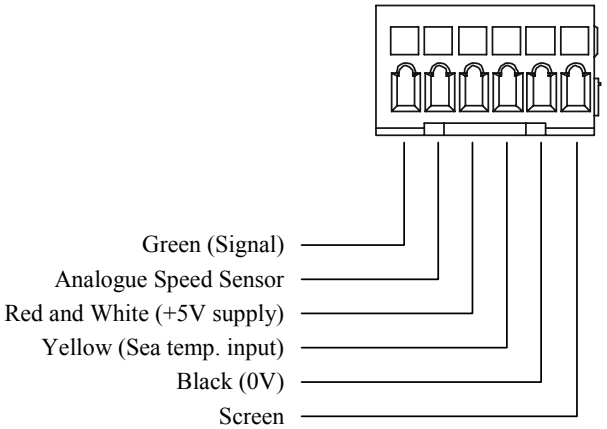




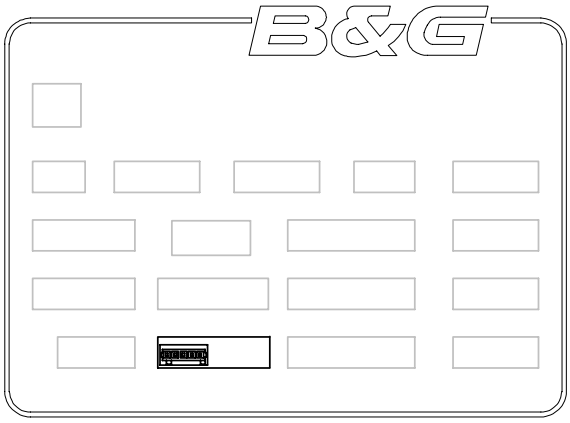
Port Speed Sensor

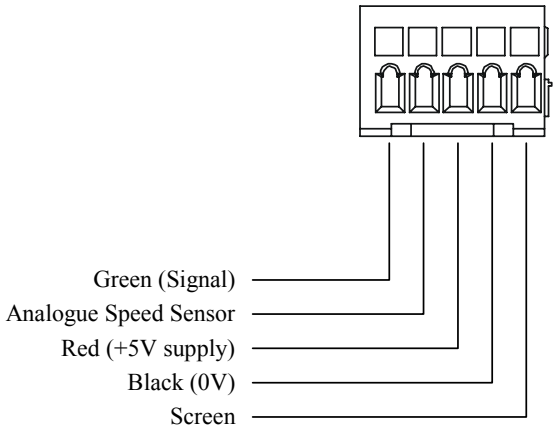
Note that the sea temperature input is Analogue input channel 15 and can be used for other functions if the paddlewheel unit is not supplying sea temperature.



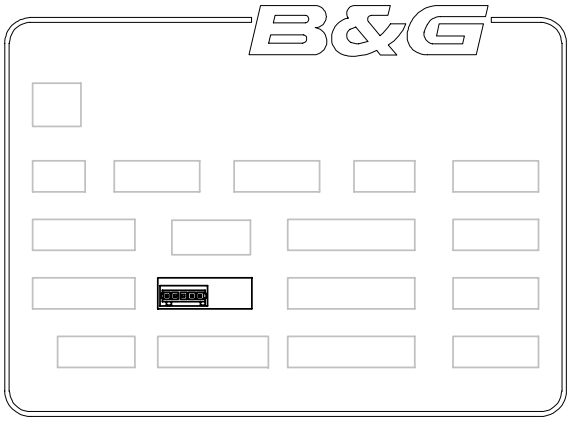


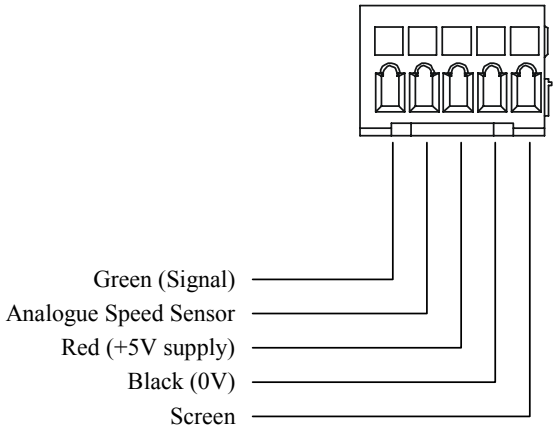
Starboard speed sensor



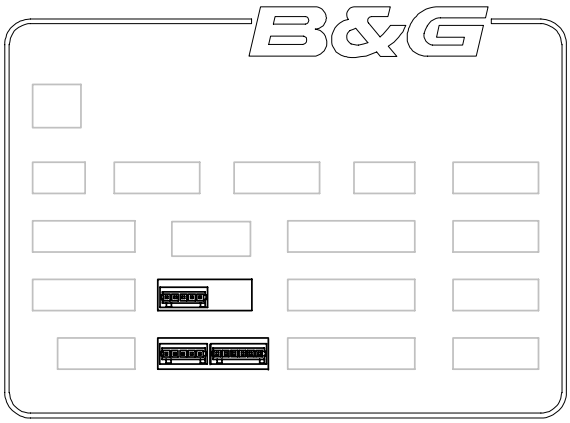


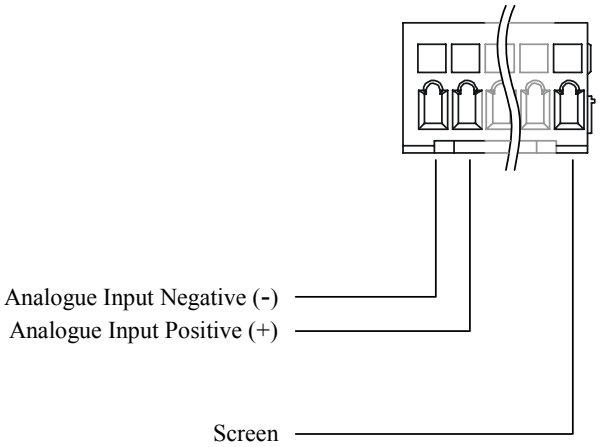
Speed 2



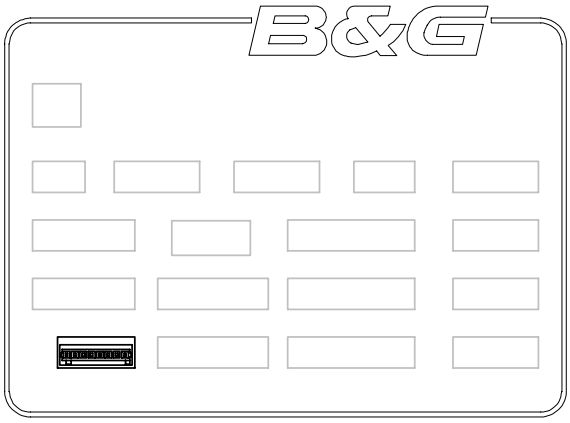


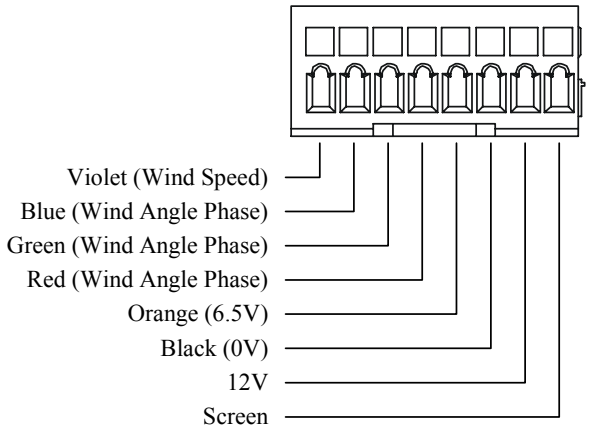
Analogue Speed Input



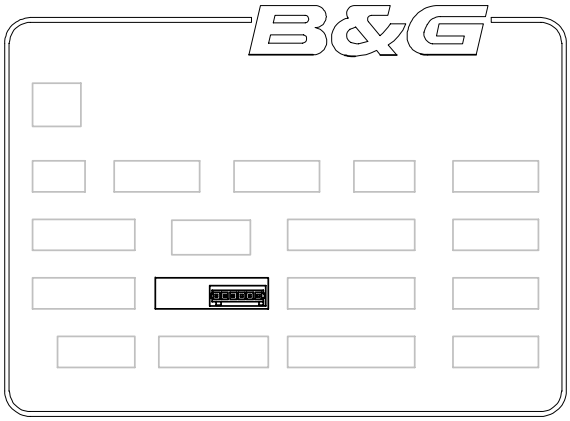


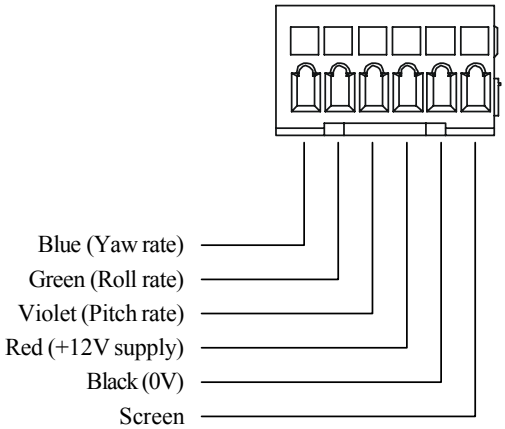
Masthead Unit





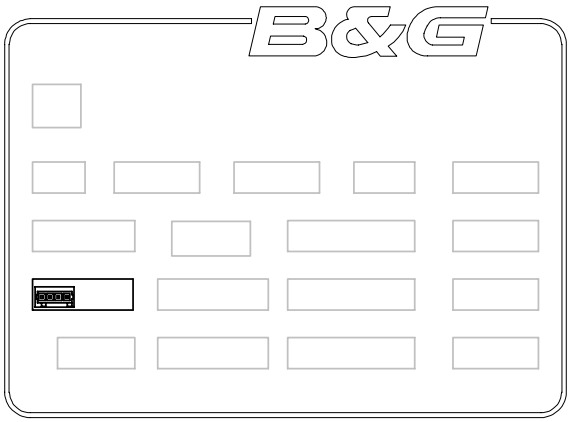
Rate Gyro

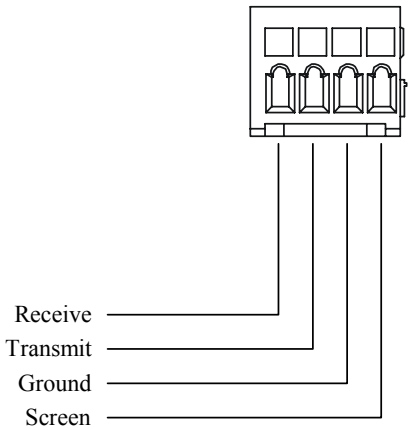




Deckman Serial connection

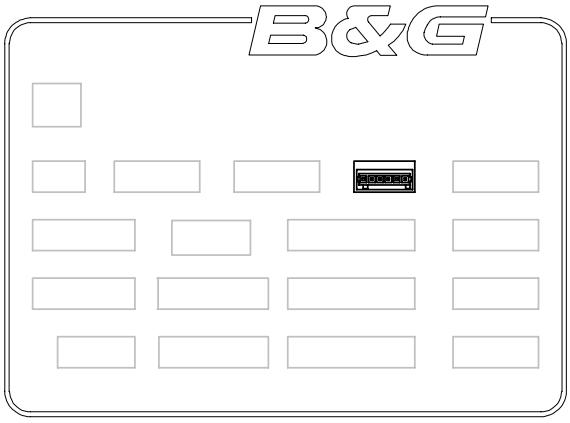
This port is only enabled if Ethernet communications is disabled in **ethernet.d**, see page 4.19

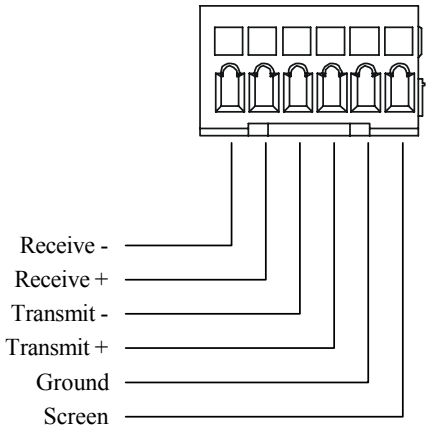




COM1 (RS422)

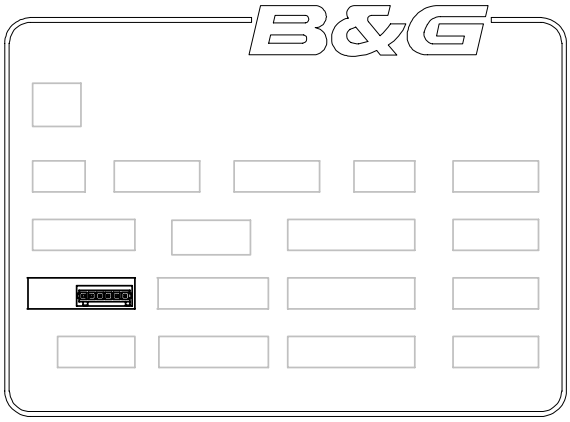
Note: This port can be used as an RS232 port if required. Link Receive -, Transmit – and Ground together.

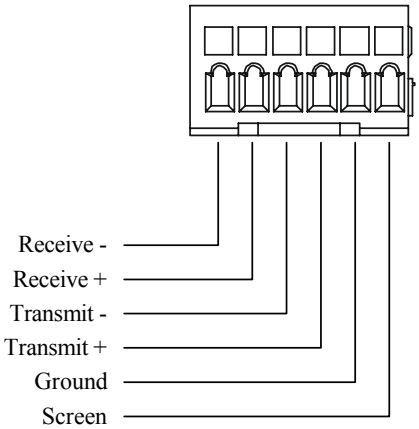




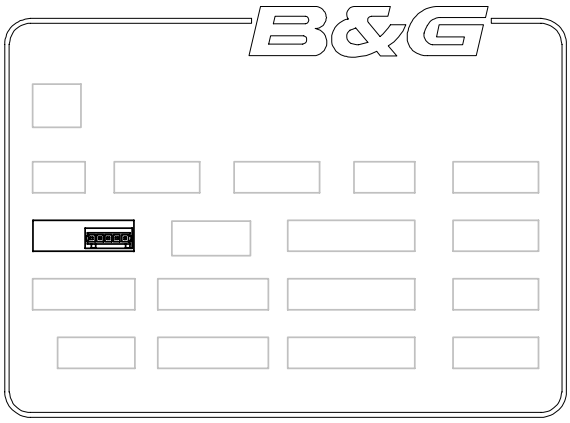
COM2 (NMEA)

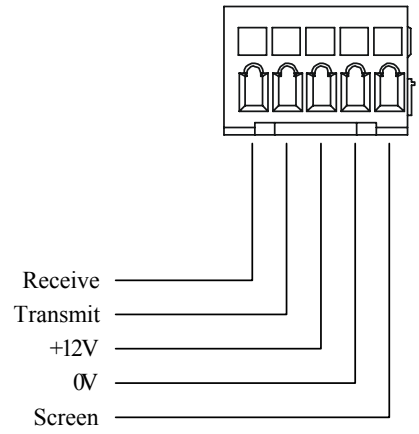
Note: This port can be used as an RS232 port if required. Link Receive –, Transmit – and Ground together.



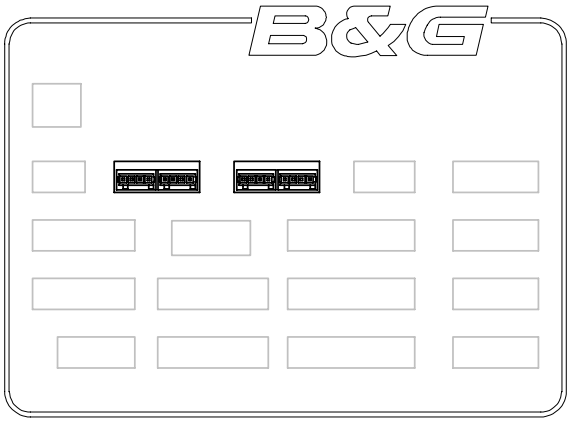


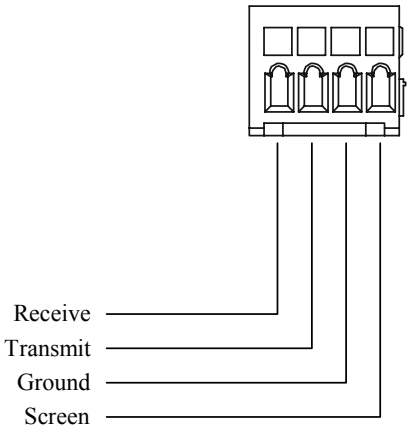
COM3 (Heading) [RS232]





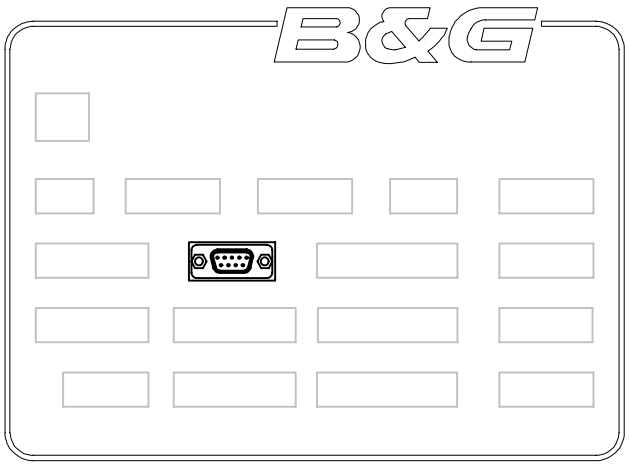
COM4 to COM7 [RS232]

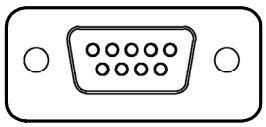




Terminal

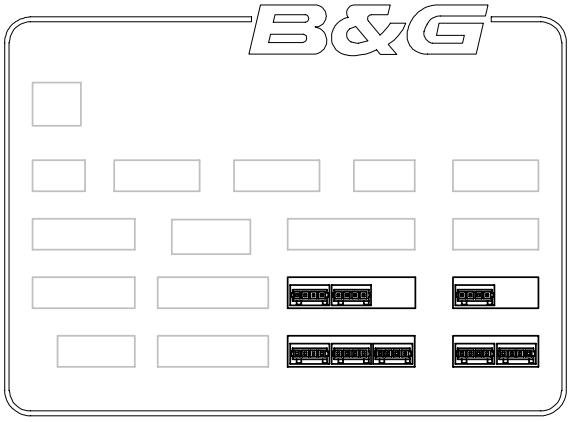
For normal diagnostic operation only RxD, TxD and SGND are required.

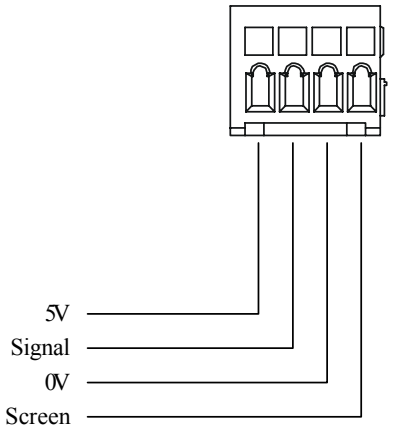




Pin 1:	n/c	
Pin 2:	RxD	Receive Data
Pin 3:	TxD	Transmit Data
Pin 4:	DTR	Data Terminal Ready
Pin 5:	SGND	Ground
Pin 6:	DSR	Data Send Ready
Pin 7:	RTS	Request To Send
Pin 8:	CTS	Clear To Send
Pin 9:	RI	Ring Indicator

5V Analogue Input (ANLG 5, 6, 7, 8, 9, 12, 13, and 14)

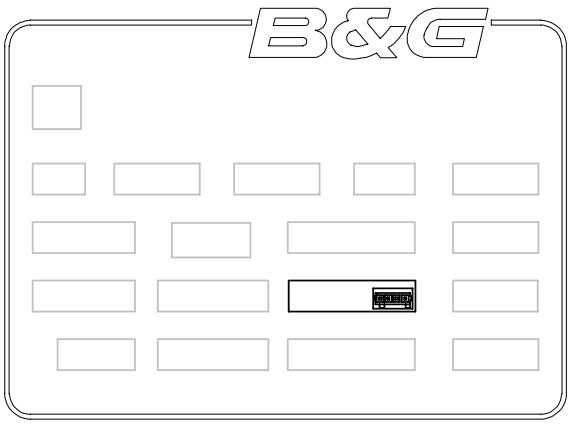


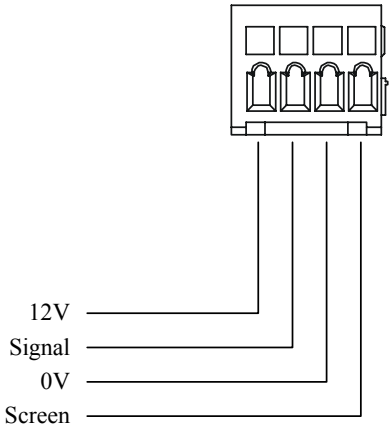


12V Analogue Input (ANLG 10)

Caution

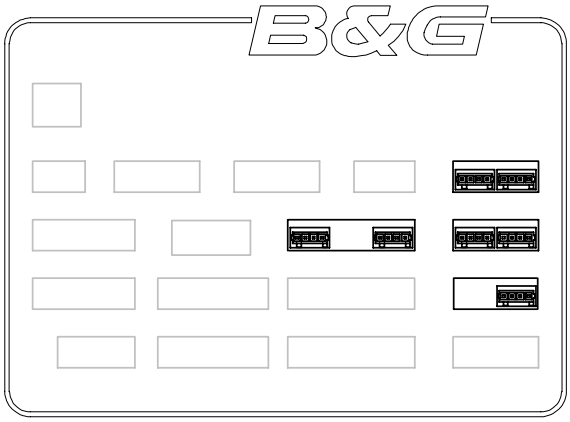
Input voltage on the "Signal" terminal must NOT exceed 5V. Voltages exceeding 5V will result in permanent damage to the system.

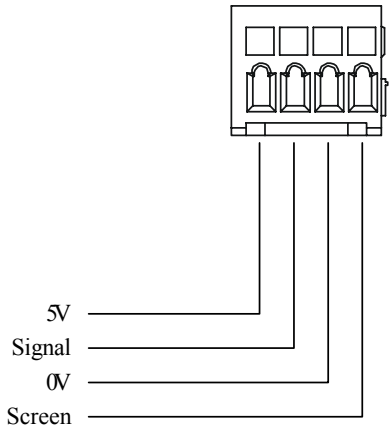




5V Spare Analogue Input (ANLG SP0, SP1, SP3, SP4, SP5, SP6, SP7)

Note that the Spare Analogue Inputs are only functional when the Analogue Expansion option is installed.

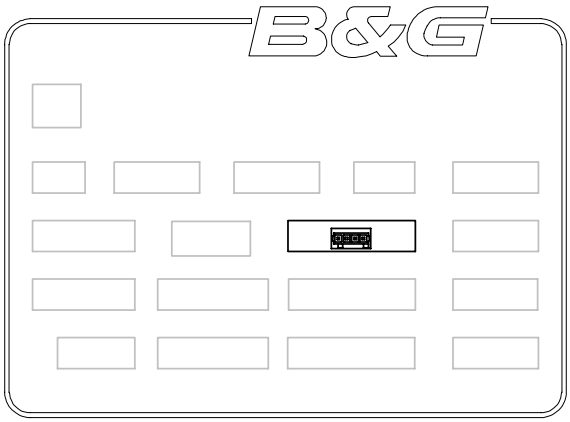


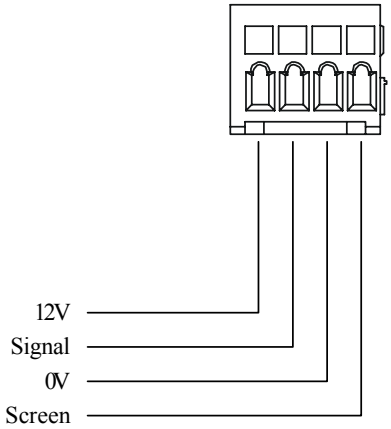


12V Spare Analogue Input (ANLG SP2)

Note that the Spare Analogue Inputs are only functional when the Analogue Expansion option is installed.

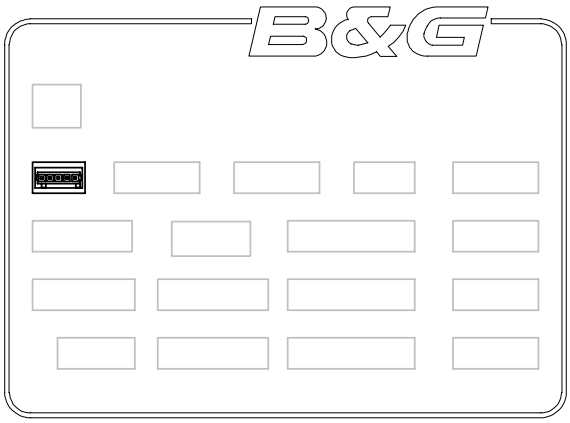
Caution
Input voltage on the "Signal" terminal must NOT exceed 5V. Voltages exceeding 5V will result in permanent damage to the system.

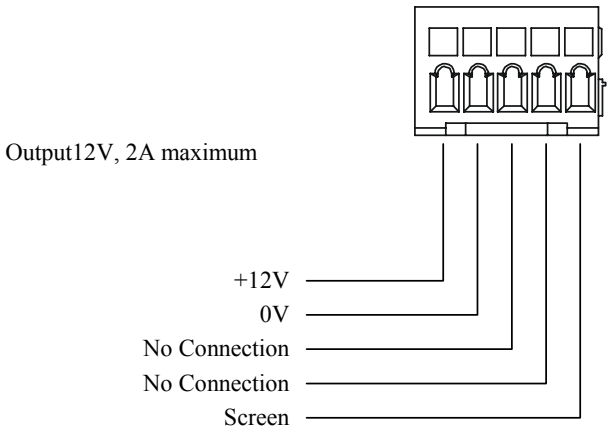




Auxiliary

An additional 12v source for powering external devices.





Chapter 7: Upgrading the WTP2

> **Caution**
> Always backup WTP2 files before carrying out any system updates or modifying files.

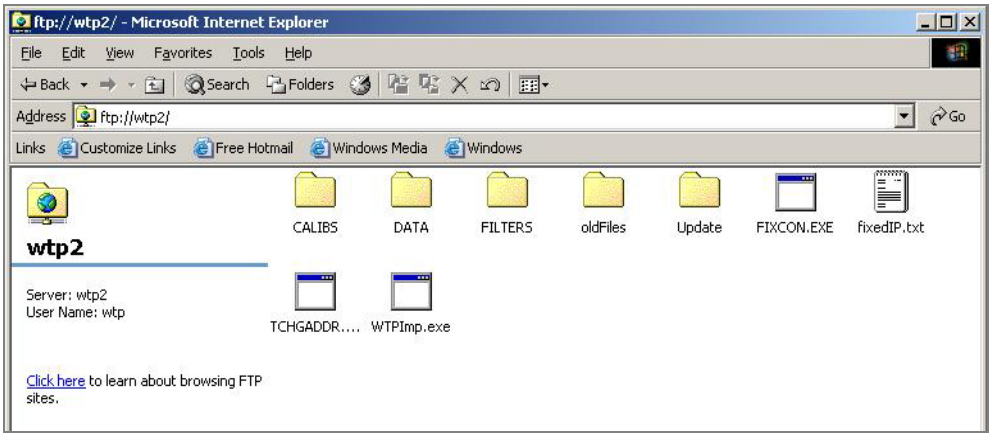
Upgrade Procedure

This document details the general upgrade procedure for the WTP2 application file (**WTPimp.exe**), in this example we will also update two data files (setting6.d and sample08.d) to demonstrate the principles used - this change is not relevant to all upgrades, you should follow specific instructions on dependent files for your upgrade which are distributed in the version.txt file along with the upgrade files. If unsure please contact B&G Technical Support.

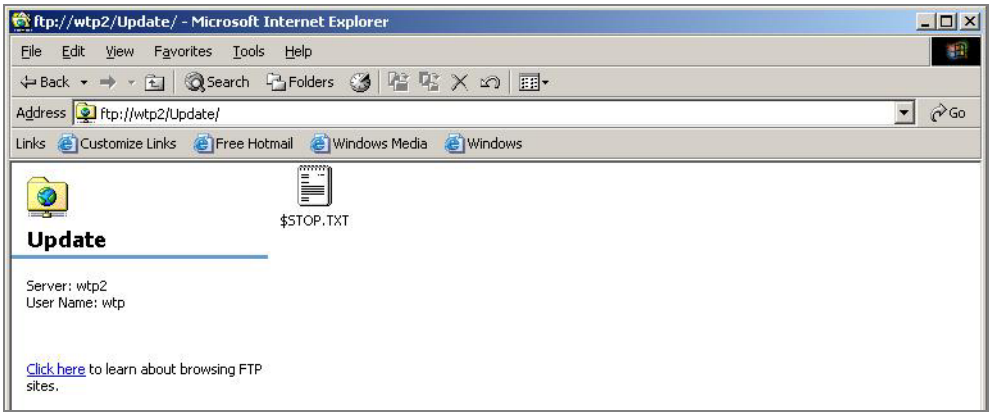
To upgrade the WTP2 to the latest software version, follow these steps:

1) Start WTP2 and connect via FTP. Consult the manual for more detail. If you are unsure of this procedure please consult a specialist.

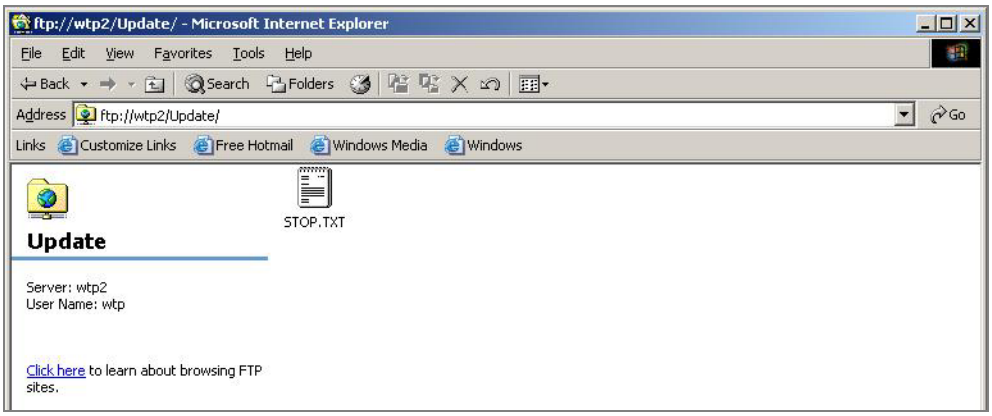
2) In the FTP root directory (as shown below), you will see a Folder called **Update**



3) Open the **Update** folder and you will find a file called **$STOP.TXT** (as shown below)



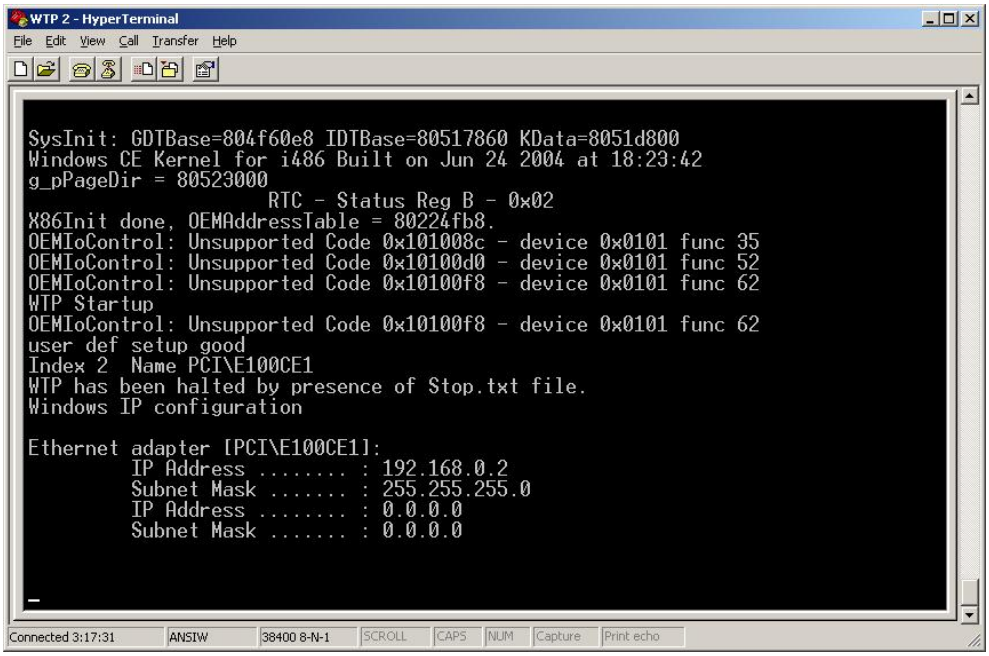
4) Rename this file to be **STOP.TXT**, (i.e. remove the "$") as shown below:



5) Once this file has been renamed, re-start the WTP2.

6) The WTP2 will begin to boot up normally but when it gets to loading the WTP software it will stop because of the presence of the **STOP.TXT** file.

This will be shown in HyperTerminal as follows:



7) Once you get to the screen shown in step 6, re-connect to the WTP2 with FTP. You will be presented with the root directory again (as per image in step 2)

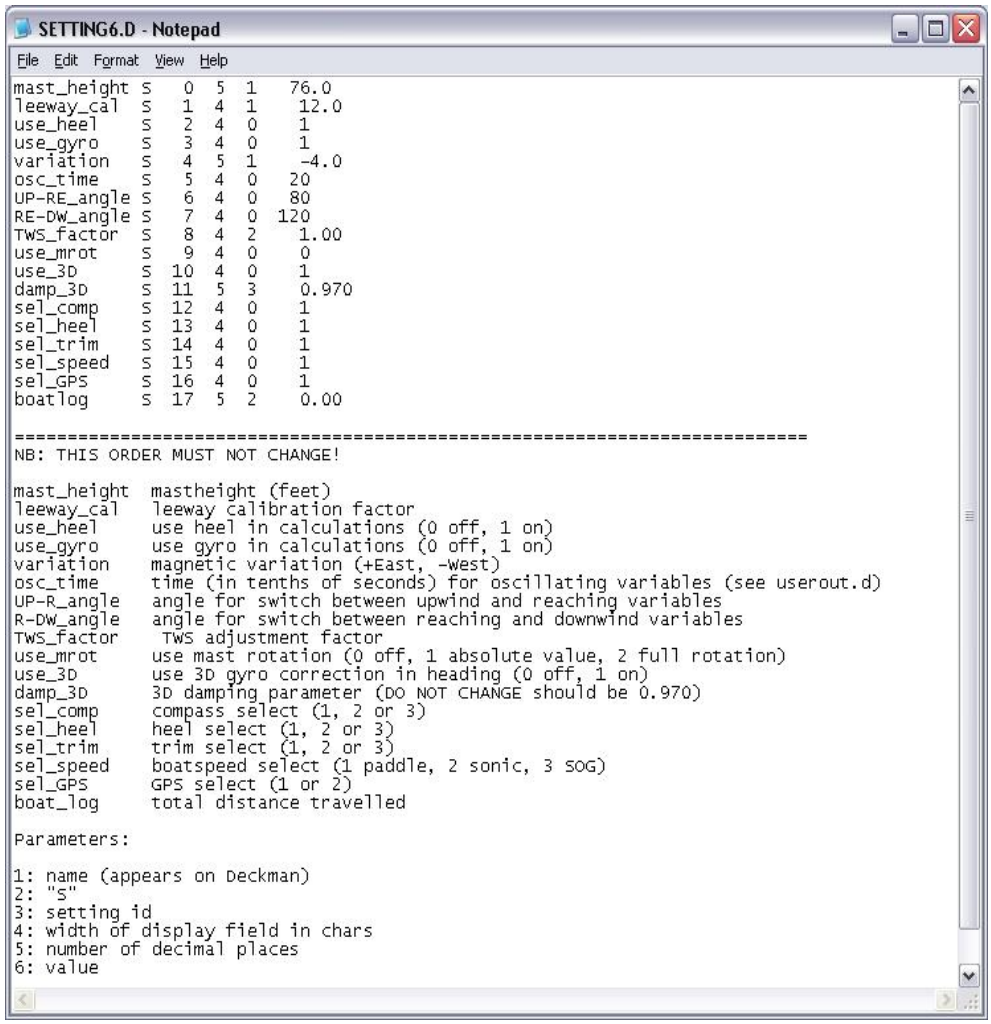
8) Copy the **CALIBS**, **DATA** and **FILTERS** folders to your desktop. Also copy **WTPImp.exe**. This will give you a full working backup if you need to undo the changes you are making.

9) Delete the file **WTPImp.exe** and replace it with the updated one.

10) Once this new file is copied you may need to amend two files in the data directory for the WTP to run - if your directory contains **setting5.d** and **sample07.d** files you will need to carry out the changes below.

11) Open the **DATA** folder, copy **setting5.d** and **sample07.d** to the desktop, as we need to modify these 2 files.

12) Copy **setting5.d** and rename to **setting6.d**. This file should have the same lines as below (values will be different to this sample as they are relevant only to your system).



SETTING6.D - Notepad

File Edit Format View Help

```
mast_height S   0  5  1   76.0
leeway_cal  S   1  4  1    12.0
use_heel    S   2  4  0    1
use_gyro    S   3  4  0    1
variation   S   4  5  1    -4.0
osc_time    S   5  4  0   20
UP-RE_angle S   6  4  0   80
RE-DW_angle S   7  4  0  120
TWS_factor  S   8  4  2    1.00
use_mrot    S   9  4  0    0
use_3D      S  10  4  0    1
damp_3D     S  11  5  3    0.970
sel_comp    S  12  4  0    1
sel_heel    S  13  4  0    1
sel_trim    S  14  4  0    1
sel_speed   S  15  4  0    1
sel_GPS     S  16  4  0    1
boatlog     S  17  5  2    0.00

================================================================================
NB: THIS ORDER MUST NOT CHANGE!

mast_height  mastheight (feet)
leeway_cal   leeway calibration factor
use_heel     use heel in calculations (0 off, 1 on)
use_gyro     use gyro in calculations (0 off, 1 on)
variation    magnetic variation (+East, -West)
osc_time     time (in tenths of seconds) for oscillating variables (see userout.d)
UP-R_angle   angle for switch between upwind and reaching variables
R-DW_angle   angle for switch between reaching and downwind variables
TWS_factor    TWS adjustment factor
use_mrot     use mast rotation (0 off, 1 absolute value, 2 full rotation)
use_3D       use 3D gyro correction in heading (0 off, 1 on)
damp_3D      3D damping parameter (DO NOT CHANGE should be 0.970)
sel_comp     compass select (1, 2 or 3)
sel_heel     heel select (1, 2 or 3)
sel_trim     trim select (1, 2 or 3)
sel_speed    boatspeed select (1 paddle, 2 sonic, 3 SOG)
sel_GPS      GPS select (1 or 2)
boat_log     total distance travelled

Parameters:

1: name (appears on Deckman)
2: "S"
3: setting id
4: width of display field in chars
5: number of decimal places
6: value
```

13) Copy **sample07.d** and rename to **sample08.d**. Once you have renamed this file, you will need to add the following data to the file:

At the top of the file, change the line:

```
16    4   24
```

to read:

```
16    4   25
```

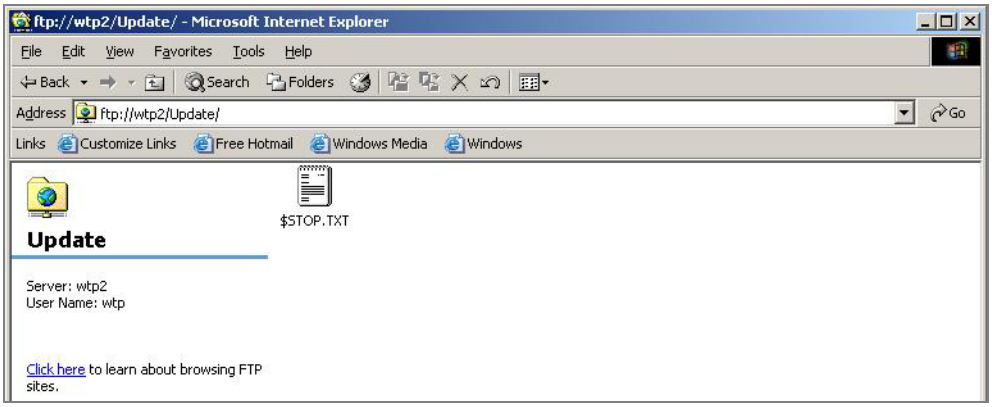
At the bottom of the [DERIVED] section, add the following line:

```
TargetBSpd          32   null.cal       TargBSpd.fil
```

Once you have made these changes, save the file.

14) Copy the new files (**setting6.d** and **sample08.d**) back into the **DATA** folder.

15) Open the **UPDATE** folder and rename **STOP.TXT** to **$STOP.TXT** (should end up as shown below)



16) Once this file has been renamed, re-start the WTP2.

17) The WTP2 will boot up normally - in Hyperterminal this is indicated by the phrase “End of Startup”

18) The WTP2 has now been upgraded to the latest software version.

Appendix A: WTP2 Variables

	Name	Short Name	Description	Notes	Normal Fastnet Func#
0	Heel	Hl	Heel		
1	dotHeel	dHl	Rate of change of heel	Not implemented	
2	Boatspeed	VS	Boat speed		41
3	dotVS	dVS	Rate of change of boat speed, i.e. acceleration	Not implemented	
4	SmoothVS	sVS	Moving average of boat speed	Not implemented	
5	MHU_A_R	A_R	Masthead unit – red phase		
6	MHU_A_G	A_G	Masthead unit – green phase		
7	MHU_A_B	A_B	Masthead unit – blue phase		
8	MW_angle	MWA	Measured wind angle		5A
9	MW_speed	MWS	Measured wind speed		57
10	AW_angle	AWA	Apparent wind angle		51
11	AW_speed	AWS	Apparent wind speed		4D
12	Leeway	Lee	Leeway		82
13	Heading	Hdg	Magnetic compass heading	Not including leeway	49
14	Course	Cse	Course	Heading and leeway combined	69
15	dotCourse	dCs	Rate of change of course	Not implemented	
16	TW_angle	TWA	True wind angle		59
17	TW_speed	TWS	True wind speed		55
18	TW_dirn	TWD	True wind direction		6D
19	VMG	VMG	Velocity made good		7F
20	GW_speed	GWS	Ground wind speed		
21	GW_dirn	GWD	Ground wind direction		
22	Orig_TWA	ta	Original true wind angle		
23	Orig_TWS	ts	Original wind speed		

	Name	Short Name	Description	Notes	Normal Fastnet Func#
24	Orig_TWD	td	Original True Wind Direction		
25	MastRot	MRo	Mast Rotation		9C
26	TWD_Off	wdo	True Wind Direction offset		
27	selSOG	SOG	Selected COG	selected from GPS1 or 2	EA
28	selCOG	COG	Selected SOG	selected from GPS1 or 2	EB
29	VMC	VMC	Velocity Made Good relative to Course		EC
30	Opt_VMC	OVC	Optimum VMC		
31	Cse_OVMC	COC	Course for Optimum VMC		
32	Vs_target	TS	Target Boat Speed		7D
33	Vs_targ%	T%	Boat Speed as a percentage of Target Boat Speed		
34	TWA_targ	AT	Target True Wind Angle		53
35	Vs_perf	PPV	Boat speed derived from performance polar		7E
36	Vs_perf%	PP%	Boat speed as a percentage of performance polar		33
37	Vs_nav	PNV	Boat speed derived from navigation polar		
38	Vs_nav%	PN%	Boat speed as a percentage of navigation polar		
39	Brg_o_Mrk	BM	Bearing of mark		E6
40	Dst_t_Mrk	DM	Distance to mark		E8
41	Tm_t_Mrk	TM	Time to mark		35
42	Curr_Rate	CrR	Current rate	Written from Deckman	
43	Curr_Dir	CrD	Current direction	Written from Deckman	
44	MCur_Rate	MCR	Measured current rate	Written from Deckman	
45	MCur_Dir	MCD	Measured current direction	Written from Deckman	
46	DCur_Rate	DCR	Diamond current rate	Written from Deckman	
47	DCur_Dir	DCD	Diamond current direction	Written from Deckman	
48	Battery	Bat	Battery volts		8D

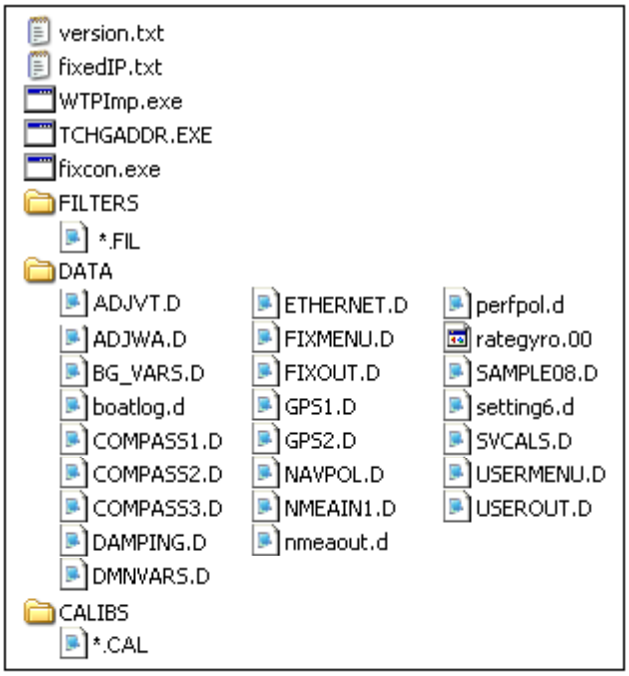
	Name	Short Name	Description	Notes	Normal Fastnet Func#
49	Rudder	Rud	Rudder Angle		0C
50	Rake	Rke	Mast Rake		CA
51	gyro_hl	GHl	Gyro Heel		
52	gyro_dhl	GdH	Roll (rate of change of gyro heel)	Input from rate gyro	3C
53	gyro_trm	GTm	Gyro trim		
54	gyro_dpt	GdP	Pitch (rate of change of trim)	Input from rate gyro	9C
55	gyro_hdg	GHg	Gyro heading		49
56	gyro_dyw	GdY	Yaw (rate of change of heading)	Input from rate gyro	44
57	trim	trm	Trim		9B
58	forestay	frs	Forestay load		CC
59	keel	kel	Keel angle	for canting keels	C9
60	seatemp	sea	Sea temperature		1F
61	airtemp	air	Air temperature		1D
62	barom	bar	Barometer		87
63	port_VS	pVS	Port boat speed paddlewheel		
64	stbd_VS	sVS	Starboard boat speed paddlewheel		
65	CMW_angle	CWA	Corrected Measured Wind Angle		A8
66	CMW_speed	CWS	Corrected Measured Wind Speed		A9
67	Depth	Dep	Depth		0B
68	XTrkErr	XTE	Cross track error		EE
69	TWA_OVMC	AOC	True Wind Angle for Optimum VMC		
70	VMG_Targ	VGT	Target VMG		
71	VMG_Targ%	VGP	VMG as a percentage of Target VMG		32
72	OppTrkW	OTW	Opposite tack track (wind)	Calculated from wind direction, polars and tidal information	9A
73	OppTrkG	OTG	Opposite tack track (COG)	Calculated from COG, polar table and tidal information	

	Name	Short Name	Description	Notes	Normal Fastnet Func#
74	Log	Log	Ship's log	Can be reset from the Settings dialog – see page 2.9.	CD
75	pitchRMS	PMS	Pitch Root Mean Squared	Gives an indication of wave amplitude	
76	pitchPrd	PPd	Pitch period	Gives an indication of wave period	
77	selUTC	UTC	Time in seconds since midnight (0000 hours), UTC	selected from GPS1 or 2	DD
78	selSVA	SVA	Digit 1: number of satellites, Digits 2-4: age of GPS fix in seconds	selected from GPS1 or 2	
79	selQHD	QHD	Digit 1: quality of GPS fix Digits 2-4: HDOP in metres	selected from GPS1 or 2	
80	Hdg2	HG2	Heading 2	see page 2.4	
81	Hdg2_hl	H2H	Heel 2	see page 2.4	
82	Hdg2_trm	H2T	Trim 2	see page 2.4	
83	Hdg3	Hg3	Heading 3	see page 2.4	
84	Hdg3_hl	H3H	Heel 3	see page 2.4	
85	Hdg3_trm	H3T	Trim 3	see page 2.4	
86	BoatSpd2	VS2	Boat speed 2	see page 2.4	
87	VS2pad	V2p	Boat speed 2, raw data.		
88	SelHdg	SHg	Selected heading	see page 2.4	49
89	SelHeel	SHl	Selected heel	see page 2.4	34
90	SelTrim	Stm	Selected trim	see page 2.4	96
91	SelBoatSpd	VSS	Selected boat speed	see page 2.4	41
92	Hdg2_Heave	Hve	Heave from Compass 2	Requires EM series compass	
93	GGBrg	GGB	GPS1 to GPS2 bearing	For comparison of GPS inputs	
94	GGRng	GGR	GPS1 to GPS2 range	For comparison of GPS inputs	
95	HHDiff	HHD	Heading 1 to Heading 2 difference	For compass comparison	
96	MastWind	MWM	Wind Angle measured relative to mast	For rotating mast systems	9D
97	FwdRud	FWR	Forward Rudder Angle		28
98	Code0	Cd0	Code 0 load		A3

	Name	Short Name	Description	Notes	Normal Fastnet Func#
99	Vang	Vng	Vang position		CB
100	gps1cog	cg1	COG from GPS1	From a position fixer. These functions are used when GPS 1 is selected, see page 2.4	
101	gps1sog	sg1	SOG from GPS1		
102	gps1qhd	qh1	QHD from GPS 1		
103	gps1sva	sv1	SVA from GPS 1		
104	gps1utc	ut1	UTC from GPS 1		
105	gps2cog	cg2	COG from GPS 2	From a position fixer. These functions are used when GPS 2 is selected, see page 2.4	
106	gps2sog	sg2	SOG from GPS 2		
107	gps2qhd	qh2	QHD from GPS 2		
108	gps2sva	sv2	SVA from GPS 2		
109	gps2utc	ut2	UTC from GPS 2		
110				New functions can be added from here onwards	

Appendix B: WTP2 Directory Structure

The files within WTP2 are stored according to the following directory structure:



Note: The rategyro.00 file is a diagnostic file generated by the WTP2. These files should be deleted if they have not specifically been requested by B&G.

Appendix C: Supported Compass Types

Compass sensor	Input sentence	Hdg	Heel	Pitch	Heave	Rates	Label in file
B&G Halcyon 2000	B&G Fastnet	Y	N	N	N	N	<no label>
B&G Halcyon Gyro	B&G Fastnet	Y	Y	Y	N	N	BGGYRO
Crossbow AHRS	Binary	Y	Y	Y	N	Y	XBAHRS
CSI Vector GPS	$PSAT,HPR,hhmmss.ss,h.h,p.p,r.r,*KK	Y	Y	Y	N	N	PSAT
Furuno SC60	$PFEC,GPatt,hhh.h,+pp.p+rr.r (Ver. 1.5)	Y	Y	Y	N	N	<no label>
	$PFEC,GPatt,hhh.h,+pp.p+rr.r*KK (Ver. 2.0)	Y	Y	Y	N	N	<no label>
Honeywell HMR3000	$PTNTHPR,h.h,a,p.p,a,r.r,a*KK	Y	Y	Y	N	N	HMR3000
Keppel HPR03	$HPR,h.h,p.p,r.r	Y	Y	Y	N	N	KEPPEL
KVH GyroTrac	%pppp,rrrr,hhhh	Y	Y	Y	N	N	<no label>
NMEA 0183 Heading Sensor	$xxHDT,h.h,T	Y	N	N	N	N	<no label>
	$xxHDM,h.h,M	Y	N	N	N	N	<no label>
	$xxHDG,h.h,d.d,a,v.v,a*KK	Y	N	N	N	N	<no label>
PNI Corp. TCM2	$Ch.hPp.pRr.rXxx.xxYyy.yyZzz.zzTcc.c	Y	Y	Y	N	N	TCM2
PNI Corp. TCM2 (Heel/Trim sensor only)	$Pp.pRr.r	N	Y	Y	N	N	TCM2
PRDID Proprietary NMEA	$PRDID,p.p,r.r,h.h*KK	Y	Y	Y	N	N	PRDID
Simrad EM-series input format (EM1000, EM3000)	Binary	Y	Y	Y	Y	N	EM3000
Xsens Mtx and Mti	Binary	Y	Y	Y	N	N	XSENS

Appendix D: Diagnostic messages displayed via Terminal

While booting the Terminal screen will show some normal motherboard system messages which can be ignored, then the WTP2 operating system will start. An example of a normal boot is shown below:

```
WTP Startup
OEMIoControl: Unsupported Code 0x10100f8 - device 0x0101 func 62
user def setup good
Index 2  Name PCI\E100CE1
Windows IP configuration

Ethernet adapter [PCI\E100CE1]:
                      IP Address ........ : 192.168.0.2
                      Subnet Mask ....... : 255.255.255.0
                      IP Address ........ : 0.0.0.0
                      Subnet Mask ....... : 0.0.0.0

B&G WTP2 15.02.06 V1.04B5 Octal
PCI\E100CE1 192.168.0.2
after theVarMgr init
startVT is 0
startWA is 0
WOC1: opened
690 init begin
690: User Menus Loaded
690: B&G Menus Loaded
690: Loading User Variables
690: Loading B&G Variables
690: Init end
690: Thread 81d70052
HDG    : comport 3  baud    4800
HDG    : comport 4  baud    4800
HDG    : comport 5  baud    4800
GPS    : comport 1  baud    9600
GPS    : comport 6  baud    4800
NMEAIN : comport 2  baud    4800
RS232: Thread e1d81fb2
NMEAOUT: comport 7  baud    4800
DMN: Init Deckman
DMN: Thread c1d37f7e
end sampler::fixselections
sam_startup
sampler c1d37f3e
End of startup
```

This allows various elements of the WTP2 to be checked, as follows:

Ethernet configuration

```
Ethernet adapter [PCI\E100CE1]:
      IP Address ........ : 192.168.0.2
      Subnet Mask ....... : 255.255.255.0
      IP Address ........ : 0.0.0.0
      Subnet Mask ....... : 0.0.0.0
```

Software Version

```
B&G WTP2 04.11.05 V104B5 Octal
```

Initial system configurations completed

```
690 init begin
690: User Menus Loaded
690: B&G Menus Loaded
690: Loading User Variables
690: Loading B&G Variables
690: Init end
690: Thread e1d8b692
```

COM ports is use and baud rates

```
HDG    : comport 4  baud    4800
HDG    : comport 5  baud    4800
GPS    : comport 1  baud    4800
GPS    : comport 6  baud    4800
NMEAIN : comport 2  baud    4800
```

RS232 and Deckman initiation

```
RS232: Thread e1fb0032
DMN: Preparing Fastout
DMN: Init Deckman
DMN: Thread 61d40f9a
```

The WTP2 boot has completed

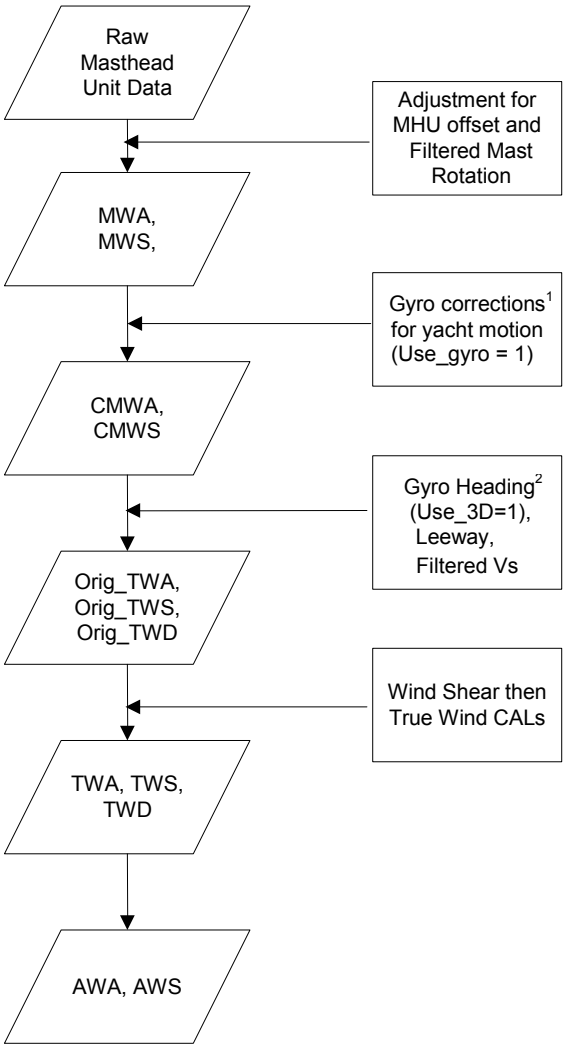
```
End of startup
```

Diagnostics

Following the boot procedure the WTP2 will continuously display various diagnostic characters and messages, these are described below:

@	Data is being transmitted on Fastnet to displays (sent at regular intervals)
$	Valid GPS position received from GPS1
~	Valid GPS position received from GPS2
1	Valid compass data received from Compass1
2	Valid compass data received from Compass2
3	Valid compass data received from Compass3
A	Valid data received on NMEA input 1
B	Valid data received on NMEA input 2
C	Valid data received on NMEA input 3
L	Serial loadcell information received
X	Checksum error on incoming data
PCI\E100CE1 192.168.0.2	Ethernet IP Address message
fnerror	Diagnostic fastnet message

Appendix E: Wind Calculation flowchart



Notes

1. If use_gyro is set to '0' (OFF) then the CMWA, CMWS stage is bypassed.

2. If use_3D is set to '0' (OFF) WTP2 will use Selected Heading rather than Gyro Heading.

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