

Hydra 330
OWNER'S MANUAL

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Produced by  **Linton**
(UK) Limited

330-HB-0335-02

INTRODUCTION

Please Read the Manual

It is important for the safe and efficient operation of your HYDRA system, that you read this manual carefully before operation.

Before doing it your way, please try ours.

OPERATIONAL LIMITATIONS

HYDRA 330 is a yacht instrumentation display system that can provide information for a wide range of functions providing it is operated in accordance with the instructions herein.

WARRANTY LIMITATIONS

The HYDRA system is covered by the unique Brookes and Gatehouse three year world wide guarantee, the conditions of which are clearly stated in the Certificate of Warranty and Ownership provided with your system.

Please ensure that the certificate has been completed correctly.

Note

Failure to produce the warranty certificate may result in a warranty claim being invalidated.

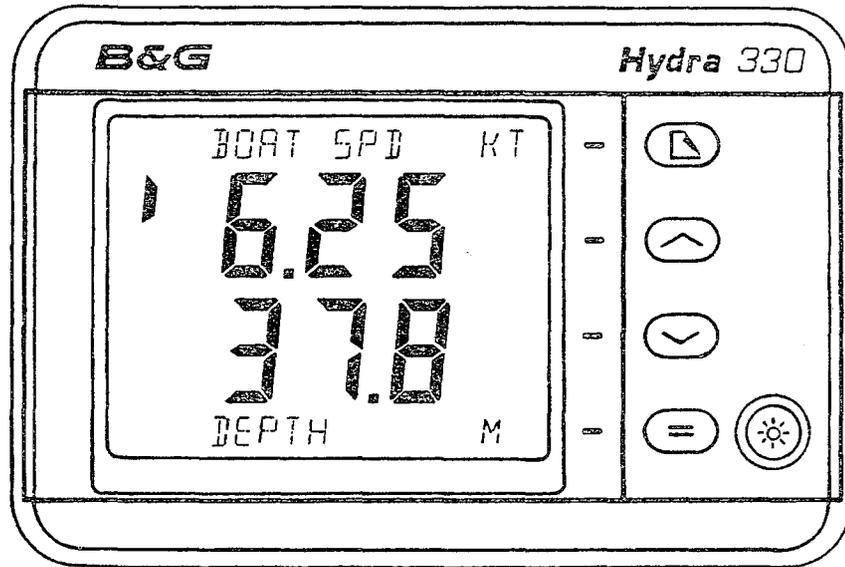
1 YOUR HYDRA 330

The HYDRA 330 is a yacht instrument system which monitors and displays information, from various source sensors, on liquid crystal display units and analogue repeaters. The information from the sensors is input to a computer unit (see System Block Diagram) which assimilates and stores the information for output to display units on request via the communication network. The basic sensors are a mast head unit which measures wind angle and speed, depth transducers, normally mounted "thru hull" and boat speed sensors. In addition, the HALCYON 3 or SUPER HALCYON 3 AUTO-SWING (R) flux gate compass connects directly into the computer unit. This will provide the additional information for magnetic heading and Dead Reckoning (DR). HYDRA 330 can also be used with B & G's highly accurate Sonic Speed (R) unit. The information displayed on request is as follows:

- SPEED, AVERAGE, VMG
- WIND (Apparent and True)
- TIMER
- TEMPERATURE
- LOG
- ALARMS
- CALIBRATION
- DEPTH
- DAMPING
- HEADING, D/R

The HYDRA 330 drives two types of display, namely the standard B & G analogue meter, driven direct from the computer unit and liquid crystal Full Function Displays (FFD) driven via the communication network.

The FFD is a custom made display which can display two values simultaneously, with associated text and units. Control of the system is achieved by operation of the front panel keys.



1.1 CONTROL KEYS

The control keys perform the following functions:

PAGE Key 

Operation of this single key enables the user to view 8 functions of the HYDRA system by selecting any one of the 4 preset page displays (2 functions per page) with a simple key press. Operation of this key also allows the operator to prematurely terminate any other function (e.g., calibration) and return to the normal page display. The 4 pages are initially set up as described but can be reset to suit the user's requirements (see Page display configuration).

Note: When the display units are first powered up, if the PAGE key is held pressed during the power up, then the four pages will be initially set up as described.

Page 1 - Boat speed in knots (top).
Depth in metres (Bottom).

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- Page 2 - Log in nautical miles (Top).
VMG in knots (Bottom).
- Page 3 - Reset log in nautical miles (Top).
Timer Hours, Minutes and Seconds
(Bottom).
- Page 4 - Apparent wind speed (Top).
Apparent wind angle (Bottom).

Each page however can be individually configured to any pair of desired or available functions.

SCROLL UP Key 

This key has two functions:

- (1) To scroll through the functional menus on the TOP display (see Appendix B, System Menu Tree).
- (2) To increase the numerical value selected (e.g., setting the upper parameters for alarms, calibration and damping).

SCROLL DOWN Key 

This key has two functions:

- (1) To scroll through the functional menus on the BOTTOM display (see Appendix B, System Menu Tree).
- (2) To decrease the numerical value selected (e.g., setting the lower parameters for alarms, calibration and damping).

ENTER Key 

This is used to enter the following:

- (1) A menu selection.

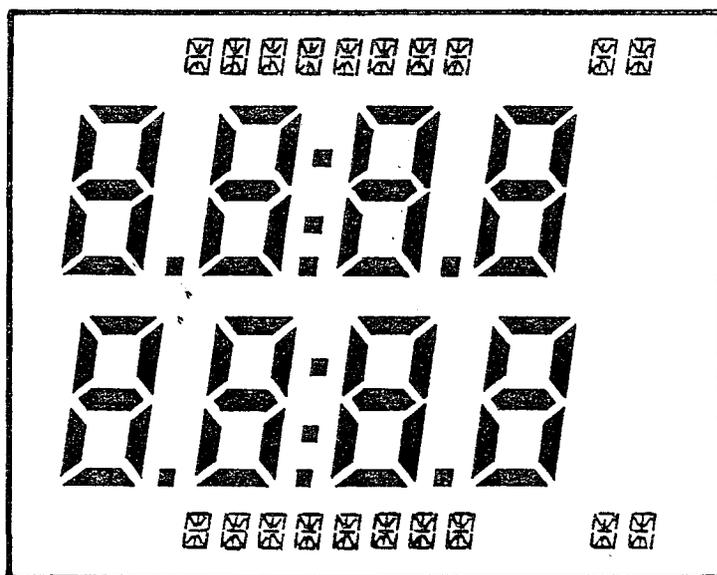
- (2) A value that is being displayed (e.g., alarm values).
- (3) The reset and start of a trip function.
- (4) Other operations that have been configured.

ON/OFF/LIGHTS Key 

This key switches on the HYDRA system, controls the level of display illumination, and switches the system off.

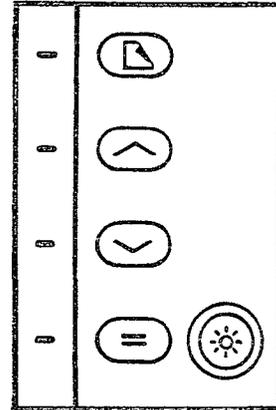
1.2 DISPLAY

HYDRA 330 has a custom designed liquid crystal display with digital and alphanumeric indications. The digital indicators are the two sets (upper and lower) of four large numerals. The alphanumeric indicators are the two sets of characters which appear above and below their respective digital indicators.



1.3 KEYPAD

Four function keys are positioned vertically to the right of the display. The power ON/OFF/LIGHTS key is positioned to the right of the lowest function key.



1.4 FUNCTIONS

ON/OFF/LIGHTS Key 

One short press of this key applies power to the HYDRA system and the display is activated to show the last page used on the previous operation. A second short press of the key provides full background illumination on all display sections. Further short presses of the key decrease the illumination in three stages from full brightness to OFF. The next press gives full illumination again.

This operation, on any one HYDRA display, performs the same sequence on all HYDRA displays connected to the system.

To switch off the system, press and hold down the key for 3 seconds. After this time lapse, the message POWER-OFF appears in the upper text for 2 seconds and then goes off.

PAGE Key 

Each press of this key selects the next page display. When a page is selected, both the upper and lower displays are shown, providing two functions.

Successive presses of the key selects the four available pages in rotation and, as each page can be programmed to display any pair of functions, the eight most frequently used functions can be accessed using only one key. When performing any other operation, pressing the page key will return the display to normal.

SCROLL Keys Operating Logic

When using the scroll keys to set up alarms, calibrations etc., always use the opposite key to the display showing the required function. For example, if setting the alarm function for DEPTH, and DEPTH is displayed on the BOTTOM display, use the **SCROLL UP** key to select the alarm function. If DEPTH is displayed on the TOP display, use the **SCROLL DOWN** key to select the alarm function.

SCROLL UP Key

When this key is pressed initially, the large digits in the upper display are blanked from the screen and the word CONTROL or SPEED appears in the upper text. The key is then held pressed to scroll through the group functions. If, when scrolling up, the required function is passed, operation of the **SCROLL DOWN** key reverses the scroll. When scrolling is stopped at the required function (see Appendix A, Table of Functions), the text flashes until selection is made by pressing the **ENTER** key.

The **SCROLL UP** key is then used to scroll through the items of the function menu and the selected item flashes until selection is made using the **ENTER** key.

A full list of the HYDRA 330 system function menus is given in Appendix B.

The **SCROLL** keys are also used to increase (**UP**) or decrease (**DOWN**) when entering calibrations, damping, alarms, etc.

SCROLL DOWN Key 

Operation of this key is as described for the **SCROLL UP** key except that all references made apply to the lower half of the display.

ENTER Key 

This key is used to enter selections made by the **SCROLL** keys, as previously described. When an alarm is raised, the **ENTER** key is pressed twice to stop the alarm indicator from flashing and, if an audible alarm is fitted, this key press silences the alarm warning and resets the alarm. Whatever function is being performed, the **ENTER** key is an **ACTION** key. For example, a selected control function is not active until the **ENTER** key is pressed to accept the function selected.

An additional feature of this key when displaying **LOG** and **TIMER** functions is to expand the display. Normally the **LOG** function displays nautical miles to two decimal places, ie, 99.99nm (maximum). One press of the **ENTER** key expands the display to 0099nm, giving a maximum available display of 9999nm if required. Similarly, the **TIMER** function normally displays a minutes and seconds reading. Expansion by the **ENTER** key displays hours and minutes instead.

2 OPERATION

2.1 PAGE DISPLAY

This provides a display of 8 functions on 4 pages selected by a single key (PAGE ) operation.

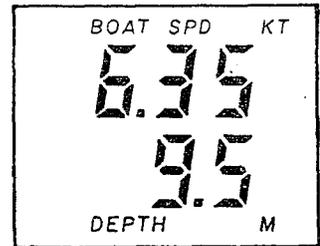
2.1.1 Page Display Configuration

Each of the four display pages can be configured to give the user all necessary information by the operation of the  key. Any combination of any two functions on the system can be configured on each page.

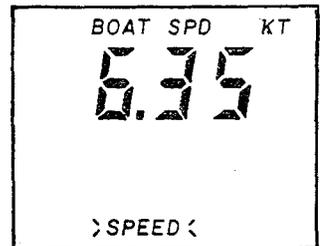
Also provided is an instantaneous display of any other function which has not been permanently programmed onto a page display.

EXAMPLE: View STD LOG

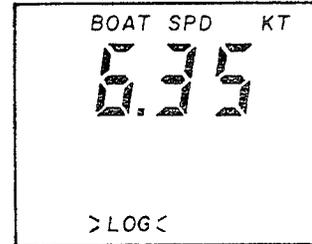
1. The display is showing:



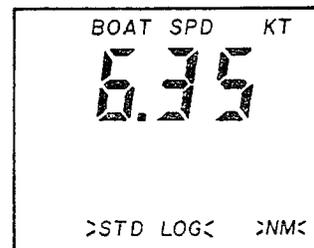
2. Press , the lower text now shows SPEED flashing, upper display not affected.



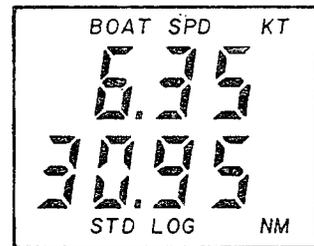
3. Press , the lower text now shows LOG flashing, upper display not affected.



4. Press , the lower text now shows STD LOG flashing, upper display not affected.

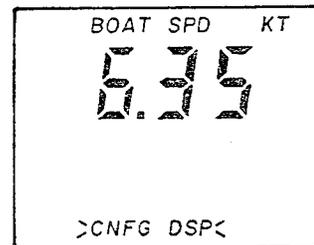


5. Press , the lower display now shows required function, upper display not affected.

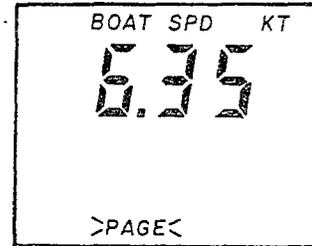


To store this display as a permanent new page, proceed as follows:

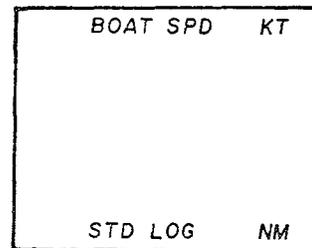
6. Press  or  and scroll appropriate text to CNFG DSP.



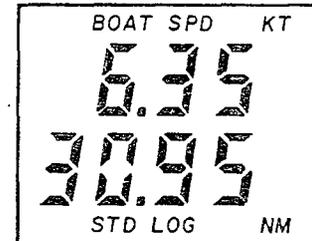
7. Press = , PAGE appears in the text.



8. Press = , the digital display is blanked and the two functions currently on the page are displayed in the text.



9. Press = to accept the new page configuration.



All page displays are held permanently in the system memory, independent of the power supply.

2.2 TRIP FUNCTIONS

HYDRA 330 provides three trip functions, namely Timer (count down / count up), Trip Log and Dead Reckoning (D/R). The functions can be reset and restarted as required, eg., for keeping a separate log of elapsed time and distance run for a given passage.

The trip functions are controlled by selecting options from the 'CONTROL' menu as shown by the two examples that are given later in this section.

The options for the TIMER function are as follows:-

START 0 - for count up
START 5)
START 10) - for count down
START 15)

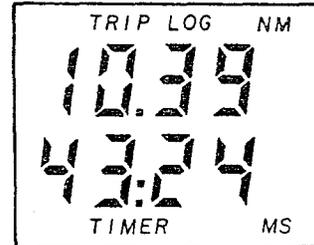
The timer display can also be frozen if required.

The 'FREEZE' option allows the displayed value to be held on display until the 'RUN' option is selected. The trip function is not stopped by freezing the display.

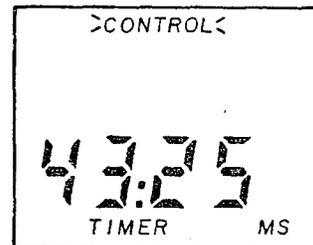
If the trip log or dead reckoning are reset then they will be started when the timer is started from zero or it counts down through zero.

EXAMPLE: Reset TIMER to 5 Minute Countdown

1. Select TIMER on the display.



2. If the TIMER is in the lower display, press , the upper text now shows CONTROL flashing.



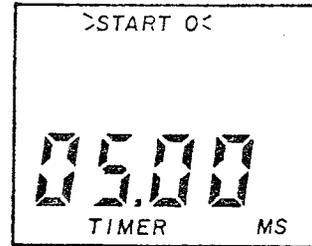
3. Press , the upper text now shows FREEZE flashing.



4. Press  twice, the upper text now shows START 5 flashing.



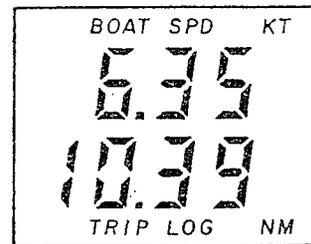
5. Press , the display now shows the timer counting down from 5 minutes and the START 0 menu is flashing.



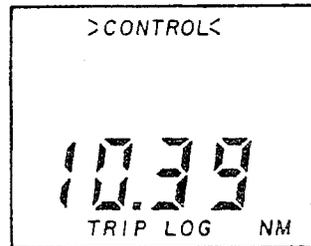
6. Press  to restore the original function to the top section of the display.

EXAMPLE: Reset TRIP LOG

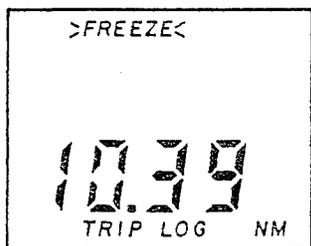
1. Select TRIP LOG on the display.



2. If the TRIP LOG is in the lower display, press , the upper text shows CONTROL flashing.



3. Press , the upper text shows FREEZE flashing.



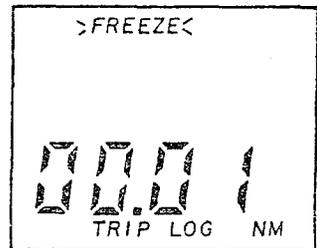
4. Press , the upper text shows RESET flashing.



5. Press , the display shows the TRIP LOG reset and the RUN menu is flashing.



6. Press , the display shows the TRIP LOG running.



7. Press , to restore the original function to the top section of the display.

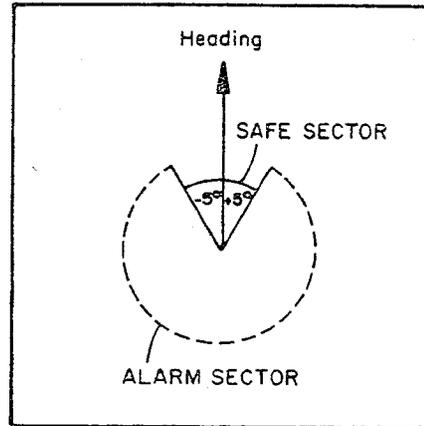
2.3 ALARMS

When a preset alarm parameter is reached, e.g., depth reducing, the system raises an alarm automatically. In an alarm condition, the lower display changes from the current page to highlight the cause of the alarm, which flashes on and off continuously until  is pressed twice. The audible alarm, if fitted, is also silenced by this key operation. After silencing/discontinue flash, the lower display continues to monitor the alarm condition. The alarm is still active and, if the alarm parameter is again exceeded, the alarm will flash/sound as necessary. The displayed alarm function remains on the lower display until  is pressed. For a list of all available functions, see Appendix A, Table of Functions.

2.3.1 Alarm Control

A 'HI ALARM' is generated if a function value exceeds a preset level, a 'LO ALARM' is generated if a function falls below a preset level.

A 'SECTOR' alarm is generated when the reference heading leaves the SAFE SECTOR as shown in the diagram.

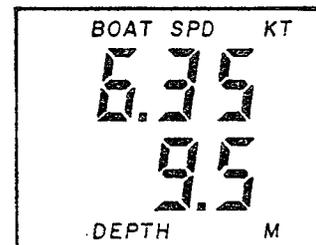


For example, when the SECTOR alarm is turned on, the alarm reference heading is the current compass heading. If the SECTOR alarm is set at 10° , the SECTOR value is the compass heading $\pm 5^{\circ}$. It is therefore important to switch OFF the SECTOR alarm before carrying out a course alteration and switching the alarm ON again when settled on the new course heading.

Any alarm can be turned ON and OFF individually, or all alarms can be turned OFF collectively.

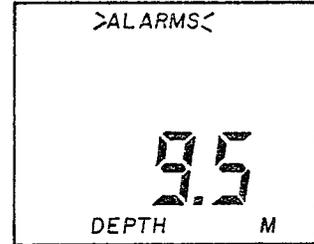
To set the 'HI', 'LO', or 'SECTOR' alarms, proceed as follows:

1. Select function which requires alarm facility, e.g., DEPTH.

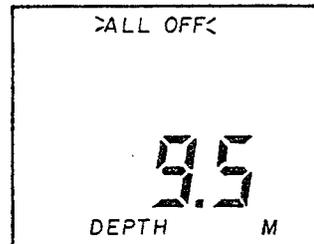


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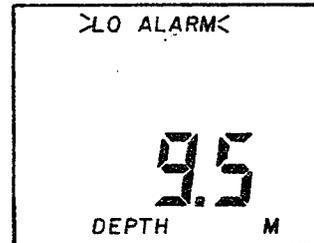
2. Press  to scroll upper text until ALARMS appears, flashing.



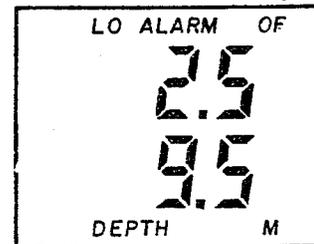
3. Press  and the upper text shows ALL OFF, flashing.



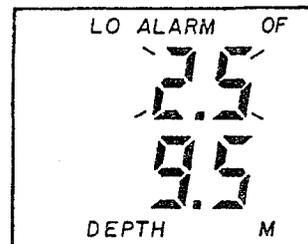
4. Press  and scroll up until upper text shows LO ALARM flashing.



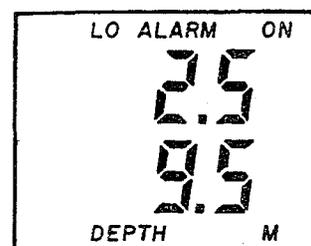
5. Press  and the display shows the current LO ALARM value.



6. To change the 'LO' value, press = , 'LO ALARM' value flashes.



7. Now press ^ or v to increase or decrease the value as required. Press = to accept the new value and turn the alarm ON.



To access the 'HI' alarm, press ^ until HI ALARM appears and press = to reveal current HI ALARM value. To change the value, use the same procedure as used to change the LO ALARM value and SECTOR alarms.

To turn OFF an alarm (HI, LO or SECTOR), press ^ until the required item (e.g., HI OFF) appears in the upper text and press = .

To turn ON an alarm, press ^ until the required item (e.g., LO ON) appears in the upper text and press = .

To disable all alarms collectively, proceed as follows:

- a. Select any page which displays a function with an alarm facility, e.g., DEPTH.

- b. Press  or  to scroll to ALARMS flashing, then press  and ALL OFF appears flashing.
- c. Press  again, all alarms are turned OFF and the display returns to normal page display.

All alarms in the system will remain OFF until the values are reset or the system is next turned on. They will then be set (e.g., either ON or OFF) as previously configured.

2.4 LIGHTING CONTROL

Use of the  key normally controls the lighting facility on all HYDRA displays simultaneously, as previously described. However, the lighting on a single HYDRA display can be controlled individually as detailed in the following instructions.

1. Press and hold  or  until LIGHTING appears in the appropriate text.
2. Press  and LOCAL appears in the text.
3. Press  again and the original page display appears.

The  key now controls the lighting on its own display only, which is isolated from the rest of the system. To return to system control, proceed as follows:

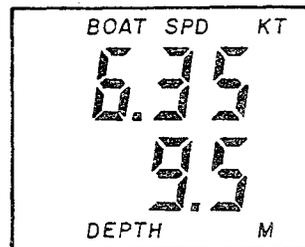
- a. Select LIGHTING as in step 1.
- b. Press  and  or  to select SYSTEM.
- c. Press  again, the original page display appears and the lighting has returned to system control.

2.5 DAMPING CONTROL

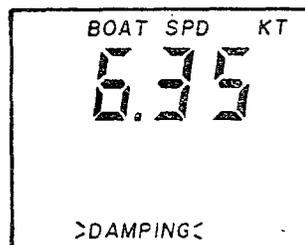
Certain functions require damping (see Appendix A, Table of Functions) to give steadier readings. This becomes more apparent in adverse weather conditions. The amount of damping used can be adjusted to suit the current environment.

EXAMPLE: Damp Boat Speed

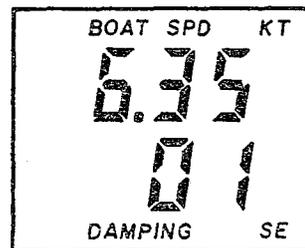
1. Select BOAT SPD using the  key.



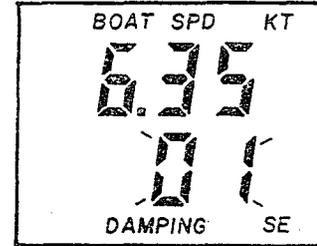
2. If BOAT SPD is in the upper display, press and hold  to select DAMPING which flashes in the lower text.



3. Press  and the current damping value is displayed on the lower display.



4. Press  and DAMPING value flashes.



5. Press  or  to increase/decrease damping as required.
6. Press  to accept new value.
7. Press  to return to normal display.

Damping control for any applicable function is achieved in a similar manner.

3 HYDRA 330 FUNCTIONS

This section describes the basic functions of the HYDRA 330 system. All functions are detailed in Appendix A.

<u>FUNCTION</u>	<u>DESCRIPTION</u>
BOAT SPD (Boat Speed)	Speed of the yacht through the water, measured in knots. Acceleration or Deceleration is denoted by a 'flag' in the left hand digital display.
AVG SPD (Average Speed)	Average speed maintained since trip log last reset.
VMG (Velocity Made Good)	Speed made to windward or leeward; displays show U when proceeding upwind or D when proceeding downwind.
STD LOG (Stored Log)	Total accumulative log for life of equipment, in nautical miles. This function cannot be reset.
TRIP LOG	A general use log, in nautical miles, for passage making etc. It can be reset.
DEPTH	Depth measurement in Metres, Feet or Fathoms, as required. It is given as the depth below the transducer +/- the Datum offset (see Depth DATUM Calibration).

<u>FUNCTION</u>	<u>DESCRIPTION</u>
APP W/S (Apparent Wind Speed)	Wind speed, in knots, as measured at the mast head unit, not taking into account yacht heading and speed.
TRUE W/S (True Wind Speed)	Actual windspeed, taking into account speed of yacht and apparent wind angle.
APP W/A (Apparent Wind Angle)	Wind angle relative to yacht heading, not accounting for speed of yacht. A minus (-) sign appears to the left or right of the digital reading to denote Port or Starboard tack respectively.
TRUE W/A (True Wind Angle)	The actual wind angle relative to the heading of the yacht. An equals (=) sign appears to the left or right of the digital reading to denote Port or Starboard respectively.
VOLTS	The present voltage of the yacht battery supply.
TIMER	A count down or count up facility, in Hours, Minutes and Seconds. It can be reset.
If a HALCYON 3 or a SUPER HALCYON 3 AUTO-SWING (R) compass is fitted, the following functions may be obtained:	
HEADING	Yacht compass heading relative to magnetic North.

<u>FUNCTION</u>	<u>DESCRIPTION</u>
D/R CRSE	Resultant Dead Reckoned Course steered from point at which D/R was last set. Note: Does not take into consideration tide or leeway.
D/R DIST	Resultant Dead Reckoned Distance travelled along D/R Course, measured in nautical miles, since D/R was last reset.

The HALCYON 3 compass must be correctly swung after installation to ensure correct operation. If any deviation is evident, a qualified compass adjuster is required. However, the SUPER HALCYON 3 AUTO-SWING ® compass automatically corrects for any yacht deviation and therefore does not require to be swung. For further details, refer to the respective compass manual.

If temperature sensors are fitted, the following functions can be obtained:

Sea Temperature - measured in degrees Centigrade.

Sea Temperature - measured in degrees Fahrenheit.

Air Temperature - measured in degrees Centigrade.

Air Temperature - measured in degrees Fahrenheit.

All temperature readings are suffixed C or F in the digital display.

4 HYDRA 330 EXPANSION

The following facilities are available to expand (and so enhance) your HYDRA 330 system, as required.

4.1 ADDITIONAL FFDs

A number of FFDs (maximum 25) can be added to the system by connecting into the HYDRA network via a junction box.

Note: Ensure that a terminator is connected at the end of the network chain (see Installation Sheet).

4.2 ADDITIONAL ANALOGUE METERS

The HYDRA 330 computer unit can drive up to 4 analogue synchro meters simultaneously. The meter options to choose from are as follows:

- 1 - 360° wind angle
- 2 - Depth
- 3 - Boat speed
- 4 - Apparent wind speed
- 5 - Magnified wind angle
- 6 - Compass heading
- 7 - Cross track error (XTE)

The default options are 1, 2, 3 and 4 as above. If options 5, 6, or 7 are required then it is necessary to reconfigure the meter drive outputs from the computer unit. This can be done from FFD, as follows:-

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1. Power up the system with the = key pressed, 'DIAGNOST' appears.
2. Press < , 'CNFG SYS' appears, press = to select this option, now press = again to select the 'METERS' option.
3. With 'OPTIONS' flashing, press = , 'METER 1' appears, the < key is now used to scroll through the meter drives, 'METER 1' to 'METER 4'. for the standard processor unit, and 'METER 5 to METER 8' for the expansion processor unit. (Refer to the installation sheet to determine the meter options and their respective meter drives).
4. With the appropriate meter drive flashing in the top display, press = to reveal the current option assigned to that meter. (The options are listed at the beginning of this section 4.2). Pressing < at this stage, and then = again, will reveal the METER 2 option. Repeating this process will reveal the METER 3 and METER 4 options as required.
5. With the meter number and option on display, press = , the lower text will flash. Use v to scroll through the options until the appropriate one (e.g., DEPTH) is shown. Pressing = will select that option, and the meter drive will be configured to drive a DEPTH meter.
6. Press D to return to normal operation.

Note: It is possible to configure more than one meter drive to the same meter option. (e.g., BOAT SPD on METER 1 and METER 2).

Meter scaling can also be varied for boat speed and wind speed. For example if a 25 knot full scale boat speed meter is required or a 90 knot wind speed meter, this can be done as follows:-

1. Follow steps 1 and 2 as in the previous sequence, configuring meters.
2. With 'OPTIONS' flashing, press  to reveal 'SCALING', press , 'BOAT SPD' will appear. A further press of  will reveal the current maximum meter scale value (e.g., 12.5 knots) for the boat speed meter.
3. To change this (e.g., 25 knots) press  and then  to increase the number to 25.0. A final press of  will enter the new maximum scale. The boat speed meter will now read between 0 and 25 knots.
4. To access the wind speed meter maximum scale, press  and then  to reveal the current value. Changing this value is done in the same way as the boat speed meter scale. (See step 3).
5. Press  to return to normal operation.

Meter lighting is controlled via the FFD ON/OFF/LIGHTS key in exactly the same way as FFD lighting.

5 CALIBRATION

Calibration ensures that the HYDRA 330 system is set up correctly to provide maximum accuracy of the information displayed to the user. The functions that require calibration are listed in the table in Appendix A. It is advised that the user keeps a written record of all calibration values in the function table. To achieve the most effective calibration of the system, the user is recommended to follow the procedural steps detailed in the following paragraphs.

5.1 LOG CALIBRATION PROCEDURE

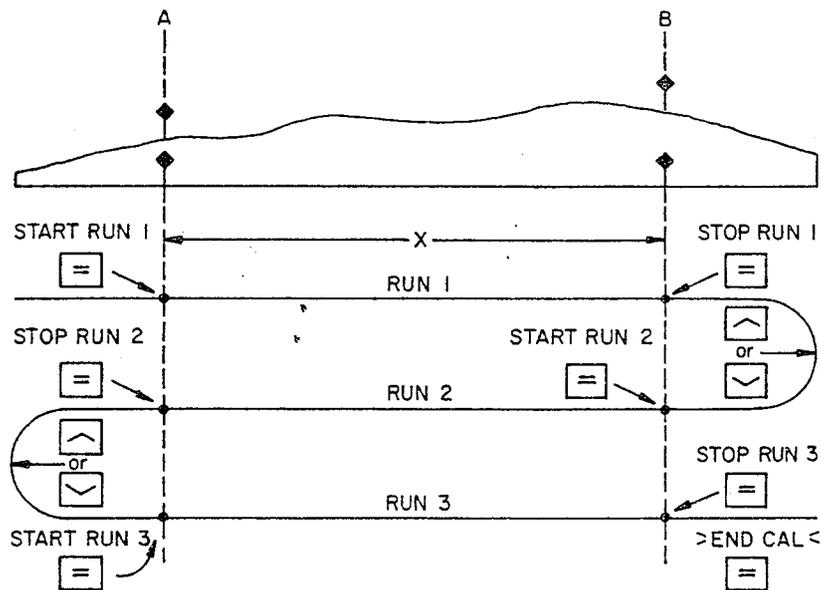
Before calibrating your log, ensure that the underwater unit is correctly aligned as follows:

- a. Paddlewheel: The moulded arrow on top of the unit must be pointing forward along the fore and aft line of the hull.
- b. Sonic Speed [®]: Ensure that the unit is operating correctly as described in the owners manual.
- c. Impeller: On the valveless housing, slacken off the three locking screws fully, then slacken the ring-nut if necessary so that the housing is free to rotate. With the vessel making constant speed under power and the impeller unit down, turn the handle slowly through a small angle on either side of the fore and aft line until maximum reading of speed is obtained on the digital or analogue display (the flow lines beneath the hull are not necessarily parallel with the fore and aft line). Retighten the ring-nut by hand and fully screw down the locking screws, ensuring that their heads 'bottom' onto the shakeproof washers on the ring-nut. Subsequent re-alignment, after removal of the underwater unit for cleaning, is obtained automatically when the unit is lowered fully into its operating position.

This calibration procedure requires the availability of suitable, conspicuous geographical markers along a given course and distance typically as shown on a chart. Consecutive runs, preferably power driven, should be made along the given track. To eliminate the effect of tidal conditions, it is advisable to perform at least two runs, preferably three, along the measured track. There are two available options when calibrating the HYDRA LOG, namely Automatic Calibration (AUTO CAL) and Manual Calibration (MANL CAL). These are outlined as follows:

5.1.1 AUTO CAL Procedure

This facility enables the user to calibrate the yacht's log accurately and simply as all calculations are performed internally by the HYDRA 330 computer unit. Referring to the following diagram, A and B are the two markers for each run and X is the actual distance for each run as ascertained from the chart.

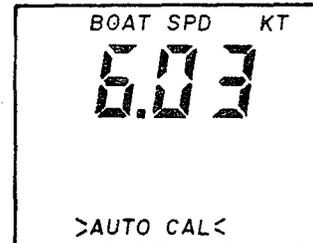


The user is required to enter the distance X in nautical miles (CAL DIST) and then, as the yacht passes marks A and B on each run, to instruct the system to start (STRT RUN) and stop (STOP RUN) and finally to end calibration (END CAL) after the last required run is complete.

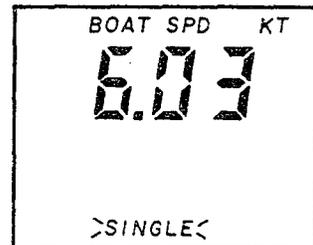
Note: The calibration process can be cancelled at any time during the operation by pressing the PAGE key, if the operator is not satisfied with calibration runs underway, e.g., hampered by another vessel or incorrect count etc.

Method

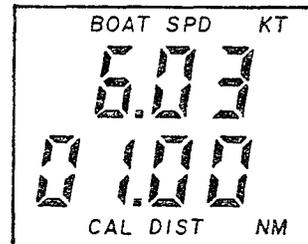
1. Select either BOAT SPD or STD LOG on the display.
2. If BOAT SPD/STD LOG is in upper display, press and hold  to select CALBRATE. If BOAT SPD/STD LOG is in lower display, use  to select CALBRATE.
3. Press  and display shows:



4. Press  and display shows:



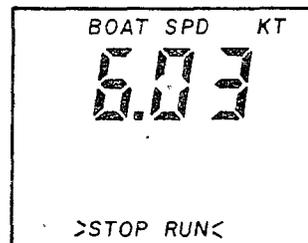
5. Press = twice and display shows the default setting for the actual calibration distance for each run along the given course.



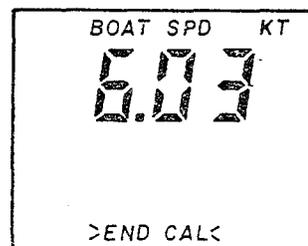
6. Press = , CAL DIST will flash. The ^ and v keys can now be used to select the appropriate measured distance (X). Press = to accept new distance. The system is now ready to start the first calibration run.

7. Press v and STRT RUN appears, flashing.

8. When crossing the first transit mark of the run, press = . The display now shows:



9. When crossing the transit mark at the end of the run, press = . The display shows:



10. Press v to select STRT RUN again and repeat steps 8 and 9.

11. If only two runs are required, press = to end calibration. The lower display will now show the new calibration value which has automatically been calculated by the computer unit. This should be recorded in Appendix A, Table of Functions.
12. If a third run is required, press V to STRT RUN then repeat from step 8.

The yacht's log is now calibrated and the new calibration value is stored permanently in the computer unit's memory.

5.1.2 MANL CAL Procedure

In this case, it is necessary to monitor the trip log and the elapsed time reading for each calibration run. Before starting the runs, proceed as follows:

1. Reset the TRIP LOG and the TIMER to zero (refer to TRIP FUNCTIONS).
2. As the vessel passes the first transit mark, start both the TRIP LOG and the TIMER by starting either function.
3. When the vessel passes the end transit mark, freeze the TRIP LOG and the TIMER by freezing either function.
4. Take a written note of both the TRIP LOG and the TIMER readings.
5. Repeat steps 1 to 4 inclusive, for each complete run.

Calculate, from the results (see step 4), the correction factor K , using one of the following formulae:

- (i) Two runs (in this case, since time is recorded, it is not necessary to maintain a constant speed during the calibration runs):

$$K = \frac{M \left(\frac{1}{t_1} + \frac{1}{t_2} \right)}{\frac{D_1}{t_1} + \frac{D_2}{t_2}}$$

Where:

M = measured distance in nautical miles.

t1, t2 = times 1 and 2 for each run in SECONDS or DECIMAL HOURS

D1, D2 = indicated distances for each run as noted at step 4.

- (ii) Three runs (performing three runs whilst recording time and distance gives the most accurate result. Again, there is no need to maintain a constant speed. The tidal current is assumed to be increasing or decreasing at a constant rate):

$$K = \frac{M \left(\frac{1}{t_1} + \frac{2}{t_2} + \frac{1}{t_3} \right)}{\frac{D_1}{t_1} + \frac{2D_2}{t_2} + \frac{D_3}{t_3}}$$

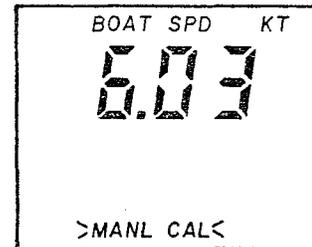
Times and distances as in (i).

Divide the current calibration value by the factor K to calculate the new calibration value. To obtain the current value, proceed as follows:

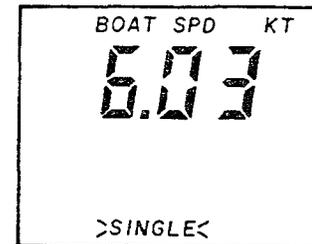
- a. Select either BOAT SPD or STD LOG on the display.

b. If BOAT SPD/STD LOG is in upper display, press and hold  to select CALBRATE. If BOAT SPD/STD LOG is in lower display, use  to select CALBRATE.

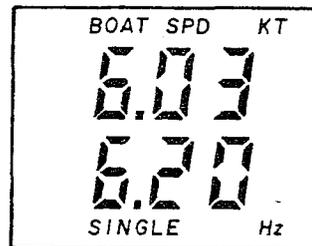
c. Press , then press  and display shows:



d. Press  and display shows:



e. Press  to reveal the current calibration value and the display shows:



f. To enter the new calibration value, press  and SINGLE flashes.

g. Use  and  to change the calibration value to the new number.

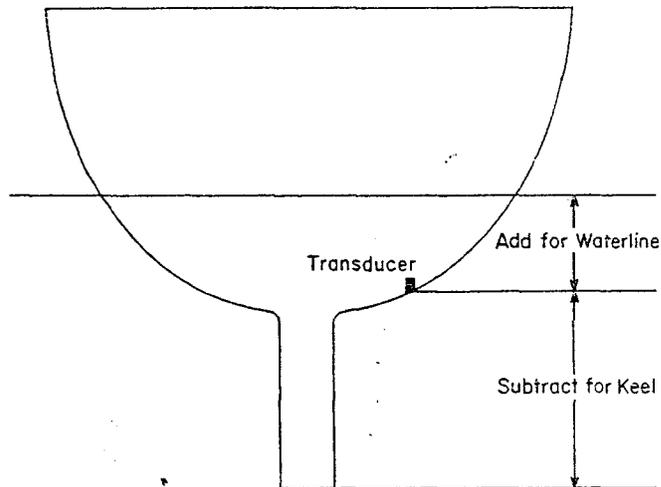
h. Press  to enter the new value into the system.

Note: When the new value is entered into the system, the BOAT SPD value, if displayed, will automatically alter accordingly.

j. Press  to return to normal page display.

5.2 DEPTH DATUM CALIBRATION PROCEDURE

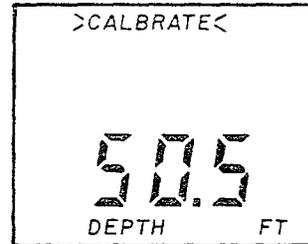
Typical transducer installations are mounted "thru hull" at a suitable position between the water line and the bottom of the keel. A DATUM (offset value) can be set, such that the depth display refers to either the water line or the keel line.



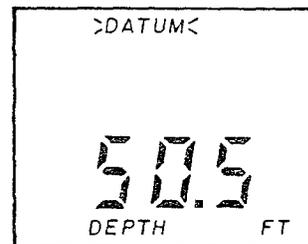
To enter the DATUM, proceed as follows:

1. Ascertain the distance offset to be entered.
2. Select DEPTH on display.

3. Press and hold  and scroll to CALBRATE, which flashes. If DEPTH is on upper display, press and hold  for CALBRATE.



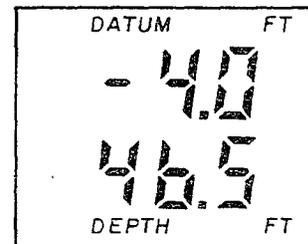
4. Press  and the display shows DATUM which flashes.



5. Press  again, DATUM stops flashing and the current datum value is displayed.
6. Press  and the DATUM value flashes.
7. Use  or  to select the new DATUM value.

Note:

If DATUM is referenced to the water line, the value is positive. If DATUM is referenced to the keel line, the value is negative and this is indicated by a minus sign in the left digit.



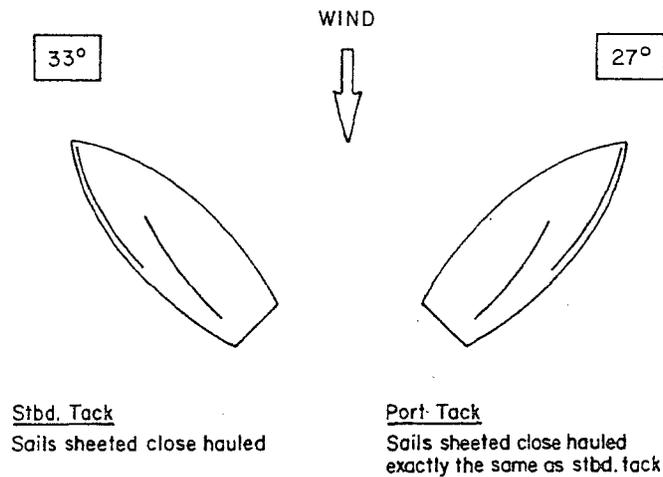
8. Press  to accept the new DATUM value into the system.

5.3 APP W/A CALIBRATION PROCEDURE

To ensure wind angle readings are consistent on either tack, it is essential that the Mast Head Unit (MHU) is aligned correctly with the yacht centre line. This correction can be applied internally in the HYDRA system, as opposed to manual alignment of the MHU.

The alignment error can be ascertained as follows:

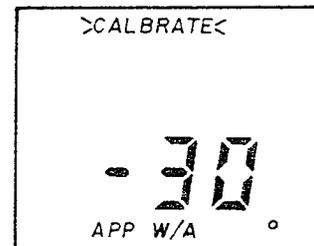
1. Whilst monitoring APP W/A on a display, sail upwind at the optimum close haul position (see diagram).



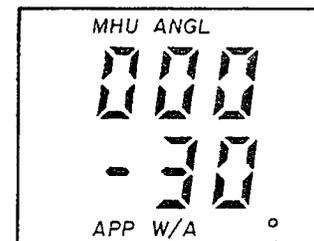
Difference = 6°
MHU error $6^\circ/2 = 3^\circ$ (CAL Value)
If Port Tack is low subtract 003°
If Stbd. Tack is low add 003°

2. When conditions are steady, write down the APP W/A reading.
3. Tack the vessel and sail at the optimum close haul position as before.

4. When conditions are again steady, write down this APP W/A reading.
5. Repeat steps 1 to 4 inclusive at least two or three times to obtain an average APP W/A for each tack.
6. Calculate the angle difference between the Port and Stbd tacks and divide the result by two to give the MHU alignment error for entry into the system.
7. With APP W/A displayed, press  and scroll to CALBRATE which flashes. If APP W/A is on upper display, press  and scroll to CALBRATE.



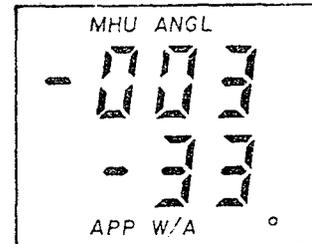
8. Press  twice and the current alignment value is displayed as shown:



9. Press ; MHU ANGL flashes, then use  or  to select new value as calculated in step 6.

Note: If APP W/A readings recorded were less on Port tack than on Stbd tack, the value to be entered should be negative as denoted by the minus sign in the left digit. If readings were less on Stbd tack, the value should be positive.

10. Press = to accept the new value into the system, the effect of which will be seen immediately on the APP W/A reading.



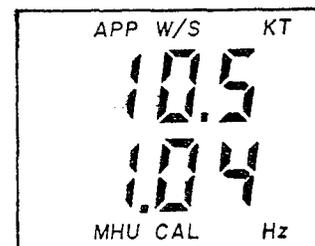
11. Repeat the complete procedure and check that similar APP W/A readings are obtained on each tack.

5.4 APP W/S CALIBRATION PROCEDURE

There are two calibrations associated with APP W/S namely MHU CAL and MHU OFFSET. These values are preset by the manufacturers to suit the Type 213 Brookes and Gatehouse MHUs and, consequently, do not require any adjustment by the user except in exceptional circumstances.

If it is proven that the windspeed reading is incorrect, ie, by comparison with other similarly equiped vessels, the MHU CAL value may be adjusted as follows:

1. With APP W/S on the display, use ^ or v as appropriate, to scroll to CALBRATE which flashes..
2. Press = twice to reveal the current calibration value as shown.



3. Press  again and MHU CAL flashes.
4. Use  and  to increase or decrease the calibration value as appropriate.

Note: If the wind speed display is underreading, decrease the MHU CAL value. If the display is overreading, increase the MHU CAL value.

5. Press  to accept the new value, the effect of which will be seen immediately as the APP W/S reading alters accordingly.

If MHU offset requires calibration, select MHU OFFS as in step 2 and enter the new value in the normal manner.

6. Press  to return to the normal page display.

5.5 BATTERY VOLTS CALIBRATION

The HYDRA 330 monitors the yacht's battery supply and can be called up on any display giving a reading in volts. This helps the user to ensure that the batteries are kept well charged and will also help to detect an alternator failure. This is calibrated by the manufacturer and should not require adjustment except in exceptional circumstances or after a system reset. If it is necessary to calibrate this function a suitable voltmeter is required.

Press and hold either  or  until 'MOTOR' appears, press  twice. 'VOLTS' is now on display.

If VOLTS is in the top display press and hold  until 'CALBRATE' appears; (otherwise use  if VOLTS is in the bottom display).

Press , 'CALVAL' will appear, now press  again, the current voltage setting will now be displayed.

Using the independent voltmeter, measure the battery supply at terminals 18 (+) and 17 (-) at the computer unit connection block.

Press = , 'CALVAL' will flash, now use ^ and/or v to increase or decrease the current voltage setting until it equals the value from the voltmeter.

Pressing = will now enter the new setting and 'CALVAL' will stop flashing.

The voltage setting is now calibrated and should not need any further adjustment. Press D to return to normal display operation.

5.6 SEA TEMPERATURE SENSOR SELECTION

If a suitable temperature sensor is fitted, the HYDRA 330 will monitor the current sea temperature. The majority of installations will have the sensor incorporated within the impeller hull fitting, in this case, no further action is required by the user.

If the sensor is a totally independent fitting (B & G part no. 224-00-027) then it is necessary to change the sensor selection value. This may be done via any FFD as follows:-

Select 'SEA TEMP' (either $^{\circ}\text{C}$ or $^{\circ}\text{F}$) on any display.

If 'SEA TEMP' is in the top display, press and hold v until 'CALBRATE' appears. (Use ^ if 'SEA TEMP' is in the bottom display).

Press = , 'CALVAL' will appear flashing, press = again, the current selection value will now be displayed (default = 1).

Press = , the value will flash, now use ^ key to increase the value to 2. Press = to accept the new value.

Press the  key to return to the normal display.

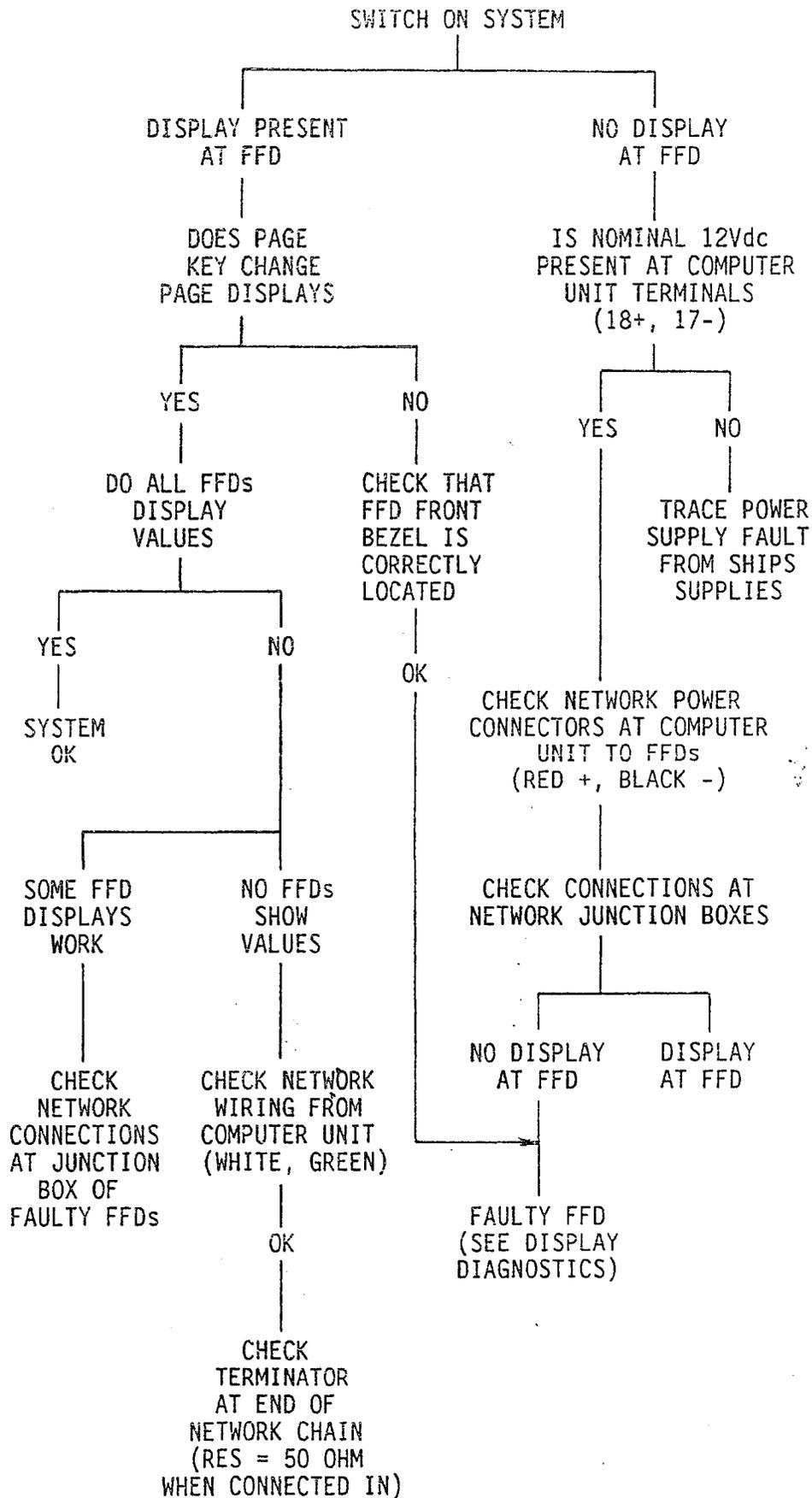
The SEA TEMP display will now give sensible readings.

6 FAULTFINDING

Faultfinding on the HYDRA 330 system is achieved at user/operator level using the functional troubleshooting charts provided in the following pages. The charts provide a step-by-step routine to faultfind through the system in a logical manner and indicates cross references to other fault location facilities (i.e., diagnostics mode) where applicable.

A faulty reading on the HYDRA 330 system display does not always indicate that the system is at fault. Prevailing conditions can affect the equipment response, therefore be sure to read the introductory information to troubleshooting charts, where applicable, i.e., Depth sounder.

CHART 1 - TROUBLESHOOTING HYDRA 330 SYSTEM



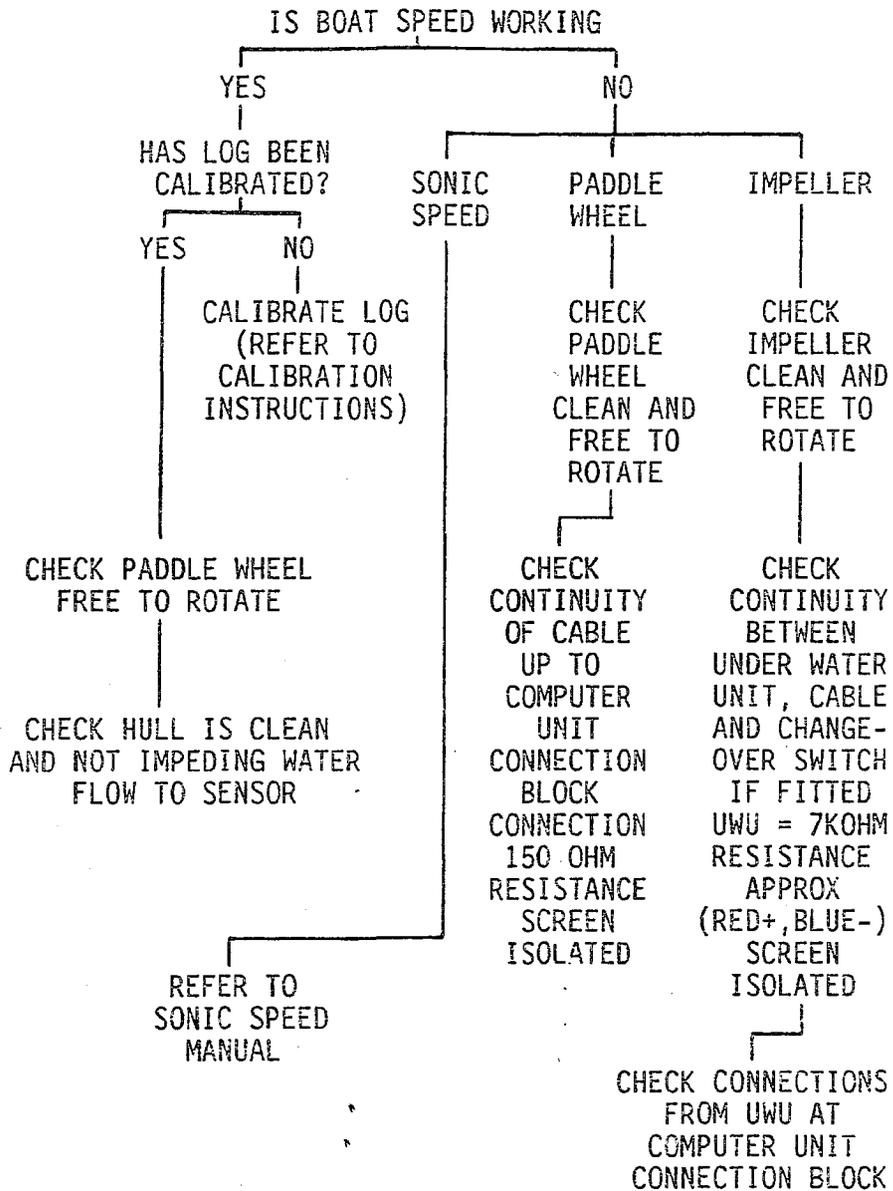


CHART 2 - TROUBLESHOOTING BOAT SPEED/LOG

330-HB-0335-02

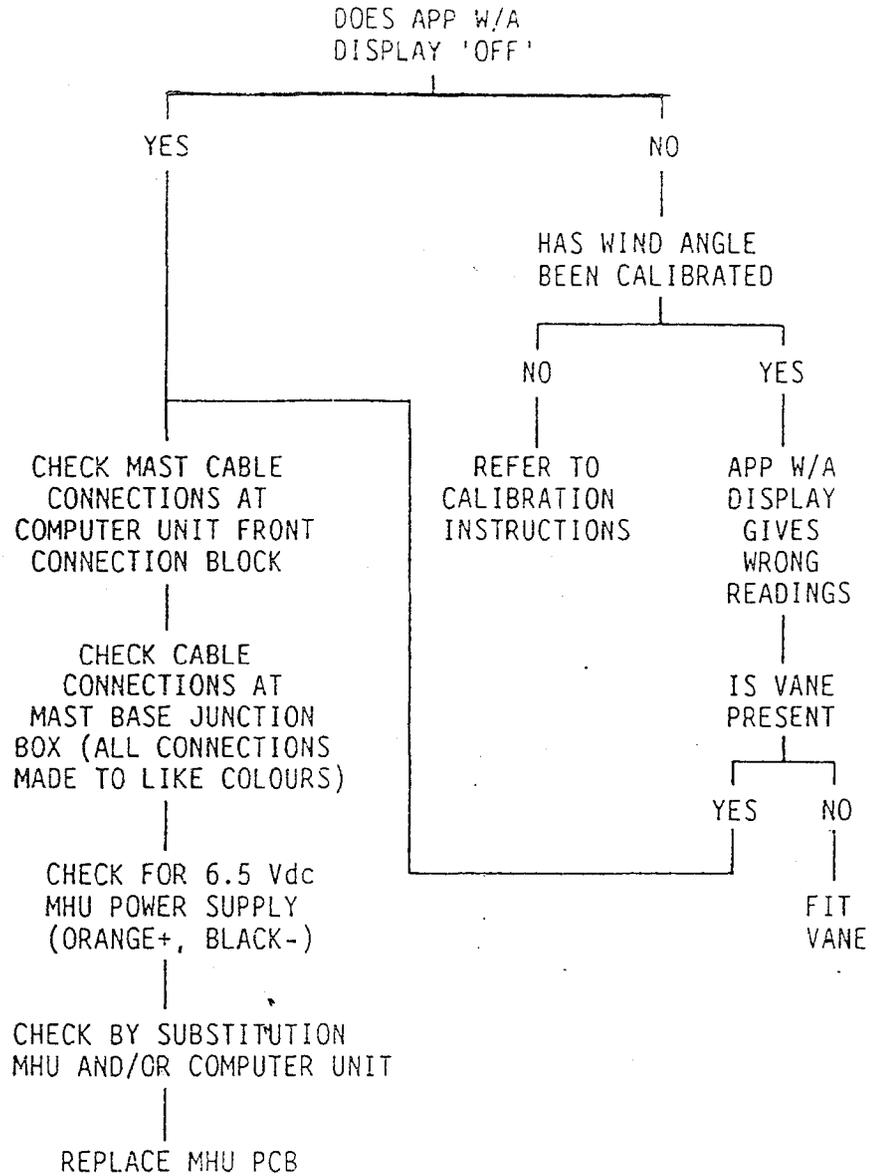
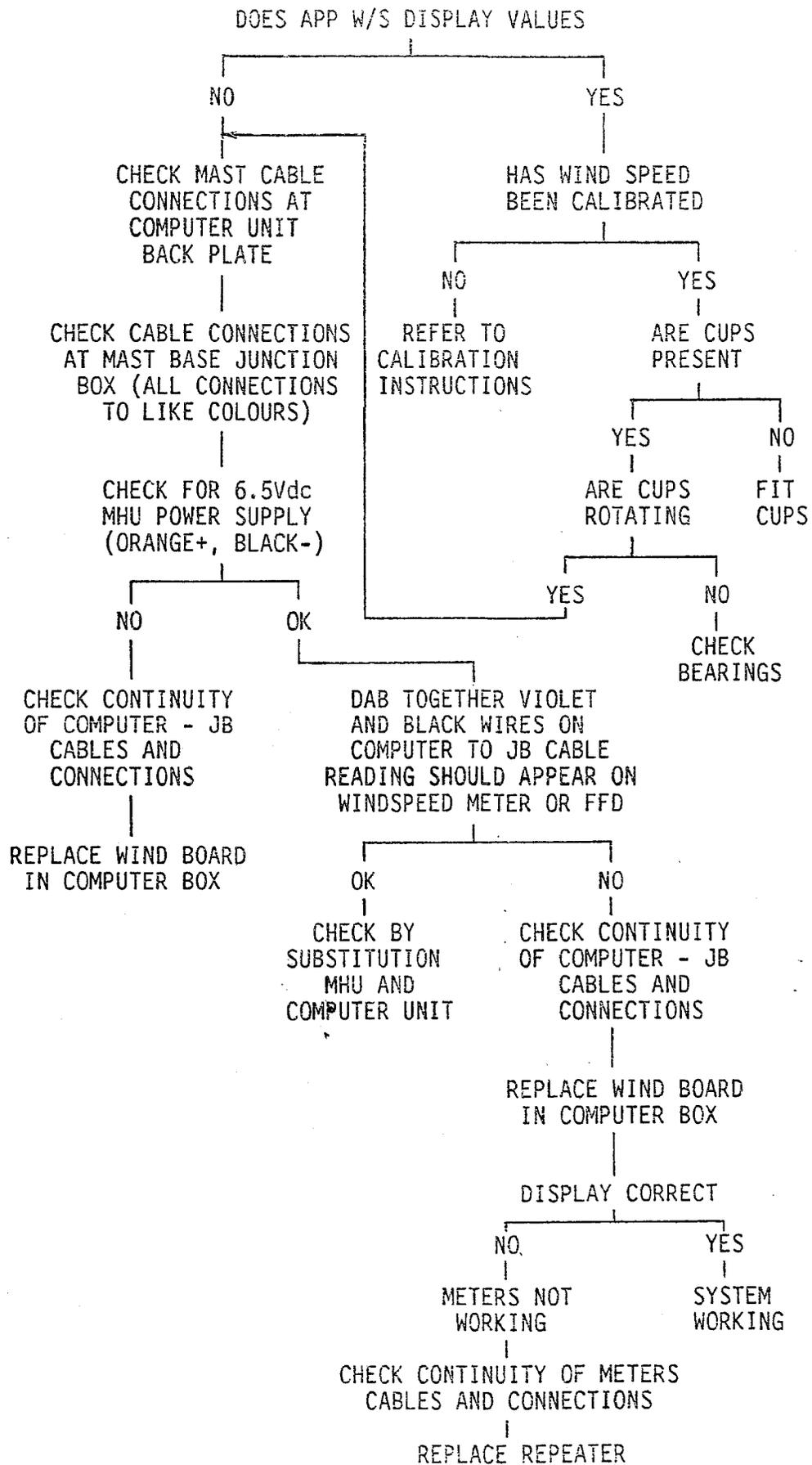


CHART 3 - TROUBLESHOOTING APPARENT WIND ANGLE

330-HB-0335-01

CHART 4 - TROUBLESHOOTING APPARENT WIND SPEED



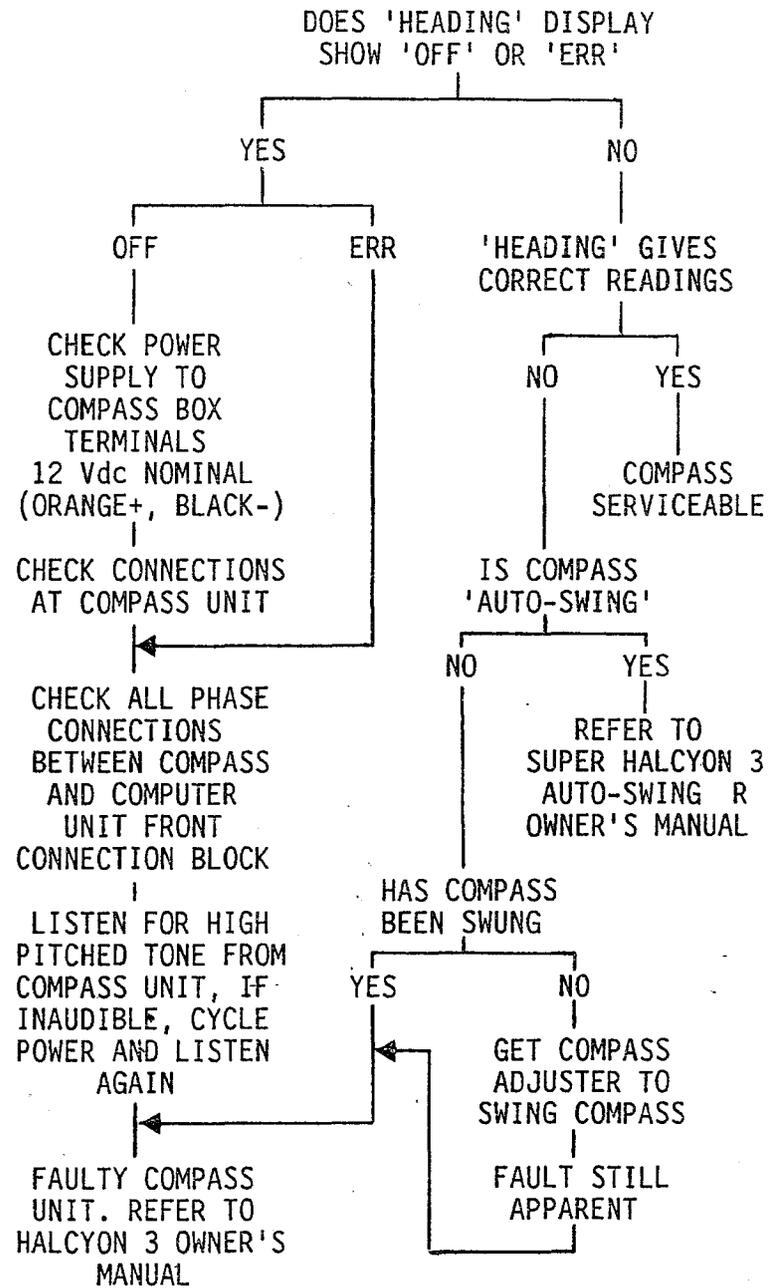


CHART 5 - TROUBLESHOOTING COMPASS

Depthsounder performance is dependent on many factors: transducer type and installation, boat speed, electrical noise, sea state, sea bed conditions, air and plankton in the water. The Hydra uses a powerful transmitter, together with a sensitive receiver and digital signal processing to obtain the best possible performance under all conditions. When a reliable measurement of depth is not possible, the display shows '___' i.e., when following in the wake of another vessel, transducer coming out of the water at high speed etc, The accuracy of measurement is dependent on the velocity of sound and the amount the sound penetrates the sea bottom. Changes in the velocity of sound are not normally significant however errors up to one foot can result from sound penetration into very soft mud.

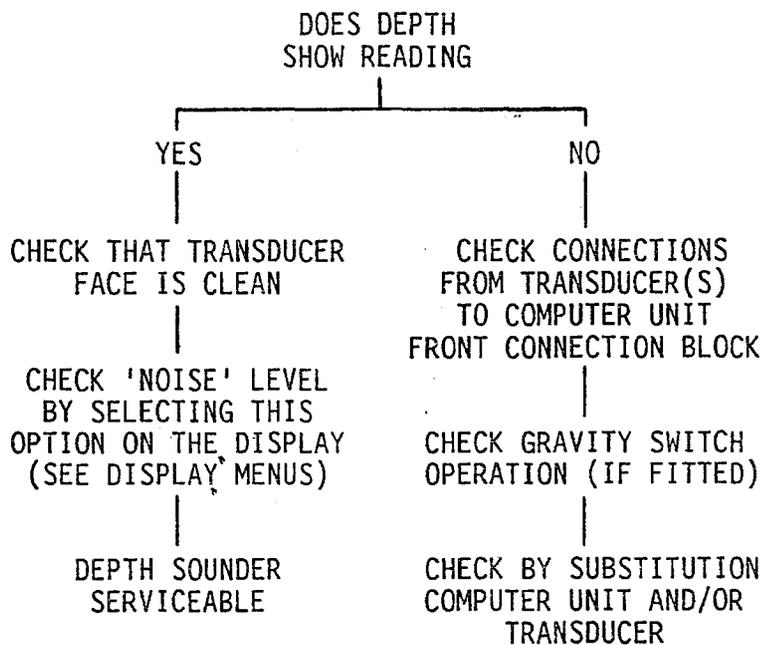


CHART 6 - TROUBLESHOOTING DEPTH SOUNDER

7 DIAGNOSTICS

The diagnostic functions of the HYDRA system are incorporated mainly to assist service technicians. However, some simple diagnostic tests can be carried out by the user/operator which will assist in diagnosing a fault, or describing the fault symptoms to the service facility.

The HYDRA system is programmed to perform internal diagnostic tests automatically each time the system is switched on and to display any appropriate error messages.

7.1 USER DIAGNOSTIC TESTS

The diagnostic function can only be entered at initial SWITCH-ON of the HYDRA system, as follows:

1. Press and hold ⊖ when switching on the system and DIAGNOST appears on the upper text in an otherwise blank display.
2. Press ⊖ and the first test option appears e.g., KEYTEST.
3. Press ⊖ to start the test.

Note: Some tests require operator inputs during the test run. The operator actions will be requested, on the display at the appropriate time.

4. On completion of each test, press ⤴ to scroll up to the next test, i.e., DISPLAY, and press ⊖ to start the test.
5. On successful completion of all tests, press ⏏ to return to the normal page display.

There are twelve test options in the DIAGNOSTICS function. The tests are detailed as follows:

KEY TEST: This tests each of the five keys in turn with the user pressing keys when requested by the display. If any key is faulty, the appropriate message is displayed.

DISPLAY: If the user holds a SCROLL key pressed, as instructed, the test cycles through all LCD segments to find any missing.

NETWORK: This test ensures correct communication on the HYDRA network.

RAM/ROM/EEPROM: These tests check the correct operation of the internal control memory. If any of these tests fail, further operation of the FFD cannot be accurately defined.

LIGHTING: This test checks the correct operation of the display lighting control.

DEBUG: This is used for accessing memory in other units in the system.

THIS TEST IS NOT FOR NORMAL USE, SINCE IT MAY SERIOUSLY AFFECT THE OPERATION OF THE HYDRA SYSTEM.

RES-SYS: This is a system reset command.

DO NOT USE THIS OPTION DURING NORMAL OPERATION AS THE SYSTEM WILL GIVE INACCURATE RESULTS UNTIL RE-CALIBRATED.

When executed, the entire HYDRA 330 system will reset. All calibration, damping and alarm values will be set back to default settings, all log values and trip functions will be reset to zero. All display units will reset to their default page settings.

VERSIONS: This option allows the user to obtain the software version numbers for the various processor units in the system. There are three types of units namely; DISPLAY, DEPTH and WIND. With VERSIONS flashing on the display, press , DISPLAY appears. Using the  key, the three options may be accessed. Pressing  after selecting any of the options, will display the software checksum of the appropriate unit, in the bottom display.

This feature is useful whenever liaising with service agents, who may need to know the version numbers as given by the checksums.

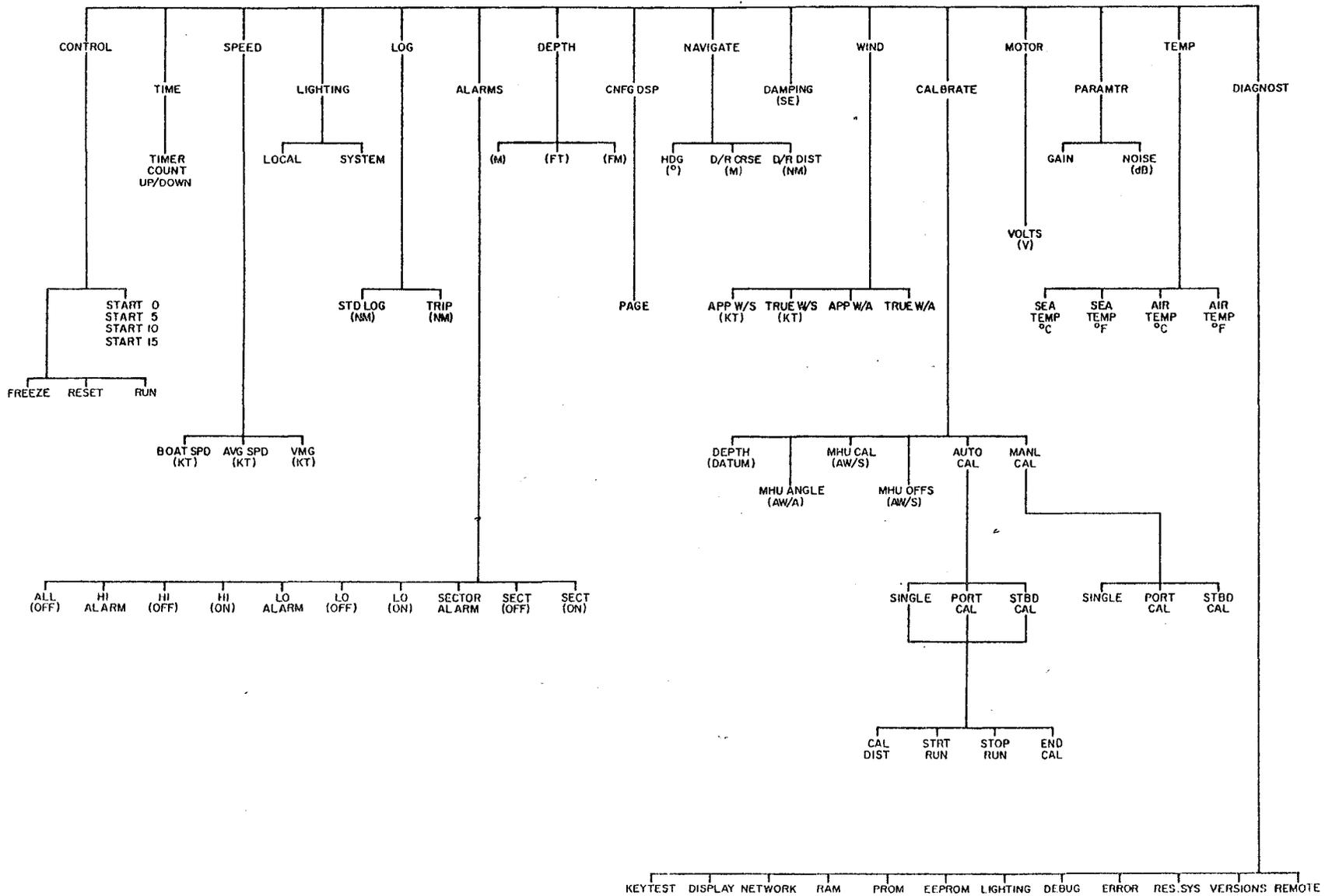
ERRORS: This test is used chiefly to interrogate the HYDRA network and is designed mainly for use by service technicians to ascertain levels of interference that may be present. For example interference may be induced by an SSB transmitter or radar.

REMOTE: This facility allows the user to invoke internal RAM, PROM and basic network checks on any remote processor node on the network, and display the appropriate error messages on a FFD.

HYDRA 330 - TABLE OF FUNCTIONS

GROUP	FUNCTION	RANGE RATE	UPDATE	DAMPING	CALIBRATION	ALARMS
SPEED	BOAT SPD	0-99.99Kt	1/4s	0-99s	0.5-9.99Hz/Kt	HI, LO
	AVG SPD	0-99.99Kt	1s			
	VMG	0-99.99Kt	1s			
LOG	STD LOG	0-9999.99nm	1/2s		0.5-9.99Hz/Kt	
	TRIP LOG *	0-9999.99	1/2s			
DEPTH	DEPTH M	0-200m	1/2s		+/- 9.99m	HI, LO
	DEPTH FT	0-660ft	1/2s		+/- 32.7ft	HI, LO
	DEPTH FM	0-110	1/2s		+/- 5.5FM	HI, LO
NAVIGATE	HEADING	0-359 ^o	1/2s	0-99s		SECTOR
	D/R CRSE *	0-359 ^o	1/2s			
	D/R DIST *	0-9999.99nm	1/2s			
WIND	APP W/S	0-99.9	1/2s	0.99s	0.5-9.99Hz/Kt	HI, LO
	TRUE W/S	0-99.9	1/2s			
	APP W/A	+/- 180 ^o	1/2s	0.99s	+/- 180 ^o	SECTOR
	TRUE W/A	+/- 180 ^o	1/2s			
MOTOR	VOLTS	0-50v	1s		10-50v	HI, LO
TEMP	SEA °C	-10 - +50	1s			HI, LO
	SEA °F	14-122	1s			HI, LO
	AIR °C	-10 - +50	1s			HI, LO
	AIR °F	14-122	1s			HI, LO
TIME	TIMER *	0-99:59:59	1s			

* denotes a 'trip' function.



HYDRA 330 SYSTEM MENU TREE

APPENDIX B to HYDRA 330

330-HB-0335-02

SPECIFICATIONS

Computer Unit

Construction: Fully sealed moulded ABS case with screw terminals

Microprocessor: CMOS 8 bit processor

Size and weight: 235 mm x 140 mm x 80 mm, 1.5 Kg

Temperature range: Operational: -10°C to +60°C
Storage: -25°C to +90°C

Humidity range: 0 to 100%

Power supplies: +10 Vdc to +16 Vdc (12 Vdc nominal)
A 24 Vdc converter option is available.

Interfaces to: Current drain: 250 mA
Compass - B & G HALCYON 3, SUPER HALCYON 3 AUTO-SWING®
Log - B & G sender unit, B & G Sonic Speed®
Wind - B & G Masthead unit
Depth - B & G Transducer unit (0-200m)
Display - FFD and/or Analogue meter
Output LOG pulses to Satellite Navigator - 200 pulses per mile

FFD Display

Construction: Case back - pressed aluminium, chromate finished.
Front plate - injection moulded plastic with glass window.
Bezel - injection moulded plastic.

Size and weight: 165 mm x 110 mm, 0.5 Kg

APPENDIX C to HYDRA 330

330-HB-0335-02

Temperature range: As computer unit

Humidity range: As computer unit

Power supplies: 12 Vdc nominal
Current drain: 15 mA
With lighting: 100 mA

Analogue Meter

Construction: Case back - spun aluminium, chromate finished with glass window
Bezel - injection moulded plastic

Size and weight: 110 mm x 110 mm x 57 mm, 0.6 Kg
(barrel diameter 66 mm)

Temperature range: As computer unit

Humidity: As computer unit

Power supplies: 12 Vdc nominal
Current drain: 40 mA
With lighting: 100 mA

Cable Lengths

Masthead cable: 24 m
Display cable: 1.5 m
Network cable: 10 m
Underwater unit: 10 m
Transducer: 10 m
Mast to computer unit: 10 m

Safe Operating Distance

Analogue meter to compass: 200 mm

Digital display to compass: N/A

APPENDIX C to HYDRA 330

330-HB-0335-02

Hydra 330
NEW FUNCTIONS

330-HB-0369-01

True Wind Direction

True wind direction is the magnetic bearing of the wind which would be felt if the boat was stationary in the water. It is calculated from the apparent wind speed and wind angle measured by the mast head unit, the boat speed and compass heading. Figure 1 shows this graphically.

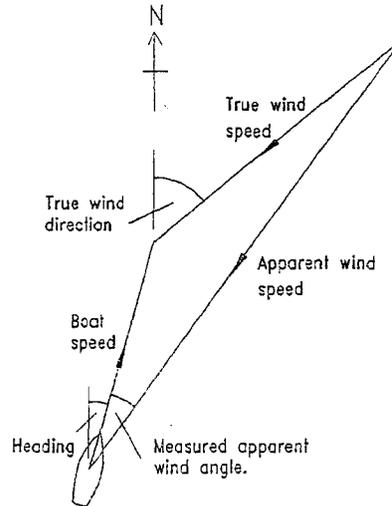


Figure 1

True Wind Direction Calibration.

The flow of air over the sails and mast have a significant effect on the wind speed and wind angle measured by the mast head unit. This is particularly true when spinnaker reaching on a mast head rig boat. Hydra can apply corrections depending on the boat's rig type. The calibration on true wind direction can be set as follows:-

- 0 no correction
- 1 corrections for mast head rig
- 2 corrections for fractional rig

It should be remembered that if 1 or 2 are selected the errors in calculated true wind values are likely to increase when under motor without sails set.

NOTE: For best results the apparent wind angle and boat speed must be calibrated as detailed in section 5 of the Owner's Manual and the compass swung.

To enter the Compass offset, proceed as follows:

- a. Select HEADING on display.
- b. If "HEADING" is on the top display press and hold (V) key until "CALBRATE" appears (otherwise use (A) key if "HEADING" is on the bottom display).
- c. Press (=) and "CAL VAL1" will appear. Press (=) again to display the current calibration value.
- d. To change the offset that will be added to all compass headings, press (=) so the current setting flashes.
- e. Use (A) and (V) keys to change the setting.
- f. Press (=) to enter the new setting into the system, the value will stop flashing. Press the top key to return to normal page display.

Linear Inputs

There are four additional inputs to the Hydra 330 which accept ratiometric sensors like B&G's Potentiometer Part Number 224-10-017 (cable 135-0A-099). The display output format is a value in the range 0 to 1000.

Connections

Terminal	Use
21	Linear sensor ground
22	Linear sensor supply
23	
24	Linear 1 input
25	Linear 2 input
26	Linear 3 input
27	Linear 4 input

135-0A-099 Cable Colours

Blue	Sensor ground	connect to terminal 21
Red	Sensor supply	connect to terminal 22
Green	Sensor signal	connect to required input, terminal 24, 25, 26 or 27

NOTE: If a number of sensors are being connected a junction box or boxes (part number 288-00-001) will be required.

Adjusting the Wind Direction Calibration

- a. Display true wind direction:
Use the  or  keys until "WIND" appears, press , use the  or  keys until "TRUE DIR" appears and press .
- b. If true wind direction is on the top display press and hold  key until "CALBRATE" appears (otherwise use  key if true wind direction is on the bottom display).
- c. Press  and "CAL VAL1" will appear. Press  again to display the current calibration value.

0 = no correction
1 = corrections for mast head rig
2 = corrections for fractional rig
- d. To change the corrections that are applied to the true wind calculations for your yacht's rig type, press  so the current setting flashes.
- e. Use  and  keys to change the setting.
- f. Press  to enter the new setting into the system, the value will stop flashing. Press the top key to return to normal page display.

Damping on true wind functions

The damping applied to true wind direction, true wind angle and true wind speed can be adjusted to suit the current conditions by following the method given in section 2.5 of the Owner's Manual.

Wind Speed Units

The apparent and true wind speed may be displayed in either knots or metres per second. The units are indicated by the right hand two characters, KT for knots MS for metres per second.

Compass Offset Adjustment

An offset can be added to all compass readings, removing the necessity to accurately align the compass sensor unit manually. With the standard Halcyon 3 compass the compass should be swung in the normal way and an offset determined that will minimise the errors. With the Super Halcyon 3 after performing an auto swing the offset can be determined by reference to a known transit.

Displaying Linear Functions

The linear functions may be called up on display in the same manner as any other Hydra function, see sections 1 and 2 of the Hydra Owner's Manual. The four linear functions are to be found in the miscellaneous menu "MISC".

Use the \uparrow or \downarrow keys until "MISC" appears, press = , use the \uparrow or \downarrow keys until the required linear function appears, for example "LINEAR 2" and press = to bring its current value onto display.

Using a 152 type Anemometer

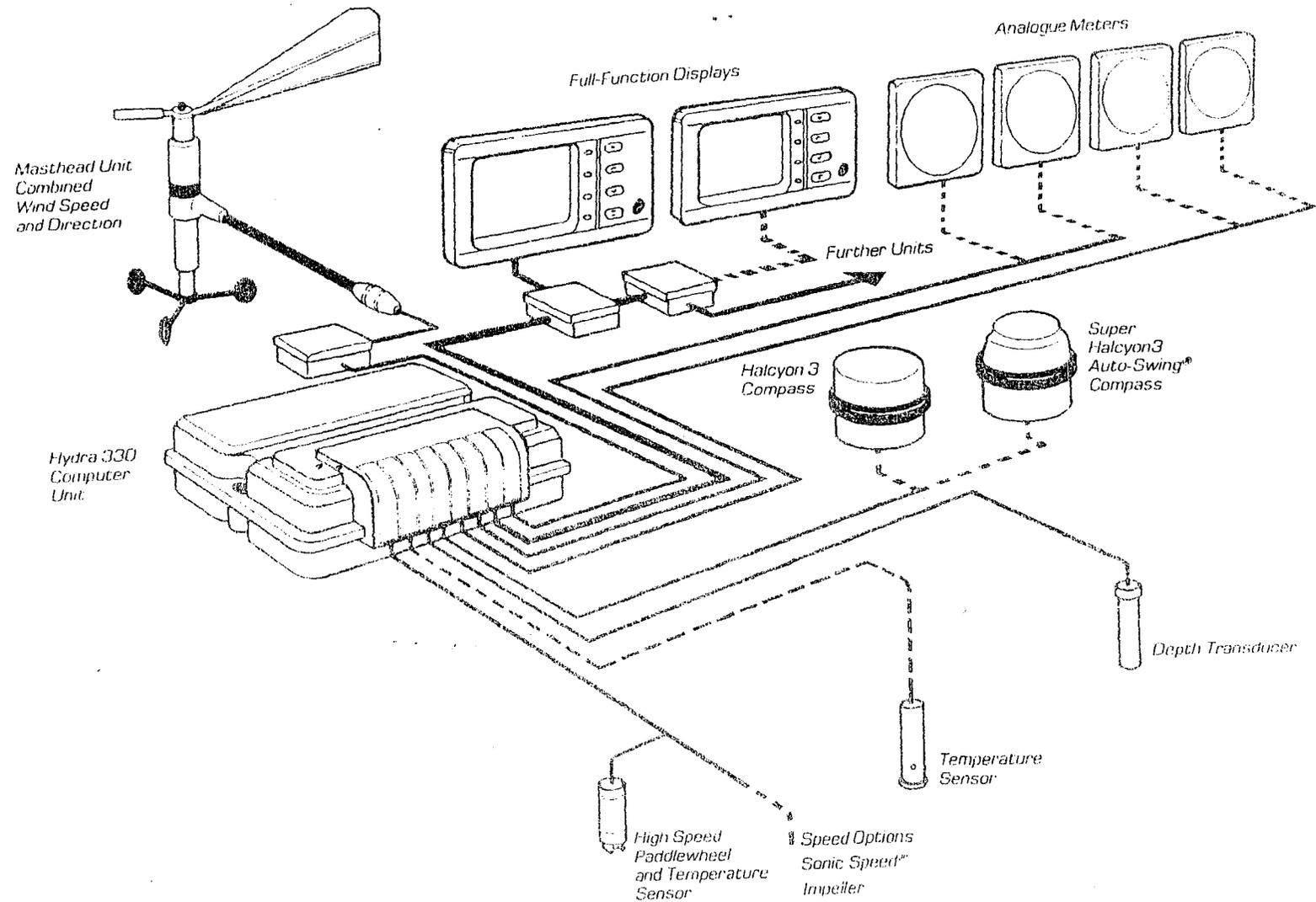
The linear 1 input can be configured to input a 152 type anemometer (part numbers: anemometer 152-00-005, base and cable 152-00-047) in place of the standard 213 Mast head unit.

Connections

Terminal	Use	152-00-047 core
21	anemometer ground	blue
24	anemometer signal	brown

Configuring Linear 1 for 152 Input

- a. Select LINEAR 1 on display.
- b. If LINEAR 1 on the top display press and hold \downarrow key until "CALBRATE" appears (otherwise use \uparrow key if LINEAR 1 is on the bottom display).
- c. Press = and "CAL VAL1" will appear. Press = again to display the current calibration value.
 - 1 = standard linear input
 - 2 = 152 input. (Wind speed from 152 used in all wind calculations.)
- d. To change the configuration, press = so the current setting flashes.
- e. Use \uparrow and \downarrow keys to change the setting.
- f. Press = to enter the new setting into the system, the value will stop flashing. Press the top key to return to normal page display.



HYDRA 330 SYSTEM BLOCK DIAGRAM