

VALEPORT LIMITED

VA500 Altimeter

Operating Manual

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1 INTRODUCTION

The VA500 altimeter has been designed with the objective of providing an accurate, reliable and robust measurement of range from surface and underwater platforms. State of the art signal processing offers unrivalled range and performance from a 500kHz transducer. Millimetre precision, 0.1m – 100m range, RS232/RS485/0-5V & 0-10V analogue outputs with a wide range power supply address the needs of the ROV, AUV and Hydrographic community in a compact, robust package.

The option of integrating a high accuracy pressure sensor (0.01%) as used in the MiniIPS offers an unbeatable package for your underwater positioning requirements.

2 **SPECIFICATIONS**

2.1 **ACOUSTIC**

State of the art signal processing technology provides stable, repeatable readings while allowing the range to be extended to unrivalled distances for a 500kHz altimeter.

Type: 500 kHz broadband transducer
Range: 0.1m – 100m
Resolution: 1mm
Beam Angle: ±3°

2.2 **PRESSURE**

The optional pressure sensor fitted to the Altimeter is a temperature compensated piezo-resistive sensor, which delivers the performance previously only available from a resonant quartz sensor at a more cost-effective price.

Type: Temperature compensated piezo-resistive
Range: 10, 30, 100, 300 or 600 Bar
Accuracy: ±0.01% FS
Resolution: 0.001% FS

2.3 **DATA ACQUISITION**

Sampling: Continuous or data on demand (by serial command/TTL trigger).
Data Rate: 1, 2, 4 Hz

2.4 **COMMUNICATIONS**

RS485 is enabled by grounding a pin in the communications lead, See section 6

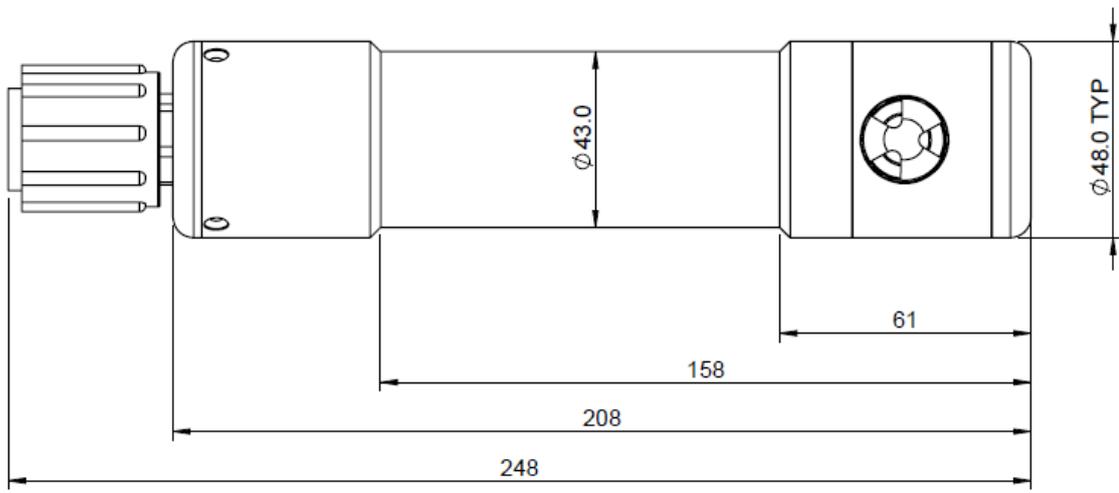
Digital Output: RS232 & RS485 fitted as standard
Protocol: 4800 to 115200 baud, (8,1,N)
Formats: Valeport NMEA / Trittech / Kongsberg / \$SDDBT NMEA
Analogue output: 0-5/10V fitted as standard

2.5 **POWER REQUIREMENTS**

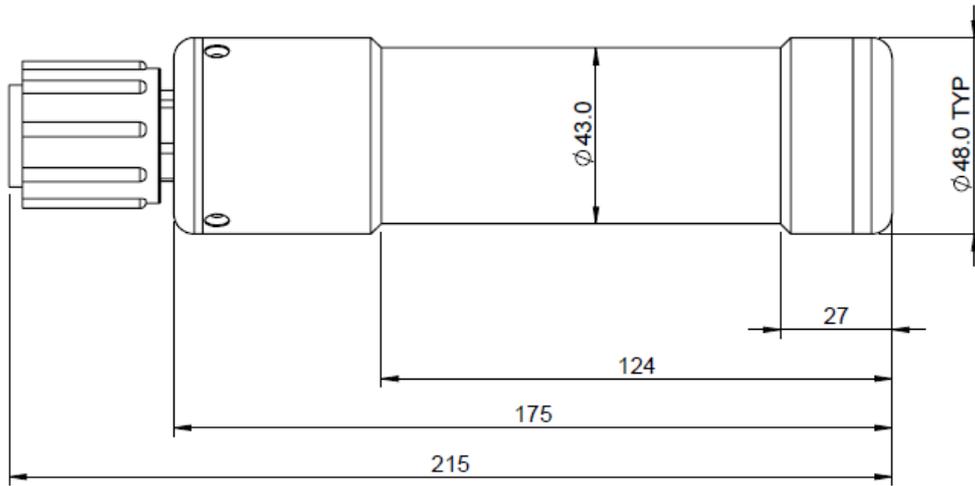
Input: 9 - 28vDC (isolated power supply)
Power: <125 mA @ 12V

2.6 **PHYSICAL**

Housing: Titanium (6000m rated)
Size: 48mm max Ø
43mm main body Ø
215mm length (including connector)
248mm length with pressure fitted
Weight: 0.95 kg (air)/ ~0.7 kg (in water)
Connector: Subconn MCBH10F (titanium)



Altimeter with Pressure



Altimeter without Pressure

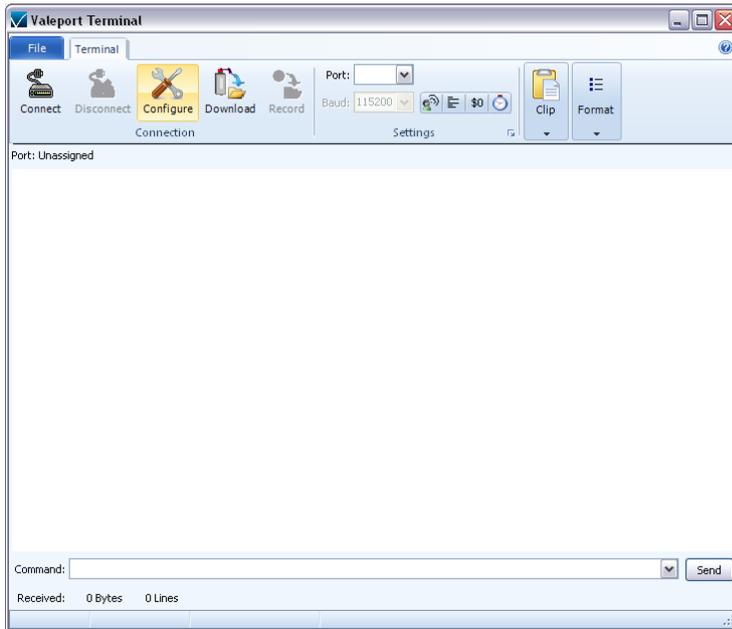
Figure 1: VA500 Altimeter dimensions

3 CONFIGURATION + OPERATION

The VA500 is supplied with a Valeport Terminal, a terminal communications program and configuration tool designed specifically for use with Valeport instruments.

Install the program by opening the install package on the supplied CD and follow the on screen instructions. Once installed, Launch the terminal program

3.1 USING THE CONFIGURATION WIZARD



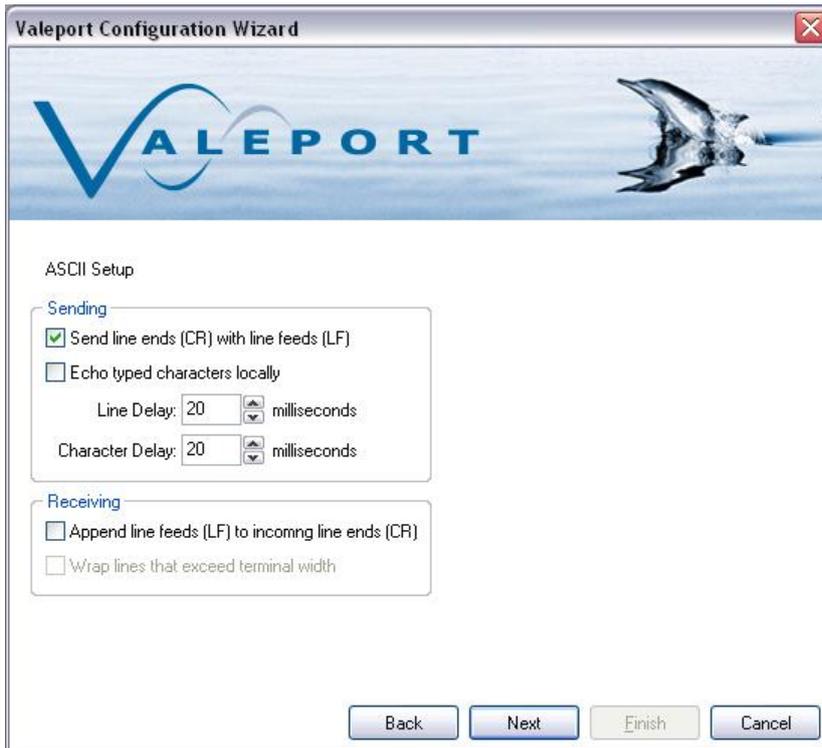
Valeport Terminal can be used to manually connect and configure the VA500 or can be used in the configuration wizard mode.

Click on the configure button to launch the wizard.

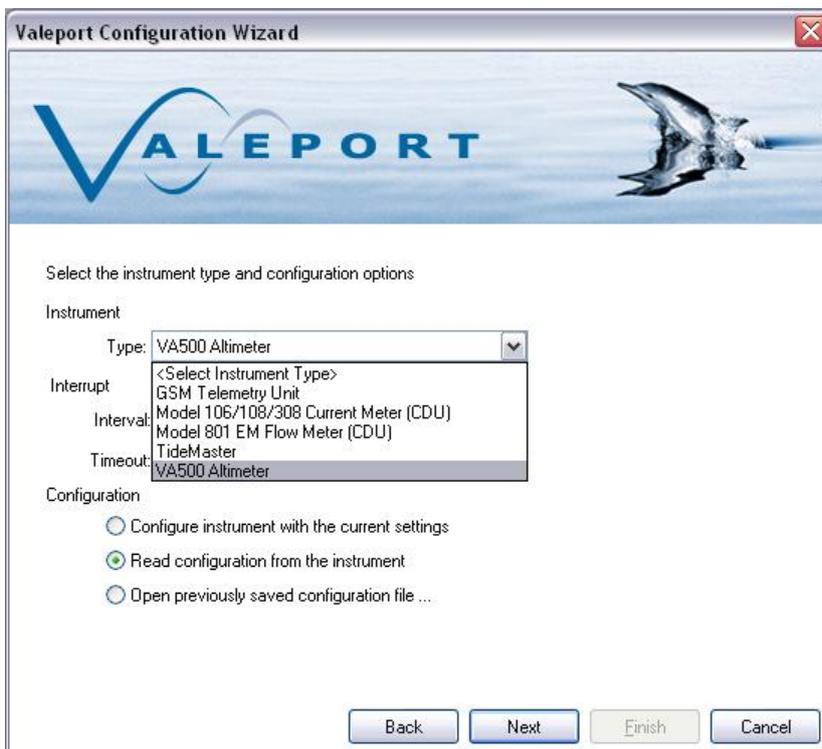


Select the COM port the VA500 is connected to.

The wizard is configured with the default settings of the unit but can be altered if the unit has been modified.



Default ASCII settings are preconfigured and should not need changing.

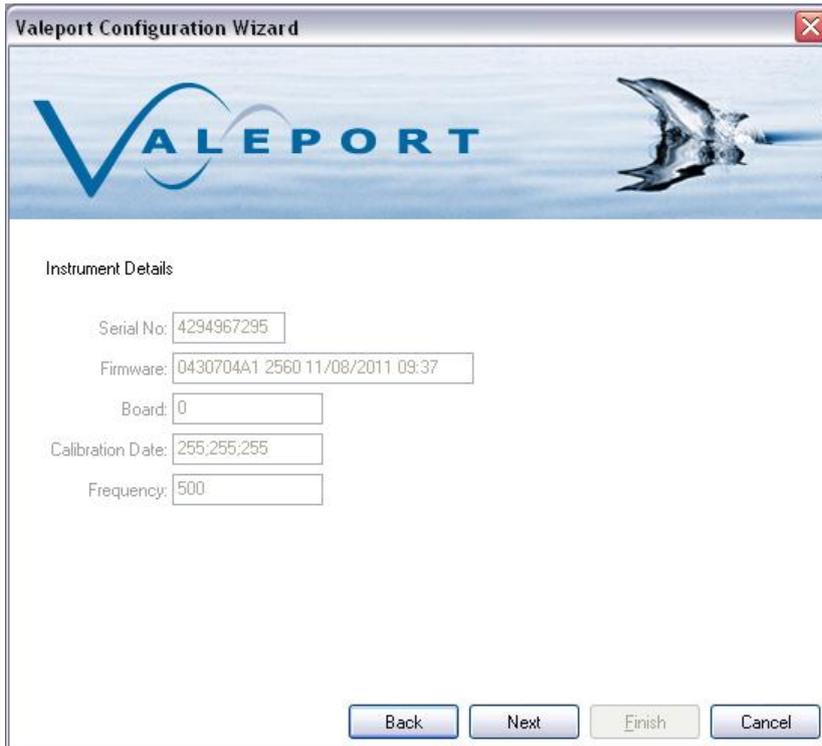


Select the VA500 altimeter from the dropdown list.

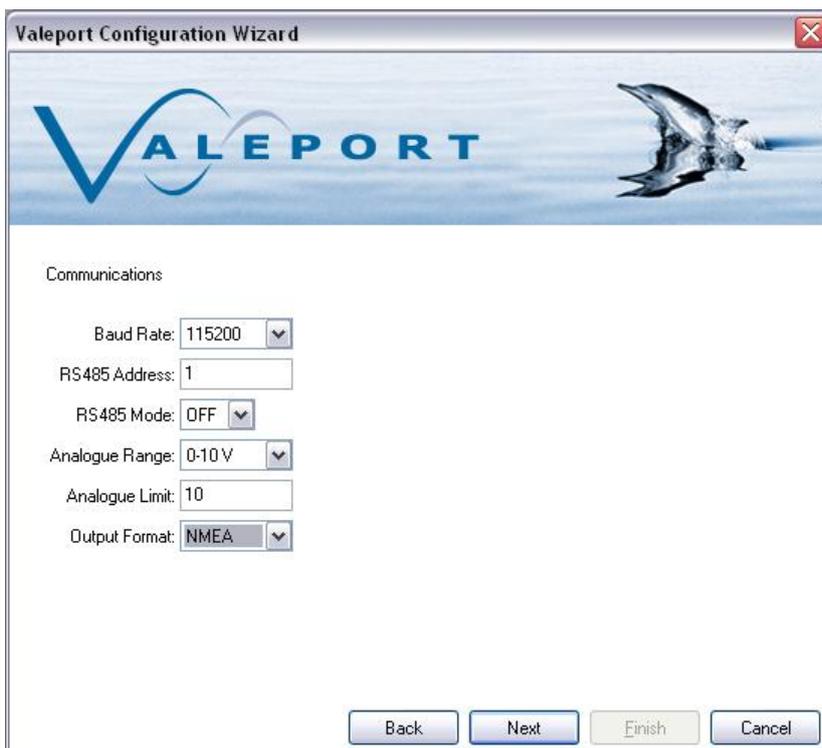
Select the Read Configuration from the instrument to determine current settings

Or

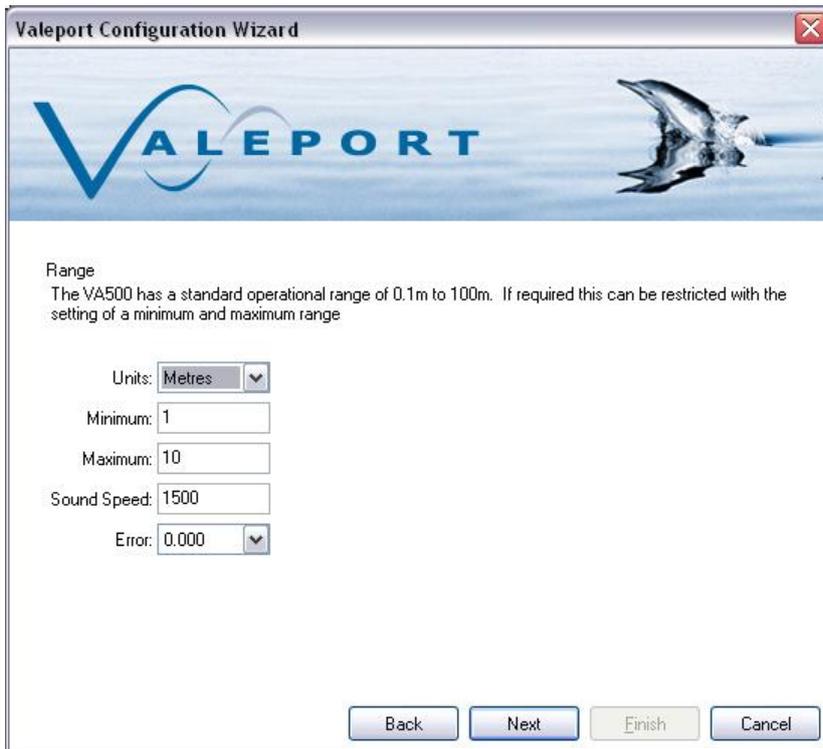
Open previously saved configuration file to load a predefined setup.



The first wizard screen will give information about the instrument. These are settings that are set at the factory.



The next page defines:
Communications settings.
Analogue mode and limits.(See wiring schedule in section 6 for analogue outputs)
Analogue range can be 0-5V or 0-10V
Analogue limit is the distance that equates to full scale voltage output.
Serial Data format (see data format section for definition of formats)



The next page defines:

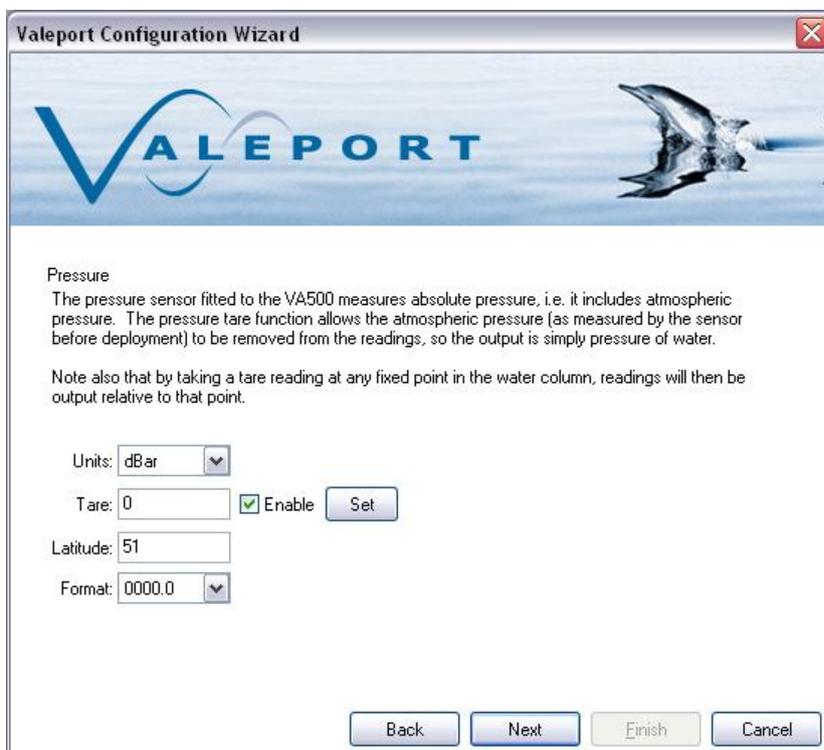
Output units, can be seconds, metres, feet or fathoms.

Minimum range allows fixed returns close to the VA500 to be filtered out.

Maximum range allows filtering of spiking in noisy environments or in the presence of multiple echoes.

Sound speed is set to 1500m/s. To improve accuracy then the local sound speed should be measured and applied here.

Error is the value returned when no echo is detected or it is outside the minimum and maximum ranges defined.

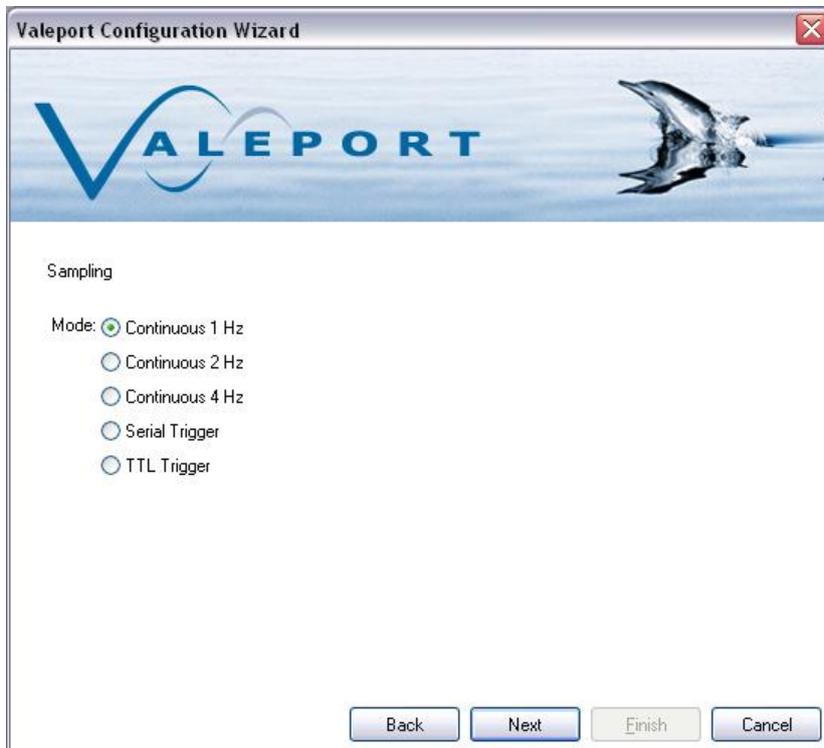


If the Altimeter is fitted with the optional pressure sensor, this can be configured here.

Units can be dBar, metres or feet.

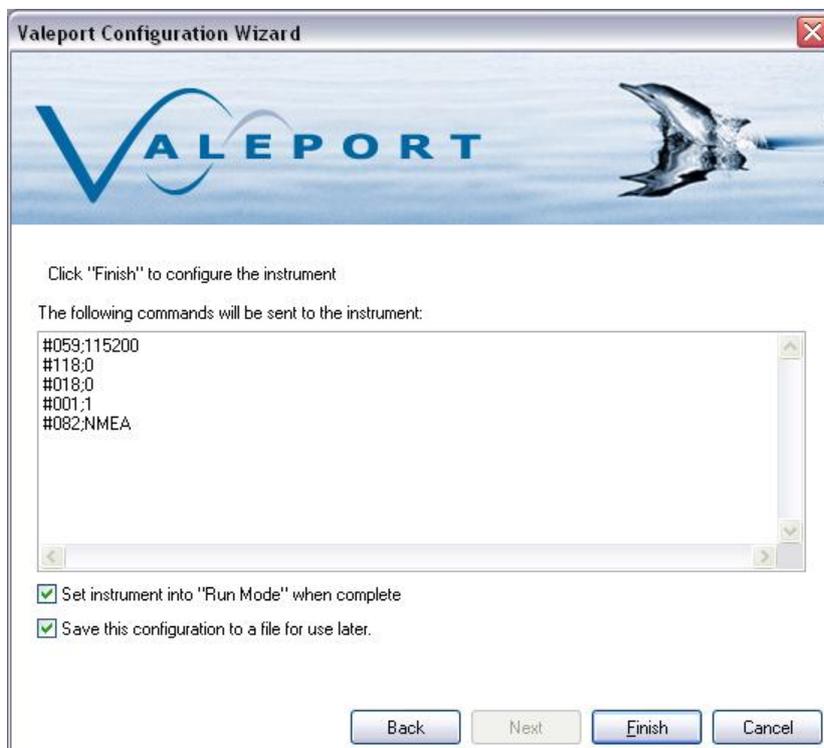
Tare allows the pressure sensor to be zeroed to atmospheric pressure.

Latitude is used in the conversion from pressure to depth.



Continuous output rates can be 1,2 or 4 Hz

Alternatively the VA500 can be triggered with a serial command (S followed by a carriage return) or via TTL (see wiring schedule in section 6)



Once configuration is complete, the wizard will summarise the commands to be sent to the instrument.

The configuration can also be saved to file for later use or reference.

If the Run mode checkbox is ticked the instrument will start outputting data into the terminal window behind once the configuration is complete.

3.2 MANUALLY CONFIGURING THE UNIT

Alternatively the VA500 Altimeter can be manually configured via serial communications using a series of # code commands. This can be with Valeport terminal or an alternative terminal program such as HyperTerminal.

Valeport Terminal is preconfigured with the required settings, but for reference the settings required to communicate with the VA500 are:

Baud Rate:	115200 (can be 9600-115200)
Data Bits	8
Parity	none
Stop bits	1
Flow control	none

Send line ends with line feed

The unit can be stopped at any time by sending the '#' character. The unit returns a '>', and waits for a further command. The unit can then be interrogated or configured using the following codes.

Note that all commands must be "sent" by pressing the Enter (carriage return) key, with the exception of the single '#' character required to enter setup mode

Note that there is a "watchdog" function here – if the unit is interrupted with the '#' character, and no further command is received for a period of 5 minutes, the sensor will automatically begin sampling data using the existing settings.

3.3 INSTRUMENT SETTINGS

# code	Followed By:	Operation
#032	<CR>	Returns the software version number.
#034	<CR>	Returns the units serial number
#136	<CR>	Read pcb serial number
#138	<CR>	Send calibration date
#839	<CR>	Reads the transducer frequency

3.4 COMMUNICATIONS SETTINGS

# code	Followed By:	Operation
#059	;baud_rate<CR>	Sets the units baud rate 2400,4800,9600,19200,38400,57600,115200
RS485 settings: RS485 is enabled by grounding a pin in the communications lead, See section 6		
#001	;ALTIMETER_address<CR>	Sets the 485 address
#002	<CR>	Returns the address
#005	;ON<CR> or ;OFF<CR>	Turns ON or OFF address mode
#006	<CR>	Returns ON or OFF for address mode
Analogue Settings:		
#094	;analogue_range<CR>	Sets the analogue output voltage range 0 – 0-5V 1 – 0-10V
#095	<CR>	Reads analogue output voltage range set above
#096	;counts<CR>	Analogue output test.
#097	;Analogue range limit<CR>	Sets the range equivalent to full scale DAC output
#098	<CR>	Reads the range equivalent to full scale DAC output

3.5 SAMPLING REGIME

# code	Followed By:	Operation
S	<CR>	Performs Single measurement
M	rate<CR>	Performs continuous measurement at set rate. If rate is omitted then instrument performs continuous measurements at previous rate. 1,2, or 4 Hz
#039	;ModeValue<CR>	Set mode without putting unit into run mode Where Mode = M Value = 1,2 or 4 for Normal mode (M) Mode = S for serial trigger single shot measurement Mode = T for TTL trigger measurement
#040	<CR>	Read operating mode.
#028	<CR>	Puts unit into run mode

3.6 OUTPUT FORMAT

See section 4 for detailed description of output formats

#089	<CR>	Reads current output format
#082	;SDDBT<CR> ;TRITEC<CR> ;BENTHOS<CR> ;NMEA<CR>	Sets output format (see section 4)

3.7 RANGE SETTINGS

The VA500 has a standard operational range of 0.1m to 100m. If required this can be restricted with the setting of a minimum range and maximum range.

The default setting for sound speed used to calculate range is 1500 m/s

# code	Followed By:	Operation
#021	;Range_units	Set to either 0 – Seconds 1 – Metres 2 – Feet 3 – Fathoms
#022	<CR>	Read range units set above
#118	;0 or 1 or 2<CR>	Set Altimeter Error output message Where 0=zero (0.000), 1=-999, 2=NR
#119	<CR>	Reads Altimeter Error output message
#823	;maximum range<CR>	set the maximum range that is considered when processing data (acoustic returns beyond maximum range are ignored)
#824	<CR>	Reads maximum range
#840	;maximum range<CR>	set the minimum range that is considered when processing data (acoustic returns before minimum range are ignored)
#841	<CR>	Reads minimum range
#830	; Value, <CR>	Variable to change the Speed of Sound ms-1
#831	<CR>	Reads the sound speed

3.8 PRESSURE SETTINGS

The pressure sensor fitted to the VA500 measures absolute pressure, i.e. it includes atmospheric pressure. The pressure tare function allows the atmospheric pressure (as measured by the sensor before deployment) to be removed from the readings, so the output is simply pressure of water. Note also that by taking a tare reading at any fixed point in the water column, readings will then be output relative to that point.

# code	Followed By:	Operation
#009	;<CR> or ;VALUE<CR>	Sets the tare value in systems with pressure fitted. ;<CR> = Makes device take a reading to use as tare. ;VALUE<CR> = User entered value in units as set by #018 command.
#010	<CR>	Returns the tare value
#011	;ON<CR> or ;OFF<CR>	Turns Tare function ON/OFF
#012	<CR>	Reads Tare mode
#016	;Latitude <CR>	Sets Latitude
#017	<CR>	Reads Latitude
#018	;Pressure units<CR>	Set to either 0 – dBar 1 – Metres 2 – Feet
#019	<CR>	Read pressure units
#083	;0 or 1 or 2 or 3	Setup the pressure output format Where 0=not fitted, 1=PPPP.P, 2=PPP.PP, 3=PP.PPP
#084	<CR>	Returns the set pressure range

4 OUTPUT FORMATS

If the optional pressure sensor is fitted and enabled then the only data format that supports this is the Valeport NMEA format. A number of other formats have been implemented to provide compatibility with existing systems.

4.1 VALEPORT NMEA

\$PRVAT, xx.xxx,M, xxxx.xxx, dBar*hh<CR><LF>

Field Number:

- | | |
|---|-----------------------|
| 1 | Range from transducer |
| 2 | Units |
| 3 | Pressure |
| 4 | Units |
| 5 | Checksum |

Example:

```
$PRVAT,00.115,M,0010.073,dBar*39
$PRVAT,00.116,M,0010.056,dBar*3d
$PRVAT,00.116,M,0010.069,dBar*31
$PRVAT,00.116,M,0010.080,dBar*36
$PRVAT,00.116,M,0010.098,dBar*3f
$PRVAT,00.114,M,0010.083,dBar*37
$PRVAT,00.115,M,0010.086,dBar*33
```

4.2 \$SDBT

NB: this format limits the resolution of the altimeter to 0.1m

Sounder, Depth: Depth below transducer

\$SDBT,x.x,f,x.x,M,x.x,F*hh<CR><LF>

Field Number:

- | | |
|----|----------------|
| 1. | Depth, feet |
| 2. | f = feet |
| 3. | Depth, meters |
| 4. | M = meters |
| 5. | Depth, Fathoms |
| 6. | F = Fathoms |
| 7. | Checksum |

Example:

```
$SDBT,0.4,f,0.1,M,0.1,F*02
$SDBT,0.4,f,0.1,M,0.1,F*02
$SDBT,0.4,f,0.1,M,0.1,F*02
$SDBT,0.4,f,0.1,M,0.1,F*02
$SDBT,0.4,f,0.1,M,0.1,F*02
$SDBT,0.4,f,0.1,M,0.1,F*02
$SDBT,0.4,f,0.1,M,0.1,F*02
```

4.3 TRITECH

xx.xxxm<CR><LF>

Example:

00.126m
00.124m
00.126m
00.125m
00.126m
00.125m
00.125m

4.4 BENTHOS

The serial output will be in the following format:

Rxx.xx<cr><lf>

where xx.xx can range from 0.10 to 99.99. If no echo was received the output will be R99.99E<cr><lf>.

Example:

R00.13
R00.12
R00.12
R00.12
R00.12
R00.12
R00.12
R00.12

5 CARE AND MAINTENANCE

There are no user serviceable parts within the VA500. The VA500 is remarkably robust, being primarily constructed of titanium. The only maintenance required, other than periodic recalibration as necessary, is to keep the sensor as clean as possible.

After use, rinse all parts in fresh water removing any growth or debris as necessary, but take exceptional care not to touch or damage the pressure diaphragm itself if fitted.

5.1 SUBCONN CARE

The following handling procedures should be adopted when using Subconn connectors:

- The connector should not be exposed to long term heat or sunshine.
- If this occurs, and the connectors are very dry, soak in fresh water before use.
- Ensure the connectors are lubricated - the recommended lubricant is:
 Loctite 8021 in a spray can
 or
 Molykote 44 Medium - but use very sparingly.
- Any accumulation of sand or mud in the female contact should be removed with fresh water. Failure to do so could result in the splaying of the female contact and damage to the O-ring seals.
- When using bulkhead connectors ensure that there are no angular loads as this destroys the connector.
- When disconnecting, pull straight, not at an angle.

6 WIRING INFORMATION

Wiring colours are correct at the time the manual was printed. However, it is advised that continuity checks are performed prior to all terminations.

6.1 INSTRUMENT CONNECTOR

Subconn MCBH10F	Function
1	Power Ground
2	Power +V
3	Analogue +Ve
4	Analogue -Ve
5	Enable 485 Link to Pin 9 for RS485. N/C for RS232
6	TTL trigger +Ve
7	RS232 Tx (To PC) /RS485A
8	RS232 Rx (From PC) /RS485B
9	RS232 Ground
10	TTL Trigger -Ve

Housed systems (standard Subconn connector):

Systems are supplied with a short (1m) lead terminated with a 9 way D-type and banana plugs for splicing or testing

END 1 :				END 2 :	END 3 :			FUNCTION
CONNECTOR	WIRE LENGTH	WIRE COLOUR	PIN	CONNECTOR	CONNECTOR	PIN	WIRE COLOUR	
SUBCONN MCIL10M + DLSA-M	60cm	BLACK	1	Black 4mm Plug RS 444-797				-V
		WHITE	2	Red 4mm Plug RS 444-832				+V
		RED	3					Analogue +Ve
		GREEN	4					Analogue -Ve
		ORANGE	5					Enable 485 Link to Pin 9 for RS485. N/C for RS232
		BLUE	6					Trigger +Ve
		WHITE/ BLACK	7		9 Way D Socket RS 465-362 With Hood. RS 480-119	2	BLUE	RS232 TX (out of sensor) /RS485A
		RED/ BLACK	8	3		WHITE	RS232 RX (into sensor) /RS485B	
		GREEN/ BLACK	9	1, 5, 6, 8, 9, SHELL		GREEN	RS232 GND	
		ORANGE/ BLACK	10				Trigger -Ve	