

VALEPORT LIMITED

miniIPS
Intelligent Pressure Sensor

Operating Manual

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1 INTRODUCTION

The Valeport miniIPS “Intelligent Pressure Sensor” is designed to measure water pressure and provide a real time output of that data. Suitable for use in a variety of subsea applications (ROV’s, construction, monitoring, positioning), one of the key development drivers was to provide a cost effective alternative to the use of resonant quartz pressure sensors. Using the very latest technology in temperature compensated piezo-resistive transducers, the miniIPS offers several advantages over resonant quartz sensors, with similar performance.

- No external diaphragms, oil reservoir or oil-filled tubes
- Easy to clean – no salt build up
- Titanium construction
- Pressure ranges from 10 to 600Bar (approx 100m to 6000m water)
- Long term calibration stability
- May be recalibrated by customers using standard Class A deadweight tester (requires optional adapter)
- RS232 or addressable RS485 data output
- Choice of calibrated data formats
- Choice of sampling modes

2 SPECIFICATIONS

Sensor:

Range:	Standard available ranges are 10, 30, 100, 300 & 600Bar
Accuracy:	±0.01% Range
Resolution:	0.0001 Bar (approximately 1mm depth)

Dimensions:

40mmØ x 185mm long (including connector)

Connector:

Standard is Subconn type MCBH6F (titanium)
Alternatives may be supplied on request
Wiring Information is in Section 4

Materials:

Main housing:	Titanium
Sensor cap:	Acetal
Transducer diaphragm:	Stainless Steel 316

Power:

9 – 30V DC input (isolated)
Draws approximately 40mA at 12vDC

Output:

Units are fitted with both RS232 and RS485 communications as standard. RS485 is enabled by grounding a pin in the communications lead (refer to Section 4). Protocol is 8 data bits, 1 stop bit, no parity, no flow control.

Baud rate is factory set to 19200. User may choose between 2400, 4800, 9600, 19200, 38400, 57600 or 115200. (Note that fast data rates may not be possible with low baud rates).

3 USING WINDOWS HYPERTERMINAL WITH THE MINIIPS

HyperTerminal is a program that is supplied free of charge with Windows, and used to communicate with external devices via the serial port(s) on your PC. There are other similar programs commercially available.

If HyperTerminal is already installed on your PC, you will be able to access it through the Start / Programs menu in Windows, either under its own HyperTerminal folder, or under Accessories / Communications.

If HyperTerminal is not installed, you can add it from your original Windows installation disks, or you can download it from the following website location: <http://www.hilgraeve.com/hpte/hpte63.exe>

Save the file to your PC, and then Run it. This will now install HyperTerminal to your PC. Note that you should confirm that you are a PRIVATE USER of the PC, or HyperTerminal will not install.

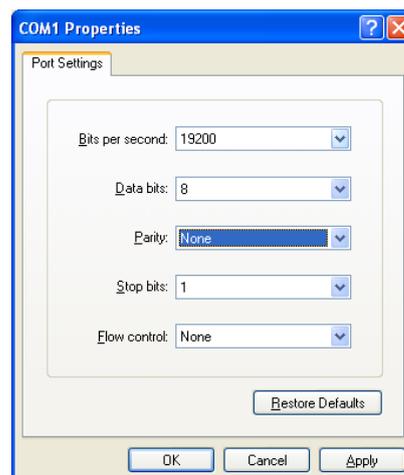
Check that the device is connected to the PC serial port using the appropriate cable, and run HyperTerminal.



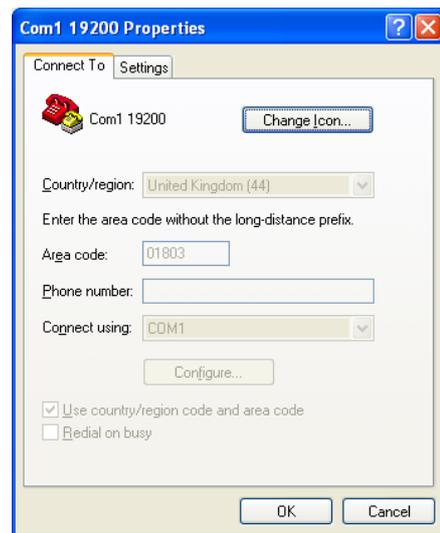
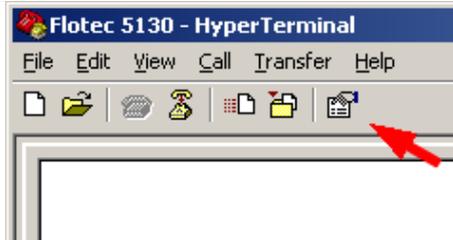
You will be asked for the name of the new connection. Choose any name and select OK.



Select the correct Com port and click OK.



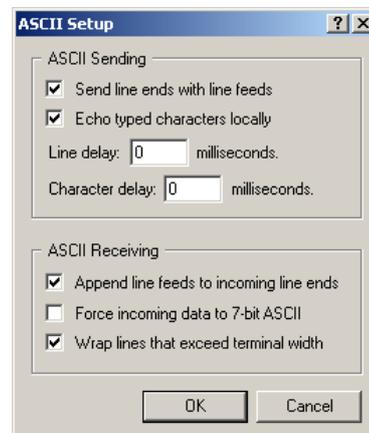
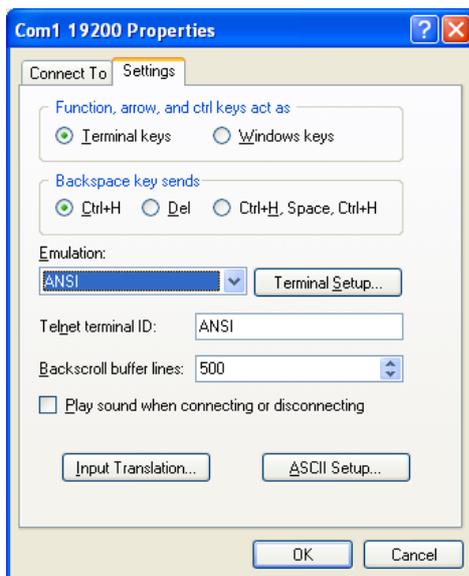
Check that all the settings are as indicated in the specific operating manual for your instrument and click OK. Note that the baud rate (bits per second) used in Valeport devices may vary, but is typically 4800 for display units, or 19200 for other devices. The remaining settings are typically as indicated above.



Click the Properties button as indicated.

The following screen will appear:

Click the Settings tab:



Ensure that the settings are as indicated and click the "ASCII Setup..." button.

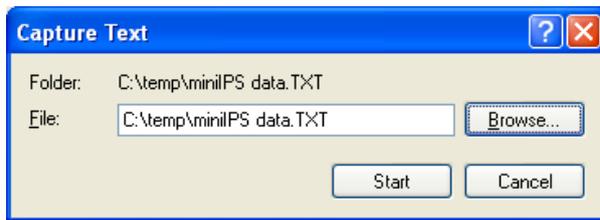
Check the boxes as indicated above and click OK twice to return to the main HyperTerminal screen

Once HyperTerminal has been setup as above, it will display all data that is output from the serial port of the instrument. In real time, this would simply be text data of the measured parameters. If you are uploading saved data, this too will be displayed on the screen as text as it is uploaded.

It is possible to save this data to the PC as it comes into the serial port, whether it is uploaded in real time or as a logged file. To do this, go to Transfer, Capture Text on the HyperTerminal menu:

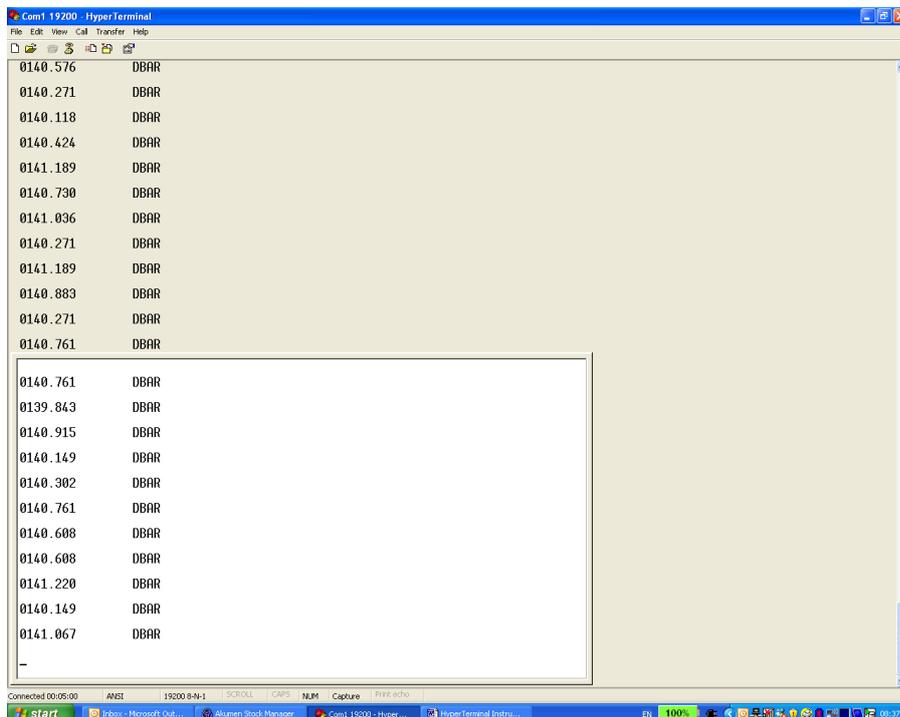


Browse to the desired directory and type the desired filename (with .txt extension). Then click on “Start”. Any data that is received will now be saved in this text file. When data upload is complete, select



Transfer, Capture Text, Stop.

All data uploaded in ASCII text format may be manipulated and graphed using any standard spreadsheet package such as Microsoft Excel.



4 DATA REQUESTS AND OUTPUT FORMATS

Control of the miniIPS is achieved through the use of “# codes”, as described below.

Note that all commands must be “sent” by pressing the Enter key, with the exception of the single ‘#’ character required to enter setup mode.

Additionally, note that you must use the main Enter key on the keyboard, not the smaller number pad Enter key. The large key actually sends two instructions – “Carriage Return” (or <CR>) and “Line Feed” (or <LF>). The miniIPS requires both these instructions to terminate a command. The smaller Enter key on a keyboard only sends the <CR> instruction.

4.1 START / STOP

When power is applied to the miniIPS, it will immediately begin to operate according to the existing settings. The most basic level of Stop / Start control is therefore by switching power on and off.

When the instrument is running, the miniIPS may be put into setup mode at any time by typing the ‘#’ character. The device will respond with a command prompt ‘>’ and await the next instruction.

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

#028 Starts sampling from setup mode, or takes a single reading if unit is in “Single” sampling mode.

4.2 COMMUNICATIONS SETUP

#059;{*baud rate*} Sets the sensor baud rate as required. Available baud rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.

Example: #059;9600

#005;ON (*or OFF*) Turns the miniIPS address mode on (*or OFF*). In address mode, the sensor will only respond to commands prefixed by its address, or the global address "00".

Examples: 03:#028 Sensor address "03" begin sampling

00:#028 All sensor addresses begin sampling

#001;*nn* Sets the sensor address to any number from 01 to 99

#002 Responds with current sensor address

4.3 SAMPLING PATTERN

The miniIPS will operate in 3 different modes:

CONT Continuous mode, where data is output at a fixed frequency from 1 to 16Hz

SINGLE Single mode is effectively "Sample on Demand" – when instructed, the sensor will measure and report a single reading

BURST Burst mode is useful for longer term deployments, where data is measured for a number of samples, and the sensor then "sleeps" for a defined period of time. The measured data may be averaged or output as it is.

In each case, the sampling mode is set using the command #003 as described overleaf. Note also that the command #004 will return the current sampling pattern.

The command string to set the sampling parameters is as follows:

#003;mode;rate;period;interval;average;length where:

<i>mode</i>	Enter CONT, SINGLE or BURST as required
<i>rate</i>	Enter 1, 2, 4, 8 or 16 as the required sampling rate in Hz. Note that this value must be included in the string for SINGLE mode, even though it is not used.
<i>period</i>	This value defines the Burst sampling mode, but must be entered for the other modes even though it is not used. Enter the number of samples that should be taken in the Burst, from 1 to 65535
<i>interval</i>	This value defines the Burst sampling mode, but must be entered for the other modes even though it is not used. Enter the number of seconds between the start of each measurement burst, from 1 to 65535
<i>average</i>	This parameter defines the Burst sampling mode, but must be entered for the other modes even though it is not used. Enter FIXED, MOVING or NONE as required. Fixed averaging means that a single average number of all the readings in the burst will be output. Moving average is a sliding window of defined duration, averaging several data points within the burst, and updating with each single reading. None means that no averaging should be done, with each data point in the burst being output as it is measured.
<i>length</i>	Defines the number of samples in the “sliding window” of the Moving Average. Enter a value from 1 to 120. Note that this value is part of the definition of Burst mode, but must also be entered for the other modes, even though it is not used.

Examples:

1: *Continuous data output at 4Hz*

#003;CONT;4;1;1;NONE;1

Note that the characters shown in italics must be included, even though they are not part of the definition of Continuous mode. It does not matter what values are used here, provided they fit within the general constraints defined above (1 to 65535 etc).

2: *Data on demand*

#003;SINGLE;1;1;1;NONE;1

Note that the characters shown in italics must be included, even though they are not part of the definition of this mode. It does not matter what values are used, as long as they fit within the general constraints for each term defined above (1 to 65535 etc).

3: *Burst Mode, 80 readings over 5 secs, once per minute. Output average value only*

#003;BURST;16;80;60;FIXED;1

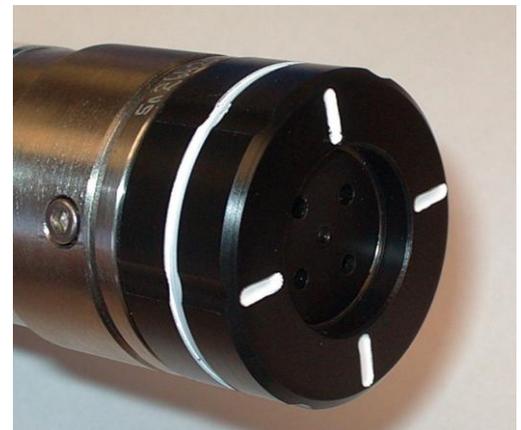
Note that the last value (shown in italics) must be included, even though it is not part of the definition of Fixed Averaging. It does not matter what values is used here, provided it fits within the general constraints defined above (1 to 120 etc).

4.4 PRESSURE TARE

The pressure sensor fitted to the miniIPS 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.

The pressure tare should be taken with the sensor in the same orientation as it will be deployed (horizontal, pointing up or pointing down) to negate any effects of the weight of the sensing element itself. Whilst this effect is small, it is an unnecessary contribution to error budget.

The location of the sensor (i.e. the point relative to which all measurements are made) is indicated by a white groove and cross in the acetal sensor cap.



#009 Unit takes a single reading to use as the Tare value. Output at that pressure should now be approximately zero.

#009;0 Tare value is removed (i.e. set to zero)

#009;nnnn Sets specific tare in dBar (max resolution of 0.000001).

Example: #009;10.325 sets tare to 10.325dBar

#010 Unit responds with current Tare value

4.5 DATA OUTPUT FORMATS

The miniIPS has a selection of different data output formats built in, allowing easy interface to software packages and third party instrumentation.

4.5.1 UNITS

The default output units for the miniIPS are deciBar (dBar), equivalent to 0.1Bar, or approximately 1m of seawater. The miniIPS can also output pressure in PSI. It is also possible to present the data in units of metres or feet of seawater, calculated using the UNESCO Simple Pressure / Depth relationship, which assumes “standard” water density.

#020;M	Outputs data in Metres
#020;F	Outputs data in Feet
#020;D	Outputs data in Dbar
#020;P	Outputs data in PSI
#135;{latitude}	Sets the local operating latitude in decimal degrees. This is required for an accurate pressure / depth conversion, since the relationship is partially dependent on local gravity, which varies with distance from the equator. Positive / negative signing for North / South of the equator is not relevant. <i>Example: #135;50.426</i> <i>Sets latitude to 50.426° (50° 25' 34"), (Totnes UK).</i>

All output formats are affected by changing the output units.

4.5.2 VALEPORT FORMAT

Command: #013;VALEPORT
Format: 0009.914 DBAR

Default separator is TAB. This may be changed to any chosen character using the command #026.

Example: #026;/
0009.914/DBAR

4.5.3 CSV FORMAT

Command: #13;CSV
Format: 00/00/00, 00:00:00, 0009.9, 0.0, 00.0
Notes: DD/MM/YY, HH:mm:SS, Output Data, Spare, Spare

4.5.4 NMEA FORMAT

Command: #013;NMEA
Format: \$PIPS,0009.91, M*78
Notes: NMEA Identifier, Output Data, Units + Checksum
Last three characters are a checksum

4.5.5 HYPACK FORMAT

Command: #013;HYPACK
 Format: 009.9 0000.0
 Notes: Output Data + Spare field

4.5.6 DIGIQUARTZ FORMAT

Command: #013;DIGIQUARTZ
 Format: *00019.914
 Notes: This format emulates the Paroscientific Digiquartz sensor output

4.5.7 DIGIQUARTZ CDL FORMAT

Command: #013;DIGIQUARTZ_CDL
 Format: *0001+0009.9139318
 Notes: This format emulates the Paroscientific Digiquartz CDL sensor output

4.6 CALIBRATION

The miniIPS may be returned to Valeport or one of its approved laboratories for recalibration, or it may be recalibrated by the customer using a Class A deadweight tester, or defined standard of the customer's choosing. Whilst this process is reasonably straightforward, it is beyond the scope of this manual. Please refer to the Support pages of Valeport's website www.valeport.co.uk for full instructions on the recalibration procedure, together with a spreadsheet to calculate the new calibration coefficients, and details of how to enter them into the sensor.

4.7 WELCOME MESSAGE

When power is applied to the miniIPS, it will normally output a welcome message as follows, detailing the software version :

```
You are connected to a Valeport Mini IPS Sensor
0760700B 14/09/2006 07:00
Copyright 2006.
```

#209;OFF (or ON) This command will disable (or enable) the welcome message when power is applied.

4.8 INFORMATION

The following commands will cause the sensor to report back various pieces of information, as described:

#032	Software version number
#034	Instrument serial number
#093	pcb serial number
#138	Year of manufacture, month and year of last inspection/service
#202	Maximum transducer pressure range
#900	Outputs a full list of all command codes applicable to the sensor. Note that not all of these codes are covered by this manual – use this feature with care.

5 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.

Systems are supplied with a short (50cm) lead for splicing or testing

Subconn 6 pin male line (MCIL6M)		Function	9 Way D Type	4mm Banana Plugs	
Pin	Wire Colour		Pin	Pin	Wire colour
1	Black	RS232 GND	5 (Link to 1,6,8,9)		
2	White	RS232 Tx (Out of sensor) or RS485A	2		
3	Red	RS232 Rx (Into sensor) or RS485B	3		
4	Green	+V		Red Plug	Red, linked to Green inside D type
5	Orange	Link to Pin 1 for RS485. N/C for RS232			
6	Blue	Power GND		Black Plug	Black, linked to Brown inside D type

6 CARE & MAINTENANCE

The miniIPS 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 deployment, remove the outer acetal sensor cap, and use the tool supplied to carefully unscrew the inner protective cap, exposing the sensor diaphragm.

Rinse all parts in fresh water removing any growth or debris as necessary, but take exceptional care not to touch or damage the diaphragm itself.



Any damage to this diaphragm will render the instrument warranty invalid.

After cleaning, simply reassemble the sensor and store in the packing case provided.