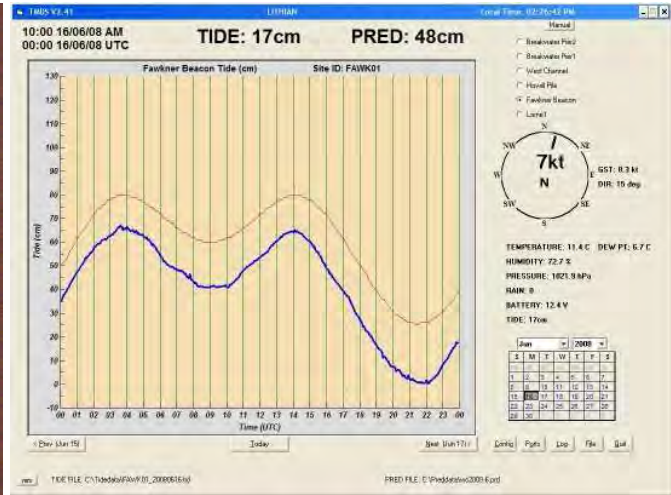


PTG500e

TIDE AND METEOROLOGICAL STATION



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Introduction

The PTG500e is a complete tide and meteorological monitoring station. It can be used in rivers, shipping channels, lakes or open ocean platforms for monitoring the water level measurement. In addition to monitoring water level, the PTG500e can record meteorological parameters, including temperature, pressure, humidity, wind speed, direction and wind gusts.

The PTG500e can be used stand alone in remote locations. In this mode, data is continually stored to internal memory according to a logging schedule specified by the user. The data can be later downloaded during maintenance visits to site.

Alternatively, the PTG500e can be used in conjunction with a communications link such as a radio modem, allowing real time monitoring for water level and weather of remote sites.

Main features of the PTG500e:

- Monitor water level using a range of sensor types, including open air probes, Aquatrak sensors and 4-20mA acoustic and pressure sensors.
- Interfaces to RS232 meteorological sensors. (Default sensor is the Vaisala WXT510.)
- High accuracy GPS locked time and location
- Simple terminal console or 4-button front panel interface for parameter setting
- RS232 interface allows data reporting, maintenance and parameter setting
- NMEA formatted output
- Rugged construction, in water sealed enclosure
- Flexible reporting, logging and averaging schedules
- Powerful internal CPU for processing water level and meteorological data
- Radio modem interface
- Up to 92MBytes of non-volatile internal memory for data storage (16M standard)
- Field upgradeable software
- Environmental connectors
- Automatic “metadata” generation
- Custom software capability for upgrades to interface to a wide variety of RS232 or 4-20mA sensors

Tide monitoring is performed using either 4-20mA open air acoustic probes, or RS232 probes such as the Aquatrak. Meteorological monitoring is implemented using the Vaisala WXT510 multi-sensor probe.

The PTG500e is typically mounted in an environmental enclosure with connectors for external tide monitoring and metrological sensors, as shown in Figure 1.

Typical Installation

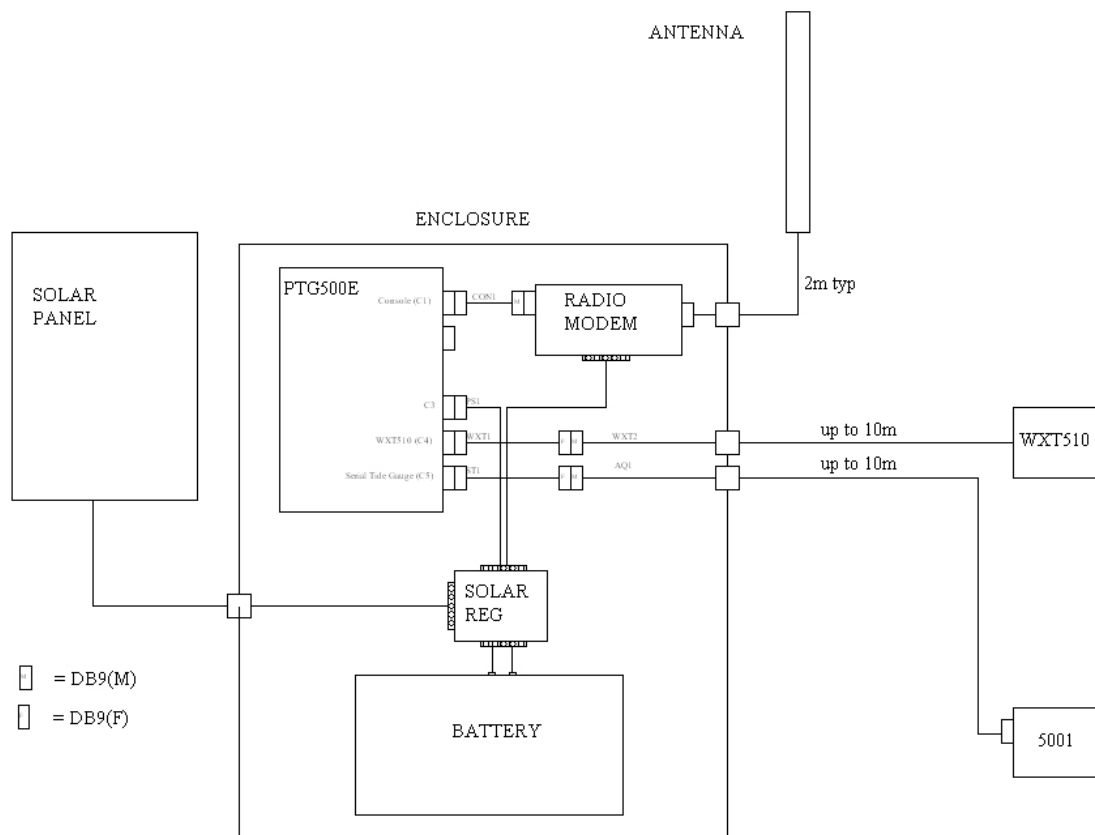


Figure 1 Typical PTG500e connections

Figure 1 shows a typical installation. The PTG500e is housed in an environmental enclosure, which contains a radio modem and a battery. An external solar panel charges the battery during the day. External RS232 sensors connect to the PTG500e, Connections to the solar panel, antenna and sensors pass through glands in the environmental enclosure.

Example typical installation components

Table 1 Typical installation parameters

Component	Typical value	Notes
Solar Panel	65-80W	Depends on location
Battery	60 AH	Approx 5 days no sun
Radio Modem	UHF or VHF modem	Depends upon range
Met Sensor	Vaisala WST510	
Tide Sensor	Aquatrak 5100 or 4-20mA probe	

Standard Cables supplied with the PTG500e

The standard cable set for the PTG500e is for use with a Vaisala WXT510 meteorological sensor and a Aquatrak 5000 series tide monitor. For other custom sensors, please contact factory.

Table 2 Standard interconnect cables

Power Cable (PS1)	B3W-F	Flying lead
	3 +ve	+12V (red)
	2 GND	
	1 GND	Ground (blk)
Console cable (Con1)	B3W-F	DB9-M
	3 (out from PTG)	2
	6 (in to PTG)	3
	8 (GND)	5
WXT510 cable (WXT1)	B8W-F	DB9-F
	1 (+12V out from PTG)	6
	2 (in to PTG)	3
	3 (out from PTG)	2
	4	
	5	
	6	
	7	
	8	5
Serial Tide Gauge (ST1)	B8W-F	DB9-F
	1 (+12V from PTG)	6
	2 (in to PTG)	3
	3	
	4 (out from PTG)	2
	5	
	6	
	7	
	8	5
	9	
WXT cable (WXT2)	Cable from WXT510	DB9-M
	M12-2 (brn)	6 (Vin+ to WXT)
	M12-7 (blu)	3 (out from WXT)
	M12-1 (wht)	2 (in to WXT)
	M12-3,8 (grn, clear)	5 (gnd)
5001 Aquatrak cable (AQ3)		C5-F (B8W-F)



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	Power in (red)	1
	Data out from 5001 (blu,org,yel)	2 (in to PTG)
		3
	Data in to 5001 (grn)	4 (out from PTG)
		5
		6
		7
	Ground (blk)	8

Tide Monitoring using Acoustic Sensors

The basic operation of an acoustic tide gauge is shown in Figure 2. The gauge actually measures the distance between the water surface and the probe head. The tide height is calculated by subtracting this distance from known height of the acoustic head above zero tide level.

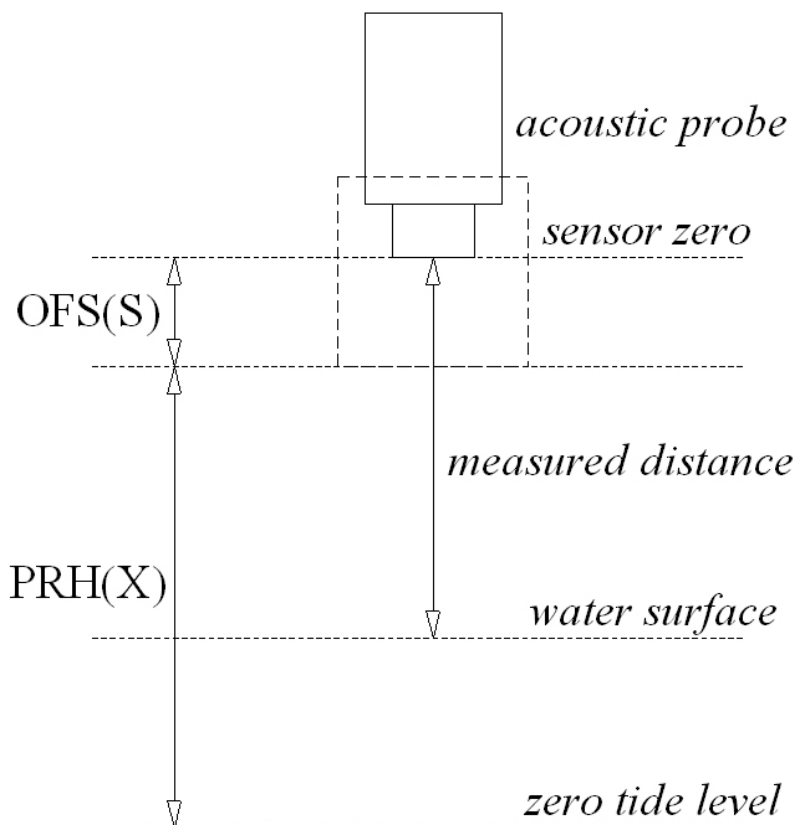


Figure 2 Acoustic tide gauge operation

For 4-20mA distance probes:

$$\mathbf{Tide = PRH + OFS - measured\ distance}$$

For Aquatrak probes:

$$\mathbf{Tide = PRH + OFS - measured\ distance \quad (APL = N)}$$

$$\mathbf{Tide = PRH + OFS + measured\ distance \quad (APL = P)}$$

Where PRH, OFS and APL are values entered with the respective commands.

Example using Siemens Probe

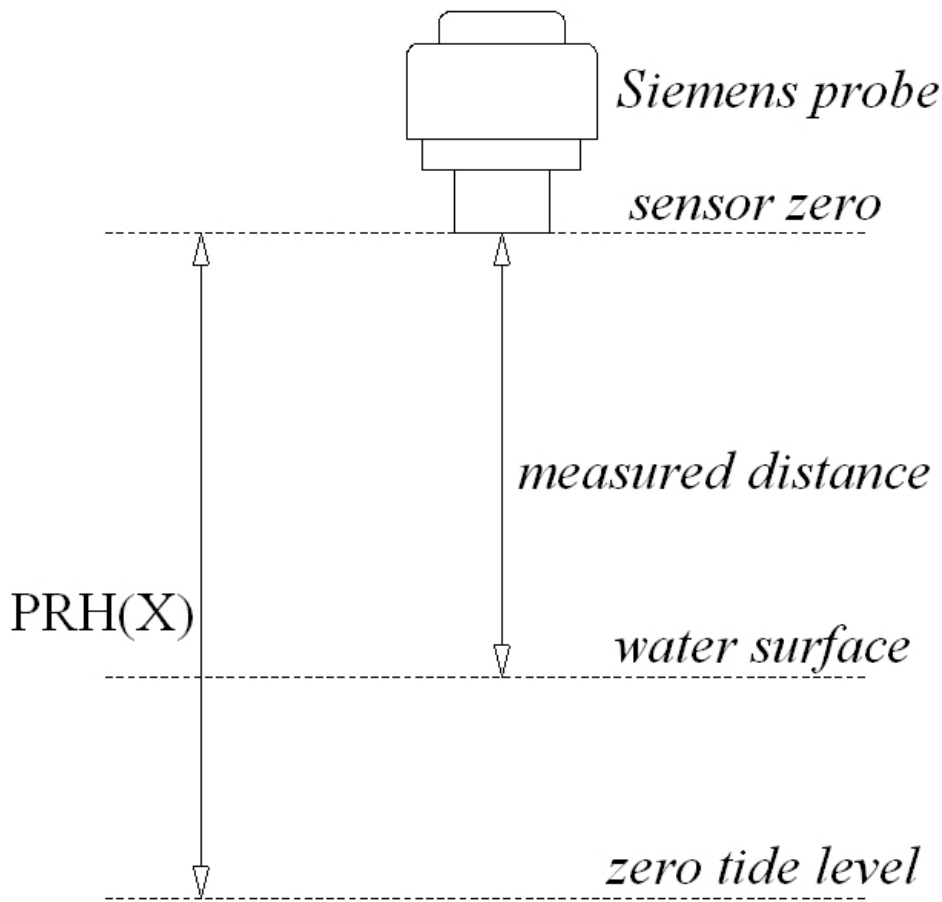


Figure 3 Siemens Probe setup

PRH is set to the height of the Siemens sensor face above zero tide level.

OFS is set to 0.

Example using Aquatrak Probe

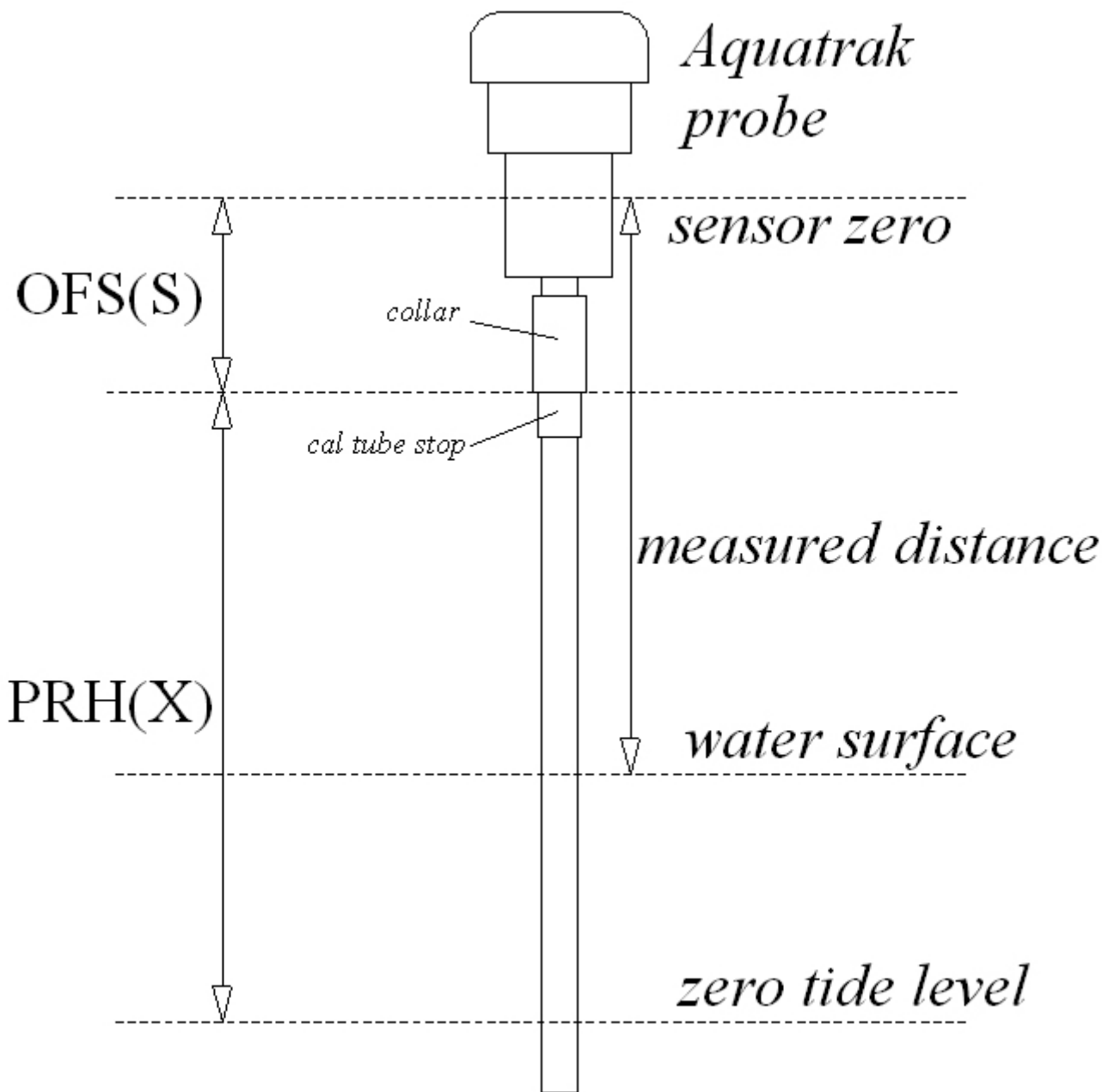


Figure 4 Aquatrak Probe setup

PRH is set to the height of the probe collar above zero tide level (X value).

OFS is set to the Aquatrak offset value, given in the calibration sheet (S value).

Tide Monitoring using Pressure Sensors

A 4-20mA pressure sensor can be used in place of the acoustic open air sensor. The advantage of the pressure sensor is that it can be used where an open air sensor is not practical – e.g. rivers or estuaries where there is no easy mounting location for the acoustic sensor.

A typical installation is shown below, and a suitable pressure sensor is shown in Appendix 6. Consult factory for application information.

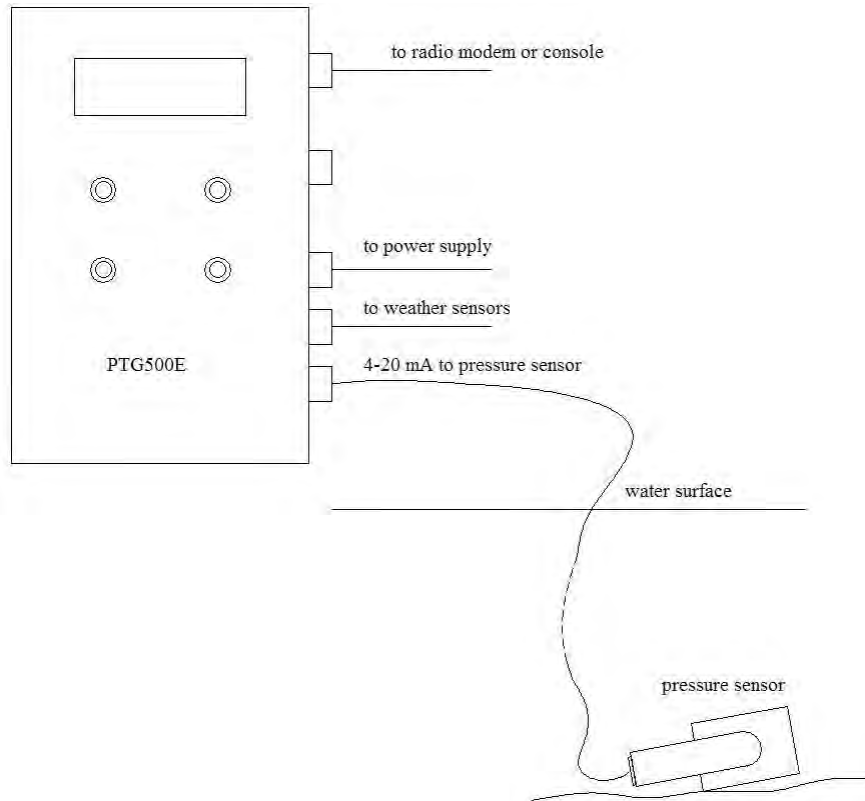


Figure 5 PTG500e with pressure sensor

When using a pressure sensor, the PTG500e calculated tide based on the following equation:

$$\text{Tide} = \text{Probe Height} + \text{Tide Offset} + \text{Tide distance}$$

The following settings should be used when using a pressure sensor.

Command	Example	Notes
D20	D20 3500	Sets the 20mA level in mm
D04	D04 0	Sets the 4mA level in mm
OFS	OFS 0	Normally set to 0 when using pressure sensor, although can be used to introduce offset.
PRH	PRH 0	Normally set to 0 when using pressure sensor
APL	PRH P	Tide reading is normally positive

Note: When the D20 and D04 values are set, the PTG500e will respond with the transfer equation used. For example, with the above settings, D20 3500 will respond with

$$\text{Dist} = 2.1875 * 100I - 875$$

where I is the current from the sensor in mA.



PTG500e NMEA output

NMEA is a widely used industrial format for RS232 data transmission, especially in marine environments. The PTG500e generates an NMEA compatible format.

A typical PTG500e output string in NMEA format is:

(In this example, data is sent every 30s, giving tide and meteorological data)

```
$PEDPT,BWPR01,1394,005421.00,0501.2007,177,322,3.6,06.5,17,73.6,1011.1,0,12.1*0,7D
```

In general, the string is:

```
$PEDPT,AAAAAA,nnnn,hhmmss.00,MMDD.YYYY,ttt,www,s.s,gg.g,tt,hh.h,pppp.p,r,12.1*0,7D
```

Where:

\$PEDPT	NEMA unique identifier for PTG500E
AAAAAA	station name
nnnn	reading number
hhmmss	time
DDMM.YYYY	date
ttt	tide height in mm
www	wind direction in degrees, may not be present
ss.s	wind speed in kts
gg.g	wind speed in kts
tt	temperature
hh.h	humidity
pppp.p	pressure
rrr	rain
vv.v	battery
S	status (0 = OK)
cc	checksum (8 bit XOR of all characters between "\$" and "*")

Notes:

1. Output is ASCII.
2. If not known or invalid, variables are not transmitted, although comma numbers are maintained.
e.g. if wind is not know or invalid, the string would be

```
$PEDPT,BWPR01,1394,005421.00,0501.2007,177,,,17,73.6,1011.1,0,12.1*0,7D
```

3. Each line is terminated with <CR><LF> (0x0d, 0x0a)
4. Data rate is 4800, 9600 or 19200, set with PTG500 menu.
5. Logging and reporting times are set via PTG500 menu.
6. Minimum reporting time is 1sec.



Below is an sample of data from Breakwater Pier (ID: BWPR01)
(Note: Data is being logged every 3 minutes.)

```
$PEDPT,BWPR01,1395,000000.00,0501.2007,1772,322,3.6,06.5,17,73.6,1011.1,0,12.1*0,7C  
$PEDPT,BWPR01,1396,000300.00,0501.2007,1773,304,3.4,04.8,17,72.6,1011.1,0,12.1*0,74  
$PEDPT,BWPR01,1397,000600.00,0501.2007,1774,315,1.8,03.3,17.1,73.1,1011,0,12.1*0,74  
$PEDPT,BWPR01,1398,000900.00,0501.2007,1788,331,4.5,06.6,17.3,71.5,1011,0,12.1*0,71  
$PEDPT,BWPR01,1399,001200.00,0501.2007,1788,330,2.2,03.5,17.3,72.1,1010.9,0,12.1*0,6D  
$PEDPT,BWPR01,1400,001500.00,0501.2007,1772,340,2.2,03.4,17.5,71.4,1010.9,0,12.1*0,64  
$PEDPT,BWPR01,1401,001800.00,0501.2007,1773,337,3.7,05.1,17.6,70.9,1010.8,0,12.1*0,61  
$PEDPT,BWPR01,1402,002100.00,0501.2007,1774,337,4.3,05.7,17.7,69.8,1010.7,0,12.1*0,6A  
$PEDPT,BWPR01,1403,002400.00,0501.2007,1775,339,2.8,04.3,17.7,69.7,1010.6,0,12.1*0,66  
$PEDPT,BWPR01,1404,002700.00,0501.2007,1776,302,2.7,03.4,17.9,69.7,1010.6,0,12.1*0,6B
```

PTG500e Cable Connections

Internal Cable Connections

Table 3 LCD – LogicFlex PCB cables

LogicFlex J7	LCD	Function
1	1	GND (Vss)
2	2	+5V (Vdd)
3	3	V0 (connect to Vss with 1K)
4	4	RS
5	5	R/W
6	6	E
7	7	DB0
8	8	DB1
9	9	DB2
10	10	DB3
11	11	DB4
12	12	DB5
13	13	DB6
14	14	DB7

LogicFlex J7 (“J7” marker near pin 1)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Gnd	+5	Vo	RS	RW	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

LCD connections (pin 14 near corner end of board)

16	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14
n/c	n/c	Gnd	+5	Vo	RS	RW	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

Table 4 PTG500e Pinouts

	Connector:	C1	EXCON5	EXCON2	EXCON3	EXCON4	EXCON2
Main Console Port. Used for radio modem and computer interface) (5Way)		1					
		2					
	TxD0 (out from PTG)	3	2				
		4					
		5					
	RxD0 (in to PTG)	6	3				
		7					
	GND	8	9				

			EXCON5	EXCON2	EXCON3	EXCON4	EXCON2
GSM Modem (5Way)	Connector:	C2					
	VP12V	1		1			
	ModemRxD	2		2			
	ModemTxD	3		3			
	ModemRTS	4		4			
	ModemCTS	5		5			
	ModemReset	6		6			
	ModemRI	7		7			
	GND	8		8			
External Power (3Way)		C3					
	BAT	3	6				
	GND	1	10				
Met Sensor (5Way) WXT510	Connector:	C4					
	VP12V	1				1	
	WXTRxD (in to PTG)	2				3	
	WXTTxD (out from PTG)	3				2	
		4					
	GPSTxD	5			2		
	GPSRxD	6			3		
	GPSPPS	7			4		
	GND	8			10		
4-20mA Probe OR 4100 Probe (5Way)	Connector:	C5					
	VP12V	1					1
	4100RxD (in)	2					3
	4-20mA probe in	3					6
	4100TxD (out)	4					2
		5					
	Probe +22V	6					9
		7					
	GND	8					10

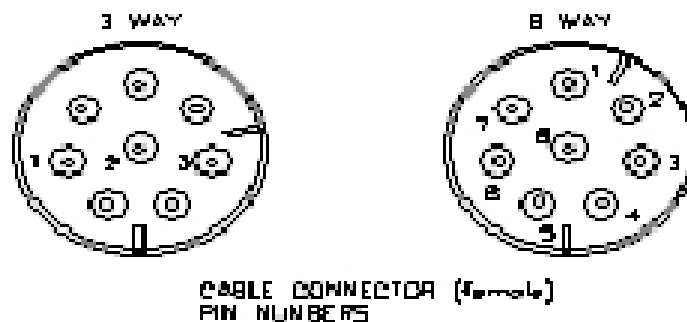


Figure 6 Buccaneer connectors (left: C3, right: C1, C2, C4, C5)

Locating pin numbers for Buccaneer connectors:

Female (cable) 8 way connectors:

1. Looking into the connector, orient the connector so that the slots form a “five past 6” pattern. Refer Fig2, right.
2. Pin 1 will be at the top, and the pins are numbered clockwise from 1 to 7 around the connector.
3. Pin 8 is in the centre.

Male (panel) 8 way connectors:

1. Looking into the connect, mentally orient the connector so that the tabs form a “five to 6” pattern.
2. Pin 1 will be at the top, and the pins are numbered anti-clockwise from 1 to 7 around the connector.
3. Pin 8 is in the centre.

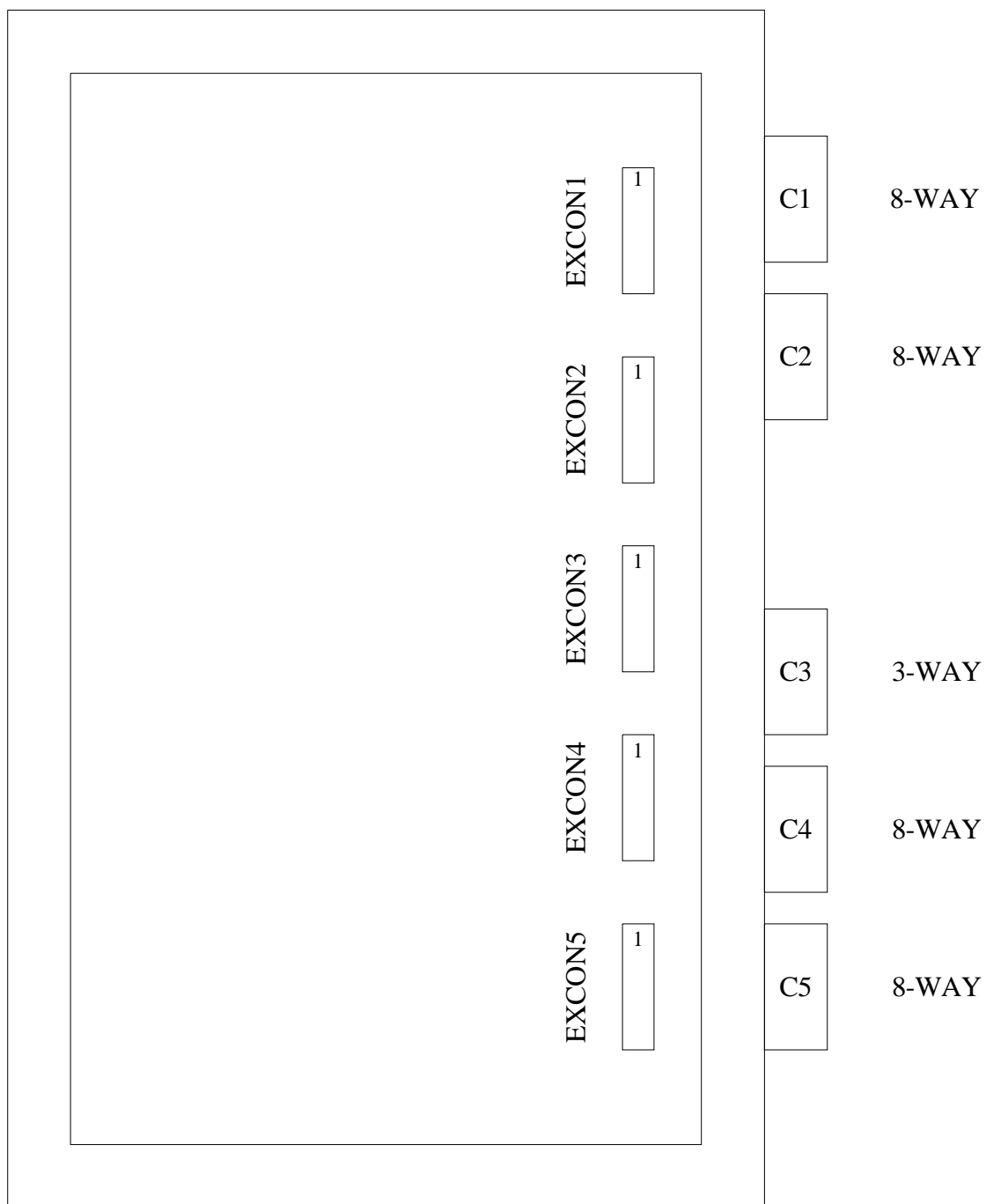


Figure 7 Connector locations

External Cable connections

General Notes (see Figure 5):

- Console/modem connections from the PTG500e are wired like a “terminal” connection. (i.e. act like a PC with male DB9 connectors, data out: pin 3, data in: pin2)
This is to allow direct connection to a radio modem, or through a null-modem to a PC.
- Sensor connections (to the 4100 and the WXT) from the PTG500e are wired like a “modem” (i.e. wired with female DB9 connectors, data out: pin 2, data in: pin 3.)
This allows direct connection to a PC.
- Sensor connections (from the 4100 and the WXT) to the PTG500e are wired like a “terminal” connection. (i.e. act like a PC with male DB9 connectors, data out: pin 3, data in: pin2)
This is to allow the sensors to be connected through a null-modem to a PC.
- A female DB9 can always be connected to a PC serial port, and a male DB9 connector can always be connected to a PC serial port through a null-modem.

Table 5 Console Cable CON1 (C1 – CONSOLE)

Cable from PTG to modem (or to computer through null-modem connector)		
EXCON5	C1-F (B3W-F)	DB9-M
2	3 (out from PTG)	3
3	6 (in to PTG)	2
9	8 (GND)	5

Table 6 Power Connector PS1

Cable from PTG to power supply		
EXCON1	C3-F (B3W-F)	Flying lead
6	3 +ve	Red
8	2 GND	
10	1 GND	Black

Table 7 Meteorological Sensor Connections WXT1 (C4 – WXT510)

Cable from PTG to WXT (or to computer through null-modem connector)		WXT cable		
EXCON4	C4-F (B8W-F)	DB9-F	DB9-M (WXT cable)	FUNCTION
1	1 (out from PTG)	6	6	+12V
2	2 (in to PTG)	3	3	WXTRxD (out from WXT)
3	3 (out from PTG)	2	2	WXTTxD (in to WXT)
	4			
	5			
	6			

		7			
10		8	5	5	GND

Table 8 Aquatrak Tide Sensor Connections ST1
 (C5 to Aquatrak 4100 or 4110)

EXCON2	Cable from PTG to 4100 (or to computer through null-modem connector)		4100 cable		FUNCTION
	C5-F (B8W-F)	DB9-F	DB9-M		
1	1	6	6		+12V
3	2 (in to PTG)	3	3		4100RxD (out from 4100)
6	3				
2	4 (out from PTG)	2	2		4100TxD (in to 4100)
	5				
	6				
	7				
10	8	5	5		GND
	9				

Table 9 4-20mA Tide Sensor Connections ST2
 (C5 to Siemens probe)

EXCON2	Cable from PTG to Probe		FUNCTION
	C5-F (B8W-F)	Probe	
1	1		
3	2		
6	3	Probe -	Signal return
	4		
	5		
9	6	Probe +	+22V
	7		
10	8		
	9		

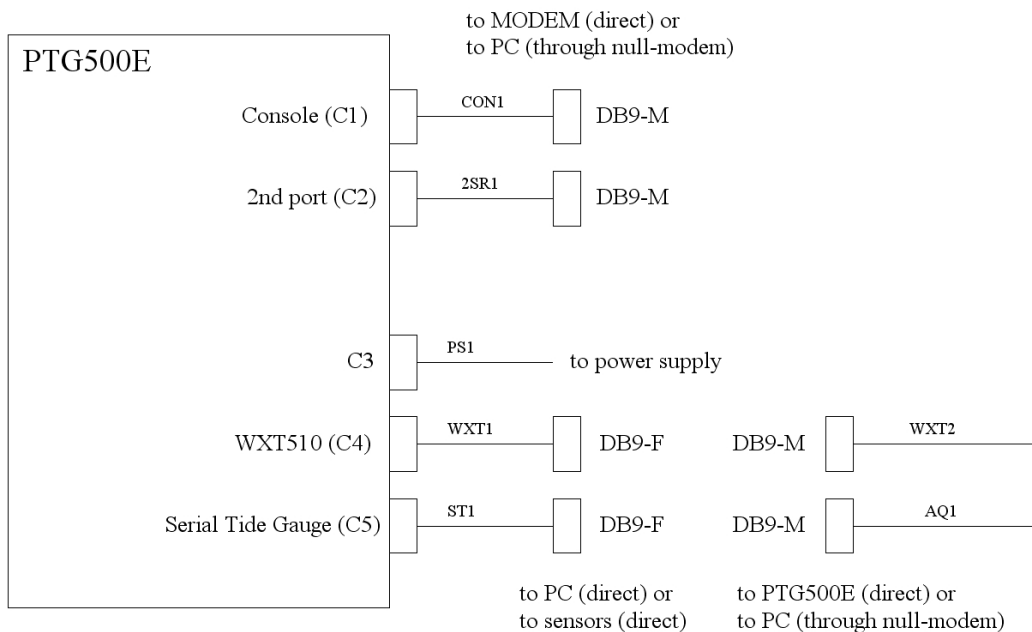


Figure 8 PTG500e serial connections

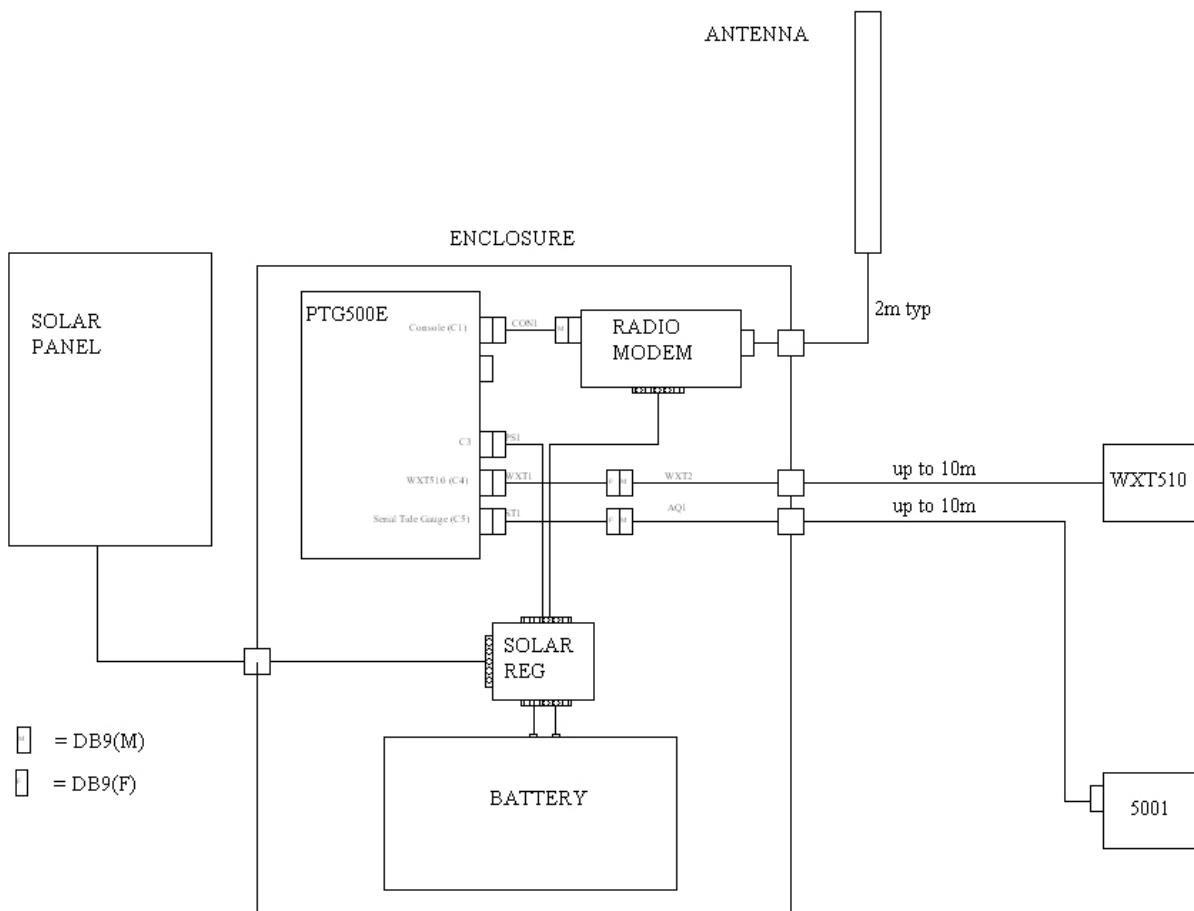


Figure 9 Typical field connections

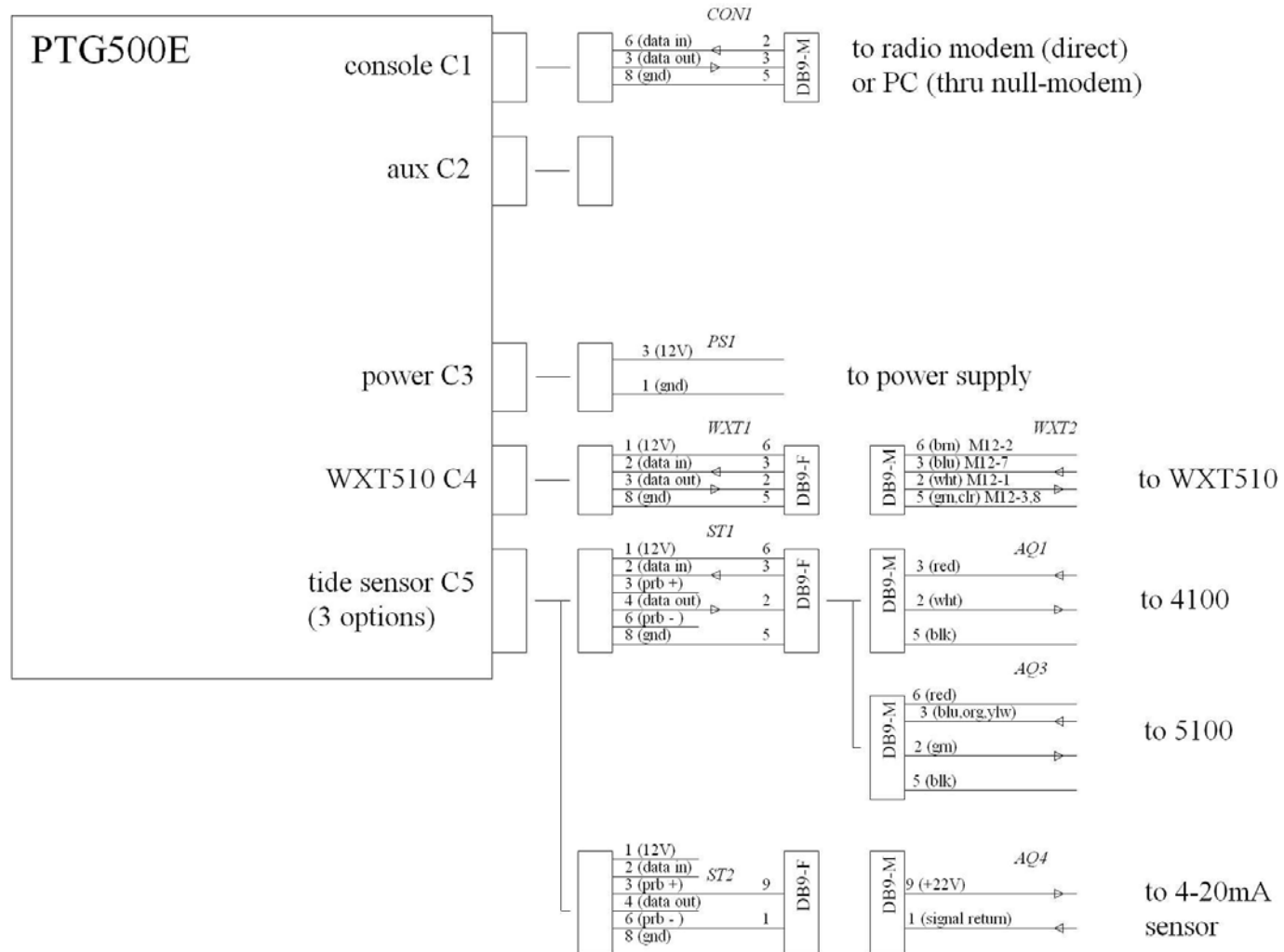


Figure 10 Serial connection details

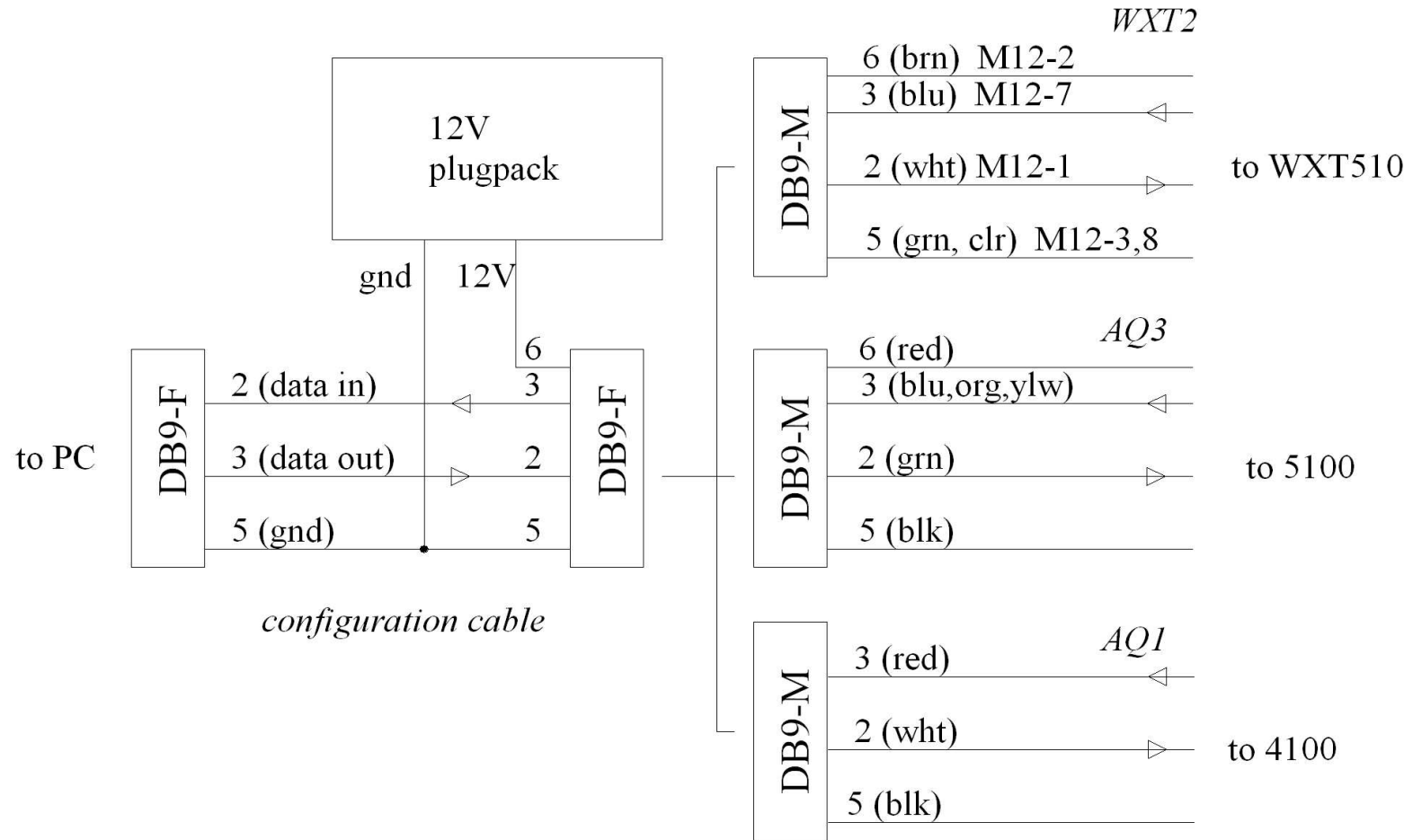


Figure 11

PTG500e configuration cable



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 Tel: +61 3 8420 8999 Fax: +61 3 8420 8900
 ACN 007 536 807 www.esands.com

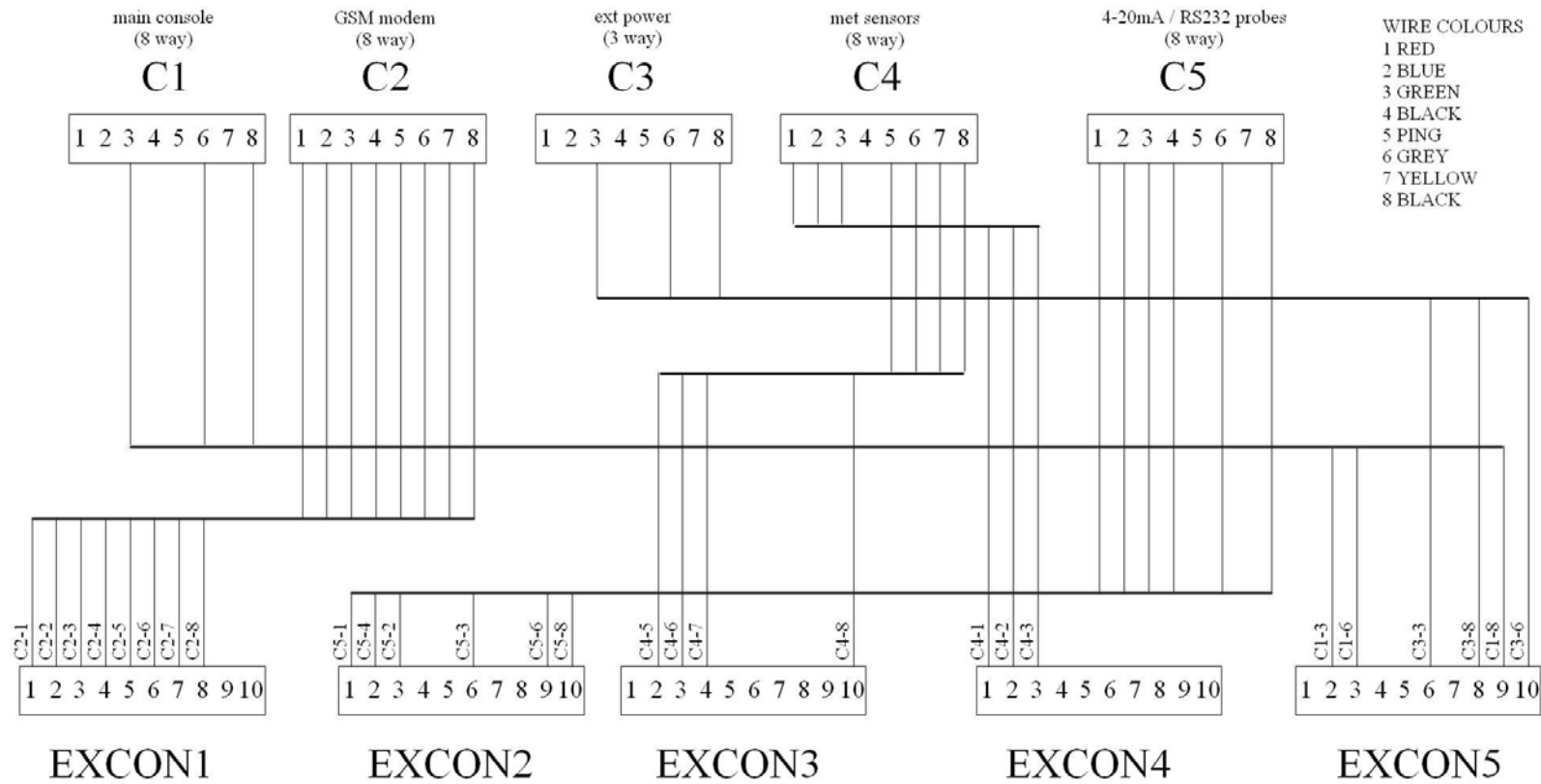


Figure 12 Internal Cable layout

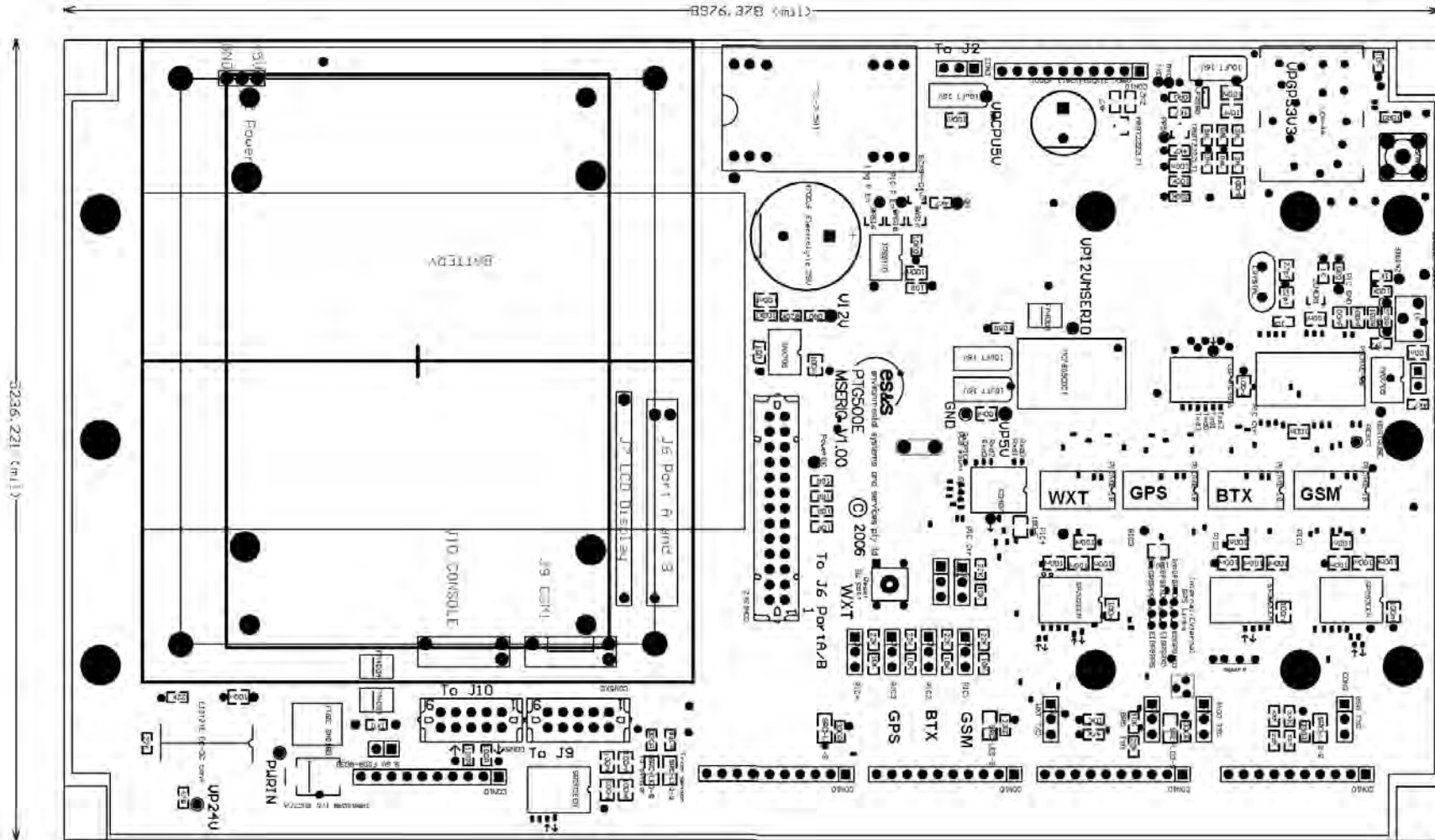


Figure 13 MSERIO component placement

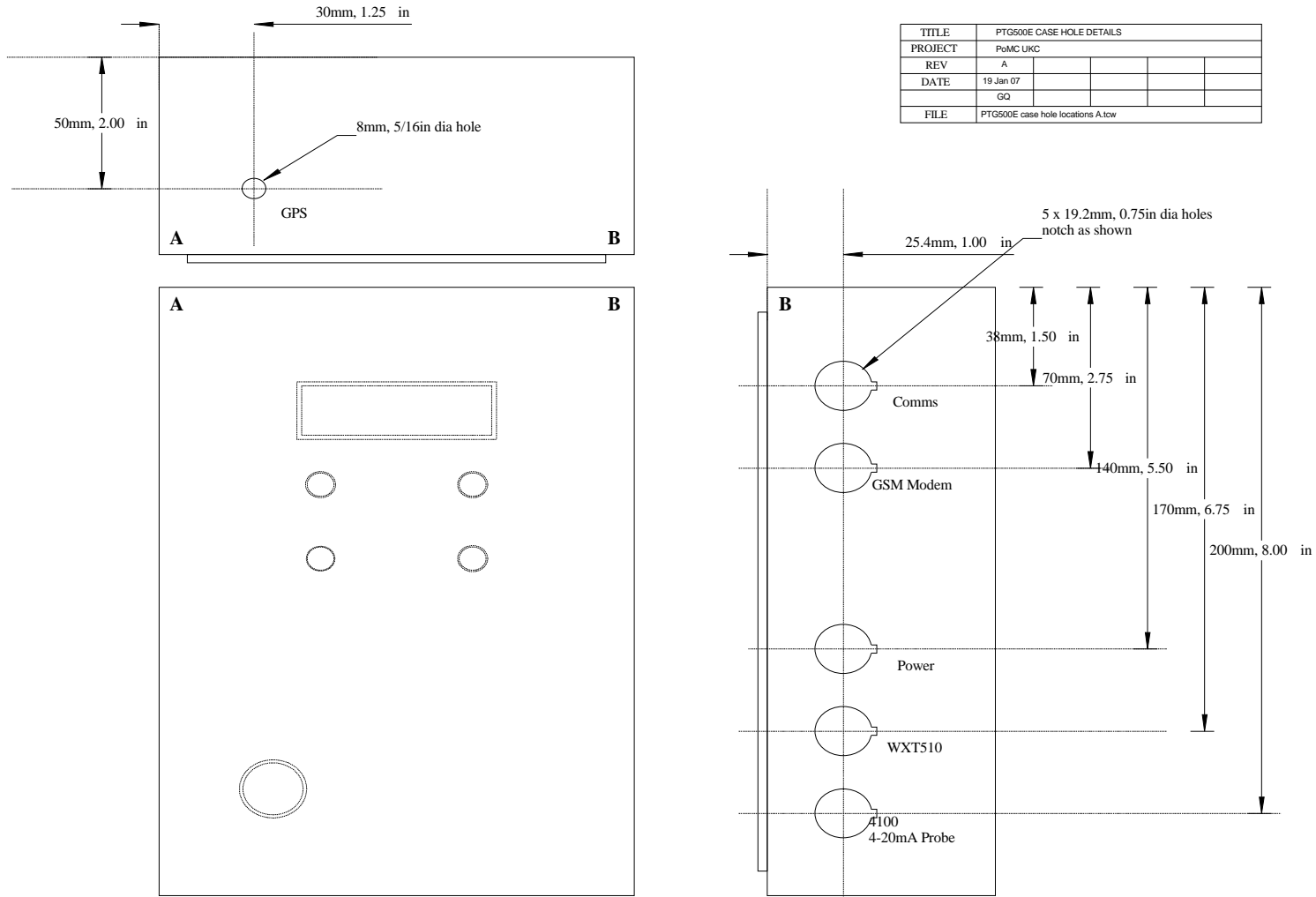


Figure 15

Connector mountings on case

LF port allocation

Table 12 Port A and B functions

pin	LF function (input port 60)	PTG input functions (note 1)	pin	LF function (output port 61)	PTG output functions (note 2)
1	GND		2	3.3V	
3	GND		4	3.3V	
5	GND		6		
7	GND		8		
9	SSIORX/		10		
11	PA7	Menu	12	PB7	
13	PA6	Select	14	PB6	FP LED
15	PA5	Up	16	PB5	
17	PA4	Down	18	PB4	
19	PA3	EPwrOK	20	PB3	LFPwrEn
21	PA2		22	PB2	LFCIO
23	PA1		24	PB1	LFCnt1
25	PA0		26	PB0	LFCnt0

Note 1: The front panel button inputs (Menu, Select, Up and Down) are held high through 10K resistors, and shorted to ground when the front panel buttons are pushed.

The EPwrOK input is set to 1 when external power drops below approx 12.2V. This is used as an indication that the PTG unit is operating from internal battery power.

Note 2: These are output function used to control internal MSERIO board functions.

Sensor setup

Note for summary of Aquatrak operation, see appendix

Aquatrak 4100

The Aquatrak 4100 module needs to be initialized so that the output data is in the correct format for the PTG500e.

Note: The 4100 must be set to 1200,8,N to be used with the PTG500e. (It may be initially set to 1200,7,E.)

1. Connect a computer running a terminal program (e.g. Hyperterminal) to the Aquatrak unit using cable AQ1.

Table 13 4100 Aquatrak cable

4100 Aquatrak signal cable (AQ1)	Aquatrak signal cable	DB9-M
	Data out (red, blu, org, yrl)	3 (out from Aqtrk)
	Power in (red)	6 (+12V)
	Data in (wht, grn)	2 (in to Aqtrk)
	Ground (blk)	5 (gnd)

2. Set the terminal program to 1200,8,N
3. After connection to the Aquatrak, hit ESC key.
4. The Aquatrak will respond with

Summary of Aquatrak 4100 operation

CURRENT USER SETTINGS

1. Maximum number of calcs: 5
2. Polarity (D)own (U)p): M
3. Offset (xxx.xxx): +0.000
4. Sensor Address: 0
5. Samples to Average: 68
6. Enter ID, 13 chars: 000000
7. Protocol (R)S232 (S)DI-12): R
8. Baud Rate: 1200
9. Units (F)eet (M)eters): M
- M. Set M! Type (0, 1, 2, 3): 0
- W. Wave Multiplier: 6.4
- A. Calculate offset automatically
- Q. Return to previous menu

<ESC><ESC>

Aquatrak 4100 V1.17 Menu

1. User Settings.
2. Measurement, range proportionate.
3. Measurement, one hertz.
4. Measurement, with counts.
5. Continuous NOS Averaging.
6. Continuous Wave Data.
- Q. Return to Command Mode.

OPTION 1 from main menu shows the user settings (see above)

OPTION 2 from main menu

Measurement, range proportionate. (OPTION 2 from main menu.)

The output below is seen (approx 2 per second) when connected directly to a PC (1200/N/8).

Selection: <2> {note - no RTN}

```
2.574 1 99
2.574 1 99
2.574 1 99
2.573 1 99
2.574 1 99
2.574 1 99
2.574 1 99
2.574 1 99
2.574 1 99
2.574 1 99
2.574 1 99
2.574 1 99
```

The first value is the distance from the head.

When this is connected to the PTG500E (see “External Cable Connections”), the PTG500e diagnostic mode (MIO 1) can be used to see the actual data being read. This should appear as

```
VP12V,707
4100 2.574 1 99 {data from 4100}
PRB,75,0,65449 {data from 4-20mA}
GPSTIME,072554,00708, {data from GPS}
4100 2.574 1 99
PRB,76,0,65449
4100 2.574 1 99
PRB,77,0,65449
4100 2.574 1 99
PRB,78,0,65449
```

When using the 4100, set PTG500e options as below:

PRT AQT (select Aquatrak sensor)

AQS 6 (use 2nd field from 4100 string for tide data:

e.g.: 4100 **2.574** 1 99)

4100 initialization string for sampling option 2

Note: the PTG500E will periodically send the following sequence to initialize the Aquatrak:

```
ESC (0x1B)
{wait 5s}
ESC (0x1B)
{wait 5s}
2 (0x32)
{wait 0.5s}
RTN (0x0D)
```

Aquatrak 4110

The Aquatrak 4110 module needs to be initialized so that the output data is in the correct format for the PTG500e.

Note: The 4110 must be set to 1200,8,N to be used with the PTG500e. (It may be initially set to 1200,7,E.)

1. Connect a computer running a terminal program (e.g. Hyperterminal) to the Aquatrak unit using cable AQ1.

Table 14 4110 Aquatrak cable

4110 Aquatrak signal cable (AQ1)	Aquatrak signal cable	DB9-M
	Data out (red, blu, org, yrl)	3 (out from Aqtrk)
	Power in (red)	6 (+12V)
	Data in (wht, grn)	2 (in to Aqtrk)
	Ground (blk)	5 (gnd)

2. Set the terminal program to 1200,8,N
3. After connection to the Aquatrak, hit ESC key.
4. The Aquatrak will respond with

Aquatrak 4110 operation

USER SETTINGS MENU

```

1. Primary Sensor Address:      0
2. Secondary Address:          2
3. Sensor ID, 13 chars:       120270
4. Slope (x.xxxxxx):          +1.000000
5. Offset (xxx.xxx):          +0.000
6. Polarity (D)own (U)p):      D
7. Units (F)eeet (M)eters):    M
8. Wave Multiplier:           4.000
9. Calculate offset
10. Baud Rate:                 1200
11. Comms Parity (N)one (E)ven): N
12. Menu item not used.
13. Continuous Sampling:       On
14. Self-Report with each sample: Off
Q. Return to previous menu
Enter Selection:
```

Using sampling option 2

<ESC><ESC> brings up the main menu

Aquatrak Model 4110 Menu Version 4.04

1. User Settings.
2. Continuous Sampling, Raw Data.
3. Continuous Sampling, Scaled Data.
4. Continuous NOS Averaging, Sliding Window.
5. Continuous Wave Data, Sliding Window.
6. Continuous Scalar Average, Sliding Window.
7. Dump Sample Array.

- 8. Measurement Command Defaults.
- 9. Dump Setup Information.
- EE EEPROM Initialization Options.
- Q. Return to Command Mode.

OPTION 1 from main menu shows the user settings (see above)

OPTION 2 from main menu causes continuous sampling.

The output below is seen (approx once per second)
 when connected directly to a PC (1200/N/8).

Selection: <2 RTN>

Index	Raw Data	Stat	Cal	Water	Celsius
267	1.778	16	26608	38794	11.6
268	1.778	16	26608	38795	11.6
269	1.778	16	26608	38794	11.6
270	1.778	16	26608	38794	11.6
271	1.778	16	26608	38794	11.6
272	1.778	16	26608	38795	11.6
273	1.778	16	26608	38795	11.6

The second value is tide value.

When this is connected to the PTG500E (see “External Cable Connections”), the PTG500e diagnostic mode (MIO 1) can be used to see the actual data being read. This should appear as

```
4100 267 1.778 16 26610 38794 11.6 {data from 4110}
PRB,70,0,65449 {data from 4-20mA}
PRB,71,0,65449
PRB,72,0,65449
VP12V,706
4100 271 1.777 16 26611 38795 11.6
PRB,73,0,65449
GPSTIME,071053,90708, {data from GPS}
PRB,74,0,65449
PRB,75,2,65450
4100 274 1.777 16 26611 38794 11.6
PRB,76,0,65449
```

When using the 4110, set PTG500e options as below:

```
PRT AQT (select Aquatrak sensor)
AQS 2 (use 3rd field from 4110 string for tide data.)
e.g. 4100 274 1.777 16 26611 38794 11.6
```

4110 initialization string for sampling option 2

Note: the PTG500E will periodically send the following initialization sequence to the Aquatrak:

```
ESC (0x1B)
{wait 5s}
ESC (0x1B)
{wait 5s}
2 (0x32)
{wait 0.5s}
RTN (0x0D)
```



```
{wait 0.5s}
RTN (0x0D)
```

Using sampling option 4

```
<ESC><ESC>
Aquatrak Model 4110 Menu Version 4.04
```

1. User Settings.
2. Continuous Sampling, Raw Data.
3. Continuous Sampling, Scaled Data.
4. Continuous NOS Averaging, Sliding Window.
5. Continuous Wave Data, Sliding Window.
6. Continuous Scalar Average, Sliding Window.
7. Dump Sample Array.
8. Measurement Command Defaults.
9. Dump Setup Information.
- EE EEPROM Initialization Options.
- Q. Return to Command Mode.

OPTION 4 from main menu

Continuous NOS Averaging, Sliding Window.

The output below is seen (approx once per second) when connected directly to a PC (1200/N/8).

Selection: <4 RTN RTN>

```
Enter number of samples:
  Mean      Sigma   Out   Bad
  2.572     0.000   0     1
  2.572     0.000   0     1
  2.572     0.000   0     1
  2.572     0.000   0     1
  2.572     0.000   0     0
  2.572     0.000   0     0
  2.572     0.000   0     0
  2.572     0.000   0     0
  2.572     0.000   0     0
  2.572     0.000   0     0
```

The first value is the tidal value.

When this is connected to the PTG500E, the diagnostic mode (MIO 1) can be used to see the actual data being read. This should appear as

```
4100      2.572      0.000      0      0
PRB,70,0,65449
PRB,71,0,65449
PRB,72,0,65449
VP12V,706
4100      2.572      0.000      0      0
PRB,73,0,65449
GPSTIME,071053,90708,
PRB,74,0,65449
PRB,75,2,65450
4100      2.572      0.000      0      0
PRB,76,0,65449
```

When using the 4110, set PTG500e options as below:

PRT AQT (select Aquatrak sensor)
 AQS 6 (use 2nd output from 4100 string.)

4110 initialization string for sampling option 4

Note: the PTG500E will periodically send the following initialization sequence to the

Aquatrak:

```
ESC (0x1B)
{wait 5s}
ESC (0x1B)
{wait 5s}
4 (0x34)
{wait 0.5s}
RTN (0x0D)
{wait 0.5s}
RTN (0x0D)
```

Using sampling option 6

<ESC><ESC>

Aquatrak Model 4110 Menu Version 4.04

1. User Settings.
2. Continuous Sampling, Raw Data.
3. Continuous Sampling, Scaled Data.
4. Continuous NOS Averaging, Sliding Window.
5. Continuous Wave Data, Sliding Window.
6. Continuous Scalar Average, Sliding Window.
7. Dump Sample Array.
8. Measurement Command Defaults.
9. Dump Setup Information.
- EE EEPROM Initialization Options.
- Q. Return to Command Mode.

OPTION 6 from main menu

Continuous Scalar Averaging, Sliding Window.

The output below is seen (approx once per second)

when connected directly to a PC (1200/N/8).

Selection: <6 RTN RTN>

Enter number of samples:

Mean	Maximum	Minimum	Bad
2.572	2.572	2.572	1
2.572	2.572	2.572	2
2.572	2.572	2.572	2
2.572	2.572	2.572	2
2.572	2.572	2.572	2
2.572	2.572	2.572	1
2.572	2.572	2.572	0
2.572	2.572	2.572	0
2.572	2.572	2.572	0
2.572	2.572	2.572	0
2.572	2.572	2.572	0
2.572	2.572	2.572	0
2.572	2.572	2.572	0
2.572	2.572	2.572	0

The first value is the distance from the head.

When this is connected to the PTG500E, the diagnostic mode (MIO 1) can be used to see the actual data being read. This should appear as

```
4100 2.572      2.572      2.572      0
PRB,70,0,65449
PRB,71,0,65449
PRB,72,0,65449
VP12V,706
4100 2.572      2.572      2.572      0
PRB,73,0,65449
GPSTIME,071053,90708,
PRB,74,0,65449
PRB,75,2,65450
4100 2.572      2.572      2.572      0
PRB,76,0,65449
```

When using the 4110, set PTG500e options as below:

PRT AQT (select Aquatrak sensor)
 AQS 6 (use 2nd output from 4100 string.)

4100 initialization string for sampling option 6

Note: the PTG500E will periodically send the following initialization sequence to the Aquatrak:

```
ESC (0x1B)
{wait 5s}
ESC (0x1B)
{wait 5s}
6 (0x36)
{wait 0.5s}
RTN (0x0D)
{wait 0.5s}
RTN (0x0D)
```

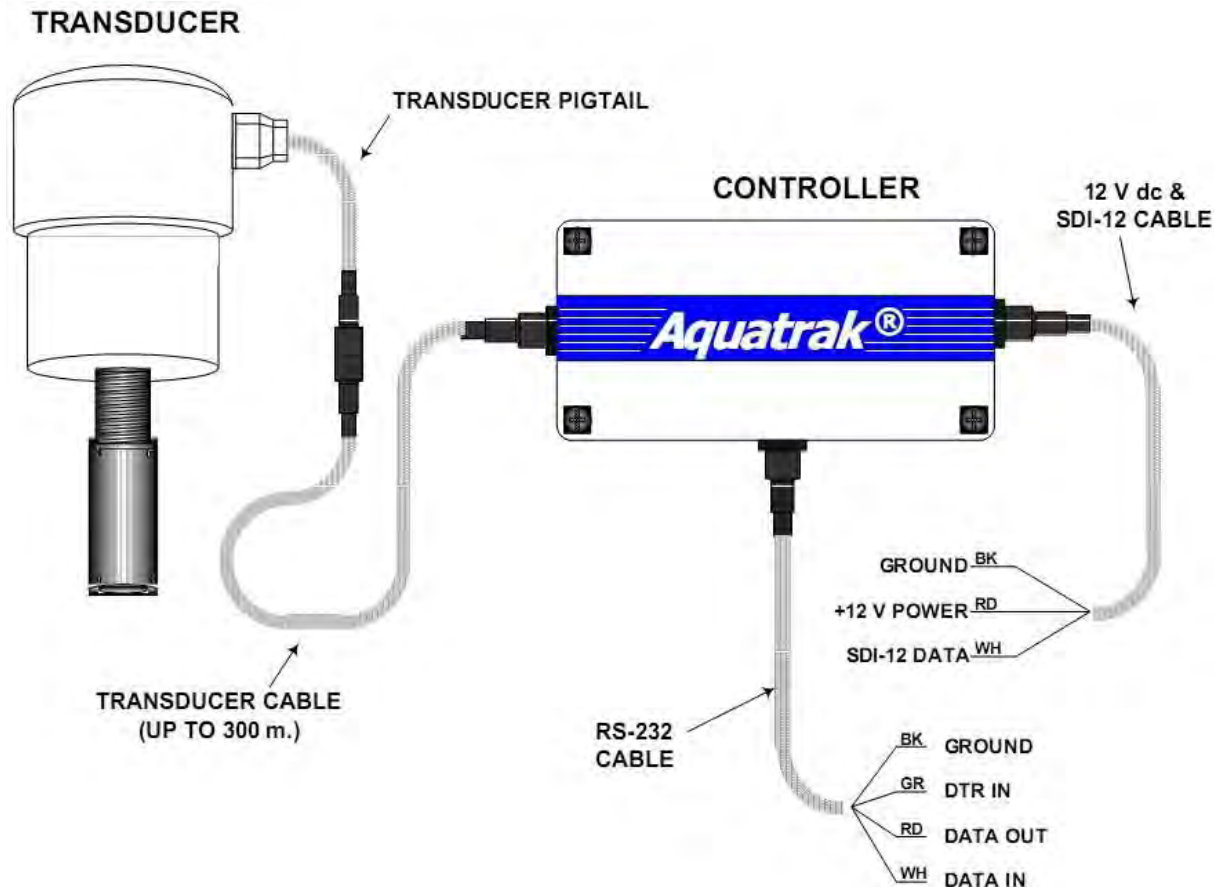


Figure 16 4100/4110 cabling

Aquatrak 5000

The Aquatrak 5000 module needs to be initialized so that the output data is in the correct format for the PTG500e.

Note: The 5000 must be set to 1200,8,N to be used with the PTG500e. (It may be initially set to 1200,7,E.)

1. Connect to a computer running a terminal emulation program (e.g. Hyperterminal) to the Aquatrak unit using the following cable:

Table 15 5000 series setup cable

5001 Aquatrak cable (AQ3)		Computer DB9 serial port	Power supply
	Power in (red)		1 (12V+)
	Data out from 5001 (blu,org,yel)	2 (data in to computer)	
	Data in to 5001 (grn)	3 (data out from computer)	
	Ground (blk)	5	5
		8	

2. Set Hyperterminal to 1200 baud, 7 bits, even parity
 3. Go to User Settings, and change the RS232 settings to 1200 baud, 8 bits, no parity.
- The Aquatrak 5000 series can now be directly connected to the PTG500e.

Aquatrak 5000 operation

USER SETTINGS MENU

- 1. Primary Sensor Address: 0
 - 2. Secondary Address: 2
 - 3. Sensor ID, 13 chars: S/N5002-00123
 - 4. Slope (x.xxxxxx): +1.000000
 - 5. Offset (xxx.xxx): +0.000
 - 6. Polarity (D)own (U)p): D
 - 7. Units (F)eet (M)eters): M
 - 8. Wave Multiplier: 4.000
 - 9. Calculate offset
 - 10. Baud Rate: 1200
 - 11. Comms Parity (N)one (E)ven: None
 - 12. Menu item not used.
 - 13. Continuous Sampling: On
 - 14. Self-Report with each sample: Off
 - Q. Return to previous menu
- Enter Selection:

<ESC><ESC> brings up the main menu

Aquatrak Model: 5000 , Version: 505, Sensor ID: S/N5002-00123

- 1. User Settings.
- 2. Continuous Sampling, Raw Data.
- 3. Continuous Sampling, Scaled Data (w Slope & Offset).
- 4. Continuous NOS Averaging, Sliding Window.
- 5. Continuous Wave Data, Sliding Window.
- 6. Continuous Scalar Average, Sliding Window.
- 7. Dump Sample Array.
- 8. Measurement Command Defaults.
- 9. Dump Setup Information.
- EE Setup Initialization Options.
- Q. Return to Command Mode.

Using sampling option 2

Selection: <2 RTN>

OPTION 1 from main menu shows the user settings (see above)

OPTION 2 from main menu

Continuous Sampling, Raw Data. (OPTION 2 from main menu.)

When option 2 is selected, the output below is seen (appox once per second) when connected directly to a PC (1200/N/8).

Selection: <2 RTN>

35	1.669	16	24129	33037	63.0	0	0	0
36	1.669	16	24128	33036	63.0	0	0	0
37	1.646	16	25485	34397	33.6	0	0	0
38	1.670	16	24030	32922	65.1	0	0	0
39	1.670	16	24025	32906	65.2	0	0	0
40	1.670	16	24016	32895	65.4	0	0	0
41	1.644	16	25517	34418	32.9	0	0	0
42	1.558	16	23862	30501	68.7	0	0	0

The second value is the distance used for tide measurement.

When this is connected to the PTG500E (see “External Cable Connections”), the PTG500e diagnostic mode (MIO 1) can be used to see the actual data being read. This should appear as:

```
4100 114 1.673 16 23847 32727 69.1 {data from 5000}
PRB,168,0,65449 {data from 4-20mA}
GPSLAT,,,,,0,00,99. {data from GPS}
PRB,169,0,65449
4100 117 1.673 16 23848 32727 69.0
PRB,170,0,65449
PRB,171,0,65449
GPSLON,14500.78751,E
4100 120 1.672 16 23909 32787 67.7
PRB,172,0,65449
4100 122 1.673 16 23848 32728 69.0
PRB,173,0,65449
```

When using the 5000, set PTG500e options as below:

```
PRT AQT (select Aquatrak sensor)
AQS 2 (use 3rd field from 5000 string.
e.g: 4100 120 1.672 16 23909 32787 67.7)
```

5000 initialization string for sampling option 2

Note: the PTG500E will periodically send the following sequence to initialize the Aquatrak:

```
ESC (0x1B)
{wait 5s}
ESC (0x1B)
{wait 5s}
2 (0x32)
{wait 0.5s}
RTN (0x0D)
```

Using sampling option 4

```
<ESC><ESC>
Aquatrak Model: 5000 , Version: 505, Sensor ID: S/N5002-00123
```

1. User Settings.
2. Continuous Sampling, Raw Data.
3. Continuous Sampling, Scaled Data (w Slope & Offset).
4. Continuous NOS Averaging, Sliding Window.
5. Continuous Wave Data, Sliding Window.
6. Continuous Scalar Average, Sliding Window.
7. Dump Sample Array.
8. Measurement Command Defaults.
9. Dump Setup Information.
- EE Setup Initialization Options.
- Q. Return to Command Mode.

Selection: <4 RTN>

```
OPTION 4 from main menu
Continuous NOS Averaging, Sliding Window.
```

When option 4 is selected, the output below is seen (approx once per second)

when connected directly to a PC (1200/N/8).

Enter number of samples: <RTN>

Mean	Sigma	Out	Bad
1.627	0.000	0	1
1.627	0.000	0	1
1.627	0.000	0	1
1.627	0.000	0	1
1.627	0.000	0	0
1.627	0.000	0	0
1.627	0.000	0	0
1.220	0.610	0	0

The first value is the distance from the head.

When this is connected to the PTG500E, the diagnostic mode (MIO 1) can be used

to see the actual data being read. This should appear as

```
4100 1.627 0.000 0 1
PRB,168,0,65449
GPSLAT,,,,,0,00,99.
PRB,169,0,65449
4100 1.627 0.000 0 1
PRB,170,0,65449
PRB,171,0,65449
GPSLON,14500.78751,E
4100 1.627 0.000 0 1
PRB,172,0,65449
4100 1.627 0.000 0 1
PRB,173,0,65449
```

When using the 5000, set PTG500e options as below:

```
PRT AQT (select Aquatrak sensor)
AQS 6 (use 2nd output from 4100 string.)
```

5000 initialization string for sampling option 4

Note: the PTG500E will periodically send the following initialization sequence to the Aquatrak:

```
ESC (0x1B)
{wait 5s}
ESC (0x1B)
{wait 5s}
4 (0x34)
{wait 0.5s}
RTN (0x0D)
RTN (0x0D)
```

Using sampling option 6

<ESC><ESC>

Aquatrak Model: 5000 , Version: 505, Sensor ID: S/N5002-00123

1. User Settings.
2. Continuous Sampling, Raw Data.
3. Continuous Sampling, Scaled Data (w Slope & Offset).
4. Continuous NOS Averaging, Sliding Window.
5. Continuous Wave Data, Sliding Window.
6. Continuous Scalar Average, Sliding Window.

- 7. Dump Sample Array.
- 8. Measurement Command Defaults.
- 9. Dump Setup Information.
- EE Setup Initialization Options.
- Q. Return to Command Mode.

Selection: <6 RTN>

OPTION 6 from main menu
 Continuous Scalar Average, Sliding Window.

When option 6 is selected, the output below is seen (approx once per second)
 when connected directly to a PC (1200/N/8).

```
Enter number of samples:
  Mean   Maximum   Minimum   Bad
  1.626   1.626     1.626     1
  1.626   1.626     1.626     1
  1.626   1.626     1.626     1
  1.626   1.627     1.626     1
  1.626   1.627     1.626     1
  1.626   1.627     1.626     1
  1.626   1.627     1.626     0
  1.626   1.627     1.626     0
  1.626   1.627     1.626     0
  1.626   1.626     1.626     0
  1.626   1.626     1.626     0
```

The first value is the distance from the head.

When this is connected to the PTG500E, the diagnostic mode (MIO 1) can be used
 to see the actual data being read. This should appear as

```
4100  1.626    1.626    1.626    0
PRB,168,0,65449
GPSLAT,,,,,0,00,99.
PRB,169,0,65449
4100  1.626    1.626    1.626    0
PRB,170,0,65449
PRB,171,0,65449
GPSLON,14500.78751,E
4100  1.626    1.626    1.626    0
PRB,172,0,65449
4100  1.626    1.626    1.626    0
PRB,173,0,65449
```

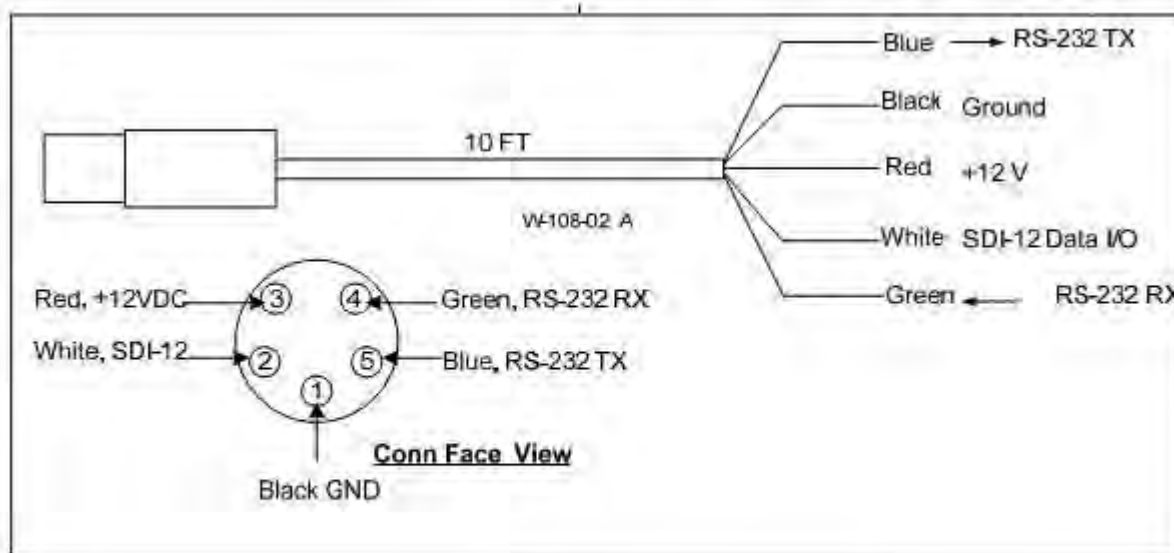
When using the 5000, set PTG500e options as below:
 PRT AQT (select Aquatrak sensor)
 AQS 6 (use 2nd output from 4100 string.)

5000 initialization string for sampling option 6

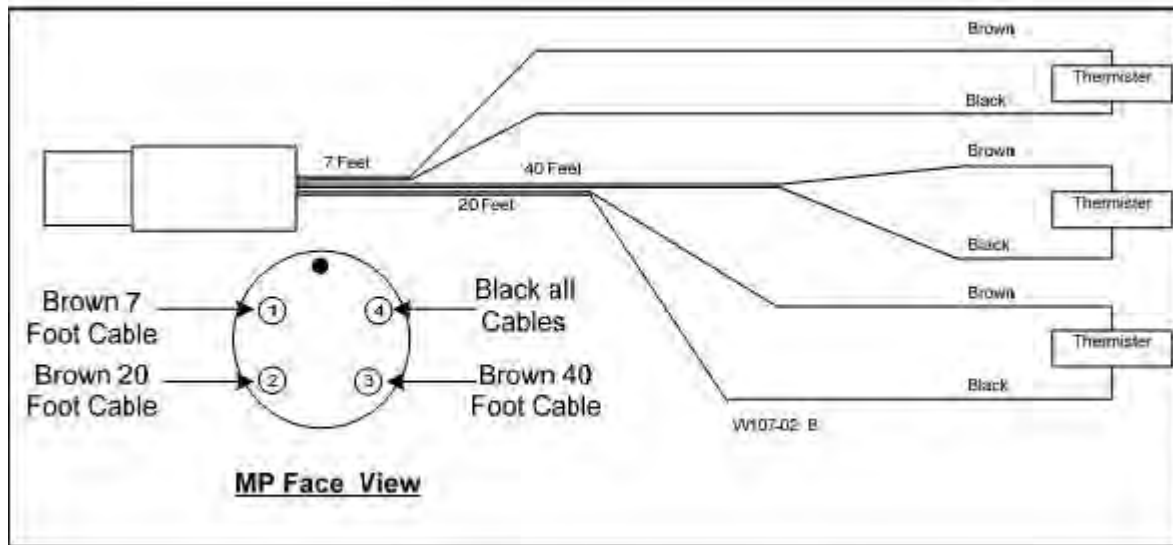
Note: the PTG500E will periodically send the following initialization sequence to the Aquatrak:

```
ESC (0x1B)
{wait 5s}
ESC (0x1B)
{wait 5s}
```

```
6 (0x36)
{wait 0.5s}
RTN (0x0D)
{wait 0.5s}
RTN (0x0D)
```

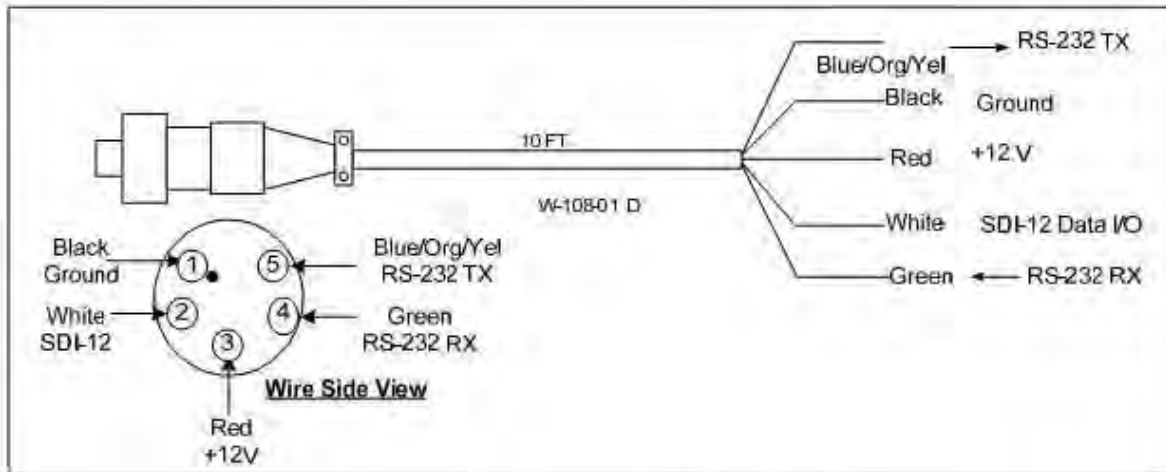


Water Proof I/O Cable (W-108-02)

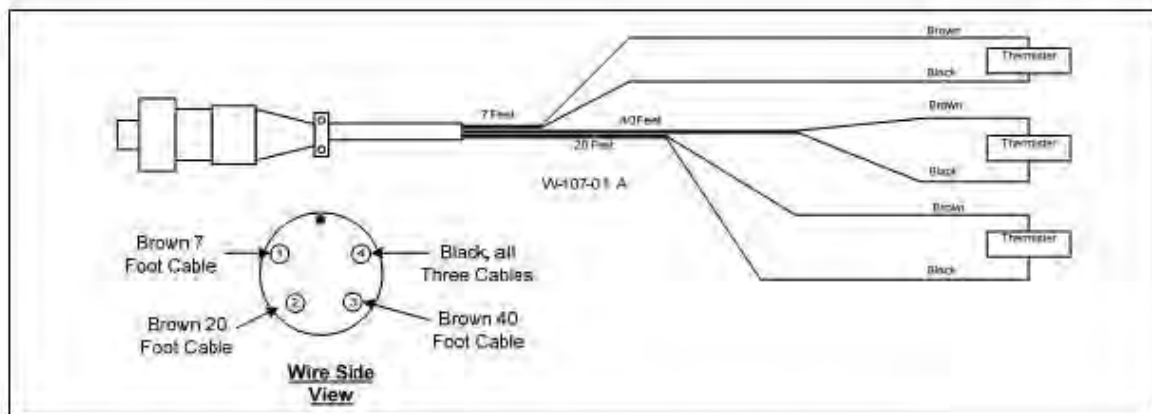


Water Proof Thermistor Cable (W-107-02)

Figure 17 Aquatrak 5000 Waterproof cabling



Water Tight I/O Cable (W-108-01)



Water Tight Thermistor Cable (W-107-01)

Figure 18 Aquatrak 5000 Watertight cabling

4-20mA sensor setup

The 4-20mA sensors vary according to manufacturer.

Typical settings are shown below.

Note that the D04 and D20 settings on the PTG500e should match the corresponding settings on the 4-20mA sensor.

Refer to Manufacturers manual for detailed setup information.

Table 16 Milltronics Probe 4-20mA settings

Parameter	Setting	Notes
4mA	0.3 m	Low end range – refer D04 command
20mA	5.00 m	High end range – refer D20 command
SP	3	
FS	3	
Blanking	0.3 m	Blanking should be the low end range.

Table 17 Siemens SITRANS LU probe settings

Parameter	Value	Meaning	Notes
P001	3	Operation	Measures distance to water surface
P003	3	Speed of response	Fast
P005	2	Units	cm
P006	500	Range	Height at 20mA
P007	470	Span	Range minus 4mA distance
P010	1	Language	English
P201	3	Output function	Space
P210	30.0	4mA setpoint	30cm – refer D04 command
P211	500.0	20mA setpoint	500cm – refer D20 command

See Appendix “Siemens Probe programming” for more information on the Siemens probe. See also figure 3, “Siemens Probe setup”.

Testing the 4-20mA probe

Once the above parameters have been set into the probe, set up the probe to point at a fixed barrier approximately two meters away. Typically the probe can be set pointing to a wall.

Enter test mode (push the down button) and the probe will display the current and distance in real time. The distance displayed on the PTG500e should match the distance displayed on the probe display.

WXT510 meteorological sensor

The WXT510 sensor produces data strings containing meteorological data and sensor voltage. The sensor is configured to produce the following string every 30 seconds, at 1200 baud:

0R0 , Dm=035D , Sm=1.2N , Sx=3.6N , Ta=20.7C , Ua=39.7P , Pa=1007.9H , Ri=0.0M , Vs=7.2V

Location of each field is given in the table below:

Table 18 WXT field allocations

Field	Loc	Units	Example
Header information	1		0R0
Wind Direction	2	Degrees	Dm=035D
Wind Average Speed	3	knots	Sm=1.2N
Wind Gust	4	knots	Sx=3.6N
Temperature	5	Degrees	Ta=20.7C
Humidity	6	%	Ua=39.7P
Pressure	7	hPa	Pa=1007.9H
Rainfall	8	Accumulated rainfall (mm)	Ri=0.0M
Sensor Voltage	9	volts	Vs=7.2V

Setup of the WXT510 sensor

1. Install the Vaisala Configuration Tool on a computer. This comes on the Vaisala CD with the WXT510.
2. Connect the Vaisala programming cable to the WXT510. Use the connector underneath the cap marked "Service" on the underside of the WXT510. The programming cable is part of the WXT510 deliverables.
3. Attach a 9V battery to the programming cable, and connect the female DB9 connector to the RS232 serial port of the computer.
4. Set the communications settings to 19200,8,N,1. (Note that the service port only operates at this speed.)
5. Run the Vaisala Configuration Tool (*WXTConf.exe*).
6. Using the Vaisala Configuration Tool, load the configuration as described in the Appendix "WXT510 configuration". This will set the WXT510 to send meteorological data every 30s. The setup can be done manually, however it is simpler to use the configuration file *WXT510_PTG_V1.10.wxc* and write this to the WXT510. This configuration file is available from ES&S.

Configuration of the WXT510 is shown in the Appendix "WXT510 configuration".

The WXT510 will now be configured to operate with the PTG500e.

Testing WXT510 operation

Testing with Programming Cable

1. With the programming cable still connected, quit the Vaisala Configuration Tool and open a terminal program (e.g. Hyperterminal) with the same communications settings as used while programming (i.e. 19200,8,N,1).

2. Every 30s, the report string similar to that shown below should appear on the terminal window.

OR0 , Dm=035D , Sm=1 . 2N , Sx=3 . 6N , Ta=20 . 7C , Ua=39 . 7P , Pa=1007 . 9H , Ri=0 . 0M , Vs=7 . 2V

While testing as described above, operation will be the same as when used with the PTG500e, except that, when used with the PTG500e:

- The standard WXT510 cable is used, not the programming cable
- Data is sent at 1200 baud
- The WXT510 is powered from the PTG500e, rather than from the 9V battery

Testing with PTG500e

Connect the WXT510 directly to the PTG500e using the normal cabling (e.g. see Figure 7). The PTG500e will power the WXT510, and receive data from it at 1200 baud.

Every 30s, the lower line of the PTG500e display should be updated with meteorological data. If this is occurring, no more testing is required.

PTG500e Operation

The PTG500e is controlled by an application program which executes in the CPU card and controls all the higher level functions of the PTG500e, including

- communications with MERIO board
- controlling reporting and logging
- interaction with the user via front panel controls
- monitoring power supply

Controlling the PTG500e

There are two modes of interacting with the PTG500e – through the console port (an RS232 serial port), and through the front panel controls.

Console Commands

The PTG500e commands are issued via the main console port, i.e. the same port used for standard data reporting. Commands are typically a three capital letter code, plus a parameter if required, followed by a CR, LF sequence, as shown below:

CMD <parameter><CR><LF>

The communications can be via a computer program, via a modem, or manually via a terminal program such as Hyperterminal. (See Appendix “Terminal Program setup”.)

For example, to set the reporting time to 60 seconds, the command would be
RPT 60<CR><LF>

To enter this manually, the operator would connect to the PTG500e via a terminal program, and type:

RPT 60 {push enter key}

The PTG500e will respond where applicable with an appropriate acknowledgement. For example, if the above command is sent, the response would be:
Report time set to 60 seconds.

The complete set of commands is shown below. (Note Use HLP to generate this list.)

AIN:	Set Auto INF transmission (e.g. AIN 1)
APL:	Set Aquatrak polarity: P or L (e.g. APL P)
AQS:	Set Aquatrak mode, 2 or 6 (e.g. AQS 2)
AVG:	Set average time (eg:AVG 100)
DAT:	Set date (eg:DAT 03-27-2007)
DEL:	Delete file (eg:DEL 0702BWPR.TID)
DIA:	Toggle diagnostics mode
DIR:	List files
DLD:	Download data (eg:DLD, or DLD 0702BWPR.TID)
DLS:	Download selected data (DLS YYMM startday endday)
FCT:	Set factory defaults
HLP:	Print help message

INF: Current setup information
 LOG: Set log time (eg:LOG 60)
 MIO: Show MSERIO data
 OFS: Set tide offset (eg:OFS -1)
 OTL: Set outliers (e.g. OTL 2)
 PRH: Set probe height (eg:PRH 500)
 PRT: Set probe type - BTX:Aquatrak, 420:4-20mA (eg:PRT 420)
 RPT: Set report time (eg:RPT 10)
 RND: Toggle random transmission time
 SAV: Save current configuration
 SID: Set site ID (eg:SID BWPR01)
 SER: Set baud rate (eg:SER 9600)
 TIM: Set time (eg:TIM 12:57:00)
 TSL: Set time slot (for timed transmissions)
 TSH: Set Human readable time string (e.g. TSH 1)
 TXL: Toggle transmit length (short or long)

Commands which are not self explanatory are listed below.

AIN: Set Auto INF transmission

When AIN Auto is set, the INF data (see below) will be transmitted automatically at 00:00. This allows all the parameters which are being used by the PTG500e to be recorded automatically.

A typical use for this function is in systems which are recording the tide and meteorological data on a daily basis. The reception software will receive this data every day, and save it along with the tide data for that day. In this way the exact parameters used by the gauge can be recorded along with the data, so that future references to the raw data will be informed as to the parameters which were used to collect the data.

APL: Set Tide polarity: P or L (e.g. APL P)

The tide measurement can be set to increasing or decreasing mode when recording a rising tide.

APL P Tide = Probe Height + Tide Offset + Tide distance

APL N Tide = Probe Height + Tide Offset - Tide distance

where

Probe Height set by PRH command

Tide Offset set by OFS command

Tide distance is measured by the tide sensor

AQS: Set Aquatrak mode, 2 or 6 (e.g. AQS 2)

Sets the Aquatrak mode to either raw data out or averaged data.

Refer to Aquatrak sensor section.

AQS 2 Causes the Aquatrak string to use the 3rd field for tide data

AQS 6 Causes the Aquatrak string to use the 2nd field for tide data

AVG: Set average time (eg:AVG 100)

The tide gauge will make measurements every second regardless of settings. The actual value displayed logged and reported for the tide is the average of the number of 1-second readings specified by this command.

For example, a typical setting of AVG 180 will cause the gauge to update the tide value every second to the moving average of the last 180 1-second readings.

D04: Sets 4mA value in mm for 4-20 mA sensors (eg: D04 300)

D20: Sets 20mA value in mm for 4-20 mA sensors (eg: D20 5000)

DAT: Set date (eg:DAT 03-27-2007)

The DAT command can be used to manually set the dates if the GPS antenna is not attached or cannot be used. Note that the time and date are set by GPS, if a GPS antenna is attached.

DEL: Delete file (eg:DEL 0702BWPR.TID)

Deletes files stored in non-volatile memory.

Caution: Files cannot be recovered after being deleted.

DIA: Toggle diagnostics mode (DIA 1 enables, DIA 0 disables)

Causes the PTG500E to output diagnostics data at the RPT time.

The data consists of

- 4-20mA current (10 x mA) and calculated distance (mm)
- Instantaneous and averaged tide value (mm), std deviation of tide, and number of outliers in tide averaging array.
- Time to next GPS update (sec).
- Front panel keypad value, Power status.
- Current array of values being used to measure the tide.

An example of the diagnostics output is shown below:

```
Probe Current: 460 Dist: 476
Tide(I): 5524 Tide(Av): 5526 Std Dev:3.3 Outliers: 0
Time to GPS Update: 1389
Port 60: 255 PwrOK: 8
5524 5524 5530 5530 5524 5524 5524 5530 5524 5524
$PEDPT,BWPR01,7331,165717.17,0528.2007,660,0,8,9.0,30.9,31.0,1014.8,0.0,12.0,0*71
```

Note: Set the RPT time first for a convenient DIA update rate.

DIR: List files

Lists all the files currently in the non-volatile memory.

DLD: Download data (eg:DLD, or DLD 0702BWPR.TID)

Downloads stored tide files through the console port.

DLD without parameters downloads the current file.

Note: For downloading files other than the current file, use the DIR command first to find the names of files available for downloading.

DLS: Download selected data (DLS YYMM startday endday)

Similar to DLD, but allows a selected day (or number of days) in a month to be selectively downloaded.

INF: Display PTG Information

This command prints the current configuration of the PTG500e. All important parameters are displayed. An example output is shown below:

```
PTG500E V2.74
00:00:01 05-01-2008
SiteID: HOVL02
Serial number: 519
Site GPS Latitude: 38.327116 S
Site GPS Longitude: 144.898679 E
Report Time: 60s
Log Time: 180s
Avg Time: 180s
Aquatrak Polarity: P
Tide Offset(S): 0 mm
Outliers: 2
Probe Height(X): 3409 mm
Battery voltage: 11.5V
Probe Type: 4-20 mA
Report: tide and met data.
Time Slot: 0s
Auto transmit INF: ON
Time/Date strings: hhmmss.00 DDMM.YYYY
Randomize transmit time: OFF.
Diagnostics OFF
STT: 20 6
Aquatrak Mode: 0
Current Log File: C:\0805HOVL.TID (92 bytes)
Last Met Update: 23:59:50 04-30-2008
Last Write to Log: 00:00:01 05-01-2008
Last GPS Update: 23:53:16 04-30-2008
Power: Internal Battery
Report string format:
  $PEDPT,SiteID,Log#,hhmmss.00,MMDD.YYYY,Tide,
  WndDr,WndSp,WndGs,Temp,Humid,Press,Rain,
  Volts,Status,StdDv*Chksum
```

FCT: Factory Defaults

This command sets the PTG500e to a known default configuration. Using these parameters will usually work in most circumstances, although further configuration may be necessary for accurate results.

The FCT command is useful for setting the PTG unit to a known default condition, from which customized settings can be used to set the operation to the exact requirements of a particular site. The parameter values set by the FCT command are given in the following table:

Table 19 FCT Factory Defaults

Report Time	60s
-------------	-----

Log Time	180s
Average Time	180s
Probe Height	5000mm
Probe Type	BTX
Time Slot	0
Randomize transmit time	OFF
Transmit tide and met data	ON
Diagnostics	OFF
MSERIO display	OFF

LOG: Set log time (eg:LOG 60)

Sets the Logging interval, which is the period after which data is stored to the internal non-volatile memory.

MIO: Show MSERIO data (eg: MIO 1 enables, MIO 0 disables)

MIO is a diagnostic command which can be used to examine the raw data from the meteorological, GPS or tide sensors.

A typical output is shown below:

```
PRB,169,458,48
PRB,170,458,48
$PEDPT,BWPR02,0013,06:13:10,02-05-2008,5527,0,0.0,0.0,0,0,0,0,12.9,0,3.8*52
PRB,171,458,48
4100 271 1.777 16 26611 38795 11.6
GPSLON,14500.77276,E
PRB,172,458,48
PRB,173,460,48
PRB,174,458,48
$PEDPT,BWPR02,0013,06:13:15,02-05-2008,5528,0,0.0,0.0,0,0,0,0,12.9,0,3.3*53
PRB,175,0,65449
VP12V,770
4100 274 1.777 16 26611 38794 11.6
PRB,176,0,65449
OR0,Dm=175D,Sm=7.3M,Sx=9.3M,Ta=19.9C,Ua=67.4P,Pa=1009.5H,Ri=0.0M,Vs=12.2V
GPSTIME,061321,20508,
PRB,177,0,65449
PRB,178,0,65449
GPSLAT,3748.95324,S
PRB,180,0,65449
PRB,181,0,65449
PRB,182,0,65449
PRB,185,0,65449
PRB,186,0,65449
VP12V,765
PRB,187,0,65449
```

Sensor outputs are identified in the following table:

String header	Values in the table
PRB	4-20mA measurement
GPSLAT	GPS latitude
GPSLON	GPS longitude
GPSTIME	GPS UTC time
VP12V	PTG voltage
OR0	WXT type met sensor
4100	Aquatrak type sensor

OFS: Set tide offset (eg:OFS -1)

Tide offset. This value is added to the averaged tide data before it is reported or logged.

OTL: Set outliers (e.g. OTL 2)

Sets the number of standard deviations which are used to define an outlier. For example, if outliers is set to 2, then any instantaneous tide value greater than 2 standard deviations from the mean will be defined as an outlier, and will not be included in the averaging calculation for the tide.

RND: Set Randomize Mode

Randomize mode is an alternative to the above method which can also be used to minimize the chance of transmitting simultaneously.

If Randomize mode is set, the PTG500e will transmit at a random number of seconds after the report time.

Consider again the three tide gauges, A, B and C, each with a Report Time of 60s and set to Randomize mode.

In this case, the stations may transmit in the following times:

Station A: hh:mm:07, hh:mm+1:02, hh:mm+2:13

Station B: hh:mm:21, hh:mm+1:17, hh:mm+2:29

Station C: hh:mm:01, hh:mm+1:19, hh:mm+2:09

Randomize mode is useful when a PTG500e does not have GPS reception.

Note: If Randomize mode is ON, then the TimeSlot value is ignored.

RPT: Set Report Time

The Reporting Time is the interval between data transmissions out the console port.

Data will be transmitted at intervals of the Reporting Time, starting on even intervals of the reporting time. For example, if the Reporting Time of 30s was set at 42s past the minute, data will be reported at hh:mm:00, hh:mm+1:30, hh:mm+2:00, etc.

A reporting time of 60s will mean that data is reported exactly on the minute.

There are two variations of the standard Reporting Time: Time Slot mode and Randomize mode.

Time Slot mode and Randomize mode are two methods used to prevent two different stations transmitting at exactly the same time. Since the PTG500e are precisely time locked through GPS, if two stations were set to transmit at say, 60s intervals, they would always transmit at together, and the two signals could interfere with each other if the transmitters were on the same frequency. This could cause a problem for tide networks containing many tide stations.

PRH: Set probe height (eg:PRH 500)

Sets the height of the tide sensor above zero tide height. Refer to Figures 2, 3 and 4.

PRT: Set probe type - BTX:Aquatrak, 420:4-20mA (eg:PRT 420)

Selects the tide gauge sensor being used: Aquatrak type or 4-20mA type.

SAV: Save current configuration

Saves the current configuration to non-volatile memory, and ensures that the gauge will start up after a power failure with the current settings.

For example, if the report string is changed from 60s to 180s, the SAV command should be used so that, after a power outage, the gauge will start up again with a Reporting Time of 180s, and not revert to the previous 60s value.

SID: Set site ID (eg:SID BWPR01)

Sets the site ID. Note that the Site ID should be six characters.

SER: Set baud rate (eg:SER 9600)

The console port's serial rate can be changed with this command to allow quicker interrogation of parameters and faster downloads.

Caution: Changing the baud rate over a radio link may render the communications link inoperative, since the radio modems may be set for a fixed serial port speed.

Note that after a power outage, the gauge always starts with a speed of 4800 baud. This is to comply with NMEA gauges, and radio modems.

TIM: Set time (eg:TIM 12:57:00)

The TIM command can be used to manually set the time if the GPS antenna is not attached or cannot be used. Note that the time and date are set by GPS, if a GPS antenna is attached.

TSL: Set Time Slot mode

In Time Slot mode, each gauge is given a separate time interval. The PTG500e will transmit at this number of seconds after the standard report time.

As an example, consider three tide gauges, A, B and C, all transmitting with a report time of 60s.

The tide stations A, B and C could be given Time Slots of 10, 20 and 30s respectively. The stations will then transmit at the following times:

Station A: hh:mm:10, hh:mm+1:10, hh:mm+2:10.....

Station B: hh:mm:20, hh:mm+1:20, hh:mm+2:20.....

Station C: hh:mm:30, hh:mm+1:30, hh:mm+2:30.....

Because each station is GPS locked, they will always maintain this time separation and will not transmit at the same time.

A Time Slot of 0 seconds is equivalent to standard Report Time.

This command is used in a PTG network with a number of gauges. It allows multiple gauges to all use the same radio frequency and ensures that they do not transmit at the same time. Note that this should be used only when all the gauges are fitted with GPS antennas. If this is not the case, the RND command can be used.

Note: The PTG500e will not accept a Time Slot greater than the Report Time.

TSH: Set Human readable time string (e.g. TSH 1)

Sets the time in one of the following formats:

1: hh:mm:ss DD/MM/YY

0: hhmmss.00 DDMM.YYYY

TXL: Toggle transmit length (short or long)

Serial Number

The serial number is a 4 digit integer used to identify each PTG500e unit. It is stored in the *PTG500e.CFG* file displayed on power up and with the INF command.

Note: The Serial Number cannot be modified via the serial port or the front panel controls.

Front Panel Controls

There are four front panel controls for the PTG – MENU, SELECT, UP and DOWN.

The 2 line LCD shows tide and metrological data and allows parameters to be examined and edited.

An ON-OFF-STANDBY switch controls power to the unit.

Generally, there are three modes of operation of the front panel display:

1. Tide and Met display
2. Menu mode
3. Editing mode



Tide and Met display

This is the normal mode of display in which Tide and Meteorological data is displayed. The values are updated in real time as data is collected.

A typical display is

1261mm	01:14:05
17.3C	1015.4kP

Menu mode

Menu mode allows different internal parameters to be displayed and edited. It is entered by pushing the **MENU** key.

Once in **MENU** mode, the different options are cycled by use of the \uparrow and \downarrow keys. The sequence of options are

Version number, site ID and serial number

```

↓
Save Config
↓
Set Time Slot
↓
Set Probe Height           ↑
↓
Set Average Time
↓
Set Log Time
↓
Set Report Time
↓
Download                   →
  
```

When the desired mode is chosen, using the **SLCT** allows the user to edit the value.

Edit mode

Once in edit mode, the current value is shown. Use of the \uparrow and \downarrow keys allows the value to be changed. If the new value is to be kept, cycling to the Save Config, and enter **SLCT** saves the configuration.

4-20 mA monitoring mode

Pushing the down arrow (\downarrow) will show the current and distance on the display for testing purposes.

current / distance
700mA / 1181mm

Updating software

The operating software for the PTG500e can be updated through the console serial port.

IMPORTANT: Incorrect attempts to update the PTG500e software may disable the unit. Updating the PTG500e software should only be done at the factory or by an experienced technician.

The procedure is as follows:

1. Using a terminal program which supports XMODEM file transfers (e.g. Hyperterminal), set up a communications link with the PTG500e through the console port. (The port should be set to 4800,N,1)
2. Exit from the main PTG500e program by using the `RST` command.
3. The PTG500e will respond with a command prompt. (e.g. `B: >`)
4. Initiate a download with `"UP PTG500e.EXE"`
5. In the terminal program, initiate an XMODEM transfer with the file to be uploaded, typically a new version of PTG500e.EXE. (The exact procedure to be followed depends on the terminal program.)
6. When the transfer is complete, the PTG500e will return to the command prompt.
7. Restart the program in the PTG500e. (e.g. type `PTG500e.EXE` at the command prompt.)

MSERIO Overall Design

The MSERIO motherboard supports the LogicFlex CPU card, four serial ports, and an analogue tide gauge.

The overall block diagram of the MSERIO board is shown in Figure 1:

Each serial input has its own PIC (U11 – U14). When serial data from one of the input devices is ready, the PIC raises a status line to the Controller (U3). The controller, monitoring all status lines, grants permission to only one. In this way the four PICs provide the following:

1. Queuing of input data from the four external devices to the one COMM input of the CPU.
2. Baud rate conversion (to 4800 baud)
3. Local handshaking and control where necessary.
4. Transference of only one serial input at a time to the CPU

PIC software

There are four PIC microprocessors, each designed to interface to a specific serial communications channel.

Controller PIC software

The controller monitors each of the input PICs, and checks if they have a string of data ready to be fed to the CPU. The Controller then allocates time for the PIC to send its string to the CPU for further processing. In this way, the data is fed from the asynchronous inputs to the CPU in an orderly manner.

4100 PIC software

Data is received from the Aquatrak 4100 or 5000 every 10 seconds, at 1200 baud.

Each string has the form:

1.765 0.0000 0 1.0 99 26407

tide SD QA counts

The Aquatrak PIC receives this data in 1200 baud, and sends it to the CPU at 4800 baud.

WXT510 PIC software

Data strings from the WXT510 sensor contain meteorological data and sensor voltage.

An example string is shown below:

0R0,Dm=108D,Sm=2.6M,Sx=3.4M,Ta=24.4C,Ua=39.2P,Pa=1007.4H,Ri=0.0M,Vs=12.2V

This data arrives from the WXT sensor every 30s at 1200baud.

PIC processor parses this data string and feeds it at 4800 baud to the CPU.

GPS PIC software

The GPS PIC receives the NMEA strings from the internal GPS module and extracts time and location information. These are formatted and sent to the CPU.

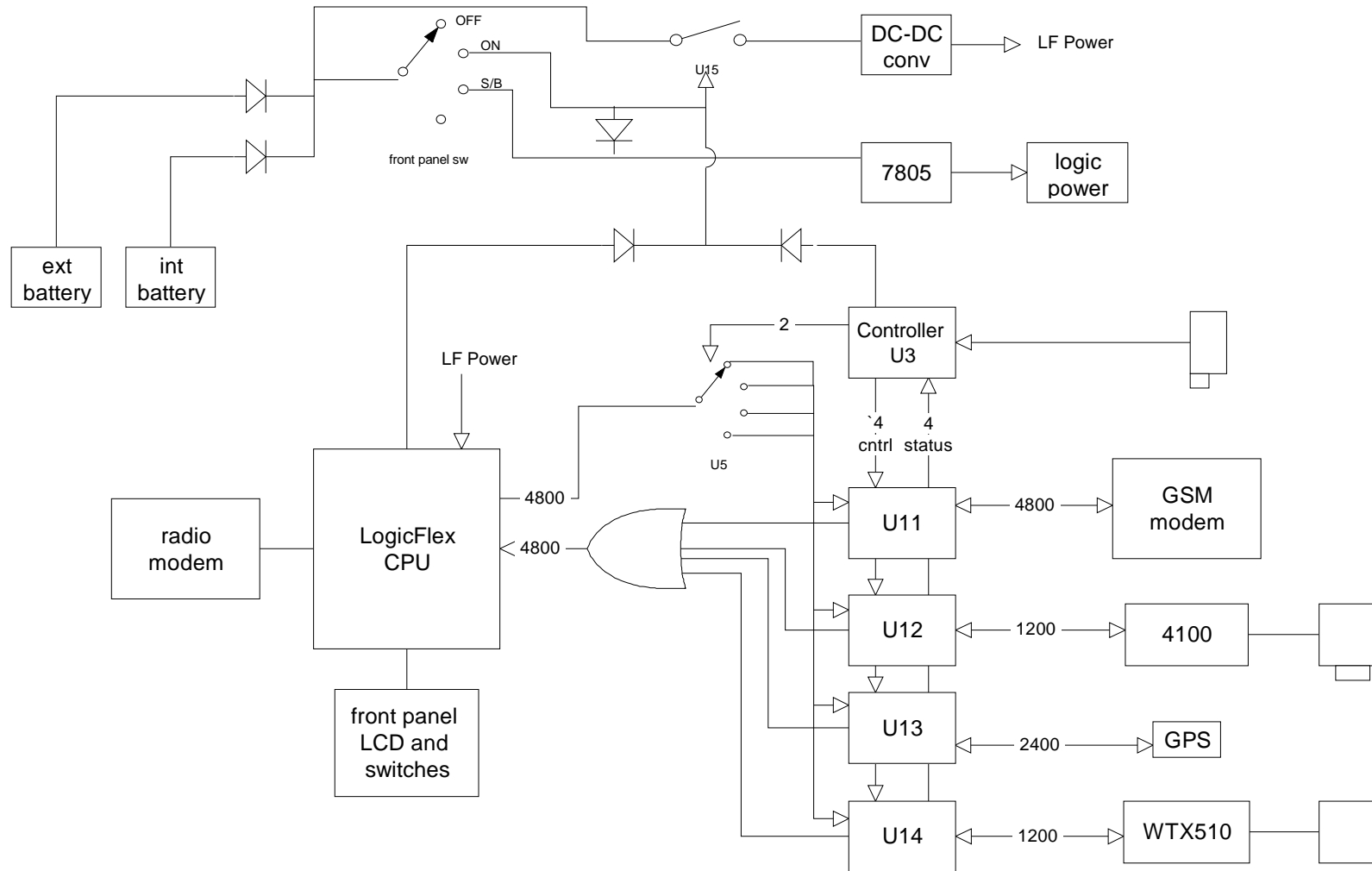


Figure 13 MSERIO internal design

PTG500e Specifications

PARAMETER	SPECIFICATION	NOTES
Tide Sensors	Acoustic Pressure Radar	The standard PTG500e can interface directly with a range of 4-20mA, RS232 or voltage sensors. 4-20mA and RS232 sensors can be used simultaneously for dual redundant tide measurement. Refer manual for typical sensors.
Redundant backup sensor	Acoustic, Pressure	Any combination of RS232 and 4-20mA sensor can be monitored simultaneously with the main sensor
Tide Range	5m 10m 40m	Std acoustic sensors Extended range sensors Radar and Pressure sensors
Tide Accuracy	1mm 1cm 1cm	Aquatrak Open air acoustic (Siemens, Milltronics, IMP) Radar (Vega)
Meteorological sensors	Temp, Pressure, Humidity, Wind Speed and Direction, Rain Wind Any RS232 formatted sensor	Vaisala WXT510 Vaisala WS420 Consult factory for custom sensors
Power	Battery Solar panel Mains	11 – 16V 65W typical (thru regulator) 110 – 220Vac (adapter)
Internal non-volatile memory	16MB std. Flash memory (no batteries required) Option up to 92MB	16M provides 1 year at 3 minute recording of tide, temp, humidity, pressure, wind speed, gust and direction.
Timekeeping accuracy	+/- 1s	GPS locked
Averaging, Logging and Reporting	Average: 1 – 3600s Reporting: 1 – 3600s Logging: 1 – 3600s	Averaging implements NOS outlier rejection algorithm
Output format	NMEA std	Custom formats available – consult factory
Metadata transmission	Automatic at 00:00	Transmits Metadata automatically
Setup and Configuration	Front panel alpha display and switches. Remote terminal	
Connectors	Buccaneer environmental	IP67 rating
Size	240 x 160 x 90 mm	
Weight	1 kg	
Software update	Local or Remote	Laptop to Console port

Appendix 1 WXT510 configuration

The following dialog boxes show the device settings used in the WXT510 meteorological sensor. The settings are contained in the file *WXT510_PTG_V1.10.wxc*.



Figure 19 WXT510 Device Settings

The above settings can be done manually, or the file *WXT510_PTG_V1.10.wxc* can be loaded to the WXT510 using the Vaisala Configuration Tool.

IMPORTANT: If using the Vaisala Configuration Tool, the “Composite message auto transmission” box in the Device Settings dialog must be ticked manually.

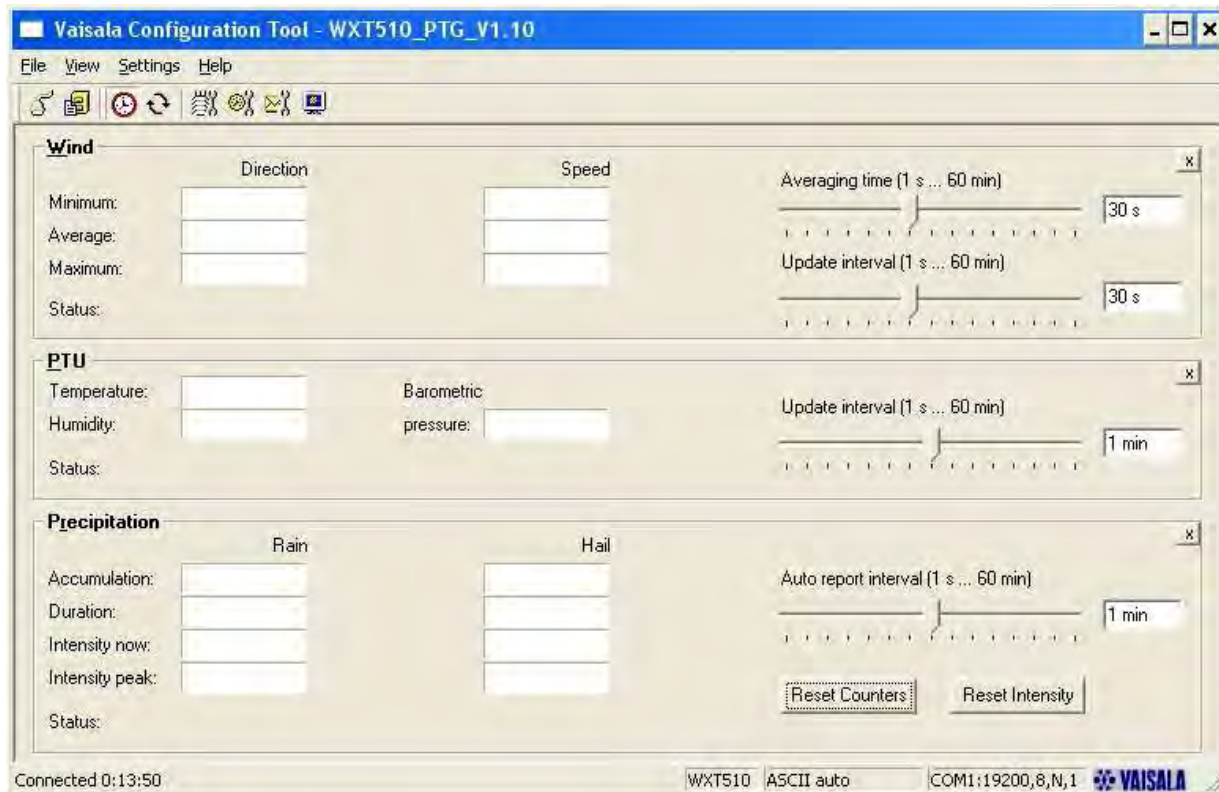


Figure 20 WXT510 Main Settings

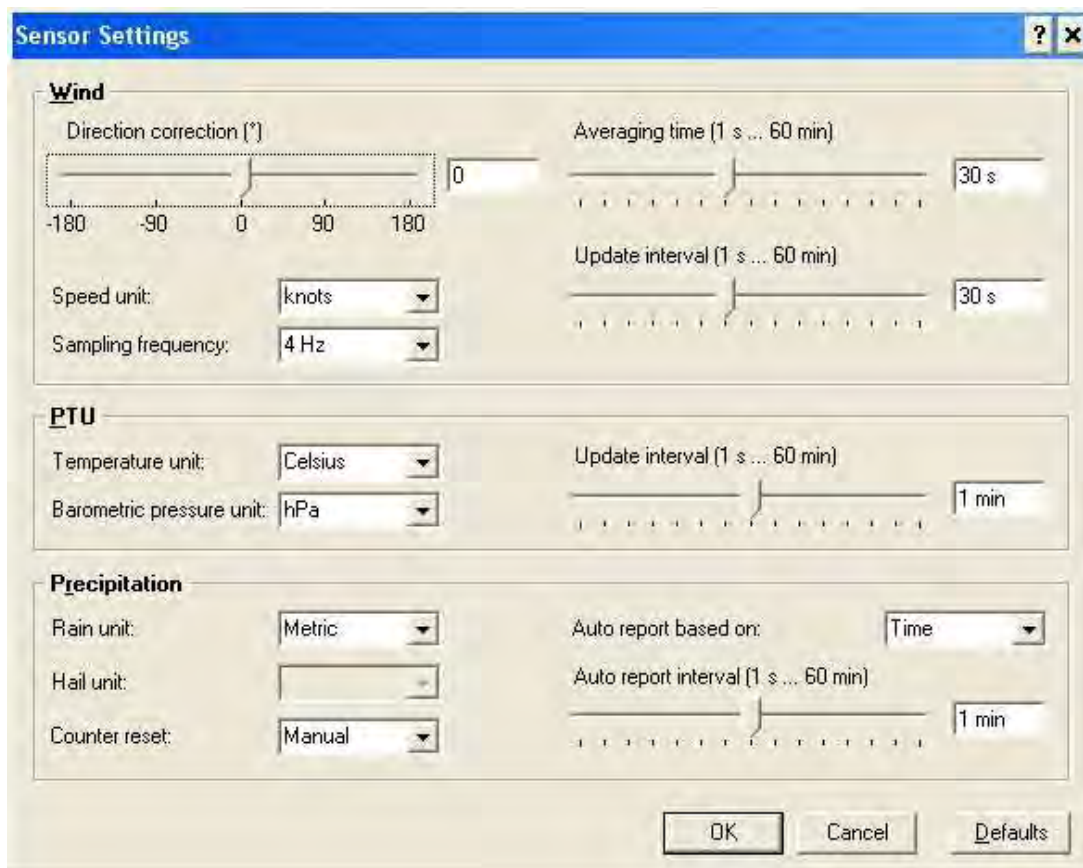


Figure 21 WXT510 Sensor Settings

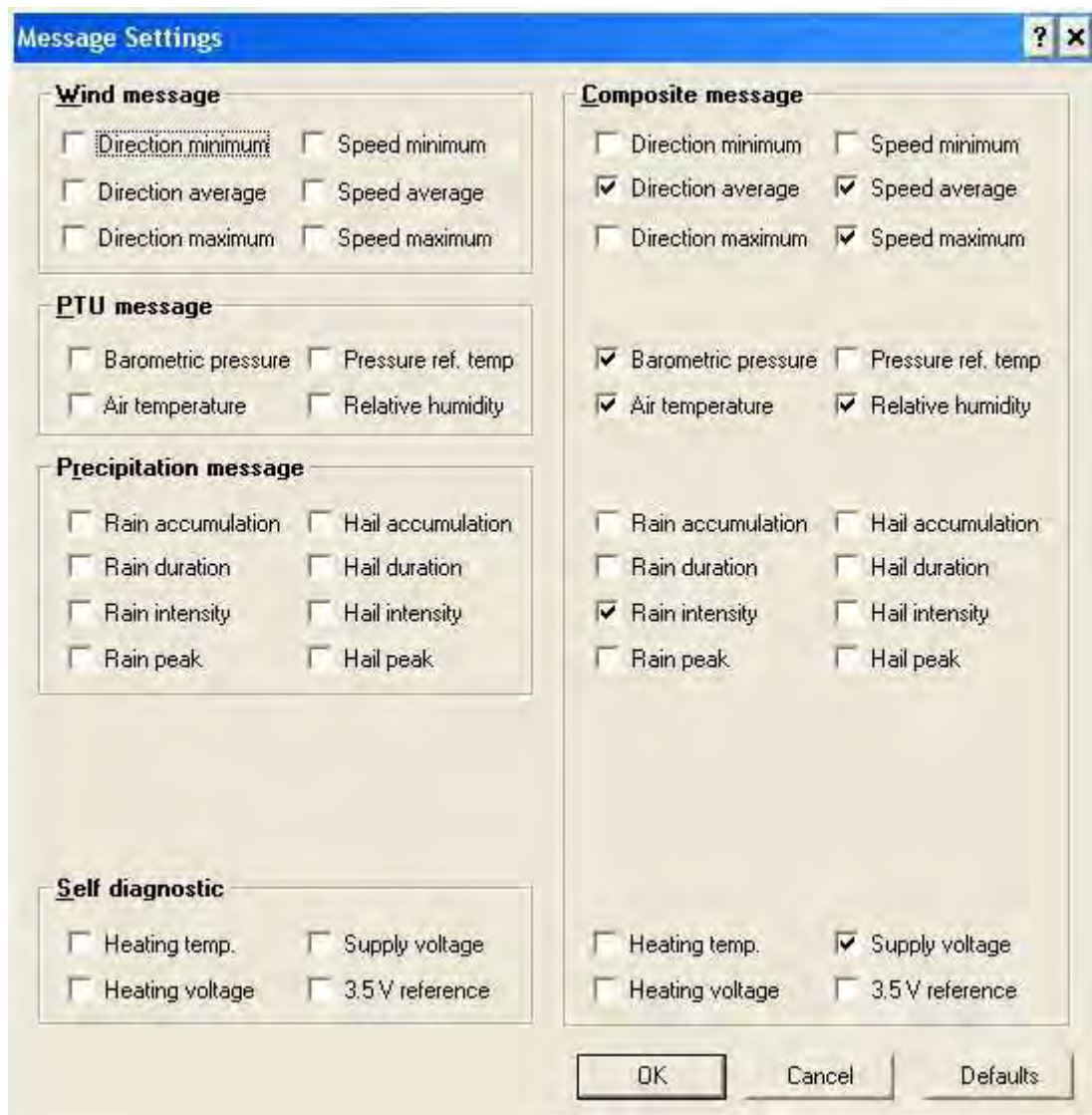


Figure 22 WXT510 Message Settings

Appendix 2 Siemens Probe programming

The Siemens SITRANS LU acoustic sensor can be used with the PTG500e for tide measurement. For full details on the setup of the SITRANS probe refer to the full manual. However, the following pages from the Siemens SITRANS LU acoustic probe manual describe basic programming operation.

Operation

Security

The Lock parameter, P000, secures SITRANS Probe LU against changes via the hand programmer. To enable programming, set P000 to the Unlocked Value stored in P069. To disable programming, enter a different value.

Note:

- A remote master can still change configuration, if P799 is set to allow this.

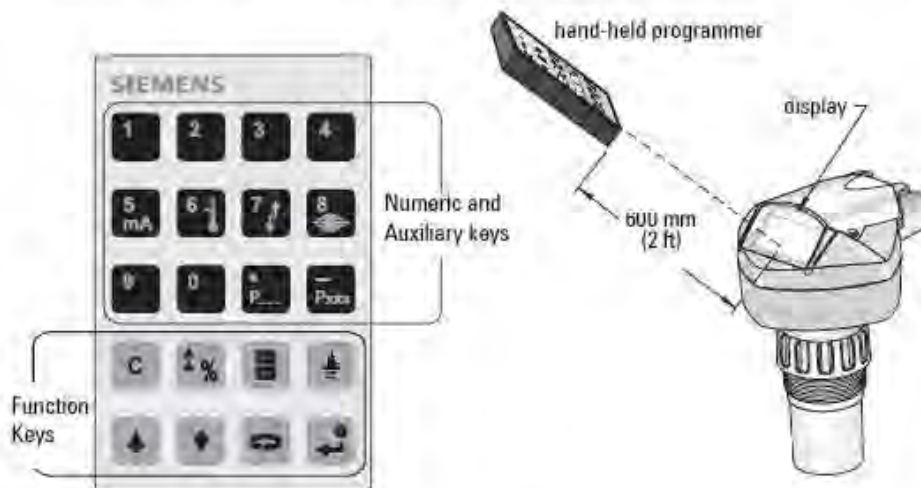
Starting PROGRAM mode

The hand programmer gives you direct access to SITRANS Probe LU.

Hand programmer

Note: For detailed instructions on using the hand programmer, see the next page.

For direct access to SITRANS Probe LU, point the hand programmer at the display from a maximum distance of 600 mm (2 ft), and press the keys.



Activating SITRANS Probe LU

Note: Keep infrared devices such as laptops, cell phones, and PDAs, away from SITRANS Probe LU to prevent inadvertent operation.

Power up the instrument. SITRANS Probe LU starts in RUN mode, and detects the material level, displayed in meters, referenced from Empty (process empty level).

Operating the SITRANS Probe LU

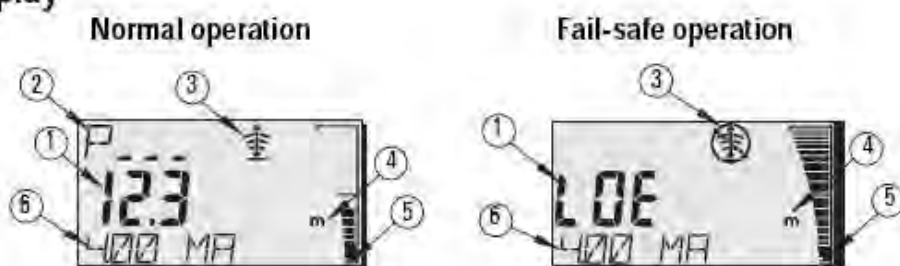
SITRANS Probe LU has two modes of operation: **RUN** and **PROGRAM**.



RUN Mode

SITRANS Probe LU automatically starts in **RUN** mode when power is applied, and detects the material level. The primary reading displays the material level (in meters) referenced from Empty (process empty level). This is the default start-up display mode.

System status is displayed on the LCD, or on a remote communications terminal.

Display











- 1 – Primary Reading (displays level, distance, or volume (or flow¹), in either units or percent)
- 2 – Secondary Reading (displays Parameter number for Auxiliary Reading²)
- 3 – Echo status indicator: Reliable Echo  or Unreliable Echo 
- 4 – Units or Percent
- 5 – Active bar graph represents material level
- 6 – Auxiliary Reading (depending on the parameter selected, it displays milliAmp value, distance or confidence, with units where applicable)

If the echo confidence drops below the echo confidence threshold³, the failsafe timer starts running. When the timer expires, the letters LOE alternate with the reading every two seconds, and the Reliable Echo indicator is replaced by the Unreliable Echo indicator. When a valid reading is received, the level reading display returns to normal operation.

Hand Programmer: function keys in RUN mode

Certain functions can be accessed directly from RUN mode by using specific keys.

Key	Run Mode
	mA output value displayed in auxiliary reading field
	Internal enclosure temperature displayed in auxiliary reading field (P343).
	Parameter for auxiliary readings ¹
	Displays the value representing Echo Confidence (P805).
	Toggle between Units and % on reading display
	Initiate and complete PROGRAM mode access
	Measurement key displays distance in auxiliary reading field.

¹ Press  plus three-digit parameter number, sets parameter to show in the auxiliary display.

PROGRAM Mode

Programming

Note: See *Accessing a parameter*, on page 20, for detailed instructions.

- Set parameters to suit your specific application.
- Activate PROGRAM mode at any time, to change parameter values and set operating conditions.
- For local programming, use the Siemens Milltronics hand programmer.
- For programming from a distance, use either a PC running SIMATIC PDM, or a HART handheld communicator.

Display



- 1 – Primary Reading (displays parameter value)
- 2 – Secondary Reading (displays parameter number)
- 3 – Programming indicator
- 4 – Auxiliary Reading (displays parameter names for parameters P001 to P010, if a language is selected. It displays the index value for indexed parameters, such as P054.)

Operation

Hand Programmer: function keys in PROGRAM mode

Key	Programming Mode
	Values
	Decimal point
	Negative value
	CLEAR value
	TOGGLE between Units and % on parameter value
	End PROGRAM session and enable RUN mode
	Update echo quality parameters
	Parameter scroll-up
	Parameter scroll-down
	DISPLAY opens parameter fields
	ENTER the displayed value

Low temperature effects on RUN/PROGRAM modes

If the internal temperature falls to $-30\text{ }^{\circ}\text{C}$ ($-22\text{ }^{\circ}\text{F}$) or below, it will affect both **RUN** and **PROGRAM** modes.

RUN mode will operate normally, with the following exceptions:

- hand programmer operation is disabled
- the LCD displays only limited information: the bar graph and the reliable/unreliable echo indicator

PROGRAM mode:

- hand programmer operation is disabled

Appendix 3 TP401a Temperature Probe

The TP401a Temperature Probe can be used to measure temperature at some distance from the PTG500e base unit. It is used when the full range of parameters of the Vaisala WXT510 are not required, and only temperature measurements are needed. The output data from the TP401a is designed to be similar to that generated by the WXT510.

The Probe is molded and sealed in one completed unit and can be powered by the PTG500E unit or separate power supply. The measured ambient temperature is transmitted to the PTG500E Unit or to a computer at a baud rate of 1200b/s, with an update rate of 30s.

The Probe can measure temperature in the range of 0C to 85C (+/- 1%). For other ranges, contact factory.

General format of data from the Probe:

0R0,0,0,0,<temperature>,0,0,0,

For example:

0R0,0,0,0,26,0,0,0,

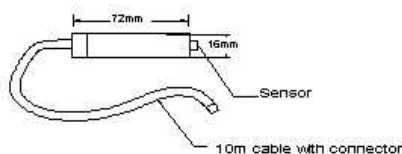


Fig.1 Temperature Probe

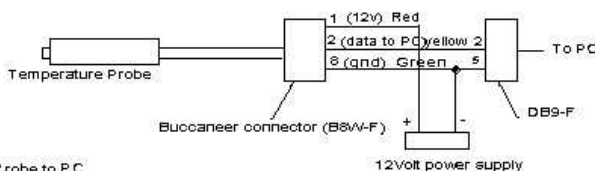


Fig. 2 Connection of Temperature Probe to PC

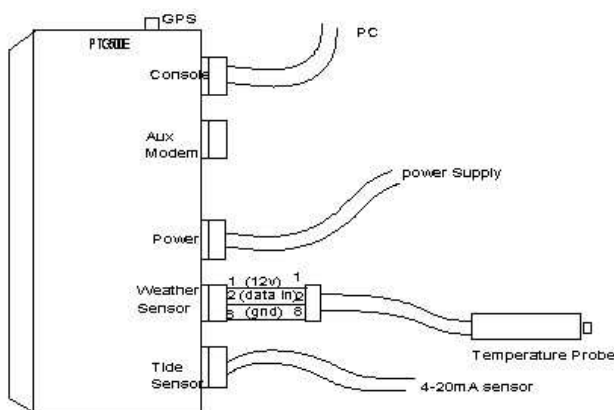


Fig.3 Connection of Temperature Probe to PTG500E

Appendix 4 Using A Terminal Program with the PTG500e

A standard RS232 terminal emulation program can be used to communicate with the PTG500e. The following settings should be used:

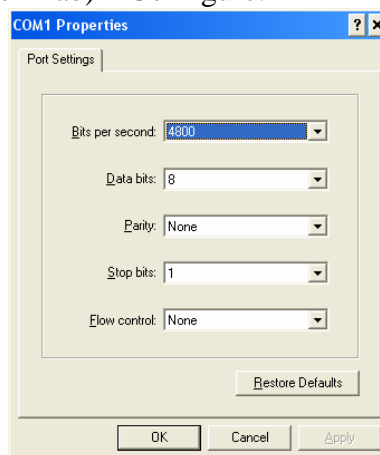
- Baud rate: 4800; Stop bits: 1; Start bits: none; Parity: none; Flow control: none.
- Ensure that the terminal program will generate a <CR><LF> combination when the “enter” key is pushed.

Example using HyperTerminal.

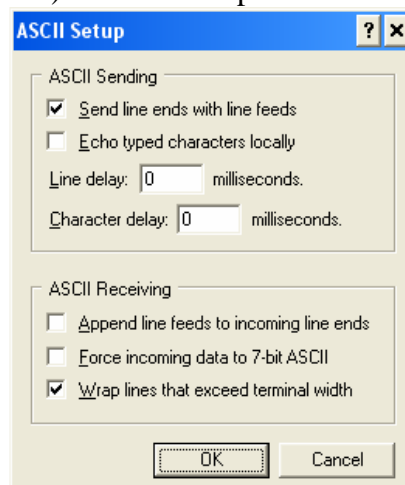
Hyperterminal is a basic RS232 communications program included by default in all MS Windows installations. It is usually found in the Accessories -> Communications program group.

After setting up a new console session, use the following dialog boxes to set up the program for correct operation with the PTG500e.

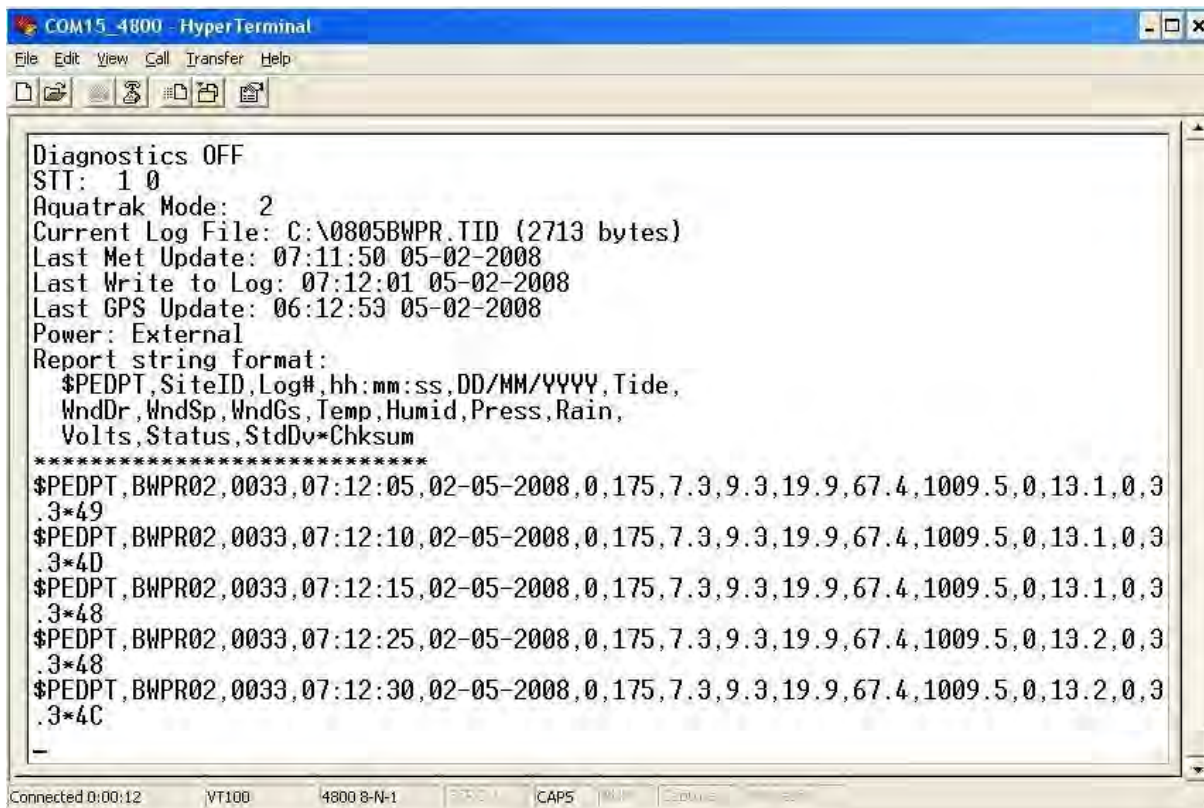
Set the Communications baud rate and handshake controls:
 File – Properties – (“Connect To” Tab) – Configure:



Ensure that *Hyperterminal* sends the correct characters when the user hits “Enter”:
 File – Properties – (“Settings” Tab) – ASCII setup:



After the above have been done, communications with the PTG500e can be achieved through the main window, as shown below:



Save the above settings to PTG500E.ht (Using “Save As”). This will allow *Hyperterminal* to be started with the correct parameters for the next session.

Note that hitting the “Enter” key should cause the PTG500e to send the current report string. This can be used as a simple test to check that the PTG500e is working and that the communications link is correctly established.

The SER command can be used to set different baud rates. For example, setting “SER 19200” will allow much faster data transfer between a PC and the PTG500e. Note that, after power cycling, the PTG500e will start up at 4800 baud.

Appendix 5 TMDS software

The TMDS software allows data from remote PTG500e units to be displayed and archived.

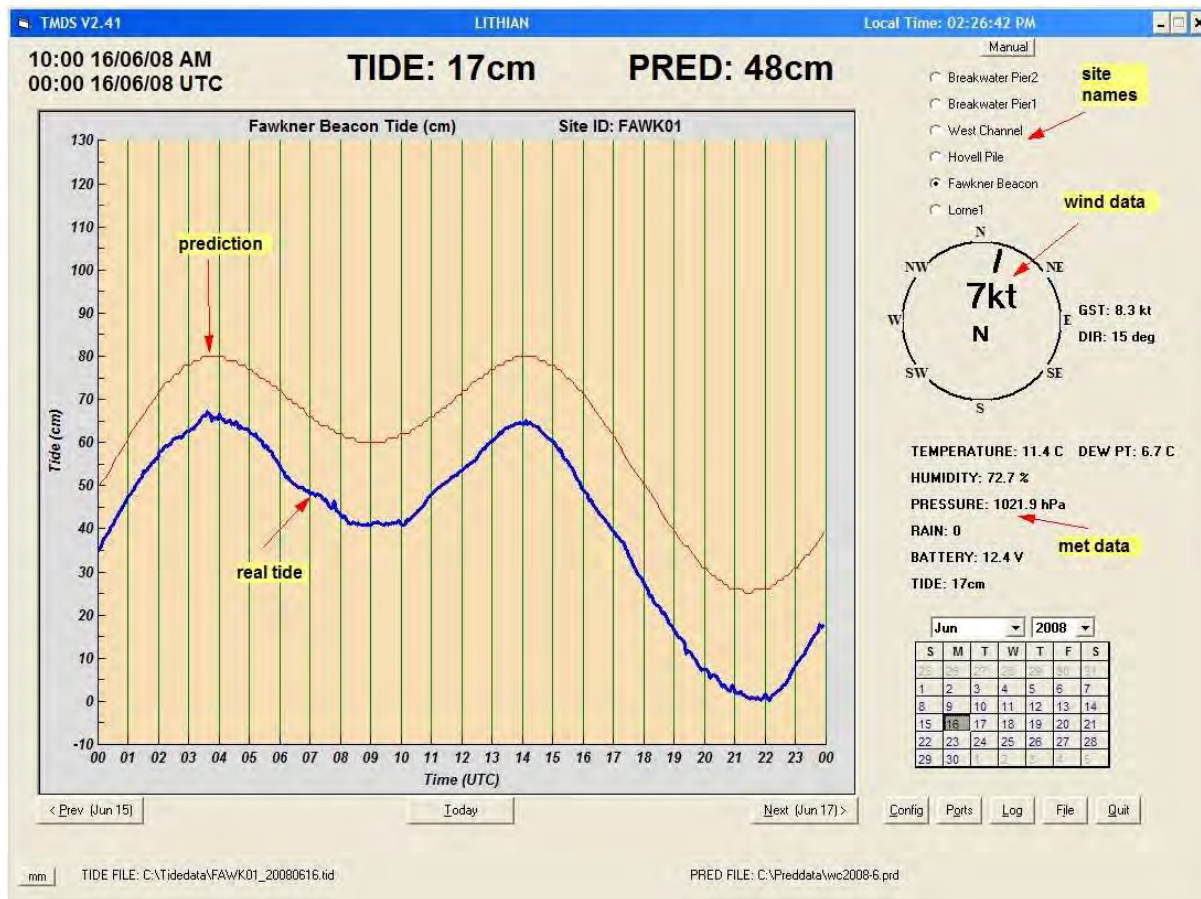


Figure 23 TMDS display

TMDS data display

The TMDS displays the data for a selected site. The parameters displayed are:

- Local and UTC time
- Tide display (blue trace)
- Predicted tide display (red trace)
- Meteorological data display (wind speed, gust and direction, temperature, humidity, pressure, rain and battery voltage). The wind parameters are displayed as a compass.

TMDS Operation

Strings from the PTG units in the field are received through serial ports. Typically, one serial port is dedicated for each site, and the PTG units are set to send data every three minutes.

As the strings are received, the TMDS software processes the data and graphs it as a function of time (see figure above). The prediction data is also displayed on the same graph.

The display is updated every minute.

Moving the cursor over the display will show the values at various times during the day. The operator can also move back and forward in time to different days using the calendar in the lower right of the display. Selecting a date with the calendar will show the data for that date.

TMDS archiving

The TMDS software continuously archives the data to disk. One file is written per site per day. The files have the same format as the data received from the PTG unit (see section “PTG500e NMEA output”).

The archive file names are in the following format:

SSSSS_YYYYMMDD.tid

SSSSS	site name as reported by the PTG unit
YYYY	year
MM	month
DD	day

For example: QNCF01_20070702.tid

A typical archive file contents is shown below:

```

.....
$PEDPT,QNCF01,3018,170300.65,0525.2007,750,0,8,9.0,30.7,32.0,1014.8,0.0,12.0,0*79
$PEDPT,QNCF01,3021,170600.61,0525.2007,770,0,8,14.0,30.5,32.0,1014.8,0.0,12.0,0*4
$PEDPT,QNCF01,3024,170900.28,0525.2007,770,0,8,17.0,30.4,32.0,1014.8,0.0,12.0,0*4
$PEDPT,QNCF01,3027,171200.90,0525.2007,770,0,8,8.0,30.3,32.0,1014.8,0.0,12.0,0*7A
$PEDPT,QNCF01,3030,171500.45,0525.2007,770,0,8,15.0,30.2,32.0,1014.8,0.0,12.0,0*4
$PEDPT,QNCF01,3033,171800.98,0525.2007,780,0,8,14.0,30.0,32.0,1014.8,0.0,12.0,0*4
$PEDPT,QNCF01,3036,172100.50,0525.2007,780,0,8,8.0,29.9,32.0,1014.8,0.0,12.0,0*7C
$PEDPT,QNCF01,3039,172400.00,0525.2007,780,0,8,9.0,29.8,32.0,1014.8,0.0,12.0,0*72
$PEDPT,QNCF01,3039,172700.00,0525.2007,780,0,8,9.6,28.2,32.0,1014.8,0.0,12.0,0*72
$PEDPT,QNCF01,3045,173000.31,0525.2007,800,0,8,17.0,29.5,32.0,1014.8,0.0,12.0,0*4
$PEDPT,QNCF01,3048,173300.80,0525.2007,790,0,8,15.0,29.4,32.0,1014.8,0.0,12.0,0*4
$PEDPT,QNCF01,3051,173600.29,0525.2007,800,0,8,8.0,29.3,32.0,1014.8,0.0,12.0,0*7A
$PEDPT,QNCF01,3057,174200.38,0525.2007,810,0,8,15.0,29.0,32.0,1014.8,0.0,12.0,0*4
$PEDPT,QNCF01,3066,175100.95,0525.2007,810,0,8,11.0,28.6,33.0,1014.8,0.0,12.0,0*4
$PEDPT,QNCF01,3069,175400.95,0525.2007,820,0,8,16.0,28.5,33.0,1014.8,0.0,12.0,0*4
$PEDPT,QNCF01,3072,175700.95,0525.2007,820,0,8,11.0,28.3,33.0,1014.8,0.0,12.0,0*4
.....

```

Tide Prediction file

A prediction file for each site is required to be on disk for the predicted tide to be displayed. This file contains data for 6 minute tide predictions. A typical prediction file (*bw2007-6.prd*) is shown below:

```

AUSTRALIA, SOUTH COAST(PT PHILLIP BAY) - WEST CHANNEL PILE4381114445 -1000 6072a
01/01/2007,00:18, 0.668
01/01/2007,00:24, 0.666
01/01/2007,00:30, 0.664
01/01/2007,00:36, 0.662
01/01/2007,00:42, 0.659
01/01/2007,00:48, 0.656
01/01/2007,00:54, 0.653
01/01/2007,01:00, 0.648
01/01/2007,01:06, 0.644
01/01/2007,01:12, 0.640
01/01/2007,01:18, 0.635
01/01/2007,01:24, 0.629
01/01/2007,01:30, 0.624

```

01/01/2007,01:36, 0.618

TMDS configuration file

The operation of TMDS can be controlled using the configuration file *TMDS.cfg*.
 A typical example of the configuration file is shown below:

```
#TMDS configuration file
#Templates:
#SITE NAME,SITEID,COM PORT,SPEED, PREDICTION FILE TEMPLATE, ;siteconfig
#nnn ;UTCoffset

Breakwater Pier,BWPR01,1,4800,wmYYYY-6.prd, ;siteconfig
Queenscliff,QNCF01,13,4800,qcYYYY-6.prd, ;siteconfig
Hovell Pile,HVLL01,14,4800,hvYYYY-6.prd, ;siteconfig
#Williamstown,BWPR01,15,4800,wmYYYY-6.prd, ;siteconfig
Lorne,LORN01,16,4800,loYYYY-6.prd, ;siteconfig
-10 ;UTCoffset
```

Lines containing a “#” at the beginning of a line will be ignored.

The configuration file contains the following line types:

siteconfig lines

Each site to be received and displayed must have a “siteconfig” line in the configuration file.

This line in the configuration file must end with `;siteconfig`

There is one siteconfig line for each site. The contents of the line are as follows:

Site Name	e.g: Breakwater Pier
Site ID	ID as defined in the PTG unit (e.g. QNCF01). Note that this is used to identify the data from the remote PTG.
Com Port	serial port number (e.g. 1 indicates com port 1)
Speed	baud rate of com port (e.g. 4800)
Pred file	Template for the name of the prediction file. This file is assumed to contain 6 minute tide predictions for the site. The YYYY in the template is replaced with the current year. e.g. If the template is <i>wmYYYY-6.prd</i> , TMDS will look for the file <i>wm2007-6.prd</i> for the 2007 tide predictions.

UTCoffset lines

This line in the configuration file must end with `;UTCoffset`

This contains the time offset in hours between the local time and UTC time.

Appendix 6 PTG500e Tester/Calibrator



The PTG500e Tester/Calibrator can be used for the following:

- test the tide sensor input (both RS232 and 4-20mA sensors)
- calibrate the 4-20mA interface
- simulate meteorological data strings

Tide sensor testing

For tide sensor calibration and tide sensor testing, connect the PTG500e Tester/Calibrator to the “Tide Sensor” connector.

If the PTG500e is set for 4-20mA sensor operation (see PRT command), it will read the low current (near 4mA) and interpret this as a tide data from a tide sensor. Using the pushbutton, a separate current near 20mA will be sent to the PTG500e.

Tide sensor calibration

For calibration, use the DIA command to put the PTG500e into diagnostics mode (see DIA command), and read the current directly. Adjust the calibration potentiometer (blue pot at the top of the PTG500e MSERIO baseboard) until the value displayed is equal to the value shown on the Tester/Calibrator.

Weather sensor testing

For simulating weather data, a string similar to that generated by a WXT500 is fed into the PTG500e. An example is given below:

$Dm=035D, Sm=1.2N, Sx=3.6N, Ta=20.7C, Ua=39.7P, Pa=1007.9H, Ri=0.0M, Vs=7.2V$

This should result in meteorological data shown on the LCD display.

Appendix 7 1830 Pressure sensor

PDCR/PTX 1830 Series

High Performance Level Pressure Sensors

- Ranges from 0.75mH₂O to 600mH₂O
- Accuracy $\pm 0.06\%$
- Fully welded titanium construction
- Integral lightning surge arrestor
- Compact 17.5mm diameter package
- Full range of installation accessories



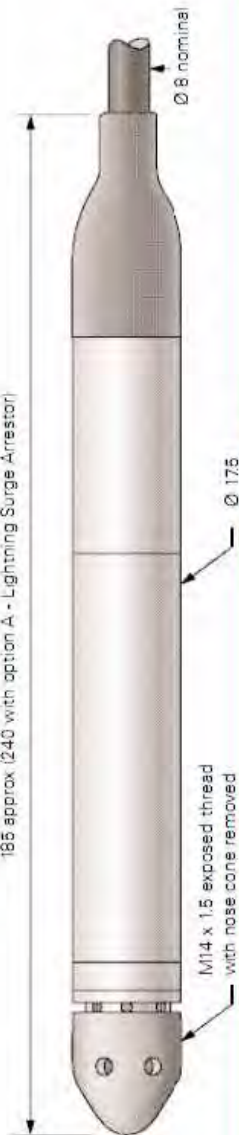
INSTALLATION DRAWINGS - Dimensions mm



Electrical Connections
PDCR 1830

- Red: Supply positive
- White: Supply negative
- Yellow: Output positive
- Blue: Output negative
- Screen wire connected to case
 (S version - screen not connected)
 Remaining cores not connected

185 approx (240 with option A - Lightning Surge Arrester)



PTX 1830

- Red: Supply positive
- Blue: Supply negative
- Screen wire connected to case
 (S version - screen not connected)
 Remaining cores not connected

STANDARD SPECIFICATIONS

Pressure Measurement

Operating Pressure Ranges

PDCR 1830 (mV)

0.75, 1.5mH₂O gauge, 3.5, 7, 10, 15, 20, 35, 50, 70, 100, 150, 200, 350, 600mH₂O gauge and absolute

PTX 1830 (mA)

Any zero based full scale (FS) from 0.75 to 600mH₂O gauge.
 3.5 to 600mH₂O absolute.

*Elevated zero, compound and reversed output ranges available.
 Refer to Druck for further information.*

Other units may be specified e.g. ftH₂O, lnH₂O, bar, mbar, psi, kpa, kg/cm²

Overpressure

The operating FS pressure range may be exceeded by the following multiples with negligible effect on calibration:

8 x for ranges up to 1.5mH₂O

6 x for ranges above 1.5mH₂O to 3.5mH₂O

4 x for ranges above 3.5mH₂O (1400mH₂O max.)

Pressure Containment

10 x for ranges up to 3.5mH₂O gauge

6 x for ranges above 3.5mH₂O gauge (1400mH₂O max.)

200 bar for absolute ranges.

Media Compatibility

Fluids compatible with titanium (body), acetal (nose cone) and polyurethane (cable assembly).

Excitation Voltage

PDCR 1830 (mV)

10V at 5mA nominal

Output is fully ratiometric to supply within 2.5V to 12V limits.

PTX 1830 (mA)

9 to 30V

9 to 28V for Intrinsically Safe version.

The minimum supply voltage (V_{MIN}) which must appear across the pressure transmitter terminals is 9V and is given by the following equation:-

$$V_{MIN} = V_{SUP} - (0.02 \times R_{LOOP})$$

Where V_{SUP} is supply voltage in Volts

R_{LOOP} is total loop resistance in Ohms

Pulse Power Excitation

Recommended power-on time before output sample is taken

PDCR 1830 - 10msec

PTX 1830 - 30msec

For pulse power operation refer to technical note.

Output Signal

PDCR 1830

25mV for 0.75mH₂O range

50mV for 1.5mH₂O and 3.5mH₂O ranges

100mV for ranges 7mH₂O and above

PTX 1830

4 to 20mA proportional for zero to FS pressure.

Common mode voltage - PDCR 1830

Typically +3.5V to +9V with respect to the negative supply

Output Impedance - PDCR 1830

2 KΩ nominal

Performance Specification

Accuracy

Combined effects of Non-linearity, Hysteresis and Repeatability:

Standard: ± 0.1% FS BSL maximum

Option D: ± 0.06% FS BSL maximum (± 0.08% max. for 1 mH₂O and below).

Zero Offset and Span Setting

PDCR 1830

Typical: ± 1.5mV

Maximum: ± 3mV

PTX 1830

Maximum: ± 0.05mA

Long Term Stability

± 0.1% typically per annum.

Operating Temperature Range

-20° to 60°C.

Compensated Temperature Range

-2° to 30°C.

Temperature Effects

± 0.3% FS for 3.5mH₂O range and above

For ranges below 3.5mH₂O multiply x 2

Shock and Vibration

MIL-STD-810E, method 514.4. Category 10 min. Figure 514.4-16

Product will withstand 20g peak shock half sine wave 9mS duration in all axes, also 2000g peak shock 0.5mS duration in all axes.

Insulation

Standard: >100MΩ at 500V d.c.

Intrinsically Safe version: <5mA at 500V a.c.

EMC and Surge Protection

CE Marked PTX 1830: IEC 61000-6-2: 1999 (10V/m Heavy Industrial)

Intrinsic Safety

PDCR 1830

Certified (Ex 94C2539) for use with IS barrier systems to EEx ia IIC T4

(80°C ambient) for cable lengths up to 29 metres maximum.

PTX 1830

Certified (BAS 01 ATEX 1018X) for use with IS barrier systems to EEx ia IIC

(-40°C ≤ Tamb ≤ 80°C) for cable lengths up to 300metres maximum.

Physical Specification

Pressure Connection

Standard: Radial holed M14 x 1.5mm male thread fitted with protective acetal nose cone.

Option C: Screw on welded male pressure connectors available

G¹/₂B (80° Int Cone)

G¹/₄B (80° Int Cone or Flat End)

1/4" NPT

7/16 UNF to MS33656-4

Electrical Connection

Vented polyurethane cable with integral Kevlar strain relief cord rated to 54kg load. Water ingress protection IP68 to 700mH₂O.

Cable Lengths

To be specified as required in 1 metre increments up to 500 metres.

For longer lengths refer to Druck.

Appendix 8 PS1000 Pressure Sensor

Description

The enhanced features and performance of the new PS1000 pressure sensor provides users with an affordable solution to a range of water level monitoring applications. The linearity and performance of this sensor is comparable to that of more expensive models.

The PS1000 has a standard output of 4-20mA loop powered with 0-2.5Vdc as an option. New features include the ability for the user to re-range the sensor with simple to use, field adjust software. This interface also allows the user to enter 'True Level' inputs for fluid density and local gravity.

The 47mm diameter body makes the PS1000 ideal for use in 2 inch boreholes. A durable acetal body, rugged ceramic capacitance transducer and double O ring sealing ensures suitability for harsh environment applications. An optional SDI-12 adaptor can provide a connection solution for process applications. The sensor comes fitted with a moulded polyurethane cable as standard. A waterproof connector (WP7) can be fitted as an optional extra.

The sensor can be supplied in selected gauge or absolute pressure ranges. Supplied for use with gauge pressure sensors is Greenspan Analytical's closed vent system. This provides an effective barrier to water ingress, while still allowing atmospheric pressure to the transducer, without the need to continually replace desiccant modules.

Our new PS1000 sensor is easy to install and provides users with a rugged and reliable solution to long term unattended monitoring. For more information, please contact your nearest sales office.

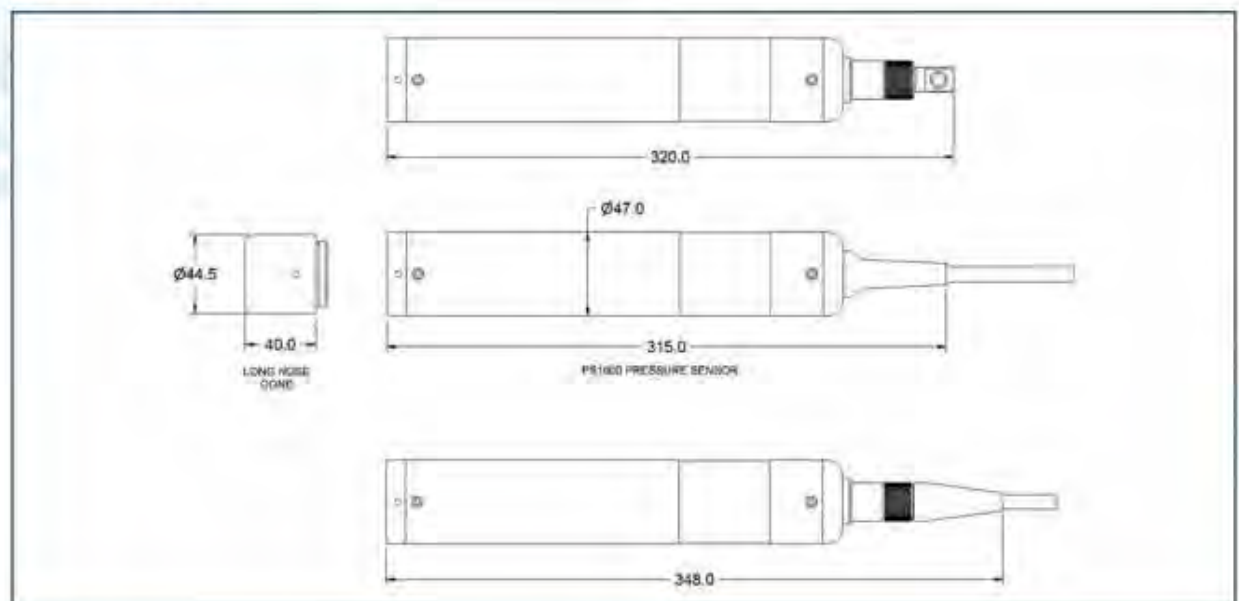
Features

- Suitable for use in 2" bore holes
- 4-20mA or 0-2.5Vdc outputs
- 0.1% FS accuracy
- Field re-ranging
- 'True Level' user inputs for fluid density and local gravity
- Double O-ring design and moulded cable gland
- Optional SDI-12 adaptor for process applications
- Acetal construction
- ½" diameter ceramic capacitance transducer
- Easy to install
- Low cost
- Long term stability better than 0.2% per annum
- User selectable averaging (0-256 samples)

Benefits

- Can be installed in active waters (acidic or salty) that would damage a stainless steel sensor.
- Low maintenance
- No need for regular desiccant replacement resulting in fewer field visits
- Low cost of ownership
- Reliability
- Easy to use

Dimensions

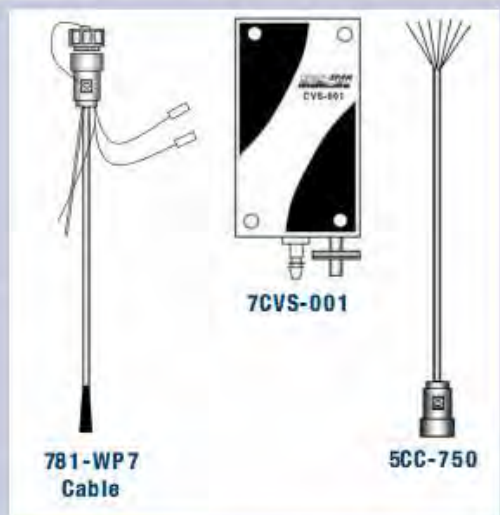


PS1000 Specification

Std ranges available	Gauge	2.5, 5, 10, 20, 40, 75, 100m
	Absolute	20, 40, 75, 100m
Other ranges available		Yes
Cable		Polyurethane sheathed cable with internal 3mm vent tube, moulded cable entry, bare wire connection
Available cable lengths		10, 30, 50, 100, 150m (32, 65, 100, 165, 325, 490ft) All cables for gauge sensors must be fitted with the CVS closed vent system
Operating temperature		0 - 50°C
Overall accuracy (*combined linearity, hysteresis and repeatability)		Pressure +/- 0.1% FS
Long term stability		0.2% FS per annum
Zero offset and full scale maximum variation		+/-0.02mA
External supply voltage		8 - 30 V
Reverse polarity protected		Yes
Surge current protected		To 2kV
Warm up time to stable reading		<150 msecs
Sensor type		1/2" Ceramic Capacitance Transducer
Weight		550g
Dimensions (L x OD)		315 x 47mm
Wetted materials		Acetal, Ceramic, 316 Passivated Stainless Steel, Polyurethane, Viton

Optional Extras and Accessories

Alternative interface option (instead of moulded cable)	Fitted WP7 waterproof connector
Detachable cables to suit WP7 connector	10, 20, 30, 50, 100, 150m fitted with 7-pin Hirschmann (HS7) connector. All cables for gauge sensors must be fitted with the CVS closed vent system.
Adaptor for Detachable	5CC-750 adaptor cable WP7 cables (HS7 to bare wire connection)
SDI-12 Adaptor	
RS232 adaptor and field adjust software	For connection to PC
Cable Suspension Clamp	
Breakout Box	



How to Order

The following information will be required for your order to be entered:

- Output (4-20mA or 0-2.5Vdc)
- Pressure Sensor Units
- Transducer Type
- 1000 Transducer Material
- Range (Metres-Gauge)
- Range (Metres-Absolute)
- 1000 Body Material
- Interface Option

- Connector Type 300
- Cable Length

Applications

- Sewer wet wells
- Bore hole monitoring
- River and dam level monitoring
- Flood warning systems
- Tank level monitoring
- Process level and pressure monitoring

Appendix 9 Aquatrak 4110 summary

Aquatrak Model 4110 Menu Version 4.05

1. User Settings.
2. Continuous Sampling, Raw Data.
3. Continuous Sampling, Scaled Data.
4. Continuous NOS Averaging, Sliding Window.
5. Continuous Wave Data, Sliding Window.
6. Continuous Scalar Average, Sliding Window.
7. Dump Sample Array.
8. Measurement Command Defaults.
9. Dump Setup Information.
- EE EEPROM Initialization Options.
- Q. Return to Command Mode.

Selection: 1

USER SETTINGS MENU

1. Primary Sensor Address: 0
2. Secondary Address: 2
3. Sensor ID, 13 chars: 120319
4. Slope (x.xxxxxx): +1.000000
5. Offset (xxx.xxx): +0.000
6. Polarity (D)own (U)p): D
7. Units (F)eet (M)eters): M
8. Wave Multiplier: 4.000
9. Calculate offset
10. Baud Rate: 1200
11. Comms Parity (N)one (E)ven): N
12. Remember RS232 Menu Mode: Y
13. Continuous Sampling: On
14. Self-Report with each sample: Off
- Q. Return to previous menu

Selection: 2

Index	Raw Data	Stat	Cal	Water	Celsius
54	2.442	32	25105	50290	41.9
55	2.442	16	25105	50291	41.9
56	2.442	16	25105	50291	41.9
57	2.442	16	25105	50291	41.9
58	2.442	16	25105	50290	41.9

Selection: 3

Index	Level	Stat	Cal	Water	Celsius
59	2.442	32	25105	50290	41.9
60	2.442	16	25105	50291	41.9
61	2.442	16	25105	50291	41.9



62	2.442	16	25105	50290	41.9
63	2.442	16	25105	50291	41.9

Selection: 4

Enter number of samples: 5

Mean	Sigma	Out	Bad
2.442	0.000	0	1
2.442	0.000	0	1
2.442	0.000	0	1
2.442	0.000	0	1
2.442	0.000	0	1
2.442	0.000	0	0
2.442	0.000	0	0
2.442	0.000	0	0
2.442	0.000	0	0

Selection: 6

Enter number of samples: 5

Mean	Maximum	Minimum	Bad
2.442	2.442	2.442	1
2.442	2.442	2.442	1
2.442	2.442	2.442	1
2.442	2.442	2.442	1
2.442	2.442	2.442	1
2.442	2.442	2.442	0
2.442	2.442	2.442	0

Selection: 7

Number of prior samples, <enter> for all: 5

Index	Value	Stat
77	2.442	16
78	2.442	16
79	2.442	16
80	2.442	16
81	2.442	16

Selection: 9

Aquatrak MODEL=4110 VER=4.05
 A_ADD=0 B_ADD=2 ID= 120319
 SL=1.000000 OF=+0.000 WA=4.000 POL=D UNIT=M
 NOS=181 C4=15 C5=30 C6=60 DEF_A=1 DEF_B=1
 BAUD=4 PAR=0
 SAMP=1 RPT=0
 PW=106 CB=60 LB=100 CL=4 CN=1



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REV	BY/DATE	DESCRIPTION	AUTHOR
1.00	21/2/2007	release	GQ
2.10	25/4/2007	Correct errors, add diagrams	GQ
2.30	10/8/2007	Add diagrams, add sensor setups	GQ
2.45	20/4/2008	Update command tables	GQ
2.46	30/5/08	Add pressure sensor information	GQ
2.50	27/8/08	Update images	GQ
2.52	22/1/09	Update Aquatrak sections, update pressure sensor info	GQ