

AquaProbe
Insertion Type
Electromagnetic Flowmeters

Configuration Manual

AquaProbe and
AquaProbe Transmitter

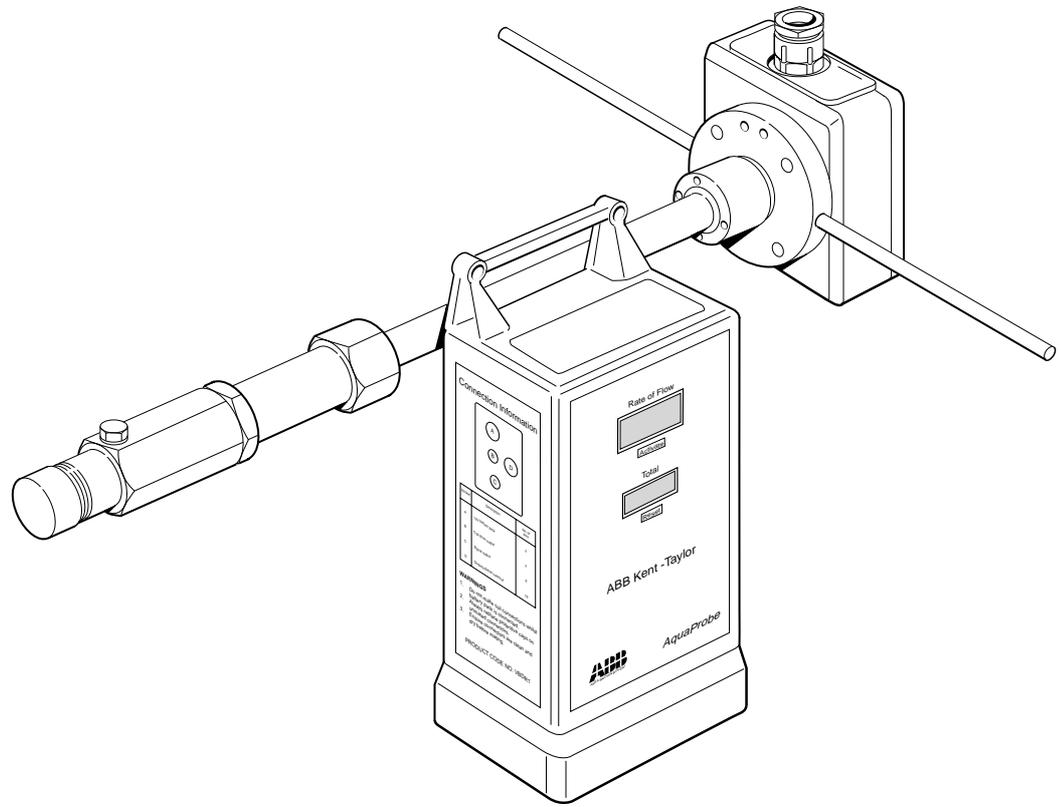


ABB INSTRUMENTATION

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ABB Instrumentation is an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

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BS EN ISO 9001



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Stonehouse, U.K. – Cert. No. FM 21106

EN 29001 (ISO 9001)



Lenno, Italy – Cert. No. 9/90A



Stonehouse, U.K. – Cert. No. 0255

Use of Instructions



Warning.

An instruction that draws attention to the risk of injury or death.



Note.

Clarification of an instruction or additional information.



Caution.

An instruction that draws attention to the risk of damage to the product, process or surroundings.



Information.

Further reference for more detailed information or technical details.

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of Technical Communications Department, ABB Instrumentation.

Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

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1 OPERATION

The AquaProbe Transmitter can be used in either a continuous or intermittent mode.

1.1 Intermittent Mode

The AquaProbe Transmitter measures the average flow rate over a period of approximately 5 seconds, at a regular user defined **Intermittent Interval** of 1 to 255 minutes. Between readings the transmitter is in a 'sleep' state resulting in minimal current usage. Battery life is proportional to the intermittent interval and can allow unattended operation from a small battery pack for in excess of one year. At the end of each measurement period the measurement is transmitted to any data terminal or data loggers connected to the AquaProbe Transmitter. The pulse output, reduced in frequency if required, is fed to an internal totaliser module.

1.2 Continuous Mode

If the wand is held over the 'ACTIVATE' pad for longer than 3 seconds the AquaProbe Transmitter measures and displays flow continuously. Serial data is transmitted at approximately 1.2 second intervals and the frequency output is updated continuously. Once initiated continuous mode is maintained for a user defined **Continuous Time** of 2 to 255 minutes. Connection of '**A+**' to ground or +12V (see AquaProbe Installation Manual) forces the AquaProbe Transmitter into continuous mode.

1.2.1 Display (Continuous Mode Only)

The 4-digit liquid crystal display (l.c.d.) has automatic decimal point selection. The maximum number of figures displayed after the decimal point is automatically selected to give a resolution approximately equivalent to 0.001 m/s. Flow rate is indicated in chosen units (e.g. litres per second) to a maximum of ± 9999 units.

The display indicates the following overrange conditions:

- a) If the measuring range of the transmitter is exceeded (approximately 15 m/s), all displayed digits flash.
- b) If the flow rate exceeds the capacity of the display, a value of ± 9999 is shown continuously.

1.3 Totaliser

The AquaProbe Transmitter is fitted with an 8 digit totaliser module. The totaliser is configured to count pulses in the forward direction only at a x1F rate, or at this rate divided by 10, 100 or 1000.

Example – if x1F is in litres then the internal totaliser can be made to display cubic metres by selecting '**÷ 1000**' – see Fig. 2.2 on page 5.



Note. The maximum reliable counting rate for the totaliser is 10Hz. If the count rate exceeds this value, counts are missed and the totaliser may stop counting.

1.3.1 Totaliser Reset

The totaliser is reset by:

- a) Connecting Pin J of the output cable connector ('RESET' – white wire in cable MVBX 99147) to GND (Pins G, S or V). For full connection details see Section 4 in the AquaProbe Installation Manual.
- b) Applying the wand to the 'RESET' pad with Pins J and T of the output cable connector linked together (i.e. yellow and white wires of cable MVBX 99147) or by serial data lead assemblies MVBX 99117 or 99119.

The totaliser is equipped with an overflow indicator. A small dot appears in the top left hand corner of the display when there is overflow from '9999999' to '0000000'.

2 PROGRAMMING...

2.1 Programming the AquaProbe Transmitter

Programming the AquaProbe transmitter allows various operating parameters to be changed. A security system consisting of two security codes is incorporated to restrict access to some parameters. If using a Psion Organiser, Husky Hunter Portable Computer or Microscribe Series 300 refer to **APPENDICES** for connection and/or keyboard operations.

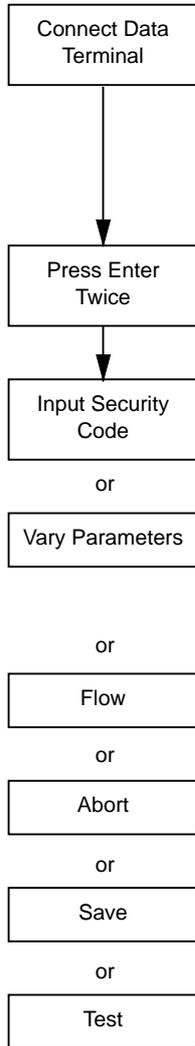
2.1.1 Accessing and Using the Main Menu

Connect a suitable serial data terminal to the AquaProbe Transmitter, which complies with the following requirements:

- a) A data rate (transmit and receive) of 4800 Baud.
- b) A data format as shown below.

| | | | |
|-------------|--------------------------|------------------------|-------------|
| 1 start bit | 7 data bits (ASCII code) | 1 parity bit (ignored) | 2 stop bits |
|-------------|--------------------------|------------------------|-------------|

- c) A serial data terminal that accepts 5 volt logic signal levels (e.g. RS423 or RS232 interface).



On the data terminal, access the communications mode and press enter twice within half a second. A prompt symbol (>) and the terminal's cursor symbol are displayed on the left hand side of the display.

Select any of the following six commands as required.

On the data terminal, type a '?' followed by the appropriate security code (shown in Table 2.1 below) and press enter. The security code is not displayed on the screen.

On the data terminal, type a 'V' and press enter and refer to Section 2.2 for full programming details. The Vary Parameter command allows changes to be made to the AquaProbe Transmitter internal data. To alter parameters 4 to 9 first enter the input security code for security level 1. To alter parameters 4 to 9 and 10 to 12 first enter the input security code for security level 2.

On the data terminal, type an 'F' and press enter. The AquaProbe returns to flow measurement, in continuous mode, using the parameter data entered in Vary Parameters until interrupted by a serial link.

On the data terminal, type an 'A' and press enter. The AquaProbe Transmitter returns to normal operation ignoring any alterations made to its parameters.

On the data terminal, type an 'S' and press enter. All data entered in Vary Parameters is saved and the AquaProbe Transmitter returns to normal operation. This is the only command which changes the AquaProbe Transmitter internal data.

On the data terminal, type a 'T' and press enter. The AquaProbe enters continuous mode until interrupted by a serial link. All flow settings and sensor calibration data are ignored and the display shows m/s only. This mode can be used in conjunction with the ABB Kent-Taylor VMD simulator to confirm correct operation.

| Security Level | Security Code to Enter | Accessible Parameters |
|---|------------------------|--------------------------------------|
| 1 | SETUP | Parameters 1 to 8 |
| If required, remove page below above line to prevent unauthorised access to calibration details | | |
| 2 | TESTCAL | Factory set parameters 10, 11 and 12 |

Table 2.1 Security Access to Parameters in the Vary Parameter Menu

...2 PROGRAMMING

2.2 Vary Parameter Command

2.2.1 Parameter Values

Parameter values are displayed as either floating point in the range $\pm 1E-38$ to $\pm 1E+38$, or integer in the range -128 to $+255$. Parameter values can be entered in either format but if an integer value is required then only the integer part of the entry is accepted.

2.2.2 Negative Parameter Values

- If a negative value is entered into parameter 5 (VU), the entire instrument reads in reverse.
- If a negative value is entered into parameter 6 (TU), the displayed flowrate is reversed but the pulse outputs are not affected.

- If a negative value is entered into parameter 7 (PU), the displayed flowrate is not affected but the forward/reverse pulse outputs are interchanged.

2.2.3 Changing Parameter Values – Fig. 2.1 and 2.2

To change parameters 4 to 12 it is necessary to enter a security code – see Section 2.1.1 on previous page. Parameters 13 to 15 are not adjustable. Press 'Escape' to return to the main menu at any time.



Note. When programming the AquaProbe Transmitter flow measurement ceases and the rate of flow display blanks.



Note. All parameter values shown are the Company default settings.



Note. To change a parameter value type in the new value and press enter. To skip a parameter, without changing its value, press enter.

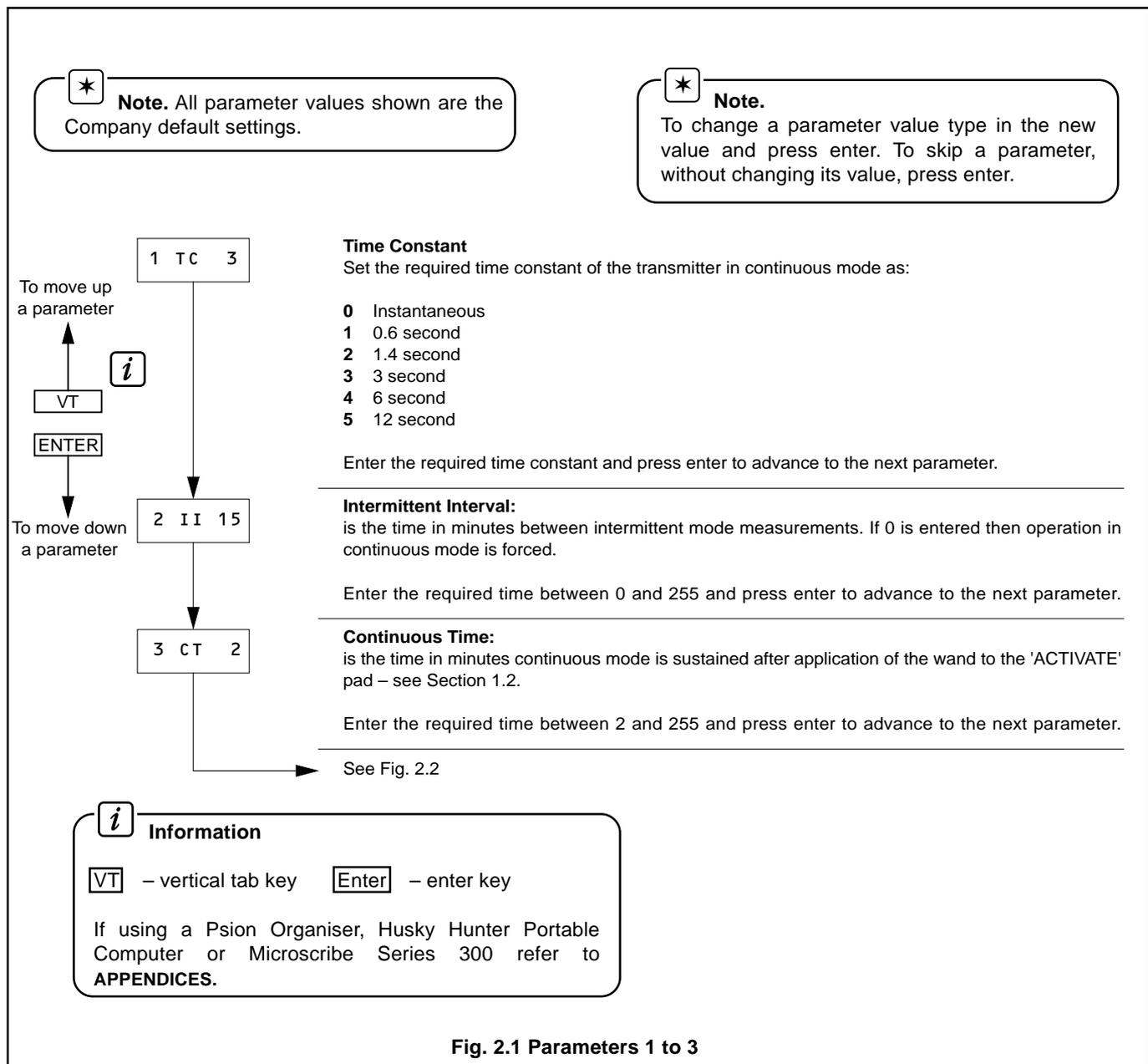
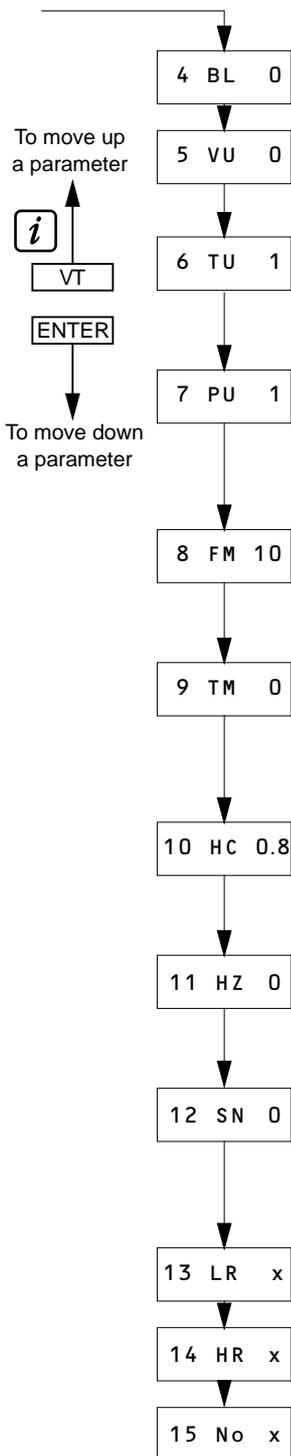


Fig. 2.1 Parameters 1 to 3



Blockage Factor (BL)

Enter the appropriate value of BL and press enter to advance to the next parameter.

Volume Units (VU)

Enter the appropriate value of VU and press enter to advance to the next parameter – see Table 2.2 for standard values.

Time Units (TU):

converts the displayed reading into 'per minute' etc. Enter the required value of TU as:

1 – seconds 60 – minutes 3600 – hours 86400 – days

Pulse Units (PU):

sets the number of pulses generated at the x1 pulse outputs for each unit of volume passed – see Section 2.2.4.

Enter the required value of PU and press enter to advance to next parameter.

Frequency Maximum:

is the maximum permissible value of the x1 pulse outputs (range 0 to 100 Hz).

Enter the required value of FM and press enter to advance to next parameter..

Totaliser Mode

The internal totaliser counts x1F forward pulses divided by the factor selected. Enter the number to select the required factor from:

0 – (÷ by 1) 1 – (÷ by 10) 2 – (÷ by 100) 3 – (÷ by 1000)

Head Calibration:

is the calibration factor for the probe and is printed on the terminal box data label.

Enter the required calibration factor and press enter to advance to the next parameter.

Head Zero:

is the zero offset correction for the sensor (mm/s) and is always set to zero.

Press enter to advance to the next parameter.

Serial Number:

is the serial number of the sensor head.

Enter the required serial number (up to 10 alphanumeric characters) and press enter to advance to the next parameter.

Factory Set Calibration Data

Factory Set Calibration Data

Factory Set Calibration Data



Information

VT – vertical tab key **Enter** – enter key

If using a Psion Organiser, Husky Hunter Portable Computer or Microscribe Series 300 refer to **APPENDICES**.

Fig. 2.2 Parameters 4 to 15

...2 PROGRAMMING

2.2.4 Parameters

When programming the AquaProbe the following parameters are required:

- VU** – Volume Units, e.g. litres, m³, gallons etc.
- TU** – Time Units, e.g. per second, per minute etc.
- PU** – Pulse Units (the value of pulse output), e.g. 1 pulse per m³.
- TM** – Totaliser Mode (the value of internal totaliser count), e.g. 1 count per m³.

a) **Volume Units** – VU is the parameter which defines the units of measurement. It is calculated as the volume of a 1 metre length of the pipeline in the required units. Table 2.2 gives the values of VU for **NOMINAL** pipe sizes and is intended as a guide only. Calculate the actual value of VU for a given pipe size using the formula:

$$VU = \quad \times K$$

- Where: D = internal diameter of pipe
 K = number of units in 1 m³,
 K = 1000 if volume units are litres
 K = 220.1 if units are Imperial Gallons
 K = 264.17 if units are U.S. Gallons
 n = a constant depending on the units of D,
 n = 4,000,000 if D is in mm
 n = 4 if D is in metres
 n = 6200 if D is in inches

b) **Time Units** – TU is set to:

- 1 for seconds
- 60 for minutes
- 3600 for hours
- 86,400 for days.

Example 1 – for an 800mm pipeline and flow units of m³/hour, VU = 0.5026 and TU = 3600.

c) **Pulse Units** – PU is the factor applied to the volume units to give the **OUTPUT PULSE** in the required units. It is the ratio between the volume flow rate units and the required pulse output units.

Example 2 – for a flow rate in m³ and a pulse output per m³ the value of PU is 1.

Example 3 – for a flow rate in litres and a pulse output per m³ PU is 0.001.

$$PU = \frac{\text{Volume Units}}{\text{Pulse Units}} = \frac{1 \text{ litre}}{1 \text{ m}^3} = \frac{1 \text{ litre}}{1000 \text{ litres}} = 0.001$$

d) **Time Mode** – TM is the factor applied to the output pulse units to give the **INTERNAL TOTALISER** in the required units. It is the ratio between the required totaliser units and the pulse output units and its value is **expressed as a power of 10**.

Example 4 – for a flow rate in m³ and a totaliser in m³ the value of TM should be 1. Since 1 is 10⁰, **TM = 0**.

Example 5 – for a flow rate in litres and a pulse output in m³ the value of TM should be 1000. Since 1000 is 10³, **TM = 3**.

$$TM = \frac{\text{Totaliser Units}}{\text{Pulse Output Units}} = \frac{1 \text{ m}^3}{1 \text{ litre}} = \frac{1000 \text{ litres}}{1 \text{ litre}} = 1000$$

Since 1000 = 10³, TM = 3 ←

| Nominal Pipe Size | | Value of VU | | | |
|-----------------------|-----------------------|-----------------------|------------------------|-----------------------------|----------------------------|
| mm (n = 4,000,000) | Inches (n = 6,200) | Litres (K = 1,000) | m ³ (K = 1) | Imp. Gallons (K = 220.1) | US Gallons (K = 264.17) |
| 200 | 7.87 | 31.4150 | 0.0314 | 6.9097 | 8.2905 |
| 250 | 9.84 | 49.0859 | 0.0491 | 10.8019 | 12.9605 |
| 300 | 11.81 | 70.6838 | 0.0707 | 15.5600 | 18.6694 |
| 400 | 15.75 | 125.6600 | 0.1257 | 27.6739 | 33.2041 |
| 500 | 19.69 | 196.3438 | 0.1963 | 43.2514 | 51.8946 |
| 600 | 23.62 | 282.7350 | 0.2827 | 62.2398 | 74.6776 |
| 800 | 31.50 | 502.6400 | 0.5026 | 110.6956 | 132.8165 |
| 1000 | 39.37 | 785.3750 | 0.7854 | 172.9178 | 207.4730 |
| 1200 | 47.24 | 1,130.9400 | 1.1309 | 248.9595 | 298.7105 |
| 1400 | 55.12 | 1,539.3350 | 1.5393 | 338.9435 | 406.6764 |
| 1600 | 62.99 | 2,010.5600 | 2.0106 | 442.6414 | 531.0969 |
| 2000 | 78.74 | 3,141.5000 | 3.1415 | 691.6711 | 829.8915 |

Table 2.2 Standard VU Parameter Values

APPENDICES

A1 Psion Organiser Series 2

If using a Psion Organiser Series 2 it is recommended that the mains adapter is used to power the organiser. The following must be carried out:

- Connect the Psion Organiser Communications Link Adapter to the AquaProbe Transmitter using the Serial Interface Lead MVBX 99119.
- Access the Comms 'SETUP' mode and set the following values.

| | |
|----------|-----------|
| BAUD | 4800 |
| PARITY | NONE |
| BITS | 8 |
| STOP | 1 |
| HAND | NONE |
| PROTOCOL | NONE |
| ECHO | HOST |
| WIDTH | NONE |
| TIMEOUT | NONE |
| REOL | <CR> <LF> |
| REOF | NONE |
| RTRN | NONE |
| TEOL | <CR> |
| TEOF | NONE |
| TTRN | NONE |

Enter the following numbers to give the operations shown above:

13, 10 <CR> <LF>
13 <CR>

- Select '**TERM**' from the Comms menu to allow communication with the AquaProbe Transmitter.

A1.1 Keyboard Designations – Fig. A1.1

| Function | Key |
|------------|---|
| Enter <CR> |  |
| DEL |  |
| ? |  +  |
| ESC |  +  |
| VT |  +  |

Note. The  and  keys must not be used, as these enable and disable the Organiser data output. Refer to the Psion Organiser handbook for further information.

Fig. A1.1 Psion Organiser series 2 Keyboard Designations

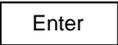
A2 Psion Organiser Series 3

If using the Psion Organiser Series 3 the following must be carried out:

- Connect the Psion Organiser Communications Link Adapter to the AquaProbe Transmitter using the Serial Interface Lead MVBX 99119.
- Refer to the Psion Series 3, 3 Link (RS232) handbook and install the Comms Application for use with the AquaProbe Transmitter. Access the 'Port' option on the 'Special' menu and set the following values.

| | |
|---------------|------|
| Baud rate | 4800 |
| Data bits | 8 |
| Stop bits | 1 |
| Parity | None |
| Ignore parity | Yes |

A2.1 Keyboard Designations – Fig. A2.1

| Function | Key |
|-----------|---|
| Enter<CR> |  |
| DEL |  |
| ESC |  |
| VT |  +  |

Note. The  and  keys must not be used, as these enable and disable the Organiser data output. Refer to the Psion Organiser handbook for further information.

Fig. A2.1 Psion Organiser Series 3 Keyboard Designations

...APPENDICES

A3 Husky Hunter Portable Computer

If using a Husky Hunter Portable Computer the following must be carried out:

- Connect the Husky Hunter Portable Computer to the AquaProbe Transmitter using the Serial Data Lead MVBX 99117.
- Refer to the Husky Hunter Portable Computer handbook and enter the values shown below.

```

Transmission Parameters
Rate-4800 Prtcl-none Pty-none
CTS-n DTR-n Echo-n T/O-no Null-0
Press ENTER if acceptable
    
```

```

Receiving Parameters
Rate-4800 Prtcl-none Pty-none
RTS-off DSR-n DCD-n T/O-no Serig-000
Press ENTER if acceptable
    
```

A4 Microscribe Series 300

If using a Microscribe Series 300 the following must be carried out:

- Connect the Microscribe Series 300 to the AquaProbe Transmitter using the Serial Data Lead MVBX 99117.
- Refer to the Microscribe Series 300 handbook and enter the values shown below.

```

Microscribe 320 V 2.11 STATUS
Baud Protocol TX Mode Auto
LF Disp Audio
4800 Xon/off CHAR OFF 40 OFF

Parity L.Echo EOF EOL Mode Sleep
RESET OFF OFF CR NORM OFF

BATTERY LEVEL 100% XXXXX
    
```

A3.1 Keyboard Designations – Fig. A3.1

| Function | Key |
|--------------|---|
| Enter <CR> |  |
| Line Feed |  |
| Vertical Tab |  |
| Delete |  |
| ESC |  +  |

Fig. A3.1 Husky Hunter Organiser Keyboard Designations

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Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification. Periodic checks must be made on the equipment's condition.

In the event of a failure under warranty, the following documentation must be provided as substantiation:

1. A listing evidencing process operation and alarm logs at time of failure.
2. Copies of operating and maintenance records relating to the alleged faulty unit.



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