Congratulations !

You have purchased the latest in Handheld Conductivity-TDS-Salinity-pH-Temperature instrumentation. We trust that your new **Aqua-CPA** will give you many years of reliable service.

The **Aqua-CPA** is a breeze to operate. This manual has been designed to help you get started, and also contains some handy application tips. If at any stage you require assistance, please contact either your local TPS representative or the TPS factory in Brisbane.

The manual is divided into the following sections:

1. **Table of Contents**
   Each major section of the handbook is clearly listed. Sub-sections have also been included to enable you to find the information you need at a glance.
2. **Introduction**
   The introduction has a diagram and explanation of the display and controls of the **Aqua-CPA**. It also contains a full listing of all of the items that you should have received with your **Aqua-CPA**. Please take the time to read this section, as it explains some of items that are mentioned in subsequent sections.
3. **Main Section**
   The main section of the handbook provides complete details of the **Aqua-CPA**, including operating modes, calibration, troubleshooting, specifications, and warranty terms.
4. **Appendices**
   Appendices containing background information and application notes are provided at the back of this manual.

Model Aqua-CPA
Cond, TDS, Salinity,
pH, Temp. Meter
Version : 2.0
Date : 20/09/2011

TPS Pty Ltd

ABN 30 009 773 371

Unit 6 / 253 Leitchs Road
Brendale, QLD,
Australia, 4500

Phone : (07) 32 058 027
International : 61 7 32 058 027

Fax : (07) 3808 4871
International : 61 7 3808 4871

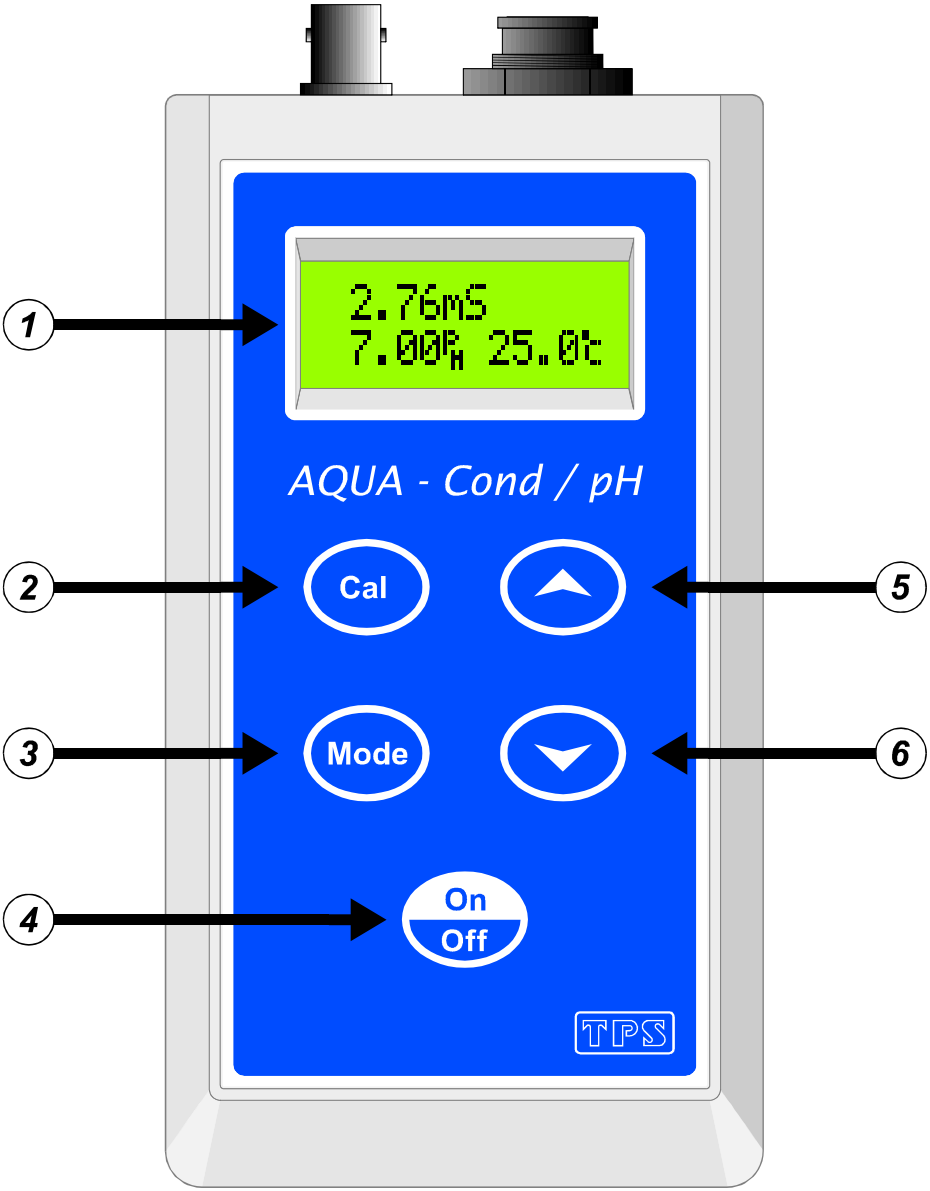
Email : tps@tps.com.au

Web : www.tps.com.au

Contents

1. Introduction

1.1 Aqua-CPA Display and Controls



✶ **Display**

24 character alpha-numeric display. The following combinations of parameters can be displayed simultaneously…

Conductivity + pH + Temperature	Conductivity + Temperature
TDS + pH + Temperature	TDS + Temperature
Salinity + pH + Temperature	Salinity + Temperature
pH + Temperature	Temperature

A “Large Digit” mode nearly doubles the size of the digits (section 2).

User-friendly prompts and error messages are also provided.

✸ 

Used to calibrate all parameters. See sections 3, 4 and 5.

Also used to select buffers for automatic buffer recognition. See section 7.

✸ 

Switches between Conductivity or TDS or Salinity, pH and Temperature. See section 2.

Used to select k=10 or k=0.1 sensor at turn-on. See section 6.

✵ 

Switches the **Aqua-CPA** on and off.

Hold this key for 3 seconds to invoke Battery Saver mode. See section 8.

⌗  and ⌖ 

These keys toggle the **Aqua-CPA** between Large Display mode and Dual Display mode. See section 2.

NOTE: The digits in Large Display mode are made by combining the two rows of the display. This results in a small gap approximately half way up the digits.

1.2 Unpacking Information

Before using your new **Aqua-CPA**, please check that the following accessories have been included:

	Part No
1. **Aqua-CPA** Cond-TDS-Salinity-pH-Temperature, Auto-ranging	121135
2. k=1/ATC/Temperature Sensor, plastic body	122201
3. pH Sensor, plastic body	121207
4. 2.76mS/cm Conductivity Standard, 200mL	122306
5. pH7.00 Buffer, 200mL	121387
6. pH4.01 Buffer, 200mL	121381
7. 9V Battery	
8. **Aqua-CPA** Manual	

Options that may have been ordered with your **Aqua-CPA**:

1. k=10/ATC/Temperature Sensor, plastic body	122221
2. k=0.1/ATC/Temperature Sensor, plastic body	122235
3. k=1/ATC/Temperature Sensor, glass body	122216
4. k=10/ATC/Temperature Sensor, glass body	122212
5. k=0.1/ATC/Temperature Sensor, glass body	122229
6. Aluminium Carry Case	130057

1.3 Specifications

	Ranges		Resolution	Accuracy
Conductivity	k=0.1 cell	0 to 2.000 µS/cm	0.001 µS/cm	±0.5% of full scale of selected range at 25 ^{O}C
		0 to 20.00 µS/cm	0.01 µS/cm	
		0 to 200.0 µS/cm	0.1 µS/cm	
		0 to 2000 µS/cm	1 µS/cm	
	k=1 cell	0 to 20.00 µS/cm	0.01 µS/cm	
		0 to 200.0 µS/cm	0.1 µS/cm	
		0 to 2000 µS/cm	1 µS/cm	
		0 to 20.00 mS/cm	0.01 mS/cm	
	k=10 cell	0 to 200.0 µS/cm	0.1 µS/cm	
		0 to 2000 µS/cm	1 µS/cm	
		0 to 20.00 mS/cm	0.01 mS/cm	
		0 to 200.0 mS/cm	0.1 mS/cm	
TDS	k=0.1 cell	0 to 1.000 ppM	0.001 ppM	±0.5% of full scale of selected range at 25 ^{O}C
		0 to 10.00 ppM	0.01 ppM	
		0 to 100.0 ppM	1 ppM	
		0 to 1000 ppM	0.01 ppK	
	k=1 cell	0 to 10.00 ppM	0.01 ppM	
		0 to 100.0 ppM	0.1 ppM	
		0 to 1000 ppM	1 ppM	
		0 to 10.00 ppK	0.01 ppK	
	k=10 cell	0 to 100.0 ppM	0.1 ppM	
		0 to 1000 ppM	1 ppM	
		0 to 10.00 ppK	0.01 ppK	
		0 to 100.0 ppK	0.1 ppK	
Salinity	k=0.1 cell	0 to 0.10 %	0.01 %	±0.5% of full scale of selected range at 25 ^{O}C
		0 to 1.0 PSU	0.1 PSU	
	k=1 cell	0 to 1.19 %		
		0 to 11.9 PSU		
	k=10 cell	0 to 8.00 %		
		0 to 80.0 PSU		
pH		0 to 14.00 pH	0.01 pH	±0.01 pH
Temperature		-10.0 to 120.0 ^{O}C (Cond sensor limit 60 ^{O}C)	0.1 ^{O}C	±0.2 ^{O}C

Additional Conductivity/TDS/Salinity Specifications

Temperature Compensation..... Automatic, -5 to 70.0 ^{O}C

Conductivity Sensor Span Range..... 75 to 133 %

Auto Standard Recognition..... Cond : 150µS/cm, 1413µS/cm, 2.76mS/cm, 12.88mS/cm, 58.0mS/cm

TDS Factor..... 0.40 to 1.00 user selected

Additional pH Specifications

Temperature Compensation..... Automatic, -5 to 100.0 ^{O}C

pH Input Impedance..... >3 x 10^{12} Ω

pH Asymmetry Range ..... -1.00 to 1.00 pH

pH Slope Range..... 85.0 to 105.0%

Auto pH Buffer Recognition..... pH4.01, pH6.86, pH7.00, pH9.18, pH10.01

Additional Temperature Specifications

Temperature Sensor Offset Range.... -10.0ºC to +10.0ºC

General Specifications

Display ..... 24 Character alphanumeric LCD, with full text prompts and error messages.

Power..... 9V Alkaline Battery for 70 hours operation.

Battery Saver ..... On: Auto switch-off after 5 minutes
Off: Continuous use

Dimensions ..... 165 x 85 x 35 mm

Mass ..... Instrument only : Approx 280g
Full Kit : Approx 2.0kg

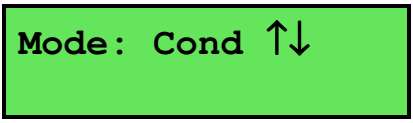
Environment..... Temperature : 0 to 45 ^{O}C
Humidity : 0 to 90 % R.H.

2. Operating Modes

2.1 Mode Selection

To select Conductivity, TDS or Salinity modes…

1. Press the Mode key until the **Aqua-CPA** is the mode selection menu. For example…

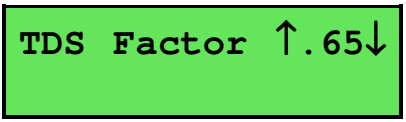


2. Press ⌃ or ⌄ to select the required from the following choices…
   - Conductivity
   - TDS
   - Salinity
3. Press Mode when the required display mode has been selected. If TDS mode has been selected the user can now enter the TDS Factor.

2.2 Setting TDS Factor

To set the TDS Factor…

1. Press the Mode key until the **Aqua-CPA** is the mode selection menu. Select the TDS Mode.
2. Press the Mode key and the currently selected TDS Factor is displayed. For example…



Press the ⌃ key to increase the Factor.

Press the ⌄ key to decrease the Factor.

Press the Mode key when the desired value is displayed.

The new TDS Factor will be now displayed.

The TDS Factor can be set from 0.40 to 1.00.

The TDS Factor will be reset to 0.65 when the meter is initialized.

2.3 Display Combination Selection

Press the Mode key to select the desired combination of displayed parameters. The sequence is shown in the following table…

Conductivity or TDS or Salinity plus pH and Temperature Mode	2.76mS 7.00m 25.0t
Conductivity, TDS or Salinity data is shown on the top line with pH and Temperature data is shown on the bottom line. Manual Temperature setting with an "m" is shown if no Conductivity or Temperature sensor is connected.	

↓ Mode

Conductivity or TDS or Salinity plus Temperature Mode	2.76mS 25.0t
Conductivity, TDS or Salinity data is shown on the top line and Temperature data is shown on the bottom line. Manual Temperature setting with an "m" is shown if no Conductivity or Temperature sensor is connected. Press ⌃ or ⌄ to toggle between regular readout or large digit readout.	

↓ Mode

pH plus Temperature Mode	7.00pH 25.0t
pH data is shown on the top line and Temperature data is shown on the bottom line. Manual Temperature setting with an "m" is shown if no Conductivity or Temperature sensor is connected. Press ⌃ or ⌄ to toggle between regular readout or large digit readout.	

↓ Mode

Temperature Mode	25.0t
Temperature data only is shown. Manual Temperature setting with an "m" is shown if no Conductivity or Temperature sensor is connected. Press ⌃ or ⌄ to toggle between regular readout or large digit readout.	

↓ Mode

Mode selection, continued…

Mode Selection	Mode: Cond ↑↓
See Mode selection Section 2.1.	
↓ (Mode)	
Back to Conductivity or TDS or Salinity plus pH and Temperature mode	

Notes: The decimal point is replaced by a ” ∗ “ if a Conductivity, pH or Temperature calibration has failed (see sections 3, 4 and 5), if the unit is initialised (see section 9), or if the unit has lost its factory calibration (see section 10.1).

3. Conductivity (TDS/Salinity) Calibration

To achieve accurate Conductivity/TDS/Salinity results, the **Aqua-CPA** requires calibration to an allowable Conductivity standard. The TDS and Salinity values are derived from the Conductivity reading and do not require a separate calibration. The conductivity of a solution varies with temperature. The **Aqua-CPA** uses Automatic Temperature Compensation (ATC) referenced to the fixed temperature of 25°C.

A "∗" in place of the decimal point indicates that the Conductivity or TDS or Salinity readout is not calibrated, or a past calibration has failed. The " ∗ " will be removed once a Conductivity calibration has been successfully performed in Conductivity standard.

3.1 Calibration Procedure

1. Switch the **Aqua-CPA** on.
2. Select a display mode showing Conductivity or TDS or Salinity readout (section 0).
3. Plug the Conductivity sensor into the sensor socket. If a k=10 or k=0.1 sensor is being used, ensure that it has been correctly selected (see section 6).
4. Rinse the Conductivity sensor in distilled water. Shake off as much water as possible. Blot the outside of the sensor dry. DO NOT BLOT THE SENSOR WIRES.

Zero Calibration

5. Let the sensor dry in air.
6. When the reading has stabilised at or near zero, press the Cal key.

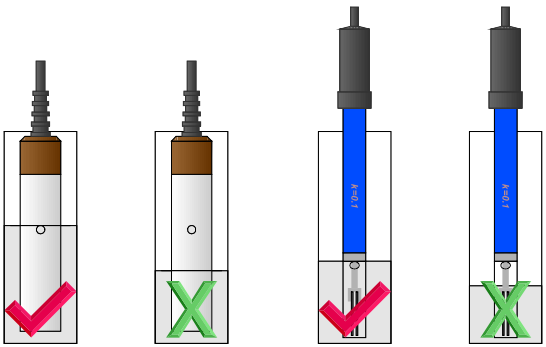
   The **Aqua-CPA** will prompt the user to select the parameter if a combination display is shown. Use the ⌃ or ⌄ keys to select Conductivity.
   The display will change to Conductivity during calibration if the **Aqua-CPA** is in TDS or Salinity Mode.
   A " ∗ " will not be removed after a zero calibration.

Standard Calibration

7. Allowable Conductivity standards are listed in section 1.3 and should be selected according to your range of measurement.

8. Place the sensor into a sample of Conductivity standard, so that it is immersed at least to the vent hole in the white plastic cover. The white plastic cover MUST be in place for correct readings.

   Glass sensors must be immersed to the hole in the glass body. See the diagrams below.



Plastic body sensors ***Glass body sensors***

   DO NOT place the sensor directly into the bottle of standard.

9. Discard the used sample of standard after use. It is advisable to use a narrow sample vessel to minimise the use of standard solution.

10. When the reading has stabilised, Press the Cal key to calibrate. The **Aqua-CPA** will prompt the user to select the parameter if a combination display is shown. Use the ⌃ or ⌄ keys to select Conductivity.
    The display will change to Conductivity if the **Aqua-CPA** is in TDS or Salinity Mode during calibration.
    The ∗ will now be replaced by a decimal point if calibration was successful.

    The **Aqua-CPA** is now calibrated for Conductivity.
    The TDS and Salinity values are derived from the Conductivity reading and do not require a separate calibration.

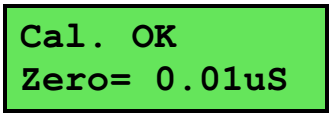
11. Discard the used samples of standard.

3.2 Calibration Notes

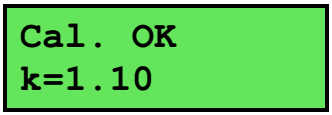
1. A Zero calibration should be performed at least monthly. In low conductivity applications (where a zero error is particularly significant) a zero calibration may have to be done weekly.
2. A Standard calibration should be performed at least weekly. Of course, more frequent calibration will result in greater confidence in results.
3. All calibration information is retained in memory when the **Aqua-CPA** is switched off, even when the battery is removed.

3.3 Calibration Messages

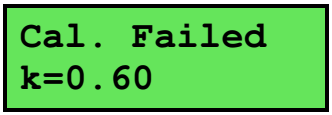
1. If a Zero calibration has been successfully performed, the **Aqua-CPA** will display zero value of the sensor. For example…



2. If a Standard calibration has been successfully performed, the **Aqua-CPA** will display the calculated k factor of the sensor. For example…



3. If a Standard calibration has failed, the **Aqua-CPA** will display the calculated k factor of the sensor following message, and then the failed span value of the sensor.



4. The **Aqua-CPA** will display the following message if it fails to recognise the calibration standard. This can occur if the calibration standard is incorrect, or if the sensor response is incorrect by a very large margin.

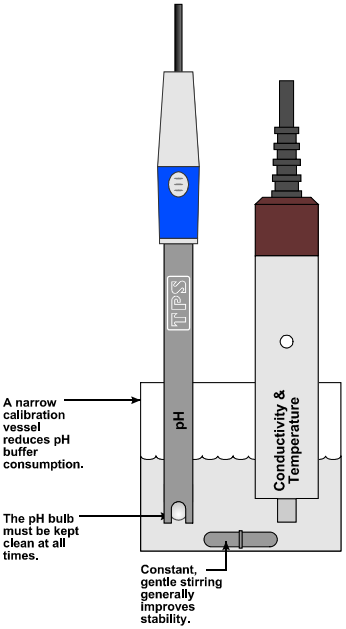
Note that the decimal point is replaced by a " ∗ " when a Standard calibration fails.

4. pH Calibration

A " ∗ " in place of the decimal point indicates that the pH readout is not calibrated, or a past calibration has failed. The " ∗ " will be removed once a full two-point pH calibration has been successfully performed.

4.1 Calibration

1. Switch the **Aqua-CPA** on.
2. Select a display mode showing pH readout (see section 2).
3. Plug the pH sensor into the BNC socket (this is the metal socket). For automatic temperature compensation, plug the Conductivity sensor into the Conductivity socket (this is the 6-pin plastic socket). If the Conductivity sensor is not connected, then the **Aqua-CPA** will use manual temperature compensation.
4. Ensure that temperature has already been calibrated, or manually set (see sections 5.1 and 5.4). NOTE: If the decimal point in the temperature reading is replaced by a " ∗ ", then the temperature readout is not calibrated.
5. Remove the wetting cap from the pH sensor.
6. Rinse the pH and Conductivity sensors in distilled water and blot them dry.
7. Ensure that you are using the buffers which have been selected for automatic buffer recognition. See section 7 for a detailed explanation.
8. Place both sensors into a small sample of pH7.00 (or pH6.86) buffer, so that the bulb and reference junction are both covered. See the diagram over the page.



DO NOT place the sensors directly into the buffer bottle. Discard the used buffer after use.

9. When the reading has stabilised, press the Cal key to calibrate. The **Aqua-CPA** will prompt the user to select the parameter if a combination display is shown. Use the ⌃ or ⌄ keys to select pH. If a 1 point calibration has been performed, a "∗" will not be removed until a full 2 point calibration has been performed.
10. Rinse the pH and Conductivity sensors in distilled water and blot them dry.
11. Place both sensors into a small sample of pH4.01, pH9.18 or pH10.01 Buffer, so that the bulb and reference junction are both covered, as per the diagram in step 8. **DO NOT** place the sensors directly into the buffer bottle. Discard the used buffer after use.

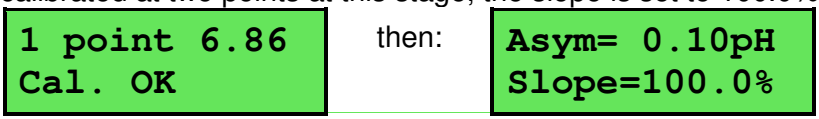
    pH9.18 and pH10.01 buffers are unstable once the bottles have been opened. Discard immediately after use.
12. When the reading has stabilised, press the Cal key to calibrate. The **Aqua-CPA** will prompt the user to select the parameter if a combination display is shown. Use the ⌃ or ⌄ keys to select pH. The " ∗ " will now be replaced by a decimal point, if calibration was successful. The **Aqua-CPA** is calibrated for pH and is ready for use.

4.2 pH Calibration Notes

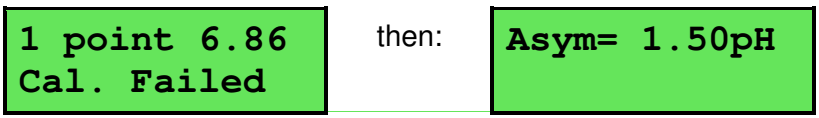
1. A 1-point calibration should be performed at least weekly. In applications where the sensor junction can become blocked, such as dairy products, mining slurries etc, a 1-point calibration may have to be done daily.
2. A full 2-point calibration should be performed at least monthly. Of course, more frequent calibration will result in greater confidence in results.
3. All calibration information is retained in memory when the **Aqua-CPA** is switched off, even when the battery is removed.
4. The **Aqua-CPA** displays the value of the pH buffer that it has attempted to recognise at calibration. Ensure that the buffer value displayed corresponds to the buffer that you are using.

4.3 pH Calibration Messages

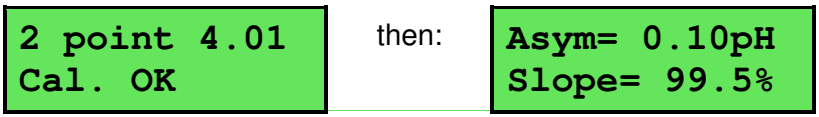
1. If a 1-point calibration has been successfully performed, the **Aqua-CPA** will display the following message, and then display the asymmetry and slope of the sensor. If the meter has not been calibrated at two points at this stage, the slope is set to 100.0%.



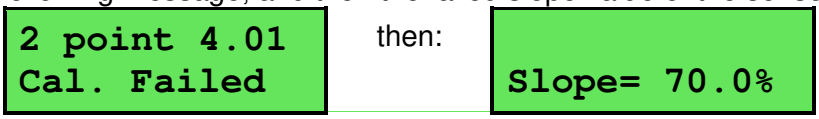
2. If a 1-point calibration has failed, the **Aqua-CPA** will display the following message, then the failed asymmetry value of the sensor.



3. If a 2-point calibration has been successfully performed, the **Aqua-CPA** will display the following message, and then the asymmetry and slope of the sensor.



4. If a 2-point calibration has failed, the **Aqua-CPA** will display the following message, and then the failed slope value of the sensor.

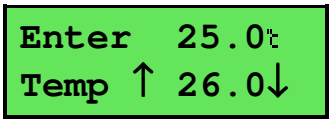


5. Temperature Calibration

A " ∗ " in place of the decimal point indicates that the Temperature readout is not calibrated, or a past calibration has failed. The " ∗ " will be removed once Temperature has been successfully calibrated.

5.1 Calibration

1. Switch the **Aqua-CPA** on.
2. Plug the Conductivity sensor into the sensor socket.
3. Place the sensor into a beaker of room temperature water, alongside a good quality mercury thermometer. Stir the sensor and the thermometer gently to ensure an even temperature throughout the beaker.
4. When the reading has stabilised, press the Cal key to calibrate. The **Aqua-CPA** will prompt the user to select the parameter if a combination display is shown. Use the ⌃ or ⌄ keys to select Temperature.
5. The reading from the sensor is now displayed on the top line, and the value you are going to set is on the bottom line. For example…



6. Press the ⌃ and ⌄ keys until the bottom line shows the same temperature as the mercury thermometer.
7. Press the Cal key to calibrate the temperature readout.

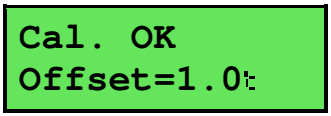
   Alternatively, press the Mode key to abort temperature calibration.

5.2 Calibration Notes

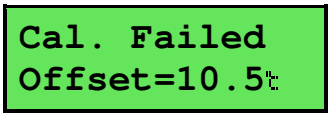
1. Temperature calibration information is stored in memory when the meter is switched off, even if the battery is removed.
2. Temperature does not need to be re-calibrated unless the Conductivity sensor is replaced or the meter is initialised.

5.3 Calibration Messages

1. If a temperature calibration has been successfully performed, the **Aqua-CPA** will display the offset value of the sensor. For example…

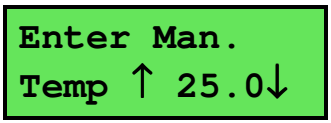


2. If a temperature calibration has failed, the **Aqua-CPA** will display the failed offset value of the sensor.



5.4 Manual Temperature Setting

1. Switch the **Aqua-CPA** on.
2. Select Temperature mode (see section 2).
3. Manual temperature setting is only available if the Conductivity sensor is not connected.
4. Press and hold the Cal key for 2 seconds. The current Manual Temperature Setting is now displayed, for example…

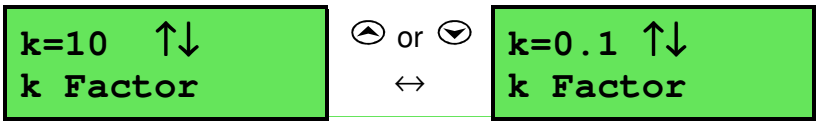


5. Press the ▲ and ▼ keys until the bottom line shows the temperature which you wish to set. This value should be the same as the temperature of the solution you are measuring.
6. Press the Cal key to set the temperature.

6. Selecting k=10 or k=0.1 sensor

The **Aqua-CPA** automatically recognises a k=1.0 sensor. The **Aqua-CPA does not** automatically recognise k=0.1 or k=10 sensors. When a k=0.1 or k=10 sensor is used, the **Aqua-CPA** must be set to the correct k factor before use. The following procedure describes how to select a k=0.1 or k=10 sensor.

1. Switch the meter **OFF**.
2. Connect the k=0.1 or k=10 sensor.
3. Press AND HOLD the Mode key while switching the meter back on.
   The k factor selection menu is now displayed (only if the k=0.1 or k=10 sensor is connected)…



4. Press the ▲ and ▼ keys to alternate between a k=10 and a k=0.1 sensor.
5. Press the Mode key to save the selected setting.

Notes

1. The manual k factor selection is kept in memory when the meter is switched off, even if the battery is removed.
2. The manual k factor selection is reset to k=10 during initialisation.
3. The **Aqua-CPA** will always automatically recognise a k=1.0 sensor, regardless of the manual k factor selection.
4. Calibration settings for k=0.1, k=1.0 and k=10 sensors are **NOT** stored separately. The **Aqua-CPA** requires re-calibration when a new k factor sensor is connected.

7. Selecting Buffers for Auto Buffer Recognition

The **Aqua-CPA** is factory set to automatically recognise pH4.01, pH6.86 and pH9.18 buffers. However, some users may prefer to use pH7.00 instead of pH6.86 and pH10.01 instead of pH9.18. The following procedure describes how to set which of these buffers are automatically recognised at calibration.

1. Switch the meter **OFF**.
2. Press and HOLD the Cal key while switching the meter back on.
3. Release the Cal key when the message, "**Buffer 1 Select**" is displayed.
4. The display will now show the currently selected primary buffer, for example…

7.00pH ↑↓Select	↑ or ↓ ↔	6.86pH ↑↓Select

5. Use the ↑ or ↓ keys to alternate between pH7.00 and pH6.86 buffers.
6. Press the Mode key to save the primary buffer.
7. After the message, "**Buffer 2 Select**", the display will now show the currently selected secondary pH buffers, for example…

4.01/9.18pH ↑↓Select	↑ or ↓ ↔	4.01/10.0pH ↑↓Select

8. Use the ↑ or ↓ keys to alternate between pH9.18 and pH10.01 buffers (the display shows pH10.0 for the latter but this buffer is stored as pH10.01).
9. Press the Mode key to save the secondary pH buffers.
10. The buffer recognition setting is kept in memory when the meter is switched off, even if the battery is removed.

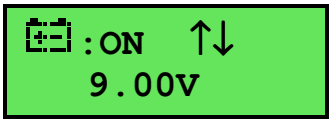
8. Battery

8.1 Battery Saver Function

The **Aqua-CPA** is equipped with a battery saver function. If no button has been pressed for five minutes, the unit beeps and flashes the display for 20 seconds, and then shuts off. This function can be disabled for continuous use.

To enable or disable the battery saver function:

1. Switch the **Aqua-CPA** on.
2. With the meter already switched on, press and HOLD the On/Off key for 3 seconds.
3. The battery saver menu is now displayed. For example…



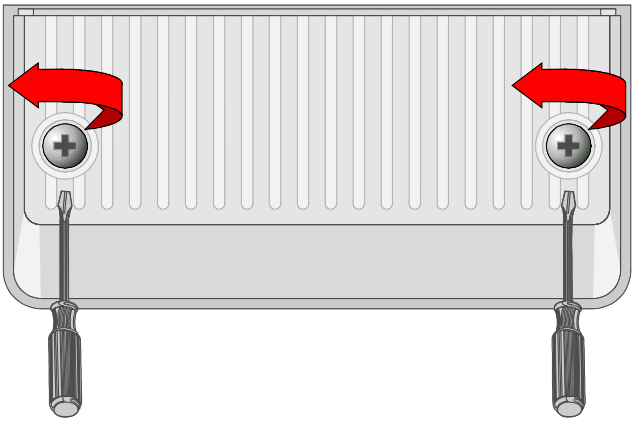
4. In this mode, use the ▲ or ▼ keys to toggle the battery saver function on or off.

   NOTE: The display also shows the battery volts. This gives the operator an idea of how much battery life is remaining. The battery symbol flashes when the battery volts drops below 7.50 volts. At 6.00 volts the meter turns itself off.

5. When you have set the battery saver function to the desired position, press the Mode key to return to normal measurement mode.

8.2 Changing the Battery

1. Turn the instrument over and locate the 2 battery cover screws on the rear. See the diagram below.



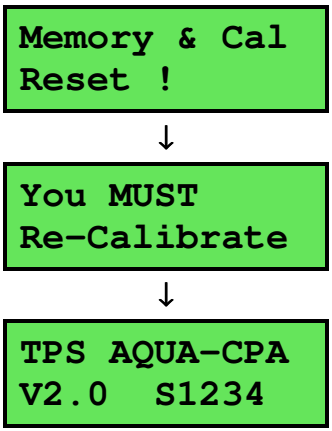
2. Raise the fold out stand (so it is out of the way) and then fully loosen both screws. It is not necessary to pull the screws all the way out. Lift off the battery cover.
3. Replace the battery with a new alkaline 9V battery.
4. Re-fit the battery cover and tighten the screws. **Do not over-tighten**.

9. Initialising the Aqua-CPA

If the calibration settings of the **Aqua-CPA** exceed the allowable limits, and the unit cannot be re-calibrated, then it may need to be initialised to factory default values. This action may be required if an sensor is replaced.

To initialise the **Aqua-CPA**…

1. Switch the **Aqua-CPA** off.
2. Press AND HOLD the ⌓ key while switching the **Aqua-CPA** on.
3. The following messages are now displayed…



4. The meter then displays Conductivity, pH and Temperature. Note that the decimal points have been replaced with a " ∗ ", to indicate that the unit requires re-calibration.

10. Troubleshooting

10.1 General Error Messages

Error Message	Possible Causes	Remedy
Factory Cal. Fail **See Handbook**	The EEPROM chip which contains the factory calibration information has failed.	The unit must be returned to TPS for service. • Conductivity, TDS and Salinity readings will be accurate only if used in same range in which it was calibrated. • Temperature readings may be up to 10% incorrect.
Memory Failed Calib. Lost Memory Reset ! You MUST Re-Cal.	User calibration settings have been lost or corrupted.	Re-calibrate the instrument. Both a Zero and a Standard calibration will be required for Conductivity (section 3) a 2 point calibration for pH (section 4 and a 1 point calibration for temperature (section 5).
Meter displays the word **OFF**, and switches off.	Battery is below 6.00 volts.	Replace the battery.
Meter will not turn on.	Battery is exhausted.	Replace the battery.
Flashing  symbol.	Battery is below 7.50 volts.	Replace the battery soon. Note that the unit will switch itself off when the battery falls below 6.00 volts.

10.2 Conductivity, TDS and Salinity Troubleshooting

Symptom	Possible Causes	Remedy
Unit fails to calibrate, even with new sensor.	Calibration settings outside of allowable limits due to previous failed calibration.	Initialise the unit. See section 9.
Unit attempts Span calibration instead of Zero calibration.	Sensor has Zero error.	Thoroughly rinse sensor in distilled water and allow to completely dry in air before attempting zero calibration. If instrument does not calibrate at Zero with sensor disconnected, then the instrument is faulty.
Standard calibration fails, and span is less than 75%.	1. Sensor is not immersed deeply enough. 2. Sensor may have a build-up of dirt or oily material on sensor wires. 3. Platinum-black coating has worn off. 4. Standard solution is inaccurate. 5. Sensor is faulty.	Immerse sensor at least to the vent hole in the white plastic cover. Clean sensor, as per the instructions detailed in section 11.1. Sensor requires replatinisation. Return to the factory, or see details in section 11.2. Replace standard solution. Return sensor to factory for repair or replacement.
Standard calibration fails, and span is greater than 133%.	1. White protective cover is not fitted. 2. Standard solution is inaccurate. 3. Sensor may have a build-up of conductive material, such as salt. 4. Sensor is faulty.	The white protective cover MUST be fitted for correct readings. Replace standard solution. Clean sensor, as per the instructions detailed in section 11.1. Return sensor to factory for repair or replacement.

Continued next page...

Conductivity, TDS and Salinity Troubleshooting, continued...

Inaccurate readings, even when calibration is successful.	1. Sensor may have a build-up of dirt or oily material on sensor wires. 2. Platinum-black coating has worn off.	Clean sensor, as per the instructions detailed in section 11.1. Sensor requires replatinisation. Return to the factory, or see details in section 11.2.
Readings drift.	1. Sensor may have a build-up of dirt or oily material on sensor wires.	Clean sensor, as per the instructions detailed in section 11.1.
Readings are low or near zero.	1. Sensor may have a build-up of dirt or oily material on sensor wires. 2. Sensor is not immersed deeply enough. 3. Sensor is faulty.	Clean sensor, as per the instructions detailed in section 11.1. Immerse sensor at least to the vent hole in the white plastic cover. Return sensor to factory for repair or replacement.
Display flashes “ATC” and “LIMIT”	The Temperature is not within the ATC limits.	Cool/Heat solution before taking measurements.

10.3 pH Troubleshooting

Symptom	Possible Causes	Remedy
Unit fails to calibrate, even with new sensor.	Calibration settings outside of allowable limits due to previous failed calibration.	Initialise the unit. See section 9.
1 Point calibration fails (Asymmetry is greater than +/- 1.00 pH).	1. Reference junction blocked.	Clean reference junction, as per instructions supplied with the sensor.
	2. Reference electrolyte contaminated.	Flush with distilled water and replace electrolyte.
2 Point calibration fails (Slope is less than 85.0%).	1. Incorrect primary buffer.	Ensure that you are using the buffers which the **Aqua-CPA** has been set to automatically recognise (See section 7).
	2. Glass bulb not clean.	Clean glass bulb as per instructions supplied with the sensor.
	3. Sensor is aged.	Attempt rejuvenation, as per instructions supplied with the sensor. If not successful, replace sensor.
	4. Connector is damp.	Dry in a warm place.
	5. Buffers are inaccurate.	Replace buffers.

Continued over the page…

pH Troubleshooting, continued...

Unstable readings.	1. Reference junction blocked.	Clean reference junction, as per instructions supplied with the sensor.
	2. Glass bulb not clean.	Clean glass bulb as per instructions supplied with the sensor.
	3. Bubble in glass bulb.	Flick the sensor to remove bubble.
	4. Faulty connection to meter.	Check connectors. Replace if necessary.
	5. Reference junction not immersed.	Ensure that the bulb AND the reference junction are fully immersed.
	6. KCl crystals around reference junction, inside the electrolyte chamber.	Rinse electrolyte chamber with warm distilled water until dissolved. Replace electrolyte.
Inaccurate readings, even when calibration is successful.	Reference junction blocked.	Clean reference junction, as per instructions supplied with the sensor.
Displays 7.00 for all solutions.	Electrical short in connector.	1. Check connector. Replace if necessary. 2. Replace sensor.
Displays 4-5 pH for all solutions.	Glass bulb or internal stem cracked.	Replace sensor.
Display flashes "ATC" and "LIMIT"	The Temperature is not within the ATC limits.	Cool/Heat solution before taking measurements.

10.4 Temperature Troubleshooting

Symptom	Possible Causes	Remedy
Displays "**OVRºC**" when sensor is plugged in.	1. Faulty sensor.	Fit new sensor, part number 122201.
	2. Faulty instrument.	Return instrument to factory for repair.
Temperature inaccurate and cannot be calibrated.	1. Faulty connector.	Check the connector and replace if necessary.
	2. Faulty sensor.	Fit new sensor, part number 122201.
	3. Faulty instrument.	Return instrument to factory.

11. Appendices

11.1 Care, Cleaning and Maintenance of Conductivity Sensors

11.1.1 Care of Conductivity sensors

The conductivity section of the sensor supplied with your **Aqua-CPA** consists of two platinum wires that are plated with a layer of "platinum-black". This is quite a soft layer and is required for stable, accurate measurements. In time, the platinum-black layer may wear off in some applications, at which time the sensor will require replatinising (see section 11.2). You can help to maintain the platinum-black layer by following these simple rules:

1. **NEVER** touch or rub the sensor wires with your fingers, cloth etc.
2. Avoid using the sensor in solutions that contain a high concentration of suspended solids, such as sand or soil, which can abrade the sensor wires. Filter these types of solutions first, if possible.
3. Avoid concentrated acids. If you must measure acids, remove the sensor immediately after taking the measurement and rinse well with distilled water.

Conductivity sensors can be stored dry. Ensure that the sensor is stored in a covered container, to avoid dust and dirt build-up.

11.1.2 Cleaning of Conductivity of Sensors.

Platinised platinum Conductivity sensors can only be cleaned by rinsing in a suitable solvent. **DO NOT wipe the sensor wires**, as this will remove the platinum-black layer.

1. Rinsing in distilled water will remove most build-ups of material on the sensor wires.
2. Films of oils or fats on the sensor wires can usually be removed by rinsing the sensor in methylated spirits.
3. Stubborn contamination can be removed by soaking the sensor in a solution of 1 part Concentrated HCl and 10 parts distilled water. The sensor should not be soaked for more than approximately 5 minutes, otherwise the platinum-black layer may start to dissolve.
4. If all of these methods fail, then the last resort is to physically scrub the sensor wires, which will remove the contaminant and the layer of platinum-black. Use only a cloth or nylon scouring pad. DO NOT USE STEEL WOOL. The sensor will then need to be cleaned in HCl, as per step 3 and replatinised, as per section 11.2.

11.2 Replatinising Conductivity Sensors

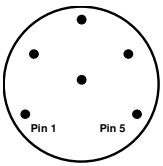
There are several ways to replatinise Conductivity sensors.

1. The simplest way is to return the sensor to the TPS factory. We can fully clean the sensor, replatinise it and test all aspects of its performance.

2. An automatic replatiniser is available from TPS, along with replatinising solution. This will plate the sensors for the right amount of time at the correct current. Ordering details are as follows:

Automatic Conductivity Sensor Replatiniser	Part No 122160
20mL Platinising Solution (for approx 30 uses)	Part No 122300

3. Conductivity sensors can be manually replatinised, according to the following procedure:
   1) Soak the sensor in a solution of 1 part Concentrated HCl and 10 parts distilled water for approximately 5 minutes.
   2) Rinse the sensor well in distilled water.
   3) Immerse the sensor in platinising solution at least to the vent hole in the white plastic cover. Platinising solution is available from TPS (part no 122300). Alternatively, platinising solution can be prepared by dissolving 1g of Hydrogen Chloroplatinate (H_2PtCl_{16}) in 30mL of distilled water, and including about 0.01g of Lead Acetate ($(CH_3COO)_2Pb$) and a drop or two of concentrated HCl.
   4) Apply a direct current of 10mA between pins 1 and 5 of the sensor plug, as per the diagram below. Reverse the polarity every 30 seconds. After approximately 8 minutes (4 minutes per sensor wire), they should have an even “soot” like appearance. Avoid excess current as this will cause incorrect platinising.
   5) After platinising, rinse the sensor well in distilled water.
   6) If you have any doubts about any of these steps, then you should consider returning the sensor to the factory. The cost of replatinising is quite low, and you will be guaranteed of the best possible result.



Sensor Connector

11.3 pH Sensor Fundamentals

A combination pH sensor is two sensors in one. The sensing membrane is the round or spear shaped bulb at the tip of the sensor. This produces a voltage that changes with the pH of the Solution. This voltage is measured with respect to the second part of the sensor, the reference section. The reference section makes contact with the sample solution using a salt bridge, which is referred to as the reference junction. A saturated solution of KCl is used to make contact with the sample. It is vital that the KCl solution has an adequate flow rate in order to obtain stable, accurate pH measurements.

11.3.1 Asymmetry of a pH Sensor

An "ideal" pH sensor produces 0 mV output at 7.00 pH. In practice, pH sensors generally produce 0 mV output at slightly above or below 7.00 pH. The amount of variance from 7.00 pH is called the asymmetry. Figure 11-1 illustrates how asymmetry is expressed.

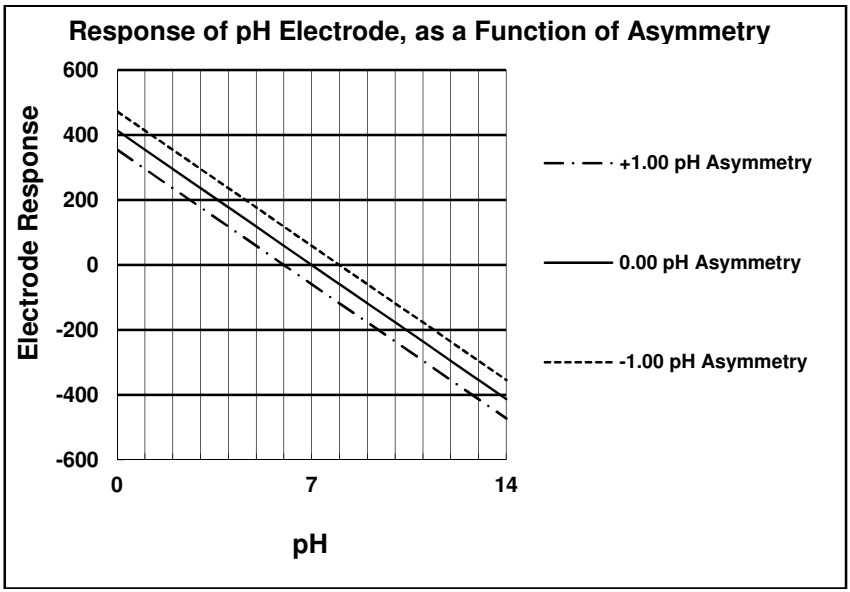


Figure 11-1

11.3.2 The Slope of a pH Sensor

As mentioned above, a pH sensor produces 0 mV output at around 7.00 pH. As the pH goes up, an “ideal” pH sensor produces -59mV/pH unit at 25 ^{O}C As the pH goes down, an ideal pH sensor produces +59mV/pH unit. In practice, pH sensors usually produce slightly less than this. The output of a pH sensor is expressed as a percentage of an ideal sensor. For example, an ideal sensor that produces 59mV/pH unit has “100% Slope”. An sensor that produces 50.15mV/pH unit has “85% Slope” (see Figure 11-2).

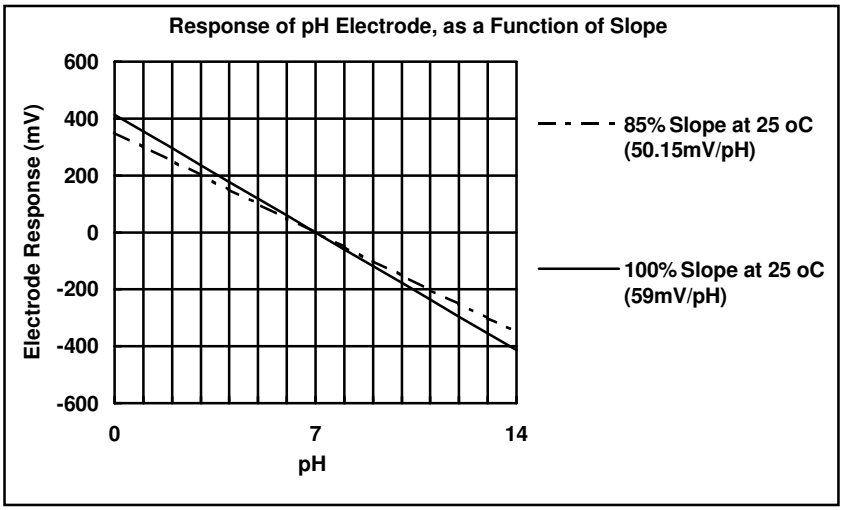


Figure 11-2

11.3.3 Temperature Compensation

The slope of a pH sensor (section 11.3.2) is affected by temperature. This effect is compensated for either by using an Automatic Temperature Compensation (ATC) sensor or by entering the sample temperature manually. Figure 11-3 shows the slope of a pH sensor at various temperatures.

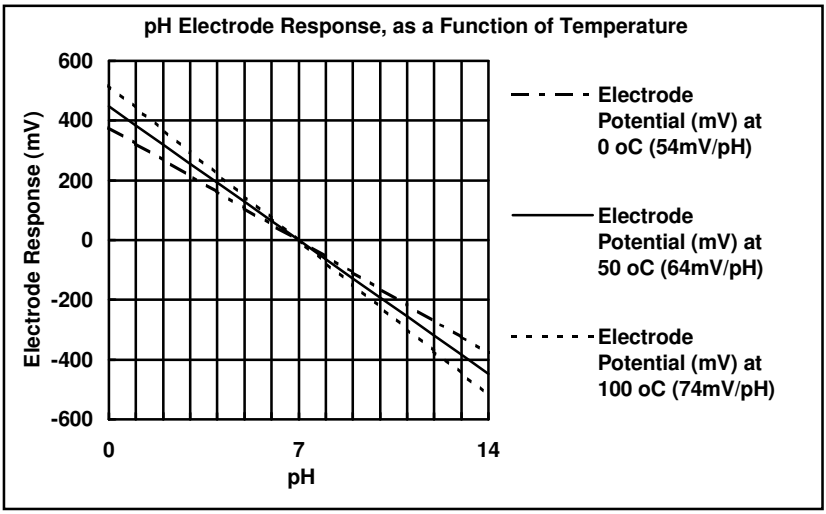
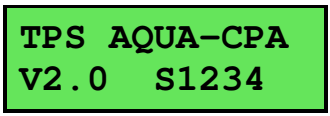


Figure 11-3

11.4 Instrument software version number.

If you need to phone or fax TPS for any further technical assistance, the version number of your **Aqua-CPA** firmware may of benefit to us. Please obtain the version number before phoning or faxing.

The version number is displayed on the bottom left of the display when the **Aqua-CPA** is switched on. For example…



"**V2.0**" in this example is the firmware version number.

"**S1234**" in this example is the instrument's serial number.

12. Warranty

TPS Pty Ltd guarantees all instruments and sensors to be free from defects in material and workmanship when subjected to normal use and service. This guarantee is expressly limited to the servicing and/or adjustment of an instrument returned to the TPS Pty Ltd Factory Service Centre, freight prepaid, within twelve (12) months from the date of delivery, and to the repairing, replacing, or adjusting of parts which upon inspection are found to be defective. Warranty period on sensors is six (6) months.

Freight costs to and from the factory are the responsibility of the purchaser. Shipping damage is not covered by this warranty.

TPS Pty Ltd accepts no liability for any incidental or consequential damages caused by or resulting from the use or misuse of this equipment either due to failure of the equipment, incorrect calibration, incorrect operation, or from interpretation of information derived from the equipment. Specifications are subject to change without notice. This warranty becomes invalid if modifications or repairs are carried out on this unit by unauthorised persons. There are no express or implied warranties which extend beyond the face hereof.

Procedure for Service

Please read service details on our **'Service' web page** first:
http://www.tps.com.au/service.htm

TPS Pty Ltd has a reputation for prompt and efficient service. If you feel that this equipment is in need of repair, please re-read the manual. Sometimes, instruments are received for "repair" in perfect working order. This can occur where batteries simply require replacement or re-charging, or where the sensor simply requires cleaning or replacement.

Return the instrument AND ALL SENSORS to TPS Pty Ltd freight pre-paid. It is your responsibility as the sender to ensure that TPS Pty Ltd receives the unit, so consider using a traceable freight service.

Please check that the following is enclosed with your equipment:

- **A TPS 'Service / Return Goods Form' – see web link below:**
  http://www.tps.com.au/Service/Service%20form_web.pdf
- **Your full name**
- **Your company name**
- **Your email address or fax number**
- **Your return street address**
- **A description of the fault. (Please be specific - "Please Repair" does not describe a fault.)**

Your equipment will be repaired and returned to you by express air freight where possible.

For instruments beyond warranty period, a repair cost will be calculated from parts and labour costs and emailed to you. If you decline to have the equipment repaired, the complete instrument will be returned to you freight paid, not serviced.

TPS Pty Ltd has only one service location, which is located at our factory in Brisbane:

Service Department
TPS Pty Ltd
Unit 6 / 253 Leitchs Road
Brendale, QLD 4500
Australia
T: (07) 3205 8027
F: (07) 3808 4871
E: tps@tps.com.au
W: www.tps.com.au