Congratulations !
You have purchased the latest in benchtop pH-mV-Temperature instrumentation. We trust that your new **901-PH** will give you many years of reliable service.

The **901-PH** 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 **901-PH**. It also contains a full listing of all of the items that you should have received with your **901-PH**. 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 **901-PH**, 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.

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Model 901-PH
pH-mV-Temp.
Meter

Handbook Version : 5
Date : 30-Aug-99
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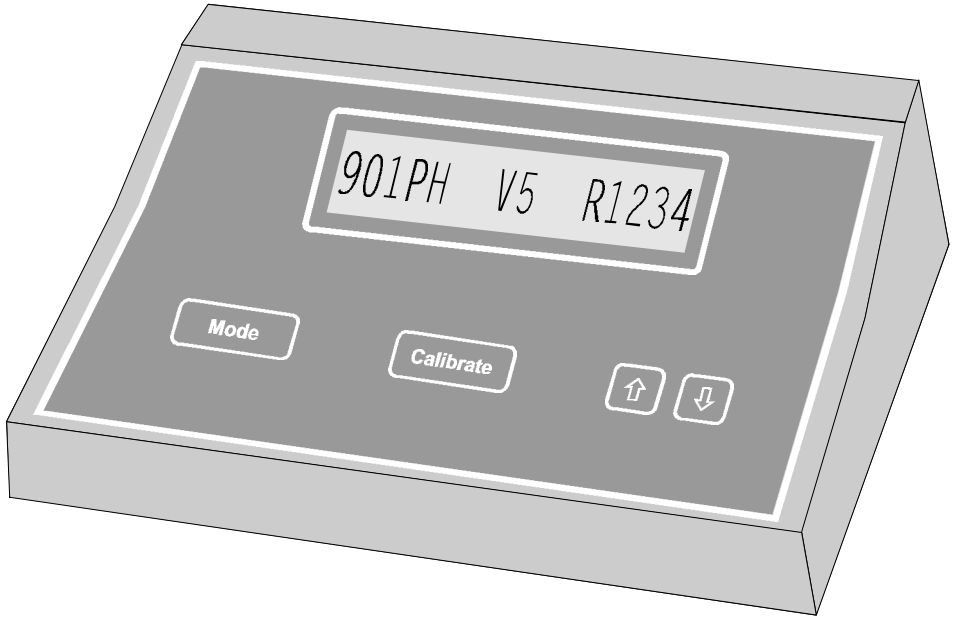
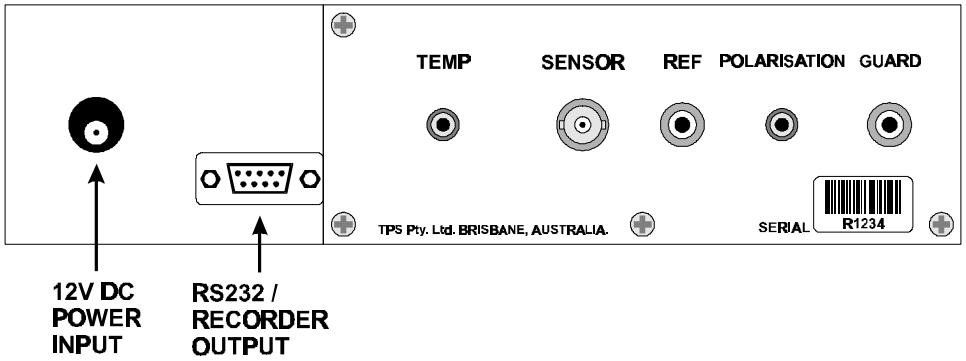
Contents

1. Introduction

1.1 901-PH Display and Controls



1.2 901-PH Rear Panel Connectors



1.3 901-PH Front Panel

Display

- 16 character alphanumeric LCD with 14.5 mm characters.
- pH/mV and Temperature can be displayed simultaneously.
- User friendly text prompts and error messages.
- Serial number is displayed when the **901-PH** is switched on.

Mode Key

- Switches between pH, mV, Temperature and 2 optional RS232 modes. See section 2.

Calibrate Key

- Used to calibrate pH and Temperature. See sections 3 and 5.
- Also used to select buffers for automatic buffer recognition. See section 8.

⇧ and ⇩ Keys

- Used for temperature calibration. See section 5.
- Used for setting the manual temperature compensation value if the temperature sensor is unplugged. See section 5.4.
- Press ⇧ to recall asymmetry value from the last successful pH calibration.
- Press ⇩ to recall slope value from the last successful pH calibration.
- Used to select baud rate when optional RS232 port is fitted. See section 6.1.
- Used to select output "send" rate when optional RS232 port is fitted. See section 6.2

1.4 Unpacking Information

Before using your new **901-PH**, please check that the following accessories have been included:

		Part No
1.	**901-PH** pH-mV-Temperature Instrument	121102
2.	Combination pH Sensor	121207
3.	Temperature/ATC Sensor	121245
4.	pH6.88 Buffer, 200mL	121306
5.	pH4.00 Buffer, 200mL	121381
6.	AC/DC Power Adaptor	130044
7.	**901-PH** Handbook	130050

Options that may have been ordered with your **901-PH**:

1.	Solution Guard Rod	121360
2.	Double Platinum Electrode for Karl Fischer Titrations	122207
3.	Flexible arm type sensor holder	130088
4.	RS232 option (includes cable)	130029
5.	RS232 Communication software for Windows	130086
6.	Recorder output option (includes cable)	130028
7.	Recorder PLUS RS232 option (includes cable)	130049

1.5 Specifications

	Ranges	Resolution	Accuracy
pH	0 to 14.00 pH	0.01 pH	±0.01 pH
mV	0 to ±600.0 mV 0 to ±1500 mV (auto-ranging)	0.1 & 1 mV	±0.15 & ±1 mV
Temperature	-10.0 to 120.0 ^{O}C	0.1 ^{O}C	±0.2 ^{O}C

Input Impedance : >3 x 10^{12} Ω
Asymmetry Range : -1.00 to 1.00 pH
Slope Range : 85.0 to 105.0%
Temperature Compensation : 0 to 100.0 ^{o}C, automatic or manual
Recorder Output : pH : 0 to 14.00 pH for 0 to 2000 mV
i.e. pH7.00 = 1000 mV
mV : -1500 to +1500 mV for 0 to 2000 mV
i.e. 0 mV = 1000 mV
Temp : -10.0 to 120.0 ^{O}C for 0 to 2000 mV
i.e. 0.0 ^{O}C = 152 mV
Output impedance approx 1000 Ohms.
Power : 12V DC by AC/DC power adaptor.
Dimensions : 270 x 210 x 75 mm
Mass : Instrument only : Approx 1.0 kg
Full Kit : Approx 2.5 kg
Environment Temperature : 0 to 45 ^{o}C
Humidity : 0 to 90 % R.H.

2. Operating Modes

If the **901-PH *IS NOT*** fitted with the RS232 option, press the Mode key to roll through the three operating modes as follows…

pH Mode — 7.00pH 25.0°c

↓ Mode

mV Mode — 500.0mV 25.0°c

↓ Mode

Temperature Mode — 25.0°c

↓ Mode

Back to pH Mode

If the **901-PH *IS*** fitted with the RS232 option, press the Mode key to roll through the five operating modes as follows…

pH Mode — 7.00pH 25.0°c

↓ Mode

mV Mode — 500.0mV 25.0°c

↓ Mode

Temperature Mode — 25.0°c

↓ Mode

RS232 Send Rate — Send Rate ↑ 0↓

↓ Mode

RS232 Baud Rate — Baud Rate ↑9600↓

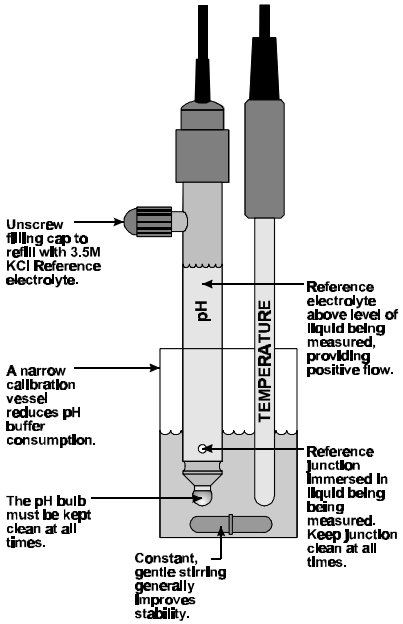
↓ Mode

Back to pH Mode

3. pH Calibration

3.1 Calibration Procedure

1. Switch the **901-PH** on and select pH mode (section 2).
2. Plug the pH sensor into the **Sensor** socket and the temperature sensor into the **Temp** socket.
3. Ensure that temperature has already been calibrated or manually set (see sections 5.1 and 5.4). NOTE: A " ∗ " in place of the decimal point in the temperature readout indicates that temperature is not calibrated.
4. Ensure that the primary and secondary buffers to be used have been correctly selected for automatic buffer recognition. See section 8.
5. Remove the wetting cap from the pH sensor.
6. Rinse the pH and Temperature sensors in distilled water and blot them dry.
7. Place both sensors into a small sample of primary buffer (pH6.88 or pH7.00) so that the bulb and reference junction are both covered, as per the diagram below.



DO NOT place the sensors directly into the buffer bottle.

8. When the reading has stabilised, press the Calibrate key to calibrate. If a 1 point calibration has been performed, a " ∗ " in place of the decimal point will not be removed until a full 2 point calibration has been performed.

9. Rinse the pH and Temperature sensors in distilled water and blot them dry.

10. Place both sensors into a small sample of secondary buffer (pH4.00, pH9.23 or pH10.01) so that the bulb and reference junction are both covered, as per the diagram in step 7 above.

    DO NOT place the sensor directly into the buffer bottle.

    NOTE: pH9.23 and pH10.01 buffers are highly unstable. Avoid using these buffers if possible. Discard immediately after use.

    When the reading has stabilised, press the Calibrate key to calibrate.

    The " ∗ " in the pH reading will now be replaced by a decimal point if calibration was successful.

11. The **901-PH** is now calibrated and is ready for use.

    Discard the used samples of buffer.

3.2 Calibration Notes

1. A 1-point calibration should be performed at least weekly. In applications where the sensor junction can become blocked (eg. wines, 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 **901-PH** is switched off, even when the power supply is removed.

3.3 Calibration Messages

1. If a 1-point calibration has been successfully performed, the **901-PH** will display the asymmetry of the sensor and then go back to pH mode. For example…

   `1 Point Cal. OK` then: `Asym=0.10pH`

   The " * " in place of the decimal point in the pH reading is not removed unless a full 2 point calibration has been previously performed.

2. If a 1-point calibration has failed, the **901-PH** will display the failed asymmetry value of the sensor, before returning to pH mode. For example…

   `1 Point Cal.Fail` then: `Asym=1.10pH`

   The decimal point in the pH reading is replaced by a " * " to indicate that pH is not correctly calibrated.

3. If a 2-point calibration has been successfully performed, the **901-PH** will display the asymmetry and slope of the sensor and then go back to pH mode. For example…

   `2 Point Cal. OK`

   then:

   `Asym=0.10pH` then: `Slope=99.0%`

   Note that " * " in the pH reading has now been replaced by a decimal point, due to the successful calibration.

4. If a 2-point calibration has failed, the **901-PH** will display the following message, and then the failed slope value of the sensor before returning to pH mode. For example…

   `2 Point Cal.Fail` then: `Slope=85.0%`

   Note that " * " replaces the decimal point in the pH reading to indicate that pH is not correctly calibrated.

4. mV Calibration

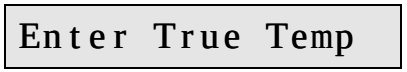
The mV section is factory calibrated. There is no user-calibration facility for this mode.

5. Temperature Calibration

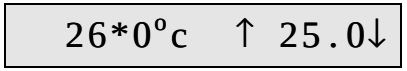
The temperature readout must be calibrated or manually set before attempting pH calibration. The decimal point in the temperature reading is replaced by a " * " if the reading is not calibrated.

5.1 Calibration Procedure

1. Switch the **901-PH** on and select Temperature mode (see section 2).
2. Plug the temperature sensor (Part No 121245) into the **Temp** socket.
3. Place the sensor alongside a good quality mercury thermometer into a beaker of room temperature water. Stir the sensor and the thermometer gently to ensure an even temperature throughout the beaker.
4. When the reading has stabilised, press the Calibrate key.
5. The **901-PH** now enters temperature calibration. For example…

   then:

6. Press the ⇧ and ⇩ keys until the display shows the same temperature as the mercury thermometer.
7. Press the Calibrate 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 when the power supply is removed.

2. Temperature does not need to be recalibrated unless the Temperature sensor is replaced or the meter is initialised.

5.3 Calibration Messages

1. If a temperature calibration has been successfully performed, the **901-PH** will display the offset value of the sensor and then return to Temperature mode. For example…

Temp Cal. OK	then:	Offset=1.0°c

   The " * " is replaced by a decimal point in the Temperature reading to indicate that Temperature is correctly calibrated.

2. If a temperature calibration has failed, the **901-PH** will display the failed offset value of the sensor before returning to Temperature mode. For example…

Temp Cal. Fail	then:	Offset=11.0°c

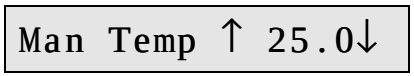
   Note that " * " replaces the decimal point in the Temperature reading to indicate that Temperature is not correctly calibrated.

5.4 Manual Temperature Setting

Manual temperature setting is only available if the temperature sensor is not plugged in.

An "m" is added to the Temperature display when the **901-PH** is using a manual Temperature setting. For example…

1. Switch the **901-PH** on and select Temperature mode (see section 2).
2. Measure the temperature of the sample solution.
3. Press the Calibrate key.
4. The **901-PH** now enters manual temperature setting. For example…



5. Press the ⇧ and ⇩ keys until the display shows the temperature of sample solution.
6. Press the Calibrate key to save the manual temperature setting.

   Alternatively, press the Mode key to quit and retain the current setting.

6. RS232 Port

This section is applicable if the optional RS232 port is fitted.

6.1 Setting the Baud Rate

1. Select RS232 Baud Rate mode (see section 2).
2. The currently selected baud rate is displayed. For example…

   Baud Rate ↑9600↓

   Press the ⇧ and ⇩ keys to scroll through the available baud rates of 300, 1200 or 9600 baud.

   Ensure that the displayed baud rate matches the baud rate set on the printer or PC with which the **901-PH** is communicating.
3. Press the Mode key to return to pH, mV or Temperature mode as required.

6.2 Sending Readings to the RS232 Port

The **901-PH** can send readings to the RS232 port at a pre-set rate.

To set this Send Rate…

1. Select RS232 Send rate mode (see section 2).
2. The currently selected Send rate is displayed. For example…

   Send Rate ↑ 0↓

   Press the ⇧ key to increase the Send Rate.

   Press the ⇩ key to decrease the Send Rate.

   The Send Rate can be set from 0 to 9999 seconds.

   Set the Send Rate to Zero to allow the **901-PH** to accept commands from a remote computer.
3. Press the Mode

6.3 RS232 Configuration

The **901-PH** RS232 configuration is 8 bits, No Parity, 1 Stop Bit, XON/XOFF Protocol.

6.4 Communication and Statistical Software

Communication between the **901-PH** and a PC can be handled with any RS232 communication software. The diskette supplied by TPS contains a BASIC program for this purpose. A Windows version is also optionally available from TPS (part number 130086).

Once the data is saved to disk, the next problem is how to use it. The data sent by the **901-PH** is formatted in columns that can be imported by programs such as Microsoft® Excel® and Lotus 123®.

Information on how to use the software is provided in the README files on the diskette.

6.5 Commands

The following command can be sent from a PC to the **901-PH**. Note that <cr> denotes carriage return and <lf> denotes a line feed.

Action	Command	Notes
Request current data	?D<cr>	Returns the current pH/mV and Temperature data from the **901-PH**. The print rate must be set to zero (see section 6.2).

6.6 Data Format

A. Data is returned to the RS232 port by the **901-PH** in the following format when requested by a PC with the ?D command (section 6.5):

DDDDDDUU♦♦TTTTTToCm<cr>

or B. Data is sent to the RS232 port by the **901-PH** in the following format when it is sent by the **901-PH** using the Send function (section 6.2):

DDDDDDUU♦♦TTTTTToCm<cr><lf>

where: **DDDDDD** is the pH or mV data. Maximum 6 characters, right justified. A " ∗ " is sent instead of the decimal point if the reading is not calibrated.

UU is the unit description, either pH or mV, left justified.

♦♦ is two spaces.

TTTTTT is the Temperature data. Maximum 6 characters, right justified. A " ∗ " is sent instead of the decimal point if the reading is not calibrated.

oCm is the Temperature unit description, left justified.
oC is sent for real temperature data.
oCm is sent for manual temperature compensation data.

Notes:

1. Data corresponds to the Mode selected (ie pH or mV).
2. pH or mV data and units are replaced by spaces in Temperature Mode.
3. **+OVR** or **–OVR** is sent when the Data is over-range.
4. **BUSY**<cr> is sent when the **901-PH** is Busy (ie in calibration, Baud Rate mode, Send rate mode etc.) or when data is not available.

7. Recorder Output Option

This section is applicable when the optional analogue recorder output is fitted. The recorder output corresponds to the currently selected display mode. There is no output in RS232 Send Rate or RS232 Baud Rate modes.

The output voltages are as follows:

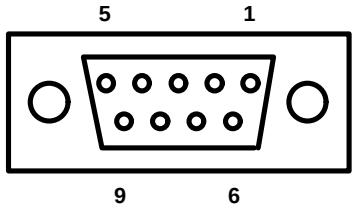
pH : 0 to 14.00 pH for 0 to 2000 mV
i.e. pH7.00 = 1000 mV Output

mV : -1500 to +1500 mV for 0 to 2000 mV
i.e. 0 mV Reading = 1000 mV Output

Temperature : -10.0 to 120.0 ^{O}C for 0 to 2000 mV
i.e. 0.0 ^{O}C = 152 mV Output

Output impedance approx 1000 Ohms.

7.1 RS232 / Recorder Output Socket Connections



Pin No	Connection
1	Chassis
2	Receive RS232 Data
3	Transmit RS232 Data
4	+10 V DC Power Output
5	Ground
6	Recorder Output Signal
7	Recorder Output Common
8	No Connection
9	No Connection

8. Selecting Buffers for Automatic Buffer Recognition

The **901-PH** is factory set to automatically recognise pH4.00, pH6.88 and pH9.23 buffers. There is also the options of using pH7.00 instead of pH6.88 and pH10.01 instead of pH9.23. The following procedure describes how to set which of these buffers are automatically recognised at calibration.

1. Switch the meter **OFF** and wait for 10 seconds.
2. Press and HOLD the Calibrate key while switching the meter back on.
3. The display will now show the currently selected primary buffer. For example…

Buffer 1 Select	then:	Buffer 1=6.88pH

   Press the ⇧ or ⇩ keys to alternate between pH6.88 and pH7.00 buffers.
4. Press the Mode key to go on when the desired primary buffer has been selected. The display will now show the currently selected high buffer. For example…

Buffer 2 Select	then:	Buffer 2=9.23pH

   Press the ⇧ or ⇩ keys to alternate between pH9.23 and pH10.01 buffers. The display shows 10.0 for the latter, but this buffer is stored in memory as 10.01.
4. Press the Mode key to exit when the desired high buffer has been selected. The setting is kept in memory when the meter is switched off, even when the power supply is removed. The buffers are re-set to pH6.88 and pH9.23 during initialisation.

   Note: pH6.88 buffer is a DIN 19266 and NBS Primary-standard pH solution. Its use is highly recommended for the most accurate possible results. If pH7.00 buffer is used, ensure that it is manufactured to 0.01pH accuracy. pH7.00 buffer has a buffer capacity less than half that of pH6.88 buffer and is therefore much less stable.

9. Initialising the 901-PH

If the calibration settings of the **901-PH** exceed the allowable limits, the unit may need to be initialised to factory default values. This action may be required if the sensor is replaced.

To initialise the **901-PH**…

1. Switch the **901-PH OFF** and wait for 10 seconds.
2. Press and hold the ⇧ key while switching the **901-PH** back on.
3. The following messages are now displayed…

Initializing	then:	901PHs V5 R1234

   (The "s" after "901PH" is shown when the optional RS232 port is fitted.)

4. The **901-PH** now goes on to pH mode. Note that a " * " replaces each of the decimal points in the pH and Temperature readings, indicating that the unit requires calibration.

Note: When the **901-PH** is initialised, automatic buffer recognition is re-set to pH4.00, pH6.88 and pH9.23. See section 8 if you wish to select pH7.00 buffer instead of pH6.88 and pH10.01 instead of pH9.23.

When the optional RS232 port is fitted, the Baud Rate is set to 9600 and the Send Rate is set to zero. See sections 6.1 and 6.2 for details if these settings need to be altered.

10. Troubleshooting

10.1 General Error Messages

Error Message	Possible Causes	Remedy
Not Factory Cal. (displayed at turn-on)	The EEPROM chip which contains the factory calibration information has failed.	Switch the **901-PH** off, wait 10 seconds, and try switching on again. If message persists, then the unit must be returned to TPS for service.
EEPROM WriteFail then: Contact Factory (displayed at calibration or set-up).	Storage of user calibration settings to the EEPROM has failed.	Switch the **901-PH** off, wait 10 seconds, and then switch the unit on again. Attempt calibration/setup again. If message persists, then the unit must be returned to TPS for service.

10.2 pH and mV Troubleshooting

Symptom	Possible Causes	Remedy
Meter displays "OverR" as a pH reading.	pH reading is over-ranged.	pH sensor not connected or faulty. Replace sensor if necessary.
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. Buffer set incorrectly.	Ensure that you are using buffers that match the selected buffer set. See section 8.
	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.
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.

pH and mV Troubleshooting, continued…

Unstable readings.	1. Static charge or electrical noise from near electrical equipment causing interference.	Fit a solution earth rod to the **Guard** connector.
	2. Reference junction blocked.	Clean reference junction as per instructions supplied with the sensor.
	3. Glass bulb not clean.	Clean glass bulb as per instructions supplied with the sensor.
	4. Bubble in glass bulb.	Flick the sensor to remove bubble.
	5. Faulty connection to meter.	Check connectors. Replace if necessary.
	6. Reference junction not immersed.	Ensure that the bulb AND the reference junction are fully immersed.
	7. KCl crystals around reference junction, inside the electrolyte chamber.	Rinse electrolyte chamber with warm distilled water until dissolved. Replace electrolyte.

10.3 Temperature Troubleshooting

Symptom	Possible Causes	Remedy
Meter reads "OverR" in Temperature mode.	Temperature sensor is connected, but is faulty.	Check the temperature sensor connector, and replace if necessary. Replace temperature sensor (part no 121245), if problem persists.
Meter displays Temperature with an "m", even when temperature sensor is plugged in.	1. Faulty connector.	Check the connector and replace if necessary.
	2. Incorrect temperature sensor.	Fit new temperature sensor, part number 121245.
	3. Faulty temperature sensor.	Fit new temperature sensor, part number 121245.
Temperature inaccurate and cannot be calibrated.	1. Faulty connector.	Check the connector and replace if necessary.
	2. Faulty temperature sensor.	Fit new temperature sensor, part number 121245.

11. Appendices

11.1 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.

11.1.1 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.

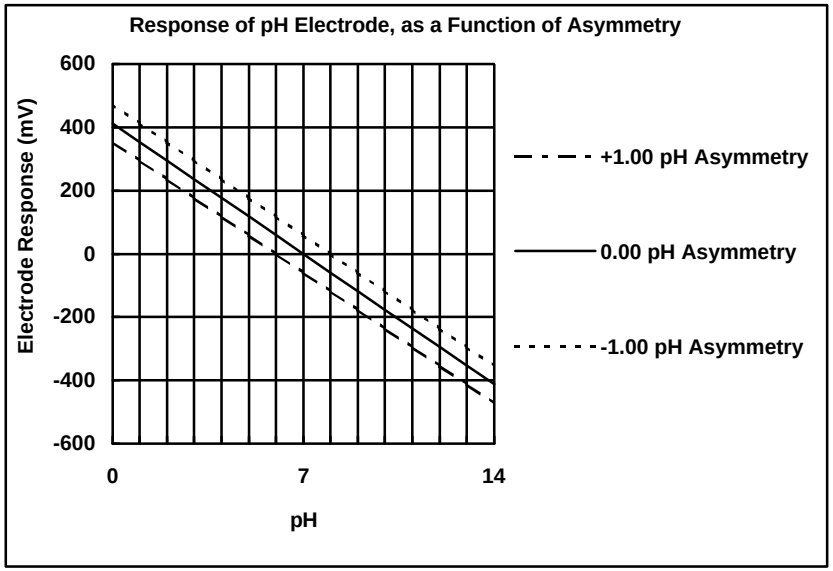


Figure 11-1

11.1.2 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 °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).

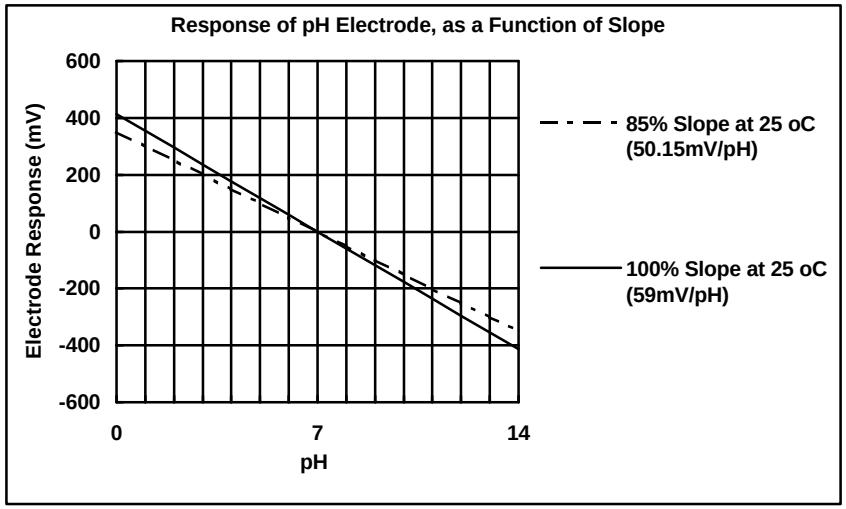


Figure 11-2

11.1.3 Temperature Compensation

The slope of a pH sensor (section 11.1.2) 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.

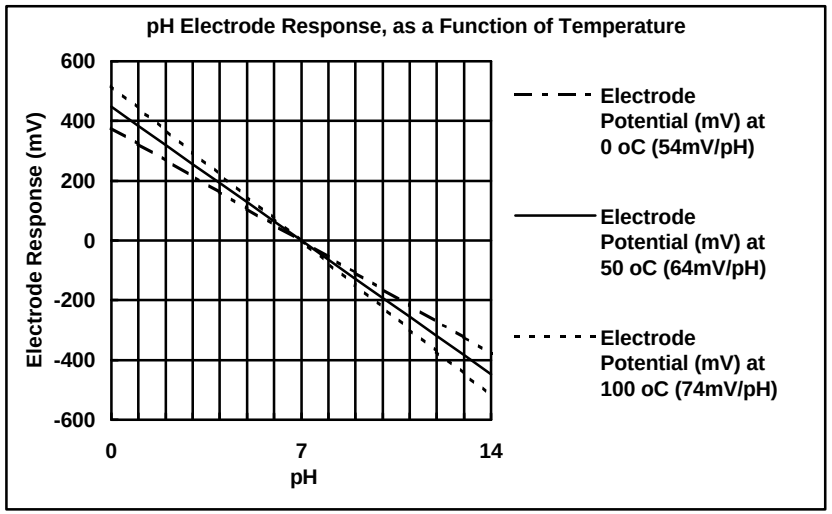


Figure 11-3

11.2 Polarisation Output Connector

The polarisation output connector on the rear panel is for Karl Fischer titrations. This titration is a method for determining minute quantities of water in non-aqueous liquids.

The TPS Double Platinum electrode (part no 122207) has two connectors. The larger BNC connector fits to the **Sensor** socket and the smaller 3.5mm phono plug fits to the **Polarisation** socket.

DO NOT PLUG THE DOUBLE PLATINUM ELECTRODE INTO THE TEMPERATURE SOCKET.

When performing Karl Fischer titrations, ensure that the **901-PH** is in mV mode.

11.3 Guard Connector

In some circumstances, the pH or mV readings may become unstable. This may be due to static charge in the sample vessel, or electrical noise from nearby electrical equipment. In these cases, a solution guard may eliminate the problem.
A solution earth rod is available from TPS (part no 121360). This connects directly to the **Guard** socket. Alternatively, run a wire from the **Guard** socket to a stainless steel fitting in contact with the sample.

11.4 Checking the reference junction of a pH sensor.

If pH readings are inaccurate or unstable, the reference junction of the sensor may be blocked. The following test can be performed to determine if the reference junction of a pH sensor is making adequate contact with the sample solution.

1. Calibrate the **901-PH**, as per section 3.
2. Dilute 1 part of pH6.88 buffer with 9 parts of distilled water.
3. Measure the pH of the diluted buffer. The result should be 7.06 +/-0.05 pH.
4. If the value obtained is outside of these limits, then clean the reference junction as per the instructions supplied with the pH sensor.
5. Re-calibrate the **901-PH** and repeat the test.
6. If the value obtained is still outside 7.06 +/-0.05 pH, then the sensor should be replaced.

11.5 Determining if an instrument or sensor is faulty

The following test can be performed to help determine if the **901-PH** or the pH sensor is faulty.

1. Initialise the **901-PH** (see section 9).
2. Disconnect the pH sensor.
3. Connect the centre pin of the **Sensor** connector with the outside frame of the connector, using a short piece of wire or a paper clip etc.
4. The meter should read approximately 7.00. If you press the Calibrate key, the **901-PH** will calibrate to around 6.88 pH, depending upon the temperature readout.
5. If the **901-PH** is operating correctly, the reading should be totally stable with the wire firmly in place. If not, the meter requires servicing.
6. Now carefully disconnect the wire from the centre pin only (make sure the other end of the wire remains connected to the outside frame of the connector).
7. The reading should steadily drift away from 7.00 (either up or down) at a rate of approximately 1 pH or less every 3 seconds. If the drift rate is faster than this, then input circuitry of the **901-PH** may be faulty and could require servicing.

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 Factory, or Authorised Service Station, 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 three (3) months.

There are no express or implied warranties which extend beyond the face hereof, and TPS Pty. Ltd. is not liable for any incidental or consequential damages arising from the use or misuse of this equipment, or from interpretation of information derived from the equipment.

Shipping damage is not covered by this warranty.

PLEASE NOTE:
A guarantee card is packed with the instrument or sensor. This card must be completed at the time of purchase and the registration section returned to TPS Pty. Ltd. within 7 days. No claims will be recognised without the original guarantee card or other proof of purchase. This warranty becomes invalid if modifications or repairs are attempted by unauthorised persons, or the serial number is missing.

PROCEDURE FOR 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.

TPS Pty. Ltd. has a fine reputation for prompt and efficient service. In just a few days, our factory service engineers and technicians will examine and repair your equipment to your full satisfaction.

To obtain this service, please follow this procedure:
Return the instrument AND ALL SENSORS to TPS freight pre-paid and insured in its original packing or suitable equivalent. INSIST on a proof of delivery receipt from the carrier for your protection in the case of shipping claims for transit loss or damage. It is your responsibility as the sender to ensure that TPS receives the unit.

Please check that the following is enclosed with your equipment:

- **Your Name and daytime phone number.**
- **Your company name, ORDER number, and return street address.**
- **A description of the fault. (Please be SPECIFIC.)**
  (Note: "Please Repair" does NOT describe a fault.)

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

For out-of-warranty units, a repair cost will be calculated from parts and labor costs. If payment is not received for the additional charges within 30 days, or if you decline to have the equipment repaired, the complete unit will be returned to you freight paid, not repaired. For full-account customers, the repair charges will be debited to your account.

- **Always describe the fault in writing.**
- **Always return the sensors with the meter.**