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

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

TPS Pty Ltd
4 Jamberoo Street
Springwood, Brisbane,
Australia, 4127

Phone : (07) 32 900 400
International : 61 7 32 900 400

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

Email : tps@tpssite.com.au

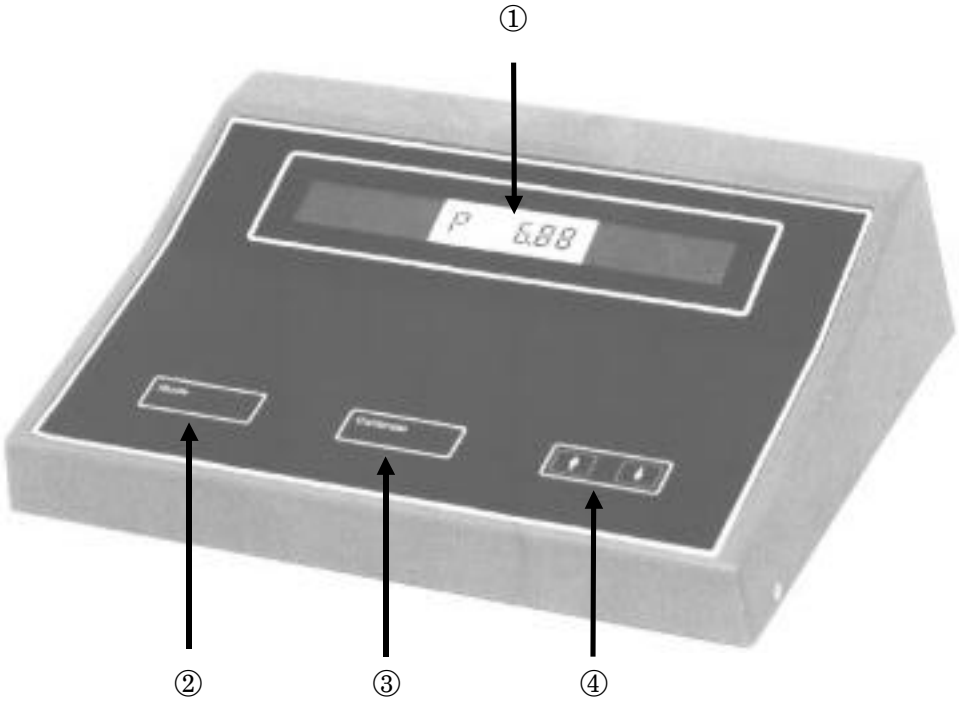
Model 901-N
pH-Conductivity-Temp. Meter

Handbook Version : 3.0
Date : 30/03/99
Author : MS

Contents

1. Introduction

1.1 901-N Display and Controls



① **Display**

6 digit LCD display with 15mm digits.

Mode Enunciator displays…

1. **P** for **p**H Mode
2. **S** for **S**alt level in mS/cm Conductivity units (ppK Salinity optional)
3. **H** for **H**eat (temperature in ^{O}C)
4. **1** for **1**200 Baud in RS232 mode (when RS232 option is fitted)
   3 for **3**00 Baud in RS232 mode (when RS232 option is fitted)
   9 for **9**600 Baud in RS232 mode (when RS232 option is fitted)

② **Mode**

Switches between pH, Conductivity/Salinity, Temperature and optional RS232 modes. See section 2.

③ **Calibrate**

Used to calibrate pH, Conductivity/Salinity and Temperature, See sections 3, 4, and 5.

Also used to select pH6.88 or pH7.00 as the primary buffer. See section 9.

④ ▲ and ▼

The ▲ and ▼ keys are used for temperature calibration (section 5), setting the manual temperature compensation value if the temperature probe is unplugged (section 5.4) and recalling calibration values from the last successful pH, Conductivity/Salinity and Temperature calibrations.

1.2 Unpacking Information

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

		Part No
1.	**901-N** pH-Conductivity-Temp Instrument	126113
2.	Intermediate Junction pH Sensor	121234
3.	k=10/ATC Pipette Style Conductivity Sensor	122210
4.	Temperature/ATC Probe	121245
5.	pH6.88 Buffer, 200mL	121306
6.	pH4.00 Buffer, 200mL	121381
7.	8.0 mS/cm Conductivity Standard	122311
8.	Filling Solution for pH Sensor	121326
9.	900 Series AC/DC Power Supply	130044
10.	**901-N** Handbook	130050

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

1.	Flexible arm type electrode holder	130088
2.	RS232 option (includes cable)	130029
3.	Recorder output option (includes cable)	130028
4.	Recorder PLUS RS232 option (includes cable)	130049
5.	Salinity Readout (instead of Conductivity)	130020

1.3 Specifications

	Ranges	Resolution	Accuracy
pH	0 to 14.00 pH	0.01 pH	±0.01 pH
Conductivity	0 to 100.0 mS/cm	0.1 mS/cm	±0.1 mS/cm
Salinity (optional)	0 to 100.0 ppK	0.1 ppK	±0.1 ppK
Temperature	-10.0 to 120.0 ^{O}C	0.1 ^{O}C	±0.2 ^{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%
Temperature Compensation : 0 to 100.0 ^{o}C, automatic or manual
Recorder Output : pH : 0 to 14.00 pH for 0 to 2000 mV
ie. pH7.00 = 1000 mV
Cond. : 0 to 100.0 mS/cm for 0 to 1000 mV
ie. 8 mS/cm = 80 mV
Salinity : 0 to 100.0 ppK for 0 to 1000 mV
ie. 2 ppK = 20 mV
Temp : -10.0 to 120.0 ^{O}C for 0 to 2000 mV
ie. 0.0 ^{O}C = 152 mV
Output impedance approx 1000 Ohms.
Power : 12V DC by AC/DC 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-N *IS NOT*** fitted with the RS232 option, press the Mode key to roll through the three operating modes as follows…

pH Mode
Mode enunciator shows "**P**"

↓

Salt Conductivity Mode
Mode enunciator shows "**S**"

↓

Temperature Mode
Mode enunciator shows "**H**"

↓

Back to pH Mode

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

pH Mode
Mode enunciator shows "**P**"

↓

Salt Conductivity Mode
Mode enunciator shows "**S**"

↓

Temperature Mode
Mode enunciator shows "**H**"

↓

RS232 Mode
Mode enunciator shows **1**, **3** or **9** (see section 6)

↓

Back to pH Mode

3. pH Calibration

3.1 Calibration Procedure

1. Switch the **901-N** on.
2. Press the [Mode] key until the meter is in pH mode. (See section 2)
3. Plug the pH electrode into the **Sensor** socket and the temperature probe into the **Temp** socket.
4. Ensure that temperature has already been calibrated, or manually set (see sections 5.1 and 5.4). NOTE: If the "**H**" is flashing in temperature mode, then the temperature readout is not calibrated.
5. Remove the wetting cap from the pH electrode.
6. Rinse the pH and Temperature electrodes in distilled water and blot them dry.

   Ensure that you are using the primary buffer for which the **901-N** has been set (See section 9, Selecting pH6.88 or pH7.00 as the Primary Buffer).

   Place both electrodes into a small sample of pH6.88 (or pH7.00) buffer, so that the bulb and reference junction are both covered.

   DO NOT place the electrodes directly into the buffer bottle. Discard the used buffer after use.
7. When the reading has stabilised, press the [Calibrate] key to calibrate. If a 1 point calibration has been performed, the flashing "**P**" will not be removed until a full 2 point calibration has been performed.
8. Rinse the pH and Temperature electrodes in distilled water and blot them dry.
9. Place both electrodes into a small sample of pH4.00 or pH9.23 Buffer, so that the bulb and reference junction are both covered.

   DO NOT place the electrodes directly into the buffer bottle.

   Discard the used buffer after use.

   NOTE: pH9.23 buffer is highly unstable. Avoid using this buffer if possible. Discard immediately after use.

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

   The flashing "**P**" will now be replaced by a decimal point, if calibration was successful.
10. The **901-N** is calibrated and ready for use.

3.2 Calibration Notes

1. A 1-point calibration should be performed at least weekly. In applications where the electrode junction can become blocked, such as 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-N** is switched off.

3.3 Calibration Messages

1. If a 1-point calibration has been successfully performed, the **901-N** will display the asymmetry of the electrode, and then go back to pH mode.

   eg: **O 0.10** then: **P 6.88**

   The "**O**" is displayed for "**O**ffset".

   Note that the "**P**" will keep flashing until a 2-point calibration is successfully performed.

2. If a 1-point calibration has failed, the **901-N** will display the following message, then the failed asymmetry value of the electrode, before returning to pH mode.

   eg: **O HELP** then: **O 2.00** then: **P 6.88**

   Note that the "**O**" and "**P**" will be flashing, due to the failed calibration.

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

   eg: **S 100.0** then: **O 0.10** then: **P 6.88**

   The "**O**" is displayed for "**O**ffset", and the "**S**" is displayed for "**S**lope"

   Note that the "**P**" is now no longer flashing, due to the successful calibration.

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

   eg: **S HELP** then: **S 84.0** then: **P 4.50**

   Note that the "**S**" and "**P**" will be flashing, due to the failed calibration.

4. Conductivity / Salinity Calibration

1. Switch the **901-N** on.
2. Press the [Mode] key until the meter is in Salt Conductivity mode (see section 2).
3. Plug the Conductivity electrode into the **Salt Conductivity Sensor** socket.
4. Rinse the Conductivity electrode in distilled water and blot dry.
5. Place the electrode into a small sample of standard solution.

   Use 8.0mS/cm when in Conductivity mode.

   Use 2.0ppK when in (optional) Salinity mode.

   Use the pipette bulb to suck up sufficient standard so that the sensor is filled to approximately 1cm above the electrode wires.

   DO NOT place the electrode directly into the standard bottle. Discard the used standard after use.
6. When the reading has stabilised, press the [Calibrate] key to calibrate. The flashing "**S**" will now stop flashing, if calibration was successful.
7. The **901-N** is calibrated and ready for use in this mode. Simply suck up the required sample with the pipette bulb. Always suck up sufficient sample so that the sensor is filled to approximately 1cm above the electrode wires.

4.1 Calibration Notes

1. Conductivity calibration should be performed at least monthly. Of course, more frequent calibration will result in greater confidence in results.
2. All calibration information is retained in memory when the **901-N** is switched off.

4.2 Calibration Messages

1. If calibration has failed, the **901-N** will display the following message before returning to Salt Conductivity mode.

   S HELP

   Note that the "**S**" will be flashing, due to the failed calibration.

5. Temperature Calibration

The temperature readout must be calibrated or manually set before attempting pH calibration. The "**H**" will flash in Temperature mode if the reading is not calibrated.

5.1 Calibration Procedure

1. Switch the **901-N** on.
2. Press the Mode key until the meter is in Temperature mode.
3. Plug the temperature probe (Part No 121245) into the **Temp** socket.
4. Place the probe into a beaker of room temperature water, alongside a good quality mercury thermometer. Stir the probe and the thermometer gently to ensure an even temperature throughout the beaker.
5. When the reading has stabilised, press the Calibrate key

   The "**H**" will now be flashing, indicating that the **901-N** is now in Temperature Calibration mode.
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.
8. **Note:** Temperature calibration information is stored in memory when the meter is switched off. Temperature does not need to be recalibrated unless the temperature probe is replaced.

5.2 Calibration Notes

1. Temperature calibration information is stored in memory when the meter is switched off.
2. Temperature does not need to be recalibrated unless the Temperature probe is replaced or the meter is initialised.

5.3 Calibration Messages

1. If a temperature calibration has been successfully performed, the **901-N** will display the offset value of the probe and then return to temperature mode.

   eg: **O 1.0** then: **H 25.0**

   The "**O**" is displayed for "**O**ffset".

2. If a temperature calibration has failed, the **901-N** will display the following message, then the failed offset value of the probe, before returning to Temperature mode.

   eg: **O HELP** then: **O 10.0** then: **H 35.0**

   Note that the "**O**" and "**H**" will be flashing, due to the failed calibration.

5.4 Manual Temperature Setting

1. Switch the **901-N** on.
2. Press the Mode key until the meter is in Temperature mode.
3. Manual temperature setting is only available if the temperature probe is not plugged in.
4. 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. RS232 Port

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

6.1 Setting the Baud Rate

1. Press the [Mode] key until the **901-N** is in the RS232 Set-up mode. This mode will have a **1**, **3** or **9** in the enunciator position.
2. Press the [Calibrate] key to roll through the available baud rates, as follows…
   1 for 1200 baud
   3 for 300 baud
   9 for 9600 baud

   Ensure that the baud rate matches the baud rate set on the printer or PC with which the **901-N** is communicating.

6.2 Sending Readings to the RS232 Port

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

To set this print rate…

1. Press the [Mode] key until the **901-N** is in the RS232 Set-up mode. This mode will have a **1**, **3** or **9** in the enunciator position. The current print rate is displayed on the right hand side of the display.
2. Press the [▲] key to increase the print rate.

   Press the [▼] key to decrease the print rate.

   The print rate can be set from 0 to 9999 seconds.

   Set the print rate to ZERO when using commands from a remote computer.

6.3 RS232 Configuration

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

6.4 Communication and Statistical Software

Communication between the **901-N** and a PC can be handled with any RS232 communication software. BASIC software for this purpose is available from TPS.

Once the data is saved to disk, the next problem is how to use it. The data 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-N**. Note that <cr> denotes carriage return and <lf> denotes a line feed.

Action	Command	Notes
Request current data	?D<cr>	Returns the current Conductivity/Salinity, pH and Temperature from the **901-N**. 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-N** in the following format when requested by a PC with the ?D command (section 6.5):

DDDDDDpH♦♦CCCCCCUUU♦TTTTTToCm<cr>

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

DDDDDDpH♦♦CCCCCCUUU♦TTTTTToCm<cr><lf>

where:

DDDDDD is the pH Data. Maximum 6 characters, right justified. A "∗" is sent instead of the decimal point if the reading is not calibrated.

pH is the pH unit description, left justified.

♦♦ is two spaces.

CCCCCC is the Conductivity or Salinity Data. Maximum 6 characters, right justified. A "∗" is sent instead of the decimal point if the reading is not calibrated.

UUU is the Conductivity or Salinity unit description, left justified. "mS" is sent to mS/cm Conductivity or ppK is sent for ppK Salinity.

♦ is one space.

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. Conductivity or Salinity data corresponds to the Mode for which the **901-N** has been factory set.
2. **+OVR** or **–OVR** is sent when the Data is over-range,
3. **BUSY**<cr> is sent when the **901-N** is Busy, i.e. in calibration etc., or when Data is not available, eg. when the **901-N** is in RS232 mode.

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 during Set-RS232 mode.

The output voltages are as follows:

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

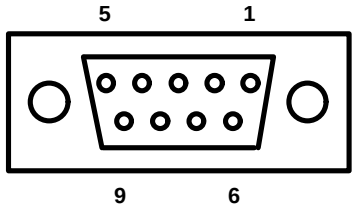
Conductivity : 0 to 100.0 mS/cm for 0 to 1000 mV
ie. 8.0 mS/cm Reading = 80 mV Output

Salinity : 0 to 100.0 ppK for 0 to 1000 mV
ie. 2.0 ppK Reading = 20 mV Output

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

Output impedance approx 1000 Ohms.

8. 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

9. Selecting pH6.88 or pH7.00 as the Primary Buffer

The **901-N** is factory set to automatically recognise pH6.88 as the primary buffer. However, some users may prefer to use pH7.00. The following procedure describes how to alternate between pH6.88 and pH7.00 as the primary buffer.

1. Switch the meter **OFF**.
2. Press and HOLD the [Calibrate] key while switching the meter back on.
3. The display will now show the currently selected primary buffer.

Use the [▲] or [▼] keys to alternate between pH6.88 and pH7.00 buffers.

4. Press the [Mode] key to exit when the desired buffer has been selected. The setting is kept in memory when the meter is switched off. The primary buffer is re-set to pH6.88 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.

10. Initialising the 901-N

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

To initialise the **901-N**…

1. Switch the **901-N** off.
2. Press and hold the [▲] key while switching the **901-N** back on.
3. The message “EEEEEE” is displayed.

   The meter then displays pH. Note that the “**P**” and “**H**” enunciators will be flashing to indicate that the unit requires recalibration.

Note: When the **901-N** is initialised, the primary buffer value is re-set to pH6.88. See section 9 if you wish to select pH7.00 buffer.

11. Troubleshooting

11.1 General Error Messages

Error Message	Possible Causes	Remedy
1 HELP (displayed at turn-on**)**	The EEPROM chip which contains the factory calibration information has failed.	Switch the **901-N** off and try switching on again. If message persists, then the unit must be returned to TPS for service.
2 HELP (displayed at calibration or set-up).	Storage of user calibration settings to the EEPROM has failed.	Switch the **901-N** off and on. Attempt calibration again. If message persists, then the unit must be returned to TPS for service.

11.2 Conductivity / Salinity Troubleshooting

Symptom	Possible Causes	Remedy
Unit fails to calibrate, even with new electrode.	Calibration settings outside of allowable limits due to previous failed calibration.	Initialise the unit. See section 10.
Standard calibration fails, and span is less than 75%.	1. Electrode is not filled enough. 2. Platinum-black coating has worn off. 3. Standard solution is inaccurate. 4. Electrode is faulty.	Suck up sample to at least 1cm above electrode wires. Return electrode to the factory for replatinisation. Replace standard solution. Return electrode to factory for repair or replacement.
Standard calibration fails, and span is greater than 133%.	1. Standard solution is inaccurate. 2. Electrode is faulty.	Replace standard solution. Return electrode to factory for repair or replacement.
Inaccurate or drifting readings, even when calibration is successful.	1. Platinum-black coating has worn off.	Return electrode to the factory for replatinisation.
Readings are low or near zero.	1. Not enough sample sucked up into electrode. 2. Electrode is faulty.	Suck up sample to at least 1cm above electrode wires. Return electrode to factory for repair or replacement.

11.3 pH Troubleshooting

Symptom	Possible Causes	Remedy
Meter flashes alternatively flashes "**P**" and "**H**" in pH mode.	Temperature probe is connected, but is faulty.	Check the temperature probe connector, and replace if necessary. Replace temperature probe (part no 121245), if problem persists.
Meter displays "**P HI**" or "**P LO**" in pH mode.	pH reading is over-ranged.	pH sensor not connected, or faulty. Replace sensor if necessary.
Unit fails to calibrate, even with new probe.	Calibration settings outside of allowable limits due to previous failed calibration.	Initialise the unit. See section 10.
1 Point calibration fails (Asymmetry is greater than +/-1.00 pH).	1. Reference junction blocked. 2. Reference electrolyte contaminated.	Clean reference junction, as per instructions supplied with the electrode. Flush with distilled water and replace electrolyte.
2 Point calibration fails (Slope is less than 85.0%).	1. Incorrect primary buffer. 2. Glass bulb not clean. 3. Electrode is aged. 4. Connector is damp. 5. Buffers are inaccurate.	Ensure that you are using the primary buffer which the **901-N** has been set (See section 9) Clean glass bulb as per instructions supplied with the electrode. Attempt rejuvenation, as per instructions supplied with the electrode. If not successful, replace electrode. Dry in a warm place. Replace buffers.
Inaccurate readings, even when calibration is successful.	Reference junction blocked.	Clean reference junction, as per instructions supplied with the electrode.
Displays 7.00 for all solutions.	Electrical short in connector.	1. Check connector. Replace if necessary. 2. Replace electrode.
Displays 4-5 pH for all solutions.	Glass bulb or internal stem cracked.	Replace electrode.

pH and mV Troubleshooting, continued…

Unstable readings.	1. Reference junction blocked.	Clean reference junction, as per instructions supplied with the electrode.
	2. Glass bulb not clean.	Clean glass bulb as per instructions supplied with the electrode.
	3. Bubble in glass bulb.	Flick the electrode 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.

11.4 Temperature Troubleshooting

Symptom	Possible Causes	Remedy
Meter reads "**H Hl**" in Temperature mode.	Temperature probe is connected, but is faulty.	Check the temperature probe connector, and replace if necessary. Replace temperature probe (part no 121245), if problem persists.
Temperature reading does not changes, when temperature probe is plugged in.	1. Faulty connector. 2. Incorrect temperature probe. 3. Faulty temperature probe.	Check the connector and replace if necessary. Fit new temperature probe, part number 121245. Fit new temperature probe, part number 121245.
Temperature inaccurate and cannot be calibrated.	1. Faulty connector. 2. Faulty temperature probe.	Check the connector and replace if necessary. Fit new temperature probe, part number 121245.

12. Warranty

TPS Pty. Ltd. guarantees all instruments and electrodes 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 electrodes 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 electrode. 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 electrode 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.**

13. Appendices

13.1 pH Electrode Fundamentals

A combination pH Electrode is two electrodes in one. The sensing membrane is the round or spear shaped bulb at the tip of the electrode. This produces a voltage that changes with the pH of the Solution. This voltage is measured with respect to the second part of the electrode, 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.

13.1.1 Asymmetry of a pH Electrode

An “ideal” pH electrode produces 0 mV output at 7.00 pH. In practice, pH electrodes 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 13-1 illustrates how asymmetry is expressed.

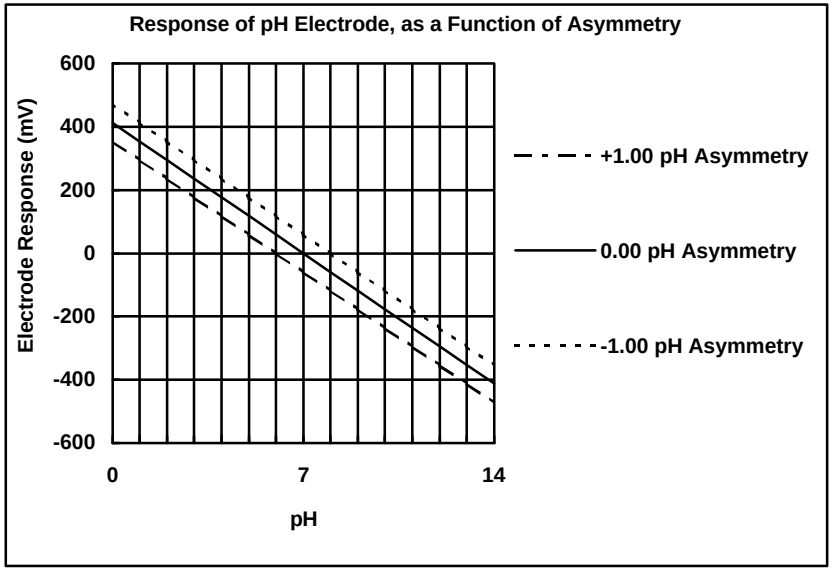


Figure 13-1

13.1.2 The Slope of a pH Electrode

As mentioned above, a pH electrode produces 0 mV output at around 7.00 pH. As the pH goes up, an "ideal" pH electrode produces -59mV/pH unit at 25 ^{o}C As the pH goes down, an ideal pH electrode produces +59mV/pH unit. In practice, pH electrodes usually produce slightly less than this. The output of a pH electrode is expressed as a percentage of an ideal electrode. For example, an ideal electrode that produces 59mV/pH unit has "100% Slope". An electrode that produces 50.15mV/pH unit has "85% Slope" (see Figure 13-2).

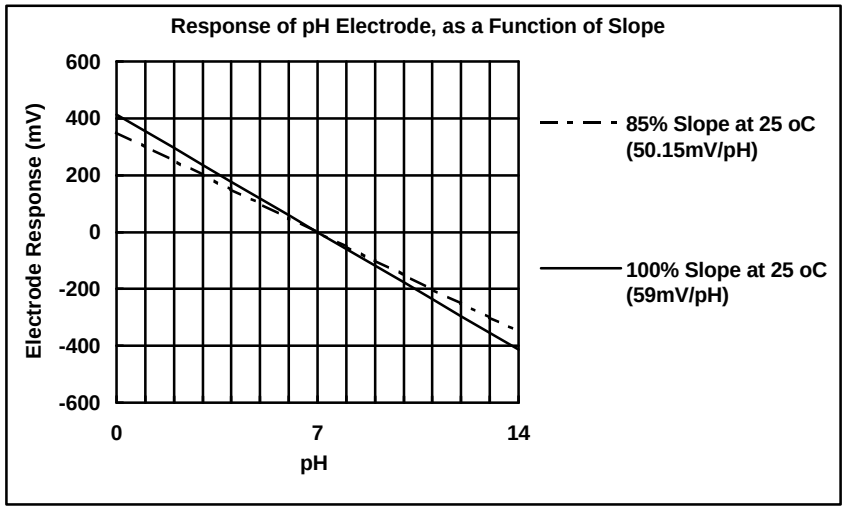


Figure 13-2

13.1.3 Temperature Compensation

The slope of a pH electrode (section 13.1.2) is affected by temperature. This effect is compensated for either by using an Automatic Temperature Compensation (ATC) probe or by entering the sample temperature manually. Figure 13-3 shows the slope of a pH electrode at various temperatures.

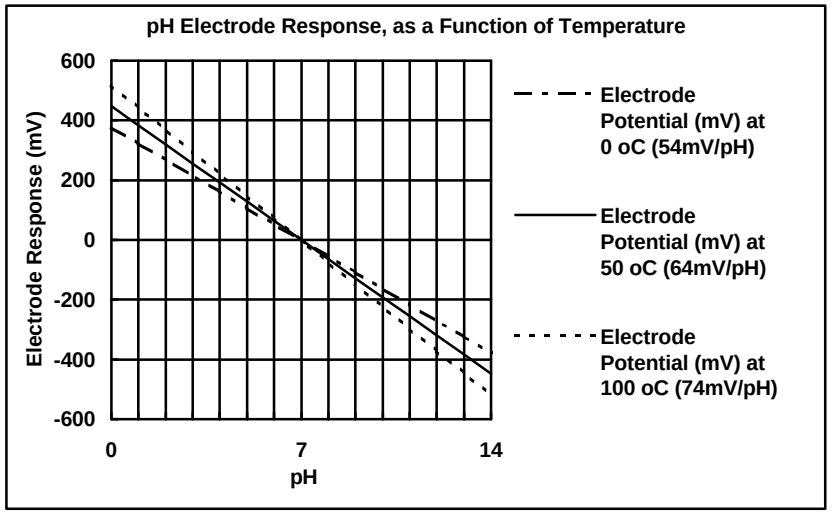


Figure 13-3

13.2 Checking the reference junction of a pH electrode.

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

1. Calibrate the **901-N** pH section, 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 +/-0.02 pH.
4. If the value obtained is outside of these limits, then clean the reference junction, as per the instructions supplied with the pH electrode.
5. Re-calibrate the **901-N** and repeat the test.
6. If the value obtained is still outside 7.06 +/-0.02 pH, then the electrode should be replaced.

13.3 Determining if the 901-N or pH electrode is faulty

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

1. Initialise the **901-N** (see section 10).
2. Disconnect the pH electrode.
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-N** will calibrate to around 6.88 pH, depending upon the temperature readout.
5. If the **901-N** 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-N** may be faulty and could require servicing.