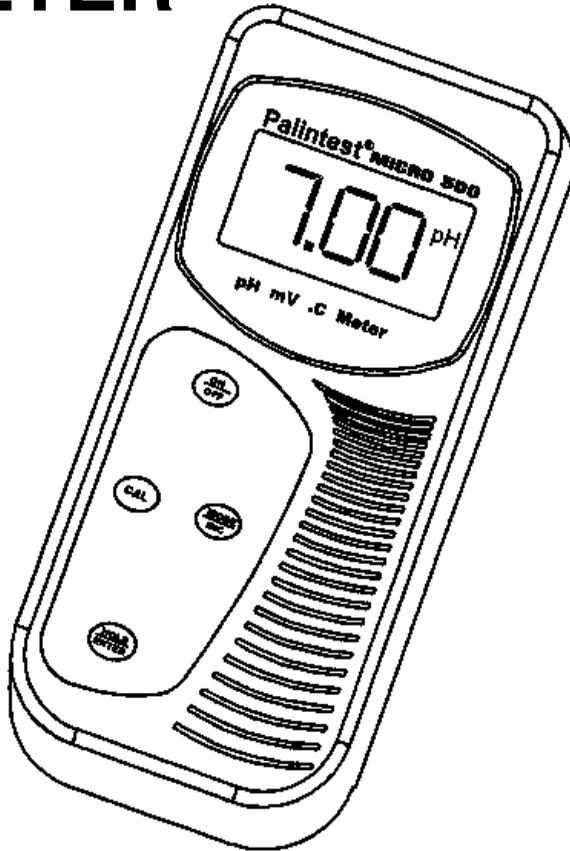


MICRO 500 pH METER



OPERATING INSTRUCTIONS

PT 140 MICRO 500 pH METER

(pH/mV/Temp Meter)

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1 INTRODUCTION

1.1 Introducing the Micro 500 Series

Thank you for purchasing the Palintest Micro 500 pH meter. This microprocessor-based hand-held meter is easy to use and has a large custom LCD (Liquid Crystal Display) for clear and easy reading.

The Micro 500 pH meter allows pH, temperature (°C) and millivolt measurement. Millivolt measurement (mV) can be used for taking Redox or ORP (Oxidation or Reduction Potential) readings with ORP electrodes.

This instruction manual is organised for quick reference with step-by-step procedures that give you thorough review of the various features and meter operations.

Included with your meter are a pH electrode, temperature sensor, rubber boot, 4 x alkaline 'AAA' batteries, an instruction manual and a warranty card. Please refer to the section on 'Accessories' for more information on pH buffers and other accessories.

2 GETTING STARTED

2.1 Description of Keypad Functions

The Palintest Micro 500 pH meter has four keys on its splash-proof keypad. These include ON/OFF, HOLD/ENTER, CAL and MODE/INC keys.

ON/OFF: Powers the meter on and turns it off. Meter directly enters measurement mode when you switch it on.

MODE: Selects measurement mode for pH, mV and temperature.

CAL: Allows calibration for pH, mV or Temperature, or to abort calibration without confirming any set value.

INC: Allows you to increment values during calibration mode.

HOLD: Freezes the measured reading for easy viewing.

ENTER: Confirms calibration value.

2.2 Description of LCD Annunciators

The meter has a large custom LCD that consists of 3½-digit segments and operation annunciators for pH, mV or °C (temperature). Other annunciators include 'HO' (when the HOLD function is activated) and 'LO' (low battery condition) :

HO	pH
	°C
LO	mV

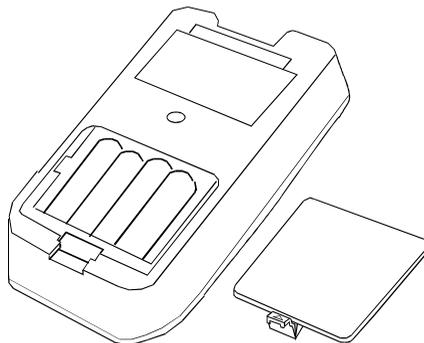
2.3 Inserting & Removing the Rubber Boot

- 1 To remove meter from rubber boot, push out from the bottom edges of meter until it is completely out of boot. Ensure that the cables of pH electrode or temperature probe are not connected.
- 2 To insert meter into rubber boot, slide in from the top of meter before pushing the bottom edges of meter down to set it into position. Lift up the stand at the back of meter for bench top applications if necessary :



2.4 Inserting New Batteries

The battery compartment is found at the back of instrument. To open the battery compartment, push in the direction of arrow and lift up the cover. Note the polarity of battery before inserting into position. After replacement, place cover back and press down until it locks tight :



2.5 Battery Replacement

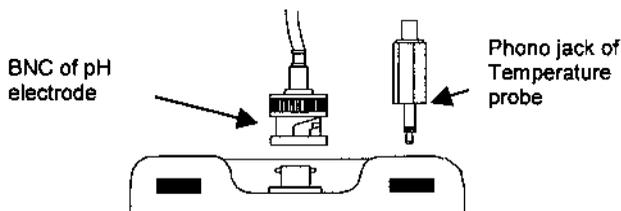
A 'LO' annunciator in the LCD alerts you when battery power is running low. Replace batteries as soon as possible after 'LO' symbol appears :



Caution: Power off the meter when changing battery.

2.6 Connecting the Electrode and Temperature Sensor

To connect electrode into meter, align the connector slots with the posts of meter's socket and rotate connector clockwise until it locks. Do not force when connecting. To remove, simply rotate the connector in anti-clockwise direction until it unlocks, and slide the connector off the socket.



Insert the mini phono jack of temperature sensor into the socket on the meter. Unplug the phono jack when not in use or to measure pH without any temperature compensation.

2.7 Switching the Meter On

- 1 Press **ON/OFF** key to power up your meter. All LCD segments display momentarily as the meter performs a self-diagnostic test, per shown in section 2.2. The LCD then switches into pH measurement mode.

- 2 Press **MODE** key to choose your desired mode of measurement with its corresponding annunciator displays in the LCD. For temperature mode, the measured reading can be 25.0°C (factory default) or the last calibrated temperature value if there is no temperature probe, or the current measured value if a temperature probe is connected.
- 3 The LCD displays 'Ur' if the meter reading exceeds the maximum or 'Or' if under minimum possible measurement range (refer to section on Specifications) :

ur

Or

3 CALIBRATION

3.1 pH Calibration

The meter is capable of up to three-point calibration with standard pH buffer values at pH 4.01, 7.00 and 10.01 to ensure accuracy across the entire range of the meter. It also allows offset adjustment in mV and Temperature modes. All new calibration values will automatically override existing data.

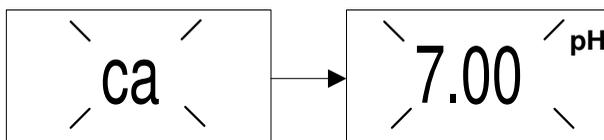
It is recommended that you perform at least two-point calibration at room temperature using standard buffers, starting with pH 7.00 followed by either pH 4.01 or 10.01. For a one-point calibration, calibration should be performed with a pH buffer value closest to expected sample value being measured. Otherwise calibrating at pH 7.00 is advisable.

Ensure that you use fresh pH buffer solutions during calibration. Do not re-use buffer solutions as they may be contaminated and affect the calibration and accuracy of measurements. Palintest Buffer Packs provide single-use buffer solutions from easy to use buffer tablets (see Accessories Section).

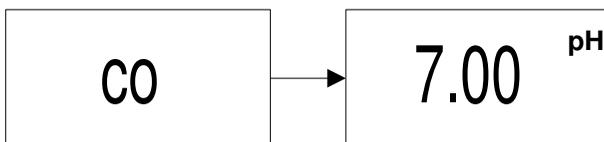
Before use, remove the plastic protective cap of pH electrode and condition the glass bulb by soaking it in tap water for 1 - 2 hours. This hydrates the glass bulb if electrode is too dry or has not been used for a long period of time.

Always rinse the probes with tap water or rinse solution before and after each calibration/sample measurement to avoid cross-contamination. For details please refer to section on Probe Care and Maintenance.

- 1 Take a sample tube containing the pH 7 solution. Power on the meter, and the meter will automatically enter pH measurement mode.
- 2 Dip both electrode and temperature sensor into the buffer solution. Swirl gently and wait for reading to stabilise (approx 30 seconds).
- 3 Press **CAL** key to enter calibration mode. A 'CA' displays momentarily and the display shows the current uncalibrated reading flashing while in the calibration mode :



Allow reading to stabilise. The meter automatically recognises pH 4.01, 7.00 or 10.01 buffers. Press **ENTER** key once to confirm calibration, the LCD displays 'CO' momentarily once calibration is confirmed. The meter exits calibration mode and returns to measurement mode :



Alternatively you can press **CAL** key to abort or exit calibration mode, without accepting new value while you are in calibration mode.

For 2 or 3-point calibration, repeat with pH buffers 4.01 and /or 10.01 for best accuracy.

Important: This meter has automatic buffer recognition which identifies the correct pH buffer values during calibration. If buffers other than pH 4.01, 7.00 or 10.01 are used, or the electrode has worn out, the LCD will flash 'Er1'. For pH 7, the tolerance is ± 1.50 pH, while for both pH 4 and pH 10 is ± 1.00 pH :



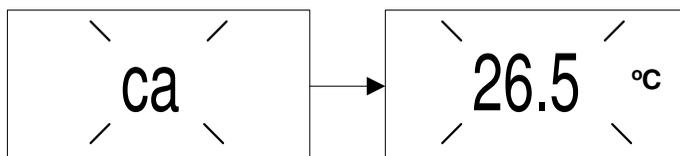
Er1

3.2 Temperature Calibration

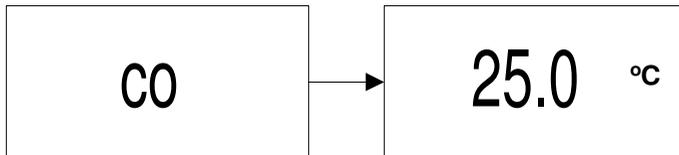
3.2.1 *With Temperature Probe For Preselected Curve*

The temperature sensor included with your meter is factory-calibrated. Over time, the temperature calibration may drift and require recalibration. If you replace the probe you should calibrate temperature probe prior to pH or mV calibration.

- 1 Connect your temperature probe to the meter. Press **MODE** key to enter Temperature mode until '°C' annunciator appears in the LCD.
- 2 Compare the displayed value to a NIST certified thermometer or other thermometer known to be accurate. For best accuracy, place probe and thermometer in a constant temperature bath.
- 3 Press **CAL** key to enter temperature calibration mode. The LCD shows 'CA' momentarily and the displayed reading flashes :



- 5 Press **INC** key until the displays shows the correct temperature. The INC key will scroll to the maximum allowable value and then loop back to the minimum allowable value adjustment (maximum adjustment is $\pm 5^{\circ}\text{C}$ from factory default).
- 6 Press **ENTER** key to confirm calibration. The LCD displays 'CO' momentarily, and the meter reverts to measurement mode :



3.2.2 With Temperature Probe (with Curve Selection)

In the event the temperature probe has drifted too far from its original characteristic due to age and use or if the probe is being replaced, it may be a good idea to match the probe to the best curve. There are 3 curves programmed in the unit. To choose the curve, proceed as follows :-

- 1 Connect your temperature probe to the meter. Dip the probe in a constant temperature bath or a liquid whose temperature can be checked with a thermometer known to be accurate. For best accuracy, place the probe and thermometer in a constant temperature bath.
- 2 Make sure that the meter is in the pH measurement mode. Press **CAL** key and the pH value flashes to indicate that you are in the CAL mode.
- 3 Press **MODE** key. The display will show the temperature of measured liquid.
- 4 Press **MODE** key. Each press will take you through one curve. Choose the curve which gives you a reading closest to the actual value (of the bath or thermometer).

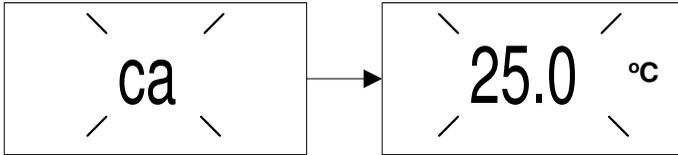
- 5 Press **ENTER** key and the curve selection is complete. The unit will now display the temperature with respect to the curve selected.
- 6 To match the value exactly with the standard value, press **CAL** key to enter temperature calibration mode. The LCD shows 'CA' momentarily and the displayed reading flashes.
- 7 Press **INC** key to make fine adjustment until the displays shows the correct temperature. The INC key will scroll to the maximum allowable value and then loop back to the minimum allowable value adjustment (maximum adjustment is $\pm 5^{\circ}\text{C}$ from factory default).
- 8 Press **ENTER** key to confirm calibration. The LCD displays 'CO' momentarily, and the meter reverts to measurement mode.

3.2.3 Without Temperature Probe (no ATC)

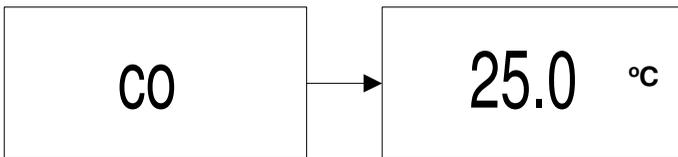
If no temperature probe is used, the meter compensates for pH response at 25°C (factory default) or at a temperature value manually set by you as follows :-

- 1 Press **MODE** key to enter into Temperature mode until ' $^{\circ}\text{C}$ ' shows in the LCD.
- 2 Compare displayed value to a certified thermometer or other thermometer known to be accurate.

- 3 Press **CAL** key to enter temperature calibration mode. The LCD shows 'CA' momentarily and the displayed reading flashes. Note that this displayed value should either be 25.0°C or last set temperature value :



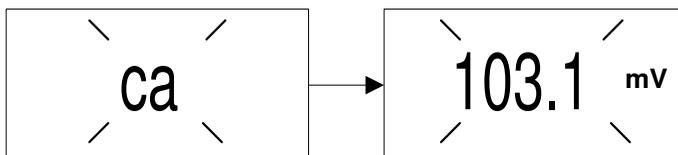
- 4 Press **INC** key until the displays shows the correct temperature. The INC key will scroll to the maximum allowable value and then loop back to the minimum allowable value adjustment (maximum adjustment is $\pm 5^\circ\text{C}$ from factory default).
- 5 Press **ENTER** key to confirm calibration. The LCD displays 'CO' momentarily, and the meter reverts to measurement mode :



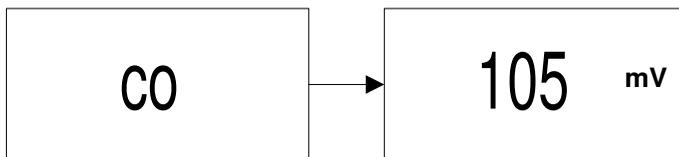
3.3 Millivolt (mV) Calibration

mV calibration is performed for ORP or Redox measurements, where you can adjust its mV value as a base value for measurements.

- 1 Press **MODE** key to enter mV mode, the LCD displays 'mV'.
- 2 Press **CAL** key. The LCD shows 'CA' momentarily, and the displayed reading flashes :



- 3 Use the **INC** key to adjust the reading to your desired value. The maximum adjustment you can make is ± 50 mV. Pressing **INC** key continuously allows you to scroll to the maximum allowable value and then loops back to the minimum allowable value.
- 4 Press **ENTER** key to confirm calibration. The LCD displays 'CO' momentarily and the meter reverts to measurement mode. and shows the current set value :



4 MEASUREMENT

4.1 Taking Measurements

- 1 Before measurement, rinse both pH electrode and temperature sensor thoroughly with tap or distilled water to remove any impurities stuck onto the electrode body.
- 2 Power on the meter. Press **MODE** key to select your desired mode of operation (pH, mV or Temperature).
- 3 Dip both probes gently into the test sample and wait for the reading to stabilise. Note reading.

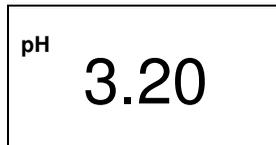
4.2 Holding a Reading

To freeze or hold your reading, press **HOLD** key once. The LCD displays 'HO' annunciator to indicate the HOLD function is activated :



4.3 Releasing a Held Reading

Press **HOLD** key again to deactivate the HOLD function or to release your frozen reading. The meter returns to measurement mode, and the 'HO' annunciator disappears from the LCD :



5 ELECTRODE CARE AND MAINTENANCE

For best results, always keep the pH electrode bulb wet. Store the pH bulb with electrode storage solution. Electrode storage solution is available as part of the Palintest Electrode Care Pack (see Accessories Section). If electrode storage solution is not available, use tap water or buffer solution. NEVER use deionised water for storage.

Wash the probes thoroughly with tap or distilled water after each use.

Because your pH electrode is susceptible to contamination or dirt, clean it every 1 to 3 months depending on extent and condition of use.

Clean the electrode in a mild detergent solution. Wipe the probe with a soft tissue paper. Avoid touching the glass membrane with your fingers. Wash thoroughly in tap water and then in distilled water. Recalibrate the meter after cleaning the electrode.

6 TROUBLESHOOTING

Problem	Cause	Solution
Power ON but no Display	a) Batteries not in place.	a) Insert batteries. b) Re-insert batteries in correct polarity.
'LO' displays in the LCD	a) Low battery.	a) Replace batteries with fresh ones.
Unstable Reading	a) Electrode not deep enough in sample. b) Dirty electrode. c) Broken electrode.	a) Place electrode deeper in sample. b) Clean electrode and recalibrate. c) Replace electrode.
'Er1' Display	a) Buffer value out of tolerance.	a) Use new buffer solution and recalibrate.
Not able to Calibrate	a) Display freezes. b) Faulty electrode.	a) Release reading by pressing HOLD key. b) Replace electrode.

7 SPECIFICATIONS

Palintest Micro 500 pH Meter	
pH Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy	± 0.01 pH
Slope Range	80 to 120%
No of Calibration Points	1 to 3 points (push-button)
Buffer Options	pH 4.01, 7.00, 10.01
Temperature Range	0.0 to 100.0°C
Resolution	0.1°C
Accuracy	± 0.5°C
Temperature Compensation	Automatic or Manual (from 0 to 100°C)
Millivolt Range	-1000 to +1000 mV
Resolution	1 mV
Accuracy	+/- 2 mV
Auto Buffer Recognition	pH 4.01, 7.00, 10.01
Hold Function	'HO'
Auto Shut Off	After 15 minutes
Low Battery Indication	'LO'
Error Message Display	'Er1'
Display	Single Custom LCD
Operating Temperature	0 to 50°C
Power Requirements	4 x 'AAA' Alkaline Batteries
Battery Life	> 100 hours
Meter Dimensions	14 x 7 x 3.5 cm
Meter Weight	200g

8 ACCESSORIES

Accessories available :-

CODE	DESCRIPTION
PT 105/5	Buffer Pack pH 4/7/10
PT 105/8	Buffer Pack pH 7
PT 110/1B	pH Electrode - BNC Connector
PT 140/4	Temperature Sensor
PT 110/3B	ORP Electrode - BNC Connector
PT 105/4	Electrode Care Pack (incl Electrode Storage Solution)
PT 105/12	Soil pH Access Set

9 WARRANTY

The Palintest Micro 500 pH Meter is guaranteed for a period of *one year* from date of purchase - its associated pH electrode is guaranteed for a period of *six months* from date of purchase. This guarantee excludes accidental damage, or damage caused by unauthorised repair or misuse.

Should repair be necessary, please contact our Technical Services Department quoting the serial number on the base of the instrument. This guarantee does not affect your statutory rights.

APPENDIX

ELECTRODES and ELECTRODE CARE

CARE OF PALINTEST pH ELECTRODES AND ORP ELECTRODES

Palintest Electrodes are supplied with Palintest pH Meters and as replacement items. Palintest Electrodes are also suitable for use with other types of general purpose pH meters.

Modern combination pH electrodes are of precision construction and comprise a glass electrode and reference electrode in a single unit. The porous 'liquid junction' provides continuity between the electrode and the test solution. Palintest Electrodes are normally of a sealed liquid or gel type which do not require refilling.

The operation of the pH meter is entirely dependent on the status of the pH electrode. For this reason it is important that the electrode is properly looked after and carefully maintained. Attention to electrode maintenance will ensure correct pH readings and long electrode life. If the electrode is neglected increasingly inaccurate readings will be obtained and a new electrode will soon be required.

pH electrodes, by their very nature, have a limited life span. It is difficult to predict how often a pH electrode will need to be replaced as this will depend on the nature and frequency of its use and on how well it is maintained. Under normal conditions when testing water or simple aqueous solutions, a typical electrode life of 6 - 12 months can be expected. Where the electrode is being used with aggressive solutions such as acids and alkalis, solutions containing particulate matter or with solutions containing non-aqueous solvents, then a shorter electrode life can be expected.

ORP Electrodes (oxidation-reduction potential or redox electrodes) comprise a platinum electrode in combination with a reference cell. Whilst the operation of ORP electrodes is somewhat different from pH electrodes they require similar care and maintenance. These instructions can therefore be applied generally for the maintenance of ORP electrodes.

Electrode Types

Different types of electrode are supplied with different Palintest meters depending on the model. Electrodes may be of glass-bodied or epoxy-bodied construction. Electrodes terminate in a BNC connector. Older types have a screw type connector.

When ordering replacement electrodes it is important to specify the model of pH meter, the type of electrode required and the type of connection fitted.

Electrode Installation

- 1 Remove the protective bottle cap from the tip of the electrode and retain for future use.
- 2 Remove any salt deposits which may have formed on the surface of the electrode by thoroughly rinsing with deionised water.
- 3 Soak the electrode for one hour by dipping into Palintest Electrode Storage Solution (PT 105/4/2). If this is not available the electrode may be soaked in water to which a little potassium chloride has been added. ***Do not soak the electrode in deionised water.***
- 4 Connect the electrode to the pH meter.

Electrode Calibration (Buffering)

All pH electrodes are inherently unstable over time and for this reason it is essential to calibrate the electrode regularly against buffer solutions of known pH value. The calibration procedure is described in the instructions provided with the pH meter. The frequency of calibration against pH buffers will depend on the nature of use and the accuracy required. For most purposes it will be sufficient to calibrate the meter daily. For highly accurate work it may be necessary to calibrate the meter each time it is used.

Palintest Buffer tablets provide a simple means of making up buffer solutions for electrode calibration. The use of these tablets is described on a separate leaflet (INST.7).

ORP electrodes provide a stable output and do not ordinarily require recalibration before or during use. Note however that passivation and poisoning of the electrode surface can result in a change of reading.

Electrode Storage

To ensure that the electrode gives a rapid response, the tip of the electrode and the liquid junction must not be allowed to dry out. Care should be exercised therefore when storing the electrode between use.

For short-term storage between measurements of up to one week, keep the electrode dipped in Palintest Electrode Storage Solution. If this solution is not available, use water containing a small amount of potassium chloride. ***Do not leave the electrode standing in deionised water.***

For long-term storage of more than one week, replace the electrode tip in the protective bottle cap, the bottle cap should contain Palintest Electrode Storage Solution. When returning the electrode to use prepare it as for a new electrode.

Cleaning the Electrode

If the electrode becomes dirty it can be cleaned by one of the following procedures :-

General Cleaning - Soak the electrode in 0.1M hydrochloric acid for one hour.

Inorganic Deposits - Soak the electrode in 0.1M EDTA tetrasodium salt for 15 minutes.

Oil and Grease - Rinse the electrode in methylated spirits or alcohol solution. In severe cases the liquid junction may become completely clogged with grease. In such cases the electrode should be replaced.

Protein - Soak the electrode in a solution of 1% pepsin in 0.1M hydrochloric acid for 15 minutes.

After performing any of the above cleaning procedures, thoroughly rinse the electrode with deionised water. Stand the electrode in Palintest Electrode Storage Solution for at least one hour before use.

Trouble-Shooting Guide

If the pH meter will not give a steady reading, or fails to give a reading of the expected value, check that the meter is being operated in accordance with the instructions supplied then investigate the electrode status.

General (Unstable or Intermittent Readings) - Check that all connections between the electrode, temperature probe and pH meter are clean and tightly fitting. Connections should be cleaned with a small piece of cotton wool moistened with methylated spirits or alcohol.

Noise (Readings Fluctuate Up and Down) - Ensure the electrode is clean. Rinse electrode tip thoroughly with distilled water.

Drift (Readings Constantly Move in One Direction) - Soak the electrode tip in warm 4M potassium chloride solution for one hour. Then rinse tip of electrode with deionised water.

Low Slope (Electrode Will Not Calibrate/Meter Cannot be Adjusted to Buffer Solution pH) - Normally caused by hairline cracks in the glass electrode. Replace electrode if this is suspected.

Slow Response (Long Time to Steady Readings/Excessive Drift) - Clean electrode thoroughly as described earlier. Allow the electrode to stand for at least one hour in Palintest Electrode Storage Solution. If no improvement in electrode performance is obtained, replace electrode.

Sample Application (Steady Reading in Buffer Solution but Not in Sample) - Check that the sample has been correctly prepared and is not subject to pH drift through continuing reaction, temperature effects or interfering substances.
