

Congratulations !

You have purchased the latest in Handheld pH-mV-Temperature instrumentation. The **WP-80M** is a special version of the **WP-80**, made specifically to the requirements of Meat Standards Australia for measuring meat pH.

The **WP-80M** 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 **WP-80M**. It also contains a full listing of all of the items that you should have received with your **WP-80M**. 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 **WP-80M**, 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 WP-80M
MSA Meat pH Meter

Version : 5.0
Date : 14-Sep-2011



TPS Pty Ltd

ABN 30 009 773 371

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@tps.com.au

Web : www.tps.com.au

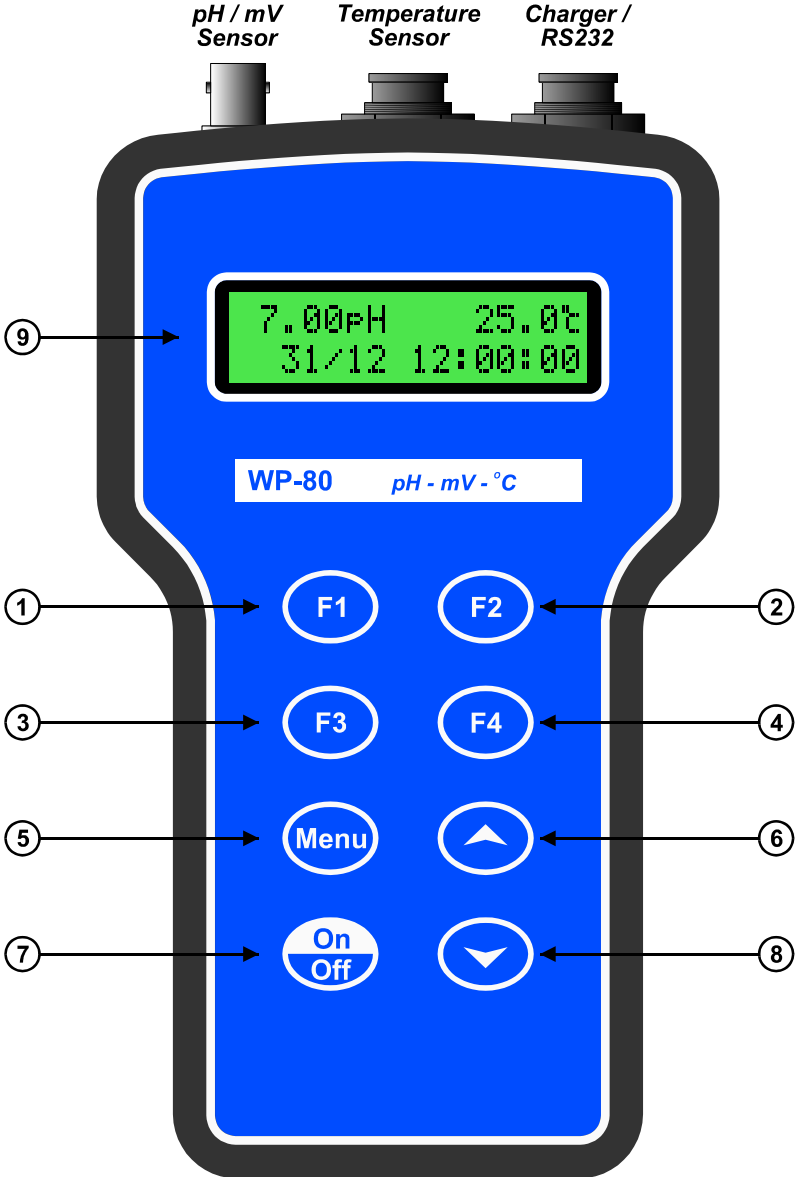
Contents

1. Introduction	5
1.1 WP-80M Display and Controls.....	5
1.2 Unpacking Information	7
1.3 WP-80M Menu Structure	8
2. Standard Operating Modes	9
2.1 Selecting pH, mV or Relative mV mode	9
3. Meat Testing Operating Modes	11
3.1 Selecting Bendall's Equation Mode	11
3.2 Selecting Extra Data Entry On or Off.....	11
3.3 Selecting pH5.70 or pH7.00 pH Sensor Iso.....	12
4. pH Calibration for pH7.00 Iso Sensors.....	14
4.1 Calibration Procedure	14
4.2 Calibration Notes	16
4.3 Calibration Messages	16
5. pH Calibration for pH5.70 Iso Sensors.....	17
5.1 Calibration Procedure	17
5.2 Calibration Notes	19
5.3 Calibration Messages	19
6. mV Calibration.....	20
7. Relative mV Calibration	20
7.1 Notes.....	21
8. Temperature Calibration.....	22
8.1 Calibration Procedure	22
8.2 Calibration Notes	22
8.3 Calibration Messages	23
8.4 Manual Temperature Setting	23
9. Good Laboratory Practices (GLP)	24
9.1 To recall GLP information on the display.....	24
9.2 Failed Calibration	25
9.3 Printing GLP Information to the RS232 Port.....	25
9.4 Instrument Serial Number.....	25
9.5 Additional GLP Features.....	25
10. Notepad Function	27
10.1 Recording Readings into the Notepad - Standard.....	27
10.2 Recalling Records from the Notepad - Standard.....	27
10.3 Recording Readings into the Notepad – Extra Data Entry	28
10.4 Recalling Records from the Notepad – Extra Data Entry	29
10.5 Erasing Records from the Notepad	29

10.6	Printing Records from the Notepad to the RS232 Port.....	30
11.	Automatic Datalogging	31
12.	RS232 Port	33
12.1	Setting the Baud Rate	33
12.2	Sending Readings to the RS232 Port.....	33
12.3	RS232 Configuration.....	33
12.4	Communication and Statistical Software	33
12.5	Commands.....	34
12.6	Data Format	35
12.7	GLP Data Format	36
12.8	Importing Data into Microsoft Excel	37
13.	Battery Saver Function	39
14.	Recharging the Battery	40
15.	Clock Function	41
15.1	Setting the Clock.....	41
15.2	Displaying or Hiding the Clock	41
16.	Selecting Buffers for Auto Buffer Recognition	42
17.	Initialising the WP-80M	43
18.	Troubleshooting	44
18.1	General Errors.....	44
18.2	pH and mV Troubleshooting	45
18.3	Temperature Troubleshooting.....	46
19.	Appendices	47
19.1	WP-80M Specifications	47
19.2	pH Electrode Fundamentals	49
19.3	Instrument firmware version number.	51
20.	Warranty.....	52

1. Introduction

1.1 WP-80M Display and Controls





Press to record readings into memory. See section 10.1.

Also used at turn-on to select primary and secondary buffers for automatic buffer recognition. See section 16.



Press to show or hide the date and time. See section 15.2.



Press to start or stop automatic logging. See section 11.

Alternatively, press to transmit current reading plus date and time to the RS232 port. See section 12.2.

Also used at turn-on to Extra Data Entry ON or OFF and pH5.70 or pH7.00 sensor iso point. See sections 3.2 and 3.3.






Press to zero relative mV, when relative mV mode is selected. See section 7.



Press to access the user-friendly menu system which makes the **WP-80M** a breeze to operate.



The  and  keys are used when calibrating temperature readout (section 8), setting manual temperature compensation (section 8.4), setting the clock (section 15.1), setting the automatic logging period (section 11), and displaying GLP information (section 9.1).

The  key is also used to initialise the **WP-80M** at turn-on. See section 17.



Switches the **WP-80M** on and off.



Display

32 character alpha-numeric display with user-friendly menu and prompting system. Shows pH/mV and temperature simultaneously. Date and time can also be displayed.

1.2 Unpacking Information

Before using your new **WP-80M**, please check that the following accessories have been included:

	Part No
1. WP-80M pH-mV-Temperature Instrument.....	130055
2. Intermediate Junction pH Sensor, 1m.....	121234
3. Stab Type Temperature/ATC Sensor, 1m	121249
4. pH7.00 Buffer, 200mL.....	121387
5. pH4.01 Buffer, 200mL.....	121381
6. Battery charger	130037
7. WP-80M Handbook	130050

Options that may have been ordered with your **WP-80M**:

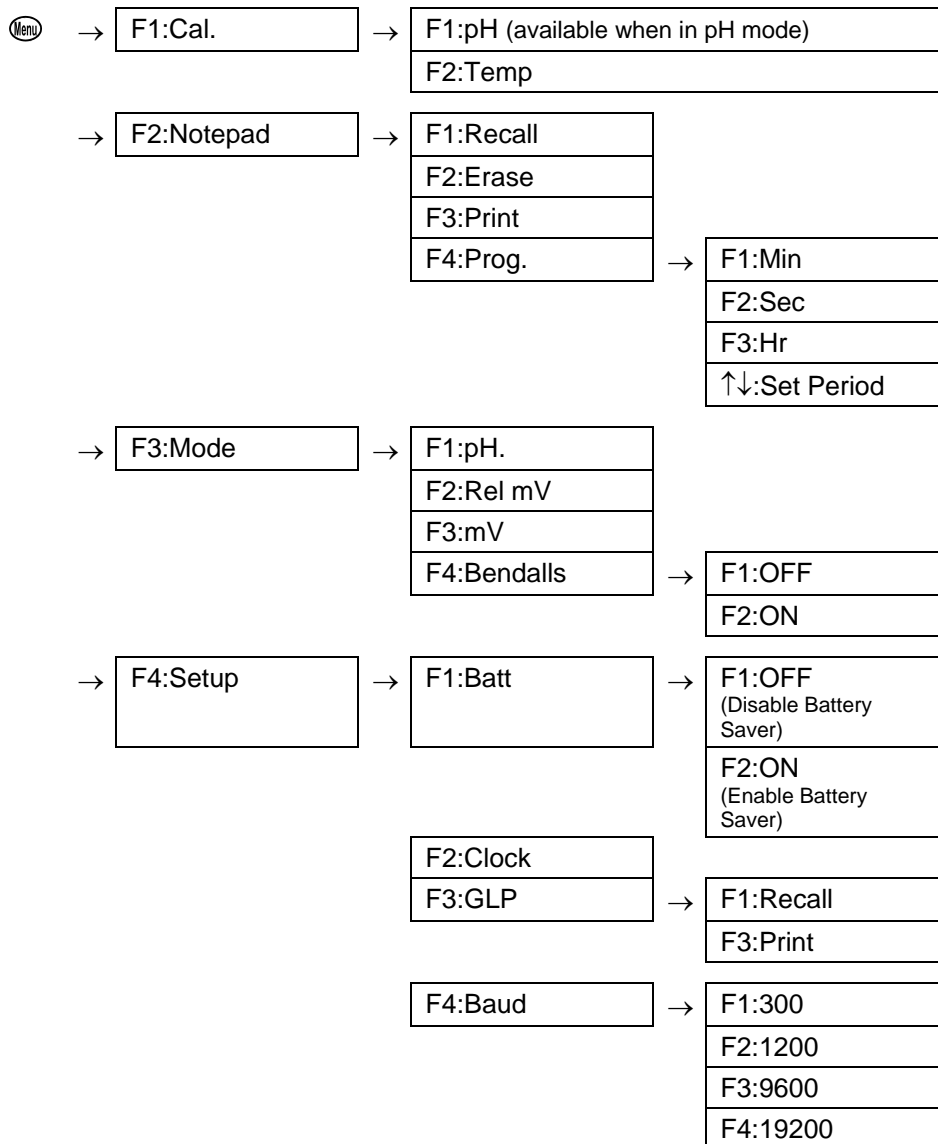
1. RS232 Serial Interface cable.....	130041
2. Communication software for Microsoft Windows 95..... and all later versions	130086
3. USB to Serial Adaptor (requires 130039 also)	130087
4. Hard Carry Case.....	130059
5. Battery charger lead for 12V cigarette lighter socket.....	130046
6. Battery charger lead for 12V DC, with battery clips.....	130052
7. Solar Panel	130012

Other spares:

1. 6V NiMH Battery	130038
--------------------------	--------

1.3 WP-80M Menu Structure

A detailed breakdown of the menu system of the **WP-80M** is shown below. This diagram provides a quick reference for the menu functions available for the **WP-80M**.



2. Standard Operating Modes

2.1 Selecting pH, mV or Relative mV mode

To select pH, mV or Relative mV mode...

1. Select the Mode menu (Menu) → **F3:Mode**...

```
F1:pH F2:Rel mV
F3:mV F4:Bandalls
```

2. Press (F1) to select pH mode.
Press (F2) to select mV mode.
Press (F3) to select Relative mV mode.
Press (Menu) to quit and retain the current selection.

2.1.1 pH Mode

Displays pH and Temperature readings simultaneously. Press (F2) to show or hide the date and time. For example...

```
7.00pH 25.0°C
31/12 12:00:00
```

If the temperature sensor is unplugged, the manual temperature setting is displayed with 1°C resolution. For example...

```
7.00pH Man 25°C
31/12 12:00:00
```

2.1.2 mV Mode

Displays mV and Temperature readings simultaneously. Press (F2) to show or hide the date and time. For example...

```
1000mV 25.0°C
31/12 12:00:00
```

If the temperature sensor is unplugged, no temperature value is displayed...

```
1000mV
31/12 12:00:00
```

2.1.3 Relative mV Mode

Displays Relative mV and Temperature readings simultaneously. Press **F2** to alternatively show absolute mV or the date and time. For example...



If the temperature sensor is unplugged, no temperature value is displayed...



Notes

1. Temperature compensation does not apply in mV mode.
2. The decimal point is replaced by a * if a pH or Temperature calibration has failed (sections 4.1, and 8.1) if the unit is initialised (section 17), or if the unit has lost its factory calibration (section 18.1).

3. Meat Testing Operating Modes

3.1 Selecting Bendall's Equation Mode

The WP-80M is capable of applying the Bendall's Equation to the pH reading for Meat Standards Australia grading requirements. To turn this function on or off ...

1. Select the Bendall's menu (Menu) → **F3:Mode** → **F4:Bendalls**)...

```
Bendalls Mode
>F1:OFF  F2:ON
```

The arrow indicates the current selection.

2. Press (F1) to turn Bendall's Equation mode OFF.

Press (F2) to turn Bendall's Equation mode ON.

Regardless of which mode the **WP-80M** was in previously, it will automatically change to pH mode when the Bendall's Equation is turned ON.

3. Note the "B" after the pH reading in the main display, indicating that the Bendalls Equation mode is ON.

```
5.70pHB  10.0°C
31/12 12:00:00
```

3.2 Selecting Extra Data Entry On or Off

The User Data Entry function can be enabled or disabled as required...

1. Switch the meter OFF.
2. Press and hold (F3) while switching the meter back ON.
3. If there is any data recorded in the Notepad memory, it must be erased first. The meter will automatically prompt you if this is the case...

```
Must First Erase
Notepad
```

then:

```
Erase, You Sure?
F1:Yes  F2:No
```

Press (F1) to Erase all Notepad Data and go on.

Press (F2) to quit and keep the Notepad data.

4. When the Notepad data has been erased, the meter will now move to the User Data Entry selection screen...

```
User Data Entry
F1:OFF  >F2:ON
```

The arrow indicates the current selection.

Press **F1** to turn the User Data Entry function OFF.

Press **F2** to turn the User Data Entry function ON.

5. The **WP-80M** now allows the user to select the Iso point of the pH sensor.

Proceed to section 3.3 for details on how to select the Iso point of the pH sensor.

Press **Menu** to quit now and retain the current Iso Point setting.

3.3 Selecting pH5.70 or pH7.00 pH Sensor Iso

Most pH sensors produce 0 mV output at pH7.00, which is the Iso potential point. For meat applications, however, pH sensors are now available with an Iso potential point of pH5.70, which is the ideal pH of meat samples. This Iso potential point reduces errors due to temperature variations and speeds up response.

The default instrument setting is for pH7.00 Iso pH sensors. This section details the procedure to change between pH5.70 and pH7.00. ***The setting should only be changed to pH5.70 if the sensor is labelled as a pH5.70 Iso pH sensor.***

1. Switch the meter **OFF**.
2. Press **and HOLD** the **F3** key while switching the meter back on.
3. If there is any data recorded in the Notepad memory, it must be erased first. The meter will automatically prompt you if this is the case...

```
Must First Erase      then:      Erase, You Sure?
Notepad              F1:Yes  F2:No
```

Press **F1** to Erase all Notepad Data and go on.

Press **F2** to quit and keep the Notepad data.

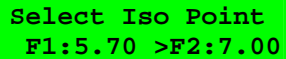
- When the Notepad data has been erased, the meter will now move to the User Data Entry selection screen...



```
User Data Entry
F1:OFF  >F2:ON
```

Press **F1** or **F2** as required (see section 3.2), or menu to go on with the current selection.

- The Iso point selection menu is now displayed.



```
Select Iso Point
F1:5.70 >F2:7.00
```

The arrow indicates the current selection.

- Press **F1** to select pH5.70 as the pH Sensor Iso point.
Press **F2** to select pH7.00 as the pH Sensor Iso point.
Press **Menu** to quit Iso point selection and retain the current setting.
- The pH sensor Iso point is now set and the instrument is ready for pH calibration (section 4).
- The setting is kept in memory when the meter is switched off, even if the battery is removed. The Iso point is re-set to pH7.00 during initialisation.

Note: All pH sensors with an Iso point of pH5.70 are labelled accordingly. If the Iso point is set incorrectly, the unit will not calibrate itself correctly, resulting in large pH measurement errors.

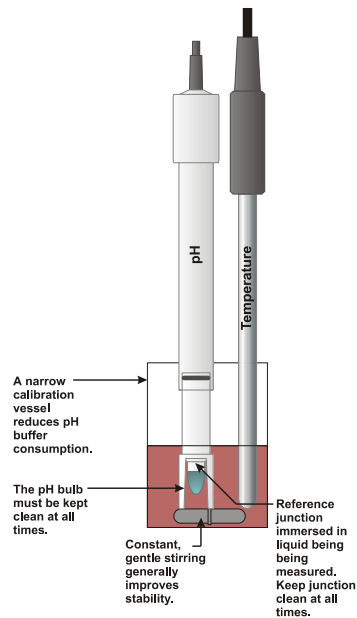
4. pH Calibration for pH7.00 Iso Sensors

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 Procedure

1. Plug the pH sensor into the **pH/mV** socket and the temperature sensor into the **Temperature** socket.
2. Switch the meter on.
3. Ensure that you are using buffers which have been selected for automatic buffer recognition. See section 16 for a detailed explanation.
4. Select pH Mode (Menu) → **F3:Mode** → **F1:pH**). Bendall's Mode may be On or Off.
5. Ensure that temperature has already been calibrated, or manually set (see sections 8.1 and 8.4). NOTE: If the decimal point in the temperature reading is shown by a " * ", then the temperature readout is not calibrated.
6. Remove the wetting cap from the pH sensor.
7. Rinse the pH and Temperature sensors in distilled water and blot them dry.
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, as per the diagram over the page.

DO NOT place the sensors directly into the buffer bottle.



9. Select pH Calibration (Menu) → F1:Cal. → F1:pH).
10. When the reading has stabilised, press the F1 key to calibrate. If a 1 point calibration has been performed, the " * " will not be removed until a full 2 point calibration has been performed.
11. Rinse the pH and Temperature sensors in distilled water and blot them dry.
12. 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, above. **DO NOT** place the sensors directly into the buffer bottle.

pH9.18 and pH10.01 buffers are unstable once the bottles have been opened. Discard immediately after use.

13. Select pH Calibration (Menu) → F1:Cal. → F1:pH).
14. When the reading has stabilised, press the F1 key to calibrate. The " * " will now be replaced by a decimal point, if calibration was successful.
15. The **WP-80M** is calibrated and ready for use in this mode. Discard the used samples of buffer.

4.2 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 **WP-80M** is switched off, even when the battery is removed. This information can be recalled or printed later using the GLP function (see section 9).
4. The **WP-80M** displays the value of the pH buffer to which it will attempt to calibrate. Ensure that the buffer value displayed corresponds to the buffer that you are using.

4.3 Calibration Messages

1. If a 1-point calibration has been successfully performed, the **WP-80M** will display the following message, and the asymmetry of the sensor. For example...

```
1 Point Cal.OK  
Asy= 0.10pH
```

2. If a 1-point calibration has failed, the **WP-80M** will display the following message, and the failed asymmetry value of the sensor. For example:

```
1 Point Cal.Fail  
Asy= 1.50pH Hi
```

or :

```
1 Point Cal.Fail  
Asy=-1.50pH Lo
```

3. If a 2-point calibration has been successfully performed, the **WP-80M** will display the following message, and the asymmetry and slope of the sensor. For example...

```
2 Point Cal.OK  
Asy= 0.10pH
```

then :

```
2 Point Cal.OK  
Slope=100.0%
```

4. If a 2-point calibration has failed, the **WP-80M** will display the following message, and the failed slope value of the sensor. For example...

```
2 Point Cal.Fail  
Slope=130.0% Hi
```

or :

```
2 Point Cal.Fail  
Slope= 70.0% Lo
```

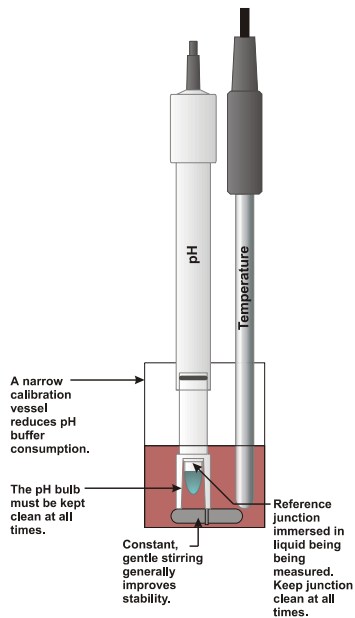
5. pH Calibration for pH5.70 Iso Sensors

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.

5.1 Calibration Procedure

1. Plug the pH sensor into the **pH/mV** socket and the temperature sensor into the **Temperature** socket.
2. Switch the meter on.
3. Select pH Mode (Menu → **F3:Mode** → **F1:pH**). Bendall's Mode may be On or Off.
4. Ensure that temperature has already been calibrated, or manually set (see sections 8.1 and 8.4). NOTE: If the decimal point in the temperature reading is shown by a " * ", then the temperature readout is not calibrated.
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 pH5.70 buffer, so that the bulb and reference junction are both covered, as per the diagram over the page.

DO NOT place the sensors directly into the buffer bottle.



8. Select pH Calibration (Menu) → F1:Cal. → F1:pH).
9. When the reading has stabilised, press the (F1) key to calibrate. If a 1 point calibration has been performed, the " * " will not be removed until a full 2 point calibration has been performed.
10. Rinse the pH and Temperature sensors in distilled water and blot them dry.
11. Place both sensors into a small sample of pH4.00 Buffer, so that the bulb and reference junction are both covered, as per the diagram in step 7, above. **DO NOT** place the sensors directly into the buffer bottle.
12. Select pH Calibration (Menu) → F1:Cal. → F1:pH).
13. When the reading has stabilised, press the (F1) key to calibrate. The " * " will now be replaced by a decimal point, if calibration was successful.
14. The **WP-80M** is calibrated and ready for use in this mode. Discard the used samples of buffer.

5.2 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 **WP-80M** is switched off, even when the battery is removed. This information can be recalled or printed later using the GLP function (see section 9).
4. The **WP-80M** displays the value of the pH buffer to which it will attempt to calibrate. Ensure that the buffer value displayed corresponds to the buffer that you are using.

5.3 Calibration Messages

1. If a 1-point calibration has been successfully performed, the **WP-80M** will display the following message, and the asymmetry of the sensor. For example...

```
1 Point Cal.OK
Asy= 0.10pH
```

2. If a 1-point calibration has failed, the **WP-80M** will display the following message, and the failed asymmetry value of the sensor. For example:

```
1 Point Cal.Fail
Asy= 1.50pH Hi
```

or :

```
1 Point Cal.Fail
Asy=-1.50pH Lo
```

3. If a 2-point calibration has been successfully performed, the **WP-80M** will display the following message, and the asymmetry and slope of the sensor. For example...

```
2 Point Cal.OK
Asy= 0.10pH
```

then :

```
2 Point Cal.OK
Slope=100.0%
```

4. If a 2-point calibration has failed, the **WP-80M** will display the following message, and the failed slope value of the sensor. For example...

```
2 Point Cal.Fail
Slope=130.0% Hi
```

or :

```
2 Point Cal.Fail
Slope= 70.0% Lo
```

6. mV Calibration

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

7. Relative mV Calibration

Select Relative mV mode when measurements relative to a known standard are required. Calibration of the Relative mV mode is simply a matter of zeroing the reading when the sensor is in the known standard.

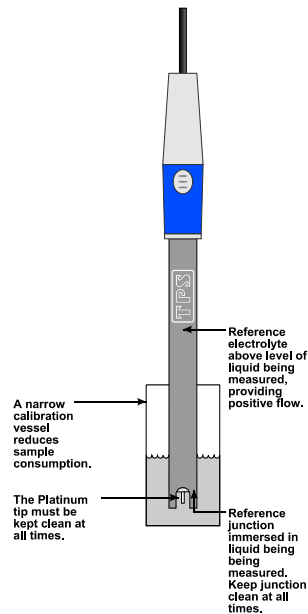
1. Plug the Redox sensor into the **pH/mV** socket. Temperature compensation is not applied in Relative mV mode, so the temperature sensor does not need to be connected.
2. Switch the meter on.
3. Select Relative mV Mode (Menu) → **F3:Mode** → **F2:Rel mV**).

The display should now be showing Relative mV on the top line with absolute mV or date and time on the bottom line. For example...



Press **F2** to alternate between absolute mV or the clock on the bottom line.

4. Remove the wetting cap from the Redox sensor.
5. Rinse the sensor in distilled water and blot dry.
6. Place the Redox sensor into a sample of the known standard. Ensure that the platinum tip and reference junction are both covered, as per the diagram over the page.



7. When the reading has stabilised, press the $F4$ key to zero the Relative mV reading. The Relative mV reading will now be zero, and the absolute mV reading will remain unchanged. For example...

0mVR 25.0°C 660mV F4:Zeros	OR:	0mVR 25.0°C 31/12 12:00:00
-------------------------------	-----	-------------------------------

8. The **WP-80M** Relative mV mode is now zeroed and is ready for use. The readout can be re-zeroed by pressing the $F4$ key whenever required.

7.1 Notes

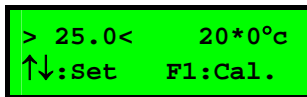
1. The Relative mV offset is retained in memory when the **WP-80M** is switched off, even when the battery is removed.
2. The Relative mV zero is reset when leaving Relative mV mode (see section 2)

8. 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.

8.1 Calibration Procedure

1. Plug the temperature sensor into the **Temperature** socket.
2. Switch the meter on.
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. Select Temperature Calibration (Menu) → **F1:Cal.** → **F2:Temp**).
5. The reading from the sensor is now displayed on the right of the display, and the value you are going to set is shown on the left. For example...



6. When the reading on the right has stabilised, press the ▲ and ▼ keys until the reading on the left shows the same temperature as the mercury thermometer.
7. Press the F1 key to calibrate the temperature readout.
Alternatively, press the Menu key to abort temperature calibration.

8.2 Calibration Notes

1. Temperature calibration information is retained in memory when the **WP-80M** is switched off, even when the battery is removed. This information can be recalled later using the GLP function (see section 9).
2. Temperature does not need to be recalibrated unless the Temperature sensor is replaced or the meter is initialised.

8.3 Calibration Messages

1. If a temperature calibration has been successfully performed, the **WP-80M** will display the following message and the offset value of the sensor. For example:

```
Calibrate OK
Offset= 1.0°C
```

2. If a temperature calibration has failed, the **WP-80M** will display the following message, and the failed offset value of the sensor. For example...



```
Calibrate Failed
Offset= 10.5°C
```


8.4 Manual Temperature Setting

If the temperature sensor is not connected, the temperature of the sample solution must be set manually for accurate pH measurements. A separate thermometer will be required for this.

1. Switch the meter on.
2. Measure the temperature of the sample.
3. Select Temperature Calibration (Menu) → **F1:Cal.** → **F2:Temp**).
4. The current temperature setting is now displayed. For example...

```
> 25.0< Man Temp
↑↓:Set   F1:Save
```


5. Press the  and  keys until the display shows the temperature of the sample.
6. Press the **F1** key to save the temperature value.

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




9. Good Laboratory Practices (GLP)

The **WP-80M** keeps a record of the date and time of the last pH asymmetry, pH slope and Temperature offset calibrations as part of GLP guidelines.

9.1 To recall GLP information on the display

1. Switch the meter on.
2. Select the GLP menu ( → **F4:Setup** → **F3:GLP**).
3. Select **F1:Recall** from the menu.
4. The instrument model, firmware version number, and instrument serial number are displayed, along with a prompt describing how to scroll through the GLP information. For example...



```
WP80M V5.0 S1234
↓:More ↑:Back
```

5. Press the  key to sequentially scroll through the GLP information for all parameters. Press the  key to scroll back to previous data. The sequence of information displayed is shown below. Press  to abort at any time.



```
WP80M V5.0 S1234
↓:More ↑:Back
```

:↓ :↑

```
pH Asy 0.10pH
@ 31/12/10 11:40
```

:↓ :↑

```
pH Slope 100.0%
@ 31/12/10 11:50
```

:↓ :↑

```
Temp Offset 0.1°C
@ 31/12/10 12:00
```

:↓ :↑

Exit

9.2 Failed Calibration

If calibration has failed, the GLP function will reset the date and time to zero. The **WP-80M** still shows the results of the last successful calibration. For example:

```
Asy 0.10pH
@ 00/00/00 00:00
```


```
Slope 100.0%
@ 00/00/00 00:00
```

```
Temp Offset 1.0°C
@ 00/00/00 00:00
```

Note that these calibration values are still used if further measurements are taken without recalibrating.

9.3 Printing GLP Information to the RS232 Port

The GLP information stored in the instrument's memory can be sent to a printer or PC via the RS232 port.

1. Switch the meter on.
2. Ensure that the **WP-80M** RS232 cable is connected to the instrument and to the printer or PC.
3. Send the GLP information to the RS232 port
( → **F4:Setup** → **F3:GLP** → **F3:Print**)
4. The GLP information is sent to the RS232 port in formatted ASCII text. For example...

```
WP80M V5.0 S1234 @ 31/12/10 12:00
pH           Asy=      0.00pH           @ 31/12/10 11:40
pH           Slope=   100.0%           @ 31/12/10 11:50
Temperature  Offset=   1.0oC           @ 31/12/10 12:00
ENDS
```

9.4 Instrument Serial Number

In case the serial number that is fitted to the rear of the **WP-80M** is removed or becomes illegible, it is also available on the **WP-80M** display.

- The serial number is displayed at turn-on, for example...

```
WP80M V5.0 S1234
pH mV Temp.
```

where **S1234** is the serial number.

- The serial number is displayed when recalling the GLP information.
- The serial number is included on the printout of GLP information.

9.5 Additional GLP Features

Another GLP requirement is to record the date and time of every reading. The **WP-80M** does this for you when readings are recorded either with

Page 26

the Notepad function (section 10) or the Automatic Data Logging function (section 11).

10. Notepad Function

10.1 Recording Readings into the Notepad - Standard

To record readings into the Notepad memory:

1. Press **F1** in normal display mode. The display should now look like this:

```

7.00pH    25.0°C
F1: 1     12:00:00
  
```

2. If you now press **F1**, the pH, Temperature, Date and Time will be recorded into the Notepad, and labelled as reading number 1.
3. Repeat steps 1 & 2 as often as required. The maximum number of readings that can be stored in the Notepad is 2400.

10.2 Recalling Records from the Notepad - Standard

To recall records from the Notepad onto the **WP-80M** display:

1. Select the Notepad menu (**Menu** → **F2:Notepad**).
2. Select **F1:Recall** from the menu.
3. Record number 1 is now displayed, for example...

```

7.00pH    25.0°C
# 1       F2:Clock
  
```

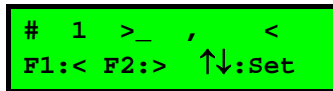
4. Press **F2** to alternatively display the date and time or the data for this record.
 Press **▲** to move forward through the records.
 Press **▼** to move backward through the records.
 Press and hold the **▲** or **▼** keys to roll rapidly through the readings.

10.3 Recording Readings into the Notepad – Extra Data Entry

This section is applicable when the Extra Data Entry function is enabled. See section 3.2 for details.

To record readings into the Notepad memory with Extra Data Entry :

1. Press **F1** in normal display mode. The display should now look like this:



```
# 1 >_ , <
F1:< F2:> ↑↓:Set
```

2. Press the **▲** and **▼** keys to scroll through from 0 to 9, then A to Z to set the first character of the data entry.

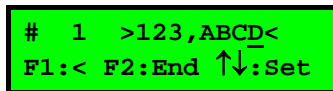
Press **F2** to move to the next character.

3. Repeat step 2 for the remaining characters.

Press **F1** to move the cursor left to make any corrections.

Any of the characters may be left blank, if required.

4. When setting the last character, the display changes, to indicate that one more press of the **F2** will save the data. For example :



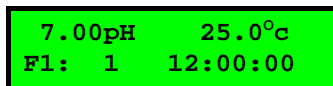
```
# 1 >123,ABCD<
F1:< F2:End ↑↓:Set
```

5. Press **F2** to save the data.

Alternatively, press **Menu** to quit without recording the data.

6. The meter now returns to pH and Temperature measurement, with a prompt to press **F1** to record the pH and Temperature data.

For example...



```
7.00pH 25.0°C
F1: 1 12:00:00
```

Press **F1** to record the data. It will be identified with the 7 character identifier, as entered previously.

Alternatively, press **Menu** to quit without recording the pH and Temperature data, **OR** the previously entered identifier.

10.4 Recalling Records from the Notepad – Extra Data Entry

This section is applicable when the Extra Data Entry function is enabled. See section 3.2 for details.

To recall records from the Notepad onto the **WP-80M** display with Extra Data Entry :

1. Select the Notepad menu (Menu → **F2:Notepad**).
2. Select **F1:Recall** from the menu.
3. The pH, Temperature and User-entered data for record number 1 is now displayed. For example...

```
7.00pH    25.0°C
# 1      123,ABCD
```

4. Press (F2) to alternate between the data and the date/time for this record. For example...

```
7.00pH    25.0°C
# 1      123,ABCD
```

← (F2) →

```
31/12 12:00:00
# 1      F2:Data
```

5. Press (Up) to move forward through the records.
Press (Down) to move backward through the records.
Press and hold the (Up) or (Down) keys to roll rapidly through the readings.
6. Press (Menu) to exit back to normal measurement mode.

10.5 Erasing Records from the Notepad

To erase all records from the Notepad:

1. Select the Notepad menu (Menu → **F2:Notepad**).
2. Select **F2:Erase** from the menu.
3. The **WP-80M** now asks if you are sure that you wish to erase all records...

```
Erase, You Sure?
F1:Yes  F2:No
```

4. Press (F1) to erase all records from the Notepad.
Press (F2) to quit without erasing the records from the Notepad.

10.6 Printing Records from the Notepad to the RS232 Port

1. Connect one end of the RS232 cable to the **Charger/RS232** socket of the **WP-80M**. The charger, optional solar panel, or optional car battery lead can be connected into the spare socket on the cable for long term use, if required.
2. Connect the other end of the RS232 cable to an RS232 Printer, or to COM1 or COM2 of a PC.
3. Ensure that the baud rate for the printer or PC and the **WP-80M** are the same.

If necessary, alter the baud rate of the **WP-80M** (see section 12.1).

The **WP-80M** uses XON/XOFF protocol. Ensure that the printer is set accordingly.

4. Select the Notepad menu (Menu → **F2:Notepad**).

5. Select **F3:Print** from the menu.

Printing starts as soon as **F3** is pressed. The display shows the word "**Printing**" until printing is completed.

11. Automatic Datalogging

The **WP-80M** can automatically log records into the Notepad. First the logging period must be programmed, then automatic logging can be started and stopped as required.

1. Select the Program menu (Menu) → **F2:Notepad** → **F4:Prog.**)
2. The display should now look like this...

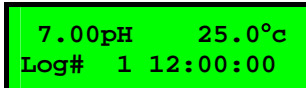
```
>00< F1:Min F2:Sec
↑↓:Period F3:Hr
```

3. Use the ▲ and ▼ keys to set the period at which the **WP-80M** will automatically log records.
4. When the logging period has been correctly set, select whether this period is in minutes, seconds or hours.
 - Press (F1) to save the period as minutes.
 - Press (F2) to save the period as seconds.
 - Press (F3) to save the period as hours.

eg: If the period was set to **05**, followed by (F2), then the **WP-80M** will automatically log a record every 5 seconds.
5. The **WP-80M** will ask if the records are to be logged into the Notepad, or sent directly to the RS232 port.
 - Press (F1) to log records into the Notepad (maximum of 2400 readings).
 - Press (F3) to send records directly to the RS232 port.
6. The automatic logging function is now programmed, and can be started and stopped as required.

Continued over the page...

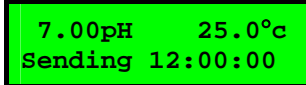
7. To start automatic logging, press **F3** in normal display mode.
If the **WP-80M** is logging into the Notepad, the display will look like this:



```
7.00pH    25.0°C  
Log#  1 12:00:00
```

The log number will increment and the **WP-80M** will beep each time a reading is recorded.

If the **WP-80M** is sending records directly to the RS232 port, the display will look like this...



```
7.00pH    25.0°C  
Sending 12:00:00
```

The **WP-80M** will beep each time a record is sent to the RS232 port.


8. Press **F3** to stop automatic logging.

Notes:

1. The clock must be set before the **WP-80M** will allow automatic logging to start. The message "**Clock Not Set**" is displayed if the clock is not set.
2. The Battery Saver function (section 13) is disabled while the meter is in Automatic Datalogging mode, to stop the meter switching off while logging data. Even when the memory is full and the meter stops logging, the Battery Saver function is still disabled. This allows the data to be downloaded and the memory to be reset remotely.






12. RS232 Port

12.1 Setting the Baud Rate


1. Select the RS232 Set-up menu ( → **F4:Setup** → **F4:Baud**).
2. The available baud rates are listed on the display.

```
F1:300  F2:1200
>F3:9600 F4:19200
```

The arrow shows the current selection.

3. Press  to select 300 baud
 Press  to select 1200 baud
 Press  to select 9600 baud
 Press  to select 19200 baud.
 Press  to quit and retain the current setting.

12.2 Sending Readings to the RS232 Port

Press  to instantly send readings to the RS232 port whenever the **WP-80M** is in normal run mode. This function is disabled if the automatic logging period is set to greater than zero (see section 11).

Records can be sent directly to the RS232 port rather than stored in memory during automatic datalogging. See section 11 for details.

12.3 RS232 Configuration

The **WP-80M** RS232 configuration is 8 bits, No Parity, 1 Stop Bit, XON/XOFF Protocol.

12.4 Communication and Statistical Software

Communication between the **WP-80M** and a PC can be handled with any RS232 communication software. **WinTPS** RS232 communication software for Windows[®] XP and later is optionally available (part number 130086).

Once the data is saved to disk, the next problem is how to use it. The data sent by the **WP-80M** is formatted in fixed-width columns that can be imported by programs such as Microsoft[®] Excel[®] and Lotus 123[®].

Information on how to use the software and import data is provided in the manual provided with the **WinTPS** CD-ROM and in section 12.8.

12.5 Commands

The following commands can be sent from a PC to the **WP-80M**. Note that <cr> denotes carriage return and <lf> denotes a line feed.

Action	Command	Notes
Request current data	?D<cr>	Returns the current pH, Temperature, date and time from the WP-80M . The log number returned is set to Zero.
Request logged data	?R<cr>	Returns all logged records from the WP-80M memory. The data ends with the message ENDS<cr>
Erase logged data	?E<cr>	Erases all logged records from the WP-80M memory. Returns the message ERASED<cr> to confirm that the records have been erased.
Request status information	?S<cr>	Returns the model name, firmware version number, instrument serial number and number of logged readings in memory, eg: WP80M♦♦V5.0♦S1234♦150<cr> , where ♦ are spaces. Note that the number of logged readings is right-justified.
Request GLP information	?G<cr>	Returns all calibration GLP information, plus the instrument model and current date (see section 12.6 for data format and handshaking).

12.6 Data Format

Data is returned to the RS232 Port by the **WP-80M** in the following format. A “•” shown anywhere in this section denotes one space.

With Extra Data Entry turned OFF :

LLLL♦PPPPPPuuu♦TTTTTTuuu♦dd/mm/yy♦hh:mm:ss

With Extra Data Entry turned ON :

LLLL♦DDD,DDDD♦PPPPPPuuu♦TTTTTTuuu♦dd/mm/yy♦hh:mm:ss

LLLL is the Log Number. Maximum 4 characters, right justified. The **WP-80M** sends a Zero for instant readings (section 12.2)

DDD,DDDD is the manually entered data. 8 characters, left justified. Comma is always fourth character, regardless of how many characters were entered.

PPPPPP is pH/mV data. 6 characters, right justified.

uuu is the pH/mV unit description, which can be any of the following...

pH•	for pH readout.
pHB	for pH readout with Bendalls Equation ON
mV•	for Millivolts readout.
mVR	for Relative Millivolts readout.

TTTTTT is Temperature data, 6 characters, right justified.

uuu is the Temperature unit description, which can be either of the following...

oC•	for real Temperature data.
oCm	for manual Temperature compensation values.

dd/mm/yy is the date, month and year data.

hh:mm:ss is the hours, minutes and seconds data.

When requested by a PC with the ?D or ?R commands (section 12.5), the data is terminated with a carriage return.

When the data is sent by the **WP-80M** using the Print function (section 10.6) or the Send function (section 12.2) the data ends with a carriage return and a line feed.

12.7 GLP Data Format

GLP information is returned as 4 lines terminated by a carriage return. When using the “?G” command (section 12.5), the computer must respond with a character after receiving each line. For example...

```
WP80M v5.0 s1234 @ 31/12/10 12:00
pH          Asy=      0.00pH          @ 31/12/10 11:25
pH          Slope=    100.0%          @ 31/12/10 11:30
Temperature Offset=  1.0oC          @ 21/12/10 11:35
ENDS
```

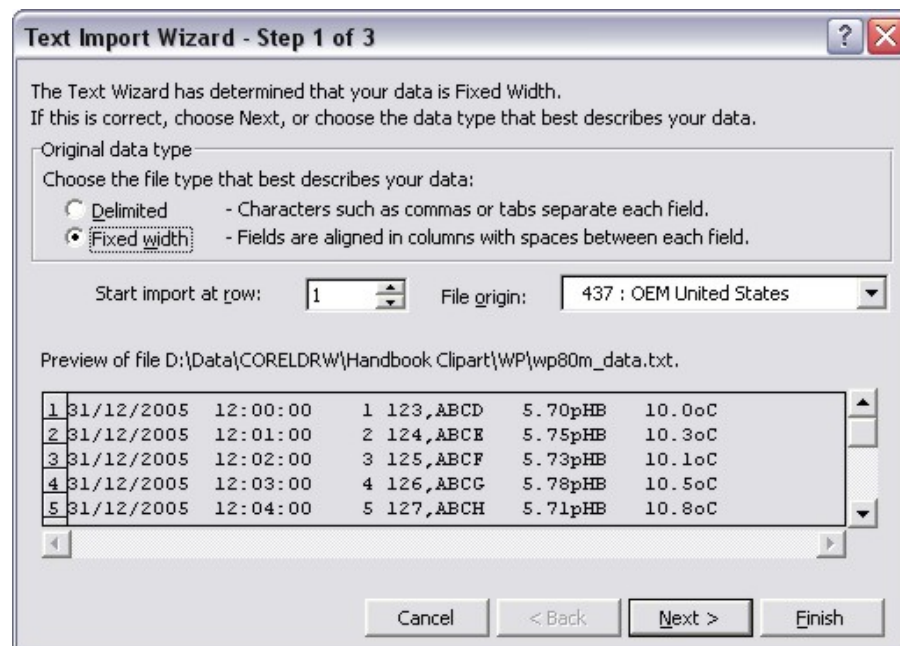
12.8 Importing Data into Microsoft Excel

The following procedure details the method for importing a **WP-80M** text data file into Microsoft® Excel®.

1. Start Microsoft® Excel® and select **File** → **Open**
2. In the “Files of type:” pull-down box, choose “Text Files (*.prn; *.txt; *.csv)”.
3. Navigate to the folder where your data file is stored and double-click it to start the Text Import Wizard.

Note: The default data folder for the WinTPS software is “C:\My Documents\WinTPS”.

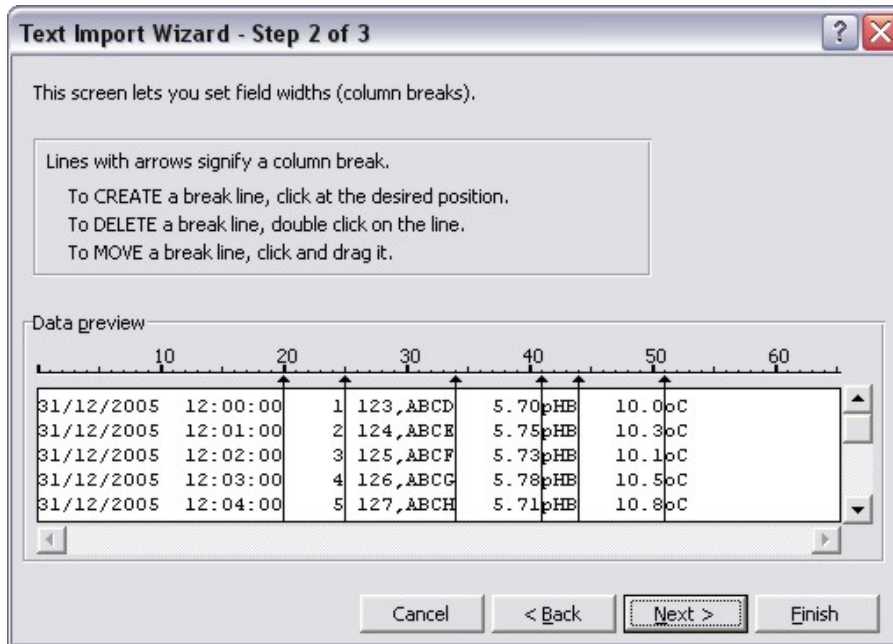
4. In step 1 of the Text Import Wizard select “Fixed width”, as per the sample screen below, then press “Next >”.



Continued over the page...

5. Step 2 of the Text Import Wizard allows you to select the points at which each data field will break into a new column. The sample screens below show where TPS recommends the breaks be inserted.

Press “Next >” after the column breaks have been inserted.



6. Simply press “Finish” at step 3 of the Text Import Wizard. TPS recommends that the data format for each column be set once the data is in spreadsheet format.

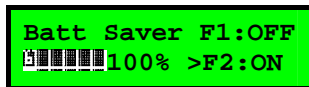
For help on formatting the data columns, charting, graphing or other operations please consult the Microsoft® Excel® help file. Alternatively please contact TPS and we will try to provide further assistance.

13. Battery Saver Function

The **WP-80M** 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 switched off for continuous use.

To enable or disable the battery saver function:

1. Switch the meter on.
2. Select Battery Saver Set-up (Menu) → **F4:Setup** → **F1:Batt**).
3. The battery saver menu is now displayed.



The arrow indicates the current selection.


The bar graph and percentage indicate the approximate level of charge in the battery.

4. Press **F1** to disable the battery saver function for continuous use.
Press **F2** to enable the battery saver function. The meter will switch itself off if no key has been pressed for five minutes.
Press **Menu** to quit the battery saver menu and retain the current setting.


Notes:

1. For troubleshooting purposes, the battery volts can also be displayed in the battery saver menu. Press **F3** to display battery volts.
2. The battery icon symbol flashes when the battery volts drops below 5.60 volts. At 5.00 volts the meter turns itself off.
3. The Battery Saver function is disabled while the meter is in Automatic Datalogging mode (section 11), to stop the meter switching off while logging data. Even when the memory is full and the meter stops logging, the Battery Saver function is still disabled. This allows the data to be downloaded and the memory reset remotely.

14. Recharging the Battery


The  symbol flashes when the battery drops below 5.60 volts. The battery should be recharged at this point. If the battery is not recharged, the **WP-80M** will switch itself off when the battery drops below 5.00 volts.

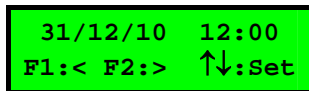
To recharge the battery...

1. Plug the battery charger, solar panel, or car cigarette lighter adaptor into the **Charger/RS232** socket. **DO NOT** plug into the **Temperature** socket, as this will damage the **WP-80M**.
2. Charge for approximately 8 hours for full capacity. The **WP-80M** has special circuitry to prevent overcharging, so the charger can be used continuously.
3. To ensure optimum battery life and capacity, the **WP-80M** should only be charged once the  symbol starts to flash.

15. Clock Function

15.1 Setting the Clock













1. Select the Clock Set-up menu ( → **F4:Setup** → **F2:Clock**).
2. The display now shows the current date and time. The cursor starts at the day. For example...




```


31/12/10 12:00
F1:< F2:> ↑↓:Set
  
```

Press the  and  keys until the day is correct.

3. Press  to move to the month. Press the  and  keys until the month is correct.
4. Press  to move to the year. Press the  and  keys until the year is correct.
5. Press  to move to the hour. Press the  and  keys until the hour is correct.
6. Press  to move the cursor to the minutes. Press the  and  keys until the minutes are correct.
7. Check that the date and time are correct.

Press  to save the settings.



If any changes are needed, press the  key to move left to the desired position.

Press  to quit without resetting the clock.

Notes

1. The **WP-80M** does not test for a valid day of the month when setting the clock (eg: attempting to enter 31/02/10 is not corrected).
2. The **WP-80M** does test for leap years.



15.2 Displaying or Hiding the Clock

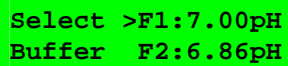
The date and time are normally displayed along with the pH or mV and Temperature readings. Press  in normal display mode to alternatively display or hide the clock. When Relative mV is selected, the  key alternatively displays the clock or absolute mV.

16. Selecting Buffers for Auto Buffer Recognition

This section is applicable when the WP-80M is set to pH7.00 Iso point. If the meter is set to pH5.70 Iso point, only pH5.70 and pH4.01 buffers can be used at calibration. See section 3.3.




The **WP-80M** is factory set to automatically recognise pH4.01, pH7.00 and pH9.18 buffers. However, some users may prefer to use pH6.86 instead of pH7.00 and pH10.01 instead of pH9.18. The following procedure describes how to set which of these buffers are automatically recognised at calibration.

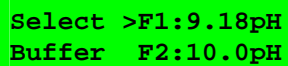
9. Switch the meter **OFF** with the  key.
10. Press and HOLD the  key while switching the meter back on.
11. The buffer selection menu is now displayed.



```
Select >F1:7.00pH
Buffer F2:6.86pH
```




The arrow indicates the current selection.

12. Press  to select pH7.00 as the primary buffer.
Press  to select pH6.86 as the primary buffer.
Press  to quit buffer selection and retain the current setting.
13. The display will now show the currently selected high pH buffer.



```
Select >F1:9.18pH
Buffer F2:10.0pH
```


The arrow indicates the current selection.

14. Press  to select pH9.18 as the high pH buffer.
Press  to select pH10.01 as the high pH buffer (the display shows 10.0 for the latter, but this buffer is stored as pH10.01).
Press  to quit buffer selection and retain the current setting.
15. The setting is kept in memory when the meter is switched off, even if the battery is removed.

17. Initialising the WP-80M

If the calibration settings of the **WP-80M** 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 **WP-80M**:

1. Switch the **WP-80M** off.
2. Press and hold the  key while switching the **WP-80M** back on.
3. The following messages should be displayed:

Initialized
MUST ReCalibrate

then :


WP80MsV5.0 S1234
pH mV Temp.

(The “s” after **WP-80M** is shown when the RS232 serial port option is fitted)

4. The meter then displays pH and Temperature. Note that the decimal points have been replaced with a *, to indicate that the unit requires recalibration.
5. The following items are reset when the **WP-80M** is initialised :
 - Any logged data is erased.
 - Calibration settings for pH and temperature are re-set to factory defaults.
 - pH Sensor Iso point is reset to pH7.00.
 - Extra Data Entry is re-set to ON.

18. Troubleshooting

18.1 General Errors

Error Message	Possible Causes	Remedy
Factory Cal. Failed <i>then:</i> See Handbook	The EEPROM chip which contains the factory calibration information has failed.	The unit must be returned to TPS for service. <ul style="list-style-type: none"> • mV & Temperature readings may be up to 10% incorrect. • pH readings will be accurate after a 2-point calibration (use manual temperature compensation).
Memory Failed Calibration Lost <i>then:</i> Initialized MUST ReCalibrate	User calibration settings have been lost or corrupted.	Re-calibrate the instrument. A full 2-point calibration will be required for pH (see section 4.1) and a 1 point calibration for temperature (see section 8.1).
Flashing  symbol.	Battery is below 5.60 volts.	Recharge the battery. Note that the unit will switch itself off when the battery falls below 5.00 volts.
Meter displays the word OFF , and switches off.	Battery is below 5.00 volts.	Recharge the battery. If this fails, check the charger. If charger OK, replace the battery.
Meter will not turn on.	Battery is exhausted.	Recharge the battery. If this fails, check the charger. If charger OK, replace the battery.
Battery does not charge up when charger is connected.	1. Faulty battery charger. 2. Faulty battery.	1. Connect the charger and switch the power on. 2. Display the battery volts in the battery saver menu (see section 13). 3. If the battery volts are increasing then the charger is OK. If the battery volts do not increase, then the charger is faulty. 4. Replace the charger or the battery, as required.

18.2 pH and mV 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 17, Initialising the WP-80M.
1 Point calibration fails (Asymmetry is greater than +/- 1.00 pH).	<ol style="list-style-type: none"> Reference junction blocked. Reference electrolyte contaminated. 	<p>Clean reference junction, as per instructions supplied with the sensor.</p> <p>Flush with distilled water and replace electrolyte.</p>
2 Point calibration fails (Slope is less than 85.0%).	<ol style="list-style-type: none"> Incorrect primary buffer. Glass bulb not clean. Sensor is aged. Connector is damp. Buffers are inaccurate. 	<p>Ensure that you are using the buffers which the WP-80M has been set to automatically recognise (see section 16).</p> <p>Clean glass bulb as per instructions supplied with the sensor.</p> <p>Attempt rejuvenation, as per instructions supplied with the sensor. If not successful, replace sensor.</p> <p>Dry in a warm place.</p> <p>Replace buffers.</p>

Continued next page...

pH and mV Troubleshooting, continued...

Unstable readings.	<ol style="list-style-type: none"> 1. Electrolyte chamber needs to be refilled. 2. Reference junction blocked. 3. Glass bulb not clean. 4. Bubble in glass bulb. 5. Faulty connection to meter. 6. Reference junction not immersed. 7. KCl crystals around reference junction, inside the electrolyte chamber. 	<p>Refill with saturated KCl filling solution.</p> <p>Clean reference junction, as per instructions supplied with the sensor.</p> <p>Clean glass bulb as per instructions supplied with the sensor.</p> <p>Flick the sensor to remove bubble.</p> <p>Check connectors. Replace if necessary.</p> <p>Ensure that the bulb AND the reference junction are fully immersed.</p> <p>Rinse electrolyte chamber with warm distilled water until dissolved. Replace electrolyte.</p>
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.	<ol style="list-style-type: none"> 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.

18.3 Temperature Troubleshooting

Symptom	Possible Causes	Remedy
Displays "Man" when temperature sensor is plugged in.	<ol style="list-style-type: none"> 1. Faulty temperature sensor. 	Fit new temperature sensor, part number 121247.
Temperature inaccurate and cannot be calibrated.	<ol style="list-style-type: none"> 1. Faulty connector. 2. Faulty temperature sensor. 	<p>Check the connector and replace if necessary.</p> <p>Fit new temperature sensor, part number 121247.</p>

19. Appendices

19.1 WP-80M Specifications

pH

Range0 to 14.00 pH

Resolution0.01 pH

Accuracy±0.01 pH

mV

Range0 to ±500.0 and 0 to ±1500 mV (auto-ranging)

Resolution0.15 and 1 mV

Accuracy±0.3 and ±1 mV

Temperature

Range-10.0 to +120.0 °C

Resolution0.1 °C

Accuracy±0.2 °C

General Specifications

Bendall's Equation.....User can select Bendall's Equation On or Off for final pH value.

Temperature Compensation.....0 to 100.0 °C, automatic or manual

pH Asymmetry Range-1.00 to 1.00 pH

pH Slope Range85.0 to 105.0%

Memory2400 readings including date and time

User can select sample identifier entry
On or Off.

Automatic Logging.....User-set for one reading every 1 to 90 seconds, minutes or hours.

RS232 Output.....300, 1200, 9600 & 19200 baud. 8 bits, no parity, 1 stop bit, XON/XOFF Protocol.

Clock	Calendar clock displays date, month, hours, minutes & seconds. Year is recorded in memory and transmitted to the RS232 port, but is not displayed.
Battery Saver	On : Auto switch-off after 5 minutes Off : Continuous use Bar Graph display of battery charge level. Readout of battery voltage available for troubleshooting.
Good Laboratory Practices	Date, Time and Value of last asymmetry and last slope calibration are stored, and can be recalled or sent to the RS232 port at any time.
Input Impedance	$>3 \times 10^{12} \Omega$
Power	6V NiMH Rechargeable Battery for approx 50 hours operation.
Dimensions	187 x 110 x 51 mm
Mass.....	Instrument only : Approx 440g Full Kit : Approx 1.7kg
Environment.....	Temperature : 0 to 45 °C Humidity : 0 to 90 % R.H.

19.2 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.

19.2.1 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 19-1 illustrates how asymmetry is expressed.

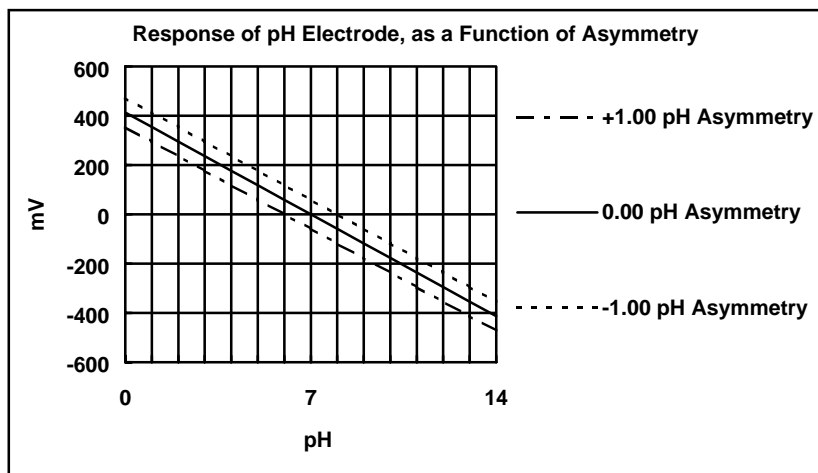


Figure 19-1

19.2.2 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 19-2).

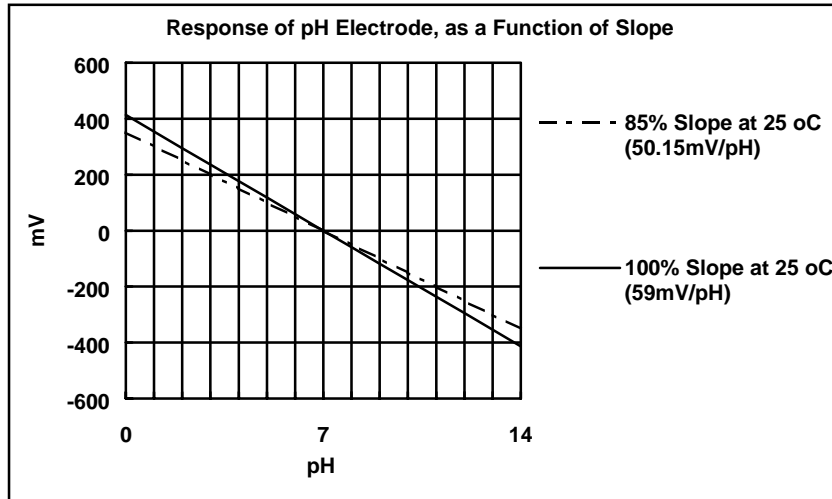


Figure 19-2

19.2.3 Temperature Compensation

The slope of a pH sensor (section 19.2.2) 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 19-3 shows the slope of a pH sensor at various temperatures.

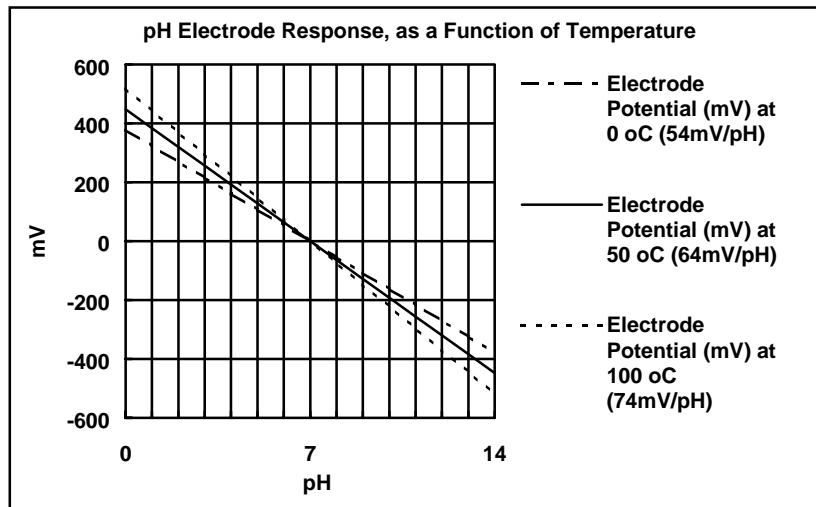


Figure 19-3

19.3 Instrument firmware version number.

If you need to phone or fax TPS for any further technical assistance, the version number of your **WP-80M** firmware may be of benefit to us. The version number is displayed by the **WP-80M** at turn-on.

20. 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 prepaid. It is your responsibility as the sender to ensure that TPS Pty Ltd receives the unit, so consider using a trackable 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
4 Jamberoo Street
Springwood, QLD 4127
Australia
T: (07) 32 900 400
F: (07) 3808 4871
E: tps@tps.com.au
W: www.tps.com.au