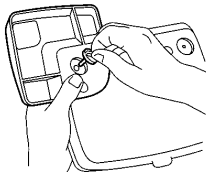
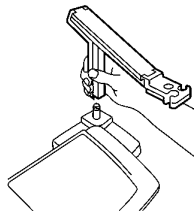


Installation

1. Unpack the meter, power supply, this instruction manual, electrodes, electrode arm, buffer sachets, guide book and calibration certificate. Keep the calibration certificate in a safe place.
2. Check the power supply unit is the correct voltage for your local supply. If it is not, contact your distributor.
3. Attach the electrode arm to the left or righthand side of the meter:
 - a. Turn the meter upside down and seat the dome of the electrode arm base into the left or righthand meter recess.

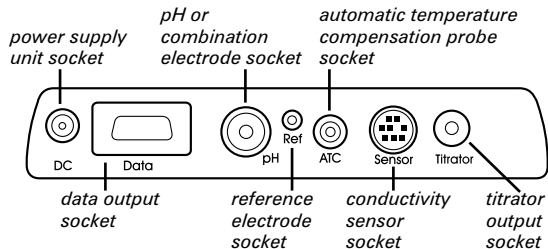


- b. Insert and tighten the fixing screw.
 - c. Turn the meter and base the right way up and locate the electrode arm onto the base fixing post. Press down to snap into place.



Input and Output Connections

Rear Panel

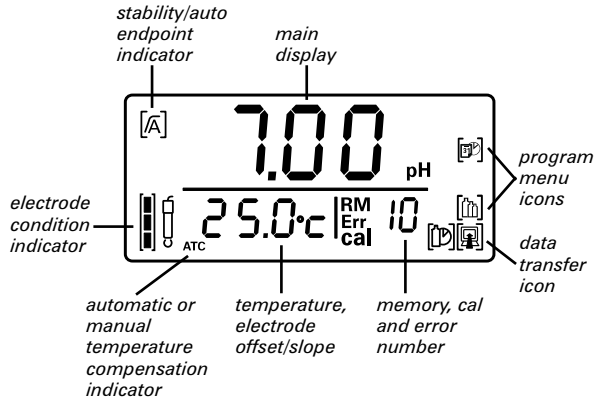


1. Disconnect the shorting clip from the **pH** socket and retain it by clipping it over the socket.
2. Connect the electrode to the **pH** socket. If you are using an electrode incorporating ATC connect the other lead to the **ATC** socket.

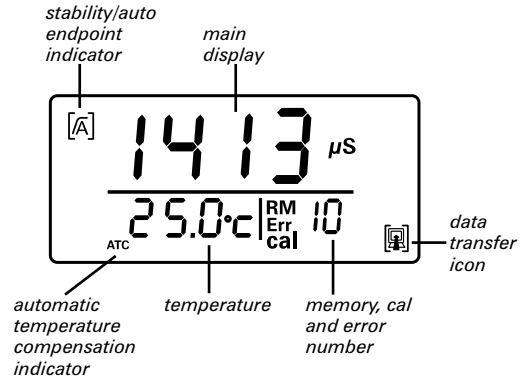
3. If you are using a separate ATC probe for the pH channel connect it to the **ATC** socket.
4. Connect conductivity sensor to the **Sensor** socket.
5. Connect the power supply unit to the **DC** socket.

Displays

pH/mV



Conductivity/TDS



Controls - pH/mV



places meter into standby mode/wakes meter up



starts/stops measurement

- hold down for 2 seconds to reset sample ID number



starts calibration

- hold down for 2 seconds to recall calibration data



selects pH or mV mode and deselects channel

- hold down for 2 seconds to enter Program menu



stores result in memory. Increases value in Program menu

- hold down for 2 seconds to turn beeper on/off



recalls result from memory. Decreases value in Program menu

- hold down for 2 seconds to turn continuous data transfer on/off



turns auto endpointing on/off

Display Indicators



endpoint stability/auto endpoint



auto or manual



temp. compensation



continuous data transfer

Program Menu Indicators



time and date



manual temperature entry



buffer selection



cal reminder interval

Calibration Indicators

E_0 mV

electrode offset value








% slope

electrode slope value




electrode condition


Controls - Conductivity/TDS

	places meter into standby mode/wakes meter up
	starts/stops measurement
	starts calibration
	selects conductivity or TDS mode and deselected channel <ul style="list-style-type: none">• hold down for 2 seconds to enter Program menu
	stores result in memory. Increases value in Program menu
	recalls result from memory. Decreases value in Program menu <ul style="list-style-type: none">• hold down for 2 seconds to turn continuous data transfer on/off
	turns auto endpointing on/off

Display Indicators

 endpoint stability/auto endpoint

ATC auto temperature compensation

 continuous data transfer

Program Menu Indicators

P1 solids factor
(0.40 to 1.00)

P2 reference temperature
(20 or 25°C)

P3 temperature coefficient
(0.0 to 10.0 %/°C)

P4 TDS units
(mg/L or ppm)

P5 mV output mode - titrator output
(20.0µS, 200µS, 2.00 mS, 20.0 mS, 200 mS or $\epsilon \cdot 10^P$)

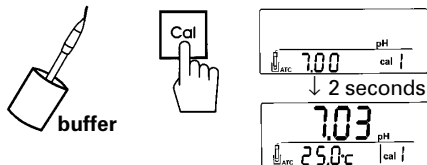
Calibrating - pH

Before commencing calibration it is essential that you read the following sections:

- n Operating Hints
- n Program Menu - pH/mV. Following the instructions you will therefore have set the time and date, manual temperature compensation (if required), the correct buffer set, the order in which the buffers are prompted and the calibration reminder interval.
- n Endpointing a Reading. Set the auto endpoint feature if required.

1 point calibration

1. Example



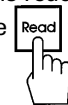
When you press **Cal** the pH buffer you selected for cal 1 (Program Menu) is displayed for 2 seconds, and then the meter starts calibrating.

The meter will perform automatic buffer recognition and therefore buffers can be presented in any order. They will, however be prompted in the sequence setup in the program menu.

2. If you are using auto endpoint the calibration reading will freeze automatically when a stable endpoint is reached.

Otherwise **Read** when the stability indicator [✓]

appears.



Example display



Calibrating - pH (continued)

3. Rinse the electrode and blot dry



to return to sample measurement, or continue with step 4 for further cal points

2 or 3 point calibration

4. Repeat steps 1, 2 and 3 using other buffers for a 2 point or 3 point calibration.
- n Press **Cal** repeatedly to exit the calibration routine at any stage.
 - n When a calibration has endpointed you can press **Mode** to display the absolute mV value and temperature of the buffer. The display reverts to the buffer and E_0 values, or buffer and slope values for a 2 point or 3 point calibration after 2 seconds.

Electrode Condition Indicator

This indicator is displayed on a 2 point or 3 point calibration when the meter has endpointed and shows the condition of the electrode at that time.



95.0 - 105.0%
electrode in
good
condition



90.0 - 94.9%
electrode
needs
cleaning



85.0 - 89.9%
electrode
needs
conditioning

Calibrating - Conductivity/TDS

Before commencing this procedure it is essential that you read the following sections:

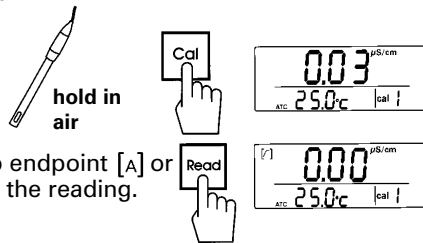
- n Operating Hints
- n Program Menu - Conductivity/TDS. Following the instructions you will therefore have set the solids factor, reference temperature, temperature coefficient, TDS units and mV output mode - titrator output where appropriate.
- n Endpointing a Reading. Set the auto endpoint feature if required.

1. Select conductivity or TDS mode



2. Calibration

Example



Use auto endpoint [A] or to freeze the reading.

3. Repeat step 2 using conductivity standard.

If you wish to move straight to a first calibration on conductivity standard, without first calibrating on air, press **Cal** twice.

4. Rinse the sensor



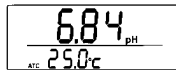
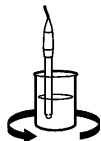
5. Press **Read** to return to sample measurement.

Measuring Samples - pH/mV

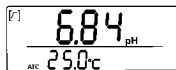
1. Select pH or mV mode



2. Measure sample



Use auto endpoint [A] or to freeze the reading.



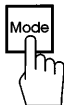
3. Rinse, blot and store the electrode.



- n If you press **Mode** to select pH or mV mode the meter begins measuring immediately. You will not need to press **Read** to start the reading.
- n The decimal point flashes during sample measurement. When the electrode output has stabilized the stability indicator appears. [r]
- n **Manual endpoint** - press **Read** to endpoint.
- n **Auto endpoint** - the meter automatically endpoints.
- n If you have the RS232 cable connected to the **Data** socket, sample data is transmitted at endpoint.

Measuring Samples - Conductivity/TDS

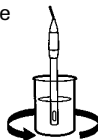
1. Select conductivity or TDS mode



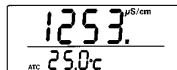
Ensure that the solids factor and temperature coefficient set are appropriate for the sample being measured.

2. Measure sample

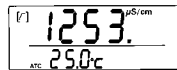
Example



sample




Use auto endpoint [A] or to freeze the reading.



3. Rinse the sensor



- n If you press **Mode** to select conductivity or TDS mode the MPC227 begins measuring immediately. You will not need to press **Read** to start the reading.
- n The decimal point flashes during sample measurement. When the sensor output has stabilized the stability indicator appears. 

Manual endpoint - press **Read** to endpoint.
Auto endpoint - the MPC227 automatically endpoints.
- n If you have the RS232 cable connected to the **Data** socket, sample data is transmitted at endpoint.

Sensor Precautions



CAUTION: To prevent static damage to the MPC227 always disconnect the conductivity sensor from the meter before cleaning the sensor.

Operating Hints

- n For greatest accuracy, standards and samples should be at the same temperature.
- n Do not use solutions after the expiry date.
- n Always measure pH and conductivity separately. Results will be affected if both are measured at one time in the same beaker.

pH/mV

- n Before using the electrode remove the wetting cap and rubber fill hole cap (if fitted).
- n Calibrate using buffers with values that bracket that of the sample. With a new pH electrode, or after maintenance, we recommend you use a buffer close to pH 7 for the first calibration point.
- n When you select the calibration buffers (Program Menu), set the buffer you will use most frequently for 1-point calibrations as cal 1 and the one you will use most frequently for the second calibration point as cal 2, and the one you will use most frequently for the third calibration point as cal 3.

- n When transferring the electrode from one solution to another, rinse it with distilled water and blot dry with tissue paper - do not wipe the electrode as this may cause polarization and slow response.
- n Correct storage of pH electrodes is very important. Consult the electrode manufacturer's instructions for advice.

Conductivity/TDS

- n When measuring, make sure the solution is above the cell chamber slot.
- n Make sure the cell chamber is free of bubbles when measuring. To reduce air bubbles, immerse the sensor at an angle and then raise to the vertical position.
- n Rinse sensor with next measurement sample between measurements, and ensure sensor is dried when re-zeroing the instrument.
- n For greatest accuracy, calibrate using a standard close in value to the sample.

Endpointing a Reading

While the electrode is reading the decimal point will flash. Endpointing a reading can be achieved by:

Using Manual Mode

The meter will continue reading until the **Read** button is pressed to manually endpoint the reading. During reading the stability indicator [✓] may appear to show that the meter recognises that a stable endpoint has been reached. Press **Read** to confirm this endpoint and to freeze the display.

Using Auto Endpoint

If this feature is used the display will freeze automatically when a stable endpoint is reached and [A] will be displayed.

To use this method press /A. The auto endpoint indicator [A] is displayed while the meter is reading. To turn off press /A again.

A reading can be manually endpointed at any time in auto mode by pressing **Read**.

Using the Memory

Entering a Reading into Memory

You can store 10 endpointed results for pH/mV and 10 for Conductivity/TDS.

Press \hat{M} when the measurement has endpointed. M 1 is displayed (or M 2 to M 10 if readings have already been stored). M $\overline{10}$ indicates the memory is full.

Recalling Memory

You can only recall stored memories once the current measurement has endpointed.

Press \hat{R} - the last stored memory is displayed.

Press \hat{R} to scroll through memories. RM 1 to RM $\overline{10}$ indicates which memory is being displayed. M $\overline{0}$ indicates no memories stored.

Clearing the Memories

Press \hat{R} until M C is displayed.

Press \hat{M} to clear the memories, M $\overline{0}$ indicates the memories have been cleared. (Press **Read** to exit without clearing the memories.)

Using Continuous Data Transfer Mode



In continuous data transfer mode readings are sent to the data output approximately every second. If the measurement endpoints (manually, or using auto endpoint) data transfer stops. If you recall memories all stored readings are output, (from the first to the last stored).

To select continuous data transfer mode press and hold **↵** for 2 seconds.

- n To maintain continuity of sample readings calibration data is only output at endpoint.
- n To send data from only one channel, deselect the channel not required by pressing **Mode**.

Resetting Sample ID

The sample identity number is sent to the serial output and increments 1 every time a sample measurement endpoints.

To reset the sample ID number to 1, press and hold **Read** for 2 seconds. **1d** will be displayed, showing that the number has been reset.

Recalling Calibration Data (pH only)

You can only recall calibration data if the current measurement has endpointed - press **Read** if necessary.

Press and hold **Cal** for 2 seconds. The display shows the date and time of the last calibration, the buffer value, the mV offset (E_0) for 1-point calibrations, and the slope value (%) for 2 (3) point calibrations.

Program Menu - pH/mV

The Program Menu allows you to set manual temperature compensation, pH calibration buffers, calibration reminder and date and time.

You can only enter the Program Menu if the current measurement has endpointed - press **Read** if necessary.

Press and hold the **Mode** key for 2 seconds to access the Program Menu - **prog** appears.

Press **Mode** to scroll through the options and press \hat{M} and \check{R} to change the value. Press **Read** to exit the Program Menu at any time. If you press **Read** when a value is flashing that value will not be entered.



Time and Date

Time and date are displayed during calibration recall, and will be sent to the serial output. Time is shown on the main display, the date is shown on the lower part of the display. Set the time and date using \hat{M} and \check{R} . Press **Mode** to enter the value and move on.

MTC Manual Temperature Compensation

You can enter temperature manually between -5.0 and 105.0°C . (An ATC probe will override manual compensation.) The meters have a preset temperature of 25°C . Use \hat{M} and \check{R} to change temperature. Press **Mode** to enter the value and move on.



pH Buffer Selection

The buffers are grouped in sets (b = 1, b = 2, b = 3); select your required set first using \hat{M} and \check{R} :

set 1 = 7.00, 4.00, 10.01, 1.68

set 2 = 7.00, 4.01, 9.21, 2.00, 11.00

set 3 = 6.87, 4.01, 9.18, 1.68

Press **Mode** to enter the set and move on.

NOTE: Check that the correct buffer set is selected in order to use the buffers supplied, i.e. set 1 in the United States, set 2 in Europe or set 3 in all other countries.

Program Menu - pH/mV (continued)



cal 1
cal 2
cal 3

Choose three buffers (cal 1, cal 2, cal 3) from the set for calibration. For ease of use, set the buffers in the order that you will use them.

The factory settings can be rearranged in any order using \hat{M} and \hat{R} . Press **Mode** to enter the value and move on.



Calibration Reminder

The calibration reminder interval can be set, in hours, between 0 and 99 (where 0 = no reminder). When the selected time has elapsed the calibration reminder symbol will appear.

The MPC227 has a preset reminder interval of 1 hour. Change the interval using \hat{M} and \hat{R} . Press **Mode** to enter the value and move on.

Press **Read** to exit the Program Menu.

Program Menu - Conductivity/TDS

The Program Menu allows you to set solids factor; reference temperature; temperature coefficient and TDS units.

You can only enter the Program Menu if the current measurement has endpointed - press **Read** if necessary.

Press and hold the **Mode** key for 2 seconds to access the Program Menu - *prog* appears.

Press **Mode** to scroll through the options and press \hat{M} and \hat{R} to change the value. Press **Read** to exit the Program Menu at any time. If you press **Read** when a value is flashing that value will not be entered.

P1 Solids Factor

The solids factor is the ratio of TDS (ppm or mg/L) to conductivity ($\mu\text{S}/\text{cm}$) and can be set between 0.40 and 1.00. The MPC227 has a preset solids factor of 0.50. Change the value using \hat{M} and \hat{R} . Press **Mode** to enter the value and move on.

P2

Reference Temperature

The temperature to which measurements are referenced can be set to 20 or 25°C. The MPC227 has a preset reference temperature of 25°C. Change the temperature using \hat{M} and \hat{R} . Press **Mode** to enter the value and move on.

P3

Temperature Coefficient

Conductivity measurements change with temperature. The temperature coefficient ($\%/^{\circ}\text{C}$) is a measure of this change and can be set between 0.0 and 10.0, as appropriate for the sample being measured. Adjusting the temperature coefficient affects the instrument temperature range - refer to section on specifications for details. The MPC227 has a preset temperature coefficient of 2.0°C. Change the coefficient using \hat{M} and \hat{R} . Press **Mode** to enter the value and move on.

Program Menu - Conductivity/TDS (continued)

P4 TDS Units

TDS can be measured in mg/L or ppm. (The MPC227 auto ranges to g/L or ppt). Change the units using \hat{M} and \check{R} . Press **Mode** to enter the units and move on.

P5 mV Output Mode - Titrator Output

The millivolt output range is selected by setting the mid point of the conductivity range required. The selectable mid points are 20.0 μ S, 200 μ S, 2.00 mS, 20.0 mS, 200 mS and \check{L}^{OP} , and the millivolt values for the whole meter range are:

Mid point	Measurement ranges	
	18 - 180 mV	180 - 1800 mV
20 μ S	2 μ S - 20 μ S	20 μ S - 200 μ S
200 μ S	20 μ S - 200 μ S	200 μ S - 2 mS
2 mS	200 μ S - 2 mS	2 mS - 20 mS
20 mS	2 mS - 20 mS	20 mS - 200 mS
200 mS	20 mS - 200 mS	200 mS - 1000 mS (900 mV)

When the conductivity level falls outside the range set, the meter will output at the minimum or maximum point of that range, whichever is closer.

The meter can be set to output millivolt values for the whole meter range. This option is selectable when the displays shows \check{L}^{OP} and the millivolt output values are:

Measurement ranges	mV output ranges
1 μ S - 10 μ S	0 - 300 mV
10 μ S - 100 μ S	300 - 600 mV
100 μ S - 1 mS	600 - 900 mV
1 mS - 10 mS	900 - 1200 mV
10 mS - 100 mS	1200 mV - 1500 mV
100 mS - 1000 mS	1500 mV - 1800 mV

Change the mid point using \hat{M} and \check{R} . Press **Mode** to enter the mid point and move on.

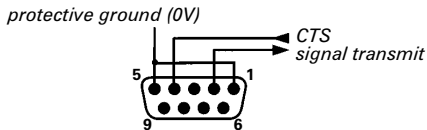
Press **Read** to exit the Program Menu.

Interfacing Serial Output

The MPC227 can interface with computers and Mettler Toledo printers, Acquire Data Acquisition software and other RS232 compatible devices via the RS232 cable. Contact your supplier for a list of compatible printers. The maximum source or sink current available is $\pm 10\text{mA}$.

Pin	Signal	Pin	Signal
1	device enable (link to pin 5)	6	not used
2	RS232 Tx (signal transmit)	7	not used
3	not used	8	not used
4	CTS (clear to send)	9	not used
5	protective ground (0V)		

Data Socket

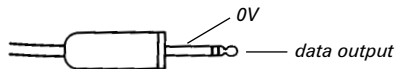


Type of communication - uni directional, baud rate 2400, data format - 7 data bits : 1 stop bit : even parity

- n Data is sent to the **Data** socket at measurement endpoint (manual or automatic), calibration recall and memory recall.
- n To use the output to monitor continually, you need to select continuous data transfer mode.

Titration Output

Output voltage is dependent on the range selected and is set by selecting the mid point of the output range required. For further information refer to the section on Program Menu - Conductivity/TDS.



Problem Solving - pH/mV

Err 1 - offset value (E_0) out of range

Check correct buffer is used.

Check mV reading for pH 7 buffer is 0 ± 35 mV. If it is not, clean or replace the electrode.

Err 2 - slope out of range



Slope less than 85%, or not calculable.

Electrode needs cleaning, conditioning or replacing. Check correct buffers are used.



Slope more than 105.0%.

Check calibration buffers.

NOTE: Where 0 mV/pH unit = 0%, and
59.16 mV/pH unit = 100% (at 25°C)

Err 3 - pH buffer outside temperature limits

pH buffers must be between 5°C and 50°C for accurate calibration.

— —.— — — Displayed (out of range)

Check electrode is connected and immersed in sample. Check wetting cap is removed.

Data Entry Errors

Date flashes and reverts to previous setting - invalid date entered.

Entered temperature value changes to -5.0 or 105.0 - the meter will not accept values outside this range.

Dashes displayed instead of buffer value during calibration buffer set up - that buffer has already been selected for a cal point. Cal points must have different values.

Problem Solving - Conductivity/TDS

— — — — + **Err 1** - measurement out of range

Check sensor is connected and immersed in sample.

Err 2 - cal 1 out of range

Clean the sensor, or replace.

Err 3 - cal 2 out of range

Check correct standard is being used.

Check correct solids factor is being used - for

Mettler Toledo standards use the following factors

1413 $\mu\text{S}/\text{cm}$ factor 0.53 12.88 mS/cm factor 0.58

Clean the sensor, or replace.

Data Entry Errors

Entered solids factor value changes to 0.40 or 1.00 - the MPC227 will not accept solids factors outside this range.

Entered temperature coefficient value changes to 0.0 or 10.0 - the MPC227 will not accept temperature coefficients outside this range.

If **MTC** is displayed, check connection to sensor/
replace sensor.

Maintenance

There are no user replaceable parts in the meter or power supply unit. Do not remove the cover.

The meter requires very little maintenance.

Occasionally wipe the meter with a damp cloth. The casework is made of ABS/PC which is known to be affected by some organic solvents, including toluene, xylene and methyl-ethyl-ketone. It is good practice to wipe away any spillages as soon as they occur.

Electrode Maintenance

Refer to the electrode product insert for full details on maintaining your electrode.

Spares and Accessories

51302118	Electrode Arm and Base
51302125	RS232 Cable
00229170	GA42 Printer
00229119	LC - P45 GLP Printer

pH/mV

52000100	InLab 413 '3 in 1' pH Electrode
52000118	InLab 410 pH Electrode
51300164	30K Ω NTC Probe
51302258	Conductivity to Titrator Cable
51300047	Guide to pH Measurement
51302069	pH 4.01 Buffer Sachets, 30/pack
51302047	pH 7.00 Buffer Sachets, 30/pack
51302070	pH 9.21 Buffer Sachets, 30/pack
51302068	Rainbow Pack Buffer Sachets (10 each of pH 4.01, 7.00 and 9.21)
51340058	pH 4.01 Buffer Solution, 250 mL x 6
51340060	pH 7.00 Buffer Solution, 250 mL x 6
51300194	pH 9.21 Buffer Solution, 250 mL x 6

Conductivity/TDS

51302119	4-Plate Carbon Conductivity Sensor
51302255	2-Plate Glass Conductivity Sensor
51302256	4-Plate Glass Conductivity Sensor
51302275	Glass Flow-Through Cell
51724716	Guide to Conductivity and Dissolved Oxygen Measurements
51302050	12.88 mS/cm Conductivity Standard Sachets, 30/pack
51302049	1413 μ S/cm Conductivity Standard Sachets, 30/pack
51300139	12.88 mS/cm Conductivity Standard Bottle, 500 mL
51300138	1413 μ S/cm Conductivity Standard Bottle, 500 mL

Buffer Tables

The MPC227 automatically corrects pH buffers for temperature using the values shown in the table.

	1.68	2.00	4.00	4.01	6.87	7.00	9.18	9.21	10.01	11.00
5°C	1.67	2.02	4.00	4.01	6.95	7.09	9.40	9.45	10.25	11.72
10°C	1.67	2.01	4.00	4.00	6.92	7.06	9.33	9.38	10.18	11.54
15°C	1.67	2.00	4.00	4.00	6.90	7.04	9.28	9.32	10.12	11.36
20°C	1.68	2.00	4.00	4.00	6.88	7.02	9.23	9.26	10.06	11.18
25°C	1.68	2.00	4.00	4.01	6.87	7.00	9.18	9.21	10.01	11.00
30°C	1.68	1.99	4.01	4.01	6.85	6.99	9.14	9.16	9.97	10.82
35°C	1.69	1.99	4.02	4.02	6.84	6.98	9.10	9.11	9.93	10.64
40°C	1.69	1.98	4.03	4.03	6.84	6.97	9.07	9.06	9.89	10.46
45°C	1.70	1.98	4.04	4.04	6.83	6.97	9.04	9.03	9.86	10.28
50°C	1.71	1.98	4.06	4.06	6.83	6.97	9.01	8.99	9.83	10.10

Refer to the section: **Program Menu - pH/mV Mode**, under **pH Buffer Selection** to select.

Specifications

Measurement Ranges

pH	0.00 to 14.00
mV	± 1999 mV
Cond.	0.00 to 1000 mS/cm
TDS	0.00 to 1000 g/L

Resolution

pH	0.01
mV	1
Temp.	0.1
Cond.	variable
TDS	variable

Relative Accuracy*

pH	± 0.01	Cond.	± 0.5%**
mV	± 1 mV	TDS	± 0.5%**
Temp.	± 0.4°C	Temp.	± 0.4°C

pH

Isopotential Point

pH	7.00
----	------

Calibration Points

pH	3 of 3
----	--------

* ± 1 least significant digit

** 0 - 200mS: ± 0.5% of range being measured
 200mS - 1000mS: ± 0.5% of range being measured or
 0.15 ohms, whichever is the greater

Input Conditions

Impedance
 > 10¹² ohms

Temp. Compensation

−5.0 to 105.0°C
 auto/manual

Conductivity

Temp. Compensation

0.0 to 80.0°C (ATC) - set by
 the value of the temperature
 coefficient

Auto Calibration Points

Zero and:
 84 µS/cm, 1413 µS/cm,
 12.88 mS/cm or 80 mS/cm

Solids Factor

0.40 to 1.00, selectable

Reference Temperature

20/25°C, selectable

Temperature Coefficient

0.0 to 10.0%/°C, selectable
 Instrument temperature range as adjusted by temp.
 coefficient:

0.0 - 2.0%	= 0 - 80°C
2.0 - 3.0%	= 0 - 60°C
3.0 - 4.0%	= 0 - 50°C
4.0 - 7.0%	= 0 - 40°C

Specifications (continued)

Memory - pH/mV	10 memories	
	Conductivity	10 memories
Outputs	Titrator (Conductivity)	
	Serial	
Display	LCD	
Operating Conditions		
Temperature	5 to 40°C	
Humidity at 35°C (non condensing)	max. 85%	
Installation Category	2	
Pollution Category	Degree 2	
Size	inches	10½ x 7½ x 2½
	mm	265 x 190 x 65
Weight	lb	2.2
	kg	1.0

Power Requirements

The MPC227 is supplied with an appropriate power supply unit.

USA/Japan 100 - 120V, 50/60Hz, 0.85VA

Europe 230V, 50Hz, 1.1VA

Output from PSU: 9V DC

Meter Power Rating: 0.6VA

NOTE: The meter should only be used with the power supply unit supplied.