



USB pH & ISE isoPod™ (Model EPU353)



- Software controlled
- Range up to ± 2 V (more than 0 – 14 pH)
- High resolution (< 0.1 mV, < 0.001 pH)
- Isolation ensures minimal interference
- Plug and play with Pod-Vu software

Description

The pH & ISE isoPod can be used to monitor most pH, ion selective and oxidation/reduction potentiometric (ORP) electrodes.

Compatibility

The pH & ISE isoPod is suitable for operation with combination potentiometric electrodes, including:

- ET042 Double Junction pH Electrode
- ET5733 Tuff Tip pH Electrode
- ET060 Redox (ORP) Electrode

Half cell electrodes require the use of a separate reference electrode which can be connected to the shell of the input BNC connector.

Use with serial compatible software (RS232) or later, on Windows XP or later computers with USB port. A virtual serial port is created. Can be used with serial compatible software such as such as:

- Connect™, www.labtronics.com/DI/RS232_Software.htm
- WinWedge®, www.taltech.com/products/winwedge.html
- Tera Term, <http://logmett.com/>
- Pod-Vu, <http://www.edaq.com/>

or with your own software written in LabView, Visual Basic or C++ etc.

Applications

The EPU353 pH & ISE isoPod can be used for real-time monitoring and analysis of pH, oxidation/redox potential, or ionic concentrations (using a suitable ion selective electrode), during bench top experiments.

Most dissolved CO_2 , NH_3 , and galvanic oxygen electrodes can also be used with this isoPod.

Calibration

The isoPod has built in firmware to perform single, double or multiple point Nernstian (linear) calibration.

Theory of Operation

The pH & ISE isoPod consists of an high input impedance grade amplifier. The device is microprocessor controlled. Digital data is output at a user defined rate, or by polling, using a serial (RS232) protocol over a USB connection.

Electrical isolation ensures minimal interference from other sensors, e.g. from Clark-type polarographic oxygen electrodes.

Pod-Vu Software

A demonstration version of eDAQ Pod-Vu software is included on the isoPod Installer USB stick. If you have purchased Pod-Vu then a license code will also have been provided to enable all Pod-Vu features.

Pod-Vu will automatically configure the virtual serial ports and locate all connected USB isoPods. Refer to the Pod-Vu manual for operating instructions.

Pod-Vu will communicate with up to eight isoPod units, calibrate sensors, log data, and graphically display the signals in real time.

Specifications

Input impedance:	$> 10^{13} \Omega \parallel 4 \text{ pF}$
Input leakage current:	$< 30 \text{ fA}$
Input ranges:	$\pm 200 \text{ mV}$, 3.6 – 10.4 pH $\pm 2 \text{ V}$, more than 0 – 14 pH
Connectors:	BNC (input), mini USB
Resolution:	16 bits, $< 0.1 \text{ mV}$, $< 0.001 \text{ pH}$
DC drift:	$< 3 \mu\text{V}/^\circ\text{C}$
DC offset error (maximum):	$< 1 \text{ mV}$
Gain error:	$< 0.1\%$ (2 V range), $< 0.5\%$ (200 mV range)
COM port settings:	115200 baud; 8 bits; 1 stopbit; no parity; flow NONE
Output rate:	up to 100/s
Isolation:	$> 250 \text{ V rms}$
Power:	$< 50 \text{ mA}$ from USB connection
Dimensions (l x w x h):	108 x 58 x 35 mm (4.25" x 2.28" x 1.38")
Weight:	~200 g (7 oz)
Operating conditions:	0 – 40°C, 0 – 90% humidity (non condensing)

eDAQ Pty Ltd reserves the right to alter these specifications at any time.

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Serial Communication

The isoPod is fitted with a USB port. This can then be used as a virtual serial port with Windows, Mac OSX, and Linux computers. A Windows USB driver for most Windows computers is located on the isoPod Installer USB stick. Otherwise you can download a suitable driver from

<http://www.ftdichip.com/Drivers/VCP.htm>

Software can then be written to communicate with the isoPod as a serial (RS232) device, for example using LabView, Visual Basic, or C++.

The serial port number must first be established. Serial Ports 1 and 2 on Windows computers are reserved for the mother board. Thus it is common to find that the isoPod is located on serial port 3 (COM3) or greater.

The virtual serial port should be configured as 115200 baud, 8 bits, 1 stopbit, no parity. Set the flow control to NONE.

When correctly configured the isoPod will send the command prompt **EPU353>** to indicate that a new command can be sent.

Interactive Communication

You can use terminal emulation software (eg Tera Term) to manually interact with the isoPod:

1. Download the Tera Term installer from <http://logmeit.com>
2. Install Tera Term choosing the 'Compact Installation' option to reduce unnecessary extras.
3. Connect the isoPod and provide the computer with the isoPod Installer USB stick if a USB driver is requested.
4. Open the Windows device manager and find the isoPod and its corresponding COM port listed under 'Ports (COM & LPT)'. On first use there is no way to know in advance what COM port will be assigned to the isoPod, except that it will be COM3 or greater.
5. Start the Tera Term software, go to the Serial port... command in the Setup menu and configure the serial port as above. Click OK to return to the main Tera Term window and use the Return key to get the **EPU353>** prompt.

Once interactive communication is established you can be confident that the serial communications are working and can proceed to write your own software.

Serial Protocol

In the list below, the term 'pH' can also refer to pF, pCl, pNa, etc., as appropriate for an ion selective electrode.

EPU353> help

EPU353> ?

Returns a list of commands

EPU353> set range <r>

Sets the range **<r>** = 2000, or 200 mV. A confirmation string is returned.

EPU353> get range

Returns the range setting, ± 2000 , or ± 200 mV.

EPU353> set units <value>

Set the name of the units after calibration. Typically **<value>** = pH but might be pF, pCa, or other name depending on your choice of electrode. A confirmation string is returned.

EPU353> get units

Returns the unit name.

EPU355> r

Return a single reading. Can be repeated at up to 10 Hz.

EPU353> v

Return a single value. That is, the reading is returned as a number, without extraneous text such as unit name etc. Can be repeated at up to 10 Hz.

EPU353> sample ascii <freq> [N]

EPU353> sample binary <freq> [N]

Return readings at a frequency of **<freq>**, an integer between 1 and 100 Hz. Readings are returned as ASCII or 32 bit binary IEEE floating point data. Specify an optional integer, **[N]**, to return that number of samples. Send ! to exit this mode. If **<freq>** is the character # then a single sample is returned every time # is sent.

EPU353> interval ascii <time> [N]

EPU353> interval binary <time> [N]

Return one sample every **<time>** seconds. Specify an optional integer, **[N]**, to return a fixed number of samples. Send ! to exit this mode.

EPU353> cal start <T>

Use the Nernstian response, $E = E_0 - 2.303(RT/nF)pH$, for pH calculations ($n = 1$) at temperature **<T>**°C. The last valid E_0 is used. The factory default is $E_0 = 0.414$ V.

EPU353> cal start <T> <n> <E0>

Use the Nernstian response, $E = E_0 - 2.303(RT/nF)pH$, for calculations with $n = <n>$, and offset, $E_0 = <E0>$, at temperature **<T>**°C.

EPU353> cal set <N> <pH> <E>

Takes a signal reading and uses it as **<E>** for the Nth calibration point, **<N>**, at a defined pH value, **<pH>** (this is usually the pH of a buffer solution). Note that **<N>** has a range of 1 – 15. When **<N>** = 1 (single point calibration) then E_0 is determined at an ideal slope (RT/nF). When **<N>** = 2 (double point calibration) then both E_0 and an experimental slope are determined. When **<N>** is 3 or more then linear regression is used to determine both E_0 and an experimental slope. The percentage Nernstian response is calculated as the ratio of this slope to the ideal value of 2.303(RT/nF).

EPU353> cal remove <N>

Remove the Nth calibration point, **<N>**. Any subsequent calibration points are decremented. Calibration is redetermined with existing calibration points.

EPU353> cal remove all

Remove all calibration points. Factory default settings are reinstated $T = 25^\circ\text{C}$, $n = +1$, $E_0 = 0.414$ V.

EPU353> cal get

Returns all calibration information. This includes the values of pH for the buffer solutions and their raw potential values (in volts), the experimentally determined values for E_0 (offset) and slope of the electrode response, and the percentage Nernstian response.

EPU353> calcpH <E>

Calculates and returns a pH based on the calibration information for a value of **<E>**

EPU353> calcv <pH>

Calculates and returns E (potential) based on the calibration information for a value of pH

EPU353> mtc <T> <isoE>

Manual temperature compensation. Defines the temperature, **<T>**°C, at which measurements will be made after initial calibration. The isopotential point is **<isoE>** (set to zero if absent).

EPU353> version

Returns the firmware version number.

EPU353> prompt off

Turns off the 'EPU355>' prompt.

prompt on

Reinstates the 'EPU355>' prompt.

How to start

If you intend to write your own software using these protocols then it is a good idea to commence by sending each command manually to the isoPod using a terminal emulation program for example Tera Term, see above. This will confirm the responses expected, so that you can be sure that any recent changes in the protocols will be accounted for.