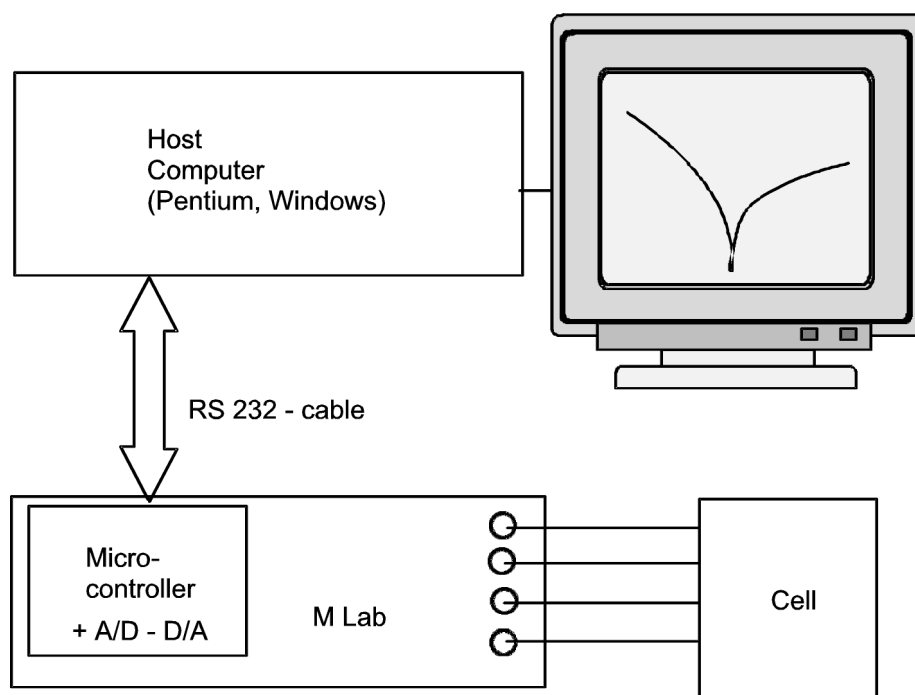


Interfacing Electrochemical Equipment to Personal Computers

There are many types of interfaces used for electrochemical workstations. Among the available variety, we chose to offer 3 different types. The user has the possibility to choose a package, completely as to his needs or just the hardware part because he wants to use homespun software.

All – in – One: M Lab

The electrochemical workstation M Lab has an interface on board, which is operated by a microcontroller. The M Lab is coupled to the host computer by a serial (RS 232) cable. The microcontroller controls the potentiostat, produces the analogue control voltage and collects the data.



Main advantages of this system:

- ◆ User is not bothered with any interfacing.
- ◆ Programs are simple and easy to use.
- ◆ Also notebooks can be used.

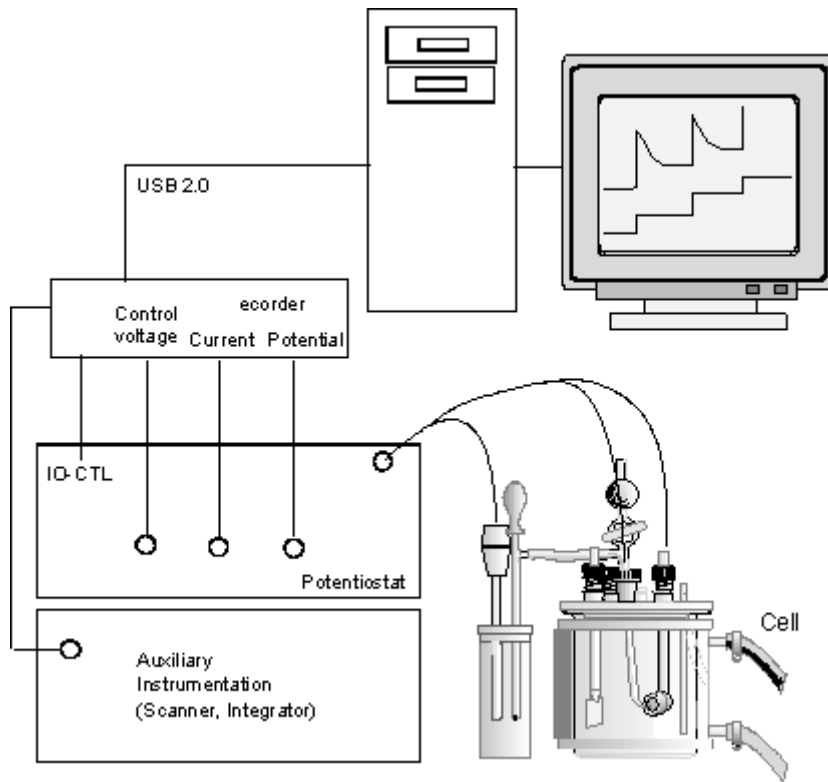
Main disadvantage:

Serial communication is limited in speed. Max. number of data sets per second: 10

EDAQ ECORDER Family

The eorders from eDAQ are fast USB 2.0 - based AD / DA interfaces which come along with data common collection software as well as with electrochemical software which is best adapted for analytical chemistry and other tasks which require fast transactions. Besides fast CV, they are able to feed techniques as pulse amperometry, square-wave-voltammetry, multi-pulse voltammetry and many other techniques. Eorders are available with different amount of A/D channels and additional I/O channels. Besides potentiostats, they directly can be connected to a row of smart sensors ("pods") for measuring temperature, pressure, conductivity, pH and others more. The hardware offers 16 bit

resolution both for A/D and D/A conversion. EDAQ also offers some small potentiostats as well as a potentiostat specially designed for handling extremely small currents in the picoamp range.



Main advantages:

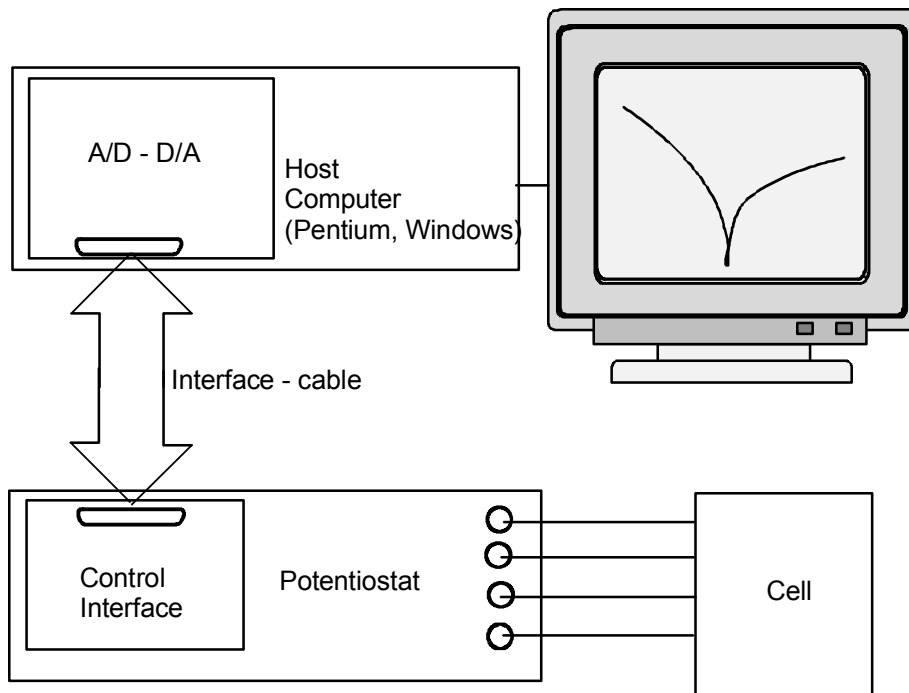
- ◆ Versatility in choosing best suitable type of potentiostat
- ◆ Open hardware architecture – works also with Apple MACs
- ◆ Three programmes available: Scope, Chart and EChem.
- ◆ Fast D/A and A/D action simultaneously :

Disadvantages:

At the moment no support for corrosion related work (is announced)

The Versatile Combinations: LPG 03, HP - family, PGS 95, POS 2, etc.

Our other potentiostats like POS 2, PGS 95 etc. get a control interface on board, which cares for all switch settings, and which in addition collects all signal lines to a terminal plug. In the computer, an A/D - D/A interface board cares for the data conversion. The details of operation depend then on the type of A/D - D/A board.



Compatible A/D – D/A Boards

Our control interfaces can, in principle, operate with most so-called "multifunction boards", i.e. A/D – D/A interface boards which are placed in your personal computer. Besides at least 2 A/D channels and 1 D/A channel they are expected to provide at least an 8 bit digital output port, and one 8 bit input port. Typically, quite a lot of these boards is equipped with 8 A/D channels (or more), 2 D/A channels, and several groups of I/O lines which can be configured in 8-bit-blocks either as input or output lines.

DT 322, KPCI 3102 and 3108

If an A/D-D/A board without D/A - FIFO is used (e.g. Data Translation DT 322 or Keithley KPCI 3102 or 3108), we differ between "slow" and "fast" operation mode.

In the "slow" mode, the D/A converter of the A/D-D/A board directly feeds out the control voltage. Depending on the speed of the computer, this can be done up to max. 20 data points per second. In this mode, the potentiostat also cares for automatic setting of the current ranges.

In the "fast" mode, a separate scan generator (or signal generator) is engaged to produce the control voltages for the potentiostat. Models POS 2 and PGS 95 have such a scan generator on board. The A/D converter of the KPCI board then just collects the data at required speed, usually max. 100 000 or more data points/s. The programme, on the other hand, triggers the devices and controls the switch settings of the potentiostat.

KPCI 3110 and 3116

These A/D - D/A boards have a "first in-first out" (FIFO) memory on board. The data which shall be sent out to the potentiostat during a task are stored in the FIFO, and the A/D-D/A board has full control over timing during a scan. This allows to send out and to receive analogue data at high speed, because the Windows - time limits do not longer apply.

USB – Interfaces

In addition to pc-internal AD/DA boards, external interfaces are available connected to the computer by USB 2.0 serial interface. Our software supports Data Translation boards DT 9804 and similar.

Advantage of these boards is the easy installation. A special risk arises when more than one of these boards is used, because the "numbering order" of the USB devices is erratic. In such cases a routine has to care for controlled approach of the USB devices.

Main advantages:

- ◆ More versatility in choosing best suitable type of potentiostat
- ◆ Open hardware architecture - therefore restricted to MS Windows
- ◆ Programs can be changed by user, or own programs can be written.
- ◆ A/D - D/A board can be chosen according to the requirements:

e.g.

KPCI 3102 (standard): up to 125 000 data sets/s, 12 bit resolution
DT 322 (high resolution): up to 125 000 data sets/s, 16 bit resolution
KPCI 3110 (high speed D/A): up to 200 kHz D/A, up to 1,25 Mhz A/D, 12 bit, 4k D/A FIFO
KPCI 3116 (Hi res/Hi speed): up to 100000 data sets/s, 16 bit, 4 k D/A FIFO

Disadvantages:

More work when installing the system

For boards without FIFO: Fast analogue scans require manual setting of scan start, slope, and scan range directly on the scan generator.

Some words about the proper A/D - D/A board

In most cases, the combination of a scanning potentiostat like PGS 95 and a standard A/D - D/A board like KPCI 3102 is quite appropriate. Slow scans (up to 20 data points / s) are produced by the D/A of the KPCI 3102, thus the system is controlled completely from the computer. The next better boards are DT 322 (Data Translation) or KPCI 3108, resolving 16 bit A/D and D/A. High - speed - scans are produced by the scan generator of the POS 2 up to 100 V/s, which corresponds to the speed of the KPCI 3102. However, there is a drawback in this operation mode: The scanner of the POS 2 has to be set manually, and the programme just triggers the scanner and collects the data.

For fully pc-controlled operation in the "fast" mode, the KPCI 3110 and KPCI 3116 offer the possibility to "download" the scan to the FIFO memory of the KPCI, which then generates a linear sweep (or ANY other shape like sine wave or square wave pulse train) at high speed. So, these two boards allow very fast scans under full computer control.

<http://www.bank-ic.de>

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