
ReleaseNotes IviumSoft 1.794 (firmware 189)

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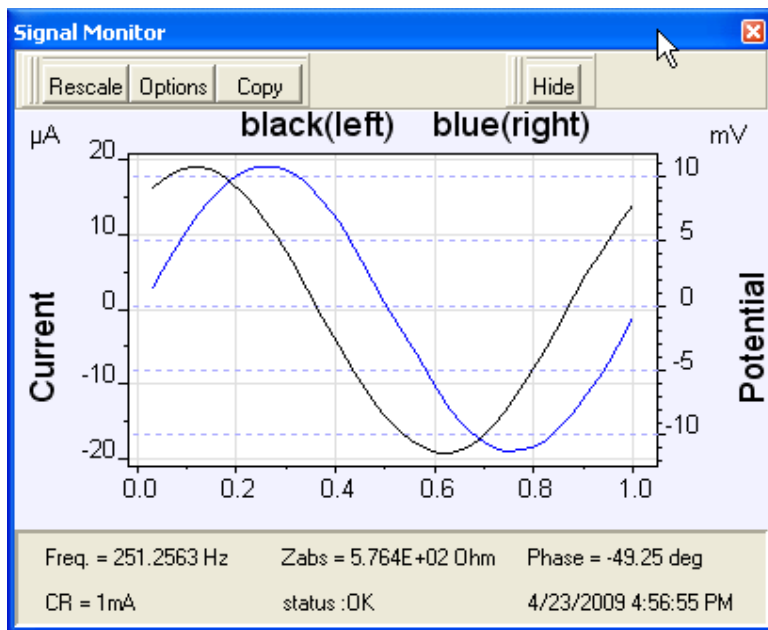
1. Increased acquisition time EIS:

The maximum data acquisition time for EIS has been increased from 2sec to 60sec. This will allow for higher measurement accuracy and better noise reduction.

2. Store signal traces and measurement status EIS

During EIS measurements, the digitized sinewaves of current and potential can be displayed in the Signal Monitor screen, already in the previous software versions. Now, these traces are stored in the datafile, and can be recalled to be investigated/analyzed later. Not only the data is stored, but also the measurement settings: Current range/ overload flags / etc, for each individual frequency.

To display the specifics of a datapoint, first open the Signal monitor, and point the mouse at the datapoint in question. The Signal view will show the data in Recall mode:



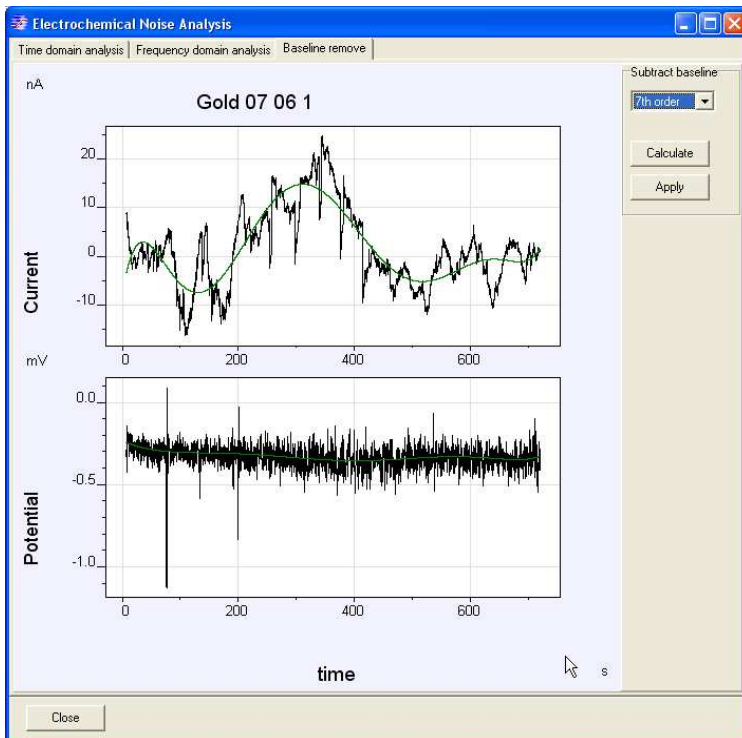
Recalling signal traces from a previously recorded EIS scan.

In the example above, the E/I traces are displayed in recall mode. It also shows the current range, which is useful if AutoCR was active. If this datapoint was obtained in an overload situation, the status would indicate this. Furthermore, the original date and time of acquisition are shown: mm/dd/yyyy hh:mm:ss.

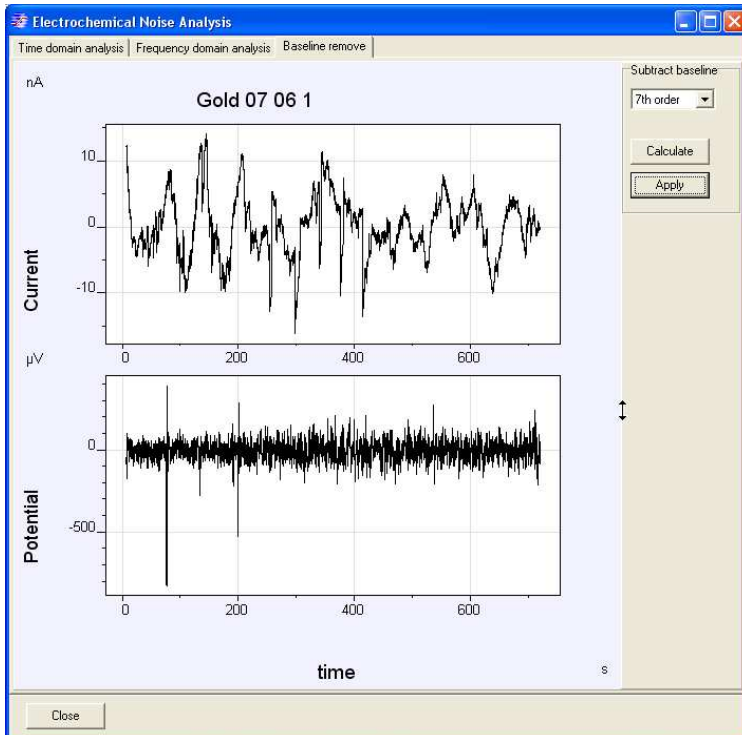
Note that the display in Recall mode is different from the AC signal monitor shown during the EIS scan.

3. Baseline subtraction ECN

A feature has been added to the ElectroChemical Noise analysis tool, to remove a baseline or trends from the data. The order of the polynomial baseline is selectable from 1st (linear) to 9th order. Pressing the "Apply" button will subtract the baseline from both the Potential and Current data. Subsequent time-domain and Frequency-domain analysis will use the corrected data. After the ECN Analysis tool is closed, the original data is also changed, and corrected curves can be saved thereafter.



ECN data before baseline subtraction



ECN data after baseline subtraction

4. Retrieve parameters individual scans in dataset

When multiple scans are displayed in a single plot, it is possible these were recorded with different parameters. The specific parameters of selected plot will be displayed in the Methodparameter panel, when the CTRL key is pressed while the scan was selected: keep the CTRL key pressed and click on the scan-name in the Legendpanel.

Note that this will also change the active Method parameters. If thereafter Start were pressed, it would start a scan using the parameters of the selected scan. However the use of the CTRL key should avoid unintentional modification of the active parameters.

This function can also be used after reading a previously recorded Dataset.

5. Modify DataOption parameters for all data

Each scan file contains DataOption parameters (surface area, transform of analog data, etc.). Usually these are set before a measurement is started, but it is also possible to modify these afterwards: In the DataOption dialog screen, modify the parameters, and press "Apply to selected scan".

Now an extra button is added: "Apply to all data". Thus the changes are applied to all currently loaded scans.

6. Galvanostatic generation icw amperometric detection using Bistat module

The techniques: Chronopotentiometry, galvanostatic CV and galvanostatic LSV, can now be combined with the bipotentiostat module.

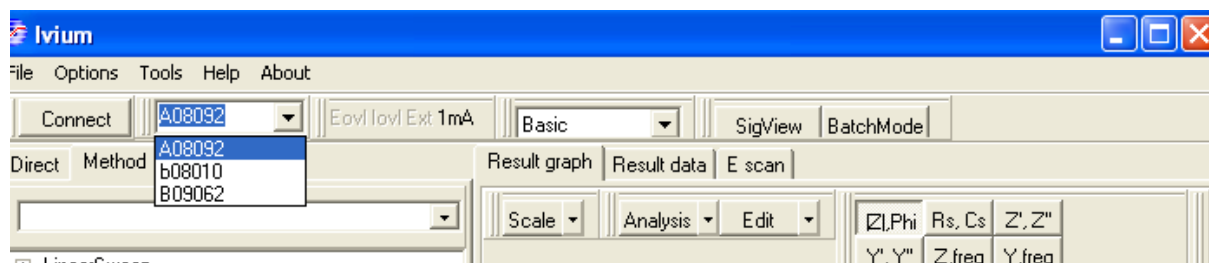
Several applications that used to require 2 potentiostats/galvanostats can now be performed with a single instrument. The primary WE and CE will control the applied current in galvanostatic mode, while the BiStat module is operating in potentiostatic mode applying a potential and measuring a current. The bipotentiostat will use the RE or S electrode, as reference. Its offset potential can be set in the +/-2V range.

When the Bistat option is activated, the measurement plot will show both working electrode currents.

The WE/CE electrodepair may be located in a different cell-compartment than the WE2/RE(S) pair. For a typical application the WE/CE pair would generate a product that is detected by measurement with the WE2.

7. Working with multiple instruments on 1 pc

Multiple Iviumstats, CompactStats and Nstat-channels can be controlled with 1 pc. When the IviumSoft software is started, the operator can select the serial number of the desired device. Pressing the Connect button will assign this software instance to the device indicated by the selectionbox at the rightside of the Connect button.



Pressing the arrow of the selectionbox will dropdown a list of available devices. In the example above, 1 IviumStat A08092 and 2 CompactStats b08010 and B09062 are available. Note that the lower case 'b' indicates that this CompactStat is using usb-power, while a capital 'B' indicates mains-adaptor power.

Multiple instances of IviumSoft can be started, that can each be assigned to another device. Once a device is assigned to a particular IviumSoft instance, it is no longer available for other instances (of course).

When multiple instances are running and assigned, these can be recognized on the Windows taskbar by corresponding buttons:



When an IviumSoft-instance is connected to a device, the text on the taskbar-button changes from "IviumSoft" to "Ivium X#####", with X##### the serial number of that particular instrument.

It is thus possible to control different experiments simultaneously, on several instruments from one pc. These instruments will operate completely independent from each other.

8. Schedule processes in BatchMode

Events can be scheduled in BatchMode using the DirectCommand.Scheduler parameter. The Repeat time timer keeps track of the total time lapsed since the Batch was started. Events can be scheduled at fixed time, independent of the durations of previous executed scans. Thus measurements can be programmed to be repeated exactly every minute, hour, day, etc.

Note the difference with the DirectCommand.Wait function, that adds a delay.

To activate, check Scheduler, and set Repeat time variable. The period can be set from 1 sec to 1E7 sec (>3 months).

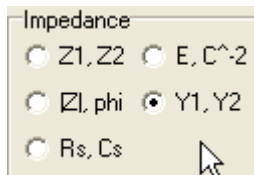
The Scheduler will take precedence over the other DirectCommands in the same Batchline, MuxChannels/DAC/etc will be set only after the Repeat time r period has passed.

9. Noise reduction

This parameter is added to the EIS techniques to reduce the impact of noise. This can be convenient in cases that suffer from excessive noise.

When activated, it will apply stronger automatic filtering, with its built in analog filters. Also it will give easy access to the Acquisition period, which is the total period that the sampled (averaged). A longer period, will give better noise reduction. Note that this will override the value in the Option menu. The default value in the Options menu is 0.4sec, while it is set to 2sec (default) when Noise reduction is activated. Of course, these values may be modified by the operator.

10. Admittance as numerical data



On the Result data Tabsheet, the option is added to show the numerical Admittance result. These are now also available for easy cut & paste to other applications.

11. Smooth all

From the Edit menu, select : "Smooth all", and All presently loaded scans will be smoothed, and spikes are removed. Savitzky Golay smoothing will be used, using a sliding polynomial of default 11 points. This number may be modified in the Edit data screen.

12. Subtract ohmic potentialdrop

The potential-loss due to the effects of ohmic resistance on Linear scans, and Cyclic Voltammograms, can be corrected by calculation. If the resistance is known, the ohmic drop can be calculated from the product with measured current. The real applied potential can thus be calculated.

First select the scan to be processed, and from the Edit menu, select : "Subtract ohmic drop". A window will popup, at which the resistance should be entered. Pressing Apply will process the selected scan.

13. Dynamic vertexes in combination with AutoCR

For Cyclic Voltammetry, and Linear Sweep Voltammetry, in standard mode, it is possible to define the scan boundaries depending on the measured currents.

If the current exceeds the defined "I max", or gets below "I min", the scan direction is reversed (CV) or stopped (LSV).

To activate this feature, check "DynamicVertexes" and set values for "I max" and "I min". This feature used to be available only at fixed Current Range. In this release, that limitation is removed, and it is also possible to use it in combination with AutoCR. However when AutoCR is activated, the dynamic vertexes will only be active in the defined "AutoCR.Max range". This means that the Absolute values of "I max" and "I min" should be larger than $0.25 \times$ the selected "Max range". In practice, usually the 'Max range' parameter will be chosen according to the desired vertexes.

14. View/edit scan properties

When multiple scans are displayed, it is possible that each was measured at different conditions. The method parameters of each individual scan can be viewed by a Right-Click of the mouse button while the mousepointer is on the scan in question in the Legend panel. A form with the corresponding data will pop up. In this form, it is also possible to edit the Title of this single scan: retype, and press the Change button.

Properties : scan 2:[bis]atgain.ids_2

Title

	Value	Unit
Mode	Standard	
Title	Scan 1	
E start	0.0000	V
E end	1.0000	V
+DynamicVertexes	<input type="checkbox"/> Off	
E step	10	mV
Scanrate	0.1	V/s
+Alpha	<input type="checkbox"/> Off	
Equilibration time	0	s
Current Range	1mA	
Filter	automatic	
Stability	automatic	
Connect to	Cell-4EL	
Analog inputs	none	
+AutoCR	<input type="checkbox"/> Off	
+Apply wrt OCP	<input type="checkbox"/> Off	
+IR feedback	<input type="checkbox"/> Off	
+Cell after meas	<input type="checkbox"/> Off	
Pretreatment	0	levels
Data Options		
+Automatic save	<input type="checkbox"/> Off	
+AUX	<input type="checkbox"/> Off	
+Anout2	<input type="checkbox"/> Off	

15. More possible Measurement Configurations

For impedance measurements, the applied and measured signals can be redefined. This is especially useful when using external equipment in combination with the potentiostat/galvanostat. One can use the Acout, Xin and Yin connectors on the peripheral port for this purpose.

Some possible applications/configurations:

- Interfacing a Solar cell, to modulate a light source, and measure the photocurrent/ potential (Modulight module).
- Interfacing with an electronic load
- Interfacing with an RDE to modulate rotation rate: Hydrodynamic impedance
- using the Ivium FRA in combination with an external analog potentiostat
- etc.

In standard setting, the impedance is defined as Y/X , which is normally the measured E/I from the electrochemical cell. When other (external) signals are used for X/Y , the meaning of the plotted impedance might be different from the classical definition. The plot is always displayed as if Y/X were E/I , and the user is responsible for any conversions.

To change the configuration of the signals, in the method parameters the advanced parameter "MeasConfig" gives the user the possibility to adjust this configuration. A list of possibilities is given in the table below:

	MeasConfig	X	Y	remarks	
0	standard	I we	E	Internal DSG not applied	
1	INT_ac I	ac intern	E	Internal DSG not applied	
2	INT_ac E	I we	ac intern		
3	EXT_ac EI	X periph.	Y periph.		
4	EXT_ac I	X periph.	E		
5	EXT_ac E	I we	Y periph.		
6	EXT_I INT_E	X periph.	ac intern		
7	EXT_E INT_I	ac intern	Y periph.		
8	DirectE	I we	E	CE as reference, instead of (RE-S)	
9	DirectE_INT_I	ac intern	E	CE as reference, instead of (RE-S)	
10	DirectE_EXT_I	X periph.	E		
11	BiStat	I we	I we2		
12	EXT_I BiStat	X periph.	I we2		

In the Direct configs, the potential control loop is bypassed. This means that the potential is the directly applied potential on the CE terminal, w.r.t. the gnd. This can be useful when controlling other equipment, such as loads. The differential electrometer can be used independently for other purposes.

16. AutoCR with Chronopotentiometry

Before this release, all Chronopotentiometry experiments had to be conducted using a fixed Current Range. Now, AutoCR can optionally be selected for this technique. If this feature is activated, the system will automatically set the most optimum CR at the beginning of each level. The CR is set to the most sensitive range that can handle the requested applied current.

Using this feature increases the dynamic range, enabling the combination of high with low current stages within 1 scan. Compared with the fixed CR configuration, there are 2 main advantages:

- a) Using the optimum CR gives better accuracy for applied currents, because errors scale with CR. Especially the applied offset error can be much lower.
- b) Using the optimum CR will result in a better response time. In galvanostatic mode, the response time is related to the actual CR. The response time for a high-impedance cell will be faster, when a more sensitive CR is used.

However in some situations, switching the CR in galvanostatic mode, may potentially cause undesirable spikes on the cell. Therefore, the system will switch to a zero-current situation during a CR-change, to avoid such spikes. The zero current duration, will be less than 5ms, and not be noticeable in the experimental graph, since AutoCR can only be used when the interval is longer than 10ms (100pnts/sec).

17. Pause/resume during ChronoAmperometry

An ongoing chronamperometric scan, in standard speed (sample interval > 2ms) can be paused by pressing the Pause button, at which it will maintain the momentary potential applied. Pressing the Resume button will continue the scan sequence, as defined by the method.

During a Pause period, the data is not recorded.

18. Export dataset as Ascii

As for datafiles, now also datasets can be exported as Ascii files, using the "Save dataset as Ascii" option on the File mainmenu.

The different scans from the actual dataset will be saved in separate files with the addition of '_x' to the filename, with x the sequence number of the scan.

19. Save & restore methodparameters between sessions

When exiting the Iviumsoft program, the actual method parameters are saved. When IviumSoft is restarted, these are reloaded.

In this manner, new sessions can continue where the previous ended.