ReleaseNotes IviumSoft 1.926 (firmware 249)

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1. Earlier threshold action in Mixed mode

In earlier software versions, the detection of thresholds was 1 interval time after the datapoint. Therefore it was possible to have 2 datapoints exceeding the threshold value, before is switched to the next level. Now, the behaviour is changed so that is proceeded to the next level, directly after the 1st exceeding datapoint

2. Wait periods in Batchcontrol in minutes & hours

The Batchcontrol.DirectCommand allows to put in delaytimes. Thusfar this was in seconds. Now, it is now possible to define delays in minutes and hours as well. All delays work cumulative.

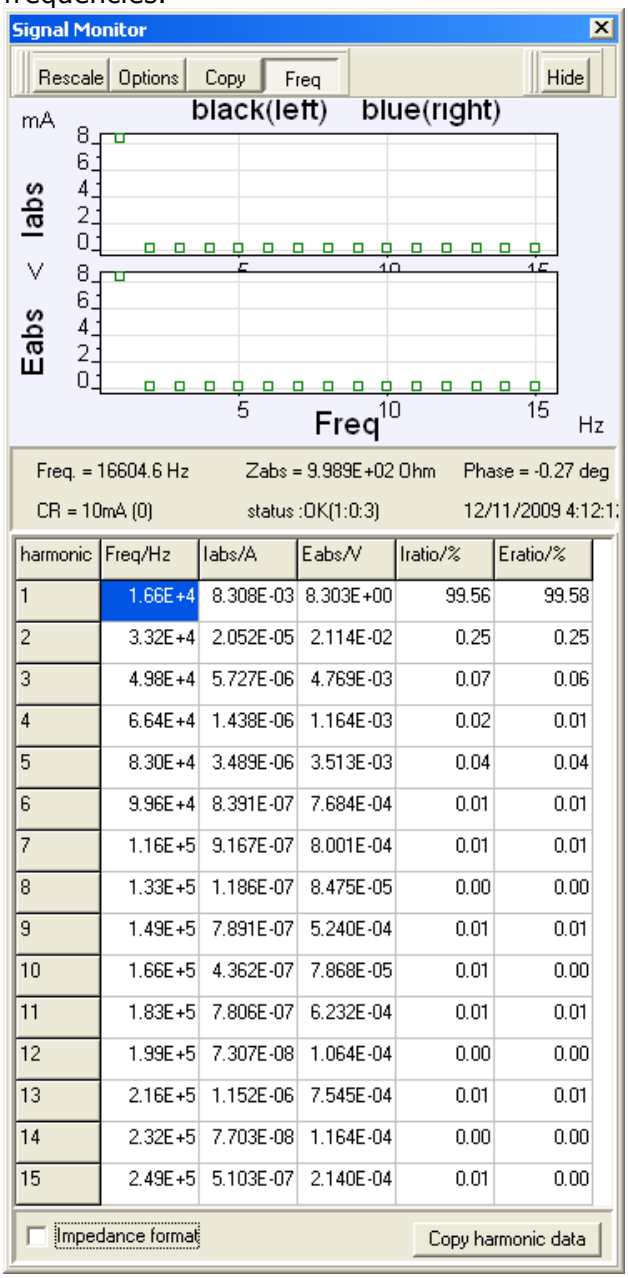
3. Add datafile to active scanlist

In the File menu, the item "Add scan" is added. Herewith it is possible to load a datafile (*.idf) to the active family of scans. As opposed to the "Load data" function, it does not clear the already present scans. Multiple datafiles can be loaded in this manner.
The new function allows compare and analyse scans that were not recorded in sequence. Also it is possible to combine datafiles into a custom dataset. It allows merging of selected scans into 1 file, because the active list can be saved as a dataset file.

4. Harmonic analysis EIS

To investigate non-linearities or (FEM) modulation products, the EIS data can now be analyzed with multiple frequency harmonic analysis. Up to 15 harmonics are calculated.
To invoke the harmonic analysis, open the Signal Monitor, press the [Freq] button and point Mouse on desired datapoint.
The harmonics are defined as multiples of the base frequency. The data can be shown expressed in absolute potentials&currents, or in impedance format. The relative

importance of each harmonic is shown as fraction of the combined total of 15 frequencies.

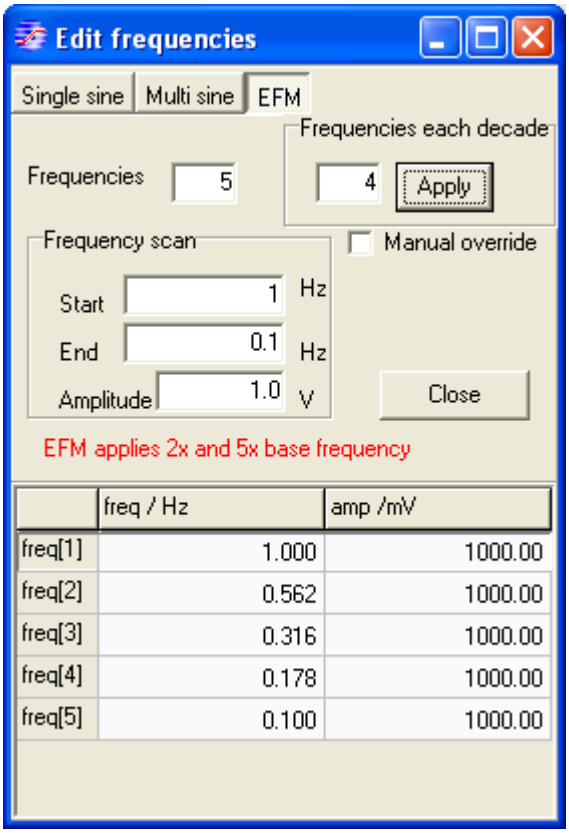


harmonic	Freq/Hz	Iabs/A	Eabs/V	Iratio/%	Eratio/%
1	1.66E+4	8.308E-03	8.303E+00	99.56	99.58
2	3.32E+4	2.052E-05	2.114E-02	0.25	0.25
3	4.98E+4	5.727E-06	4.769E-03	0.07	0.06
4	6.64E+4	1.438E-06	1.164E-03	0.02	0.01
5	8.30E+4	3.489E-06	3.513E-03	0.04	0.04
6	9.96E+4	8.391E-07	7.684E-04	0.01	0.01
7	1.16E+5	9.167E-07	8.001E-04	0.01	0.01
8	1.33E+5	1.186E-07	8.475E-05	0.00	0.00
9	1.49E+5	7.891E-07	5.240E-04	0.01	0.01
10	1.66E+5	4.362E-07	7.868E-05	0.01	0.00
11	1.83E+5	7.806E-07	6.232E-04	0.01	0.01
12	1.99E+5	7.307E-08	1.064E-04	0.00	0.00
13	2.16E+5	1.152E-06	7.545E-04	0.01	0.01
14	2.32E+5	7.703E-08	1.164E-04	0.00	0.00
15	2.49E+5	5.103E-07	2.140E-04	0.01	0.00

This data can be used for verification of impedance quality: for a single sine experiment on linear systems, the higher harmonics should be small or absent.
Also, it can be used to investigate nonlinearity effects. However, when the data is used quantitatively, it must be realized that the (higher harmonics) data is not calibrated as rigorously as the base frequency data.

5. EFM Electrochemical Frequency Modulation

With EFM, one applies a sum of 2 frequencies: 2x and 5x the base frequency. Applying such a signal on an non-linear cell will result in a mix of well defined modulation products, which can be analyzed (for example with the harmonic analysis, see par 4).



EFM can be activated in the "Edit frequencies" dialog screen, by pressing the EFM button. Each frequency in the scan is treated as a base frequency. In the example picture above, the first datapoint freq[1] will be applied as a sum of 2Hz + 5Hz, freq[2] will be applied as 0.2Hz and 0.5Hz etc.
The main graph will show the base frequency on the horizontal axis and the impedance of 2xbasefrequency on the vertical axis. (at 1Hz you will see the impedance of 2Hz). For viewing the complete result, see the Signal Monitor (harmonic analysis).

In principle the EFM can be used for base frequencies up to 31Hz. However due to distortion at higher frequencies, it is recommended for quantitative analysis to remain below 10Hz.

6. Numerical results for corrected potential and current density

Conformance to the graphical datadisplay, now also the numerical data for potential and current will be displayed optionally as corrected potential and current density. It is also selectable with the Ecorr and Idens buttons.
This will allow exporting the data in this modified format.

7. Added functions to remote driver dll: Abort & GetDataFromLine

The driver dll for customized programming is updated with 2 functions:

- IV_abort: to abort an ongoing technique. Calling this function has the same effect as pressing the Abort button
- IV_getdatafromline(int,int2,d1,d2,d3); same as IV_readdata, but with the additional parameter which specifies the scannr. This function will allow reading data from non-selected (previous) scans.

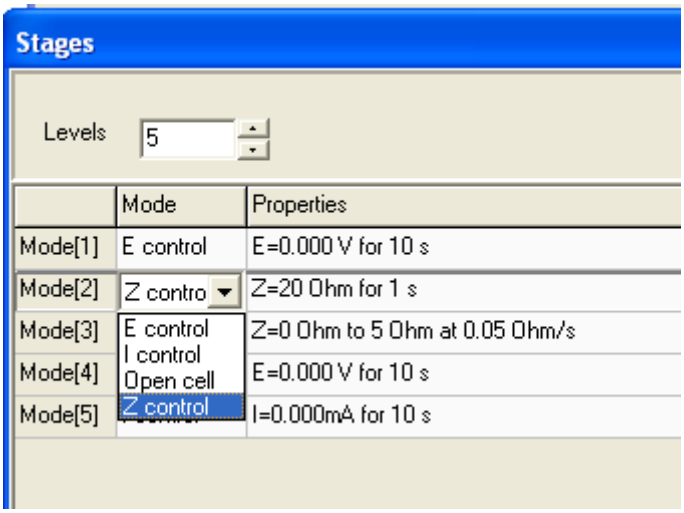
8. E50 Voltage enhancement module

The new E50 module can be activated from the Option form. When activated the voltage resolution and accuracy is increased with a factor 50, while the voltage range is decreased with a factor 50. For an IviumStat the applied resolution changes 333uV→ 6.66uV and scanrange +/-10V → +/-200mV.
Note that in potentiostatic mode, both applied and measured resolution is enhanced. But in galvanostatic mode, only the measured resolution is enhanced.

The E50 module in potentiostatic control must only be used at Hi-stability mode, at which the potentiostat has a fixed bandwidth of 2.5kHz. For galvanostatic control, any stability setting may be used.

9. ZSTAT, controlled load mode

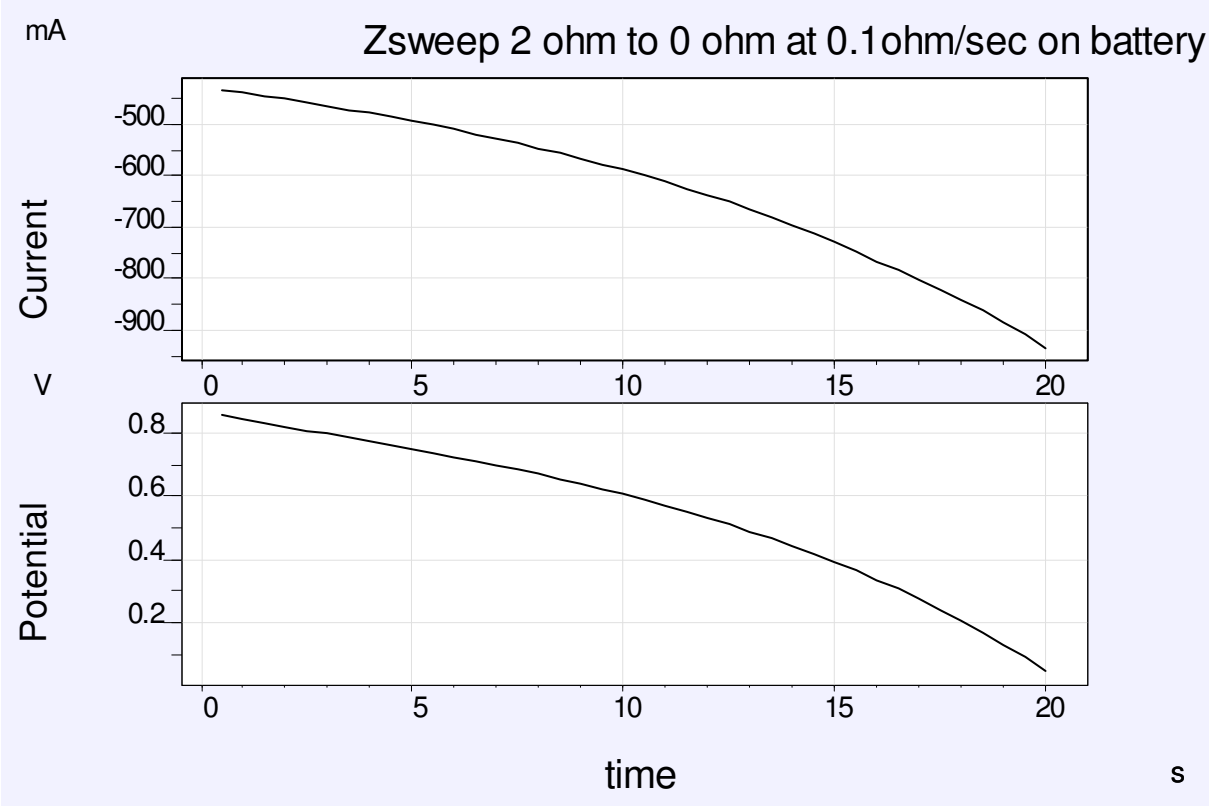
A new control mode has been introduced, that will apply a variable load on the cell. In this mode, the ratio potential/current is controlled. This mode is intended for active cells that generate power on their own: batteries, fuel cells, solar cells, etc.



The Zstat mode can be selected in the Transient/MixedMode technique, as a 4th selectable control option for a stage: E_control / I_control / Open Cell / Z_control

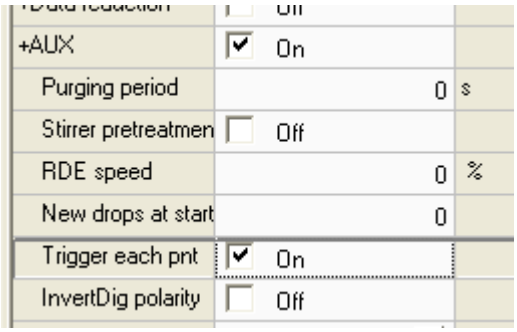
For Z_control, the load value may be fixed to a constant ohmic value, or as a linear sweep. The allowed range is defined by 2 Volt/CurrentRange, for example at CR=100mA the allowed range is 0 to 20 ohm. However, if the E50 potential enhancement module is used, the range lowers accordingly.

Similar to E_control and I_control, in Z_control the resistance value can be sweeped, see example below (CR=1A).



10. Optional Triggerpulse at every interval

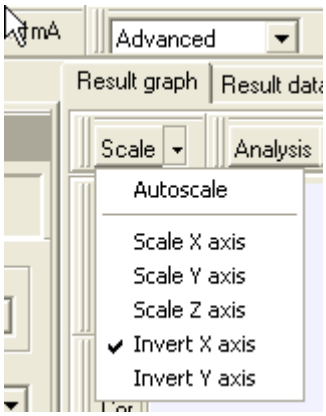
External devices can be synchronized by using the trigger pulse from the peripheral port digital output 3. From the AUX parameter, the " Trigger each pnt" can be checked.



When checked, the digital output 3 will apply a pulse directly after every measured point. For the staircase sweep techniques, the next potential/current step is applied before the pulse.
The pulse is about 0.1ms wide, and active low: digout3 is normally 3.3V and goes to 0V for 100us. The polarity can be changed with the "invertDig polarity" option.
This feature is available in the LSV/CV/transient techniques at standard speed (max data rate <500 pnts/sec).

11. Invert Xaxis and/or Yaxis

Normally graphs are plotted from left to right and from bottom to top, with the lowest values at the left-bottom. The individual axis in the Result graph can be inverted by selection. In the Scale menu, the options "Invert Xaxis" and/or "Invert Yaxis" can be checked, after which the corresponding axis are visually inverted in the graph. Note that the underlying data is not changed (of course).



12. Autosave nth cycle

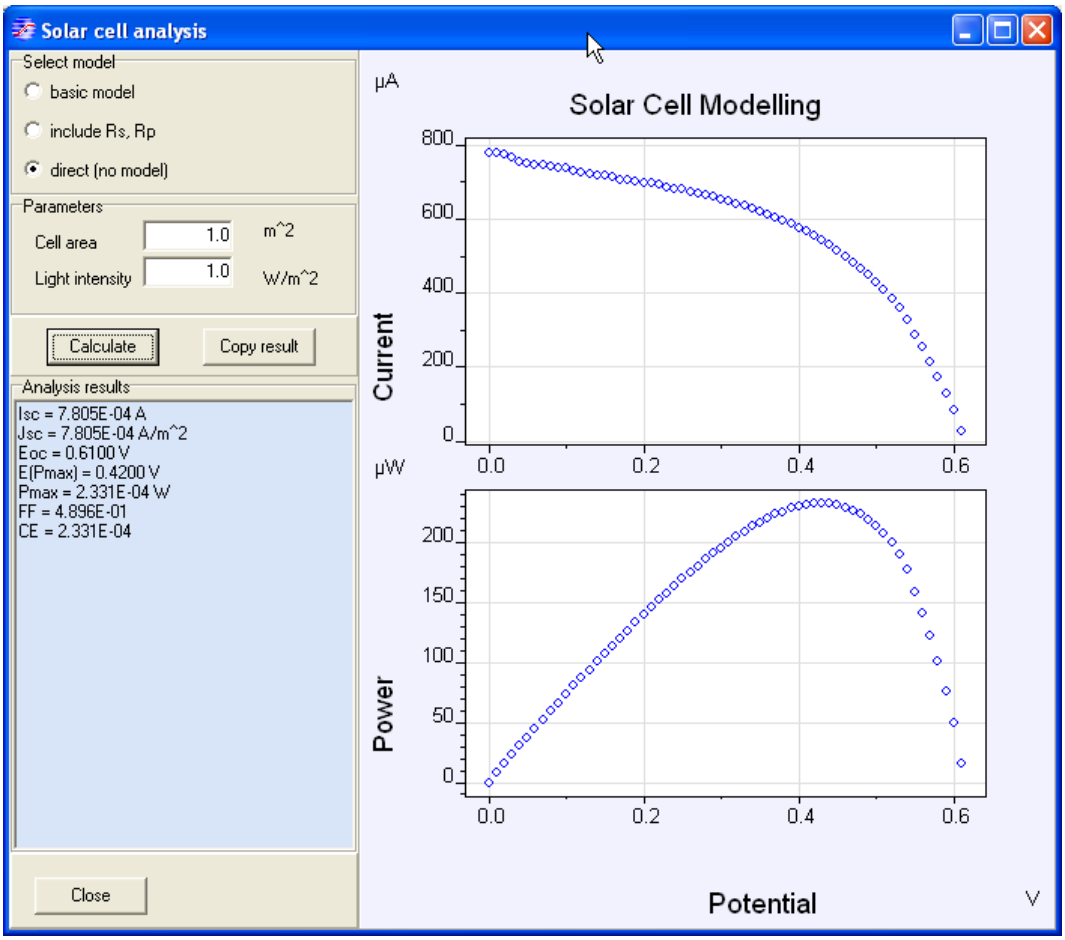
The AutoSave facility has been expanded with an extra option. It is now possible to selectively autosave selected scans in multiple cycle experiments. For example in CV, one can decide to save every 5th, 10th, or any arbitrary scannumber.
Under the AutoSave parameter, an extra subparameter appears: "nth cycle" that can be assigned:

0: means no cycle is saved;
1: means every cycle;
2 means every 2nd cycle;
...and so on.

The cycle data is saved as a regular datafile (idf), using the defined Autosave filename, with a cycle identifier at the end: xxx_c1.idf, xxx_c2.idf, etc.
Note that each time a cycle is saved, the clock for timed saves is reset. So if the timed saving period exceeds the cycleperiod save, timed saving will not happen.

13. Direct Solar analysis (without modelling).

Previously the Solar cell analysis was based on the semiconductor (diode) model with or without parallel and series resistors.
A direct method was added that does not rely on any model. It directly calculates the solarvariables, by finding the shortcut current/Open cell potential/Pmax/etc. by iteration over the data.



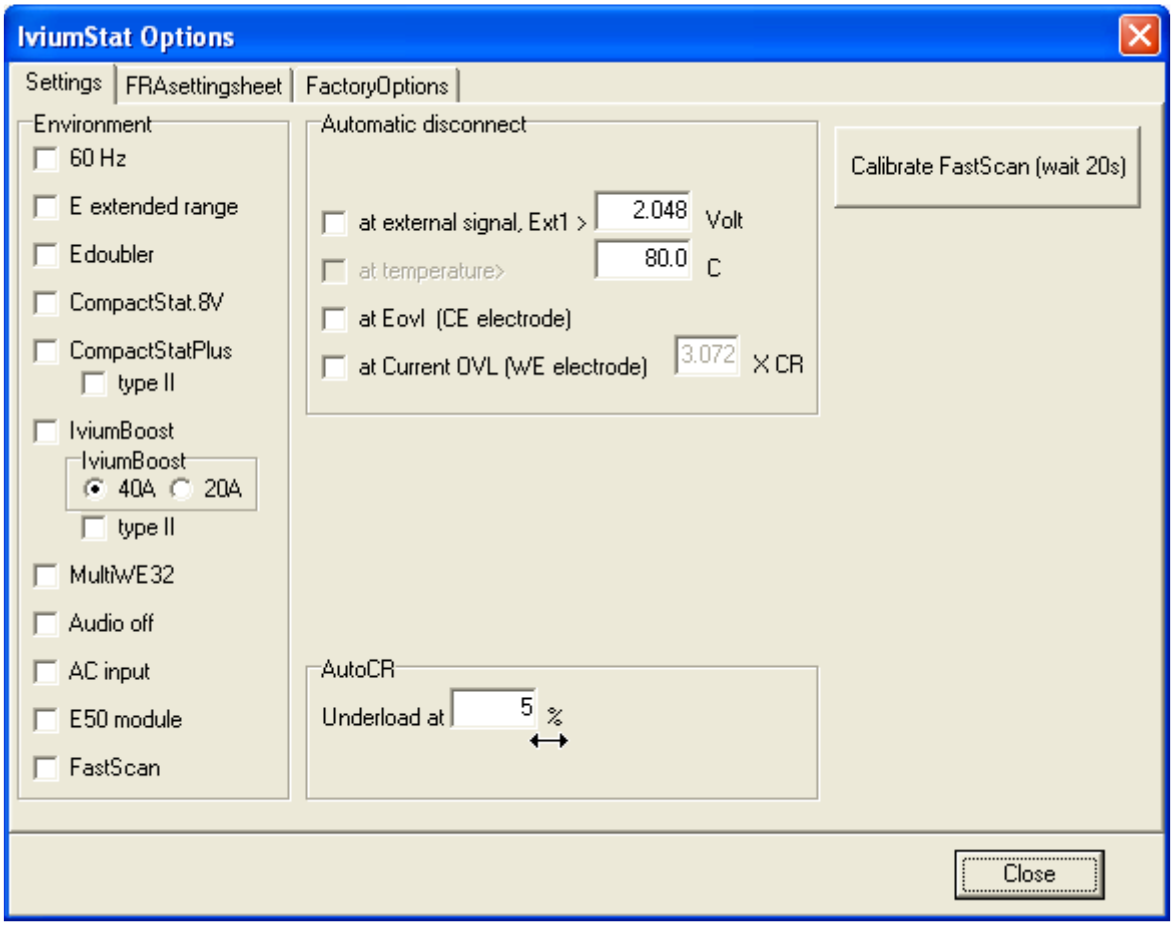
14. Data reduction: addition of maximum interval time

When data reduction is used, in combination with the minimum change criteria, it is possible to define a maximum period after which a datapoint is guaranteed to be recorded.

For example, if in ChronoAmperometry the datareduction is activated with a "min I delta" of 10nA, that means that only new datapoints are collected if the measured value differs more than 10nA from the previous recorded value. In situations where the current is very stable, no new datapoints are collected at all. This can be prevented. The "max interval" parameter will set a timeout period at which always a new datapoint is recorded.

15. Selectable underload threshold for AutoCR

When AutoCR is activated the system will switch to a higher range at overload, and to a lower range at an underload condition. Standard, the underload condition is flagged when the measured current is below 5% of the CR, for 4 consecutive measurements.
In certain situations, it is useful to lower the underload threshold, for example for noisy signals, to create more margin between CR switchpoints.
In the Options menu, on the Settings tabsheet, in the AutoCR box, a value can be entered for the underload level as percentage of CR. By default, it is set to 5%, and is adjustable from 0.2% to 25% in 0.1% increments.



NOTE: It is recommended that it should be kept on 5%. Only in situations where the AutoCR does not work properly due to noise, it can be lowered.