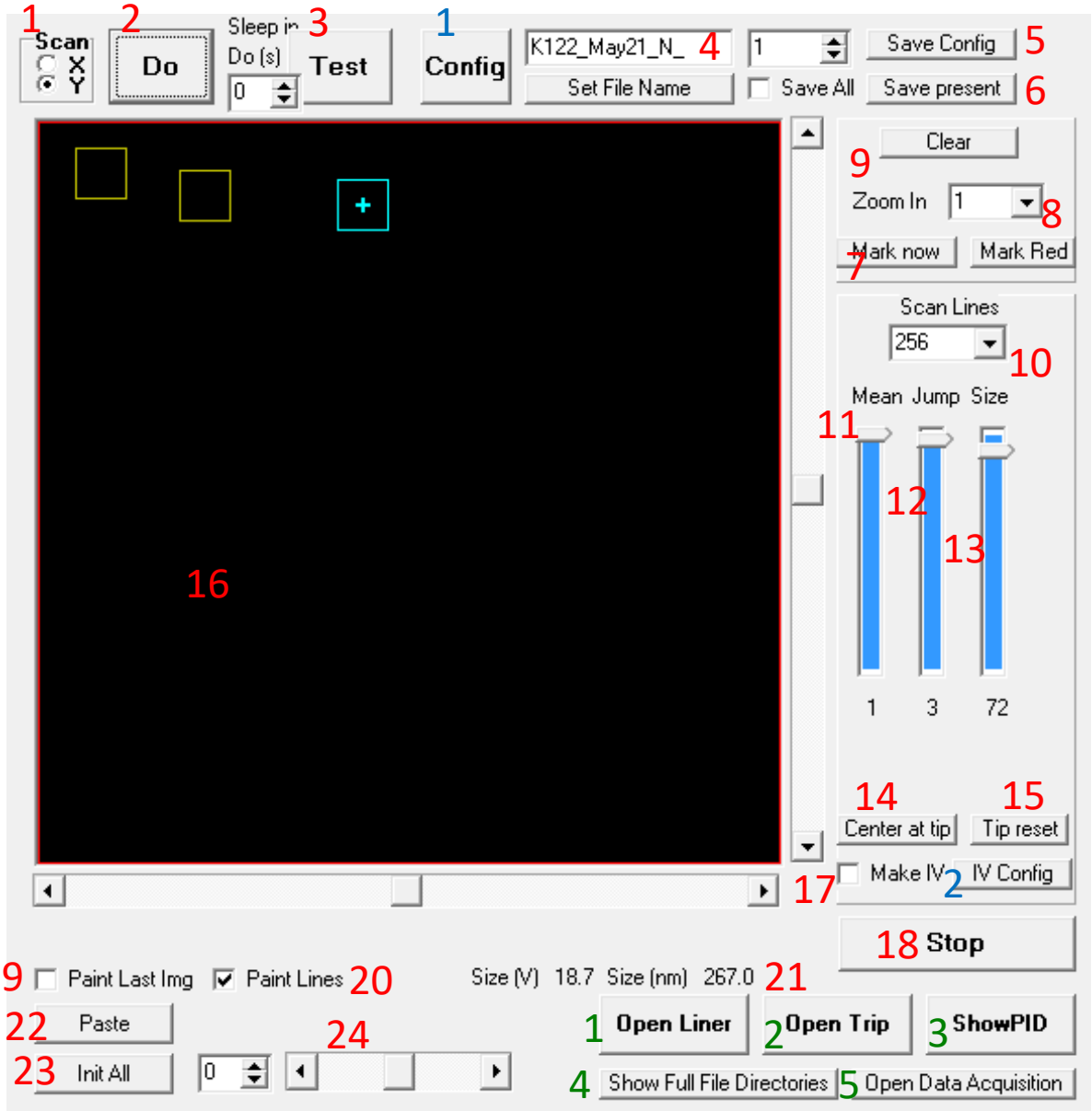
Guide through WinSPM

Main window: WinSPM_Scan

Program starts by opening this window and stops when closing it.

In red we show functions that can be performed with the software. In green we show opening buttons for additional windows, required to perform different operations.

The configuration of different parameters of the software, in particular the connection with the hardware, is shown in blue.



1) When making an image, fast scanning is along X or Y, as indicated in the radiobutton.

2) Starts scanning at the area marked in blue in the dark square which represents the full scanning window (16, full scanning window in dark, present scanning window in blue). Scanning is always made on a square.

3) Scans one line at the center of the blue square and along the fast scanning direction (1).

4) Filename used to saved data. To select the file name and saving path, use the button below. Image names are appended with a number, which can be modified by the control on the right. The number is automatically incremented by one after one image is saved. By checking "save all", all images that are made are automatically saved when the image is finished.

5) Save present configuration of the window, to be able to use it after closing the window.

6) Last image is saved and the number appended to the name is increased by one.

7) Marks present scanning window (in blue within 16) with an ocre square. This allows returning to this area later.

8) Zooms into the scanning window.

9) Erase marks on the scanning window.

10) Number of points taken in each scan.

11) Number of points taken at each position and then averaged.

12) The scans are made on a 16 bit basis. The number of points (10) implies usually smaller intervals. We can scan faster by increasing 12. If 12 is one, the minimum scan step is used. By using larger values, we make larger steps.

13) Size of the scanning window (blue in 16).

14) Centers the square area on the present position of the tip.

15) Returns tip to center of image.

16) Overall scanning window. When zoom 8 is one, this is the maximum scanning window. The blue square shows the scanning field of view.

17) When checked, we call at each point the module "IV" to make an IV or a IZ curve.

18) Stops a scanning or other ongoing processes.

19) Images are painted within the blue scanning window, just after having been taken.

20) When checked, the image is painted line by line during scanning, in the scanning window (see below).

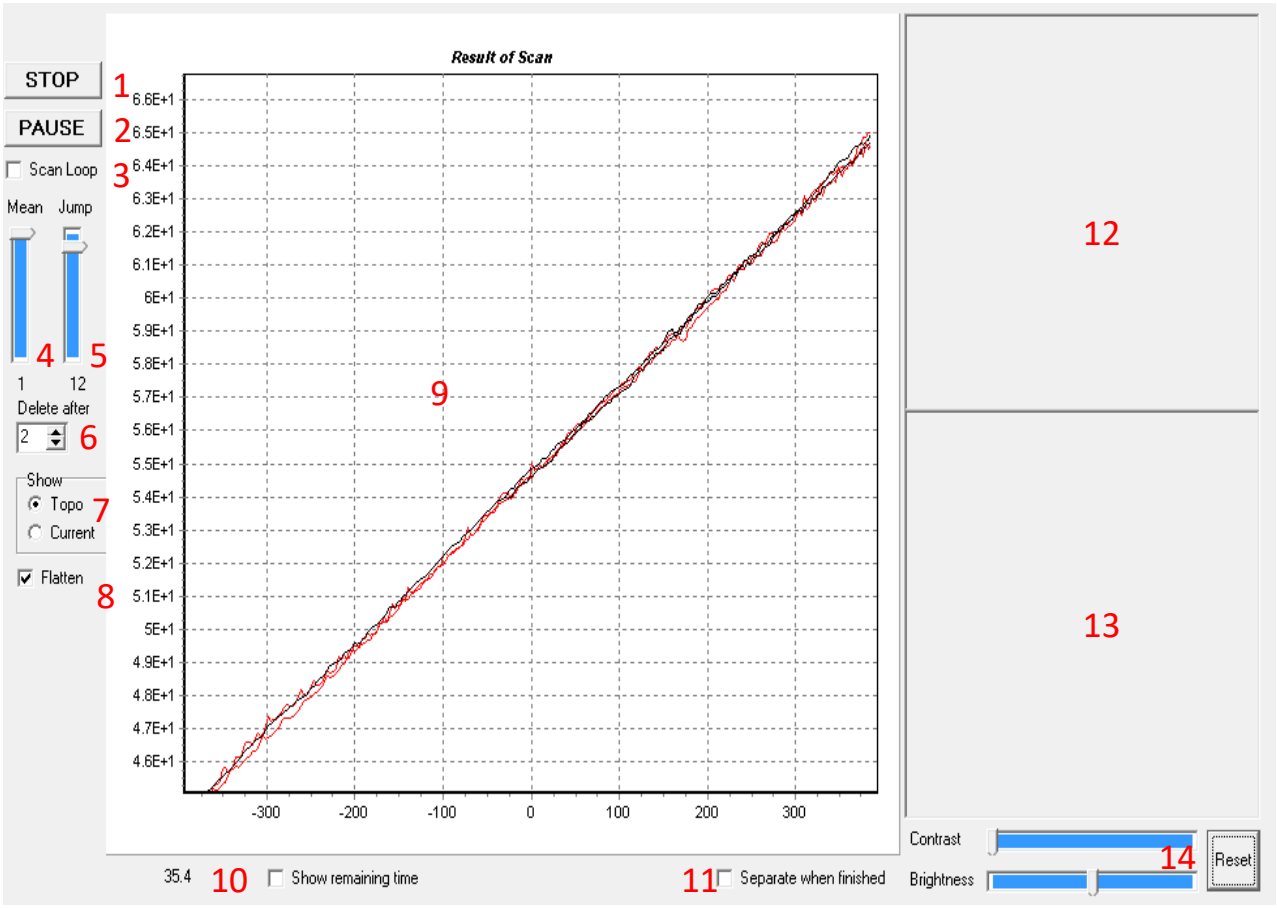
21) Present scan size, in nm and in voltage.

22) Any image located in the copy buffer of windows is pasted within the scanning field of view (blue square). This way, we can treat data to obtain vortex lattice or spectroscopic images and we can then insert these within the blue square, to position the tip at an interesting location.

23) Initializes data acquisition. Use with care, this puts all outputs to zero.

24) Send the value on the bar to the DAC numbered in the updown control box.

Subsidiary window during scanning Win_SPM_Scan.

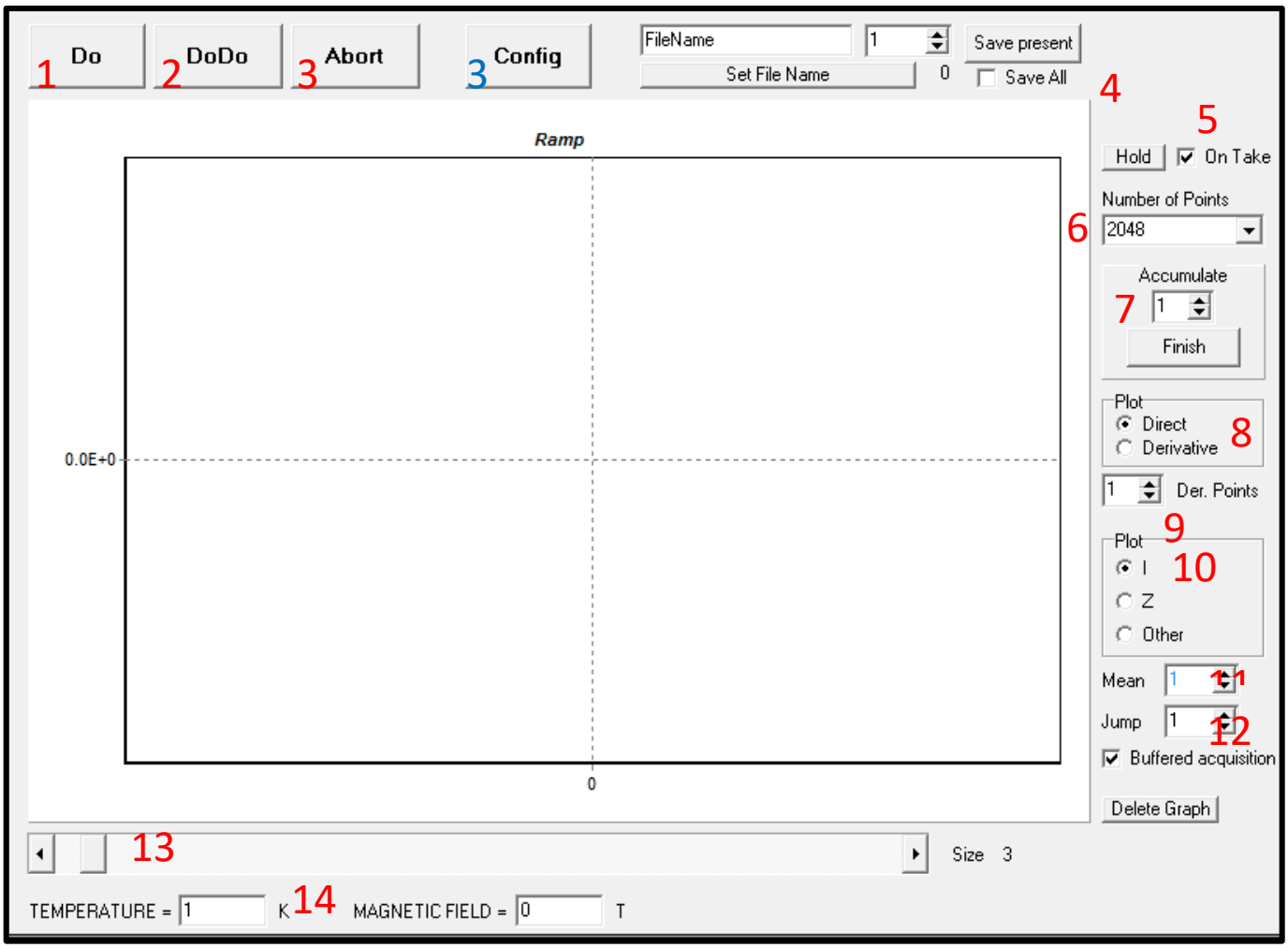


When scanning (after pushing 2 in the main window), a scanning window is opened.

1) This stops the scanning process, sends the tip back to the center of the blue square and closes this window.
2) This pauses the scanning process. The tip is maintained at this position, until the button is pushed again to resume scanning. This can be used to make a current voltage curves, for example.
3) When checked, this will start a new scan, after this scan is finished.
4) This is the same as 12 in previous window and can be modified during scanning.
5) This is the same as 13 in previous window and can be modified during scanning.
6) Number of scan lines drawn in this window (in 9) before erasing from the window for clarity.
7) The panels 12 and 13 show the image line by line. This choses the ADC number from which we make the images shown in those panels. Notice that the current value should be flat, if feedback loop would be perfect.
8) When checked, it removes a global plane to 12 and 13.
9) Scanned curved shown as it is made. This consumes a significant amount of time. When measuring during night, or to optimize time, leave at zero.
10) If checked, the needed remaining imaging time is shown in the left.
11) If checked, the tip is separated when the scan finishes.

12) The result of the scan is drawn in this panel (forward direction).
13) The result of the scan is drawn in this panel (backward direction).
14) Contrast and brightness of panels 12 and 13.

1: Opens another window: Win_SPM_MakeLines.



1) Make one scan and obtain a curve. A scan is defined as a procedure where make a ramp on which we move a given DAC from a maximum to a minimum value. During the scan, the feedback loop is switched off. Each time we modify the value during the ramp we wait and acquire one or more data from a set of ADCs, before going to the next value of the ramp.

2) Repeats scans in a non-stop loop.

3) Stop the loop 2.

4) Here we can set the data saving. The filename and path is set using the button. The name is transferred from the main window, and can be modified here if needed. The filename is given in the text box. The updown control provides the present file number. Each time one curve is saved, the file number is incremented by one. By checking SaveAll we save every curve made by pushing 1.

5) This is to control the feedback loop. After making a Do, the feedback will be switched on automatically (independently if it was on or off previous to the scan).

6) Number of points in a curve.

7) Makes the number of curves within the updown box and produces the average of all curves. The feedback control will switch on after each curve for a short time (defined in the feedback window). The averaging can be stopped by pushing the “finish” button.

8) Here we can plot the curve, or its derivative.

9) Number of points used to make the derivative in 8.

10) This is the ADC value shown in the main window. We can chose among three values, associated to the ADCs using the configuration window shown below.

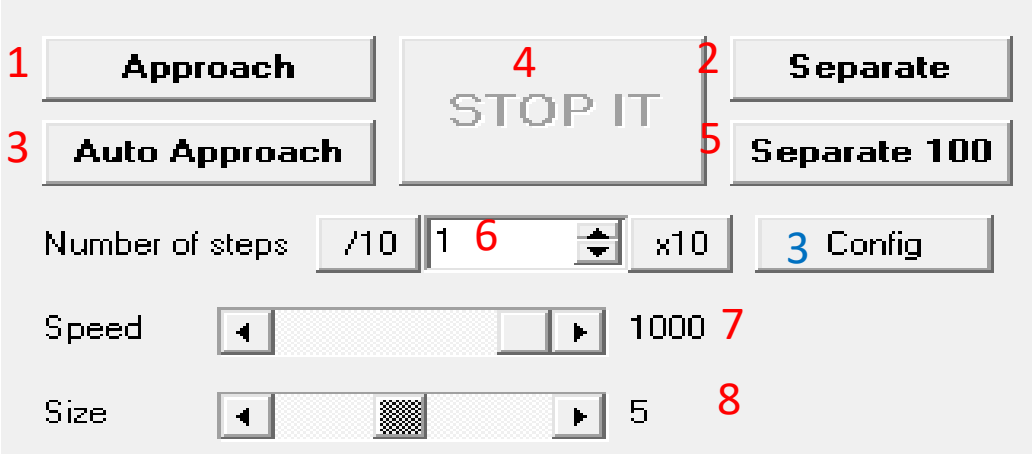
11) For each point in the curve, the ADC is measured the number of times shown and the average is recorded.

12) The velocity of the ramp can be decreased by increasing the number of steps between two points of the curve. One means that the curve is taken step by step. Larger than one means that the DAC is operated the mentioned amount of times between curve points.

13) This is the size of the ramp. 10 is the whole 16 bit DAC size.

14) These are free writing fields, to be added to the header of the saved files.

2: Opens another window: Win_SPM_Travel



This sends a sawtooth signal to a given DAC, to produce coarse motion along one direction.

1) Sends a set of sawtooths to the DAC along one direction (approach, as defined by the configuration).

2) Sends a set of sawtooths to the DAC along the opposite direction.

3) This pushes the button 1 until a signal is observed in the current, as defined in the configuration.

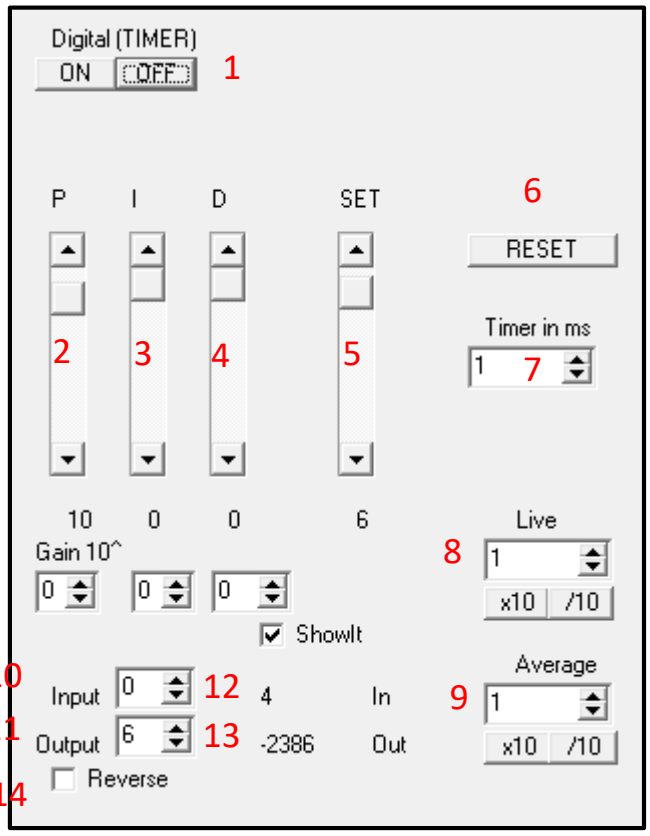
4) This stops sending signals.

5) As 2, but with 100 steps.

6) Number of sawtooths send each time 1 or 2 are pushed.

7) Time for one sawtooth signal. The flank is always as steep as possible (changes DAC from +10 V to -10 V).

8) Size of the sawtooth signal (0 to 10 V).



3: Opens another window: Win_SPM_Feedback

1) Switch the feedback on and off.
2) Size of P.

3) Size of I.

4) Size of D.

5) Reference point.

6) Reset feedback loop.

7) Put zero for near to continuous call to the feedback function.

8) Repeats the feedback the amount of times shown in the box. It can be multiplied or divided by 10. Use with care, as it may not have stopped before the timer switchs the feedback on again.

9) Number of points to average each time a value is acquired for the feedback loop.

10)ADC used for the feedback input.

11) DAC used for the feedback output.

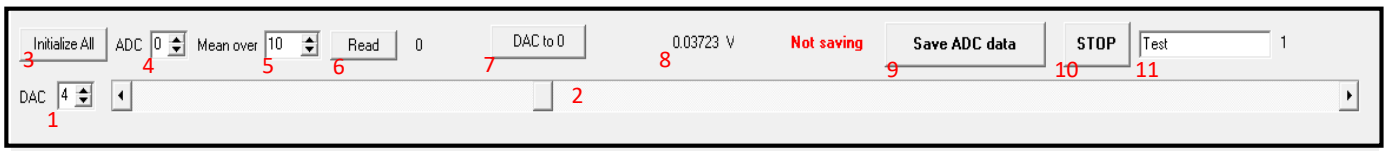
12) Current read, from zero (min) to 32768 (max).

13) Value sent by the feedback to the DAC, from -32768 (min) to 32768 (max)

14) This reverses the output of the feedback.

4: Opens another window: WinSPM_FileDirectories

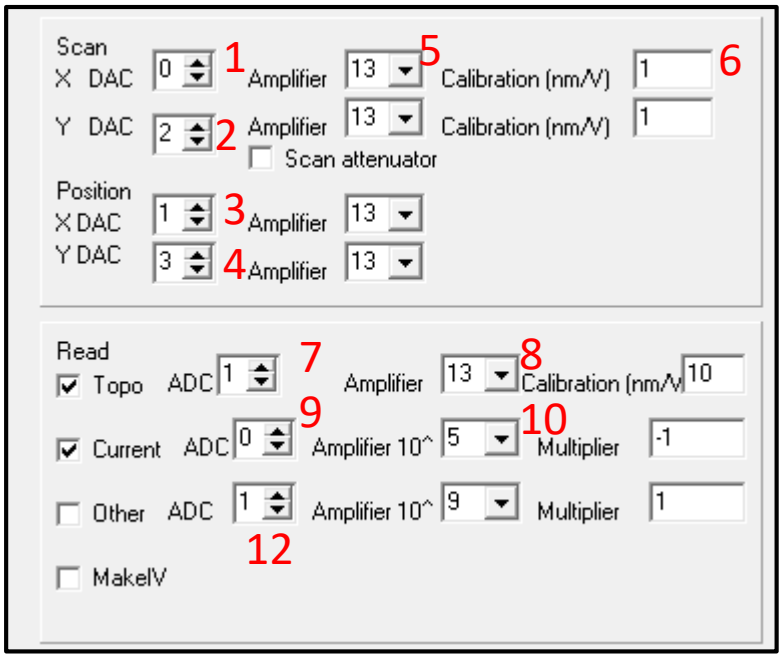
This is to inform about positions of file directories.



5: Auxiliary data acquisition window (testing)

This window helps testing the hardware. It should never be used in normal operation, as the values indicated here are completely independent of the rest of the program.

1) Moving the bar 2, we can vary the voltage sent to DAC named in this updown box.
2) Bar to change the value of DAC in 1.
3) Sets all DACs to zero and initializes everything.
4) ADC to be read when pushing 6.
5) Number of points to make an average each time we push 6.
6) Read ADC, show result in the right of the box.
7) DAC of 1 and bar 2 are set to zero.
8) Value of the DAC 1 and scale bar 2.
9) ADC data can be saved as a function of time.
10) Stop saving ADC data as a function of time.
11) Filename with data from ADC saved.



1: Configuration window for the scan

1), 2), 3), 4) Modify the DAC configuration. Scan are DACs used for scanning. Position are DACs used to position the tip within the scanning window (cross in main window).

5) Voltage amplification provided by the hardware. This is used to calculate x and y axis values during scan.

6) Calibration of the piezoelectrics.

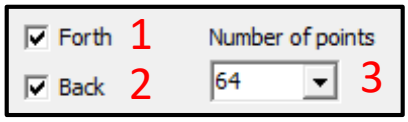
7) ADC used to read the variable "topo".

8) Hardware amplifier of Z piezo and calibration. This allows to save the right value for the constant current scans.

9) Second variable read (ADC for current).

11) Current amplification (IV converter) and multiplier.

12) Data for an additional reading.

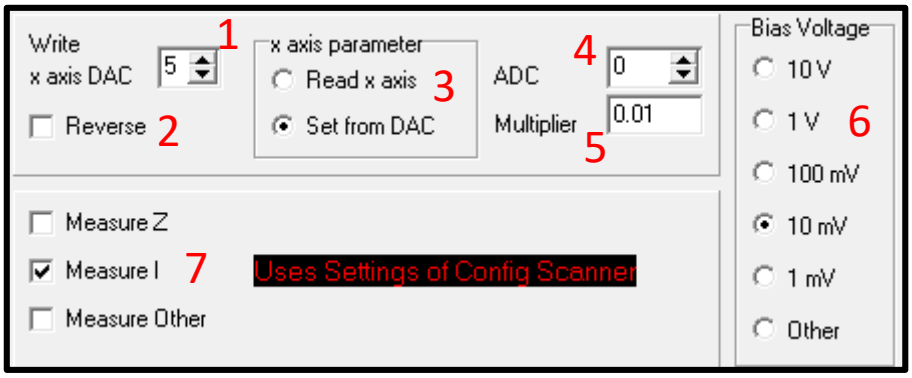


2: Configuration for taking curves during scan

1) Save forth of the curve taking procedure.

2) Save back.

3) Number of points where we make an IV curve.



3: Configuration for the curve window.

1) X axis DAC. Define the main DAC used to make the ramps.

2) Reverses sign

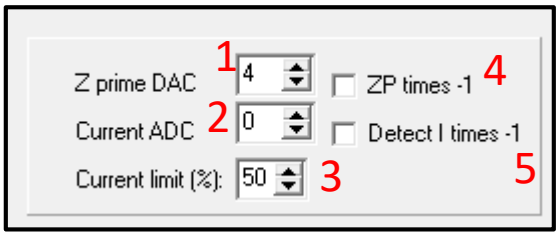
3) Reads the x axis from a given ADC or sets it from what is sent to the DAC.

4) ADC channel to be read.

5) Multiplier to the ADC.

6) If the voltage is divided by the user, the division can be set-up here for saving purposes.

7) Indicate which channels should be measured (up to three).



4: Configuration of the coarse approach window

1) DAC used to send the sawtooth signal.

2) ADC used to read the current.

3) When current increases this value, the coarse approach stops in the autoapproach mode.

4) Set the direction of the sawtooth signal.

5) Sets the sign of the current.