

SkyScan1272 Software Update from versions 1.0.x to version 1.1.x



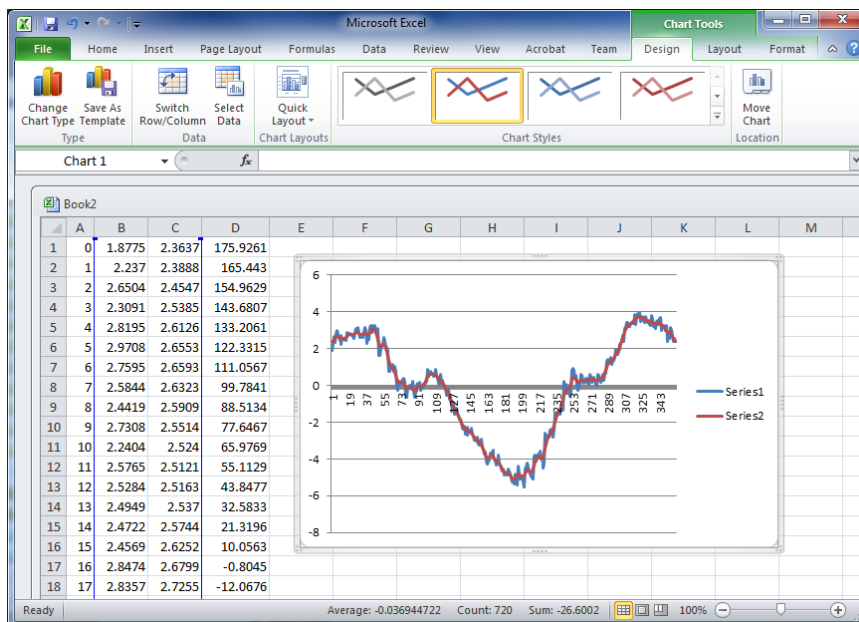
Control software for SkyScan1272 in version 1.1.x requires different from previous versions installation procedure. ZIP-file with update includes new camera drivers and requires some recalibration of the system to improve quality of scanning and reconstruction results. Significant improvement of reconstruction quality provides by 1.1 version connected to new camera drivers, camera access libraries and multiple improvements in image processing and correction procedures inside the control program.

Please follow listed below steps during installation:

1. Download and unpack zip-file to a new folder.
2. Right mouse click to Computer (desk-top or start menu), select Properties, and then click to Device Manager in the left top corner. Click to Imaging Devices, right click to XIMEA USB camera, and select Update Driver Software. Select Browse my computer... and in Search window browse to the folder with unpacked zip-file, click Next. Update camera driver. It will change the label of the camera in Device Manager to XIMEA USB... x64. Disconnect USB cable(s) from the scanner or from control computer. The camera will disappear from Device Manager. Connect cable(s) back. It will reinitialize camera driver and camera will appear in Device Manager again.
3. Copy SkyScan1272.exe and m3api.dll files from the folder with unzipped files to the folder with control software. To find the folder with control software you can use right mouse click to shortcut on the desktop with following selection "Open File Location".
4. Start control software. In the first start with new version the software will show dialog, which allows you to keep or reset user interface customization. We recommend you to reset it by clicking Ok to be sure that all new options will be available. Resetting user interface customization will not change any settings in your software.
5. Check that visual camera can work with new driver and libraries. In the case of problem, restart computer.
6. Check image from x-ray camera. It may look more "grainy" than before because calibration of the system with old camera driver is slightly different from calibration required by new driver.
7. Make alignment using alignment pin supplied with the system. Update angular alignment by choosing "compensate image tilt" in alignment results dialog. Remove alignment pin afterwards.
8. Acquire all new flat-field references for all modes, bright and dark for all camera positions using automatic exposure adjustments. To do so, remove all objects from the system, go to Options -> Scanning Modes..., select last option under the table with exposures, uncheck two checkboxes

under this selection, check box “adjust exposure automatically” and press Ok. Updating all flat-field references can take several hours.

- Install alignment pin again. Make Trajectory Calibration according to User Manual or using context help. New trajectory calibration procedure will save binary trajectory file Skyscan1272CC.clb, which will be used in the following scans, and text report in the file 1272calibrationCC.log. Last one can be opened for inspection by Microsoft Excel. Open Microsoft Excel, select Data in the top menu, go to “From Text” in the toolbar, change file type mask from Text Files to All Files, browse to find 1272calibrationCC.log in the folder with control software and click twice to it (or once to file and once to “Open” button). In following dialog select Delimited type of column separation, select 8 in “Start import at row” to skip file header, and then click “Next” button. In next dialog check “Space” box in “Delimiters” and click “Next”. Next dialog should be set to “Column data format” as “General” with following click to “Finish”. In the case of appearance next small dialog for “Import Data”, just click OK. The table with four columns will appear on the screen: first one is angular position from 0 till 359 degrees, second and third show calculated and smoothed trajectory profile, and fourth one contains raw data used in trajectory calibration. To get graphical representation of trajectory calibration curve, select second and third columns (click to B and C keeping Ctrl in keyboard), go to Insert in top menu, select Line in toolbar and choose first pictogram with lines. This is an example of trajectory calibration curves:



Blue curve corresponds to measured values. It is slightly “noisy” from 1/10 pixel measuring accuracy, red curve shows smoothed values, which will be used for trajectory correction with sub-pixel accuracy.

- Adjust position correction in elevation to ensure in proper connections of sub-scans during oversize scans by following way: In Options->Scanner Settings set “Image shift in elevation (um/mm)” to 0. Install alignment pin, select lowest camera resolution (1K for 11Mp systems, 1.2K for 16Mp systems), no filter, magnification – to get pixel size around 8 microns. Make scout view and select part of the object (draw line over scout view keeping Ctrl pushed) to get four

partial scans in connected scan (number of partial scans can be seen in brackets aside indication of the length of the line). In following dialogs agree to add this scan to the batch and set scanning parameters to get fast scanning: 1 degree rotation step, no averaging, no random movement, and click "Ok" in Scanning Options dialog. Click "Start scan" in "Batch and Oversize Scanning" window. After scanning, start reconstruction program. It will indicate position in the middle of first (bottom) sub-scan. Click to Settings tab and write down automatically calculated misalignment compensation value. Go back to the Start tab, double-click to the image somewhere in the second from the bottom sub-scan (sub-scan borders can be seen in left and right side of the image), then open Settings tab again and write down Misalignment compensation value for second sub-scan, repeat the same for third and fourth sub-scans. Now calculate three differences in misalignments between neighbour sub-scans and take average value, then – multiply it to pixel size used during scanning. It will correspond to object shift in microns between sub-scans. Go back to Start tab and measure vertical size of single sub-scan by drawing line between two marks on the side of the image with pressed right mouse button – it will correspond to elevation of object in mm between sub-scans. Divide calculated object shift in microns between sub-scans to elevation in mm between sub-scans and enter this value to "Image shift in elevation (um/mm)" in the "Scanner settings" dialog of control program. Remember that in the case of misalignment in the bottom of connected scan is larger than in the top, the value should be positive, if smaller – negative. To test proper calibration you can repeat the same scanning of alignment pin. In the case of proper calibration, estimated difference in misalignments between partial scans, calculated by NRecon, will be not more than 1-2 pixels. Such misalignments can be easily handled by automatic merging procedure for connected scans, implemented in NRecon.

11. After performing all listed above calibrations you can start to scan your samples. Following remarks will help you to get best possible results using new version of control software:
 - a. Reconstruction program NRecon can perform misalignment correction with accuracy much better than can be seen in automatic suggestion. Automatic suggestion for misalignment correction based on the comparison of object images after 180 degree rotation using resampling to parallel projections. By comparing two images, suggested value for misalignment correction can be calculated with accuracy down to 0.5 pixel. If using suggested value you still can see small misalignment, you can change correction value by small increase or decrease with any accuracy and reconstruction software will make necessary processing in sub-pixel level.
 - b. New very accurate processing procedures in control software allow significant reducing of ring artifacts. In most cases you will be able to use smaller values (1...4) for ring artefact correction during reconstruction to remove ring artifacts.
 - c. Due to exact sub-pixel geometrical operations in new version of control program, you will probably find significant reduction of the noise in reconstructed slices compare to identical scans using previous versions of control program, especially – for camera binning modes, i.e. with resolution smaller than maximum. That means Smoothing value in reconstruction settings can be significantly low than before, which will preserve small details on the reconstructed slices.

In the case of any problem in installation of new version of 1272 control software, please inform Bruker microCT using e-mail link in "About" box of 1272 control program.