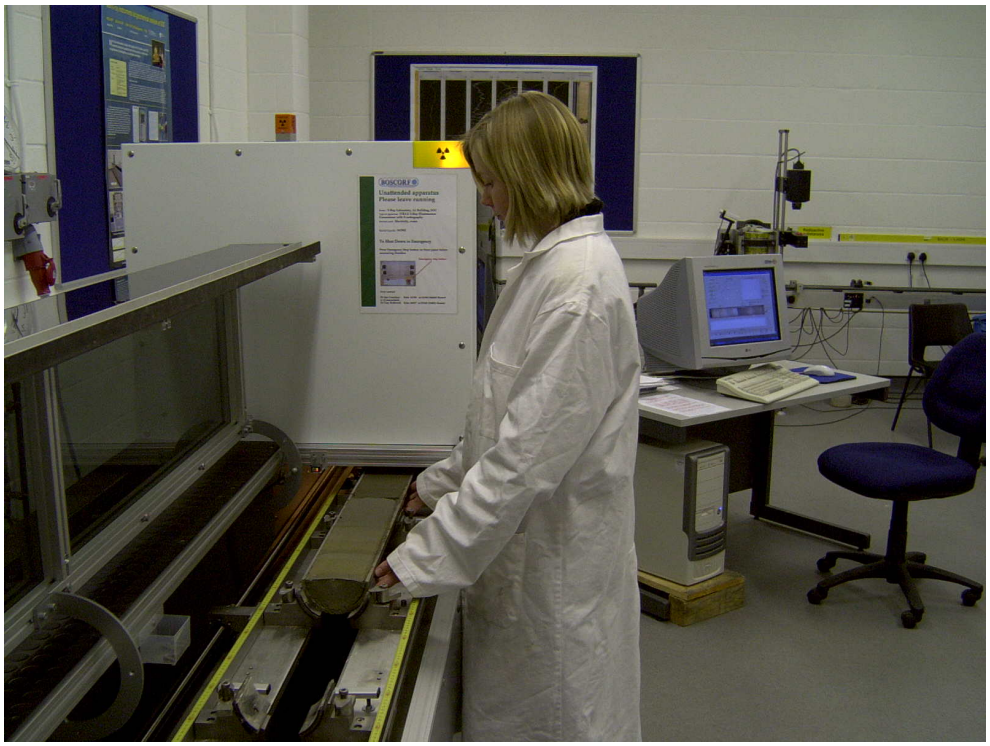
BOSCORF
British Ocean Sediment Core Research Facility

USING THE ITRAX CORESCANNER

A step-by-step user guide

Version 2.0 (August 2012)



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Using the ITRAX Corescanner

1. Prior to using the corescanner

1.1. Prior to loading the core, inspect the sediment surface. It should be as smooth and as flat as possible.

1.2. Check the height of the top core liner edge (as mounted in the instrument, looking away from the observer) – if this is more than 1cm higher than the core surface in the line of measurement, the liner edge must be cut down using one of the rotary saws on the core splitter (**wear eye and ear protection**) to prevent possible collision with the detector bracket during analysis.

1.3. Be aware that if the core has a significantly undulating surface, height adjustment of the core cradle may be needed after the surface scan, which will show whether a significant part of the core surface has a validity of '0'.

2. Using the corescanner

2.1. The corescanner is protected by safety circuits and cannot be operated with any of the lids open or with any of the instrument panels removed. The yellow lights on the top corners of the measurement chamber indicate that the X-ray tube is energised. The red lights on top of the measurement chamber and above the glass waveguide indicate that the X-ray tube shutter is open (Fig. 1).

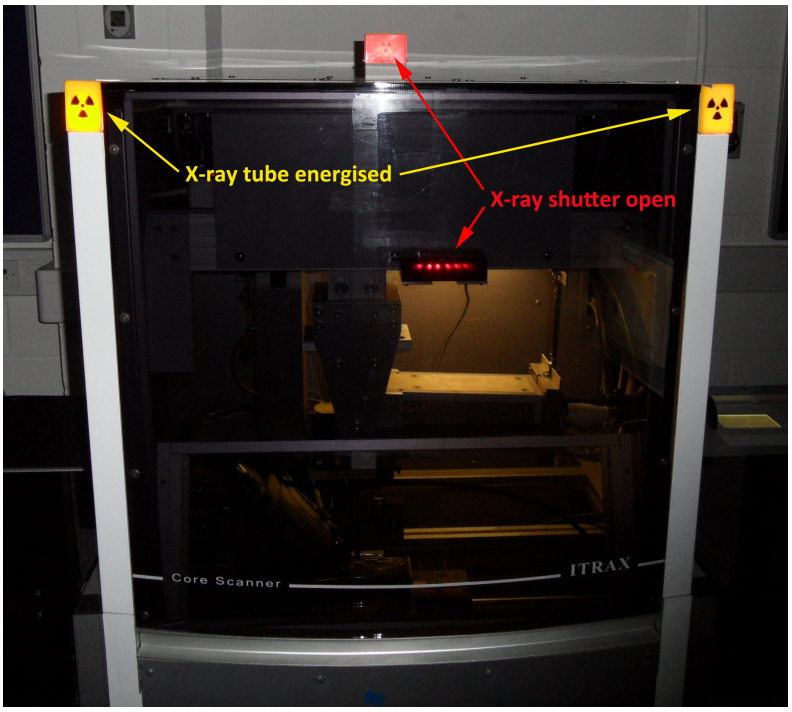


Fig. 1. ITRAX corescanner - warning lights

2.2. Load the core into carriage with the top of the core to the right. The core must be able to enter the measurement chamber without triggering the core height-detecting beam at the entrance to the measurement chamber (Fig. 2). The height of the carriage can be adjusted using the pullout pins on the swivel blocks which hold the core (Fig. 3) – **remove the core to do this**.

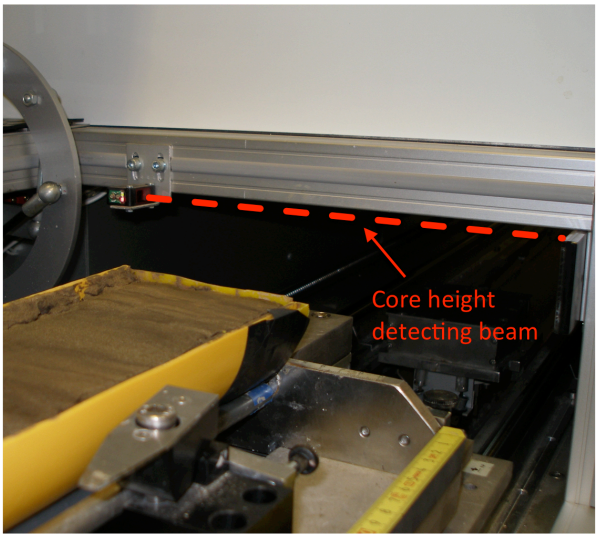


Fig. 2. Core height detecting beam. Core must be lower than this to enter the measurement chamber.

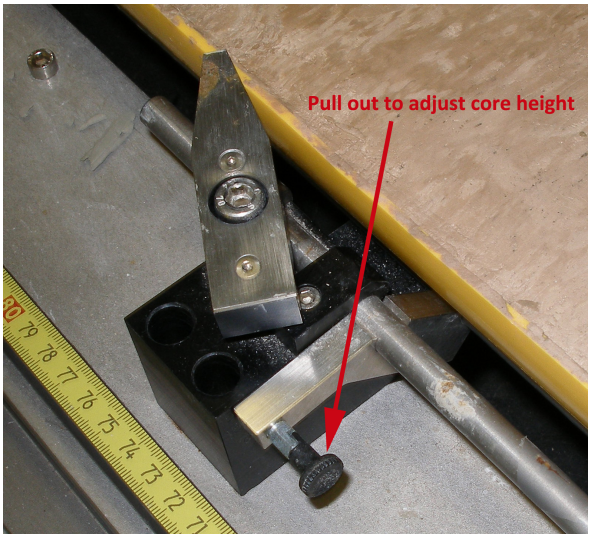


Fig. 3. Core height adjustment mechanism.

2.3. Place a piece of card at the bottom end of the core (this can be mounted on wooden blocks) – the edge of the card should be as flush as possible with the core surface at the end of the core (Fig. 4).

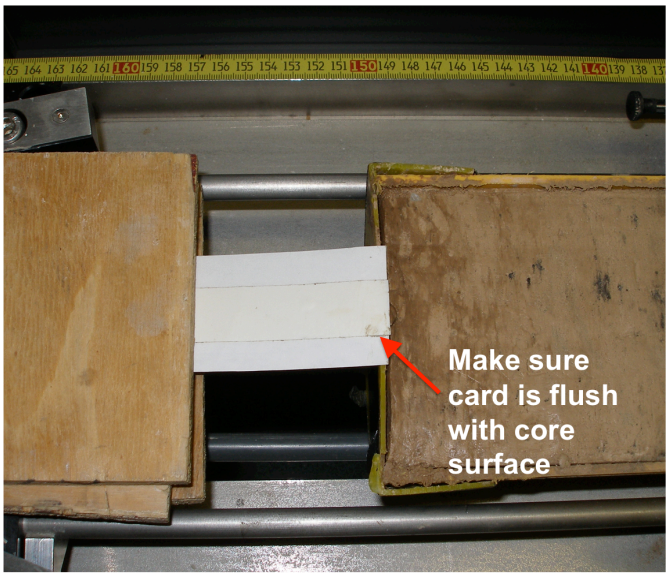
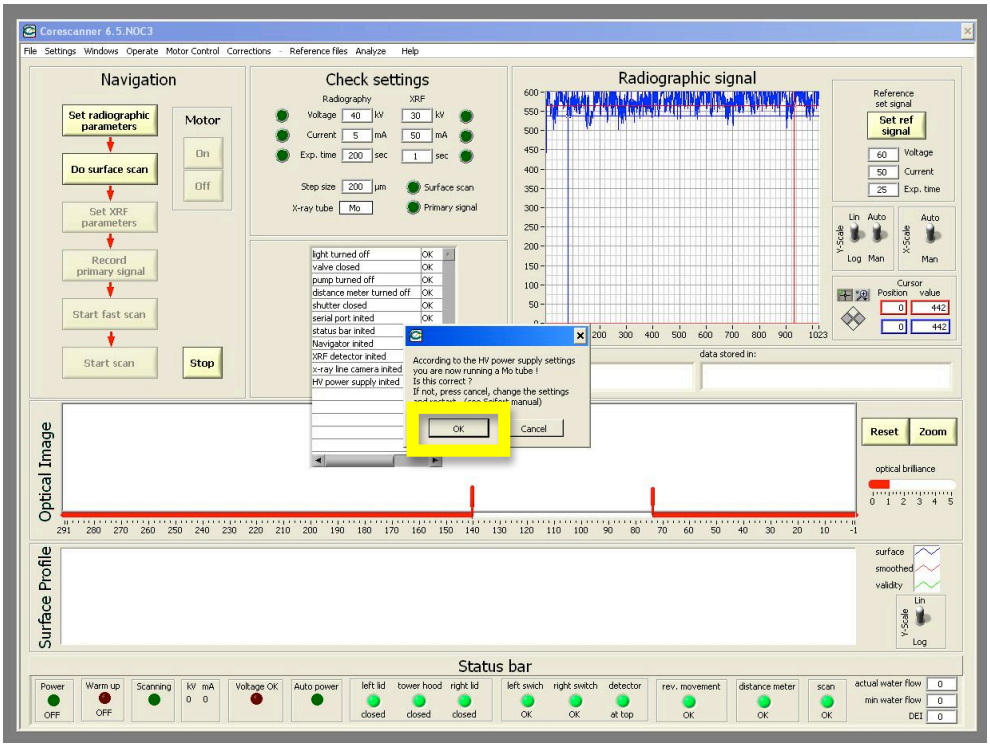


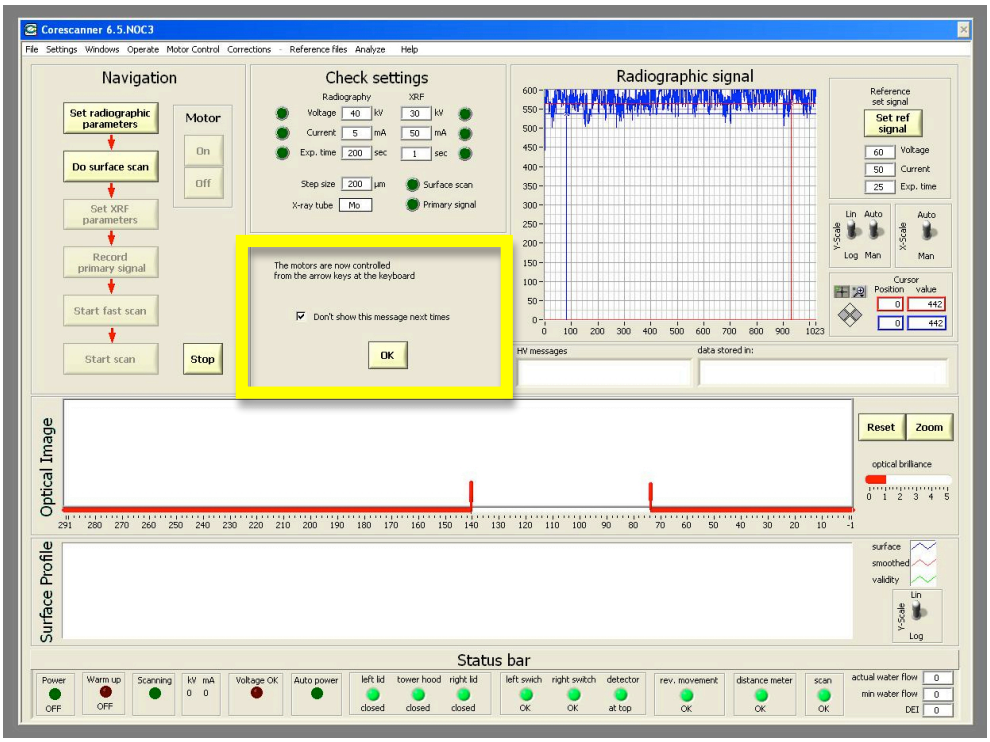
Fig. 4. Align card flush with core surface to prevent data loss as detector lifts up at end of run.

2.4. Double click the 'Corescanner 6.5NOC3.1' icon on the operating computer desktop. Wait for the self-checks to finish.

2.5. When asked to confirm whether running a Mo tube, click 'OK'. (Note: When confronted with an 'OK' button, you must click this to progress the program).



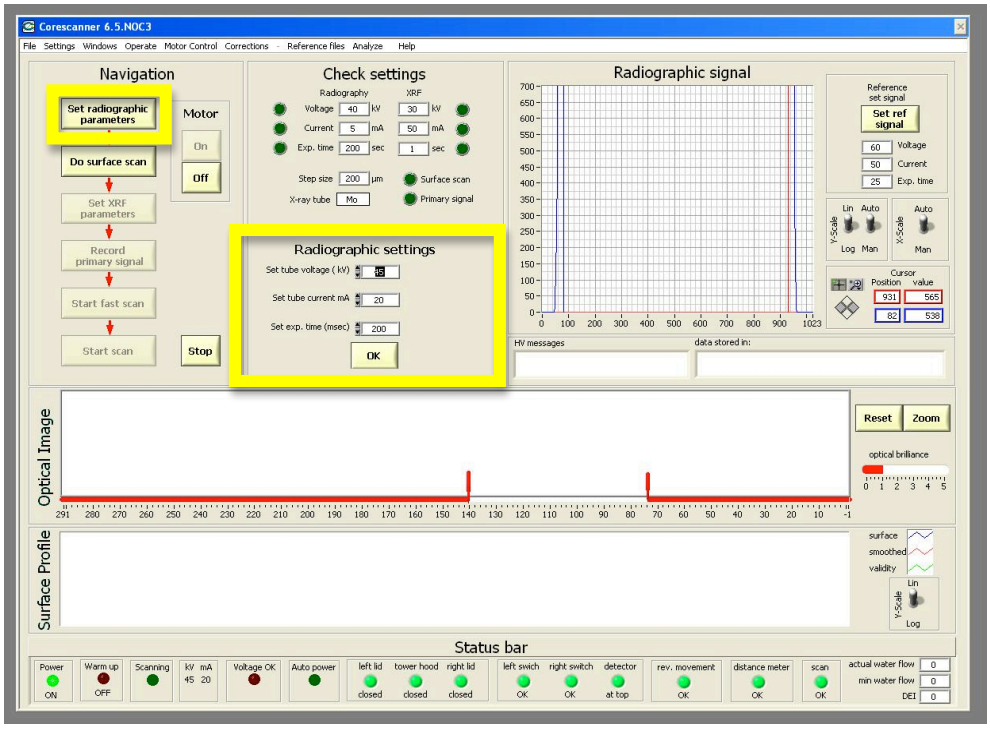
2.6. Click 'OK' to acknowledge motor control when prompted.



2.7. Click the ‘Set radiographic parameters’ button on the left of the user interface panel.

Set tube voltage kV = Enter ‘55’ in box
Set tube current mA = Enter ‘50’ in box
Set exp. Time (ms) = Enter ‘400’ or ‘500’ for large diameter cores (11cm)
Enter ‘200’ for small diameter cores (7cm)
Click ‘OK’

Note: For information on the optimum settings for X-radiography see Appendix B.



2.8. Click the ‘Do surface scan’ button on the left of the user interface panel.

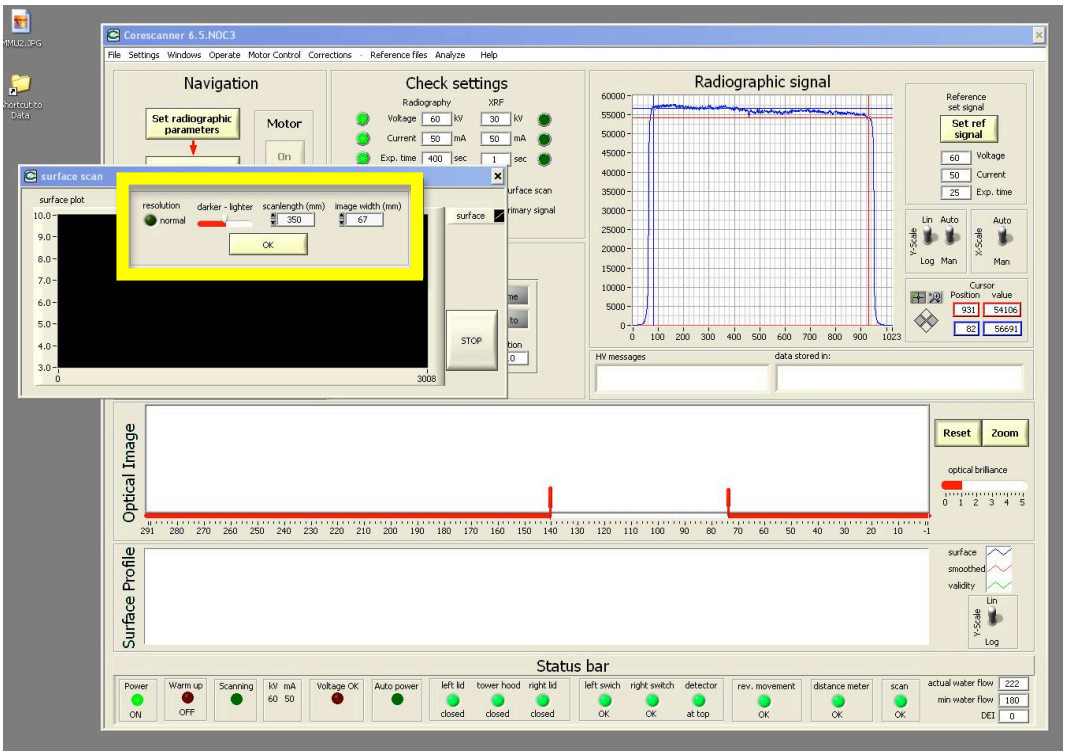
Enter length of core **in mm** in ‘scanlength’ box.

Note: You can alter the resolution of the optical image here too. ‘Normal’ resolution will be a few KB, but ‘High’ resolution may be several Mb in file size.

Do not alter ‘image width’.

Click ‘OK’.

The scan will then begin.



Whilst the scan is taking place, watch and check that the light on the laser profiler changes from red to green (Fig. 5). Watch the path of the laser (red dot) along the core surface to ensure that there are no serious irregularities in the measurement path. If there are, consider changing the line of measurement by altering the core offset in the core carriage (if this is done, repeat the scan).

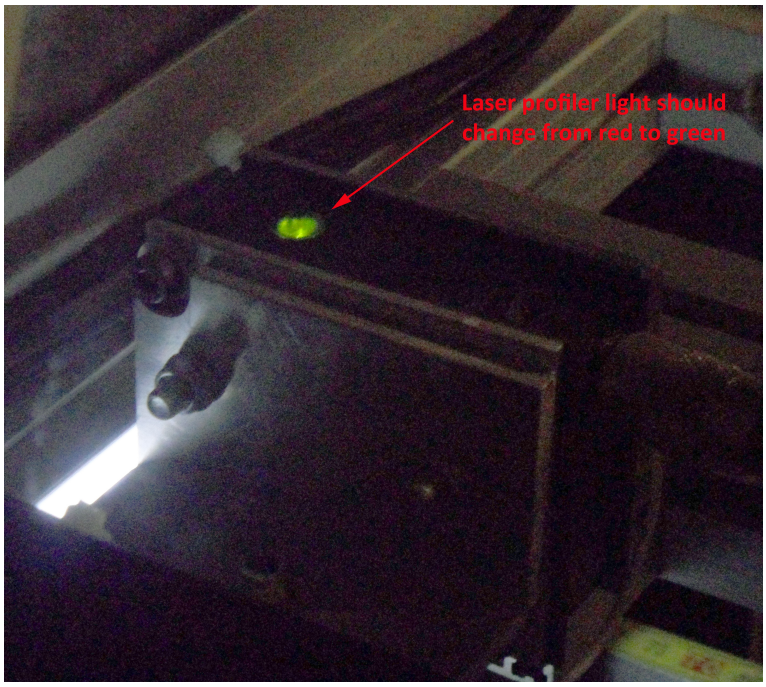


Fig. 5. During the surface scan, as the core passes through the measurement chamber, the laser profiler light will turn from red to green.

During scanning an optical image of the core will be acquired and the surface topography mapped.

After scanning, the core will move to the start position and display the core profile (blue), detector path (red) and validity profiles (green) on the screen. Examine these, if the validity profile (which will either be '1' or '0') dips to zero over a significant portion of the core, consider raising the core section height in the carriage. Do this by returning to the 'Home' position, removing the core, adjusting the height of the rods in the core carriage, replacing the core and rescanning.

Clicking on the 'optical brilliance' bar and then clicking the 'reset button will lighten and darken the image (this is for display purposes only).

Move the red slider bars by clicking and dragging them to each end of the core or to the outer limits of the section you wish to measure.

2.9. Press the ‘Home’ button. The core will move to the ‘Home’ position. Check visually that it is in the correct position by ensuring the leading edge of the carriage block is lined up with the black inked arrow on the frame (Fig. 6). If not in the correct position, manually adjust by pressing the keyboard arrow keys (this will only work if lids are closed) (Fig. 7).

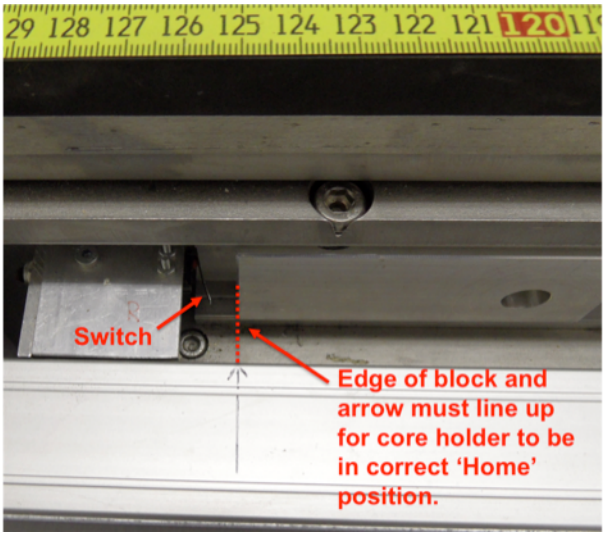


Fig. 6. When returned to 'Home', make sure edge of block and arrow line up (a glitch in the program sometimes returns the holder so the block hits the switch (left) and stops).

Fig. 7. If after returning the core to the 'Home' position it is not positioned as in Fig. 6, use the arrow keys on the operating computer keyboard to move the core carriage so the block and arrow line up. This can only be done if the lids are closed.

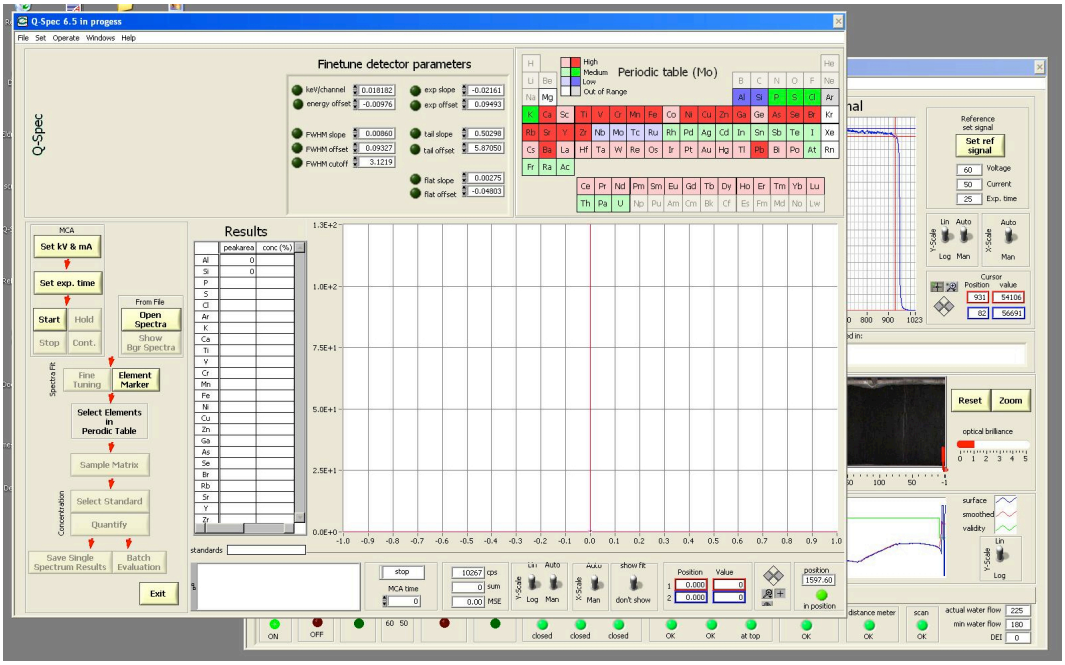
2.10. Cover the core surface with 6-micron thick polypropylene film (Fig. 8) and tape the leading film edges. **Do not move the core.**

Fig. 8. Polypropylene film to cover the cut core surface. This is applied to prevent desiccation of the core during the run.

2.11. Select a flat area of the core surface with a validity of '1' from the profile displayed on screen. Note its distance in mm downcore.

2.12. Enter the distance noted above in mm into the 'position' box and press the 'go to' button. The core will now move to that position.

2.13. Click the ‘Set XRF Parameters’ button on the left of the user interface panel. A new window will open onscreen and the shutter will open (red X-ray lights come on). Visually check that the detector goes down to the core surface.



2.14. Click ‘Set kV & mA ‘ button.

kV = 30
mA = 50

Click ‘OK’.

Click ‘Set exp. time’ button. Enter ‘60’ into the box.

Click ‘OK’.

Go to the ‘Set’ tab at the top of the window.

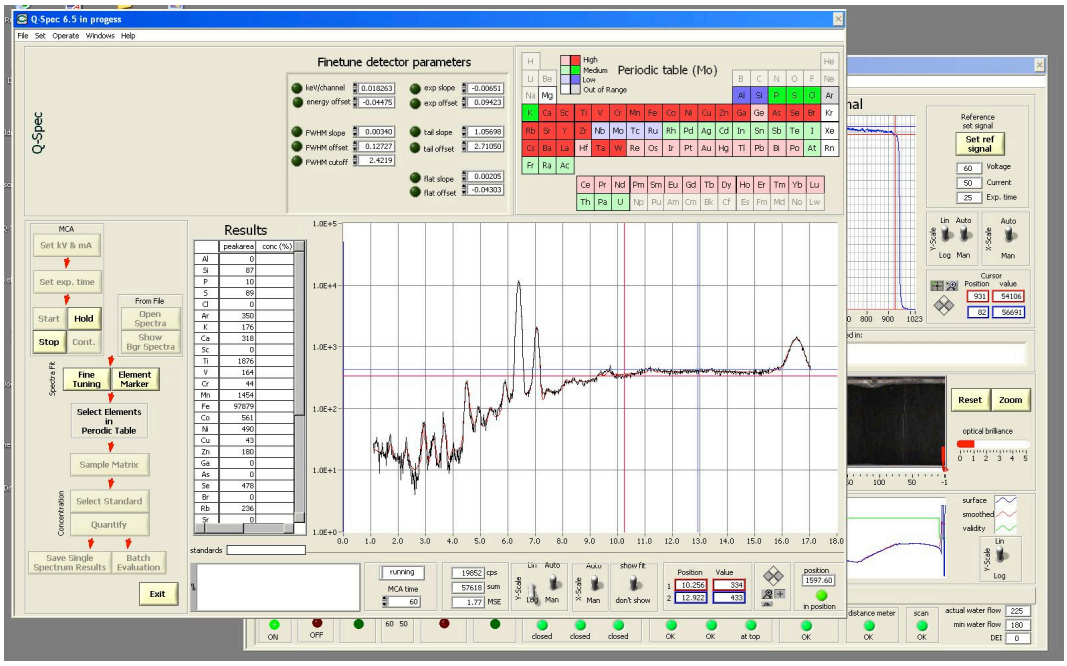
Select ‘Use my settings’ from the drop down menu.

Choose a suitable settings file for your measurements (e.g. from a previous section of the same core) and click ‘Open’.

Check that all elements that you are interested in are highlighted on the periodic table.

Press the ‘Start’ button.

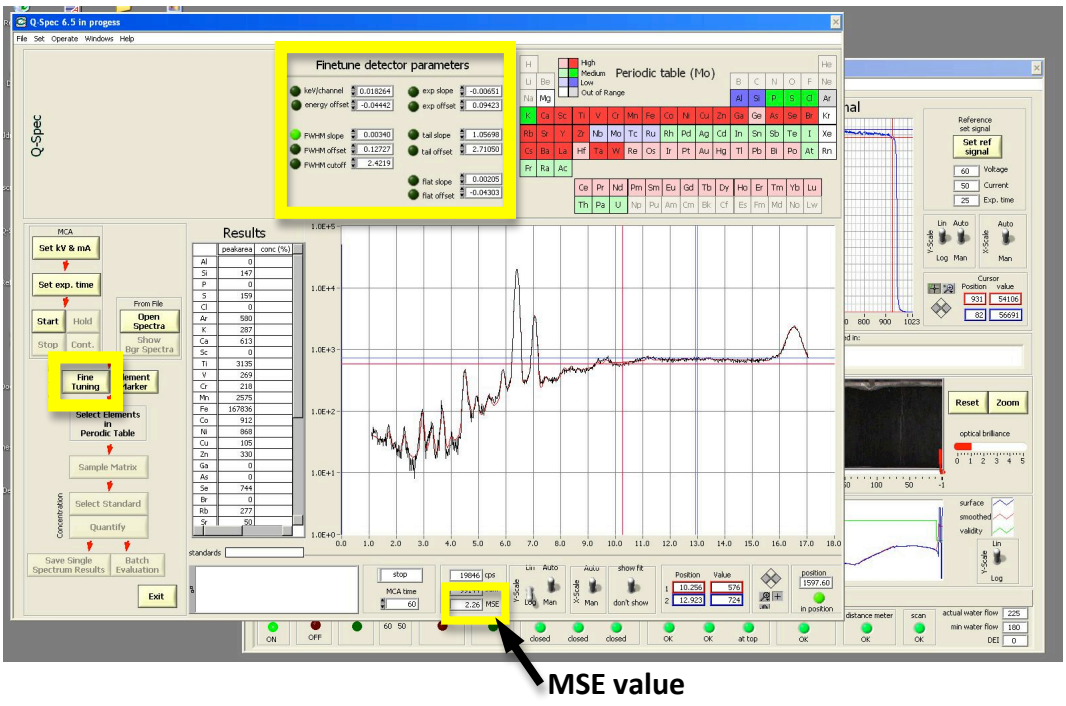
An XRF spectrum will now be acquired.



Wait 60 seconds. After this the MSE value will stop increasing and the spectrum screen will stop 'pulsating'.

It is best to have the Y-scale switched to 'log' to determine curve fit.

Now you need to try and fit the curves better and reduce the MSE value to as low as possible. This can be done using the 'Finetune detector parameters'.



Click through each button in sequence under the 'Finetune detector parameters' heading to fit the curves. When the green button light goes out, move to the next button below. If the numbers are 'cycling', click on the green button to stop them and move onto the next button.

Repeat this procedure as necessary to get the MSE value as low as possible and to get the best curve fit.

Stop when the MSE value won't decrease further or starts increasing.

Then click the 'Fine tuning' button.

(Click 'Sample Matrix' and adjust 'Sample thickness' if necessary).

Click 'Exit'.

Shutter will close (red lights go out) and the detector will rise.

2.15. Click 'Record primary signal' button on the left of the user interface panel.

The core will move out of the way of the line-scan camera below the core to allow a reference X-ray zero shot.

Watch the ‘Radiograph signal’ on the computer screen and listen for the audible click when the shutter opens.
The radiographic signal immediately after the click should replicate the previous signal and/or should show a flattish signal across the diode arrays in the X-ray line scan camera below the core.

Repeat if necessary (e.g. if the shutter sticks).

2.16. Click ‘Start scan’.

New window opens.

Enter User ID (usually users initials).

Enter Section name/number (normally cruise and core number).

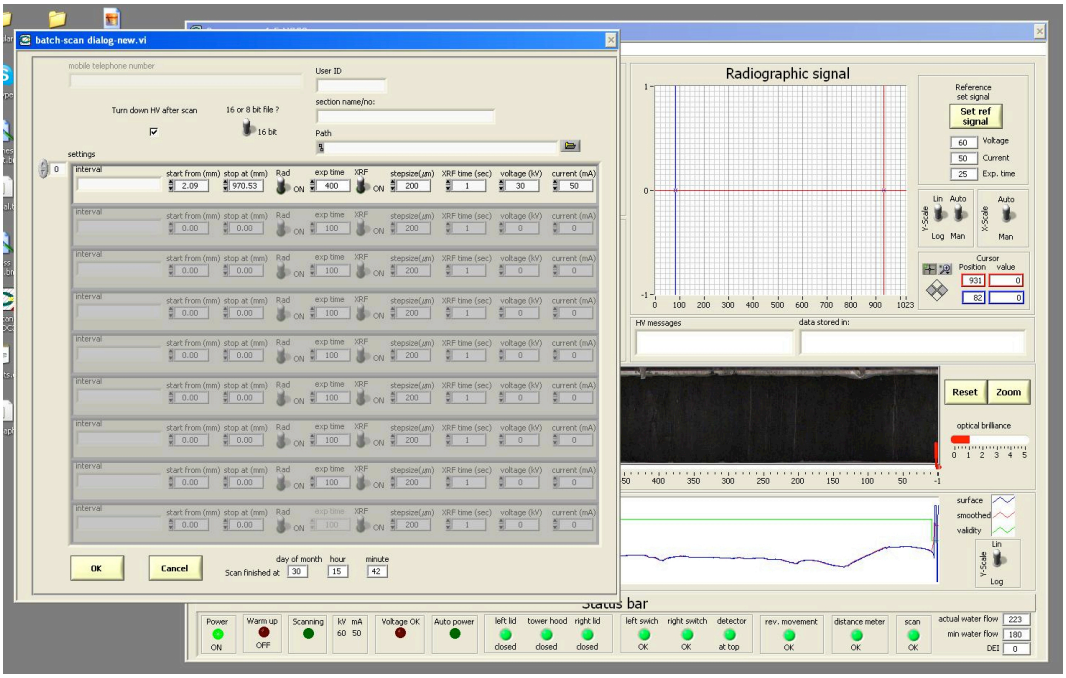
Click folder button for path.

Create a new fold in the data file if necessary **(must be core name/number, e.g. LC25, CD166_1, D12567 etc.)** or find a previously created core folder to which the section run belongs.

Click ‘Select Cur. Dir.’

Enter section number/name in interval.

Do not use Windows-forbidden characters in any box.



Enter Step-size in box (in microns).

Enter XRF count time in box (in seconds, usually 30 seconds).

Do not alter any of the other values displayed.

Click outside of the box to see an estimate of the time the run will be finished.

Check all the values are correct.

Click 'OK'.

The scan will now start.

2.17. IMPORTANT: Make sure the ITRAX Corescanner log is completed – one page for each section run.

IN AN EMERGENCY: Press the red 'Emergency stop' button on the front panel below the measurement chamber (Fig. 9).

Contact: Suzie MacLachlan, ext. 26292 or Guy Rothwell, ext. 26567.

Any incidents should be recorded in the ITRAX users log.

Fig. 9. Emergency stop button on the front panel of ITRAX below the measurement chamber. Press this to shut down the instrument in an emergency. It will need to be pushed and released to restart the instrument.

Appendices

Appendix A – Notes

- When ITRAX is powered and running, the yellow light should be flashing on the power supply (Fig. 10).

- Check kV and mA values on the power supply panel match those entered during the run (e.g. 55/50 for X-radiography and 30/50 for XRF) (Fig. 9). When scan is complete, instrument will automatically power down to 10/5 to preserve X-ray tube life.

- Make sure the coolant tank in the K4 chiller unit is full. Add Hexid coolant if necessary (use the funnel to do this). The level must not fall below the mid-tank sensor bar (Fig. 11).

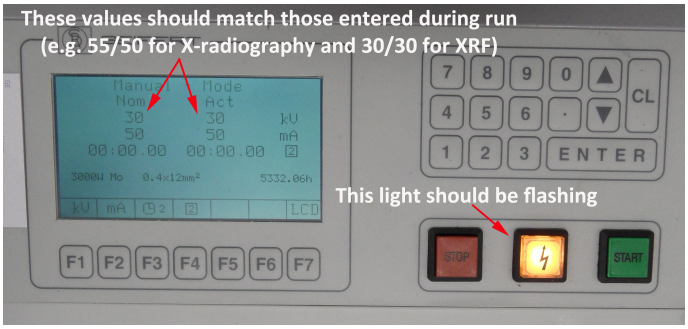


Fig. 9. ITRAX power supply unit display.

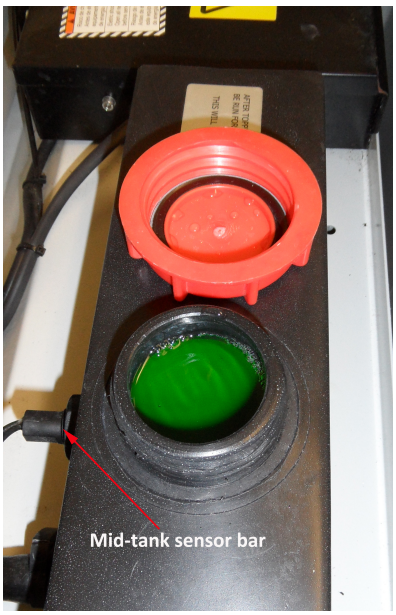


Fig. 10. Coolant tank in the K4 chiller unit. Always ensure that the coolant level never falls below the height of the mid-tank sensor bar.

Appendix B – Optimum settings for X-radiographs on the ITRAX

- Good X-radiographs require 200 microns as the step size. X-radiograph and XRF scans can be run separately by flicking the switches on the data entry panel (step 2.16).

- To obtain best results for X-radiography of large diameter cores (11 cm), run separately with no XRF and use the settings below:

    - 200 μm step size.

    - 800 ms dwell time.

    - Power supply settings 60 kV and 45 mA.

  A 1.5 m long core with these settings will take 1-2 hours to run.

If you have any problems or questions please contact:

Suzie MacLachlan – Ext. 26292
Guy Rothwell – Ext. 26567