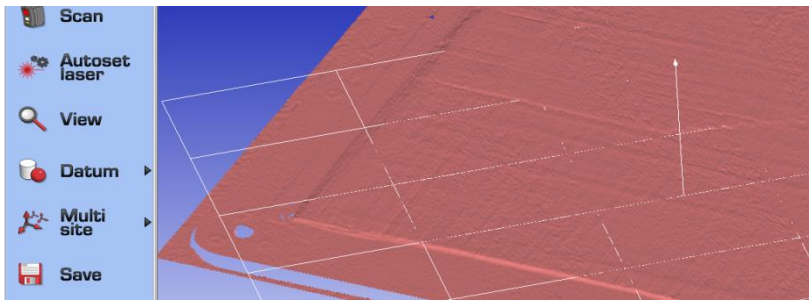


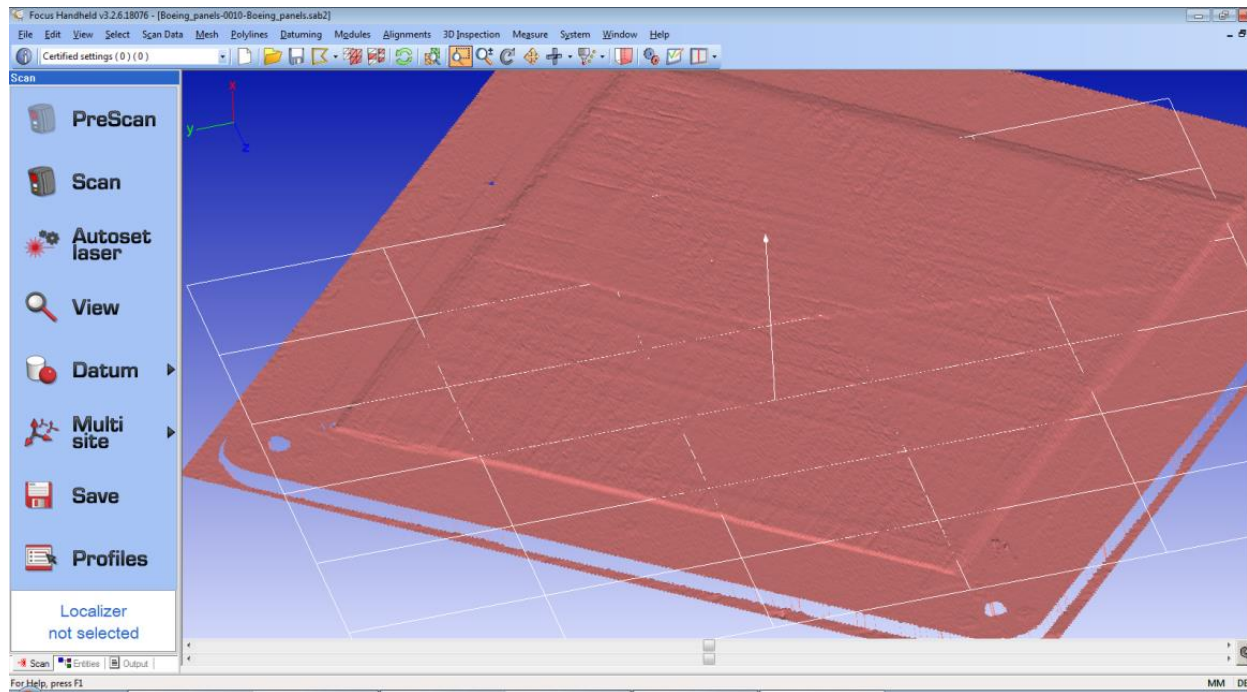


Focus HandHeld

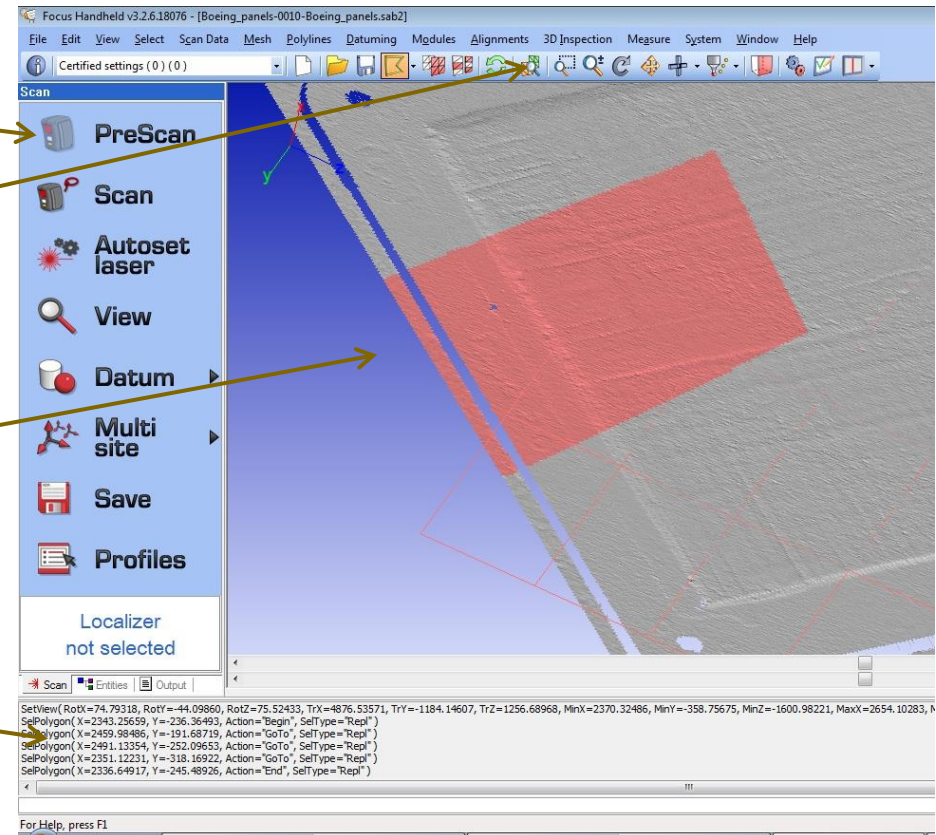
Overview and training notes



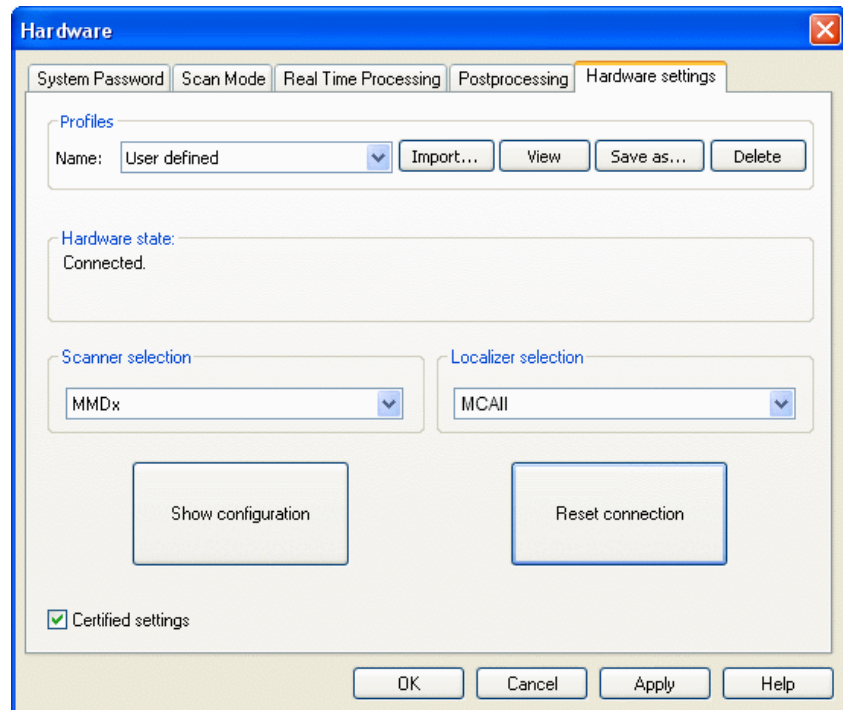
- Focus HandHeld is scanning capture and analysis software compatible with Nikon MMD and MMDx scanners
- It supports a number of localisers for manual scanning including the K-Series system
- Automatic and manual filtering allow data reduction before CAD comparison, feature fitting or exporting



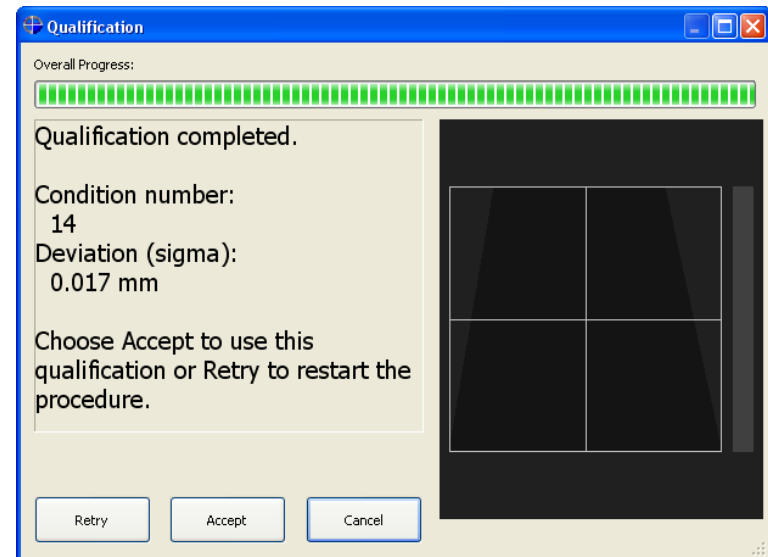
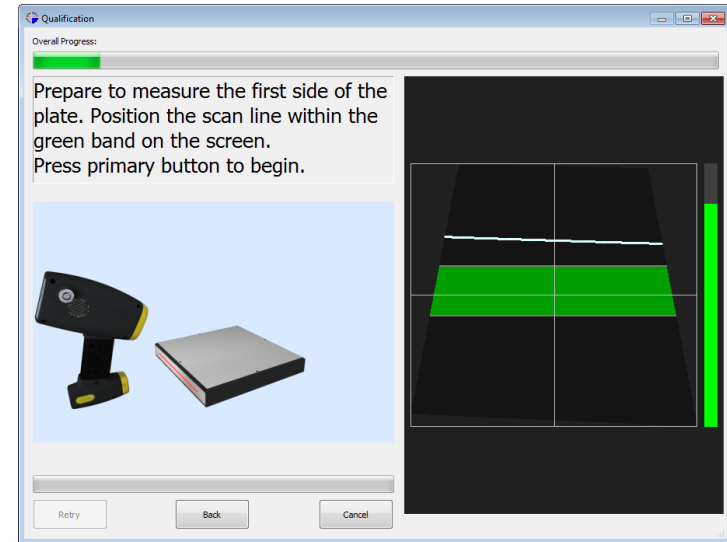
- The Focus HandHeld window is split into a number of areas which the user can choose to display or hide
- **Workspace:**
 - Displays operation buttons, entities window and output window (tabs)
- **Toolbar:**
 - Menus and shortcuts to common functions
- **Graphics window:**
 - Displays measurements and CAD. View can be manipulated with mouse or scroll bars
- **Command window:**
 - Shows a list of the commands applied as command line functions (for macro generation)



- On starting the software, it will automatically attempt to connect to the MMDx scanner
- If a localiser has not been set, a message box will ask the user to choose one
- Hardware settings can be accessed through the Hardware Settings button on the toolbar
- To change scanner specific settings (intensity, scan area, 2D preview etc) click on the 'Show Configuration' button
- The scanner qualification is also accessible through this button

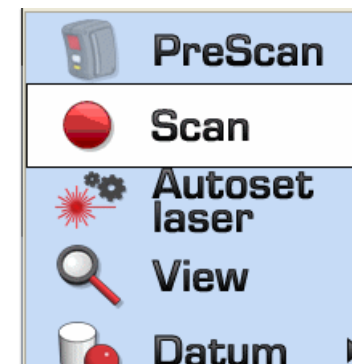
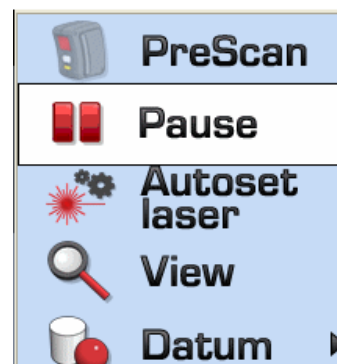


- Qualification involves registering the scanner coordinate system to the localiser coordinate system
- Qualification needs to be performed anytime the scanner is removed and re-attached to the localiser, or when scanning quality is degraded
- For the MMDx scanner, the qualification is performed by taking a number of measurements of a static plate
- To begin the qualification, go to the 'Qualification' section of the Hardware Configuration dialog box (see previous slide)
- Click on the 'Start Plate Qualification' button. This starts the Plate Qualification wizard
- The wizard guides the user through the qualification steps
- Once qualification is completed, the results are shown
- Condition number should be below 40 and Deviation should be below 0.040mm

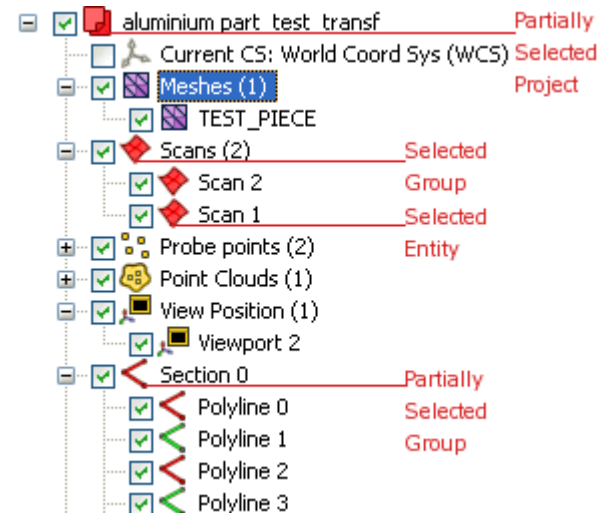
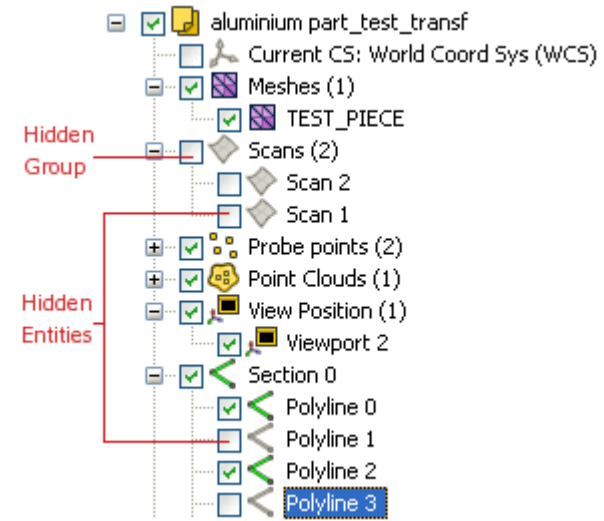


Performing a Scan

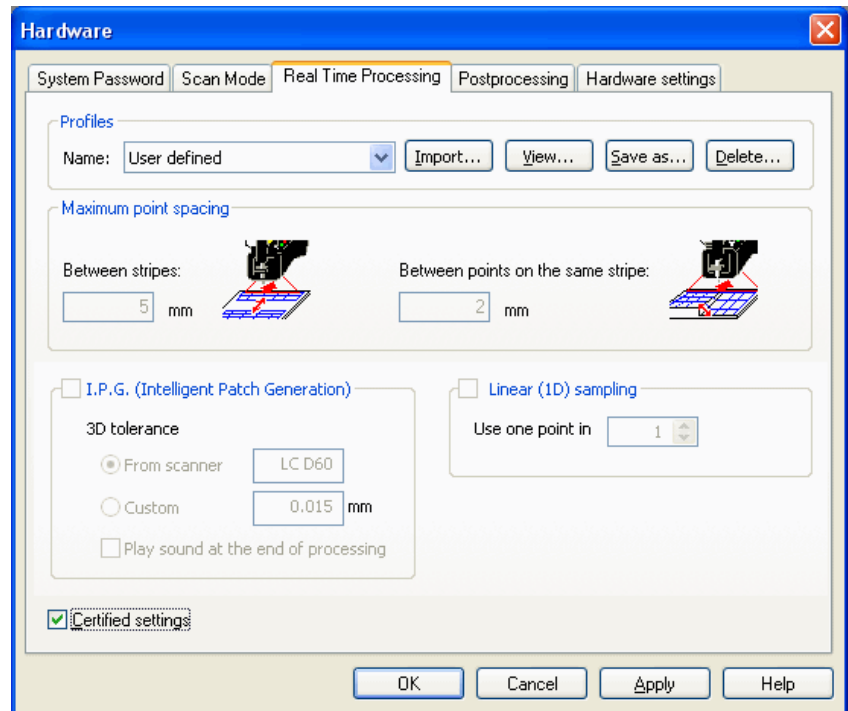
- If the scanner has been qualified to the localiser, scans can be performed
- The 'PreScan' and 'Scan' buttons in the workspace section control scanning
- PreScan allows a quick pass over the part to determine the extents of the view in the graphics windows prior to a full scan
- Scan puts the system into a paused scan mode. Clicking the trigger (B) button takes the system into measuring mode and the scan data appears real time in the graphics window
- Clicking the trigger button again pauses the scan and allows the system to perform automatic post-processing of the scan data
- Clicking the function (A) button ends the scan

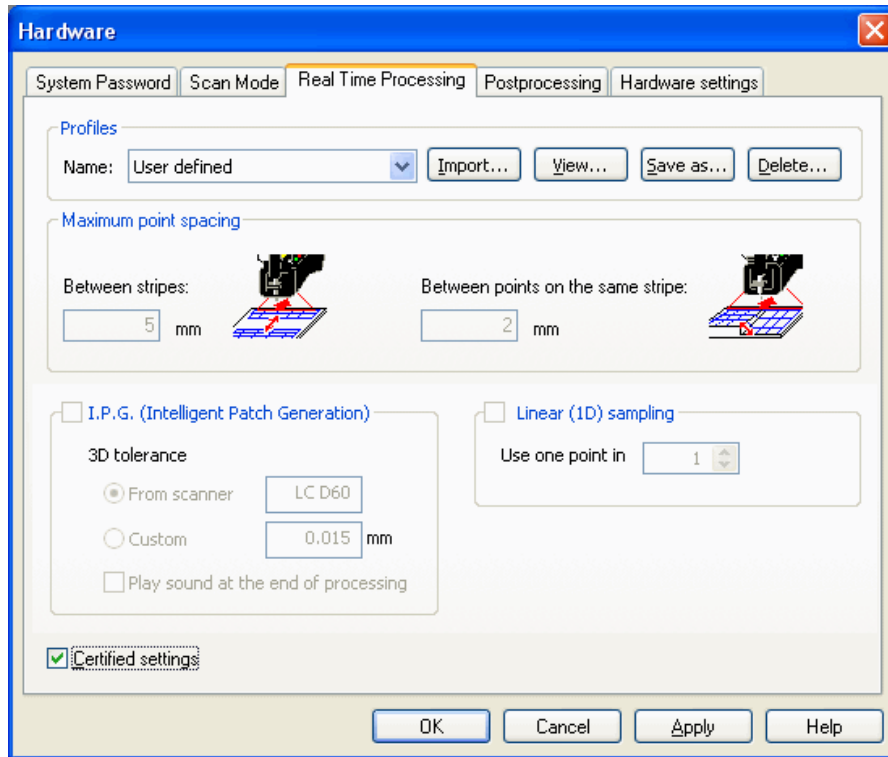


- As well as being displayed in the graphics window, the scan is also shown in the Entities Tab
- The Entities tab in the Workspace section shows all the data in the current file
- The data is grouped by type and each group and element has a check box which controls visibility in the graphics window
- Clicking on the icons allows easy selection and de-selection of elements

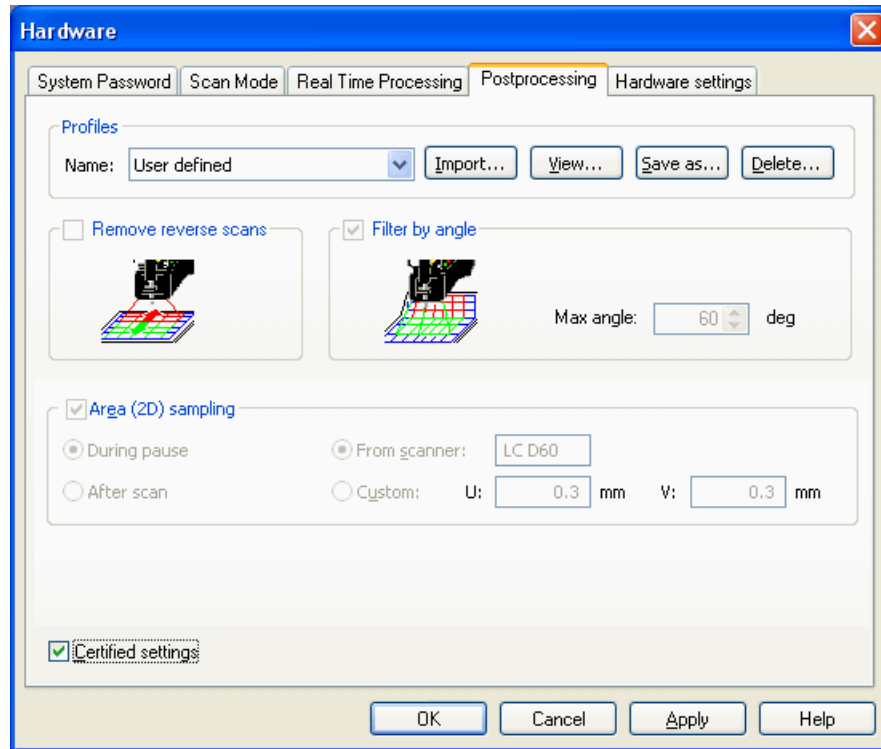


- A certain amount of automatic processing and filtering on the scan data can be performed
- This processing is either performed real-time, or as a post-processing activity (during pause or after scan complete)
- The settings can be accessed through the 'Hardware Settings' dialog
- Each tab has a set of default 'certified settings'. To change values, uncheck the box to the bottom left of the dialog



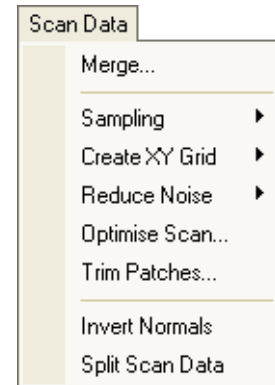
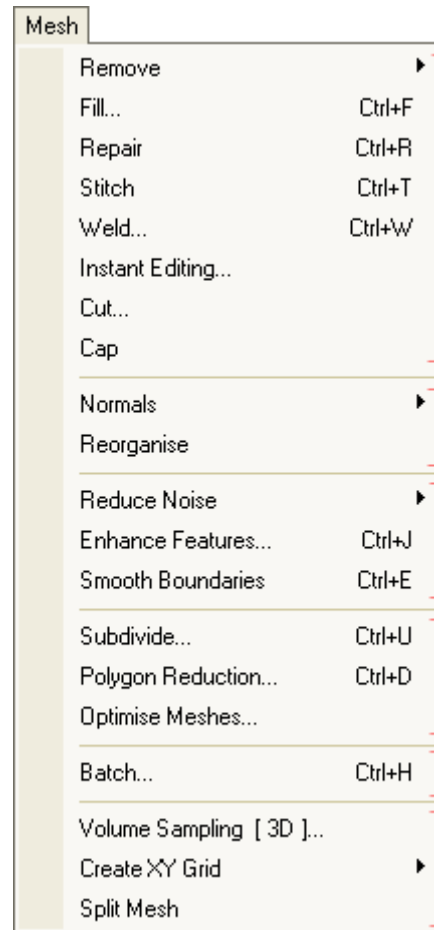


- Real time processing occurs whilst the data is being collected
- Maximum point spacing allows the system to determine whether neighbouring points are on the same surface (displayed as continuous shaded surface)
- I.P.G is for LC range of scanners
- Linear sampling allows a sub-sampling of the points along a scan line



- Post processing occurs during a pause or at the end of a scan
- Remove reverse scans limits scanning to a single direction over the part
- Filter by angle removes scans of high incidence surfaces to the scanner direction
- Area Sampling performs a sub-sampling of each scan patch based on a 2d grid imposed on the captured data

- As well as the automatic data processing, manual data processing can be applied to the scan data in order to simplify it and make it easier to analyse or transform it into a different format for export
- This processing can occur either on the Scan Data or on a Mesh created from the scan data



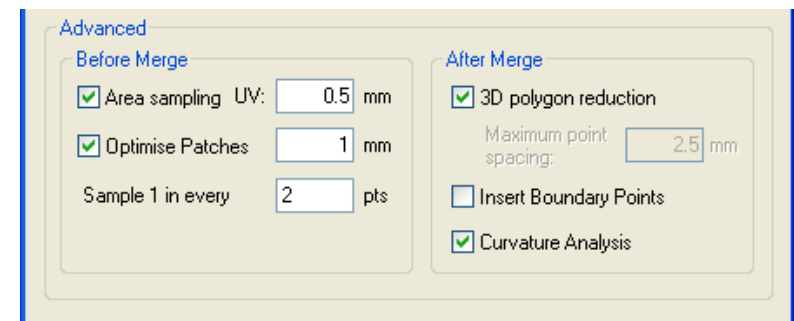
Scan data consists of ordered measured points grouped by lines and patches as it would come from the scanner. Lines and patches may overlap

Mesh data is a polygonised surface created from points and is easy to process compared to scan data, but may lose detail through filtering. Mesh data is a common format used by other analysis programs

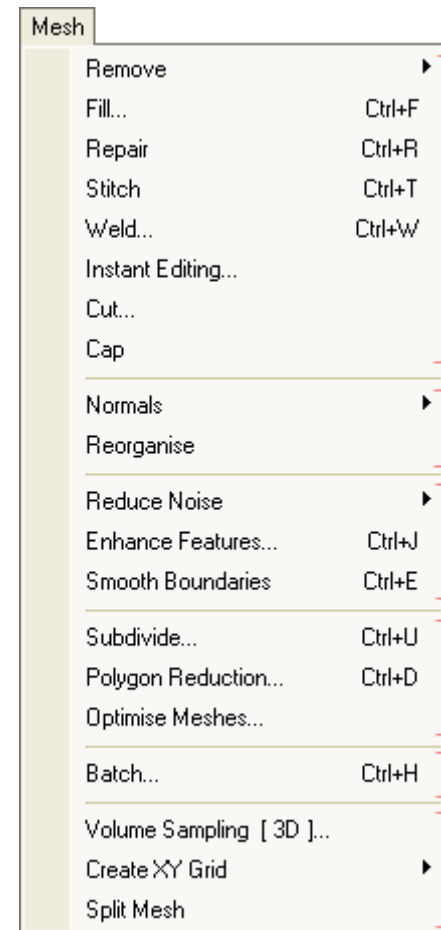
- Selected options detailed below:
 - Merge – Creates a mesh from the scan data
 - Sampling – 1D, 2D (both as per auto processing), 3D (sample to 3D volumetric grid)
 - Reduce noise – Smooth data or remove scatter points
 - Optimise Scan... Modify patches so that overlaps are congruent
 - Split Scan Data – Split complete scan into component patches



- Merge allows some further automatic processing before and after mesh creation:



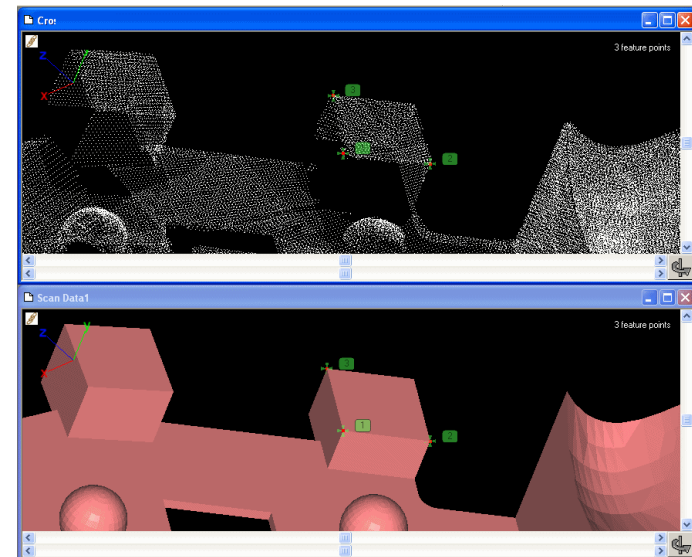
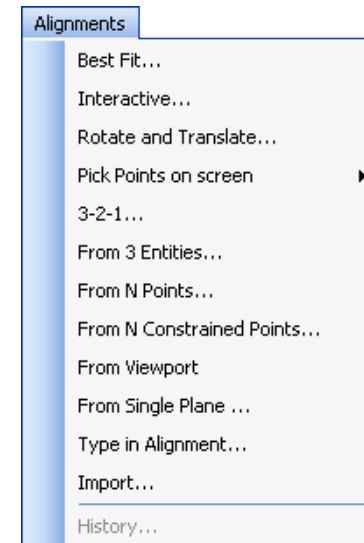
- Selected options detailed below:
 - Remove – Automatic removal of polygons based on criteria
 - Fill, Repair, Stitch, Weld – add in polygons to fix gaps
 - Reduce Noise – Smooth the data based on surrounding points
 - Enhance Features, Smooth boundaries – Modify mesh based on features or edges to give a better look to the surface
 - Polygon reduction – Remove points based on curvature to keep features (more curvature, more points)
 - Split Mesh – Automatically divide mesh into sub meshes based on detected features



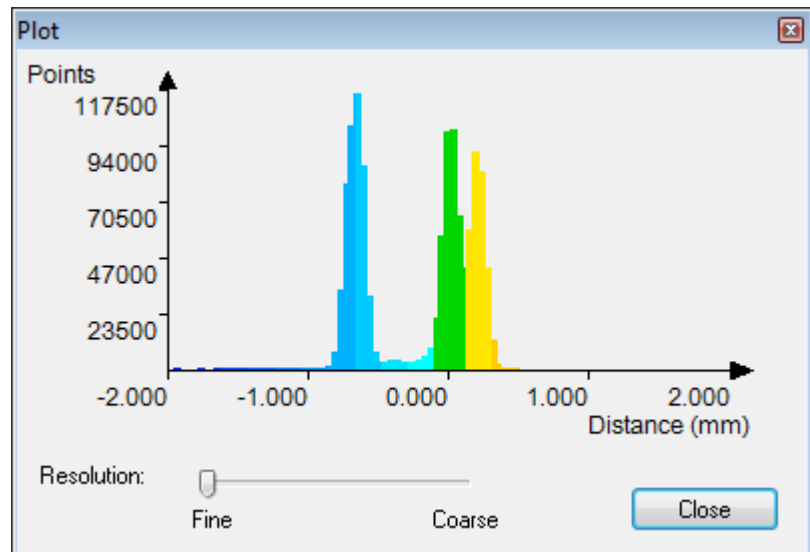
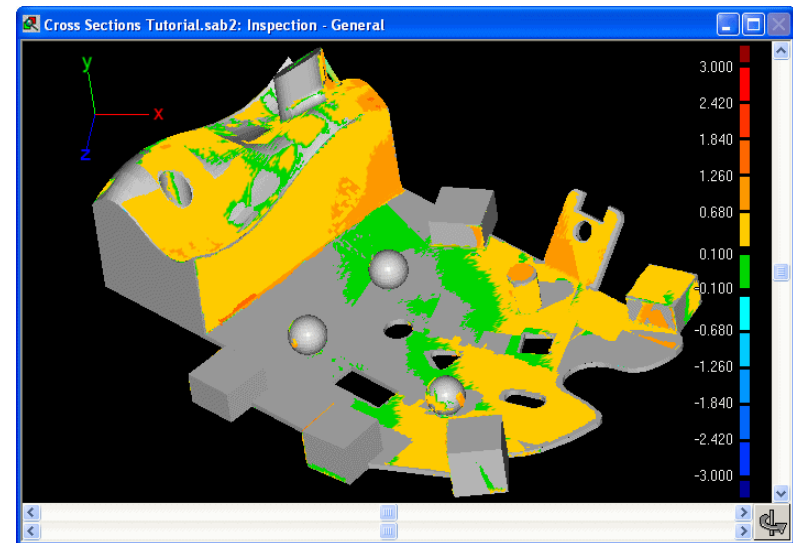
- As well as selection through the tree, selections can be made directly through the graphics window
- Polygonal, freehand, square and circular selections are possible by clicking and dragging in the graphics window
- 'Front face only' allows selection of points/mesh elements that have normals out of the graphics window
- The graphics window displays the scan data in a variety of formats, some of which make selections easier
- The view can be changed by using the number keys 1 to 7 from points to wireframe to shaded to smooth shaded



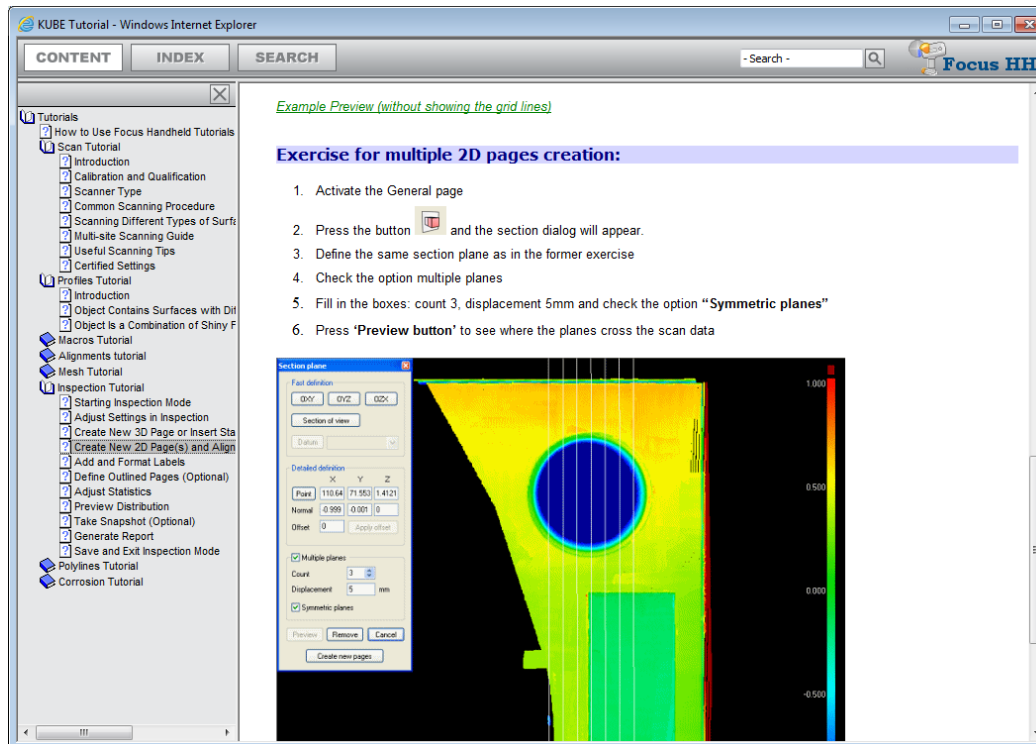
- Numerous alignment options are available for aligning scan data to CAD
- Best Fit performs a full fit of scan data (points or mesh) to other entities. This works best if the scan has already been partially fitted using another alignment
- Pick points on screen allows the user to match any points from the scan to any corresponding point on the CAD or alignment entity. This can then be followed by a 'Best Fit' to fine tune the alignment



- Once entities are aligned, they can be compared to each other to give a colour based contour map of the deviations
- From this analysis snapshots, reports, cross sections and deviation data can be viewed or exported



- Focus HandHeld comes with a set of tutorials and examples to help the user through the various options and scanning methods
- These are accessible through the Help menu and cover most topics that the user may wish to perform





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