# TrakScan
## for Windows v1·1

# User Manual

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# Quick-Start

## Introduction

TrakScan is an application specifically written to maximise the usefulness of the Autoscan computer-controlled microscope stage for Earth Sciences applications. TrakScan for Windows is an updated version of the Fission-Track Dating (FTD) component of the existing DOS-based TrakScan program suite.

This section, **Quick-Start**, provides a brief overview of the steps required to configure and process a batch of standard glass and grain slides. Other sections are formatted in the same general order as TrakScan should be used but contain a detailed description of each operation and individual screen controls.

## Starting TrakScan - General Functions

To start TrakScan:
1. Ensure that all components are correctly connected and powered. Switch on power to the Autoscan motor controller unit, ensure the camera is connected to the frame grabber and powered, power the digitizer tablet (if used) and the microscope.
2. Select the TrakScan icon from the Windows Start\Programs menu (§ *Starting TrakScan, p9*). While TrakScan is loading a splash screen is displayed indicating the status of TrakScan system components, the Autoscan stage, frame grabber and camera, and digitiser tablet (if fitted). Check this screen and correct any faults that may occur (§ *Splash Screen, p9*).

When TrakScan has started the TrakScan main screen will be displayed (*§ TrakScan Main Screen, p12*). The main screen has general controls for creating a new, opening an existing, or closing a batch file (*§ Batch Buttons, p12*) and changing the active Microscope Objective definition (*§ Camera/Tablet Calibration, p21*).

⚠️ Any time the working microscope objective is changed, the appropriate Microscope Objective definition must also be selected using the Microscope Objective drop-down list (*§ Info Panel, p13*).

The main screen *File Menu* (*§ File Menu, p13*) has items for creating a new, opening an existing, closing or exporting a batch file, and exiting TrakScan. The *System Menu* (*§ System Menu, p14*) has items for invoking the Live View (*§ Live View, p19*), the System Setup (*§ System Setup, p20*), and Preferences (*§ Preferences, p15*) screens, and initiating some grain slide operations. Also, the following hot-keys can be used to invoke system functions from the main screen.

| File Menu | | System Menu | |
|---|---|---|---|
| <Ctrl>N | Create new TrakScan batch file | <Ctrl>I | Display the Live View screen |
| <Ctrl>O | Open an existing TrakScan batch file | <Ctrl>H | Display the System Setup screen |
| <Ctrl>C | Close currently open TrakScan batch | <Ctrl>R | Set zero reference at stage position |
| <Ctrl>L | Open the last opened TrakScan batch | <Ctrl>Z | Send stage to zero reference position |
| <Ctrl>E | Export currently open TrakScan batch | <Ctrl>G | Move stage to center of grain mount |
| <Ctrl>Q | Shutdown TrakScan | <Ctrl>M | Move stage to center of mica mount |
| | | <Ctrl>S | Swap between grain/mica mounts |
| | | <Ctrl>P | Display TrakScan Preferences screen |
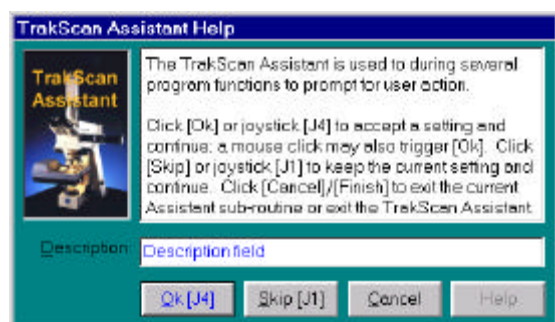


During some TrakScan operations the TrakScan Assistant (*§ TrakScan Assistant, p18*) will be displayed. This is a small dialog box shown over the currently displayed screen which contains instructions and controls designed to assist the operator with the current program function.

Click the *Ok* button (or stage joystick button J4, if enabled) to accept the current or a newly entered setting and continue to the next function step. Click *Skip* (or joystick button J1, if enabled) to accept the current setting, discarding any new values that may have been entered, and continue to the next function step. Click the *Cancel* button to exit the current function at any time.

The Live View screen displays a full-scale live view directly from the camera.  This screen is displayed by selecting the *Live View* item on the main screen *System* menu, or using the <Ctrl>I hot-key.

## System (Hardware) Setup

The *System Setup* screen is displayed by selecting the *System Setup* item on the main screen *System* menu, or using the <Ctrl>H hot-key.  Functions and information available on this screen are grouped onto four tabs.  These are *Stage*, which displays stage information, *Camera*, which displays frame grabber and camera information, *Tablet*, which is used to enable the digitiser tablet (if fitted) and configure the digitiser tablet, and *Camera/Tablet Calibration*, which is used to create Microscope Objective definitions.

This screen contains general TrakScan configuration settings which should only need to be set once when TrakScan is first started.  After that, this information should only need to be altered if any TrakScan hardware is changed.  The *Stage*, *Camera* and *Tablet* tabs display information about these items of hardware and can be used to individually connect to these items if connection was not successful during startup (*§ Splash Screen, p9*).

The *Camera/Tablet Calibration* tab contains controls for creating a *Microscope Objective* definition record for each working objective on the microscope.  These records contain data for converting measurements taken from the camera image or digitiser tablet to microns.  When the working microscope objective is changed, the appropriate Microscope Objective definition must also be selected using the Microscope Objective combo (drop-down) box on the main screen (*§ Info Panel, p13*).  This enables TrakScan to correctly convert measurements taken using mouse or puck position to microns.

## Batch Configuration

TrakScan is dedicated to the configuration, processing and review of a FTD slide batch; that is, a group of slides from related rock samples or group of samples.  A TrakScan batch is a hierarchical structure containing one or more Grain Mount and Standard Glass slides.  The configuration of, and data collected from these slides is stored in a single TrakScan batch (Microsoft® Access-compatible) database.  The filename of the batch database is the batch name within the TrakScan application.

To create a new TrakScan batch:
1. Select the *New Batch* item from the *File (Batch)* menu (*§ File Menu, p13*), press the <Ctrl>N hot-key, or click the *New Batch* button (*§ Batch Buttons, p12*); the Windows File Open dialog box is displayed.
2. Browse to the desired folder to store the new database (by default the TrakScan\Data directory), enter the new TrakScan database file name then click *Ok*.

To open an existing TrakScan batch:
1. Select the *Open Batch* item from the *File (Batch)* menu (*§ File Menu, p13*), press the <Ctrl>O hot-key, or click the *Open Batch* button (*§ BatchButtons, p12*); the Windows File Open dialog box is displayed.
2. Browse to the folder where the database is located (by default the TrakScan\Data directory), select the database file then click *Ok*.
3. Alternatively, select one of the previously opened TrakScan batch files from the *File (Batch)* menu (*§ File Menu, p13*), or press the <Ctrl>L hot-key or click the *Open Last* button (*§ Batch Buttons, p12*) to re-open the most recently opened batch file.

To close the currently open TrakScan batch:
1. Select the *Close Batch* item from the *File (Batch)* menu (*§ File Menu, p13*), press the <Ctrl>C hot-key, or click the *Close Batch* button (*§ BatchButons, p12*).
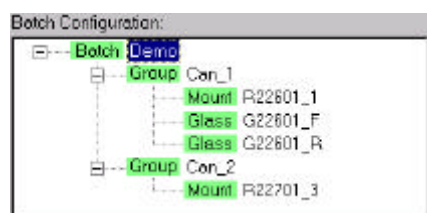


As mentioned above, a TrakScan batch is a hierarchical structure containing one or more groups, which in turn can contain one or more grain mount and standard glass slides.  This structure is displayed using the *Batch Configuration* tree.  The root node of the batch tree is the Batch batch node itself which simply displays the name of the batch.  As they are added, nodes representing Group slide groups, Mount grain mount slides and Glass standard glass slides are added to the batch tree under the batch node.  Use this tree to select the grain mount and standard glass slides to configure and process.

A slide group in a TrakScan batch is represented as a `Group` node in the *Batch Configuration* tree.  To add a slide group to the batch, click the *Add Group to Batch* button on the *Batch* tab.  A new `Group` node representing the newly added slide group will be added under the batch node in the *Batch Configuration* tree and the *Group* tab is selected.  When a group is first added, it is given the default name 'New Group #'.

To add a group to the batch:
1. Select the `Batch` node on the *Batch Configuration* tree; the *Batch* tab is displayed.
2. Click the *Add Group to Batch* button to add a `Group` node representing a group to the batch.  Rename the node as required.

To add grain and standard glass slides to a group:
1. Select the `Batch` node on the *Batch Configuration* tree; the *Batch* tab is displayed.
2. Click the *Add Grain Slide to Batch* button to add a `Mount` node representing a grain slide to the group. Rename the node as required.
3. Click the *Add Standard Glass to Batch* button to add a `Glass` node representing a standard glass slide to the group.  Rename the node as required.

To configure a grain slide:
1. Select the `Mount` node in the *Batch Configuration* tree representing the grain slide to be configured; the *Grain Mount* tab is displayed.
2. Enter a *Description*, *Irradiation Number* (No) and *Sample No* for the grain slide as required.
3. Click the *Grain Mount Setup Assistant* button and follow instructions displayed by the TrakScan Assistant to set the Zero Reference for the slide (*§ Grain Mount Zero Reference, p26*), and the Focus and Alignment points (*§ Grain Mount Alignment Points, p26*) for the grain and mica mounts on the slide.

Before focusing on the Zero Reference point on a grain slide, manually lower the stage using the microscope focus and raise the stage to near its upper limit.  This allows the stage full focus travel for later operations.  Then use the microscope focus to focus on the zero reference mark.  **After this only use the stage joystick (or focus knob) to adjust focus.**  Using the microscope focus after this will prevent TrakScan from automatically adjusting focus during slide processing.

To configure a standard glass slide:
1. Select the `Glass` node in the *Batch Configuration* tree representing the standard glass slide to be configured; the *Standard Glass* tab is displayed.
2. Enter a *Description*, *Irradiation Number* (No) and *Sample No* for the standard glass slide as required.


**Processing a Standard Glass**

The standard glass slide is used to determine the dosage of thermal neutrons received by the FTD sample.

Processing a standard glass slide requires the user to define one or more representative areas on the camera image of the standard glass mica detector; referred to as standard glass areas-of-interest (AOI's). When an AOI has been defined, the user counts the tracks within that area.  TrakScan then calculates the track density (Rho-D, expressed in millions tracks/cm², M/cm²) for that AOI and an average Rho-D for all AOI's on that standard glass.

To select a standard glass slide for processing:
1. Insert the standard glass slide in the stage slide holder and ensure that it is firmly located against the right and rear edges of the recess.
2. Select the `Glass` node in the *Batch Configuration* tree representing the standard glass slide to be processed (*§ Selecting a Standard Glass, p30*); the *Process Standard Glass* tab will be made visible.
3. Select the *Process Standard Glass* tab.

To count tracks on a standard glass slide:
1. Click the *AOI* button (*§ Process Panel, p31*); the TrakScan Assistant will be displayed.
2. Enter a description for the AOI.
3. Define the AOI area by click-and-dragging the mouse over the camera view of the standard glass to define two diagonally opposite corners of the rectangular AOI.  Repeat this process if necessary to exactly define the area of the AOI.  Note, while the mouse is being dragged to the AOI end corner, a red box stretching from the AOI start corner to the current mouse position is drawn on the camera view to

      assist with AOI definition.
4.    When the AOI description has been entered and its area defined click *Ok*.
5.    Mark tracks within the AOI by clicking the track with the left mouse button in the camera view.  The track will be marked with the increment track count symbol ✦ and the *Track Count* value for the AOI will be incremented in the *Standard Glass AOI's* list (*§ Standard Glass AOI List, p31)*.  Repeat this process to mark and count all tracks within the AOI.  If a point on the camera view has been incorrectly marked as a track, position the mouse over the incorrect track mark and press the right mouse button.  That point will be marked in the overlay with the decrement track count symbol ✕ and the *Track Count* value for the AOI will be decremented.  When all tracks have been counted click the *Finish* button

## Processing a Grain Slide

Analysis of a grain slide is used to determine two parameters for the rock sample; the number of fission tracks in a given area (track density) which is used to estimate the geological age of the rock grain, and the average length of the fission tracks which provides an estimate of the temperature-time history of the grain.

Processing a grain slide using TrakScan requires the user to identify individual grains on the grain mount, count the tracks in individual grains and count the induced tracks in the same area of the corresponding mica mount, and measure the length of tracks in the grain mount.

To select a grain slide for processing:
1.    Insert the grain slide in the stage slide holder and ensure that it is firmly located against the right and rear edges of the recess.  Preferably, the slide should have the grain mount on the left, the mica on the right and the reference cross at front center when looking at the stage.
2.    Ensure the stage origin has been set on the zero reference mark for the slide (*§ Grain Mount Zero Reference, p26*).
3.    Ensure the focus and alignment points of the grain/mica mounts on the slide have been set (*§ Grain Mount Alignment Points, p26*).
4.    Select the `Mount` node in the *Batch Configuration* tree representing the grain slide to be processed (*§ Selecting a Grain Mount, p34*); the *Process Grain Mount* tab will be made visible.
5.    Select the *Process Grain Mount* tab.

To record grain mount grains for latter processing:
1.    Click the *Grain* button (*§ Process Panel, p36*); the TrakScan Assistant will be displayed.
2.    Enter a description for the grain.
3.    Center the grain in the camera view of the grain mount by clicking the center of the grain.  Repeat this process if necessary to exactly center the grain in the camera view.
4.    When the grain description has been entered and it has been centered in the view click *Ok*.
5.    Define the grain's C-axis orientation by marking the start and end points of an (imaginary) line parallel to the C-axis.  Click the C-axis start point in the camera view then click *Ok*.
6.    Click the C-axis end point in the camera view then click *Ok*.  Note, while the mouse is being moved to the C-axis end point, a red line stretching from the C-axis start point to the current mouse position is drawn on the camera view to assist with C-axis alignment.
7.    Repeat the process from Step 2 to add other grain records or click *Finish*.

To count tracks on a grain slide grain/mica mounts:
1.    Select the grain whose tracks are to be counted from the *Grains* list (*§ Grain and Track Lists, p37*).
2.    Click the *Count* button (*§ Process Panel, p36*); the TrakScan Assistant will be displayed.
3.    Mark tracks on the grain/mica mount by clicking tracks with the left mouse button in the camera view.  The track will be marked and the *Grain/Mica Count* value for the grain will be incremented in the *Grains* list. The TrakScan Assistant will increment the appropriate grain/mica count depending upon whether grain or mica mount view is displayed when tracks are marked.  Grain tracks are marked with the increment grain track count symbol ✦ while mica tracks are marked with the increment mica track count symbol ✛.  Repeat this process to mark and count all tracks on the grain/mica mounts.  If a point on the camera view has been incorrectly marked as a track, position the mouse over the incorrect track mark and press the right mouse button.  That point will be marked in the overlay with the decrement track count symbol ✕ and the appropriate track count value will be decremented.  When all tracks have been counted click the *Finish* button.
4.    At any time while counting click the *Swap* button (*§ ImagePanel, p35*) to move between the grain and mica mounts.

To measure the length of tracks (or a feature) on the grain mount:
1.   Select the grain whose track lengths are to be measure from the *Grains* list (*§ Grain and Track Lists, p37*).
2.   Click the *True* button (*§ Process Panel, p36*) up or down to record the apparent (2-dimensional) or true (3-dimensional) length of a track.  The apparent length is measured by recording the distance between the start and end of the track projected into the X-Y plane.  The true length is measured by recording the distance between the start and end of the track in X-Y-Z space.  The X-Y coordinates for a true tracks are recorded as for an apparent track while the start and end points of the track in the Z (focus) axis are recorded by focussing on the start and end of the track, respectively.
3.   Click the *Proj*, *TinT*, *TinCle* or *Other* button (*§ Process Panel, p36*) to record the length of projected tracks, track-in-track tracks, track-in-cleavage tracks or the length of other features, respectively.  The TrakScan Assistant will be displayed.
4.   Mark the X-Y start of the track by clicking start point of the track in the camera view.  If true track length is being recorded, adjust stage focus until the start of the track is exactly in focus.  When the start of the track has been marked (and is in focus) click *Ok*.
5.   If the length of a TinCle-type track is being measured, mark (and focus on) the start and end points of the track-cleavage intersection.  When each point has been marked, click the *Ok* button.
6.   Mark the X-Y end of the track by clicking end point of the track in the camera view.  If true track length is being recorded, adjust stage focus until the end of the track is exactly in focus.  When the end of the track has been marked (and is in focus) click *Ok*.
7.   Repeat the process from Step 4 to add other tracks of the same type, or click *Finish*.

To change track type without closing the TrakScan Assistant, click the appropriate *Proj*, *TinT*, *TinCle* or *Other* button when the TrakScan Assistant is prompting to mark the track start point.

The above description applies to measuring tracks by clicking the camera view with the mouse.  Track lengths can also be measured using the digitiser tablet.  This is done by marking a track/cleavage point with the tablet puck viewed through the microscope instead of using the mouse.

# Introduction

**Fission-Track Dating (FTD)**

Whilst there are many alternative methods employed in fission track dating, one of the most reliable and increasingly the most important is the External Detector Method (EDM). The Autoscan Fission Track Dating system has been specifically designed to facilitate rapid analysis by this method.

A detailed description of the EDM technique can be found in the listed references (*§ Appendix F: FTD References, p***Error! Bookmark not defined.**). Briefly, a batch of crystals is mounted, polished to reveal an internal surface and etched to reveal the spontaneous tracks. This mount is then covered with an external detector (usually mica) which is held in close contact with the polished surface of the grain mount during thermal neutron irradiation. Subsequent etching of the external detector reveals a `print' of each grain composed of induced tracks. Careful and precise location allows counting of the number of spontaneous tracks in a certain area of a particular grain and the number of induced tracks in the same area of the corresponding mica print. It is this task of precise location which the Autoscan stage system has been designed to facilitate.

The main advantages of the EDM technique are insensitivity to inter-granular variations in Uranium concentration and the capability of age calculation for individual grains. It is becoming increasingly clear that the distribution of single grain ages is extremely important in fission track age interpretation. Furthermore, because EDM does not require a laboratory annealing step it is not subject to uncertainties introduced by altered etching properties, as are other techniques such as the population method in Zircon or Sphene.

By automating the matching of grains and their induced track prints, the Autoscan system offers a significant saving in microscope time while leaving the operator in control of the actual track counting. Moreover it offers the possibility of performing an analysis where the induced track density is so low that the induced track print cannot easily be recognized. Normally this would preclude manual analysis by EDM.

**FTD Mount Preparation**

The Autoscan system requires that the grain mount and its external detector be mounted on a standard 75 x 25 mm (3" x 1") microscope slide. Ideally, the two should be mounted as mirror images of each other, (i.e. with the etched tracks uppermost on both and with no gross rotation). High positional accuracy is not required as the stage system will easily accommodate variations in position and rotation.

The grain mount is usually referred to as `sample' or `grain', and the external mica detector as `replica', `mica', or `detector'. The tracks found on the sample mount are often referred to as `spontaneous' tracks, and those on the mica as `induced' tracks. The sample and replica should be positioned approximately 1 cm apart symmetrically about the center of the slide. This spacing is required to allow high power objectives to be focussed anywhere on the replica without hitting (and possibly damaging) the sample. If the spacing is less than 1 cm, some large diameter high power objectives may touch the sample when focussing on the central edge of the detector. With the new ZEISS series of microscopes, which have a near-vertical nosepiece axis, an even wider spacing may be necessary.

Using a diamond pencil or similar scribing tool, mark a small cross on the mid-line of the slide and between the two mounts and the slide edge, as illustrated below. Positional accuracy is not especially important. This cross will be used as a zero reference point for all co-ordinates on the slide, and is used in the initial alignment routine and upon remounting of a previously aligned slide.

To simplify the alignment procedure, some registration marks can be made on the grain mount and mica when assembled for irradiation. A method commonly used is to make a pin-prick hole in each corner of the assembled pair. These can then be used to provide a coarse relative positioning reference between the mica and grain mount during the alignment procedure.
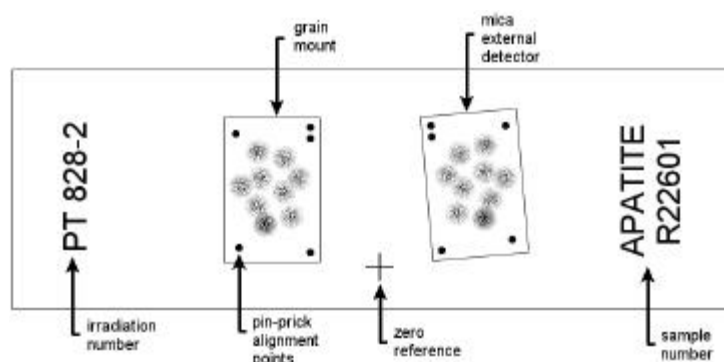
Note, the pin-pricks which are used during the alignment procedure. Using two pin-pricks in one corner assists in achieving the correct orientation during the mounting process. Also note the scribed cross, on the mid-line between the grain mount and the external mica detector, which is used as the (0,0,0) reference point for the slide.

## TrakScan

TrakScan is an application specifically written to maximise the usefulness of the Autoscan computer-controlled microscope stage for Earth Sciences applications.  TrakScan for Windows is an updated version of the Fission-Track Dating (FTD) component of the existing DOS-based TrakScan program suite.  TrakScan for Windows incorporates direct image acquisition from the microscope (via a camera and frame grabber) permitting many functional and user-friendly enhancements.

 In TrakScan, some screen controls allow their values to be changed and some are display purposes only.  Screen controls which allow their values to be changed, Editable controls, are shown with a blue foreground colour.  Display only or Locked controls, are shown with a black foreground colour.

## This Manual

This manual describes in detail the operation of TrakScan.  It is divided into sections the way the TrakScan program is divided into areas of function.  When describing a particular TrakScan function, the manual is formatted in the order in which steps within the function are arranged.  Generally, the portion of the screen showing the TrakScan function being described is illustrated in the manual.

The main sections of the manual are:

For those familiar with TrakScan operation, the **Quick-Start** section provides a brief overview of the steps required to configure and process a batch of standard glass and grain slides.  Other sections are formatted in the same general order as TrakScan should be operated but contain a detailed description of each operation and individual screen controls.

While a *Glossary of Terms* (*§ Appendix C, p4*) is provided at the rear of the manual, several terms used repeatedly throughout the manual will be defined here.  The *grain mount* is the substrate on which a batch of crystals is mounted and polished.  The *(external) mica (detector) mount* is the mica slice which is held in contact with the polished surface of the grain mount during thermal neutron irradiation.  The grain mount and

mica mount are then mounted on the glass *grain slide*.  A *standard glass slide* is the glass slide used to determine the dosage of thermal neutrons which has been received by the FTD sample.  A *standard glass area of interest (AOI)* is an area of the mica mount irradiated with the standard glass slide which is analysed to determine thermal neutron dosage received during irradiation of a batch of grain and standard glass slides.

When a reference is made to another section of the manual, the relevant section is marked with the § symbol.  When TrakScan screen controls are referred to in the manual, the caption (title) of the screen control is shown in *italics*.

The symbols  and  are used throughout the manual to indicate an important operational note or hint, or a critical TrakScan requirement or warning, respectively.

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## Autoscan Systems Pty. Ltd.

*Company Overview*

Autoscan Systems Pty. Ltd. (ABN 73 006 275 136) is an Australian scientific instrument manufacturing company which was incorporated in 1984.  Since that time, we have become the world's leading manufacturer and supplier of automated microscope stages.  Our equipment, which has been sold in 17 countries to date, automates the use of optical microscopes, and is known and respected as the very best microscope stage equipment available.

*Autoscan Microscope Stages*

Our Autoscan stages use dc servo-motors for the X and Y (left-right and forward-backward) and Z (vertical, or focus) motions.  The fact that the focus motion is built right into our stages represents a major plus in many applications, as it leaves the microscope's focus mechanism free for separate manipulation.  To the best of our knowledge, ours is the only microscope stage in the world which incorporates integrated motorised movement in all 3 axes; 2-axis X-Y and 1-axis (focus) stages can also be supplied.

Our stages move in sub-micron increments in all three axes; X, Y and focus.  For reference, a human hair is typically 80μ in cross-section.  Movement of the stage is initiated by means of a special 3-axis joystick.  The stage is controlled by an electronic controller box, to which commands are in turn issued from a computer.

*Autoscan Software Systems*

Autoscan has developed and markets the following specialised software systems:
- AutoScope: A computerised microscopy system incorporating automatic stage movement control and image processing for object recognition.
- TrakScan: A software package to assist in the geological technique called Fission-Track Dating (FTD) and general point counting applications.
- Irradiate: Application used for controlling heavy-ion beam irradiation of single-cell biological entities.
- Stage ASDK: The Autoscan software developers kit (ASDK), including the Autoscan stage driver DLL, allows developers to write their own software to control and operate the family of Autoscan Systems 2/3-axis microscope stages via the serial port on a Windows 95/98/NT platform.

*Contact Autoscan*

Autoscan Systems Pty. Ltd. can be contacted at:

| P.O. Box 112 | Suite 4, 293 Bay Street, | Telephone: + 61 3 9596 8065 |
|---|---|---|
| Ormond, 3204 | Brighton.  3186. | Facsimile:  + 61 3 9596 8369 |
| Victoria.  Australia. | Victoria.  Australia. | Email: autoscan@autoscan.com.au |
| | | Internet: www.autoscan.com.au/~autoscan |

# Starting TrakScan

**Before Starting TrakScan**

Befort starting the TrakScan program check the system hardware and microscope setup.

Ensure that all components are correctly connected and powered. Switch on power to the Autoscan motor controller unit, ensure the camera is connected to the frame grabber and powered, power the digitizer tablet (if used) and the microscope.

Ensure that all the microscope objectives are accurately centered (if these can be adjusted on the microscope) and that the condenser is raised to its proper working position.

Insert a slide into the slide holder. Ensure that it is firmly located against the right and rear edges of the recess. The slide should have the grain mount on the left, the mica on the right and the reference cross at front center when looking at the stage.

**Starting TrakScan**
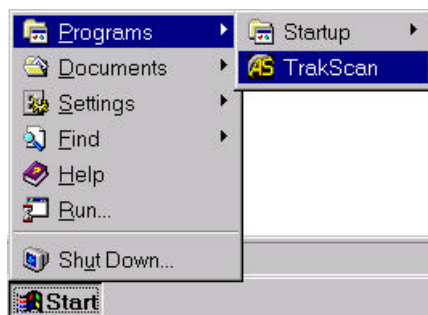
When hardware checks have been performed, start TrakScan by selecting the *TrakScan* icon from *Programs* under Windows *Start* menu. Alternatively, copy the TrakScan shortcut from the Start menu to the desktop then start TrakScan by double-clicking that icon on the desktop.

**Splash Screen**

While TrakScan is loading, a splash screen is displayed indicating whether all required system components have been found, that an Autoscan stage, frame grabber (and camera), and digitiser tablet (if fitted) are connected and working.

During the *System Check*, TrakScan checks that the application database, and stage and frame grabber drivers can be loaded. If a problems occurs with any of these, a message is displayed and remedial action suggested.
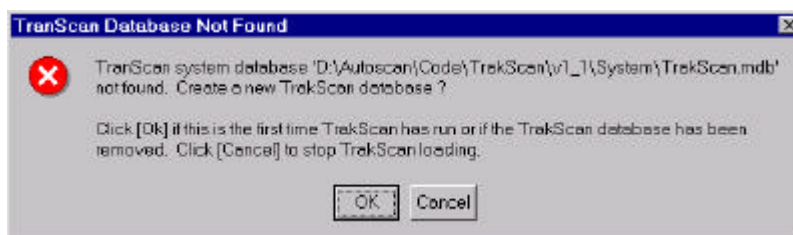
TrakScan application settings are stored in the TrakScan.mdb database. When TrakScan is run for the first time, or if this file has been removed, TrakScan will prompt to create a new copy of this database. Click the *Ok* button to create a new copy of this file and allow the program to start.

**Stage Not Found**

Autoscan stage not found.

Please check that the stage is connected to the computer and is powered-up.

[ Retry ]  [ Cancel ]

During the Autoscan Stage check, TrakScan checks that the Autoscan stage is connected to the computer and operating correctly. If this check fails this message is displayed. Check that the stage is correctly connected to COM1: of the computer and powered up. Click *Retry* to re-check stage presence and operation. Click *Cancel* to allow TrakScan to continue loading without the stage connected. The later will allow TrakScan to start and operate with all functions except those requiring the stage.

**Frame Grabber Error**

Error 'File not found: FG32_Picolo_Ntsc.dll' occurred while initialising frame grabber.

Please check the installation procedure for the frame grabber.

[ Retry ]  [ Cancel ]
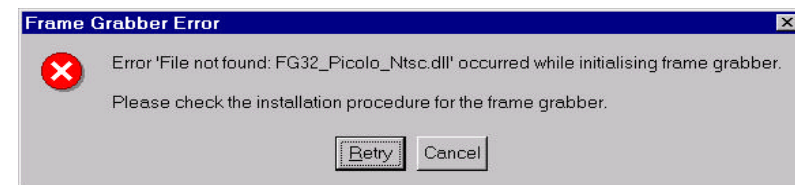
During the Frame Grabber check, TrakScan checks that the appropriate frame grabber driver exists and can be loaded, that a frame grabber is installed in the computer and that images can be acquired from the camera connected to the frame grabber. If the frame grabber driver file cannot be found, a message is displayed to this effect. If the file has been moved, move it back to the TrakScan\System directory. If the file does not exist, copy it from the TrakScan installation CD. Click Retry to retry the frame grabber driver file initialisation, or Cancel to continue loading TrakScan without the ability to acquire images from the camera.

**Frame Grabber Not Found**

Frame grabber not found.

Please check the installation procedure for the frame grabber.

[ Retry ]  [ Cancel ]

Also as part of the frame grabber check, TrakScan checks that a frame grabber of the type matching the frame grabber driver is installed. If a frame grabber is not found, a message is displayed to that effect and remedial action suggested.

**Camera Error**

Cannot acquire image from camera.

Please check that the camera is powered up and connected to the frame grabber.

[ Retry ]  [ Cancel ]

If the frame grabber is fitted and operating correctly but cannot acquire images from the camera this message is displayed. Check that the microscope camera is correctly connected to the frame grabber and powered up. Click *Retry* to re-test camera operation. Click *Cancel* to allow Irradiate to continue loading without image acquisition.
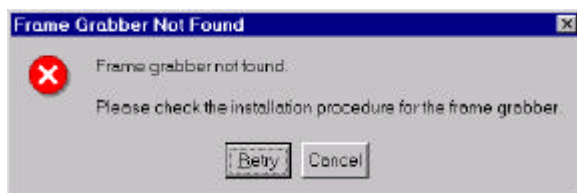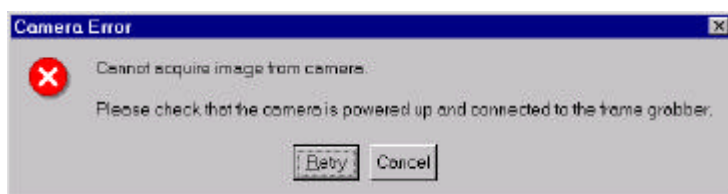
**Tablet Not Connected**

No reply from tablet

Please confirm that the tablet is powered-up, connected to computer COM2, and configured to operate in Digitizer Binary Mode at 9600 baud with odd (O) parity.

[ Retry ]  [ Cancel ]
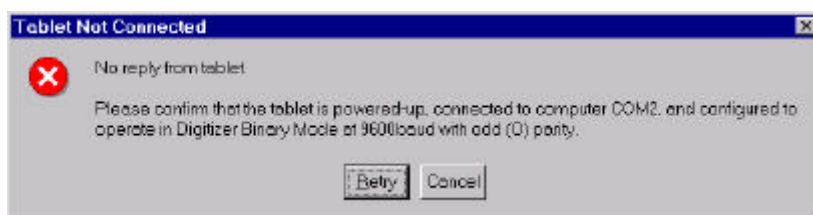
If TrakScan has been configured to work with a digitiser (*§ Tablet Setup, p21*), during the Digitiser Tablet check, TrakScan checks that a Digitiser Tablet is connected to the computer and operating correctly. If this check fails this message is displayed. Check that the tablet is correctly connected to COM2: of the computer, set to 9600 baud with Odd-parity, set to operate in binary mode, and powered up. Click *Retry* to re-check tablet presence and operation. Click *Cancel* to allow TrakScan to continue loading without a tablet connected. The latter will allow TrakScan to start and operate with all functions except track length measurement using the tablet.

**Trakscan Tablet**

Will a digitiser tablet be used with Trakscan on this computer ?

Note: If [No] is clicked, Trakscan will not check for a connected tablet next time it starts. The tablet check can be re-enabled at any time from the System Setup screen.

[ Yes ]  [ No ]
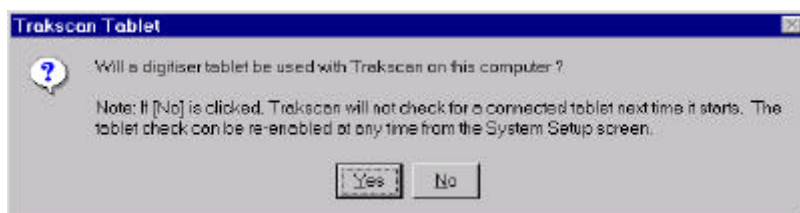
If the digitiser tablet was not found and *Cancel* clicked when the *Tablet Not Connected* message box was displayed, TrakScan prompts whether a digitiser tablet will be used with TrakScan (the default condition when TrakScan is installed). If the digitiser tablet is only temporarily disconnected click the *Yes* button. If a digitiser tablet is not used with TrakScan click *No*. In this case TrakScan will not check for a digitiser tablet each time it starts. Note, the digitiser tablet can be enabled/disabled at any time

within TrakScan (*§ Tablet Setup, p21*).



If any fatal errors occurred during the above system and hardware checks (for example, the TrakScan application database was not found and the user clicked *Cancel*), a message is displayed and TrakScan will automatically shutdown.  Correct the previously displayed errors and re-start TrakScan.

# TrakScan Main Screen

**Introduction**

Following a successful system check, the TrakScan main system screen is then displayed as shown below.
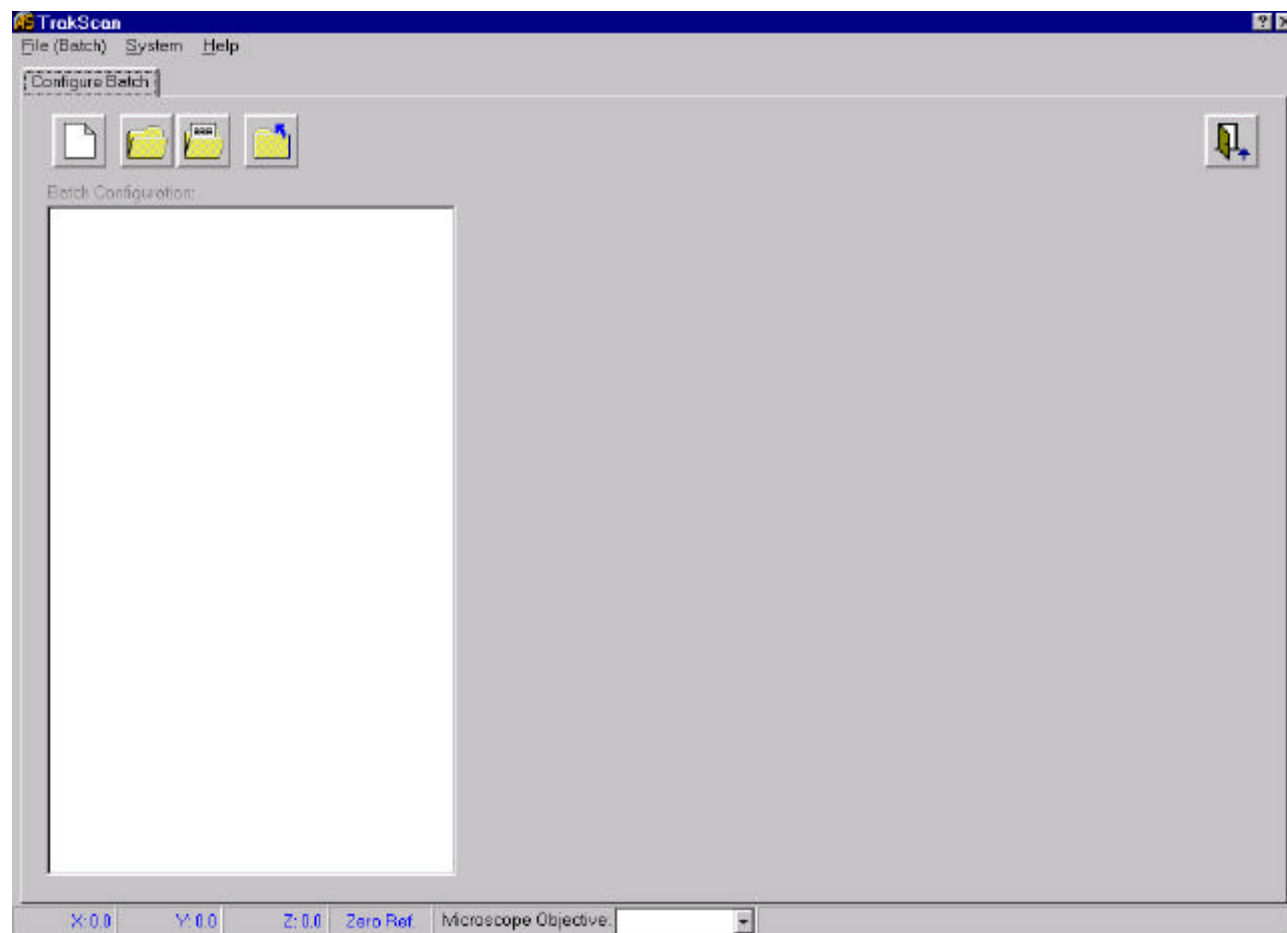


TrakScan data is organised into a data file referred to as the batch; described in more detail below (*§ TrakScan Batch File, p12*). When TrakScan is started, no batch is open and most of the screen controls are not visible. The main screen is occupied with a tab control. A *Configure Batch* tab is always displayed on this tab control. Other tabs are made visible when a batch is opened.

**TrakScan Batch File**

TrakScan is dedicated to the configuration, processing and review of a FTD slide batch; that is, a group of slides from related rock samples or group of samples. A TrakScan batch is a hierarchical structure containing one or more Grain Mount and Standard Glass slides. The configuration of, and data collected from these slides is stored in a single TrakScan batch (Microsoft® Access-compatible) database. The filename of the batch database is the batch name within the TrakScan application.

New batches are created and existing batches opened using the *Batch Buttons* (*§ Batch Buttons, p12*) or the *File Menu* (*§ File Manu, p13*). These functions and the configuration of a batch are described in more detail below (*§ Batch Configuration, p24*). The table and field structure of a TrakScan batch database is described elsewhere (*§ Appendix B: TrakScan Batch Database Structure, p1*).

**Batch Buttons**

 New batches can be created, and existing batches opened using the batch buttons

on the *Configure Batch* tab on the main screen. From left to right these buttons create a new batch, browse to and open an existing batch file using the standard Windows File Open dialog box, open the most recently open batch file and close the currently open batch file, respectively. These functions are also available from the *File (Batch)* menu (*§ File Manu, p13*) and are described in more detail in a later section (*§ Batch File Operations, p24*).

To shutdown TrakScan, click the Exit button on the main screen *Configure Batch* tab. This function is also available from the *File (Batch)* menu.

## Main Screen Info Panel

General TrakScan operational information and settings are displayed in panels at the bottom of the TrakScan main screen. This panel contains the current X-axis, Y-axis and Z-axis (Focus) position of the stage and whether the stage is currently located in the vicinity of the Zero Reference mark, the grain mount or the mica detector.

The *Microscope Objective* combo-box contains a drop-down list of the microscope objective definitions that have been configured for use with TrakScan. These definitions contain calibration data used for converting measurements taken using the camera image (measured in pixels) and the digitiser tablet (measured in counts) to the appropriate engineering units (microns). When the active microscope objective is changed, the appropriate Microscope Objective definition must also be selected using this control so TrakScan can correctly convert measurements taken using the camera image or digitiser tablet to microns. Creating Microscope Objective definitions is described in more detail in *§ Camera/Tablet Calibration, p21*.
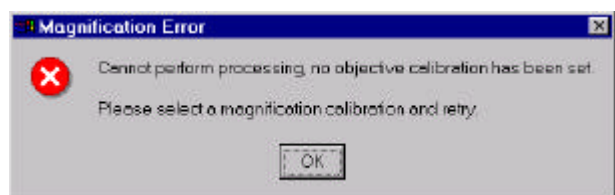
Before a grain mount or standard glass can be processed, a microscope objective definition must be selected. If any processing is attempted before a microscope objective definition is set, an error message is displayed. Click *Ok* to acknowledge the message, then use the *Microscope Objective* combo (drop-down) box to select the microscope objective definition corresponding to the microscope objective currently being used.

## File Menu

The TrakScan *File (Batch)* menu contains several items related to TrakScan batch file operations.

Select the *New Batch* menu item (also invoked using the <Ctrl>N hot-key) to create a new TrakScan batch. Select the *Open Batch* menu item (also invoked using the <Ctrl>O hot-key) to open an existing TrakScan batch. If a batch is currently open, the *Close Batch* menu item will be enabled. Select this item (or press the <Ctrl>C hot-key) to close the currently open batch. The *File (Batch)* menu also contains a list of (up to 10) of the most recently open files. To open a batch from this list simply select the batch file name. When this is done, the batch will be opened and its configuration displayed as described above. Alternatively, to re-open the last opened file use the <Ctrl>L hot-key. These functions are described in more detail in a later section (*§ Batch File Operations, p24*).

If a batch is currently open, the *Export Batch* menu item will be enabled. This function exports data from the grain mount and standard glass slides stored in the (Microsoft® Access-compatible) batch database file to tab-delimited (ASCII) text files. In this form they can be readily viewed or accessed by post-processing software packages. When this item is selected, data contained in the currently open batch is exported to five files separately containing standard glass slides configuration information, standard glass slide fields-of-view

configuration information and data, grain mount slides configuration information and data, grain mount slide grain data, and grain mount slide grain track data.  These files are located in the TrakScan\Export directory and named <Batch>_Glass.txt, <Batch>_StdAOI.txt, <Batch>_Mount.txt, <Batch>_Grain.txt and <Batch>_Track.txt, respectively, where <Batch> is the batch file name.  A message is displayed when the export is complete.  The format of the export files are described in *§ Appendix B: TrakScan Batch Database Structure, p1*.

To shutdown TrakScan, select the *Exit* item (also invoked using the <Ctrl>Q hot-key).  This will close any open batch then shutdown the TrakScan application.

## System Menu



The TrakScan *System* menu contains several items related to configuring TrakScan and common TrakScan operations.

Select the *Live View* menu item (also invoked using the <Ctrl>I hot-key) to display the Live View screen (*§ Live View, p19*).  This screen displays a full-scale live view directly from the camera.

The *System Setup* menu item (also invoked using the <Ctrl>H hot-key) is used to display the *System (Hardware) Setup* screen (*§ System Setup, p20*).  This screen displays stage and frame grabber information, is used to enable and configure the digitiser tablet (if fitted) and create Microscope Objective definitions used to convert measurements taken using the camera image and digitiser tablet to engineering units (microns) (*§ Camera/Tablet Calibration, p21*).

The *Set Slide Zero Ref* and *Goto Slide Zero Ref* menu items (also invoked using the <Ctrl>R, and <Ctrl>Z hot-keys, respectively) are used to set and goto the current slide zero reference position.  The slide zero reference position (the zero reference mark on a grain mount) coincides with the origin (0,0,0) of the stage coordinate system.  Use the *Set Slide Zero Ref* menu item to set the stage origin (that is, reset stage coordinates to (0,0,0)) at its current position.  Use the *Goto Slide Zero Ref* menu item to move the stage from its current position to its origin at any time.  The use of the Zero Reference mark is described in more detail in *§ Grain Mount Zero Reference, p26*.

The *Goto Grain Mount* and *Goto Mica Detector* menu items (<Ctrl>G, and <Ctrl>M, respectively) are used to move the stage to the focus points (in the vicinity) of the grain and external mica detector mounts on a grain slide, respectively.  The alignment of these mounts is described in more detail in *§ Grain Mount Alignment Points, p26*.  The *Swap Grain/Mica* menu (<Ctrl>S) will move the stage to the equivalent point of the opposite side of the slide.  For example, if the stage is currently located over the grain mount, selecting this item will move the stage to the equivalent point on the mica mount.

The *Preferences* menu item (also invoked using the <Ctrl>P hot-key) is used to display the *Preferences* screen (*§ Preferences, p15*).  This screen contains settings to control various aspects of TrakScan operation.

## Help Menu
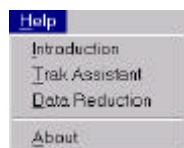


TrakScan help is provided by this manual.  However, the *Help* menu contains several items to display brief on-line help issues which can be readily updated.  The *Introduction* menu item simply invokes the Windows Notepad® and displays the TrakScan\System\TrakHelp.txt text file which contains important items and updates relating to TrakScan.  Similarly, the *Data Reduction* menu item invokes Notepad and displays the TrakScan\System\DataReduction.txt text file which contains information about, and contact details for, vendors of data reduction software which can be used for post-processing data files created by TrakScan.  The *TrakScan Assistant* menu item displays the TrakScan Assistant screen with instructions about how it is used.  The *About* menu item displays a screen containing TrakScan version information.  This screen can also display system information related to the computer running TrakScan.
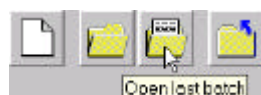


Brief help relating to a particular control is available within TrakScan itself with the aid of 'tooltips'.  If the mouse is moved to, and allowed to hover over a screen control, a small yellow tooltips box is automatically displayed which contains a brief description about that control.  When the mouse is next moved, or a mouse button pressed, the

tooltips will be automatically hidden.

Another form of help with TrakScan is provided by the TrakScan Assistant (*§ TrakScan Assistant, p18*).  The TrakScan Assistant is invoked by different TrakScan functions.  When invoked, the TrakScan Assistant is a small dialog box shown over the currently displayed screen which contains instructions and controls designed to assist the operator with the current program function, particularly those involving a number of steps.  For example, the TrakScan Assistant is used to guide the operator through the focus and alignment procedure for a grain mount.

## Preferences
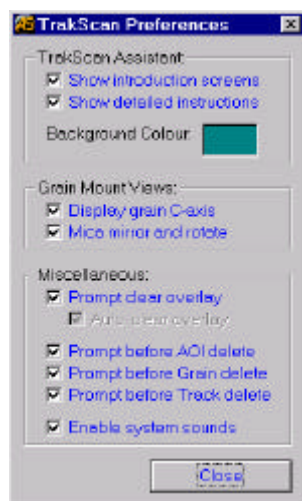


The *Preferences* screen contains settings to control various aspects of TrakScan operation.  It is displayed by selecting the *Preferences* item on the main screen *System* menu, or using the <Ctrl>P hot-key on the main screen.

*TrakScan Assistant Preferences*

The TrakScan Assistant is a small dialog box shown over the currently displayed screen which contains instructions and controls designed to assist the operator with the current program function (*§ TrakScan Assistant, p18*).  For example, the TrakScan Assistant is used to guide the operator through the focus and alignment procedure for a grain mount.

When the TrakScan Assistant is used with a procedure which includes a number of steps, an introductory screen explaining the procedure about to be followed can be displayed.  Tick the *Show introduction screens* check box to enable this screen to be displayed.  When the user becomes familiar with TrakScan operation, un-tick this check-box to prevent an introductory screen being displayed whenever the TrakScan Assistant is used with a program function.

The TrakScan Assistant screen is comprised of a panel with instructions and controls which allow the user to initiate different actions.  Tick the *Show detailed instructions* check box to show the instructions panel on the TrakScan Assistant screen.  When the user becomes familiar with the individual steps in the different TrakScan Assistant operations, un-tick this check-box to hide the instructions panel thereby reducing the screen area required by the TrakScan Assistant.

To highlight the TrakScan Assistant on the screen its background colour can be changed.  The currently active background colour is displayed in a panel beside the *Background Colour* label.  To change the background colour click this panel.  A colour palette dialog box will be displayed.  Select a new colour then click *Ok*.  The new colour will be displayed in the *Background Colour* panel and used as the TrakScan Assistant's background colour next time it is displayed.

*Grain Mount View Preferences*

When a grain mount is being processed (*§ Process Grain Mount, p34*), a camera view of the grain mount is displayed on the screen.  The *Grain Mount View* preferences control various aspects of how the grain mount is displayed.

Tick the *Display grain C-axis* check box to display a (blue) line indicating the orientation of the currently selected grain's C-axis over the camera view when the grain mount is displayed.

By its construction (*§ FTD Mount Preparation, p6*), the external mica detector mount is a mirror (horizontally flipped) impression of the grain mount.  These mounts may also be rotated with respect to each-other when they are attached to a slide.  The mirroring and rotational misalignment of the external mica detector mount can be corrected by TrakScan before a camera view of the mica detector is displayed.  This correction is made when the *Mica mirror and rotate* check-box is ticked.  Note, the quality of a rotated image may be slightly less compared to an unrotated one because the discrete pixels comprising the original image cannot be transferred exactly to a discrete location in the rotated image.

*Miscellaneous Preferences*

When grain track length is measured (*§ Measuring Track Length, p40*) by mouse clicking track and crack, start and end points on the camera view of the grain mount, the actual track is marked in an overlay of the camera view.  This view must be cleared when it is no longer relevant; for example, when the stage is moved.  If the *Prompt clear overlay* check box is ticked, TrakScan will prompt whether to clear the overlay before certain program functions (add grains, count grain tracks, measure track length, and add standard glass AOI) are started.  If *Prompt clear overlay* check box is un-ticked and *Auto clear overlay* is ticked, TrakScan Assistant will automatically clear the overlay when these program functions are initiated.  If both these settings are un-ticked, TrakScan will never prompt to clear the overlay and will not automatically clear the overlay by itself.  Note, the overlay can be manually cleared at any time by the operator by clicking the *Clear* overlay button on *Process Grain Mount* tab (*§ Process Grain Mount Tab, p34*) or *Process Standard Glass* tab (*§ Process Standard Glass Tab, p30*).

TrakScan keeps a record of defined standard glass slide areas-of-interest (AOI) (*§ Standard Glass AOI List, p31*), and grain slide grains and tracks (*§ Grain and Track Lists, p37*).  Individual AOI, grain and track records can be manually deleted.  Ticking the *Prompt before AOI delete*, *Prompt before Track delete* or *Prompt before Grain delete* check boxes will cause TrakScan to display a prompt before deleting an AOI, grain or track record.  The prompt will allow the user to continue to delete the record or cancel the delete operation.

Sounds can be generated by TrakScan to acknowledge operator actions (such as marking track length) or to annunciate error conditions.  If the *Enable system sounds* check-box is ticked, these sounds will be made by TrakScan when appropriate.  If this setting is un-ticked, TrakScan will not generate sounds when operator actions or error conditions occur.  Note, a sound card is required for sounds to be generated.


**Hot-Keys**

As described in the above sections related to the main screen menu's, menu functions can be invoked by pressing a hot-key combinations.  All hot-keys combinations involve pressing the keyboard Control key <Ctrl> and a letter key at the same time.  Main screen hot-keys (grouped by their parent menu) and their associated functions are summarised in the following table.

| File Menu | |
|---|---|
| <Ctrl>N | Create new TrakScan batch (database file) |
| <Ctrl>O | Open an existing TrakScan batch (database file) |
| <Ctrl>C | Close the currently open TrakScan batch |
| <Ctrl>L | Open the last opened TrakScan batch |
| <Ctrl>E | Export the currently open TrakScan batch |
| <Ctrl>Q | Shutdown TrakScan |
| System Menu | |
| <Ctrl>I | Display the Live View screen |
| <Ctrl>H | Display the System Setup screen |
| <Ctrl>R | Set stage origin (zero reference) at current position |
| <Ctrl>Z | Send stage to current origin (zero reference) position |
| <Ctrl>G | Move stage to center of grain mount |
| <Ctrl>S | Swap between grain/mica mounts |
| <Ctrl>M | Move stage to center of mica detector mount |
| <Ctrl>P | Display TrakScan Preferences screen |


**Common Program Functions**

Several common program functions are available at different points of the program.  While these functions are noted at those points of the program, they are described in detail here.

*Click-And-Move*

A function available on all screen images displaying a live view from the camera is *Click-And-Move* which automatically moves the stage to center a point clicked on the screen.  To do this, hold down the left mouse

button; the cursor will change to a ✛ crosshair pointer.  While still holding down the left mouse button, move the mouse to position the crosshair over the object or feature to be centered.  When the crosshair is in position, release the left mouse button.  The stage will be automatically moved to center the mouse-clicked point in the camera view and the mouse cursor returns to the default ☟ pointer..  Note, error messages are displayed if the stage is not connected (§ *Splash Screen, p9*), an image cannot be obtained from the frame grabber or camera (§*Splash Screen, p9*), or a Microscope Objective definition has not been set (§ *Info Panel, p13*).
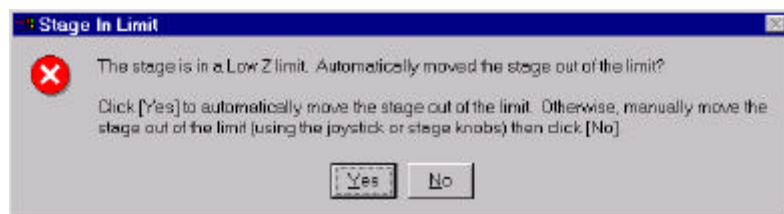
*Stage Controls*

A stage control panel is displayed on some program screens.  It contains controls for manually moving the stage from the computer screen.  The *X:*, *Y:* and *Z:* up/down buttons allow the stage position to be individually incremented/decremented in any of these axes. The distance that the stage moves in the X and Y axis direction depends on the setting in the associated combo (drop-down) box.  This can be set to increment/decrement stage position is steps of 1µ, 10µ, 100µ or 1000µ, or set to 'Field' in which case the stage will be moved by the camera image width/height.  The latter allows a slide to be stepped off in camera fields-of-view if required.  The Z (focus) axis position is always changed in steps of 10µ.

Current stage position is always displayed in the main screen info panel at the bottom of this screen. Also, the slide zero reference position (the zero reference mark on a grain mount) coincides with the origin (0,0,0) of the stage coordinate system.  This position can be set, or moved to, at any time by selecting the *Set Slide Zero Ref* (<Ctrl>R), or *Goto Slide Zero Ref* (<Ctrl>Z) menu items from the *System* menu, respectively.  Furthermore, *Click-And-Move* is available on the standard glass camera view.  Clicking a point on the camera view will move the stage to center that point on the screen.

If the stage is moved outside its normal operating area and engages one of its limit switches, stage operation is automatically stopped by the controller box.  This protects the stage mechanism from inappropriate movement.  This is referred to as a stage 'in a limit' condition.  If the stage was moved into the limit under joystick control, the joystick must be used to move the stage out of the limit.  Note, while the joystick is enabled for this purpose, it can only be used to move the stage out of the limit and not further into the limit.

If the stage was moved into the limit under TrakScan control, a message box is displayed with the option for the program to automatically move the stage out of the limit.  Click *Yes* to let TrakScan automatically move the stage out of the limit, or manually move the stage out of the limit using the joystick then click *No*.  If the automatic method is used, TrakScan will move the stage 5mm away from the limit direction.  This is repeated until the stage is no longer in limit.  As such, the stage will be located at some arbitrary point just inside the limit when this automatic move is complete.

*Tablet Puck Position*

The digitiser tablet puck is the four-button cursor supplied with the tablet.  In conjunction with a microscope and drawing tube, it is used for measuring grain track length.
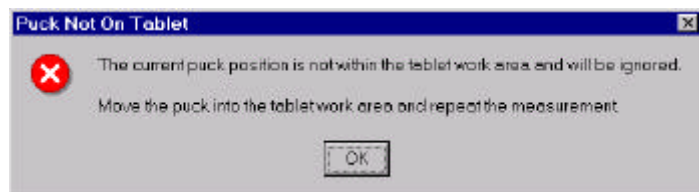
Puck position is reported to the TrakScan program when one of the puck buttons is pressed.  If the puck is not within the work area of the tablet when the puck button is pressed, a message is displayed.  Click *Ok*.  The last puck position reported will be ignored by TrakScan and should be repeated.

# TrakScan Assistant

The TrakScan Assistant is a small dialog box shown over the currently displayed screen which contains instructions and controls designed to assist the operator with the current program function, particularly those involving a number of steps.  For example, the TrakScan Assistant is used to guide the operator through the focus and alignment procedure for a grain mount.



The TrakScan Assistant is comprised of a screen caption, an instruction panel, a (Description) text-box for entering information (if requi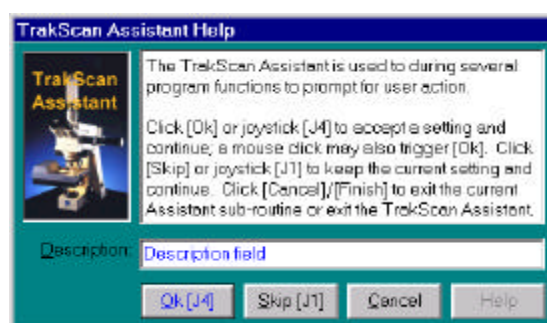red) and a row of action buttons.  The instruction panel contains a description of the current function step and outcome associated with each of the buttons.  The (Description) text-box is visible only if the program requires the operator to enter free-format text, such as a description or value.

Although the caption displayed on each of the action buttons may change depending upon the function, the buttons are referred to as the *Ok*, *Skip*, *Cancel* and *Help* buttons.  Click the *Ok* button to accept the current or a newly entered setting and continue to the next function step.  Click the *Skip* button to accept the current setting, discarding any new values that may have been entered, and continue to the next function step.  Click the *Cancel* button to exit the current function at any time.  Generally, any values entered up to that point will be discarded.  Click the *Help* button, if enabled, to display a help screen containing more detailed information about the current step of the TrakScan function.

During some TrakScan Assistant operations (for example, during grain slide setup), the action key functions can also be triggered using the keys on the stage joystick.  If the joystick keys are enabled, the *Ok* and *Skip* buttons will be displayed as *Ok [J4]* and *Skip [J1]*, respectively.  Press joystick button J4 (top left) to activate the TrakScan Assistant's *Ok* button action.  Similarly, press joystick button J1 (rear right) to activate the *Skip* button.  Using the joystick buttons allows all steps in this procedure to be completed at the microscope if required.



If the *Show detailed instructions* TrakScan Assistant preferences setting (*§ TrakScan Assistant Preferences, p15*) is not activated, the TrakScan Assistant icon and instruction panel is not displayed and the TrakScan Assistant screen only displays the action buttons as a toolbar.  The Description text-box appears as it is needed.  The screen caption is still displayed which describes, in one line, the current function step.  When the user is familiar with the individual steps in the different TrakScan Assistant operations, deactivate this setting to hide the instructions panel thereby reducing the screen area required by the TrakScan Assistant.

# Live View

The Live View screen displays a full-scale live view directly from the camera. This screen is displayed by selecting the *Live View* item on the main screen *System* menu, or using the <Ctrl>I hot-key on that screen.



Several functions are available from the Live View screen. These are accessed by clicking the *Tools…* button which then displays a drop-down menu of functions.

The *Set Zero Ref* and *Goto Zero Ref* menu functions are used to set and goto the current slide zero reference position. The slide zero reference position (the zero reference mark on a grain mount) coincides with the origin (0,0,0) of the stage coordinate system. Select the *Set Zero Ref* menu item to set the stage origin (that is, reset stage coordinates to (0,0,0)) at its current position. Select the *Goto Zero Ref* menu item to move the stage from its current position to its origin at any time. The use of the Zero Reference mark is described in more detail in *§ Grain Mount Zero Reference, p26*. If a grain mount is in use (and its alignment points set, *§ Grain Mount Alignment Points, p26*), select the *Swap* menu item to move between associated points on the grain and external mica detector mounts.

Part or all of the Live View image can be saved to disk as a bitmap using the *Save Frame* and *Save ROI* menu items. To save the entire view select the *Save Frame* menu item. TrakScan will prompt for the filename to be used for saving the image bitmap. Enter or select a filename then click *Ok* to save the entire image. Similarly, a portion of the image, an ROI or Region of Interest, can be saved by selecting the *Save ROI* menu item. When this is done, the mouse cursor will change to a $+$ crosshair pointer. Click and drag the mouse on the Live Screen image to mark the ROI to be saved. TrakScan will then prompt for the filename to be used for saving the image ROI bitmap. Enter or select a filename then click *Ok* to save the image ROI bitmap.

The Live View screen can be displayed always on-top of the main screen if required. To do this select the *Always On-Top* menu item. This menu item will be ticked and the Live View will be shown over the main screen while still allowing use of the main screen. Selecting this menu item again will un-tick it, in which case the Live View is hidden when the main screen is clicked.

Select *Close* or *Cancel* to close the Live View screen or cancel the *Tools* menu, respectively. Note, *Click-And-Move* (*§ Click-And-Move, p16*) is available on this screen. This function automatically moves the stage to center a point clicked on the screen.

# System Setup

**Introduction**
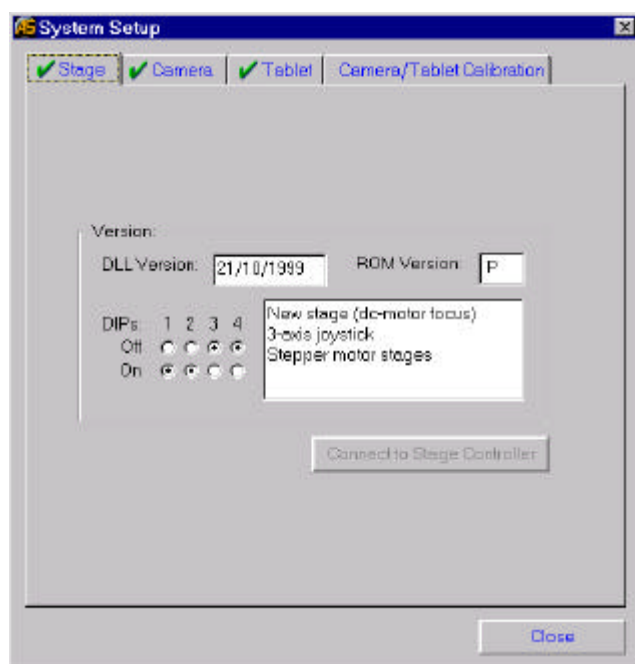


This *System Setup* screen is displayed by selecting the *System Setup* item on the main screen *System* menu, or using the <Ctrl>H hot-key on the main screen. Functions and information available on this screen are grouped onto four tabs. The *Stage* tab displays stage information, the *Camera* tab displays frame grabber and camera information, the *Tablet* tab is used to enable the digitiser tablet (if fitted) and configure the digitiser tablet, and the *Camera/Tablet Calibration* tab is used to create Microscope Objective definitions. These separate tabs are described below.

Click the *Close* button to close the System Setup screen and return to the main screen.

**Stage Setup**

On the *Stage* tab, shown above, the Autoscan stage type (EL300 controller box EPROM version and DIP switch settings) and stage DLL (driver) version information is shown in the *Version* frame. If the stage failed connection during application startup (*§ Splash Screen, p9*) the *Stage* tab will be marked with a ✗ cross symbol. Click the *Connect to Stage Controller* button to re-attempt connection to the stage. If the re-connection was successful, the *Stage* tab will now be marked with a ✔ tick symbol and the *Connect to Stage Controller* button will be disabled.

**Camera Setup**
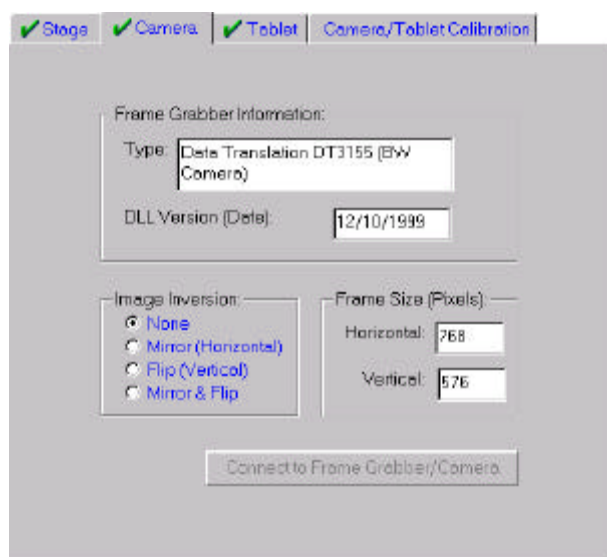


On the *Camera* tab, the frame grabber type and DLL (driver) version is shown in the *Version* frame. The camera/frame grabber image size is shown in the *Frame Size* frame. If the camera/frame grabber failed connection during application startup (*§ Splash Screen, p9*) the *Camera* tab will be marked with a ✗ cross symbol. Click the *Connect to Frame Grabber/Camera* button to re-test image acquisition via the camera. If re-connection and image acquisition was successful, the *Camera* tab will now be marked with a ✔ tick symbol and the *Connect to Frame Grabber/Camera* button will be disabled.

Depending on the relative image paths within the microscope between the eyepieces and the camera, the camera image may be aligned differently with respect to the view through the microscope eyepieces. If the view is simply rotated, rotate the camera on the microscope C-mount until it is aligned with the eyepieces view.

If the view is mirrored (horizontal inversion) or flipped (vertical inversion) with respect to the eyepieces, select the appropriate *Camera Image Inversion* option button to invert the camera image before it is displayed so that it is aligned correctly with the eyepieces view.

## Tablet Setup

Controls on the *Tablet* tab allow the digitiser tablet to be enabled and tested.  To enable the use of a digitiser tablet within TrakScan tick the *Digitiser tablet used with TrakScan* check-box.

If the digitiser tablet failed connection during application startup (§ *Splash Screen, p9*) or it had not been previously enabled for use within TrakScan, the *Tablet* tab will be marked with a ✗ cross symbol.  Click the *Connect to Tablet* button to re-attempt connection to the tablet.  If re-connection was successful, the *Tablet* tab will now be marked with a ✔ tick symbol and the *Connect to Tablet* button will be disabled.

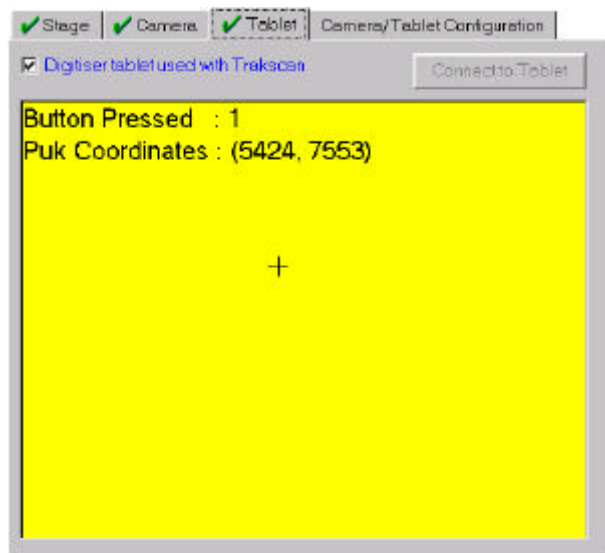If TrakScan is connected to the digitiser tablet, the operation of the tablet can be checked by pressing any of the four tablet puck buttons.  When a button is pressed, the button number and the tablet coordinates of the puck when the button was pressed will be displayed in the panel on the *Tablet* tab.  A crosshair point will also be shown at approximate position of the puck on the tablet work area.  The background colour of the panel will be changed to show the preset colour of the puck button (described below).

Tablets supplied by Autoscan with a TrakScan system include a four button tablet puck.  The buttons are used for measuring the length of projected, TinT, TinCle tracks and Other features (§ *Measuring Track Length, p40*).  The use of individual puck buttons can be configured depending upon the preferences of the operator.  Use the *Tablet Button Configuration* option buttons to set the track type associated with each puck button.

For convenience, the background colour of the puck buttons can be individually set so that the function of the buttons can be readily identified when adding tracks (§ *Process Grain Mount Tab, p34*).  To change a puck button colour, select that colour using the combo (drop-down) box associated with that button.  When a colour is selected, that background colour will be applied to the button label to illustrate its appearance.

## Camera/Tablet Calibration
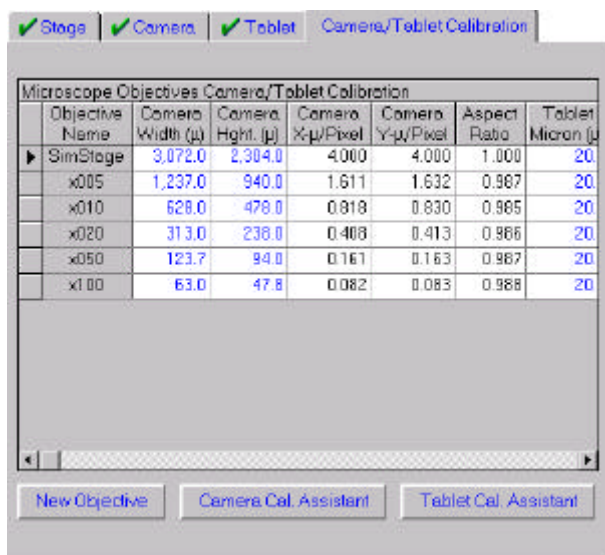
The *Camera/Tablet Calibration* tab on the System Setup screen is used to create Microscope Objective definitions and configure the digitiser tablet (if fitted).

Within TrakScan the length of objects (tracks) on a slide viewed using the microscope can be measured using the computer mouse on the camera image or using the tablet puck on the tablet (as viewed through the microscope eyepiece via a drawing tube).  In both cases, the relationship between mouse or puck movement and its equivalent length in microns must be known.  The magnification of the microscope objective has the most significant effect on this relationship.  As such, a different microscope objective definition record can be created for each working objective on the microscope.  These definitions contain calibration data used for converting measurements taken using the

| Objective Name | Camera Width (µ) | Camera Hght. (µ) | Camera X-µ/Pixel | Camera Y-µ/Pixel | Aspect Ratio | Tablet Micron (µ |
|---|---|---|---|---|---|---|
| SimStage | 3,072.0 | 2,304.0 | 4.000 | 4.000 | 1.000 | 20. |
| x005 | 1,237.0 | 940.0 | 1.611 | 1.632 | 0.987 | 20. |
| x010 | 628.0 | 478.0 | 0.818 | 0.830 | 0.985 | 20. |
| x020 | 313.0 | 236.0 | 0.408 | 0.413 | 0.986 | 20. |
| x050 | 123.7 | 94.0 | 0.161 | 0.163 | 0.987 | 20. |
| x100 | 63.0 | 47.8 | 0.082 | 0.083 | 0.988 | 20. |

mouse position over the camera image displayed on the computer screen (measured in pixels) and the tablet puck position over the working area of the tablet (measured in counts) to the appropriate engineering units (microns).  When the active microscope objective is changed, the appropriate Microscope Objective definition must also be selected using the Microscope Objective combo (drop-down) box on the main screen (*§ Info Panel, p13*) so that TrakScan can correctly convert measurements taken using mouse or puck position to microns.

The calibration relating mouse position on the camera image to microns is (optically) fixed for a particular microscope objective.  However, while the calibration relating puck position on the tablet to microns is principally dependant on the microscope objective being used it can also change with the zoom factor of the drawing tube, when re-focussing the tube, or if the relative position of the tablet and microscope is changed.  As such, the tablet calibration data for a particular microscope object should be re-checked if any of these factors are changed.

The name and details of microscope objective definitions that already exist are shown in the *Microscope Objectives Camera/Tablet Calibration* grid.  The data contained in this grid is described in more detail below.
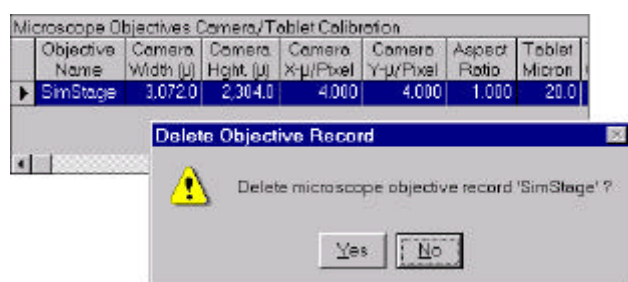


To delete an existing microscope objective definition record, click the record selector cell ▶ for the record to be deleted then press the <Delete> key.  A message will be displayed prompting whether to continue and delete the record. Click *Yes* to delete the record, or *No* to cancel without deleting the record.

Creating a new microscope objective definition record involves three steps; namely, create the record, set camera calibration data, and set the tablet calibration data.  To create a new microscope objective definition record, click the *New Objective* button.  The TrakScan Assistant will be displayed.  Enter a unique name (up to 20 characters) for the new definition record.  It is useful if the name indicates the microscope objective that it is associated with; for example, 'x010'.  When the name has been entered, click the *Ok* button, or *Cancel* to exit the procedure without creating a new definition record.  When *Ok* is clicked, the new definition record will be created and shown in the *Microscope Objectives Camera/Tablet Calibration* grid.
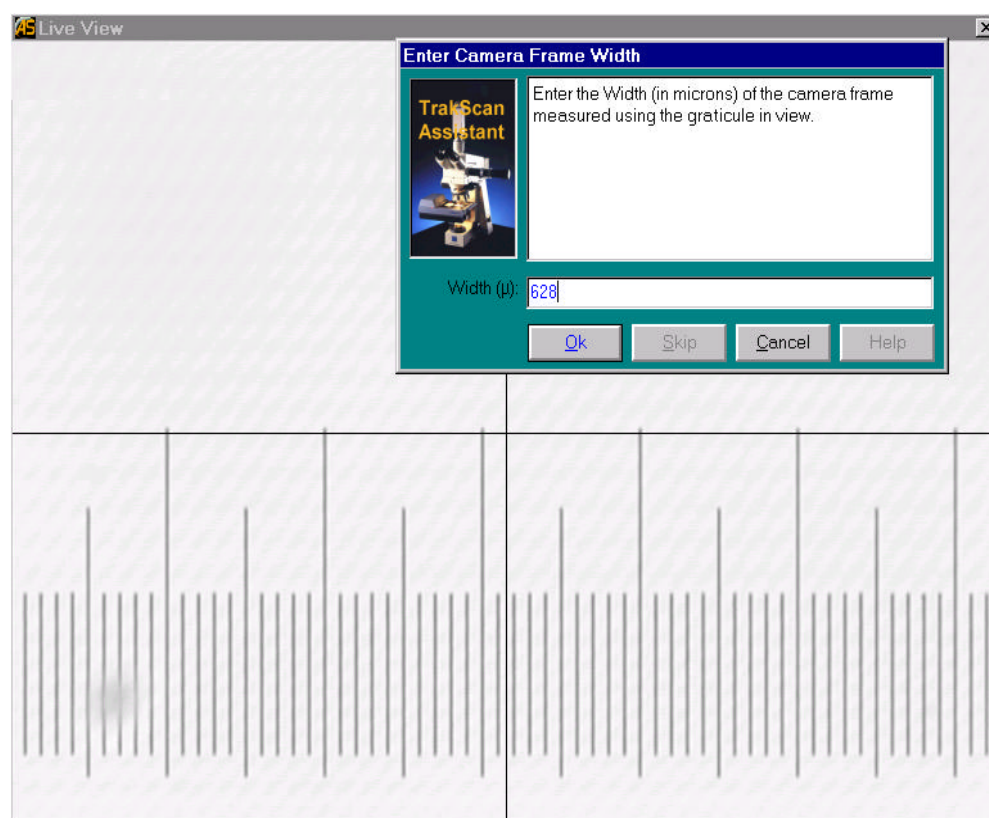


The next step in creating a new microscope objective definition record involves setting the camera calibration data.  This involves entering the width and height (in microns) of the image of the stage acquired from the camera through the microscope.  This data can be readily measured by mounting a stage micrometer (calibrated slide) on the stage and measuring the size of the image.

To do this, click the *Camera Cal. Assistant* button.  The Live View screen, showing a view of the gauge

micrometer, will be displayed.   The TrakScan Assistant will also be displayed, prompting for the width of the image to be entered.  Align the stage micrometer with the X-axis of the stage, record the width of the image (in microns), enter this reading in the TrakScan Assistant, then click *Ok*.  The TrakScan Assistant will then prompt for the height of the image to be entered.  Similarly, align the stage micrometer with the Y-axis of the stage, record the height of the image, enter this reading in the TrakScan Assistant, then click *Ok*.
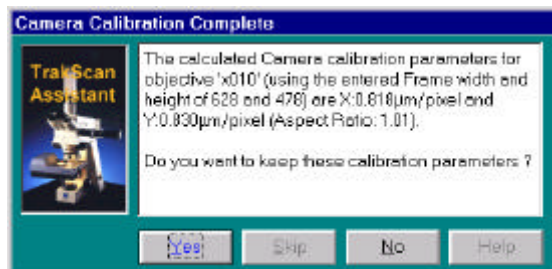


The camera calibration is now complete.  The TrakScan Assistant displays the results of the calibration including the entered image width and height, calculated X-axis and Y-axis micron per pixel ratios and the resulting aspect ratio.  Click *Yes* to save these settings, or *No* to discard them.

These calibration values are now shown in the Camera *Width (µ)*, *Height (µ)*, *X-µ/pixel*, *Y-µ/pixel* and *Aspect Ratio* columns of the *Microscope Objectives Camera/Tablet Calibration* grid for the microscope definition record.  The Camera *Width (µ)* and *Height (µ)* values can be changed at any time by editing these cells directly in the grid.  When this is done the *X-µ/pixel*, *Y-µ/pixel* and *Aspect Ratio* values will be automatically re-calculated and displayed; these fields are for display purposes only and cannot be edited.

If a tablet is used with the TrakScan system (*§ Tablet Setup, p21*), the final step in creating a new microscope objective definition record involves setting the tablet calibration data.  This involves marking the start and end points of a known micron division using the tablet puck.  As above, mounting a stage micrometer on the stage readily provides the known micron division.

To do this, click the *Tablet Cal. Assistant* button.  The Live View screen, showing a view of the gauge micrometer, will be displayed.   The TrakScan Assistant will also be displayed, prompting for the micron division (for example, 20µ depending upon the objective being used) which will be used for tablet calibration.  Enter this value in the TrakScan Assistant, then click *Ok*.  The TrakScan Assistant will then prompt the user to mark the start point of the micron division.  Move the puck crosshair to the start of the micron division then press any puck key.  The TrakScan Assistant will then prompt the user to mark the end point of the micron division.  Move the puck crosshair to the end of the micron division then press any puck key.  The TrakScan Assistant displays the distance, in puck counts, between the start and end points of the micron division.  This process can now be repeated using the same micron division on a different part of the stage micrometer to obtain a better statistical average of the puck counts for the same micron division.  Each time a division is measured in this way the TrakScan Assistant will show the least measurement, the number of divisions recorded so far, and calculate a running average of puck counts.  When sufficient divisions have been recorded, click the Finish button to continue.
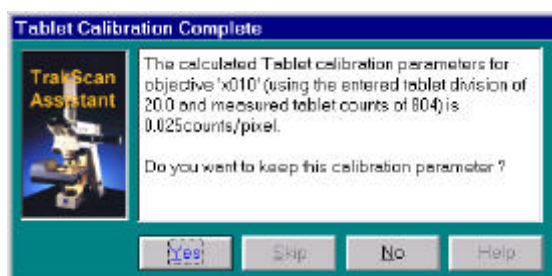


The tablet calibration is now complete.  The TrakScan Assistant displays the results of the calibration including the entered micron division used, the measured average puck counts, and the calculated micron per counts ratio.  Click *Yes* to save these settings, or *No* to discard them.

These calibration values are now shown in the Tablet *Micron (µ)*, *Counts* and *µ/Count* columns of the *Microscope Objectives Camera/Tablet Calibration* grid for the microscope definition record.  The Tablet *Micron (µ)* and *Counts* values can be changed at any time by editing these cells directly in the grid.  When this is done the *µ/Count* value will be automatically re-calculated and displayed; this field is for display purposes only and cannot be edited.

During this procedure the joystick buttons are also enabled.  Press joystick button J4 (top left) to activate the TrakScan Assistant's *Ok* button or joystick button J1 (rear right) to activate the *Skip* button.  Using the joystick buttons allows all steps in this procedure to be completed at the microscope if required.  However, if the microscope is used for slide alignment its eyepiece graticule must be centered on the same point as the camera or else it only must be used for all alignment procedures.

If a tablet is not used with the TrakScan system (*§ Tablet Setup, p21*), the *Tablet Cal. Assistant* button and tablet columns in the *Microscope Objectives Camera/Tablet Calibration* grid will not be visible.

# Batch Configuration

## Introduction

TrakScan is dedicated to the configuration, processing and review of a FTD slide batch; that is, a group of slides from related rock samples or group of samples. A TrakScan batch is a hierarchical structure containing one or more Grain Mount and Standard Glass slides. The configuration of, and data collected from these slides is stored in a single TrakScan batch (Microsoft® Access-compatible) database. The filename of the batch database is the batch name within the TrakScan application.

This section describes how to create new and open existing batch files, add grain mount and standard glass slides to the batch, and configure these slides. These operations all occur on the *Batch Configuration* tab on the main screen. Later sections describe how to process grain mount (*§ Process Grain Mount, p34*) and standard glass (*§ Process Standard Glass, p30*) slides.

## Batch File Operations

As described above, the configuration of, and data collected from grain mount and standard glass slides in a TrakScan batch is stored in a single batch (Microsoft® Access-compatible) database. New batches are created, and existing batches opened using the *Batch Buttons* (*§ Batch Buttons, p12*) or the *File Menu* (*§ File Menu, p13*).

To create a new TrakScan batch, select the *New Batch* item from the main screen *File (Batch)* menu, press the <Ctrl>N hot-key, or click the *New Batch* button. When this is done, the standard Windows File Open dialog box is displayed prompting the user to *Enter a New TrakScan Batch Database Filename*. By default, the File Open dialog box is opened in the TrakScan\Data directory. However, a TrakScan database file can be located in any directory. Enter the name of the TrakScan batch database file then click *Open*. A single (Microsoft® Access-compatible) database file is created with the entered name. This database contains all configuration and data for grain mount and standard glass slides associated with the batch. The *Batch Configuration* tab will be re-configured (*§ Batch Configuration, p24*) to display the new, but empty, batch file that was created.

To open an existing TrakScan batch, select the *Open Batch* item from the main screen *File (Batch)* menu, press the <Ctrl>O hot-key, or click the *Open Batch* button. When this is done, the standard Windows File Open dialog box is displayed prompting the user to select the TrakScan batch database file (*.mdb) to open. By default, the File Open dialog box is opened in the TrakScan\Data directory. If the batch file is not located in the default directory, browse to the batch file directory. Select the TrakScan batch database file to be opened then click *Open*. The *Batch Configuration* tab will be re-configured (*§ Batch Configuration, p24*) to display the configuration of the opened batch.

If a batch is currently open, the *Close Batch* item on the main screen *File (Batch)* menu will be enabled. To close the currently open batch, select the *Close Batch* item from this menu, press the <Ctrl>C hot-key, or click the *Close Batch* button. When this is selected, the batch will be closed, its associated batch database file closed and compacted, and the TrakScan main screen will be resume its appearance as when TrakScan is started and a batch is not open. Note, when a batch is closed, a copy of the batch database is made before it is compacted. This backup has the filename <Batch>.bak, where <Batch> is the batch file name.

The main screen *File (Batch)* menu also contains a list of (up to 10) of the most recently open files. To open a batch from this list simply select the batch file name. When this is done, the batch will be opened and its configuration displayed as described above. Alternatively, to re-open the last opened file use the <Ctrl>L hot-key.

## Batch and Group Configuration
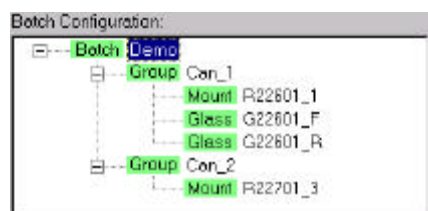


As mentioned above, a TrakScan batch is a hierarchical structure containing one or more groups, which in turn can contain one or more grain mount and standard glass slides. This structure is displayed using the *Batch Configuration* tree control. The root 'node' of the batch

tree is the <mark>Batch</mark> batch node itself which simply displays the name of the batch.

As they are added, nodes representing <mark>Group</mark> slide groups, <mark>Mount</mark> grain mount slides and <mark>Glass</mark> standard glass slides are added to the batch tree under the batch node.  Use this tree to select the grain mount and standard glass slides to configure and process.
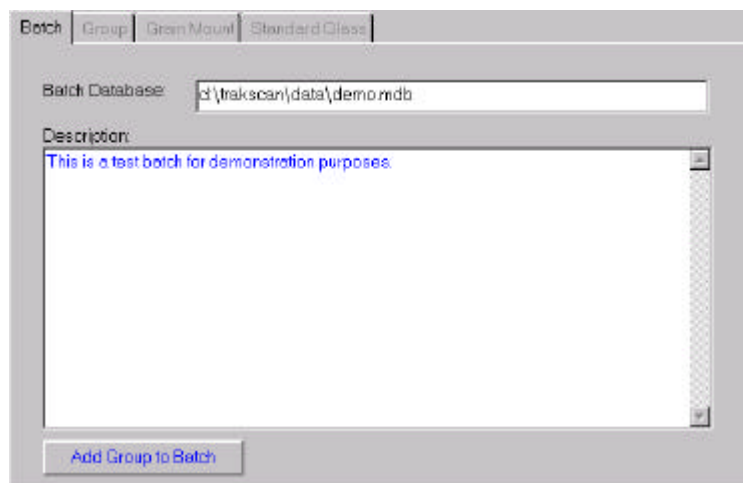


Selecting the <mark>Batch</mark> node on the Batch Configuration tree will select the Batch tab of the configuration tab control.

The *Batch Database* text-box shows the full path-name to the batch database file which contains this TrakScan batch configuration. This field cannot be edited.

Use the *Description* text-box to enter a free-format description (up to 255 characters) of this TrakScan batch.
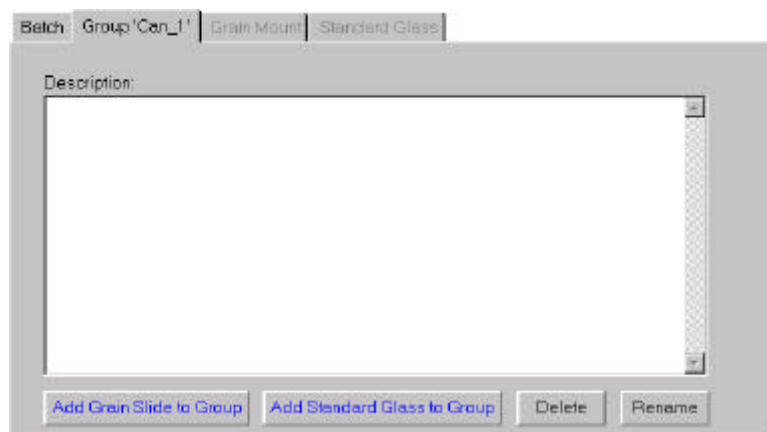


A slide group in a TrakScan batch is represented as a <mark>Group</mark> node in the *Batch Configuration* tree.  To add a slide group to the batch, click the *Add Group to Batch* button on the *Batch* tab.  A new <mark>Group</mark> node representing the newly added slide group will be added under the batch node in the *Batch Configuration* tree and the *Group* tab is selected.  When a group is first added, it is given the default name 'New Group #'.

Use the *Description* text-box to enter a free-format description (up to 255 characters) of the slide group.

To remove a slide group from a batch, click the *Delete Mount* button.  Alternatively, select the group node in the *Batch Configuration* tree then press the <Delete> key.  In either case a message will be displayed asking whether to continue and delete the group.  Click *Yes* to delete the group, or *No* to cancel the group deletion.

As mentioned above, when a group node is first added to the *Batch Configuration* tree, it is given the default name 'New Group #'.  To change the name of a group at any time click the *Rename* button.  This will highlight the node name of this group in the *Batch Configuration* tree (as with Windows Explorer®) allowing it to be changed.  Similarly, slow double-click the node name of the group in the *Batch Configuration* tree.  This will also highlight its name so that it can be changed.  When the node name has been changed, press <Enter> to de-highlight and save the new node name.

To add a grain mount slide to the group, click the *Add Grain Slide to Group* button.  Similarly, to add a standard glass mount slide to the group, click the *Add Standard Glass to Group* button.  These functions are described in more detail below (*§ Grain Mount Node Operations, p26* and *§ Standard Glass Node Operations, p29*).

**Grain Mount Configuration**

*Introduction*

A grain mount slide in a TrakScan batch is represented as a <mark>Mount</mark> node in the *Batch Configuration* tree.  To add a grain mount slide to the group, click the *Add Grain Slide to Group* button on the *Batch* tab.  A new

Mount node representing the newly added grain mount slide will be added under the group node in the *Batch Configuration* tree and the *Grain Mount* tab is selected.  When a grain mount is first added, it is given the default name 'New Mount #'.  This name can be changed as described below.

*Grain Mount Node Operations*

The *Grain Mount* tab contains all the settings required for describing and configuring the grain mount slide.

Use the *Description* text-box to enter a free-format description (up to 255 characters) of the grain mount.  Similarly, use the Irradiation No and Sample No text-boxes to enter the irradiation and sample number of the slide, respectively.

To remove a grain mount slide from a group, click the *Delete* button.  Alternatively, select the grain mount node in the *Batch Configuration* tree then press the <Delete> key.  In either case a message will be displayed asking whether to continue and delete the slide.  Click *Yes* to delete the grain mount slide, or *No* to cancel the slide deletion.

As mentioned above, when a grain mount slide node is first added to the *Batch Configuration* tree, it is given the default name 'New Mount #'.  To change the name of a grain mount slide at any time click the *Rename* button.  This will highlight the node name of this slide in the *Batch Configuration* tree (as with Windows Explorer®) allowing it to be changed.  Similarly, slow double-click the node name of the slide in the *Batch Configuration* tree.  This will also highlight its name so that it can be changed.  When the node name has been changed, press <Enter> to de-highlight and save the new node name.

*Grain Mount Zero Reference*

The zero reference mark on a slide is used as the origin for the coordinates, both X, Y and Z (focus), of all features (grains and tracks) recorded on the slide.  The zero reference mark coincides with the origin (0,0,0) of the stage coordinate system.

The zero reference is usually marked on a slide using a diamond pencil or similar scribing tool as a small cross on the mid-line of the slide and between the two mounts and the slide edge.  Using the zero reference mark for all measurements provides a coordinate reference that is local to the slide.  It is used as part of the grain mount alignment procedure and allows features previously recorded on the slide to be re-visited if the slide is remounted on the microscope at a later time.

All measurements are made with-respect-to the stage axis system.  This axis system is x-axis positive to the left (stage top plate movement to the right), y-axis positive away from the microscope frame (stage top plate moves towards the microscope frame), and focus (z-axis) positive down (stage top plate moves up).

While the zero reference mark is set as part of the grain mount alignment process (described below) it can be set and moved to at any time using the *Set Mount Zero Reference at Current Stage Position* and *Goto Mount Zero Reference* buttons.  Click the *Set Mount Zero Reference at Current Stage Position* button to set the stage origin (that is, reset stage coordinates to (0,0,0)) at the current position.  Click the *Goto Mount Zero Reference* button to move the stage from its current position to the origin at any time.

*Grain Mount Alignment Points*

The grain mount alignment process involves setting the zero reference mark, setting the focus level for the

grain mount and the external mica detector, and setting alignment points which define the relative position and orientation of the grain mount and the external mica detector.

Each of the coordinate values for these settings are displayed on the screen in their own text-box.  While these values can be manually entered, the TrakScan Assistant can be used to guide the user through the individual steps of the grain mount alignment process.  To do this click the *Grain Mount Setup Assistant* button.
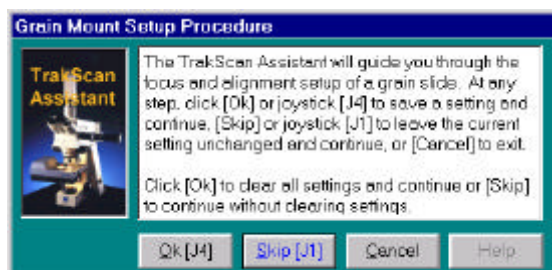


If the *Grain Mount Setup Assistant* is used, the Live View screen, showing the camera view of the slide, and the TrakScan Assistant will also be displayed.  The latter first displays an introductory screen asking whether to erase any existing alignment settings before continuing.  Click *Ok* to erase any settings before continuing, or click *Skip* to continue without erasing any existing settings.

Using *Skip* with the Grain Mount Setup Assistant at this and later steps in this procedure, allows all the alignment points to be re-visited and checked in turn without necessarily changing their value.  At all steps in the following procedure *Ok* and *Skip* can be used in this way.  However, the following description assumes that a grain slide is being setup for the first time in which case *Ok* will be used to save the new settings.  Furthermore, the description assumes that the stage joystick or *Click-And-Move* on the Live View are used to position the stage.

During this procedure the joystick buttons are also enabled.  Press joystick button J4 (top left) to activate the TrakScan Assistant's *Ok* button or joystick button J1 (rear right) to activate the *Skip* button.  Using the joystick buttons allows all steps in this procedure to be completed at the microscope if required.  However, if the microscope is used for slide alignment its eyepiece graticule must be centered on the same point as the camera or else it only must be used for all alignment procedures.
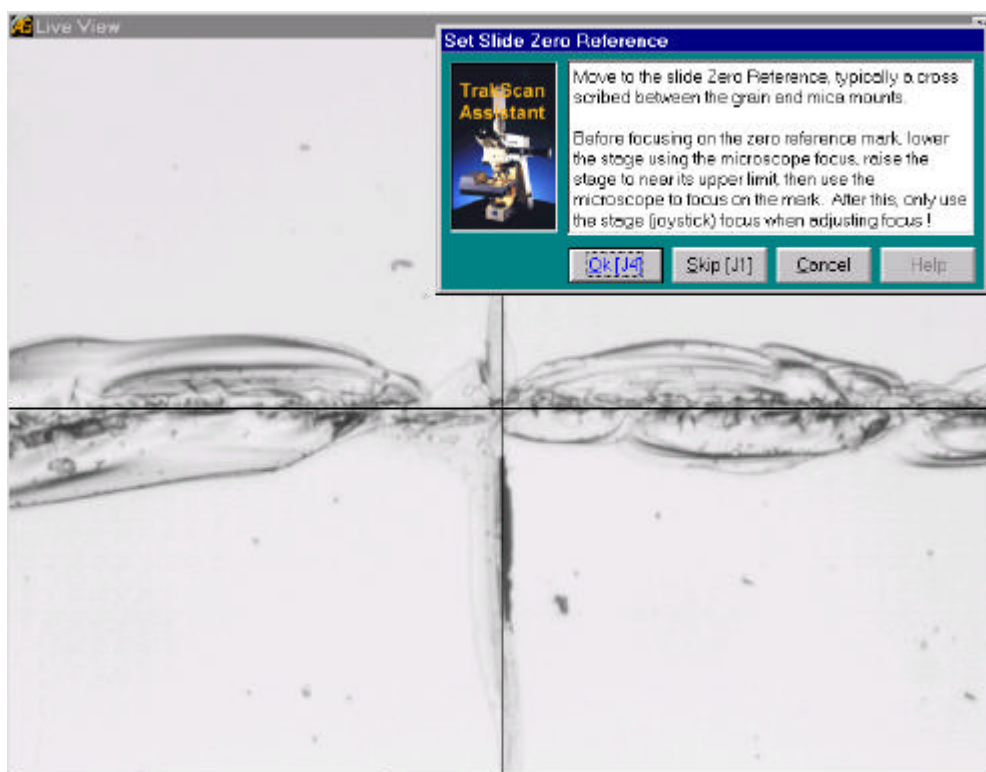


Next, the TrakScan Assistant prompts the user to set the grain mount's zero reference mark.  Use the joystick, or *Click-And-Move* on the Live View screen, to center the zero reference mark in the Live View screen. Focus on the zero reference mark as described below. When the zero reference mark has been set click *Ok* to continue.

Before focusing on the zero reference point, manually lower the stage using the microscope focus and raise the stage to near its upper limit.  This allows the stage full focus travel for later operations.  Then use the microscope focus to focus on the zero reference mark. **After this only use the stage joystick (or focus knob) to adjust focus**.  Using the microscope focus after this will prevent TrakScan from automatically adjusting focus during slide processing.

Next, the TrakScan Assistant prompts to set the focus level for the grain and external mica detector mounts. These values allow TrakScan to automatically change focus when moving between these mounts. When the zero reference mark has been set, the stage is automatically lowered by 1500µ (approximate height of grain mount).  Manually move the stage to locate a grain somewhere near the middle of the grain mount that is likely to have good tracks associated with it on the mica side, then focus on the top surface of the grain using stage focus only.  When this is done click *Ok* to continue.

When the grain focus has been set, the stage is automatically moved to an equivalent point (from the zero reference) on the mica detector side of the slide.  Manually move and focus the stage on the mica tracks related to the grain used above to set the grain focus level.  When the mica mount is in focus click *Ok* to continue.
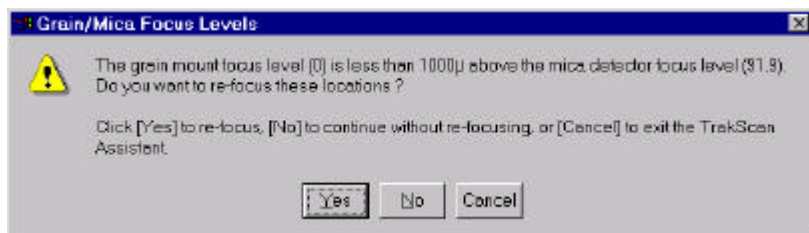


Normally the grain mount is higher than the mica detector mount on the slide so the stage must be raised when changing focus between the grain and mica mounts.  If this is not the case, TrakScan will display a message to this effect with the option to reset grain and mica mount focus. Click *Yes* to repeat the grain and mica mount focus steps described above, click *No* to continue while using the grain and mica mount focus levels already set, or *Cancel* to exit the Grain Mount Setup Assistant procedure.

The relative position and orientation of these mounts can now be determined using their alignment points. The alignment points are usually four pin-pricks which were pierced through the grain/mica sandwich before it was irradiated (*§ FTD Mount Preparation, p6*).  These pin-pricks are easy to identify and provide precise, reproducible alignment points on the two mounts.  One pair of diagonally opposite pin-pricks is used for a rough alignment.  While the other pair of pin-pricks can be used for the fine alignment, greater accuracy can be obtained using two grains located at diagonally opposite ends of the grain mount that are likely to have good tracks on the mica mount.

The rough alignment points are set first.  After the grain and mica mount focus has been set, the stage is automatically moved back to, and focused on the grain mount.  Manually move the stage to, and center one of the pin-pricks then click *Ok* to continue.  This is rough alignment point #1.  The stage is then automatically moved to an equivalent point (from the zero reference) on the mica detector side of the slide.  Manually move the stage to the associated pin-prick on the mica mount, then click *Ok* to continue.  Repeat this process on the grain and mica mounts using the pin-prick (rough alignment point #2) diagonally opposite to the one used for setting the rough alignment point #1.  The rough alignment is now complete.

The fine alignment is achieved using a similar process to that described above for rough alignment.  The TrakScan Assistant will prompt the user to center the first grain mount fine alignment point.  Pick one of the other pair of pin-pricks on the grain mount or, better still, a grain which looks as though it may have clear tracks in the mica.  Manually move the stage to, and center one of the pin-pricks or a grain track then click *Ok* to continue. This is fine alignment point #1.  The stage will be automatically moved to the mica mount side. Manually move and center the corresponding point (pin-prick or mica track) on the mica then click *Ok* to continue.  Repeat this process for fine alignment point #2 located at the diagonally opposite corner to fine alignment point #1.

This completes the fine alignment procedure.  TrakScan will now be able to accurately move between equivalent points on the grain and mica mounts, automatically compensating for position and orientation differences between these mounts.
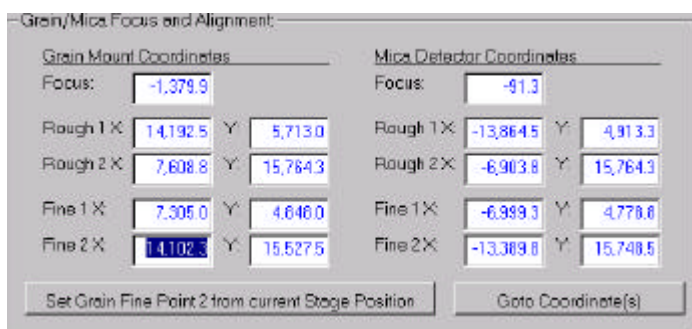


Each of the grain and mica focus and alignments points recorded using the above process are displayed on the screen in their own coordinates text-box.  These values can be manually edited if required.  Alternatively, the *Grain Mount Setup Assistant* can be re-run. Use the Skip button to pass-over setup points until the point to be altered is reached.  Then re-

position the point and click *Ok* to update that point's location. Cancel can then be clicked to exit the *Grain Mount Setup Assistant* while keeping the updated point. Another way, is to highlight one of the coordinates of a point then click the *Goto Coordinate(s)* button; the Grain Fine Alignment Point #2, shown, will be used as an example. The stage will be moved to that point. Move the stage to adjust the location of the point then click the *Set Grain Fine Point 2 from the current Stage Position* button. The coordinates of the point will be updated.

⚠️ The accuracy with which TrakScan can move between equivalent points on the grain and mica mounts can be checked using the Live View screen. Display the Live View screen and locate a suitable grain on the grain mount side of the slide. Click the *Swap* button and TrakScan will move to the predicted equivalent point of the mica mount. Similarly, move to a point on the mica mount, click Swap and TrakScan will move to the equivalent point on the grain.

## Standard Glass Configuration

*Introduction*

A standard glass slide in a TrakScan batch is represented as a Glass node in the *Batch Configuration* tree. To add a standard glass slide to the batch, click the *Add Standard Glass to Batch* button on the *Batch* tab. A new Glass node representing the newly added standard glass slide will be added under the batch node in the *Batch Configuration* tree and the *Standard Glass* tab is selected. When a standard glass is first added, it is given the default name 'New Glass #'. This name can be changed as described below.

*Standard Glass Node Operations*



The *Standard Glass* tab contains all the settings required for describing the standard glass slide.

Use the *Description* text-box to enter a free-format description (up to 255 characters) of the standard glass. Similarly, use the *Irradiation No* and *Sample No* text-boxes to enter the irradiation and sample number of the slide, respectively.

To remove a grain mount slide from a batch, click the *Delete Glass* button. Alternatively, select the grain mount node in the *Batch Configuration* tree then press the <Delete> key. In either case a message will be displayed asking whether to continue and delete the slide. Click *Yes* to delete the grain mount slide, or *No* to cancel the slide deletion.

As mentioned above, when a grain mount slide node is first added to the *Batch Configuration* tree, it is given the default name 'New Glass #'. To change the name of a standard glass slide at any time click the *Rename Glass* button. This will highlight the node name of this slide in the *Batch Configuration* tree (as with Windows Explorer®) allowing it to be changed. Similarly, slow double-click the node name of the slide in the *Batch Configuration* tree. This will also highlight its name so that it can be changed. When the node name has been changed, press <Enter> to de-highlight and save the new node name.
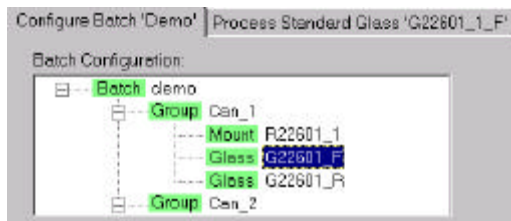
# Process Standard Glass

## Introduction

The standard glass slide is used to determine the dosage of thermal neutrons which has been received by the FTD sample. In this technique, one or more samples of a standard glass having a known Uranium concentration are distributed throughout the load of samples during their irradiation in the nuclear reactor. Each of the glass samples is in contact with a mica detector, and the resulting induced tracks on the mica is indicative of the thermal neutron dosage received.

Processing a standard glass slide using TrakScan requires the user to define one or more representative areas on the live camera image of the standard glass mica detector. These areas are referred to as standard glass areas-of-interest (Std. AOI). When a Std. AOI has been defined, the user counts the tracks within that area. TrakScan then calculates the track density (Rho-D, expressed in millions tracks/cm², M/cm²) for that AOI and an average Rho-D for all AOI's on that standard glass.

## Selecting a Standard Glass



When a standard glass has been added to a TrakScan batch (represented as Glass in the *Batch Configuration* tree) and configured (*§ Standard Glass Configuration, p29*), it is available to be processed. To process the slide, first ensure that it is firmly located against the right and rear edges of the stage recess. Then select the slide to be processed by clicking its Glass node. It will be highlighted and the *Process Standard Glass* tab will be made visible. Click this tab to display the standard glass processing controls.

## Process Standard Glass Tab

*Introduction*

The Process Standard Glass tab, shown below, is used for processing a standard glass slide.
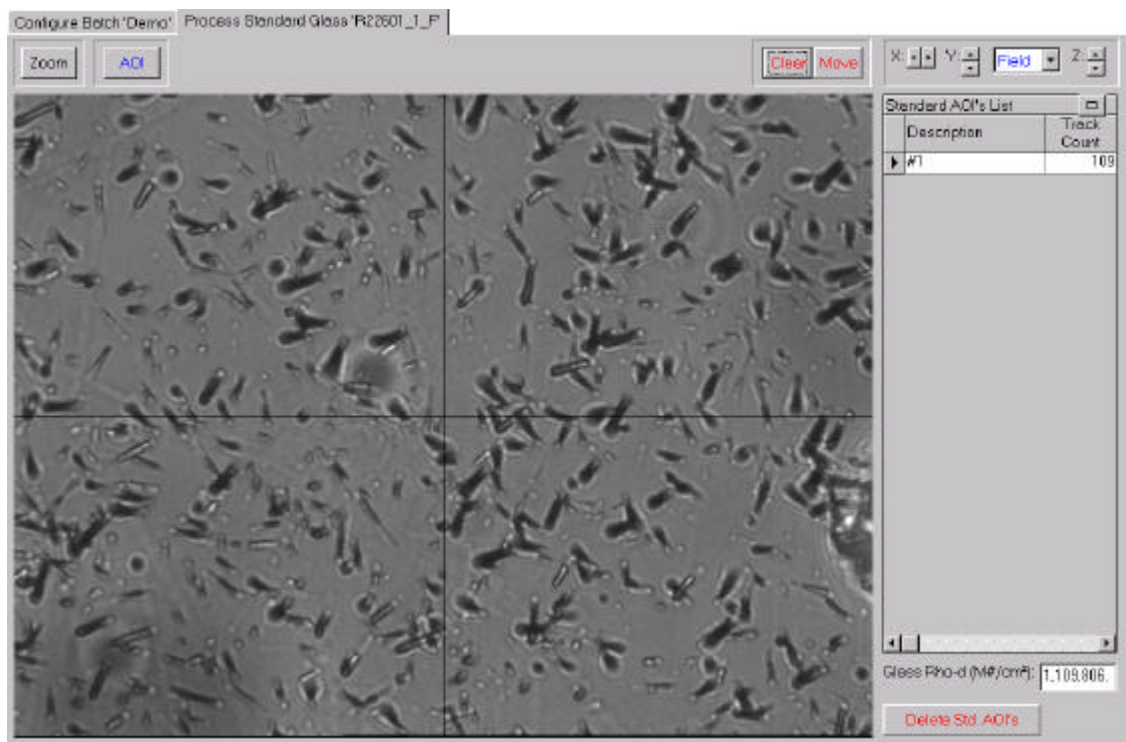
The tab contains several panels of controls, a live camera view of the slide and a grid displaying the details of standard glass areas-of-interest that have been defined.  These controls will be described below.

*Image Panel*

The image panel contains a single *Zoom* check button.  This button allows the displayed camera image to be zoomed in by a factor of two (x2) on the screen without affecting the current microscope objective or its definition.  Clicking this button will toggle it down and zoom in on the center area of the camera view, allowing work in greater detail if required.  Clicking the button again will toggle it up and return the camera view to its normal scaling.

*Process Panel*

The process panel contains a single *AOI* button.  This button starts the TrakScan Assistant which provides instructions for naming and marking a standard glass AOI and counting AOI tracks.  This process is described in more detail in *§ Processing a Standard Glass, p32*.

*Overlay Panel*

When a standard glass AOI is defined on the camera view of the standard glass mica detector, the AOI is drawn in an overlay of the camera view.  The overlay is superimposed on the camera view which remains live, that is, continually updating.  This allows TrakScan marked features to remain displayed over the camera view which itself remains live to display any microscope or stage changes (such as changing between transmitted or reflected light, or adjusting stage focus).  This view must be cleared when it is no longer relevant; for example, when the stage X-Y-Focus position is changed.  To click the overlay at any time click the *Clear* button.  If the stage is inadvertently moved, the overlay will no longer be correctly superimposed on the camera view.  If this happens, click the *Move* button.  This will move the stage back to the position is was in when the first feature was drawn in the overlay.

*Stage Panel*

The stage panel contains controls for manually moving the stage from the computer screen.  The *X:*, *Y:* and *Z:* up/down buttons allow the stage position to be individually incremented/decremented in any of these axes.  The distance that the stage moves in the X and Y axis direction depends on the setting in the associated combo (drop-down) box.  This can be set to increment/decrement stage position is steps of 1μ, 10μ, 100μ or 1000μ, or set to 'Field' in which case the stage will be moved by the camera image width/height.  The latter allows a slide to be stepped off in camera fields-of-view if required.  **The Z (focus) axis position is always changed in steps of 10μ.**

*Standard Glass AOI List*

When a standard glass AOI is created (*§ Defining a Standard Glass Area-Of-Interest, p32*), it is added to the *Standard Glass AOI's* list. This list contains a record of each AOI including its description, area, number of counts and calculated track density (Rho-D).  While the *Description*, *Track Count* and *AOI Area* field values are initially set by the TrakScan Assistant when a AOI is created, they can be changed at any time by editing these cells directly in the list.  The *Rho-D* value is automatically calculated by TrakScan based on the *Track Count* and *AOI Area* values.  This field is for display purposes only, but will be automatically updated if the *Track Count* or *AOI Area* values are changed.

Normally, this list is displayed with reduced width so that it does not overlap the camera view.  In this case the minimise/maximise button (in the top right-hand corner of the list) is displayed as ⬛.  To show all columns of the AOI list click this button.  The AOI list will be widened (as shown above) so all columns are displayed and the minimise/maximise button will change to its ▣ state.  Clicking this button again (or any other screen control) will reduce the AOI list to its original width.
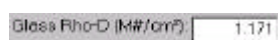
The track density (Rho-D) for the standard glass is shown in a text box below the

*Standard Glass AOI's* list.  This is calculated by dividing the sum of the track counts of individual standard glass AOI's by the sum of their areas.

To delete an individual standard glass AOI record, click the record selector ▶ in the list for the record to be deleted then press the <Delete> key.  If the *Prompt before AOI delete* preferences check box is not ticked (*§ Miscellaneous Preferences, p16*), the record will be immediately deleted.  If this preference setting is ticked, a message will be displayed prompting whether to continue and delete the record.  Click *Yes* to delete the record, or *No* to cancel without deleting the record.

Delete Std. AOI's    Alternatively, to delete one or more standard glass AOI records, click the *Delete Std. AOI's* button.    If the *Prompt before AOI delete* preferences check box is not ticked (*§ Miscellaneous Preferences, p16*), all the AOI records for the standard glass (as shown in the *Standard Glass AOI's* list) will be immediately deleted.   If this preference setting is ticked, a message will be displayed prompting whether to delete all AOI records (click *Yes*), delete only the currently selected AOI record (click *No*), or to cancel the operation (click *Cancel*).

❌    Care should be taken before clicking the *Delete Std. AOI's* button if with the *Prompt before AOI delete* preferences check box is not ticked (*§ Miscellaneous Preferences, p16*) as all AOI records for the standard glass will be immediately and permanently deleted.

**Processing a Standard Glass**

*Introduction*

Before defining a standard glass AOI, manually move the stage to a suitable area on the standard glass mica detector mount, then click the *AOI* button.  Depending on preference settings (*§ Miscellaneous Preferences, p16*) and whether an overlay is already displayed, the TrakScan Assistant may prompt the user to clear the overlay.  When this is done the TrakScan Assistant displays an introductory screen describing the procedure which will be followed for defining a standard glass AOI.

⚠️    Before doing any standard glass processing, ensure that the microscope objective definition (*§ Info Panel, p13*) matching the current working objective has been set.  If this is not correct, standard glass AOI measurements (and the resulting Rho-D calculation) will not be correct.

*Defining a Standard Glass Area-Of-Interest*
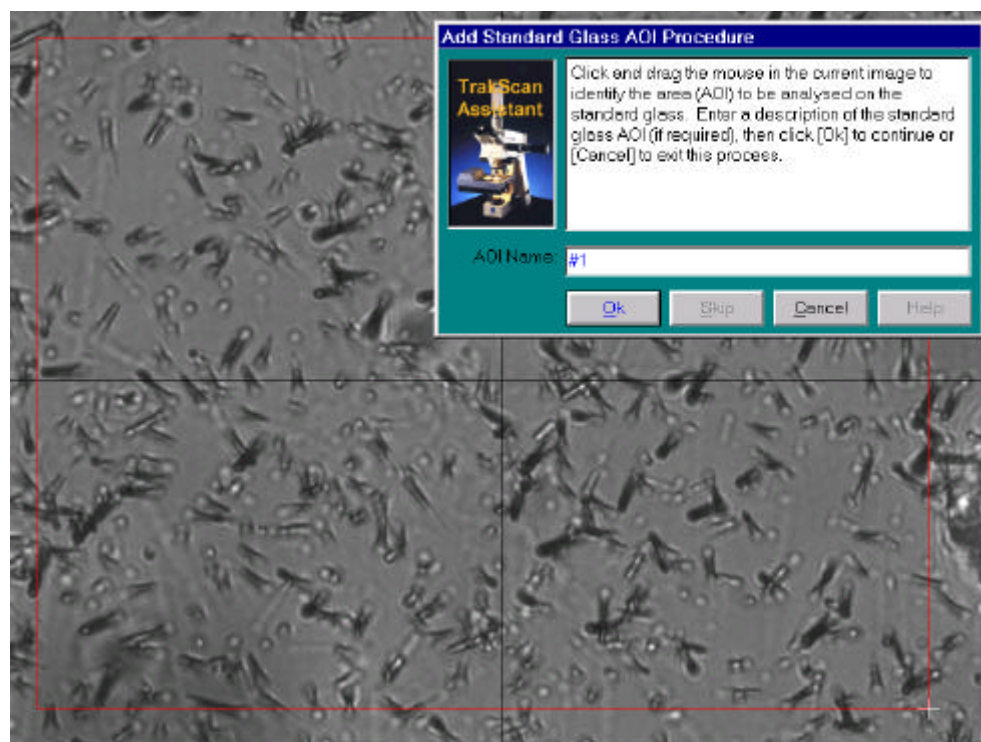


When this is done, the TrakScan Assistant will prompt the user to enter a name for the standard glass AOI and then mark it on the camera view of the standard glass mica detector mount.

Enter the name of the AOI (default 'aoi####'). The area of an AOI is defined by marking the two diagonally opposite corner of the rectangular AOI area on the camera view. This is done by click-and-dragging the mouse; that is, move the mouse to one corner of the intended AOI, press and hold the left mouse button,

while holding down the button drag the mouse to the diagonally opposite corner of the intended ROI, then release the mouse button. While the mouse is being dragged, a red box indicating the marked AOI will be displayed.  This process can be repeated until the intended area for analysis is bounded by the display AOI box.  When the AOI is correctly marked, click *Ok* to create the AOI record and continue.  Alternatively, click *Cancel* to exit this process without creating an AOI record.
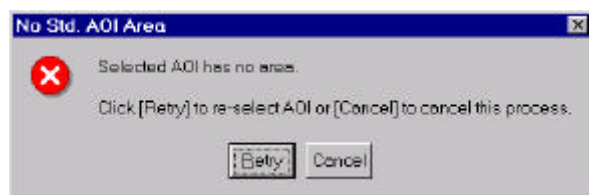


If no AOI area has been marked in the camera view, a message is displayed to this effect.  Click *Retry* to repeat the process above, or *Cancel* to exit the operation at this point.

When the AOI is correctly marked, an AOI record will be added to the *Standard Glass AOI's* list and the AOI will be drawn in the overlay.  The camera view will become live to display any microscope or stage changes (such as changing between transmitted or reflected light, or adjusting stage focus).

*Counting Standard Glass AOI Tracks*



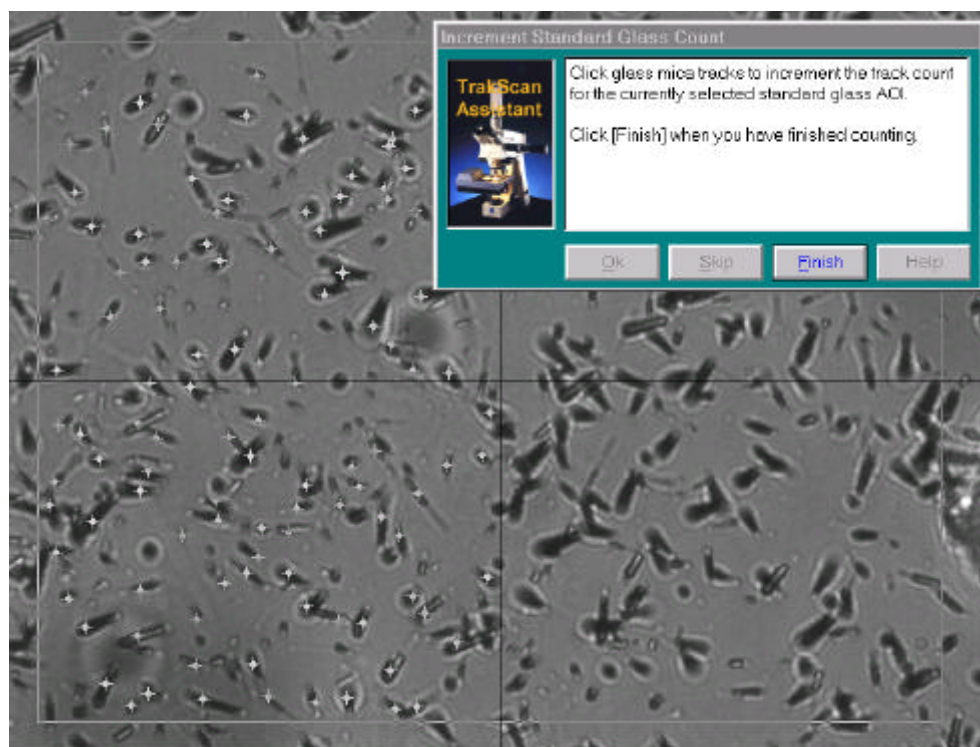The next step is to mark tracks within the AOI.  To mark a track, simply click the track with the left mouse button in the camera view.  The track will be marked in the overlay with the increment track count symbol ✛ and the *Track Count* value for the AOI will be incremented in the *Standard Glass AOI's* list.  Repeat this process to mark and count all tracks within the AOI.  If a point on the camera view has been incorrectly marked as a track, position the mouse over the incorrect track mark and press the right mouse button.

That point will be marked in the overlay with the decrement track count symbol ✕ and the *Track Count* value for the AOI will be decremented in the *Standard Glass AOI's* list.



If a point on the camera view outside the AOI is marked a message will be displayed and that point will not be shown as a track or included in the track count.

When all the tracks have been marked, click the *Finish* button to exit the process.  The results can be viewed in the *Standard Glass AOI's* list.  If the marked track count is incorrect, it can be manually changed by editing the *Track Count* cell for that AOI's record in the *Standard Glass AOI's* list.  The track density (Rho-D) for AOI will be automatically calculated and displayed in the *Rho-D* cell and the Rho-D for the slide updated.

The above process can be repeated to add and process multiple AOI's for a standard glass.  This will provide a better statistical average of track density for the standard glass.
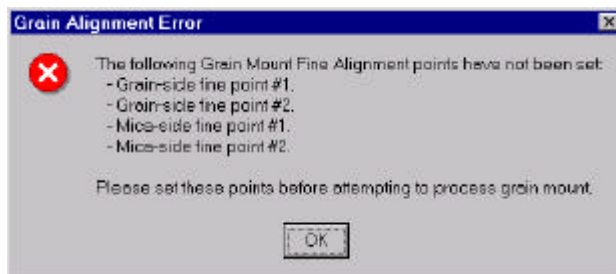
# Process Grain Mount

## Introduction

Analysis of a grain slide is used to determine two parameters for the rock sample; the number of fission tracks in a given area, the track density, and the average length of the fission tracks. Track density in a grain is used to estimate the geological age of the rock grain since the number of these tracks is proportional to the time over which they have been accumulated. Average track length is used to estimate the temperature history of the grain since the fission tracks, which have a constant nominal length when created, anneal and shorten with increasing temperature-time exposure of the rock.

Before processing a grain slide, the user is required to define the relative position and orientation of the grain mount and external mica detector (*§ Grain Mount Alignment Points, p26*). Following this, processing a grain slide using TrakScan requires the user to identify individual grains on the grain mount, count the tracks in individual grains and count the induced tracks in the same area of the corresponding mica mount, and measure the length of tracks in the grain mount. This data can then be exported for use by third-party post-processing data-reduction software packages.

## Selecting a Grain Mount
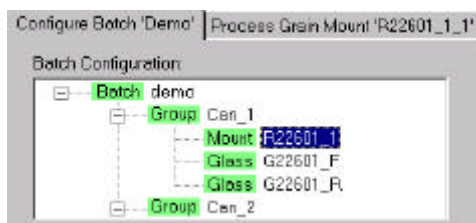


When a grain slide has been added to a TrakScan batch (represented as *Mount* in the *Batch Configuration* tree) and configured (*§ Batch Configuration, p24*), it is available to be processed. To process the slide, first ensure that it is firmly located against the right and rear edges of the stage recess. Then select the slide to be processed by clicking its *Mount* node. It will be highlighted and the *Process Grain Mount* tab will be made visible. Click this tab to display the grain slide processing controls.



If the *Process Grain Mount* tab is clicked but the alignment points for the grain slide have not been set (*§ Grain Mount Alignment Points, p26*), a message is displayed, indicating where the error has occurred, and the program returns to the *Configure Batch* tab. Goto to the *Grain Mount* configuration tab and set the alignment points required for complete grain slide setup.

## Process Grain Mount Tab

*Introduction*

The Process Grain Mount tab, shown below, is used for processing grain slides.
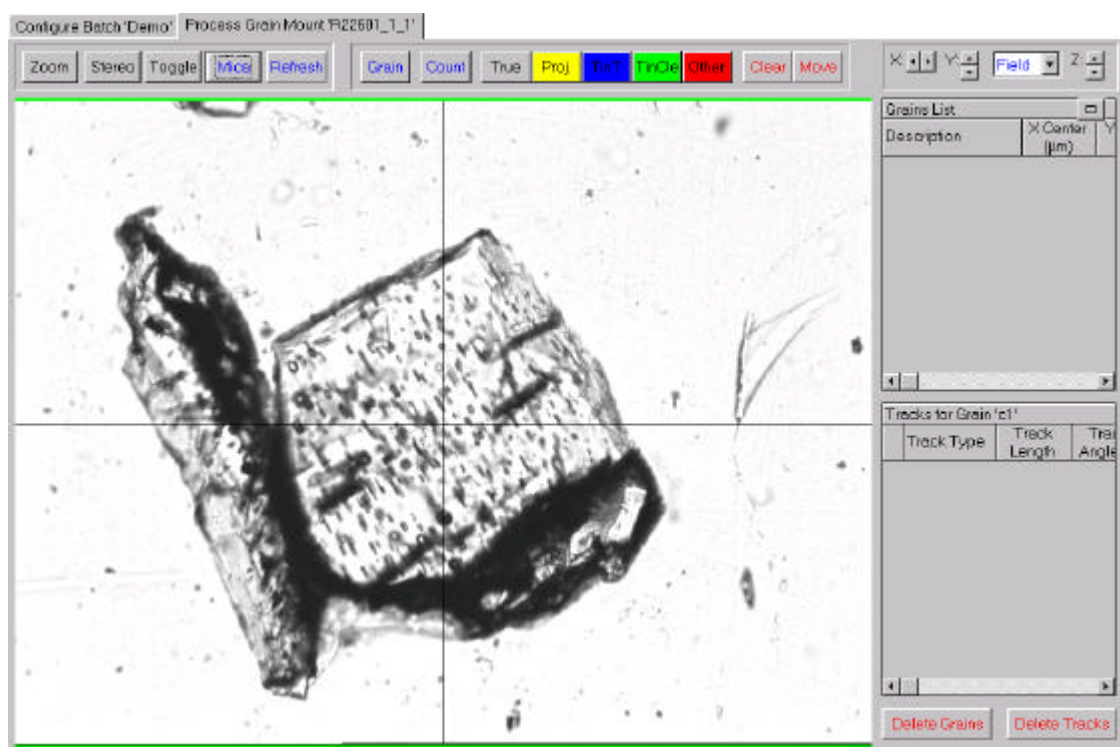
The tab contains several panels of controls, a live camera view of the slide and a grid displaying the details of grain slide grains and tracks that have been defined.  These controls will be described below.

*Image Panel*



The image panel contains several controls principally for altering the camera views of grain and mica mounts.  The *Zoom* check button allows the displayed camera image to be zoomed in by a factor of two (x2) on the screen without affecting the current microscope objective or its definition.  Clicking this button toggles it down and zooms in on the center area of the camera view, allowing work in greater detail if required.  Clicking the button again will toggle it up and return the camera view to its normal scaling.



Normally a single image (referred to as the single view) showing the current live view from the camera is displayed, as shown above.  However, a stereo view is available which separately shows images from the grain and mica. Clicking the *Stereo* check button will toggle the button down and replace the single view with two half-scale views; one from the grain mount side of the grain slide and one from the mica mount side.  Click the button again to toggle it up and return the single camera view.

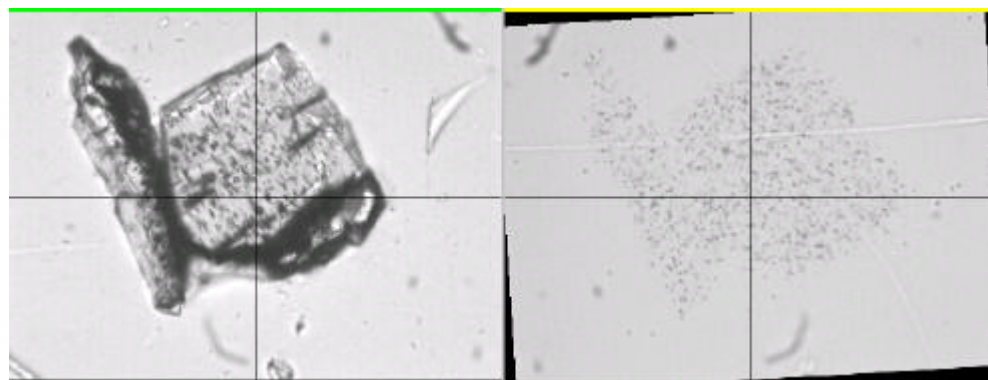The *Stereo* view separately shows grain and mica images.  One view, shown with a green border, is the live view from the camera.  The other, with a yellow border, is non-live and shows the last image taken from the opposite side of the slide; that is; the mica mount if the grain mount was displayed and visa-versa.  If the stage is moved, the static image border turns red indicating that it is no longer current.  Depending upon the *Preferences* that have been set (*§ Miscellaneous Preferences, p16*), the mica image may be mirrored and rotated (by the angular difference between the grain and mica) before it is displayed, as shown above.  If this is done, it is displayed with the same orientation as the grain mount.  Note, using the *Zoom* button in the

*Stereo* view will zoom in on the images (displaying them with the same zoom as the single view without using the zoom function).

The *Toggle* check button is only enabled when the single view is displayed.  This function is similar to the *Stereo* view.  Clicking the *Toggle* check button will toggle it down and replace the current live camera view (shown with a green border) with the last image (shown with a yellow border) taken from the opposite side of the slide.  Note, the stage is not actually moved during the process as TrakScan keeps a copy of the last camera view from the opposite side of the slide at all times.  If the stage is moved while the non-live view is displayed (that is, the view from the opposite side of the stage to the currently live view), the border of this view turns red indicating that it is no longer current.  Clicking the *Toggle* button again will toggle it up and return the current live view.

The *Swap* button operates in the same manner as the *Swap* button on the Live View (*§ Live View, p19*).  If the stage is currently located in the vicinity of the grain mount, the *Swap* button caption is changed to *Mica*. If the stage is currently located on the mica mount, the *Swap* button caption is changed to *Grain*.  Click this button to move the stage to the equivalent point of the opposite side of the slide.  For example, if the stage is currently located over the grain mount, the *Swap* button will be shown is *Mica*.  Clicking *Mica* will move the stage to the equivalent point on the mica mount (and the *Swap* button caption will change to *Grain*).

The *Refresh* button is intended for use in conjunction with the *Stereo* and *Toggle* buttons.  As described above, when the stereo view is in use (the *Stereo* button is down) or the non-live view is displayed with the single view (the *Toggle* button is down), the non-live view is shown with a yellow border.  This indicates that the view still shows an image of the equivalent point on the opposite side of the slide to the currently live view.  If the stage is moved, the non-live image border turns red indicating that it is no longer current.  When this happens, clicking the *Refresh* button will temporarily move the stage to the non-live side of the slide, update the non-live image, then return the stage to the live side.  For example, if the stage is currently located over the grain mount, clicking the *Refresh* button will temporarily move the stage to the eqivalent point on the mica side, update the mica image, and then move the stage back to the grain side.

Before clicking either the *Swap* or *Refresh* buttons, be aware that the stage will carry out major movements.

*Process Panel*
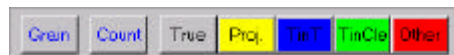
 The process panel contains controls for defining grains (*Grain*), counting grain/mica tracks (*Count*) and measuring the length of grain tracks (*True*, *Proj*, *TinT*, *TinCle* and *Other*).  These processes are described in more detail in *§ Adding Grains, p38*, *§ Counting Grain/Mica Tracks, p40* and *§ Measuring Track Length, p40*, respectively.  Note, if a tablet is not used with the TrakScan system, the track length controls are shown with the usual gray Windows background colour.  If a tablet is used, the background colour of these buttons is set according to the tablet puck button colours established during TrakScan setup (*§ Camera/Tablet Calibration, p21*).

*Overlay Panel*

 When a standard glass AOI is defined on the camera view of the standard glass mica detector, the AOI is drawn in an overlay of the camera view.  The overlay is superimposed on the camera view which remains live, that is, continually updating.  This allows TrakScan marked features to remain displayed over the camera view which itself remains live to display any microscope or stage changes (such as changing between transmitted or reflected light, or adjusting stage focus).  This view must be cleared when it is no longer relevant; for example, when the stage X-Y position is changed.  To click the overlay at any time click the *Clear* button.  If the stage is inadvertently moved, the overlay will no longer be correctly superimposed on the camera view.  If this happens, click the *Move* button.  This will move the stage back to the position it was in when the first feature was drawn in the overlay.

*Stage Panel*

 The stage panel contains controls for manually moving the stage from the computer screen.  The *X:*, *Y:* and *Z:* up/down buttons allow the stage position to be individually incremented/decremented in any of these axss.  The distance that the stage moves in the X and Y axis direction depends on the setting in the associated combo (drop-down) box.  This can be set to

increment/decrement stage position in steps of 1µ, 10µ, 100µ or 1000µ, or set to 'Field' in which case the stage will be moved by the camera image width/height.  The latter allows a slide to be stepped off in camera fields-of-view if required.  **The Z (focus) axis position is always changed in steps of 10µ.**

*Grain and Track Lists*



When a grain is defined (§ *Adding Grains, p38*), it is added to the *Grains* list for that slide.  This list contains a record of each grain including its description, type, coordinates on the slide, current C-axis orientation (if defined) and the number of tracks from the grain and its equivalent mica mount area.  The *Description*, X and *Y Center* and *Current C-Axis* field values are initially set by the TrakScan Assistant when a grain is created; the *Grain Count* and *Mica Count* fields are set by the TrakScan Assistant when tracks are counted.  After they have been set, the *Description*, *Grain Type*, *Grain Count* and *Mica Count* fields can be changed at any time by editing these cells directly in the list.  The *Grain Type* field is a drop-down list with *Age*, *Length* or *Both* items.  *Age*, Length or Both grains are only suitable for grain/mica track counting (§ *Counting Grain/Mica Tracks, p40*), grain track length measurement (§ *Measuring Track Length, p40*), or suitable for both, respectively.  When a grain record is clicked in the Grains list, the stage will be moved to center that grain in the cameras view.  Furthermore, if the *Display grain C-axis* preference check box is ticked (§ *Miscellaneous Preferences, p16*), a blue line will be drawn through the center of the screen showing this grains C-axis orientation.



When a grain record is selected in the *Grains* list, tracks (lengths) that have been recorded on that grain are shown in the *Tracks* list.  This list is updated with new records as track lengths are measured. This list contains a record of each track including its abbreviated type, length, angle to grain C-axis, cleavage length and angle to C-axis if TinCle, and grain C-axis angle at the time the track was measured.  These field values are set by the TrakScan Assistant and cannot be edited.  Note, clicking a column caption in this grid will re-sort records in the grid in the order of the clicked column values.

When a track record is clicked in the Tracks list and the stage is in the region where that track was originally measured, the track will be redrawn in the overlay to show its location on the grain.

Normally, the *Grain* list and the *Track* list are displayed with reduced width so that it does not overlap the camera view.  In this case the minimise/maximise button (in the top right-hand corner of the *Grains* list) is displayed as ▣.  To show all columns of these lists, click this button.  The lists will be widened so all columns are displayed (as shown above) and the minimise/maximise button will change to its ▣ state.  Clicking this button again (or any other screen control) will reduce the lists to their original width.

To delete an individual record from either the *Grain* or *Track* lists, click the record selector ▶ in the list for the record to be deleted then press the <Delete> key.  If the *Prompt before Grain delete* or *Prompt before Track delete* preferences check box, respectively, is not ticked (§ *Miscellaneous Preferences, p16*), the record will be immediately deleted.  If this preference setting is ticked, a message will be displayed prompting whether to continue and delete the record.  Click *Yes* to delete the record, or *No* to cancel without deleting the record.  Deleting a grain record will automatically delete all tracks records belonging to that grain.

**Delete Grains** Alternatively, to delete one or more grain records, click the *Delete Grains* button.  If the *Prompt before Grain delete* preferences check box is not ticked (§ *Miscellaneous Preferences, p16*), all the grain records for the grain slide (as shown in the *Grains* list) will be immediately deleted.  If this preference setting is ticked, a message will be displayed prompting whether to delete all grain records (click *Yes*), delete only the currently selected grain record (click *No*), or to cancel the operation (click *Cancel*).

**Delete Tracks** Similarly, to delete one or more grain track records, click the *Delete Tracks* button.  If the *Prompt before Track delete* preferences check box is not ticked (§ *Miscellaneous Preferences, p16*), all the track records for the currently selected grain (as shown in the *Tracks for Grain* list) will be immediately

deleted.  If this preference setting is ticked, a message will be displayed prompting whether to delete all tracks records for that grain (click *Yes*), delete only the currently selected track record (click *No*), or to cancel the operation (click *Cancel*).

❌ Care should be taken before clicking the *Delete Grains* button if the *Prompt before Grain delete* preferences check box is not ticked (§ *Miscellaneous Preferences, p16*) as all grain records for that grain slide will be immediately and permanently deleted.  Similar care should be taken before clicking the *Delete Tracks* button if the *Prompt before Track delete* preferences check box is not ticked.

**Processing a Grain Slide**

*Introduction*

Following this, processing a grain slide using TrakScan requires the user to identify individual grains on the grain mount, count the tracks in individual grains and count the induced tracks in the same area of the corresponding mica mount, and measure the length of tracks in the grain mount.  This data can then be exported for use by thirrd-party post-processing data-reduction software packages.

⚠️ Before doing any grain mount processing (adding grains, and counting and measuring tracks), ensure that the microscope objective definition (§ *Info Panel, p13*) matching the working objective has been set.  If this is not done, length measurements recorded on screen or using the tablet will not be accurate.

*Adding Grains*

Before adding grains to the Grains list for a grain slide, manually move the stage into the vicinity of the grain mount.  To add grains, click the *Grain* button.  Depending on preference settings (§ *Miscellaneous Preferences, p16*) and whether an overlay is already displayed, the TrakScan Assistant may prompt the user to clear the overlay.  When this is done the TrakScan Assistant displays an introductory screen describing the procedure which will be followed for defining grains.
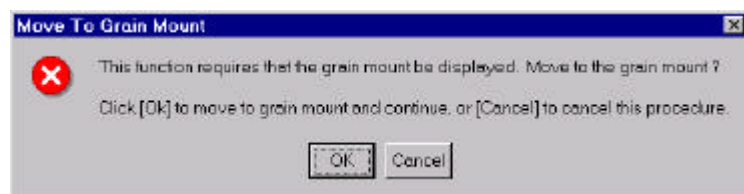


If the stage was not over the grain mount when the *Grain* button is clicked, a message will be displayed requesting that the stage be moved to the grain mount.  Click *Ok* to move to an equivalent point on the grain, or click *Cancel* to exit this procedure.
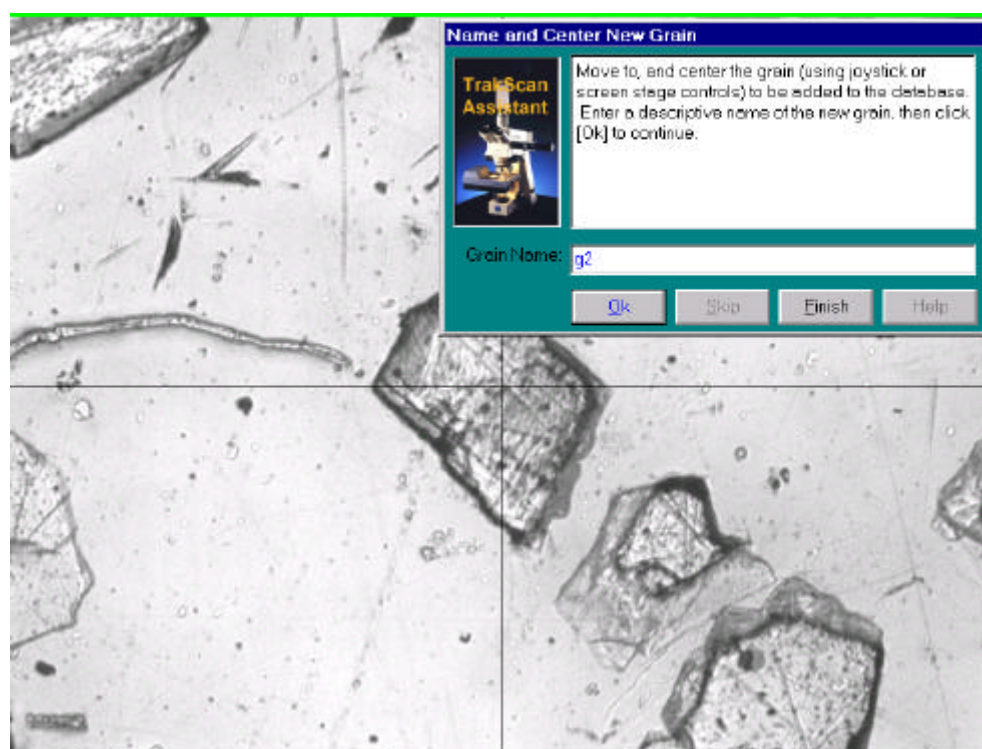


When this is done, the TrakScan Assistant will prompt the user to enter a name for the grain and then click its position on the camera view of the grain mount.

Enter the grain name (defaults to 'g####'). To mark the grain position, click the grain on the camera view. This is like Click-And-Drag in that the grain will be moved to the center of the view.

When a grain has been named and moved to the center of the screen click *Ok*.

Clicking Cancel, will exit the add grain procedure without adding a grain.
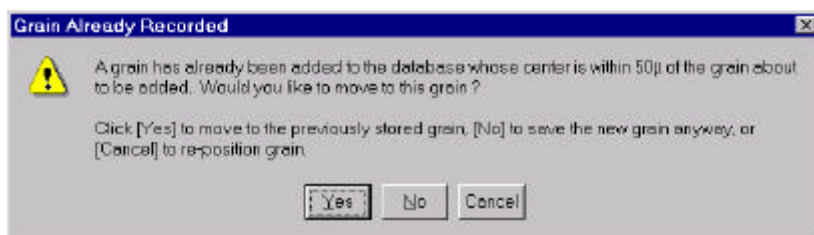


If Ok is clicked, but the marked grain is within 50µ of a grain already in the Grains list a message will be displayed, prompting the operator whether to move to the previously saved grain or save grain as a new grain.  To move to the position of the previously recorded grain without adding a new grain, click *Yes*.  The stage will be moved to display the previously recorded grain position and the TrakScan Assistant will return to the point of prompting for a new grain.  Alternatively, click *No* to save the new grain as a separate record and continue, or click *Cancel* to reset the TrakScan Assistant to the point of prompting for a new grain.
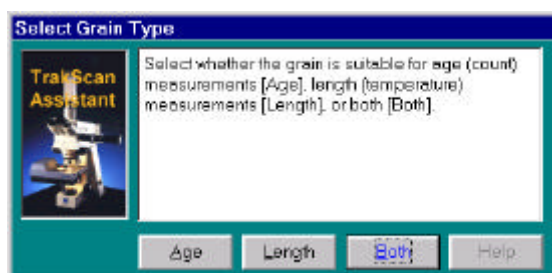


The TrakScan Assistant will then prompt for the grain type; click *Age*, *Length* or *Both* as appropriate.  Note, this field can be changed later in the Grain Type field of the Grains list (*§ Grain and Track Lists, p37*) if required.

The TrakScan Assistant will then prompt for the grain's C-axis orientation to be defined.  To add a grain without also defining its C-axis (as with an age grain), click the *Skip* button.  The new grain will be added to the *Grains* list (with its C-axis set to 0°), and the TrakScan Assistant will return to the point of prompting for the (next) new grain.  To discard this grain and return to the new grain prompt, click *Cancel*.
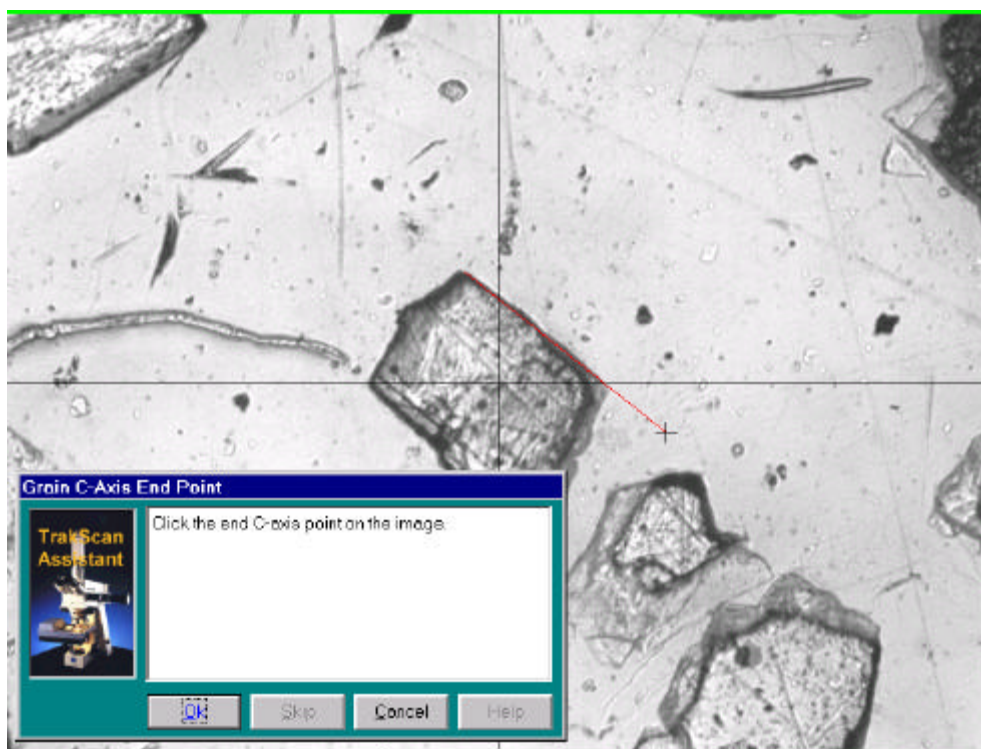


Alternatively, the C-axis orientation for a (temperature) grain can be defined.  This is done by marking the start and end points of an (imaginary) line parallel to the grain's C-axis.  The TrakScan Assistant will be prompting for the start point of the C-axis to be marked.  Click the image to mark the start point of the C-axis line.  The TrakScan Assistant will then prompt for the end point of the C-axis to be marked.

Note, while the mouse is being moved to the C-axis end point, a red line stretching from the C-axis start point to the current mouse position is drawn on the camera view to assist with C-axis alignment.  Click the image to mark the end point of the C-axis line.  When the grain's C-axis has been marked, the new grain will be added to the *Grains* list and the TrakScan Assistant will return to the point of prompting for the (next) new grain.

When all new grains have been added, click the TrakScan's *Finish* button.  The TrakScan Assistant will

disappear, the most recently added grain will be selected in the Grains list, and (if the *Display grain C-axis* preference check box is ticked (*§ Miscellaneous Preferences, p16*) a blue line will be drawn through the center of the screen showing this grain's C-axis orientation.

*Counting Grain/Mica Tracks*

To count grain mount or mica mount tracks for a grain, first select that grain in the *Grains* list.  The stage will be moved to center that grain in the camera image.  To count tracks in the mica associated with this grain, click the *Swap* (*Mica*) button to move to an equivalent area of the mica related to the grain.  Then click the *Count* button. Depending on preference settings (*§ Miscellaneous Preferences, p16*) and whether an overlay is already displayed, the TrakScan Assistant may prompt the user to clear the overlay.  When this is done the TrakScan Assistant displays an introductory screen describing the procedure which will be followed for defining grains.
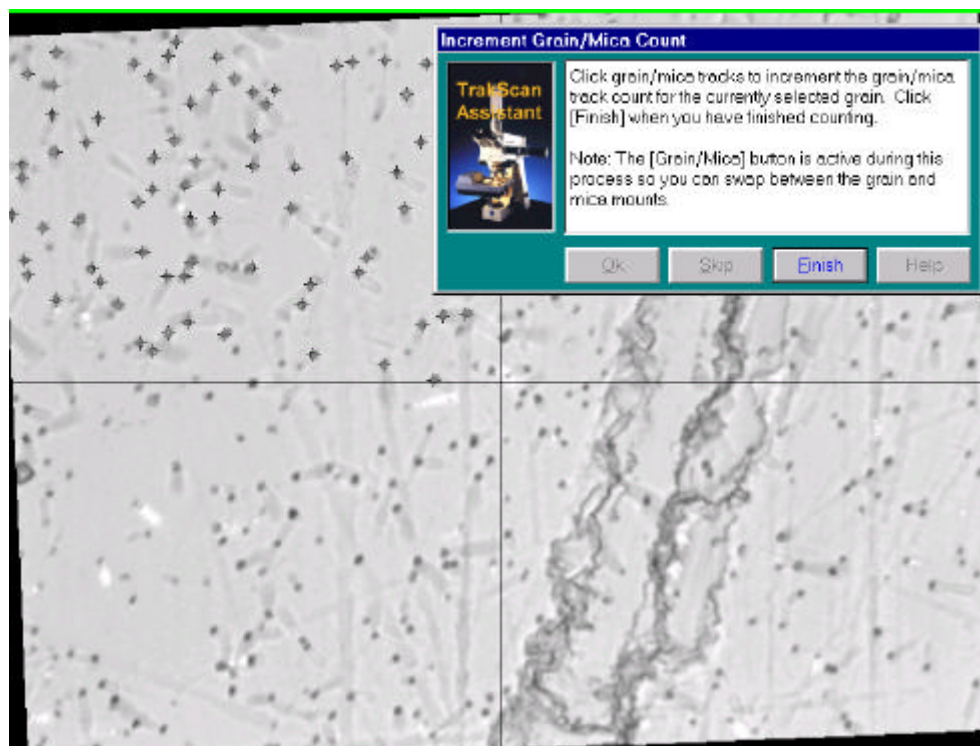


When this is done, the TrakScan Assistant is ready to count tracks in the grain or mica.  This is done by marking the tracks displayed in the grain or mica mount camera view.  To mark a track, simply click the track with the left mouse button in the camera view.  If the track is a grain mount track, it will be marked in the overlay with the increment grain track count symbol ✦ and the *Grain Count* value for the grain will be incremented in the *Grains* list. If the track is a mica mount track (as shown), it will be marked in the overlay with the increment mica track count symbol ✚ and the *Mica Count* value for the grain will be incremented in the *Grains* list.  Repeat this process to mark and count all tracks within the mica.  Note, the *Swap* button is enabled during this process so the user can move between the grain and mica mounts at any time while the TrakScan Assistant is displayed.  Note, the TrakScan Assistant will increment the appropriate grain/mica count depending upon whether grain or mica mount view is displayed when tracks are marked.

If a point on the camera view has been incorrectly marked as a track, position the mouse over the incorrect track mark and press the right mouse button.  That point will be marked in the overlay with the decrement track count symbol ✕ and appropriate *Grain Count* or *Mica Count* value for the grain will be decremented in the *Grains* list.

When all grain/mica tracks have been counted, click the *Finish* button.  Note, the values in the *Grain Count* and *Mica Count* cells in the Grains list can also be changed at any time by editing these values directly in the appropriate cell.

*Measuring Track Length*

Length measurements can be classified into one of four track or feature categories.  These categories are:

    Proj      Projected Track.  Surface track which intersects the surface of the grain (thereby exposing it to the etchant).

    TinT      Track-In-Track Track.  Confined track (which does not intersect the surface) which intersects a surface track.

> TinCle  Track-In-Cleavage Track. Confined track (which does not intersect the surface) which intersects a crack or cleavage plane that emerges at the grain surface.
>
> Other  Miscellaneous Feature.  Any grain feature whose linear dimension can be measured.

The process of recording the length of an Other feature is the same as that for a Projected or TinT tracks. So, while the following description only refers to tracks, the process applies equally to recording *Other* lengths.  Similarly, while measuring the length of a TinCle involves two additional steps, the process involved is similar to that for Proj or TinT tracks.

Also, the Apparent (2-dimensional) or True (3-dimensional) length of a track or feature can be measured. The Apparent length is measured by recording the distance between the start and end of the track projected into the X-Y plane as it appears looking through the microscope or on the camera view.  The True length is measured by recording the distance between the start and end of the track in X-Y-Z space.  The X-Y coordinates are recorded as for an Apparent track; the start and end points of the track in the Z (focus) axis are recorded by focussing on the start and end of the track, respectively.

To measure the length of tracks or features in a grain, first select that grain in the *Grains* list.  The stage will be moved to center that grain in the camera image.  To record Apparent track length leave the *True* check button in the up position.  To record True track length, click the True check button to toggle it to the down position.  Then select the track type using the *Proj*, *TinT*, *TinCle* or *Other* option button.



Track lengths can only be measured on the grain mount.  If the stage was located in the vicinity of the mica mount when the track type option button is clicked, a message will be displayed requesting that the stage be moved to the grain mount.  Click *Ok* to move to a point on the grain mount equivalent to that of the currently displayed mica mount, or click *Cancel* to exit this procedure.

When this is done, depending on the overlay preference settings (*§ Miscellaneous Preferences, p16*) and whether an overlay is already displayed, the TrakScan Assistant may prompt the user to clear the overlay.
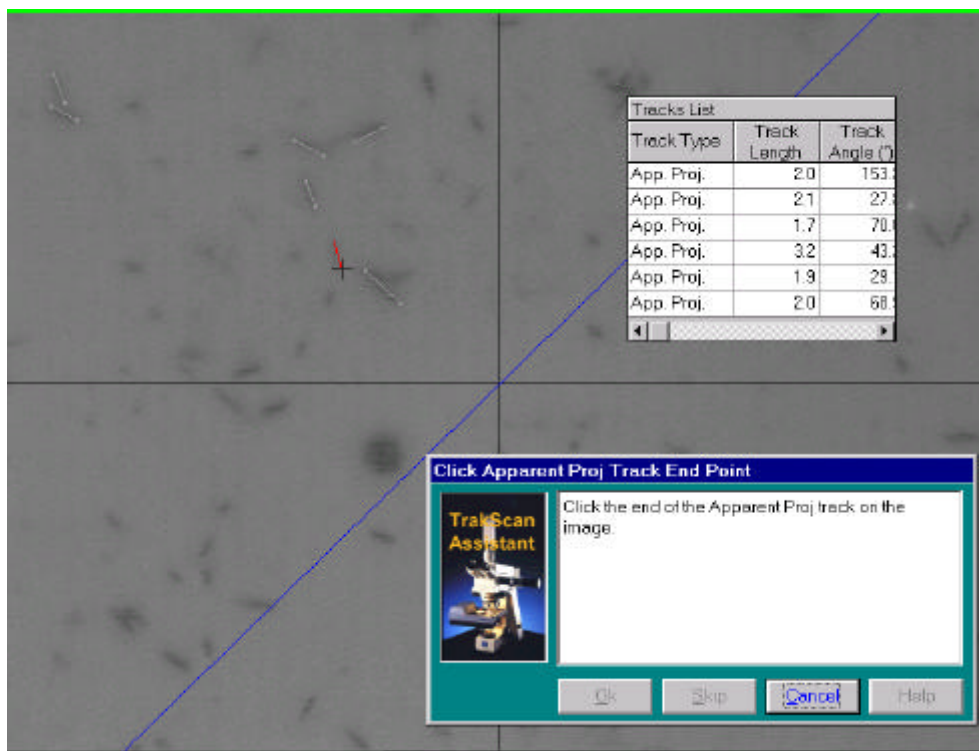


TrakScan is now ready to measure track lengths.  This is done by marking the start and end points of the track.  The TrakScan Assistant prompts for the start point of the track to be marked. If a True track length is being recorded the stage joystick is enabled.  Adjust stage focus using the stage joystick, until the start of the track is in perfect focus.  Then mark the track start point by clicking that point in the camera image using the mouse.  If a tablet is used with the TrakScan system, the track start point can also be marked by moving the puck crosshair to the track start point (as viewed through the microscope) then pressing the appropriate puck track button.  The track start point will now be marked.

The TrakScan Assistant will then prompt for the end point of the track to be marked.  If a True track length is

being recorded, adjust stage focus, using the stage joystick, until the end of the track is in perfect focus. To mark the track end point, move the mouse to that point in the camera view and click it using the mouse left button. Note, while the mouse is being moved to the track end point, a red line stretching from the track start point to the current mouse position is drawn on the camera view to assist with track marking. If a tablet is used, mark the track end point using the tablet puck.

When the track end point has been marked, the length of the track and its orientation to the grains current C-axis will be calculated. A record of the track, with these calculations, will be added to the *Tracks* list, and the TrakScan Assistant will return to the point of prompting for the (next) new track.

While the above process applies to Proj and TinT track types and Other features, a TinCle track involves two additional steps. Between marking the track start and end points, the TrakScan Assistant will prompt to mark the start and the end points of the track-cleavage intersection. When this is done, the length of the cleavage and its orientation to the grains current C-axis will be calculated and added to the track record with the track information.

⚠️ If the mouse is used for measuring track length, greater mouse positioning accuracy can be achieved using the following process. First hold down the left mouse button, the cursor will change to a ✛ crosshair pointer which allows it to be positioned more accurately. While still holding down the left mouse button, move the mouse to position the crosshair over the track point to be marked. When the crosshair is in position, release the left mouse button. The track point will be marked and the cursor will return to the default ⇖ pointer.

App. Proj.
App. TinT
**App. TinCle**
App. Other

True Proj.
True TinT
True TinCle
True Other

Cancel

When the TrakScan Assistant is prompting for the track start point to be marked, the track type can be changed. If the mouse is being used to mark tracks, click the *True* check button or the *Proj*, *TinT*, *TinCle* or *Other* track-type option buttons to change the track type. Alternatively, instead of left mouse clicking the track start point, right-clicking the track start point will display a popup menu at the marked mouse position. Select the track type from the popup menu. This function will change the track type and mark the track start point with one action.

If the tablet puck is being used to mark tracks, simply click the appropriate puck button (*§ Camera/Tablet Calibration, p21*) to start measuring a track of that type.

⚠️ If a track measurement is started with the mouse it must be completed with the mouse. Similarly, if a track measurement is started with the tablet puck it must be completed with the puck.

Also, when the TrakScan Assistant is prompting for the track start point to be marked, the TrakScan Assistant's cancel button is shown with a *Finish* caption. Click *Finish* to exit the track measurement process. At any other time during track measurement, the TrakScan Assistant's cancel button is shown as *Cancel*. Clicking *Cancel* will abort that particular track measurement and return the TrakScan Assistant to prompt for the track start point.

**Track Too Long**  ⚠️

The measured track length (688.3µ) is too long (>20µ).

Do you want to discard this track but use its angle (134.5°) to update the grain C-axis ?

Click [Yes] to update the grain C-axis angle, [No] to save this as a track anyway, or [Cancel] to discard this track measurement.

[ Yes ]   [ No ]   [ Cancel ]
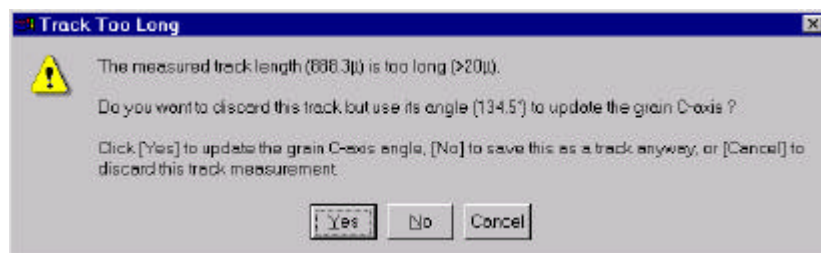
If a measured Proj, TinT or TinCle track is greater than 20µ it is deemed to be too long to be a track. A message is displayed to this effect, prompting whether to use the measurement to update the grains C-axis orientation. Click *Yes* to do this, *No* to force the track measurement to be saved or *Cancel* to discard this

measurement and return to the mark track start point prompt.

# Appendix A:  Hardware/Software Installation

**Hardware Requirements**

TrakScan hardware requirements include:
- Computer with the following minimum requirements:
    - Windows 95/98/NT (v4.0 or higher),
    - A Pentium processor, 150MHz or faster,
    - Minimum display of 1024x768 with 64K colours supporting overlays,
    - Minimum 64Mb of RAM, and
    - CD-ROM drive (for system installation).
- Autoscan stage fitted to the Local computer in an off-line system
- Camera (fitted to microscope) and frame grabber, and
- Digitiser tablet and 4-button puck (Summagraphics-compatible), if required.

**System Installation**

To install Irradiate system hardware and software:
1. Connect the Autoscan stage to computer COM1: serial port.
2. Install and configure the frame grabber in computer.
3. Connect the Digitiser Tablet to the computer COM2: serial port.
4. Install TrakScan software.

**Autoscan Stage Connection**

To connect the Autoscan stage, Connect an (RS-232) serial cable from Autoscan EL300 stage controller 'Computer' plug to the Off-Line Local computer COM1: serial port. Power-up the Autoscan stage.

For further information related to installation and setup of the Autoscan AS3000B stage, refer to the 'AutoScan AS300-b-Based System Hardware Installation Guide'.

**Frame Grabber Installation**

Install frame grabber as per instructions supplied with frame grabber for type of frame grabber and computer operating system.

**Digitiser Tablet Installation**

This section describes the installation of a digitiser tablet.  TrakScan for Windows supports digitiser tablets which have a WinTab driver.  This is a universal Windows driver which interfaces Windows software (like TrakScan) to a tablet manufacturer specific driver which in-turn connects to a manufactures tablet.  The digitising tablet, in conjunction with a drawing tube and 4-button puck fitted with a LED, is used to measure the lengths of microscopic features.  The tablet is calibrated using a stage micrometer slide.

Before installing the digitiser tablet drivers:
1. Unpack the digitiser tablet, and place it on a horizontal surface, under the drawing tube.  The tablet should be firmly supported to prevent any horizontal or vertical movements while in use, or between sessions. Even a small movement of the tablet can result in large changes in the calibration, due to the magnifying effect of the drawing tube system.
2. The 4-button cursor is fitted with a cable terminated in a telephone-type RJ12 6-pin plug.  Insert the plug into the socket under the tablet and push until the plug snaps into the socket.
3. The data cable is fitted with a male "D"-type connector.  Plug this connector into the second serial port, COM 2:, of the IBM-compatible computer.  If your computer only has one serial port, refer to your computer's manual for further information on installation of a second serial port.

To the digitiser tablet drivers for a new tablet:

1.   Follow the instructions supplied with the tablet for installing tablet-specific driver (which should install the WinTab driver files).

To install the GTCO-compatible WinTab driver to upgrade an existing TrakScan system using a Summagraphics-compatible digitiser tablet:
1.   Run Setup.exe from the Win95&98 or WinNT directory (as applicable) under the GTCO_WinTab directory on the TrakScan installation CD.  Installation to Windows NT is described below.
2.   When Setup.exe is run, the WinNT The *Welcome to GTCO NT Wintab Driver version 1.14* dialog is displayed.  Click *Next*.
3.   The *Select a Wintab driver* dialog is displayed.  Select *SketchMaster Tablet* in the *Driver selection* list box then click *Next*.
4.   The *Wintab installation options* dialog is displayed.  Select *GTCO MM Tablet* and *4-button puck* in the *Model and cursor type selection* frame list boxes, select the *Com 2* option button in the *COM Port selection* frame, then click *Next*.
5.   The *Information* dialog is displayed.  Click *Next*.
6.   GTCO Wintab drivers will be installed.  When this is complete the *Setup Complete* dialog box is displayed.  Select the *Yes, I want to restart my computer now* option button then click *Finish*.

Your computer will be automatically re-started.  When it has re-started:
7.   Select the *GTCO Control Panel* icon from the *Start\Programs\GTCO NT Wintab Driver* folder.  The GTCO *Tablet Control Panel* dialog should will be displayed.  If a DLL Initialisation Failed message is displayed, check that the tablet is powered and connected to COM2: then restart the computer.  The following applies if the tablet has been correctly configured and the GTCO *Tablet Control Panel* dialog is displayed.
8.   Double-click the *Information* icon; the *Tablet Information* dialog will be displayed.  Confirm that the driver is configured for a GTCO MM Tablet using a 4-button puck (with 12" by 12" work area and 500dpi resolution).  When finished click the *Ok* button to close this dialog.
9.   Double-click the *Features* icon; the *Features* dialog will be displayed.  Confirm/select the *4 button puck* setting in the *Cursor Type* list box.  Click the *Ok* button to close this dialog.
10.  Double-click the *Customisation* icon; the *Tablet Setup* dialog will be displayed.  Set the Relative option button for the Tracking Mode setting.  In the *Button Assignments* frame, untick the *Default* check box then set *(None)* as click action for *buttons* 1 to 4.  Tick the *Whole Tablet* check box in the *Tracking Area* frame.  Click the *Ok* button to close this dialog.
11.  Close the *Tablet Control Panel* dialog.


## Zeiss Microscope Drawing Tube Installation

This section describes the installation of a drawing tube on the Zeiss AxioPlan and AxioSkop microscopes.  For other brands of microscope, consult the literature provided by your microscope manufacturer.

The drawing tube is called an "Intermediate Tube For Image Projection" by ZEISS.  The drawing tube unit is inserted into the opening for the fluorescence reflector on these microscopes; that is, between the microscope stand and the binocular head.  The drawing tube can be used in such a way as to project out to either the right or the left of the microscope stand.  Any object situated at the side of the microscope, and well lit, will then result in an image being projected into the intermediate microscopic image.  In conjunction with a digitiser tablet fitted with an LED light on the cursor, the drawing tube allows the user to measure the lengths of microscopic features.  When used for this purpose, the drawing tube must be calibrated for a specific objective-magnification configuration, using a stage micrometer slide.

It is recommended that only eyepieces with a field number of 20 be used.  This will minimise vignetting effects and provide an unobstructed field of view.

To install the drawing tube:
1.   Remove the binocular from the microscope stand by loosening the clamping screw with a 3 mm Allen key.
2.   Unscrew the binocular tube lens on the underside of the binocular assembly, using the tool supplied with the drawing tube (note the two small pins projecting from the tool, which mate with two small holes in the lens body).  Store the binocular tube lens in the lid of the container supplied.
3.   Remove the "tube panel", the pyramid-shaped shroud, from the rear top of the microscope stand.  In its place, fit the rectangular adapter block provided with the drawing tube.  Then replace the "tube panel" on top of the adapter block.
4.   Mount the drawing tube on the front of the stand (with the tube either projecting out to the left or right as required), and tighten the Allen screw with the 3 mm Allen key.

5. Mount the binocular assembly, minus its bottom lens, on top of the drawing tube assembly, align it and tighten the Allen screw with a 3 mm Allen key.
6. Adjust the magnification and focus as required, and check that the filter adjustment is set to "free aperture" (as distinct from "green filter" or "light shutter closed").

## Trakscan Application Installation

All software components for TrakScan are supplied on the Software Installation CD.  Install TrakScan as follows:
1. Start Windows on the computer.
2. Insert the TrakScan CD.
3. Double-click the Setup.exe program in the Live\Disk1 folder.  The *TrakScan* screen is displayed.
4. Click *Ok* on the Welcome screen.
5. Click the large *Setup* button.
6. Accept the default install directory (or *Browse* to a new directory if desired) then click *Ok*.
7. TrakScan will now be installed.
8. A message is displayed when installation is complete.

Note, a demonstration version of TrakScan is also included on the install CD.  This version does not require any of the system hardware as it simulates Autoscan stage function and frame grabber/camera function using a pre-stored grain slide mimic stored as bitmap file (SimStage.bmp).  The demonstration version can be installed by running the Setup.exe program in the Demo\Disk1 folder then following the instructions as above.

## Trakscan Sound Files

Sounds can be generated by TrakScan to acknowledge operator actions (*§ Miscellaneous Preferences, p16*).  Sounds are generated by playing a wave sound file (*.wav) through the computer's sound card. Default wave files are installed in the TrakScan\Sounds directory when TrakScan is installed.  Different wave files for different program functions are installed; the wave filename is the name of the function.  These wave files can be changed if desired providing the correct file name is maintained.

# Appendix B:  Trakscan Batch Database Structure

Data collected using the TrakScan application is stored in a TrakScan batch database.  A TrakScan batch is a hierarchical structure containing one or more Grain Mount and Standard Glass slides.  Data collected from the Grain Mount and Standard Glass slides of a batch is stored in single Access database file.  The filename of the batch database is the batch name within the TrakScan application.  The table and field structure of a TrakScan batch database is described below.

 All measurements are made with-respect-to the stage axis system.  This axis system is x-axis positive to the left (stage top plate movement to the right), y-axis positive away from the microscope frame (stage top plate moves towards the microscope frame), and focus (z-axis) positive down (stage top plate moves up).

## TrakScan Batch Database Tables

A TrakScan batch database contains the following tables:

|        |                                                                          |
|--------|--------------------------------------------------------------------------|
| Batch: | Contains TrakScan application data.                                      |
| Glass: | Contains details of standard glass slides in a TrakScan batch.           |
| StdAOI: | Contains data recorded for area's analysed on standard glass slides.     |
| Mount: | Contains details of grain mount slides in a TrakScan batch; including track counts. |
| Grain: | Contains data recorded for grains analysed on grain mount slides.        |
| Track: | Contains data recorded for tracks analysed for grains on grain mount slides. |

## TrakScan Batch Database 'Glass' Table Fields

| Field Name | Description | Units | Type |
|------------|-------------|-------|------|
| Name | Short name of TrakScan batch standard glass slide | | Text (20 characters) |
| Desc | Description of standard glass slide | | Text (255 characters) |
| IrrNo | Irradiation number of standard glass slide | | Text (20 characters) |
| SampleNo | Sample number of standard glass slide | | Text (20 characters) |
| Count | Calculated sum of count of tracks for all area's (StdAOI's) analysed on standard glass slide | | Long integer (4-byte) |
| Area | Calculated total area (StdAOI's) analysed on standard glass slide | µm² | Single precision (8-byte) |
| RhoD | Calculated track density for all analysed area's (StdAOI's) of standard glass slide | #/cm² | Single precision (8-byte) |

The primary (no duplicates) index of this table is based on field *Name*.

## TrakScan Batch Database 'StdAOI' Table Fields

| Field Name | Description | Units | Type |
|------------|-------------|-------|------|
| Glass | Short name of parent standard glass slide (*Glass:Name*) | | Text (20 characters) |
| AutoIndex | Index number of standard glass slide analysed area (AOI) | | Long integer (4-byte) |
| Desc | Description of standard glass slide analysed area (AOI) | | Text (255 characters) |
| AOIStartX | X coord. of start of standard glass analysed area (AOI) | µm | Single precision (8-byte) |
| AOIStartY | Y coord. of start of standard glass analysed area (AOI) | µm | Single precision (8-byte) |
| AOIEndX | X coord. of end of standard glass analysed area (AOI) | µm | Single precision (8-byte) |
| AOIEndY | Y coord. of end of standard glass analysed area (AOI) | µm | Single precision (8-byte) |
| AOIZ | Focus level of standard glass analysed area (AOI) | µm | Single precision (8-byte) |
| Area | Area of standard glass slide AOI | µm² | Single precision (8-byte) |
| Count | Count of tracks found in standard glass slide AOI | | Long integer (4-byte) |

The primary (no duplicates) index this of table is based on field *AutoIndex*.  Referential integrity (delete and update) is enforced between the *Glass* field of this table and the *Name* field of the *Glass* table.

**TrakScan Batch Database 'Mount' Table Fields**

| Field Name | Description | Units | Type |
|---|---|---|---|
| Name | Short name of TrakScan batch grain mount slide | | Text (20 characters) |
| Desc | Description of grain mount slide | | Text (255 characters) |
| IrrNo | Irradiation number of grain mount slide | | Text (20 characters) |
| SampleNo | Sample number of grain mount slide | | Text (20 characters) |
| GrainFocusX | X coord. of focus level point on grain side of grain mount | µm | Single precision (8-byte) |
| GrainFocusY | Y coord. of focus level point on grain side of grain mount | µm | Single precision (8-byte) |
| GrainFocusZ | Focus level on grain side of grain mount | µm | Single precision (8-byte) |
| MicaFocusX | X coord. of focus level point on mica side of grain mount | µm | Single precision (8-byte) |
| MicaFocusY | Y coord. of focus level point on mica side of grain mount | µm | Single precision (8-byte) |
| MicaFocusZ | Focus level on mica side of mica mount | µm | Single precision (8-byte) |
| RoughGrainPt1X | X coord. of rough align #1 point on grain side of grain mount | µm | Single precision (8-byte) |
| RoughGrainPt1Y | Y coord. of rough align #1 point on grain side of grain mount | µm | Single precision (8-byte) |
| RoughMicaPt1X | X coord. of rough align #1 point on mica side of grain mount | µm | Single precision (8-byte) |
| RoughMicaPt1Y | Y coord. of rough align #1 point on mica side of grain mount | µm | Single precision (8-byte) |
| RoughGrainPt2X | X coord. of rough align #2 point on grain side of grain mount | µm | Single precision (8-byte) |
| RoughGrainPt2Y | Y coord. of rough align #2 point on grain side of grain mount | µm | Single precision (8-byte) |
| RoughMicaPt2X | X coord. of rough align #2 point on mica side of grain mount | µm | Single precision (8-byte) |
| RoughMicaPt2Y | Y coord. of rough align #2 point on mica side of grain mount | µm | Single precision (8-byte) |
| FineGrainPt1X | X coord. of fine align #1 point on grain side of grain mount | µm | Single precision (8-byte) |
| FineGrainPt1Y | Y coord. of fine align #1 point on grain side of grain mount | µm | Single precision (8-byte) |
| FineMicaPt1X | X coord. of fine align #1 point on mica side of grain mount | µm | Single precision (8-byte) |
| FineMicaPt1Y | Y coord. of fine align #1 point on mica side of grain mount | µm | Single precision (8-byte) |
| FineGrainPt2X | X coord. of fine align #2 point on grain side of grain mount | µm | Single precision (8-byte) |
| FineGrainPt2Y | Y coord. of fine align #2 point on grain side of grain mount | µm | Single precision (8-byte) |
| FineMicaPt2X | X coord. of fine align #2 point on mica side of grain mount | µm | Single precision (8-byte) |
| FineMicaPt2Y | Y coord. of fine align #2 point on mica side of grain mount | µm | Single precision (8-byte) |

The primary (no duplicates) index this of table is based on field *Name*.

**TrakScan Batch Database 'Grain' Table Fields**

| Field Name | Description | Units | Type |
|---|---|---|---|
| Mount | Short name of parent grain mount slide (*Mount:Name*) | | Text (20 characters) |
| AutoIndex | Index number of grain on grain mount slide | | Long integer (4-byte) |
| Desc | Description of grain on grain mount slide | | Text (255 characters) |
| CenterX | Center X coord. of grain marked on grain mount slide | µm | Single precision (8-byte) |
| CenterY | Center Y coord. of grain marked on grain mount slide | µm | Single precision (8-byte) |
| CaxisStartX | X coord. of start of C-Axis | µm | Single precision (8-byte) |
| CaxisStartY | Y coord. of start of C-Axis | µm | Single precision (8-byte) |
| CaxisEndX | X coord. of end of C-Axis | µm | Single precision (8-byte) |
| CaxisEndY | Y coord. of end of C-Axis | µm | Single precision (8-byte) |
| CAxisAngle | C-axis angle of grain on grain mount slide (w.r.t. the stage axis) | °Deg | Single precision (8-byte) |
| GrainCount | Count of tracks found in grains on the grain side of grain mount | | Long (4-byte) integer |
| MicaCount | Count of tracks found in grain impression on the mica side of grain mount | | Long (4-byte) integer |

The primary (no duplicates) index this of table is based on fields *Mount* and *AutoIndex*.  Referential integrity (delete and update) is enforced between the *Mount* field of this table and the *Name* field of the *Mount* table.

**TrakScan Batch Database 'Track' Table Fields**

| Field Name | Description | Units | Type |
|---|---|---|---|
| Mount | Short name of parent grain mount slide (*Grain:Mount*) | | Text (20 characters) |
| Grain | Index number of parent grain (*Grain:AutoIndex*) | | Text (255 characters) |
| AutoIndex | Index number of track found in grain on grain mount slide | | Long integer (4-byte) |
| Type | Number indicating track type<br>    0:  apparent (2-axis) Projected track<br>    1:  apparent (2-axis) TinT track<br>    2:  apparent (2-axis) TinCle track | | Short integer (4-byte) |

| Field Name | Description | Units | Type |
|---|---|---|---|
| | 3:  apparent (2-axis) Other-type track or feature<br>4:  true (3-axis) Projected track<br>5:  true (3-axis) TinT track<br>6:  true (3-axis) TinCle track<br>7:  true (3-axis) Other-type track or feature | | |
| TrackStartX | X coord. of start of track | µm | Single precision (8-byte) |
| TrackStartY | Y coord. of start of track | µm | Single precision (8-byte) |
| TrackStartZ | Focus coord. of start of track | µm | Single precision (8-byte) |
| CrackStartX | X coord. of start of crack (if applicable) | µm | Single precision (8-byte) |
| CrackStartY | Y coord. of start of crack (if applicable) | µm | Single precision (8-byte) |
| CrackStartZ | Focus coord. of start of crack (if applicable) | µm | Single precision (8-byte) |
| CrackEndX | X coord. of end of crack (if applicable) | µm | Single precision (8-byte) |
| CrackEndY | Y coord. of end of crack (if applicable) | µm | Single precision (8-byte) |
| CrackEndZ | Focus coord. of end of crack (if applicable) | µm | Single precision (8-byte) |
| TrackEndX | X coord. of end of track | µm | Single precision (8-byte) |
| TrackEndY | Y coord. of end of track | µm | Single precision (8-byte) |
| TrackEndZ | Focus coord. of end of track | µm | Single precision (8-byte) |
| TrackLen | Calculated length of track | µm | Single precision (8-byte) |
| TrackAngle | Calculated angle of track with-respect-to grain C-axis | °Deg | Single precision (8-byte) |
| CrackLen | Calculated length of crack (if applicable) | µm | Single precision (8-byte) |
| CrackAngle | Calculated angle of crack with-respect-to grain C-axis | °Deg | Single precision (8-byte) |

The primary (no duplicates) index of this table is based on fields *Mount* and *AutoIndex*  Referential integrity (delete and update) is enforced between the *Mount* and *Grains* field of this table and the *Mount* and *AutoIndex* fields of the *Mount* table, respectively.

# Appendix C:  Glossary of Terms

The following abbreviations and terms are used in the TrakScan program and manual.  This is a combined list of Autoscan stage terms and Fission-Track Dating terms.

| | |
|---|---|
| Area of Interest (AOI) | An area on a slide of interest to be processed. |
| Autoscan Stage | The precision motorised microscope stage designed and manufactured by Autoscan Systems Pty. Ltd. controlled by AutoScope. |
| Batch | A hierarchical structure containing a group of related grain and standard glass slides. |
| Camera | Digital/analog camera fitted to the microscope to acquire images of the contents of the slide mounted on the stage. |
| Frame Grabber | Hardware interface between the camera and the computer. |
| Grain Mount | Substrate on which a batch of crystals is mounted and polished. |
| Grain Slide | Glass slide matching grain and mica mounts. |
| Objective Definition | The scaling (in X and Y) relating the size of objects, in pixels, as viewed using the camera to their actual size, in microns.  A different magnification calibration must be created for each microscope objective used. |
| Mica Mount | Mica slice which is held in contact with the polished surface of the grain mount or standard glass during thermal neutron irradiation. |
| Standard Glass Slide | Glass slide used to determine the dosage of thermal neutrons which has been received by an FTD sample |
| Track Density (Rho-D) | The track density is the number of tracks in a given area of the standard glass slide, expressed in units of millions of tracks per cm² (M#/cm²). |