Appendix A

Keyboard Shortcuts

Keystrokes		Function
F1		Help
F1	+Shift	Context Sensitive Help
F2		Performs lens hysteresis correction
F2	+Shift	Toggles the Toolbar
F3		Closes all additional windows
F3	+Shift	Toggles the PC-plane
F4		Steps through each entry in the magnification table
F4	+Shift	Exits from mag table mode
F5,F6.F7,F8		Executes installed macros
F5,F6.F7,F8	+Shift	Executes installed macros
F9		Help on key usage
F10		Menu
F11		Selects the Annotate/Measure function and toggles between Move and Edit modes
F11	+Shift	Toggles the Datazone on and off
Tab		Toggles coarse and fine adjustment
Esc		Aborts the currently executing auto function or macro
Pause		Pauses/Resumes execution of the macro
A		Performs auto-stigmation routine
B		Assigns Beam Shift to the arrow keys
F		Starts an autofocus routine
I		Arrow keys may be used to adjust the two parameters currently displayed in the image window
M		Assigns Magnification to the arrow keys
S		Assigns Stage X Y control to the arrow keys
V		Displays the vacuum status panel
Z		Assigns Stage Z control to the arrow keys
+		Increments the scan rate
-		Decrements the scan rate
Space		Reveals PC plane if hidden by shift-F3
Alt		Followed by arrow key movements allow navigation of the pull-down menus of the currently selected window

Appendix B

Guidance on Installing Other Windows™ Applications

Introduction

As new Windows™ applications are being created and updated from week to week, it is impossible to keep track of each one as it becomes available. Although a standard is slowly emerging for installing these third party applications, each application usually still has a unique set-up procedure.

A general set of guidelines however should be considered before installing any Windows™ application on your system.

- Always back-up your system disk before modifying it. The easiest way is to simply back-up you configuration files only; such as: `\CONFIG.SYS, \AUTOEXEC.BAT, \WINDOWS\*.INI,WINDOWS\*.GRP`. Although this is not a complete back-up, most of the old system configuration files will have been saved.

- Always read the application manual thoroughly before starting any installation.

- Always check that your hardware configuration is compatible with this application.

- Always check that you have at least the recommended hard disk space free for the application - use Windows™ File Manager.

- With Microsoft® Applications, choose Express Set-up if this option is available.

- Only choose advanced, or custom installation options if you are confident that you will be able to answer all the questions the installation program may ask you. These options usually require a good knowledge of how DOS, or the specific Windows™ Application works.

Below is a list of applications already installed and tested on Leica *Stereoscan 400* Series SEMs. If you are in any doubt as to the compatibility of a third party application you wish to install, telephone Leica Customer Care Department (44) 223 411411 or fax (44) 223 412776.

- Microsoft® MS-DOS® 5.0
- Microsoft® Windows™ 3.1
- Microsoft® Word for Windows™ 2.0
- Microsoft® Excel™ 4.0
- Microsoft® Visual Basic™ 1.0
- Zenographics Super Print 2.2
- Micrografx® Picture Publisher® 3.0
- Novell® Netware™ 3.11
- Adaptec ASPI SCSI Disk Module 3.0

This list is by no means a commitment of Leica Cambridge to support any of the above.

It is most strongly recommended that only Leica supplied and distributed and proprietary branded software is used with this instrument. Leica will bear no responsibility for software corruptions or viruses caused by using pirated or suspect copies of any software. Indeed Leica reserve the right to take any action they deem necessary, in the event of a virus finding its way back to the factory from a corrupted instrument we have had to visit.

It is also highly recommended that back-ups are made regularly, especially of important and valuable data such as images.

Appendix C

Windows™ Expansion via the PC/AT Backplane

The *Stereoscan 430* PC/AT backplane consists of six 16-bit standard AT bus slots, two of which are used. If the *Stereoscan 430* has any factory fitted options, then some of the free slots may be occupied, for example the WORM drive interface occupies one slot.

Each card that is installed must not interfere with the cards already installed on the bus. There are four areas in which a card may interfere with the existing hardware, memory, I/O, DMA channels and interrupts.

The following sections deal with each of these areas in turn. Space is provided in each table which may be used to record the settings of installed cards.

Memory

The standard PC memory map for DOS reserves space in the 640kB to 1MB range for ROM BIOS code and display memory. The gaps left between the standard components are available for other options. For example a network card may have a small amount of SRAM in which to buffer communicated data, this SRAM would be configured in a spare address in the 640kB to 1MB range.

The following shows the memory map of a standard *Stereoscan 430* in the 640kB to 1BM range:-

Address	Description
A0000-BFFFF	VGA Display Memory
C0000-C7FFF	VGA BIOS ROM
C8000-CFFFF	
D0000-DFFFF	Leica Hardware
E0000-EFFFF	
F0000-FFFFF	System BIOS ROM

There are two regions available for use by optional cards, C8000 to CFFFF and E0000 to EFFFF. Any extra cards fitted should therefore be configured to use a range in these areas.

One further complication is that on the *Stereoscan 430* it is possible to map PC DRAM into the C8000 to CFFFF area and load device drivers into this area, thus saving space in the DOS application area. This will not happen if there is hardware occupying this range and therefore the EMM386.EXE used to control access to the area will have been loaded unnecessarily.

I/O Space

Expansion cards are most likely to include a set of registers with which to control the card. These are usually I/O registers occupying space in the I/O map of the *Stereoscan 430* PC (as opposed to the memory map, see above).

The cards fitted must be configured not to clash with the existing registers. There is however some scope for disabling registers on the PC card in the *Stereoscan 430's* when other options are fitted, this is a trade off between items. For example, if an internal modem card is fitted, then it is usual to configure it at the address occupied by a serial COM port and to disable the existing serial COM port.

The following shows the I/O map of a *Stereoscan 430*:-

Address	**Device**
000-01F	DMA Controller 1
020-03F	Interrupt Controller 1
040-05F	Timer
060-06F	Keyboard Controller
070-07F	Real Time Clock
080-09F	DMA Page Registers
0A0-0BF	Interrupt Controller 2
0C0-0DF	DMA Controller 2
0E0-0EF	
0F0-0FF	Reserved for maths co-processor
100-1EF	
1F0-1FF	Fixed Disk Controller
200-207	Reserved for Games Port

208-277	
278-27F	Reserved for Parallel Port Controller 2
280-2F7	
2F8-2FF	Serial Port Controller 2
300-307	Leica Hardware
304-377	
378-37F	Parallel Port Controller 1
380-3BF	
3C0-3DF	Video Controller
3E0-3EF	
3F0-3F7	Floppy Disk Controller
3F8-3FF	Serial Port Controller 1
400-877	
878-87F	Reserved for Diagnostic Port
880-FFF	

There are several ranges available for plug in cards.

12 bits of I/O address are decoded by the PC, whereas the 80 x 86 supports the use of 16 bit I/O addresses. This means that the PC will respond to addresses above the 1000 boundary.

DMA Channels

There are 8 DMA channels on a PC, two of which are used by the PC. These are as follows:-

Channel	Device
0	
1	
2	Floppy Disk Controller
3	
4	Cascade for DMA Controller 1
5	
6	
7	

The free channels 0, 1 and 3 are available for 8 bit DMA transfers, channels 5,6 and 7 are available for 16 bit transfers.

Interrupts

The interrupt controller supports 16 interrupts, which are used as follows:-

Interrupt	Device
0	Timer
1	Keyboard
2	Reserved
3	Serial Port 2
4	Serial Port 1
5	
6	Floppy Disk Controller
7	Parallel Port 1
8	Real Time Clock
9	Reserved
10	
11	
12	
13	Maths Co-Processor
14	Hard Disk Controller
15	

The remaining interrupts are available for any plug in cards.

Standard Options

The following is a summary of settings used by cards that are supplied with options fitted by Leica:-

Card	Option	Memory Page	I/O	DMA	Interrupts
Corel LS2000	WORM	E400-E7FF	-	-	-
Borsu 10+	Bernoulli or Magneto-Opt	-	330-33F	3	-
Adaptec 1542	DAT	-	330-33F	5	11
SMC Elite 16	Network	CC00-CFFF	280-29F	-	3
LaserPix	LaserPix	E000-E3FF	-	-	10

Appendix D

Leica Service Centres and Approved Agents

Reporting software problems, please report to:-

Leica Cambridge Ltd
Clifton Road
Cambridge
CB1 3QH England
Tel: (44) 223 411411
Fax: (44) 223 412776

Please include software version number, system serial number together with a full description of the symptoms and circumstances leading to the error.

Service Problems

Please report to your local Service Centre.

Service Manager - SEM
Leica Instruments Pty Ltd
45 Epping Road, PO Box 21
North Ryde
New South Wales 2113
Australia

Service Manager - SEM
Leica AG
PO Box 95
Hernalser Hauptstrasse 219
A-1170 Vienna
Austria

Zaf Sistemas
Rua Braganca Paulista 132
04727 Sao Paulo S.P.
Brazil

Service Manager - SEM
Leica Canada Inc
513 McNicoll Avenue
Willowdale
Ontario M2H 29C
Canada

Service Manager - SEM
Arotec Columbia SA
CRA 15 No 38-23
Apdo Aereo 050862
Bogota De
Colombia

Service Manager - SEM
Micro Service
01 BP 1344
Abodjan 02
Cote D'ivoire

Service Manager - SEM
Leica A/S
Sydvestvej 102
DK-2600 Glostrup
Denmark

Service Manager - SEM
Nilomark OY
Sirrikuja 3D
00940 Helsinki
Finland

Service Manager - SEM
Leica Sarl
86 Avenue du 18 Juin 1940
F-92563 Rueil-Malmaison Cedex
France

Service Manager - SEM
Leica Vertrieb GmbH
Lilienthalstrasse 39-45
D-6140 Bensheim
Germany

Service Manager - SEM
Leica BV
Verrijin Stuartlaan 7
NL-2288 EK Rijswijk
PO Box 80
NL 2280 AB Rijswijk
Netherlands

Service Manager - SEM
Leica Instruments Ltd
19th Floor North, Cornwall House
Taikoo Trading Estate
28 Tong Chong Street
Quarry Bay
Hong Kong

Service Manager - SEM
Leica India Ltd
74 Rajouri Apartments
Opposite Govt of India Press
New Dehli 110064
India

Service Manager - SEM
Jam Ara
Flat 6, No 1 2nd Street
Kouye Nasr
Tehran
Iran

Service Manager - SEM
SM Technology Ltd
7 Links View Close
Stanmore
Middlesex HA7 3AW
United Kingdom

Service Manager - SEM
Saifan Precision Instruments
R Wallenberg 4
PO Box 13266
Tel Aviv 61130
Israel

Service Manager - SEM
Assing Spa
70 Via Agostino Depretis
00184 Roma
Italy

Service Manager - SEM
Leica KK
Sarugakuho Building
8-8 Sarugakuho, 2-chome
Chiyoda-ku, Tokyo 101
Japan

Service Manager - SEM
Leica Instruments Ltd
3FL, Dongsung Bldg
52-1 Samsung Dong
Kangam-Gu Seoul
Korea

Service Manager - SEM
Harry Mazal SA
Laguna De Tamiahua 204
Col Anahuao Del Miguel Hidalgo
11320 Mexico DF
Mexico

Service Manager - SEM
Leica Mikroskopi AS
Ostre Akar Vei 206
N-0518 Oslo 5
Norway

Service Manager - SEM
Makkays Hi-Tech Services
Kulsum Plaza, 42 Blue Area
Islamabad
Pakistan

Service Manager - SEM
Leica Pte Ltd
77 Ayer Rajah Crescent
Ayer Rajah Industrial Estate
Singapore 0513

Service Manager - SEM
SMM Instruments (Pty) Ltd
SMM House, Kyalami Boulevard
Kyalami Park,
Midrand, PO Box 11400
Vorna Valley, RSA 1686
South Africa

Service Manager - SEM
Leica Espana SA
Freixa 45
08021 Barcelona
Spain

Service Manager - SEM
Leica AB
Stromogatan 6
S-16440 Kista
Sweden

Service Manager - SEM
Leica AG
Kanalstrasse 21
8152 Glattbrugg
Switzerland

Service Manager - SEM
Saintech International Inc
12-2 Fl, No 57 Section 3
Sec 3, Taipei Ming-Sheng
Taipei
Taiwan ROC

Service Manager - SEM
Gulf and World Traders
PO Box 5527
Dubai
U.A.E.

Service Manager - SEM
Leica Inc
111 Deerlake Road
Deerfield, IL-60015
USA

Service Manager - SEM
Ola SA
c/o SR Ar Filio Martinez
CALLE "C"-QTA 123
Sector Santa Marta
Caracus
Venezuela

Appendix E

1. Software Options

1.1. Adjustable Reduced Raster

Introduction

This facility which is enabled when the **Reduced raster** licence is present allows the user to adjust the size and position of the reduced raster.

Operation

Selection

Adjustable reduced raster is selected in the same manner as the fixed reduced raster.

Procedures

When in reduced raster scanning and raster control (i.e. **RASTER** displayed in the window caption) the shape of the cursor will change according to the element of the raster which may be dragged (e.g. raster edge, corner or move whole raster).

There are scan rate restrictions according to the width of the raster. The software will reduce the scan speed automatically if this is necessary.

1.2. Advanced Annotation

Introduction

The advanced annotation software option provides the following:-

- **Alternative Fonts.** The ability to select a greater range of annotation fonts.
- **Bitmap annotation objects.** A Bitmap Object is a bitmap loaded from a file which may be embedded in an annotation panel or datazone.
- **Tag Annotation objects.** A Tag object is a bitmap for use as a special marker of areas of interest on the image.

Operation

Selection

Annotation Fonts

When the advanced annotation licence is present Font2 through Font6 may be changed via Top Menu - Edit - Ann Fonts.

Tags and Bitmaps

Select annotation/measurement mode (Special Function key F11 or Top Menu - Edit - Annot/Meas).

Display the Annotation/measurement Popup Menu by pressing the right mouse button over the image.

The Tag and Bitmap entries are found on the popup menu under 'Annotation'.

Controls

Annotation Fonts

As Standard the annotation logical fonts Font0 through Font6 are the fonts Leica24, Leica16, Leica29, Arrows25, Arrows31, Math16 and Math24. Font2 through Font6 may be individually substituted with other TIGA fonts via Top Menu.

Bitmap

A Bitmap Object is a bitmap loaded from a file , which may be any .BMP file such as generated by Paintbrush or SDK Paint.

The use of the transparent colour is determined by the **Transparency** attribute.

A Bitmap is a non anchor object and may be embedded into annotation panels.

Tag

A **Tag object** is the same as a **Bitmap object** except in the following respects:-

A Tag is an anchor object and does not embed in panels.

The transparency attribute is initially set.

Procedures

When a logical font is changed any annotation will be deleted.

Tags and Bitmaps may be moved and deleted in the same way as any other annotation objects.

1.3. Advanced Measurement

Introduction

The advanced measurement software option provides the following:-

- Angular Measurement
- Radial measurement
- Vector Profile

Operation

Selection

Select annotation/measurement mode (Special Function key F11 or Top Menu - Edit - Annot/Meas).

Display the Annotation/measurement Popup Menu by pressing the right mouse button over the image.

The measurement entries are found on the popup menu under 'Measure'.

Controls

Angular Measurement

The angular measurement facility comprises a related pair of measurement lines, a reference line (identified by the symbol AnR at it's midpoint) and a measurement line (identified by An at it's midpoint).

Each line has a 'blob' at the end which identifies it's centre of rotation. Each line may be adjusted in length, angle and position.

Associated with the objects is an annotation panel loaded from file An.ANN containing the measurement parameter which is:

An Angle between the reference line and the associated line

Where n is the instance identifier (i.e. 1 for first object created, 2 for second).

Radial Measurement

The radial measurement object is a circle which may be adjusted in diameter.

Associated with the object is an annotation panel loaded from file Dn.ANN containing the measurement parameter which is:-

Dn Diameter of circle

Where n is the instance identifier (i.e. 1 for first object created, 2 for second etc up to the limit permitted)

The dimensional measurement is derived from the **zone magnification** hence in situations where multiple zones are present (e.g. split or quad modes) the bounding rectangle must lie wholly within a zone. If the bounding rectangle is moved so that it spans zones the dimensional value is set to zero and a 'BEEP' given.

Vector Profile

Selecting the vector profile measurement facility brings up the profile display and creates a measurement line (with the identifier '**Prof**'). This line may be moved on the stored image and each end positioned individually.

When the line is dropped the trace on the profile display describes the grey levels lying under the line. Note that the leftmost point of the line is the leftmost position on the profile display.

The profile display has a pair of cursors which may be moved horizontally. The grey level at each cursor position is displayed on the profile display.

Associated with the measurement line is an annotation panel loaded from file PROF.ANN containing the profile width measurement parameter which is the distance (along the measurement line) reflected by the cursor spacing.

As with other measurement objects if the profile line crosses into another zone the measurement is invalidated and displayed as zero. A warning BEEP is given.

Procedures

The normal operational procedures for measurement objects apply to these measurement objects:-

In **Move** mode the individual objects may be moved about the image.

In **Edit** mode selecting the object causes the 'handles' for the object to be displayed, these may be dragged or moved using the 'precision' technique described in the On-line Help. The object may be deselected either by selecting **escape** on the popup menu or, if the popup menu is displayed, by clicking the right mouse button over the image.

Angular Measurement

Each measurement object has two handles; one at each end, these may be moved to redefine the line.

Selecting the measurement parameter An in the annotation panel while in Edit mode, or selecting the parameter in the status list, will prompt for a

new value. If a new value is entered the reference line remains fixed and the other line rotates to the specified angle.

Radial Measurement

Each measurement object has 9 handles; centre, N, S, E, W, NE, NW, SE, SW.

The centre handle moves the entire object without change in diameter.

The N, S, E, W handles adjust the diameter with the diametrically opposed point remaining fixed.

The NE, NW, SE, SW handles adjust the diameter with the centre remaining fixed.

Selecting the measurement parameter Dn in the annotation panel while in **Edit** mode, or selecting the parameter in the status list, will prompt for a new value. If a new value is entered the object is altered to the specified diameter with the centre point remaining fixed..

Vector Profile

The measurement line has two handles; one at each end, these may be moved to redefine the line.

Selecting the Profile Width parameter in the annotation panel while in **Edit** mode, or selecting the parameter in the status list, will prompt for a new value.

The profile cursors will be positioned to reflect the value entered. This is achieved by first moving the right cursor. The left cursor is moved if necessary.

1.4. Derivative

Introduction

This option allows an image to be enhanced by mixing it with the derivative of itself. This has the effect of highlighting vertical surface detail and edges within the image.

Operation

Selection

Derivative is selected from the Gamma/Diff option of the **Image** menu. This brings up the Gamma/Diff panel from which the derivative mixing can be controlled.

Controls

The derivative value is adjusted using the slider bar on the Gamma/Diff panel. It is also possible to enter the exact value by double clicking on the derivative value on the Gamma/Diff panel.

1.5. Dual Magnification

Introduction

This option allows a zoomed image to be displayed in split screen mode without having to freeze the image at the base magnification.

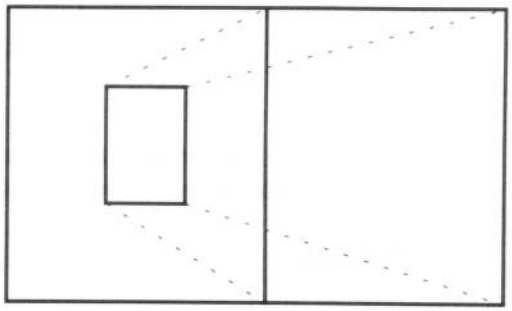
Operation

Selection

Dual Magnification can be selected from the **Scanning** menu or Dual Magnification icon in the Expert Toolbar.

Controls

When Dual Magnification is selected, the left hand image is enclosed by a green boarder which can be sized in the same way as a normal Windows$_{TM}$ panel. The right hand image displays the area of the specimen enclosed by the box on the left hand image. Thus the zoom factor is determined by the size of the box.



The position of the box can be adjusted in Raster mode by placing the cursor inside the zoom box and dragging it to a new position. Raster mode is selected by clicking over the image area with the right mouse button (bringing up the mode popup menu) and selecting **Raster**.

Procedures

Dual magnification can be used to highlight a feature of the image while showing a lower magnification view of the specimen, thus indicating how the feature is positioned on the specimen.

1.6. Gamma and Input LUT

Introduction

The Gamma and Input LUT licence provides control of the Input Look Up Tables.

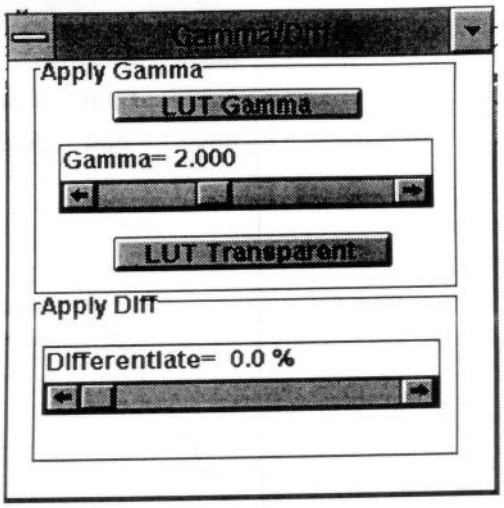
There is one LUT for each zone (e.g. each quadrant in quad screen mode), the LUT transforms the input signal according to the pattern loaded. The pattern may be transparent (no transformation), a gamma transformation or other pattern as defined by the input LUT Window.

Operation of Gamma Facility

Selection

Select Top Menu - Image - Gamma\Diff.

Controls



The Gamma Diff Panel

Procedures

To select the Gamma transform press the **Gamma** button.

Adjust the gamma parameter using the scroll bar.

To deselect the Gamma transform press the **Transparent** button.

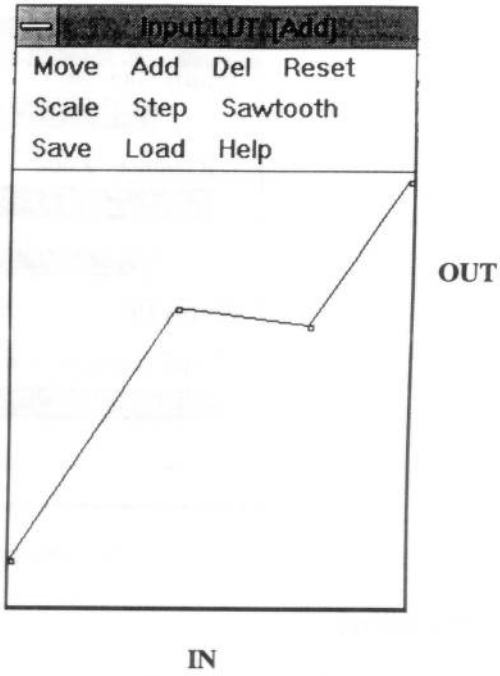
If there are multiple zones the anchor symbol should be positioned in the zone for which the LUT should be controlled.

Operation of the Input LUT Window

Selection

Select Top Menu - Edit - Input LUT

Controls



Overview

The input LUT is used to perform a translation on the input signal as defined by the pattern loaded into the LUT.

The pattern may be transparent (no transformation), a gamma transformation or a user defined pattern created in the Input LUT Window.

The LUT pattern is represented by a set of lines connecting points. Each point has as its co-ordinates the input grey level (X in the range 0.255) and the output grey level (Y in the range 0.255). The minimum definition is two points at X=0 and X=255. Other points may be added at other X values, only one point may reside at a specific X value.

The points list may be manipulated using the **add**, **move** and **delete** functions.

In addition patterns of points may be created using the **steps** or **sawtooth** functions.

The list of points may be **saved** or **loaded** from file.

The width of the window may be changed using the **scale** function.

Reset

This resets the points list to a transparent function (2 points 0,0 and 255,255).

Add

This function will add a point to the trace at the position of the mouse cursor when the left mouse button is pressed, the point may be dragged to the desired position.

Move

This function will select the nearest point on the trace to the mouse cursor when the left button is pressed. The point may be dragged to the desired position. The point is constrained to lie between the two adjacent points.

Delete

This function will select the nearest point on the trace to the mouse cursor when the left button is pressed and delete it.

A minimum of two points must remain.

Scale

This function controls the width of the window, either one pixel per grey level (width 255) or 2 pixels per grey level (width 512).

Save

This function saves the points list into a file with extension ULU (User defined Look Up table). By default the file will be saved in the user directory.

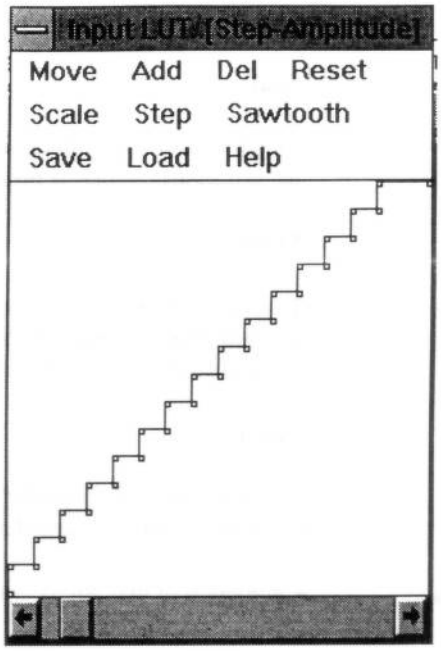
Load

This function loads the points list from a file with extension ULU (User defined Look Up table). By default the selection will be from the user directory.

Steps

This points function generates a set of points forming steps.

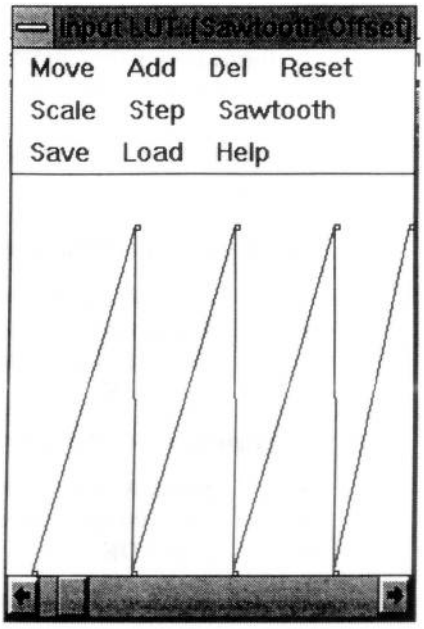
The amplitude, period and offset of the steps may be selected and adjusted using the scrollbar at the bottom of the window. The points generated may be individually moved, deleted etc.



Sawtooth

This points function generates a set of points forming a sawtooth waveform.

The amplitude, period and offset of the waveform may be selected and adjusted using the scrollbar at the bottom of the window. The points generated may be individually moved, deleted etc.



Procedures

The current mode may be selected from the menu as shown above.

Alternatively clicking the right mouse button over the window will toggle between functions.

The current function is displayed in the window caption.

1.7. Port Expansion from 4 to 8

Introduction

The port expansion licence increases from 4 to 8 the number of signal sources (e.g. detectors) that may be simultaneously connected.

Operation

Selection

When the licence is present the total connection capacity is increased.

After the licence is installed it is necessary to define the configuration, this is performed using the Configuration window which is displayed using Top Menu - Tools - Service - configure.

If a supervisor password has been defined it must be entered to gain access to these facilities:-

Configuration - define signal sources present

- Select **detectors** from the configuration menu
- Check the identities of the sources fitted. A detector presence may not be altered if it is **connected** (see below)
- Select **OK**

Configuration - define any auxiliary inputs

- Select **Aux** from the configuration menu
- Enter the auxiliary detector characteristics (see below)
- Select **OK**

Configuration - define connections

- Select **connections** from the configuration menu
- Using the mouse manipulate the connections to achieve a suitable configuration (see below)
- Physically connect cables to agree with configuration
- Exit from Configuration menu

Procedures

Auxiliary Detector Characteristics

This window is used to define the identity, resource requirements and signal output for auxiliary detectors.

For information the standard detector information is displayed.

Aux information may not be changed if the **user password** has not been correctly entered, if the **detector** is not present or if the detector is **connected**.

A group box at the top left of the window displays the detector identities, selecting one of these with the mouse will display the resource requirements, signal output and detector name which in the appropriate instances may be altered.

The signal and resource information is used in the connections window to determine the suitability of plugging modules. Incorrect data may result in damage for which Leica Cambridge will not accept responsibility.

Connections Window

This window defines the plugging of detectors.

The components involved are **connectors**, **detectors** and **resources** which may be selected by the mouse , dragged and dropped onto the receiving component or a parking area to indicate graphically the plugging of the system.

Connectors

On the right of the window are a set of connectors.

Connector properties are:-

Identity	e.g. Connector 1
Label	e.g. PL13, the back plate label
Signal	e.g. 50mV, the signal level accepted

Each connector has a slot into which a detector may be plugged.

A configured **detector** may be dropped into an empty slot which has suitable electrical characteristics. While a detector is selected suitable empty slots are coloured RED.

A detector may be unplugged from a connector and dropped into the detector parking area (centre screen).

Detector

The detector parking area is the centre portion of the screen.

Unused detectors are parked in this area.

A detector may require some **resources** in order to be configured and will have empty slots where these may be inserted. If a detector is not fully configured it cannot be picked up and suitable resources will be identified by a RED border.

If a detector is fully configured it may be picked up and a suitable empty **connector** slot will be coloured RED if one exists.

*The resource requirements of **auxiliary** detectors must be correctly specified.*

Detector Resources

Detectors may require none, one or two of the following:-

- PM1, PM2, PM3 : Photo multiplier supplies from the EHT set
- BSDA : Back scattered Detector Amplifier.
- SCMA : Specimen Current Monitor Amplifier.

The parking area for these objects when not in use is the left side of the screen.

A resource when picked up will cause the appropriate potential empty slots in detectors to be coloured RED.

Resources may not be unplugged from detectors in use (i.e. plugged into connectors).

1.8. Quad Mode

Introduction

This option allows four images to be displayed on the screen simultaneously. Different detectors can be used to acquire the images and different signal processing and noise reduction can be applied to each zone.

Operation

Selection

Quad mode is selected from the **Scanning** menu or the Quad Mode icon in the Expert Toolbar.

Controls

When in quad mode scanning the anchor symbol indicates which zone is being controlled by any zone specific function. A different zone can be selected by dragging the anchor symbol into it. Zone specific functions include:-

- Detector selection
- Frame averaging
- Freeze and unfreeze

In addition to these, the signal level controls adjust the settings of the detector assigned to the current zone.

Procedures

Quad mode can be used to display four different images acquired in different ways. For example the first image might be a low magnification image of the specimen, the second a higher magnification detail, the third might be the same detail using a different detector and the fourth might be the same image inverted.

This type of effect can be set up by freezing each zone when its contents are acceptable and moving the anchor symbol to the next zone. Once all the zones are set up, the whole image can be printed, recorded or exported in the usual way.

1.9. RS232 Remote Control

Introduction

This option provides remote control of the S400 via an RS232 input port.

The RS232 licence is required for this option.

A document specifying the protocol used is available under a non disclosure agreement.

Operation

Configuration

The communications characteristics of the port to be used should be defined in **WIN.INI**

e.g.
[ports]
COM1:=9600,n,8,1,x

To define the port used by the Remote Control Application select the Remote Control icon in Program Manager, then select File - Properties and add the port identity to the command line

e.g.
REMCON.EXE COM2

Procedures

The remote control application is started by double clicking the Remote Control icon in Program Manager. The LEO software provides access facilities for Remcon, LEO should therefore be running before starting Remcon.

1.10. Scan Rate (Expanded)

Introduction

This option allows a larger range of scan rates to be selected, ie pixel average values from 1 to 32k (in powers of 2).

Operation

Selection

The additional scan rates can be selected in the usual ways, ie:-

1. The scan plus and scan minus icons
2. The + and - keys on the keyboard
3. Via the **Scan->Speeds** pull down menu

Procedures

Expanded scan speeds are used in exactly the same way as the standard set of scan rates.

1.11. Signal Mixing

Introduction

This option provides the ability to mix the live signals from two detectors.

The signals are referred to as **Signal A** (the normal signal) and **Signal B** (the mix signal).

Each of signal A and Signal B may be chosen from any of the connected detectors.

The mix proportions may be adjusted.

Operation

Configuration

If a Supervisor password has been defined it must be entered to perform the following actions.

Select the configuration window using Top Menu - Tools - Service - Configure.

Select **Options** from the Configure menu.

Select the **Mixer** state to **Present.**

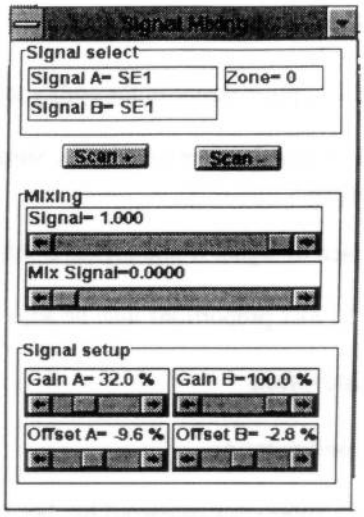
Exit from the Configuration Window.

The functions below will only operate if the Mixer State is present and the signal mixing licence is installed.

Selection

The signal mixing panel is displayed using Top Menu - Image - Signal Mixing.

Controls



Signal A

To alter the signal source for Signal A click on the definition and select from the list displayed.

Signal B

To alter the signal source for Signal A click on the definition and select from the list displayed.

Scan +

This increases the scanning speed by changing the pixel average dwell time.

Scan -

This decreases the scanning speed by changing the pixel average dwell time.

Mixing

The mixing controls allow the relative proportions of signal A and B to be determined. If the Signal parameter is adjusted, then the Mix Signal parameter will be changed so that the sum of the two parameters is always 1 (and vice versa).

Zone Specific Gain and Offset

The gain and offset fields (for signals A and B) can be used to adjust the signal level in individual zones without changing the detector brightness or contrast.

For example in Dual Mag mode the zoomed image may contain a dark region on the specimen. The gain or offset of the zoomed image could be adjusted to set the correct level, without affecting the base image.

1.12. Stage Centre Feature

Introduction

This function allows the user to draw a box around an object in the field of view, bring it to the centre and increase the magnification such that the object fills the field of view.

The function is provided as part of the 'Centre Feature and Stage Map' software option.

A prerequisite is a motorised stage.

Operation

Selection

The function may be selected as follows:-

- From the Top Menu - Stage/Vac - Feature
- From the Stage Move popup menu (press the right mouse button over the stage move window)
- Via the Centre Feature Macro function
- Via the Centre Feature Icon Function

Controls

There is a LINK facility (use Top Menu - tools - links) provided which enables the user to inhibit the use of beam shift for this function below a specified magnification.

Procedures

When this function is performed the initial magnification is saved, and may be restored by pressing special function key F4. Note that subsequent presses of F4 perform Mag Table functions (until another centre feature function is performed).

When the function is selected other windows will be temporarily hidden and messages in the image window caption area will guide you through the procedure.

Select one corner of the area required

Over the image click on one corner of the area of interest. Once this point is selected there is no need to hold the mouse button down. A rectangle will be drawn representing the area. If required you may cancel this function with the right mouse button.

Select the opposite corner of the area required

Over the image click on the opposite corner to complete the selection of the area of interest. Alternatively click the right mouse button to reselect the top left corner.

The software will attempt to use the beamshift to move the area to the centre of the screen. If the movement required is outside the range of the beamshift then a stage movement will be used, with the positioning such that following the move the beamshift will be zero.

The magnification will then be increased such that the defined area fills the field of view.

F4 will return the magnification to its previous value.

1.13. Stage Centre Point

Introduction

This function allows the user to point to an object in the field of view and bring it to the centre. The function is provided as part of the standard software but requires the stage motorisation option.

Operation

The function may be selected as follows:-

- From the Top Menu - Stage/Vac - Centre Point

- From the Stage Move popup menu (press the right mouse button over the stage move window)
- Via the Centre Point Macro function
- Via the Centre Point Icon Function
- By pressing Ctrl Tab on the keyboard

There is a LINK facility (use Top Menu - tools - links) provided which enables the user to inhibit the use of beam shift for this function below a specified magnification.

Procedures

When the function is selected the cursor will change to a four arrow symbol ***(see margin)*** and the caption of the image window will indicate that the user is expected to select a point with the left mouse button or cancel the function by pressing the right mouse button over the image window.

The software will attempt to use the beamshift to move the point to the centre of the screen. If the movement required is outside the range of the beamshift then a stage movement will be used, with the positioning such that following the move the beamshift will be zero.

1.14. Stage Control

Introduction

This facility provides the software control for a motorised stage. The functionality is provided as part of the standard software but requires the stage motorisation hardware option.

Operation

Configuration

The stage type and the axes that are motorised must be defined in the configuration window options list.

The Configuration window is displayed by selecting Top Menu - Tools - Service - Configure.

Limits and Touch Alarm

On each axis there are 6 limits:-

- Low Outer Limit
- Low Inner Limit
- Low User Limit
- High User Limit
- High Inner Limit
- High outer Limit

The current limit state may be displayed in the Status window by selecting the parameters X limit hit, Y Limit hit and Z limit hit.

A user limit is a software limit. They may be selected in the status window (Stage High X, Stage Low X, Stage High Y, Stage Low Y, Stage High Z and Stage Low Z). To change a user limit click on the required limit and enter the value. Note the limits may be set by a macro.

If a user limit is hit a warning is given and the stage slowed to a halt. Position is not lost.

If an Inner limit is hit the motor is slowed to a halt and the axis may only be moved away from the limit.

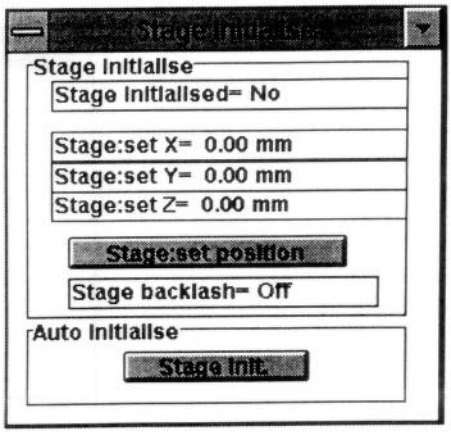
If an outer limit is hit the motors are stopped and may only be moved manually. Position is lost.

If the touch alarm is detected a buzzer is sounded, an error is given, position is lost and the motors must be moved manually until the buzzer is silent.

Controls

Stage Initialisation

The Stage Initialisation panel is used to define the actual position and is displayed by Top Menu - Stage/Vac - Stage Init. On initial installation, or if an axis outer limit limit has been hit, or if the touch alarm has occurred the stage position is unknown. The Stage Initialisation panel is used to define the actual position and is displayed by Top Menu - Stage/Vac - Stage Init.



There are two methods of defining the stage position:-

Manual initialisation Click on Stage:Set X and enter the actual position by reading the micrometer position (note that a line is drawn on the micrometer showing the position of the decimal point).

Repeat for Y and Z axes. Then press Stage:Set Position.

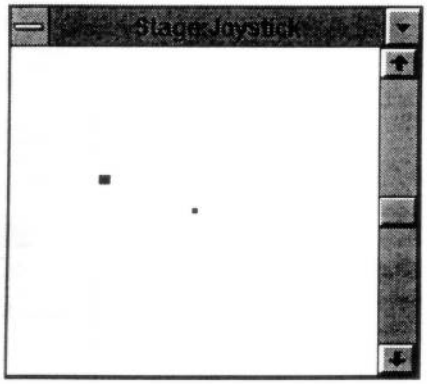
Auto Initialisation Click on Stage Init, the stage will move until the inner limits are found, this will determine the origin.

Stage Move Window

The Stage Move window is used to display the current stage position and to provide a control interface.

The Stage Move Window may be displayed by:-

- Top Menu - Stage/Vac - Stage move
- The Icon Function 'Stage Move'
- The Macro function 'Stage Move'



The stage Move window comprises a square area which represents the XY co-ordinate space of the stage together with a scroll bar on the right hand side which is used for stage Z control.

The stage may be in either Joystick or Goto mode. The caption indicates the current mode. Initially the stage is in Joystick mode, Goto mode is only possible when the stage has been initialised. These functions allow the stage to be moved using the mouse.

Popup Menu

The stage window mode and additional functions are provided by a popup menu. This menu is displayed by pressing the right mouse button over the Stage Move Window.

Joystick Mode

When in joystick mode the mouse may be used in the stage window as a joystick. The current position of the stage is indicated by a RED dot. A BLUE dot indicates the joystick position. The Joystick dot may be dragged away from the centre causing the stage to move in the required direction. The further from the centre the faster the stage speed. The speed is also adjusted according to magnification. Releasing the mouse button causes the joystick marker to return to the centre and the stage to stop.

In joystick mode the stage Z scrollbar thumb button is centrally positioned and may be dragged up or down to move the Z travel. Again the further from the centre the faster the movement, and movement is stopped when the button is released.The scroll bar increment and decrement functions give a single shot magnification related movement.

Joystick mode may be used before the stage is initialised (i.e. when it's true position is entered) and in this case the position indication may be erroneous.

Goto Mode

The stage may only be selected to GOTO mode when it has been initialised (i.e. when it's true position has been defined). In this mode the window represents the XY co-ordinate space of the stage and it's current position is indicated by a RED dot. The mouse may be used to select a point within this space to define the absolute stage position required. A BLUE dot is used to indicate the required position. When the required position is requested the stage will move to it. If a stage request is made while the stage is already in motion then the current motion will be aborted.

The stage Z scroll bar in GOTO mode indicates the current Z position by the thumb button, this may be dragged to a desired ABSOLUTE position or the coarse/fine scroll bar functions used to adjust the position of Z.

Backlash

Two functions are provided on the popup menu, a backlash state which toggles on/off to indicate that backlash correction should be performed when in Goto mode, and an Execute Backlash command which initiates a backlash correction manoeuvre.

Off

This function on the popup menu closes both the Popup menu and the Stage Window.

Quit

This function on the Popup Menu closes the Popup Menu.

Keyboard Control

The cursor (arrow) keys may be used to control the stage as follows:-

Use of ARROW keys for Stage XY control

If **S** is pressed the ARROW keys are temporarily assigned to control the stage XY position.

While an ARROW key is held down the stage moves in the appropriate direction.

Steps may be coarse or fine as defined by the toolbar icon or using the *tab* key.

If Esc is pressed while the stage is moving the movement is aborted.

To Return to default use of the ARROW keys press **I.**

Use of ARROW keys for field stepping

If **shift S** is pressed the ARROW keys are temporarily assigned to perform field stepping.

While in this mode pressing an ARROW key will step the image by an exact field size in the appropriate direction. In SPLIT and QUAD modes the step size is correspondingly sized.

The movement is achieved by a combination of stage movement and beamshift as used in the centre pointfunction.

To Return to default use of the ARROW keys press **I.**

Use of ARROW keys for Stage Z control

If Z is pressed the ARROW keys are temporarily assigned to control the stage Z position.

While an up/down ARROW key is held down the stage moves in the appropriate direction.

Steps may be coarse or fine as defined by the toolbar icon or using the *tab* key.

If Esc is pressed while the stage is moving the movement is aborted

To Return to default use of the ARROW keys press I.

1.15. Stage Co-ordinate Store and Recall

Introduction

This option allows a list of stage positions together with magnification, focus and beamshift to be saved so that the user may easily return to the positions. Optionally

the position may be given a symbolic name. Lists of positions may be saved to or loaded from file.

A prerequisite is a motorised stage.

Operation

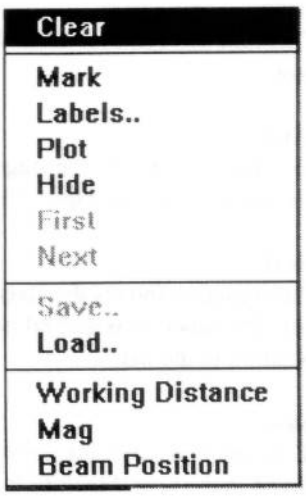
Selection

The position recording functions are provided on the popup menu associated with the Stage Move window. To display the Stage Move window select Top Menu Stage/Vac - Stage Move. Pressing the right mouse button over the Stage Move window will display the popup menu. The menu item **Record** provides the coordinate store and recall functions

The stage must be initialised for the functions to be operational (i.e. the correct position of the stage must be known).

Controls

The submenu provides the following functions:-



In addition Macro functions are provided for Mark Position, Goto First mark and Goto Next mark.

Procedures

The list of points is held in memory and on LEO start up it is initially empty.

Clear
This function clears the points list. Confirmation is requested.

Mark
This function saves the current stage position, working distance (focus), magnification and beam shift position in the points list without a label. This function is available as a Macro function.

Labels
This function displays the STAGE LABEL dialog box which is used to save the current stage position , working distance (focus), magnification and beam shift position in the points list with a user defined label. It is also used to go directly to labelled positions. For more detail see below.

Plot
This function displays a black dot on the stage window for each position stored in the points list.

Hide
This function removes from the stage window the position markers displayed by plot.

First
This function moves the stage to the first position stored in the list. The function is greyed if the list is empty. This function is also available as a Macro function.

Next
This function moves the stage to the next sequential (chronological) position in the list. The function is greyed out if the stage is not at the first position or is at the last position in the list.

Save
This function saves the points list in a file with the extension XYZ. The file will be saved in the user directory by default. Confirmation is requested if the file already exists. See below for file format.

Load
This function loads the points list from a file with extension XYZ. The previous contents of the list will be overwritten.

Working Distance
The current working distance (focus) is saved whenever an entry is made into the points list. If this function is selected then whenever the stage is moved to a saved position the working distance is set to the stored value.

Magnification
The current base magnification is saved whenever an entry is made into the points list. If this function is selected then whenever the stage is moved to a saved position the magnification is set to the stored value.

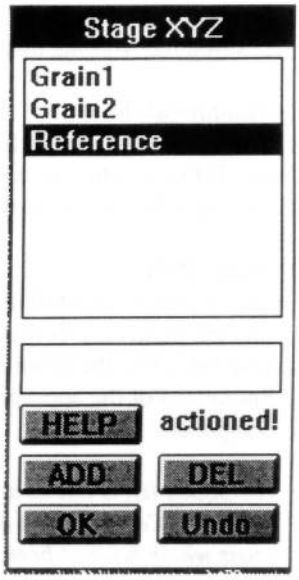
Beam Shift
The current beam shift distance (Beam offset) is saved whenever an entry is made into the points list. If this function is selected then whenever the stage is moved to a saved position the beam offset is added to the stage position (within the step size limitations of the appropriate stage) and the beam shift set to the sub step component.

The points list is not destroyed by closing the Stage Move or Stage Map Windows. Confirmation is requested on Shutdown of LEO if a points lists exists which has not been saved.

Hint

Create macros for special function keys to call each of the Mark, First and Next functions (e.g. F7 for mark). When roaming the specimen pressing F7 will then record the position for you to revisit later.

Stage Labels Dialog Box



The dialog box displays the currently stored labels in a list box (in alphanumeric order).

Below the list box is a text entry window, characters typed here will be matched to the entries in the list box and the nearest match highlighted.

Selecting a list box entry will cause the stage to move to the stored position.

To indicate if the stage is currently positioned at the highlighted entry the legend "actioned!" will be displayed when this is the case.

Stage Label : ADD
This function brings up a data entry dialog box into which the user may type any string of text to identify the current stage position. OK will enter the position and label into the list, CANCEL will remove the data entry box without action.

Stage Label :DEL
This function deletes the currently hightlighted list box entry from the list.

Stage Label : UNDO
This function causes the stage to move to the position which was current when the dialog box was requested.

Stage Label : OK
This function removes the stage label dialog box, all list entries are preserved.

File Format

The format of the XYZ file is as follows:-

XYZ	Fixed identifier
Stage XYZ	Fixed identifier
StagePosition	Fixed identifier
c:\user\default\three.XYZ	File details
3	Number of points
Reference	Label for first point
4.013e-002	X (meters)
2.956e-002	Y (meters)
5.07e-003	Z (meters)
0	Reserved
0	Reserved
0	Reserved
16.55287743	Magnification
2.643531375e-002	Working Distance (Meters)
0.	Beam shift X (Meters)
0.	Beam Shift Y (Meters).
	Second point - no label
3.687e-002	X
3.163e-002	Y
5.07e-003	Z
0	Reserved
0	Reserved
0	Reserved
16.55287743	Mag
2.643531375e-002	WD
0.	Beam shift X
0.	Beam Shift Y
	Third point - no label
3.968e-002	X
3.281e-002	Y
5.07e-003	Z
0	Reserved
0	Reserved
0	Reserved
16.55287743	Magnification
2.643531375e-002	Working Distance (Meters)
0.	Reserved
0.	Reserved

1.16. Stage Map

Introduction

The Stage Map function enables a low magnification frozen image in Zone 0 (i.e. the left half in split screen mode or the top left quadrant in quad screen mode) to be used as a map for selecting stage positions.

The function is provided as part of the 'Centre Feature and Stage Map' software option.

A prerequisite is a motorised stage.

Operation

Selection

Stage Map is only operational if the stage is initialised.

Stage map may be selected by:-

- Top Menu - Stage/Vac - Stage Map
- Macro Function Stage Map
- Icon Function Stage Map

Controls

To use this function:-

- Select a mode (SPLIT or QUAD)
- Adjust the stage position at a low magnification such that the required area of the specimen is wholly displayed
- Select Stage Map
- This will cause the zone to be frozen and the current stage position and magnification to be saved for the map
- The stage map function requires accurate positioning of the stage, hence a warning will be given if the backlash correction is not enabled

Procedures

While over the map the cursor will be a four arrow symbol ***(see margin)*** but normal elsewhere.

The magnification may now be increased and the other live zone(s) used to observe features of interest. The mouse may be used to select a point on the 'map' and the stage (and hence live image) moved to the required position.

To display the popup menu press the right mouse button over the map.

The Record functions (available if Stage Coordinate store and recall licence is present) may be used to save and recall positions. This is the same points list as used by the Stage Move Window.

The map may be removed using **Close map** from the popup menu or by selecting Normal mode scanning. Note that any positions recorded are preserved and may be saved/used by the Stage Move Window Record functions.

Alternatively **Remap** from the popup menu will save a new stage position and magnification for the map.

Hint

If on requesting stage map the stage backlash correction is off and you require accurate positioning:-

1. Unfreeze the image (press *scoll lock* on the keyboard).
2. Select backlash correction to be on (√) from the popup menu.
3. Select execute backlash from the popup menu.
4. Select Remap from the popup menu.

1.17. Stage Scan

Introduction

The Stage scan software option provides the facility of using the motorised stage to inspect an area of the specimen as a series of fields.

There is a choice of four types of scan pattern, and several methods of defining scan areas.

Once the scan pattern is defined commands may be used to step through the fields.

The stage window also provides buttons which give access to the label and centre point functions (if licenced).

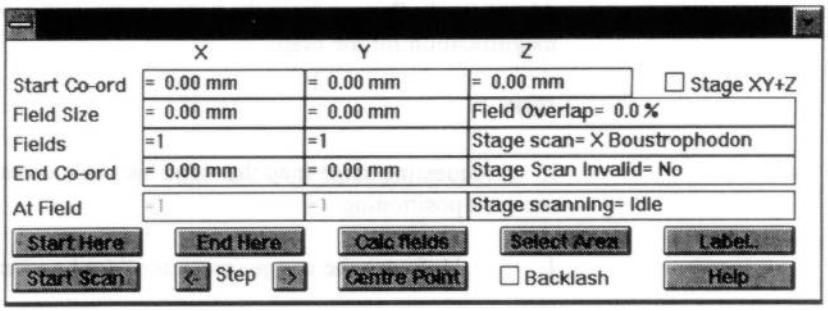
Operation

Selection

Operation of this facility is only enabled when the stage has been initialised.

The Stage Scan Window is displayed by selecteing Top Menu - Stage/Vac - Stage Scan.

Controls



Stage Scan Patterns

There are four different field patterns, for this example assume there are 9 fields numbered 1 through 9.

X Boustrophodon	**X Raster**
1 2 3	1 2 3
6 5 4	4 5 6
7 8 9	7 8 9
Y Boustrophodon	**Y Raster**
1 6 7	1 4 7
2 5 8	2 5 8
3 4 9	3 6 9

Stage Scan Start Position

These are the X, Y and Z positions at which the stage scan will start.

The stage will move to this position on execution of the **Start scan** command.

The values may be defined manually (select the parameter with the mouse), by the **select area** button or by the **start here** button.

Field Size

The X and Y field size parameters define the distance the stage will step between fields.

The values may be defined manually, or will be entered by the **calculation** function.

Fields

The X and Y fields parameters define the number of fields the stage will step in the appropriate direction for the scan pattern.

The values may be defined manually, or will be entered by the **calculation** function.

Stage Scan End position

This is the X Y position which will be used in the calculation function and defines the position at which the stage scan will end.

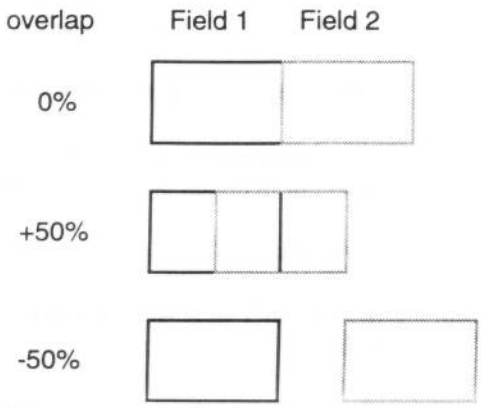
The values may be defined manually, by the **select area** button or by the **End here** button.

At Field

The X and Y **At Field** parameters define at which field the stage is currently positioned. These parameters may be used as annotation so that the correct field identity may be identifed in video prints.

Field Overlap

This parameter may be set manually and is used in the **calculation** function to determine the amount of overlap between fields. A field overlap of 0% will result in a set of fields which butt together.



Stage Scan Invalid

This indicates if the current stage scan pattern is invalid or not.

The scan will be invalid if the combination of scan parameters would take the stage beyond the user defined stage limits (in X, Y or Z).

Stage Scanning

This parameter indicates the current state of stage scanning:-
Idle Stage scan has not been started
At Field Stage is positioned at a field in the scan pattern
Moving The stage is in motion as a result of a Next field Command
At End The scan pattern has been completed

Stage XY+Z

This state is used when tilt compensation is operative.
If the checkbox is empty then no Z movement is made.
If the checkbox is marked then movement in Z is made relative to the startZ when movement is made in the tilt direction.

Backlash

If this box is checked backlash correction will be performed on each stage step.

Start Here

Executing this command will set the **start co-ords** to the current stage position.

End Here

Executing this command will set the **End co-ords** to the current stage position.

Calc Fields

This function performs the following calculation.
The field of view is determined from the current magnification (i.e. the physical dimensions on the specimen of the image in normal mode).
The field of view is used with the **field overlap** to determine the **field size.**
Using the **Start co-ord**, the **End Co-ord** and the **field size** the **number of fields** is determined.

Select scan area

This function is used to set the **Start co-ord** and **End Co-ord** when the whole of the area to be scanned is visible at a suitable low magnification.

It is used as follows:-

1. **Press the select area button.**
   Messages will be displayed in the image caption area to guide you.

2. **Select one corner of the area to be scanned**
   Over the image click on one corner of the area to be scanned. Once this point is selected there is no need to hold the mouse button down. A rectangle will be drawn representing the scan area. If required you may cancel this function with the right mouse button.

3. **Select the opposite corner of the area to be scanned**
   Over the image click on the opposite corner.

Stage Scan : Commands

There are three commands provided:-

1. **Start scan**
   This moves the stage to the start position and sets the scan status to **at field**.

2. **Next step** (Button labelled **->**)
   This moves to the next field in the scan pattern. If the current field is the

last field in the pattern the stage is not moved but the scan status is set to **end scan**.

3. **Previous step** (Button labelled <-)
This moves to the previous field in the scan pattern. If the current field is the first field in the pattern the stage is not moved but the scan status is set to **end scan**.

*The special function key **F12** performs a **Next step** function and **shift F12** performs a **Previous Step** function.*

Procedures

Methods of defining the stage scan area

1. Manually enter the **start co-ords** and **end co-ords** and then use **calc fields**.

2. Manually enter the **start co-ords** , **field size** and **number of fields**.

3. Position the stage at the location where the scan is to start (using the **stage move window** or **centre point** then press **start here**. Then position the stage at the location where the scan is to end and press **end here**.

4. Where the whole area to be scanned can be viewed at a suitable low magnification use **select area.**

The stage position represents the position of the centre of the image.

Hints

Stage macro functions

Examples of macros including stage functions are given below, associating them with special function keys provides some useful functionality.

Macro F8
Comment:1-Apr-1993 8:49 Stage scan macro
If Stage Scan Invalid=No then
Stage start scan
While Not Stage scanning=end scan
Delay[5]:
Stage Next Field

End While
Else
Message:Scan is invalid
End If

*If this macro is executing the **pause** key will cause the macro to be temporarily suspended. Pressing **pause** again will resume the macro. This is particularly useful with the window and overlay planes turned off, providing a 'survey' function.*

Macros using the stage position recording functions.

Macro F5
Comment: 1-Apr-1993 12:12
Func:Stage:Mark Position

This macro executes the **mark point** so that the location of fields of interest may be recorded for future inspection.

Macro Shift F6
Comment: 1-Apr-1993 12:13
Func:Stage:Goto First mark

This function moves the stage to the first recorded position.

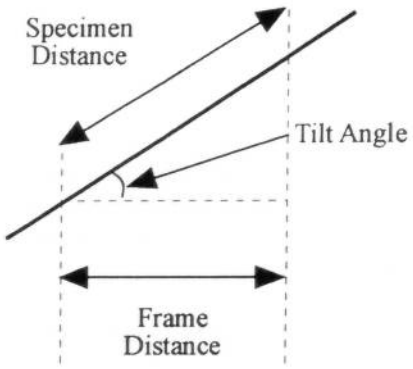
Macro F6
Comment: 1-Apr-1993 12:14
Func:Stage:Goto Next mark

This function steps to the next recorded position.

1.18. Tilt Compensation

Introduction

This option allows the image to be corrected for the foreshortening effect of scanning a tilted specimen. At high tilt angles the beam scans more of the specimen in the tilted direction giving the image a *squashed* appearance. By resizing the scans in the tilt direction this effect can be eliminated.



The important angle is the angle of the specimen surface to the horizontal, which may be different to the stage tilt angle (if the specimen is not flat).

Operation

Selection

Tilt compensation is selected from the Rotate / Tilt option on the **Scanning** menu. Tilt compensation is enabled by selecting the check box.

Controls

The compensation angle is adjusted using the slider bar on the Rotate / Tilt panel. It is also possible to enter the exact value by double clicking on the tilt compensation value on the Rotate / Tilt panel.

Procedures

Tilt compensation should be selected when viewing samples at high angles of tilt. The angle of compensation should be adjusted until the normal aspect ratio of the specimen is restored.

1.19. Window Mode

Introduction

This facility allows the user in **Normal** scanning mode to define 'windows' within the image to show an alternative signal.

Zones

In **Normal mode** the whole of the image are is defined as being **Zone 0**.
In **Split screen mode** the left half is **Zone 0** and the right half is **Zone 1.**
In **Quad screen mode** the quadrants are **Zone 0** through **Zone 3** for the top left, top right, bottom left and bottom right respectively.
In **Window mode** the **alternative signal** is **Zone 2**.

Each zone may have it's own signal source (detector or mixed signal), noise reduction coefficients, etc.

Operation

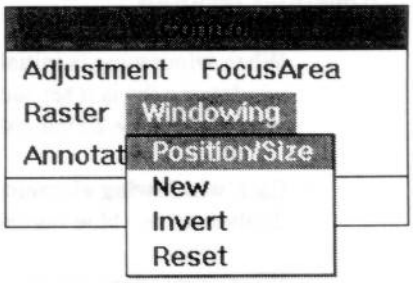
Selection

Top Menu - Scanning - Window mode.

Controls

Display the pop up control menu by clicking the right mouse button over the image while in **adjustment, raster** or **windowing** control mode.

The windowing controls are available under **windowing**.



Windowing Size/Position

In this mode the mouse is used to manipulate the size and position of the **windowing elements**. The cursor shape changes to indicate which component (side, corner, whole raster) may be dragged.

When an item is dropped such that it overlays another item the last one dropped overwrites the overlapped area.

Windowing New item

When this function is selected a new **windowing element** is created of default size and position. On creation it will be defined as **Zone 2.**

Windowing: Invert

This function selects a sub mode (indicated by the caption) in which any **windowing element's zone** state is inverted. (i.e. if Zone 2 then switch to Zone 0, if Zone 0 then switch to Zone 2).

The zone state of the background may be inverted.

This sub mode may be cancelled by selecting another **control mode**.

Windowing Reset

This function resets the list of **Window elements** to be the background (as Zone 0) and a single rectangular window (as Zone 2). The Control mode is selected to be position/size.

Procedures

Windowing Elements

When windowing is initially switched on, or if **Reset** is given, the windowing list is reset such that the whole image area is **zone 0** and there is a single **Zone 2** element of default size and position.

Each **windowing element** may be **zone 0** (normal - green border) or **zone 2** (alternative - blue border).

Windowing elements may be superimposed one upon another.

To determine which zone, or to select control for a zone, the anchor icon may be positioned as required.

1.20. X-Ray Dot Mapping

Introduction

This option provides the ability to display multiple presence dot maps or an intensity dot map for EDX and WDX data.

When in Xray mode the image store is partitioned into two overlaid planes; one for Xray data, one for grey Image data. The dot maps may therefore be displayed grey backed if required.

Operation

Configuration

XRay Interface Kit

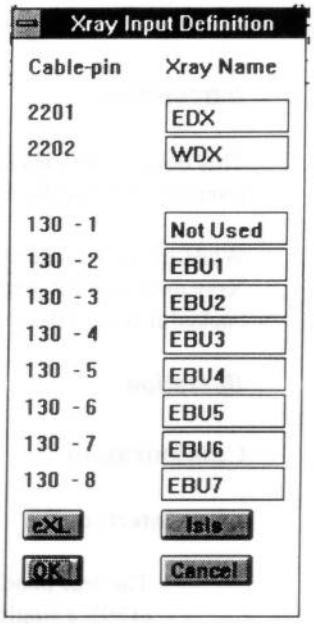
The rear panel provides connection for a multiple dot map EDX cable (130), a single dot map EDX cable (2201) and a single WDX dot map cable (2202).

Internal to the electronics pod are two switches which are set on installation by the service engineer.

- **Single/Multiple EDX** Defines if single or multiple cable is in use
- **WDX/EDX** Defines if the WDX input is used

Software

Top Menu - Tools - Service - Configure to display the configuration window
Select **Options**
Set the **EDX Dots** to **None/Single/Multiple** as required
Set the **WDX** to **Absent/Present** as required
Select **XRayNames**



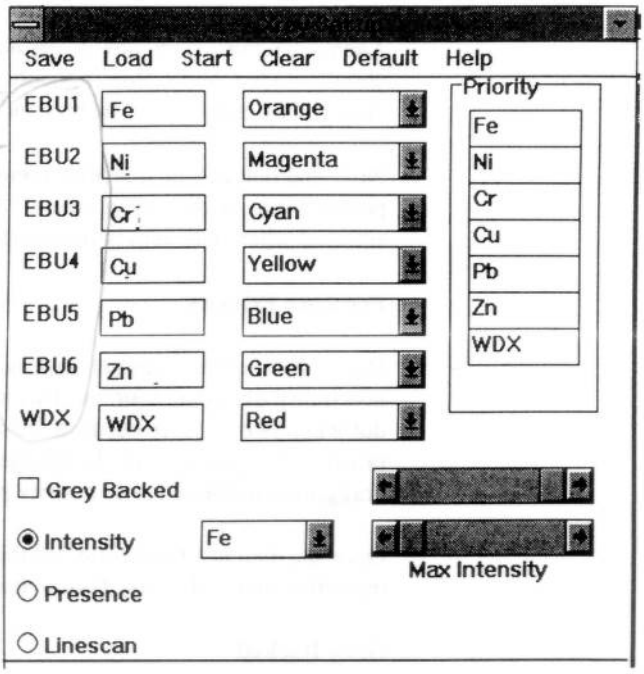
This function enables the annotation of the Xray inputs to be related to the energy window names used on the Xray system, these identifiers appear on the left side of the Xray set up window. The dialog box shows the cable and connector pin numbers of the signals. For ease of use two sets of identifiers are selectable, eXL and ISIS. Other identifiers may be entered individually if required.

If the identifiers are changed the menu option default should be selected on the next use of the Xray Set up window to utilise the changed identifiers.

Selection

The Xray set up panel is displayed using Top Menu - Detectors - Xray.

Controls



This window provides set up and control for X Ray dot map input and adapts itself according to the configuration (i.e. if WDX is present, if EDX is present, and if so if single or multiple dot map signals are available). The example above is for WDX plus multiple EDX dot maps.

X Ray dot map inputs are connected to X Ray ports. At installation these ports are given identifiers consistent with the XRay system in use, these identifiers appear on the left of the window.

Each port supplies the count pulses for a selected energy window. These pulses are accumulated on a pixel basis and used as source information for the Dot Map function.

X Ray Data Identifiers

For convenience the text description of the port data (energy window) may be entered by the user. These descriptions are in the column immediately to the right of the input port identity. Just click the cursor in the edit box and the text may be edited in the normal way (e.g. enter the chemical symbol). This new description will be actioned when the mouse is clicked anywhere else in the Xray window.

Dot Map Colour

Each Xray Ports data may be displayed in one of a number of colours. The colour is shown in the Combo Box in the third column from the left. The colour may be changed by clicking on the box and selecting the preferred colour.

Note that one colour is **transparent**, this may be chosen if the data for this X ray port is not to be displayed, useful for **presence** dot maps. If the transparent colour is selected when data acquisition starts data for that port will not be acquired.

Presence Priority

On the right of the Xray set up window is a box containing all the identities of the non transparent data sources. This window determines the priority of the presence dot when two or more occur in the same pixel. The top of the box is the highest priority. The priority may be changed by selecting an entry with the mouse and dragging it to the required priority position.

Once the data has been collected the priority may be rearranged interactively to see the effect on the display. This is non destructive to the Xray data.

Grey Backed

Select **grey backed** if you wish to retain the grey image under the dot map, otherwise this will be set to black.

Grey Intensity

This scroll bar adjacent to the **Grey Backed** check box controls the intensity of the grey image.

Intensity

This radio button selects the intensity dot map mode. Adjacent to this button is a Combo Box to define which data is to be collected. The scroll bar in the same row as the intensity radio button defines the count value which will represent the maximum colour brightness. At it's left position only 2 counts will be required to give the full colour value and at it's right position a count of 128 will be required to give the full colour value.

Linescan

This button selects Xray Linescan if the Xray Linescan licence is present.

Xray Menu : Save

This command saves the current Xray set up to a file with the extension **XRS** in the user directory.

Xray Menu : Load

This command loads the Xray set up from a file with the extension **XRS** in the user directory.

Xray Menu : Start/Stop

These commands start and stop the Xray acquisition.

Xray Menu : Clear

This command clears both the Xray and Grey planes.

Xray Menu : Default

This function resets the Xray set up to the default state.

Procedures

General

On entry to the Xray set up window the normal mode display LUT contents are stored and the display LUT switched into Xray mode.

There are three parts to the dot map function:-

a) set up of the required function
b) data acquisition
c) colour coding of the display LUT

Closing the Xray window will give an **XRayReset** which stops X ray acquisition and restores the display LUT to Normal mode.

Intensity Dot Map Set Up

In dot map intensity mode the counts are collected from one energy window, if the count is non zero then the intensity value is inserted into the image pixel.

- Select **grey backed** if you wish to retain the grey image under the dot map, otherwise this will be set to black
- Select the **Intensity** radio button
- Select the **colour** for the required energy window (non transparent)
- Select the energy window from the list adjacent to the radio button
- Select **Start** from the menu to acquire the Xray data

LUT Manipulations on Intensity Dot Maps

During or after data collection:-

- The colour of the energy window may be changed
- The Max. Intensity value may be changed

Presence Dot Map Set Up

In dot map presence mode the counts are collected from all energy windows which are defined as having a non transparent colour. If there is a count in any window then the pixel is designated as a **dot** and the presence information replaces the image pixel.

- Select **grey backed** if you wish to retain the grey image under the dot map, otherwise this will be set to black
- Select the **Presence** radio button
- Select the **colours** for the required energy windows (transparent if the data is not to be acquired)
- Select **Start** from the menu to acquire the Xray data

LUT Manipulations on Presence Dot Maps

During or after data collection:

- The colour of each energy window may be changed. Note if the colour was transparent when the data was acquired then the data will not have been collected.

- When a pixel contains non zero counts on two or more ports (energy windows) which are not transparent then the one displayed is determined by the presence **priority** which may be altered as required.

Hint

It is important to choose the correct colours for dot maps if they are to be output to monochrome video printers, Grey TIFF files (as seen) or clipboard

Recommended colours are:-

One map	white
Two maps	white, dark red.
Three maps	white, orange, green
Four maps	white, dark red, magenta, dark green

When exporting annotation for dot maps

If the grey intensity function is used to reduce the intensity of the grey image it will also reduce the intensity of any annotation merged with the image for export.

Registration of Xray Data with Image

Different Xray systems may have different internal timings which may give rise to a slight mismatch in registration between the Xray data and the image. If this is found to be the case reducing the data acquisition scan rate will reduce the mismatch. It may be necessary to experiment to find the fastest acquisition rate which gives a suitable registration where high accuracy is required.

1.21. X-Ray Linescan

Introduction

When in Xray Linescan mode the speed is automatically reduced to a maximum pixel average rate of 1024 and the line position indicated by a green raster line which may be moved using the mouse in Raster control mode.

On entering Xray Linescan mode the data acquisition is initiated. The data from up to 7 energy windows (according to configuration) is simultaneously loaded into an internal buffer. Data from successive line scans are accumulated.

Each Energy window is identified by a **user defined identifier** which is defined in the **Xray set up window**.

The Linescan data is displayed in a profile window in the same manner as the other line profiles (e.g. Linescan, live line scan etc.) . The profile display may be user configured from the **Xray Linescan control window.**

If **DDE support** is configured **copy-link** is provided.

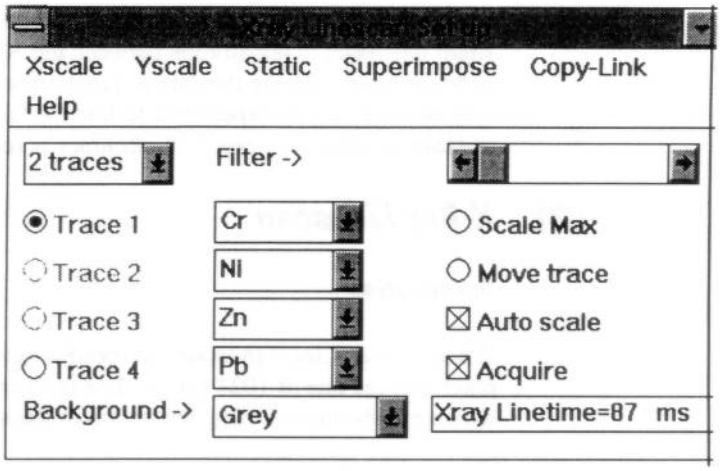
Operation

Selection

The Xray Linescan facility may be switched on either via Top menu - scanning - Xray Linescan or by selecting the Linescan radio button in the **Xray set up window** (Top Menu - detectors - Xray).

The **Xray Linescan control window** may be displayed by clicking the right mouse button over the profile window.

Controls



The facilities controlled by this window may be performed whether the acquisition is active or not.

Facilities provided are:-

Number of Traces

The profile may display from one to four traces simultaneously as selected from the drop down box. Each trace is displayed in a different colour, as shown by the colour of the **current trace** selection radio buttons.

Current Trace for Control

The **trace offset** and **scaling** functions operate on the current control trace. This trace is indicated by selecting one of the four radio buttons on the left of the window.

Filter Value

The current filter value used for all displayed traces may be set using the scroll bar at the top right of the window. This may be done at any time and is non destructive of the acquired data.

The filter value, which is in the range 1 through 16, is the number of adjacent pixel values which are merged to provide the mean of the pixel. i.e. with a filter value of 8 the pixel value displayed is the mean of the pixel at a position and the 8 pixels preceding it and 8 pixels following it.

Trace Source Selection

The drop down box associated with each trace may be set to any of the 7 energy windows acquired. Each window is identified by the **user defined identifier** (see Xray Dot map description).

Auto Scaling

When data acquisition is started each trace defaults to Auto scaling mode.

In this mode a trace has it's data scaled for display such that the maximum value in the line will give a full scale excursion of the trace.

Full scale for the trace is 256 pixels with ***yScale*** *= 1.*

If **Scale Max.** has been in use auto scaling may be reselected using the check box.

Scale to Trace Point

For the **current trace** this scaling mode may be selected using the radio button on the right labelled **Scale Max**.

In this mode a blue line is displayed in the profile window which selects an X position on the trace. The pixel value at this position is used to define the full scale excursion of the trace, hence pixels with greater values will be truncated at full

scale. The X position marker may be dragged to a new position using the mouse. The new value takes effect when the marker is dropped.

The scaling may be returned to auto scaling by selecting the **auto scale** check box.

Superimposed or Offset Traces

By default all traces are superimposed on the same Y axis.

If required a trace may be offset by selecting the **move trace** radio button. When in offset mode the y size of the profile is doubled permitting up to full scale offset, note that this does not increase the full scale excursion of the trace.

When this mode is selected a marker is displayed on the profile window showing the current baseline of the trace. This baseline may be dragged to a new position using the mouse. If acquisition is currently on the new baseline only takes effect when dropped at the new position, otherwise the baseline is continuously changed.

The speed of response is affected by the scale values chosen - the greater the screen area to be drawn the slower the response.

To revert to superimposed traces select the **superimpose** function from the menu.

*The offset values are not destroyed in superimpose mode, clicking on **move trace** will restore them.*

Background Colour

Using the drop down box at the bottom of the window the colour of the profile background may be selected from one of:-

Grey
Black
Transparent

The trace colours have been selected such that they will appear white against a black or transparent background on monochrome hard copy. Grey will appear as black.

Data Acquire On/Off

The acquisition may be started or stopped by the check box on the lower right of the window.

If the line position is changed the data buffer will be cleared and acquisition restarted.

X Scale

The xScale value determines the display width of the profile window. A scale value of 1 will give a full width (every pixel) display. A scale value of 2 will display a half width (every other pixel) display, etc.

Y Scale

The yScale value determines the display height of the profile window.

A scale value of 1 will give a full height (256 pixel) display. A scale value of 2 will display a half height display, etc.

This height will be doubled if the trace offset function is used.

Drawing Active/Static

The drawing of the profile (not to be confused with the acquisition of the data) may be switched on (active) or off (static) using the menu function.

While an image export is in operation the traces will temporarily be static.

Copy-Link

This function is provided if **DDE support** is configured. This performs a DDE copy-link function via the clipboard to any applications which have requested profile data. The data for the current trace is transferred.

Linetime

This parameter displays the time to acquire a line of data. (Note data from multiple windows is collected in a single linetime).

Annotation

A set of annotation labels may be created for Linescan traces.

Select annotation mode (press F11);

Display the annotation pop up menu (click right mouse button over image).

Select **Annotation - Xray Traces**. This will create one annotation item per trace with the **identifier** text.

Move these items to suitable positions.

1.22. 2D Ymod

Introduction

The term Ymod comes from the technique of Y axis modulation used historically to generate a topographical image on a display tube.

The Ymod function draws a series of line profiles scanned across the stored image to represent the signal level in the image. A hidden line removal algorithm gives a reasonable topological representation, although any interpretation must be carefully considered.

Operation

Selection

Top Menu - Image - Ymod.

Controls

On selection of this function the Ymod window is displayed together with it's popup menu.

If the popup menu is closed using the **Quit** command it may be re displayed by pressing the right mouse button over the Ymod window.

Amplitude Scale

This value controls the scaling of the amplitude signal.

A value of 2 means that for a grey level of 200 above the **threshold** an amplitude of 100 pixels is drawn.

Line Increment

This value defines the separation between lines scanned over the image.

A value of 4 means that every fourth line is scanned.

Threshold

This value defines the threshold grey level value below which the trace is drawn as a horizontal line. Correct choice of the threshold can greatly improve the appearance.

Coloured

This control selects if the trace is monochrome or coloured.

If coloured is selected the range of grey levels above the **threshold** is divided into four equal parts.

The colour of the line drawn from the previous sample point to the current sample point is determined by the grey level of the sample point.

Superimpose

This control determines if the display is to be in a separate window (in which case the size is determined by the **X scale** and **Y scale** settings) or superimposed over the image.

Transparent Background

This control determines if the background to the Ymod display is to be transparent (i.e. the image is visible behind it) or opaque.

Procedures

The drawing is time consuming hence redrawing is initiated using **sample**.

The size and granularity of the drawing is controlled by the **X scale**, **Y scale** and **line increment**.

The appearance is controlled by the **threshold**, **amplitude scaling**, **colour selection** and **transparency selection**.

Optionally the traces may be **superimposed** over the image.

Any change in the characteristics or position of the Ymod will cause the traces to be deleted. To re acquire the data use **sample!**

2. Hardware Options

2.1 Stage Motorisation

The stage motorisation kit is available for either X and Y or X Y and Z stage axes. Included are over travel protection and audible touch alarm. This accessory is required for the software options:-

- Stage Control
- Stage Co-Ordinate Store and Recall
- Stage Centre Feature
- Stage Centre Point
- Stage Map
- Stage Scan

2.2 High Resolution Record Unit (HRRU)

Introduction

The *Stereoscan 400* Series HRRU is a pod fitted to the right hand side of the instrument. It is connected to the instrument internally by two fibre-optic connectors, and externally by a mains lead which is plugged into the mains connection block at the rear of the instrument.

The HRRU is capable of taking either a Stored or a Live Image micrograph with or without an Overlay (Data Zone or other annotation), using a variety of camera types at different record rates and with different film speeds. It is also possible to set the development time required for a particular type of film.

In order to operate, the system must know that an HRRU is actually fitted, and this can be checked by looking at the Options section of the Configure menu. This is reached by selecting from the Menu Line:-

Tools -> Service ->Configure -> Options

The ***HRRU*** line should read ***HRRU = Mark 2***

Operation

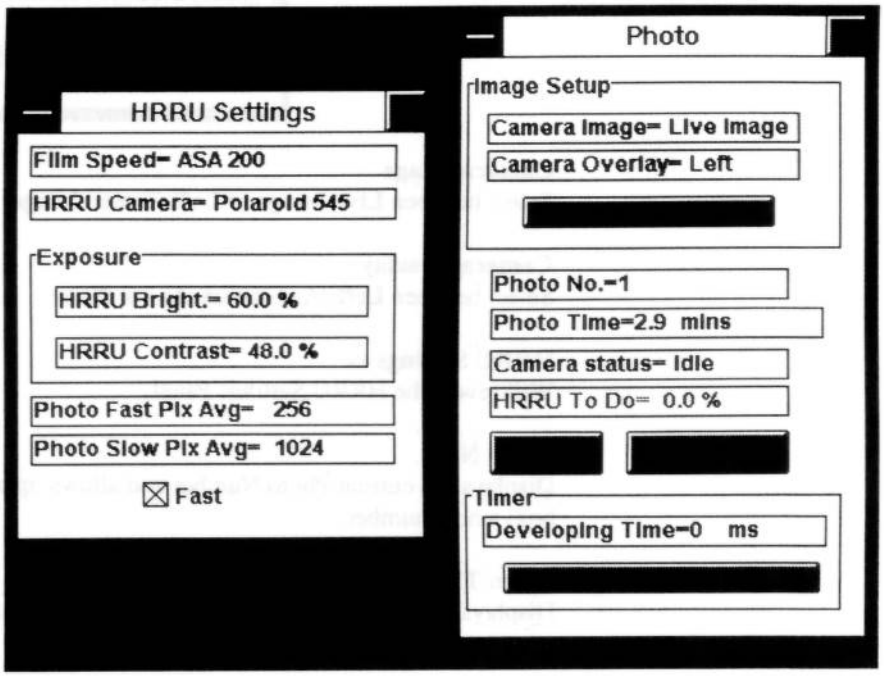
As the HRRU is so flexible, the system has to be told exactly what type of micrograph the operator wants to take, using which type of camera and film speed etc. This can be done by selecting from the menu line:-

File -> Export/ Photo setup

And from the panel that is then revealed select:-

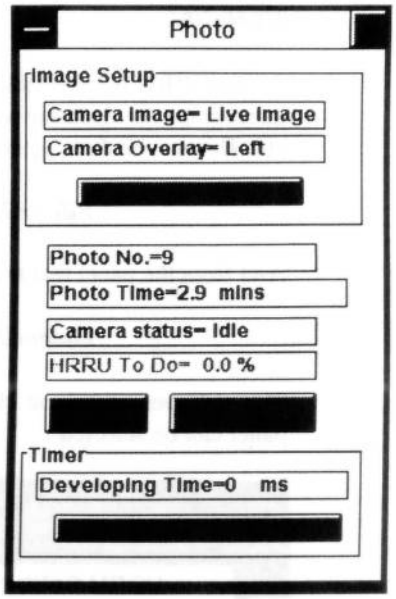
Output To = HRRU followed by ***Set Up***

This will then reveal the Photo Set Up Panel, and from that the HRRU Settings panel can be selected.



Using these two panels every detail of how, and on what medium the micrograph is to be recorded can be set.

Photo Set up Panel



Camera Image
Select between **Live Image** or **Left** (Stored Image)

Camera Overlay
Select between **Left** (Annotation etc.) or **None**

HRRU Settings ->
Will reveal the HRRU Settings Panel.

Photo No =
Displays the current Photo Number and allows operator to select (by clicking the box) a new number.

Photo Time =
Displays the time a micrograph will take for particular settings of Film Speed and whether Photo Fast or Slow has been selected.

Camera Status =
Displays either **Busy** or **Idle**.

HRRU To Do =
Gives indication between 100 and 0% of progress of record scan.

The button marked **Photo** will start a record scan, while the button marked **Abort Photo** will stop a record scan immediately regardless of it's progress.

By clicking on the **Developing Time = 0 ms** box, the operator can enter any time required for developing the type of film being used, and once the button marked **Start Develop Timer** has been selected, this time will count down to zero to indicate that the film has been developed correctly.

If the Output Device has already been set to the HRRU, but the conditions for taking a micrograph need to be changed for any reason, the **Photo Setup** panel can be revealed by clicking on the photo Icon of the Tool Bar with the right hand mouse button.

Also see note on next page.

HRRU Settings Panel

Film Speed = ASA
Allows selection of ASA 800, 400, 200, 100 and 50.

HRRU Camera =
Allows the following to be selected :-

120mm Camera
35mm Camera, and
either Polaroid Types 545 or 500.

HRRU Bright. and **HRRU Contrast** enable the Operator to set the brightness and contrast settings of the HRRU as required. This can be tested, and if necessary adjusted, using the Grey Wedge available in the Display LUT.

Caution should be exercised when adjusting these settings as excessive brightness can burn the HRRU Tube!

Photo Fast Pix Avg. =
Sets the fast record rate.

Photo Slow Pix Avg. =
Sets the slow record rate.

If the box marked **Fast** is selected, then a fast record speed is performed, and if it is not, then a slow record rate will be performed.

It should be noted that once the various photo settings have been made it, is not necessary to access these panels every time that a photo dump is required. If the Output Device has been set to be the HRRU, all that is then required to initiate a Micrograph recording is to select the Photo Icon in the TOOL bar with the left mouse button. Ensure that the image is frozen, if a Stored image is required or NOT if a Live image is required.

Operational Notes

Lens Aperture
This should normally be set to f11, however, if for example 50 ASA film is being used but the Live image recording time (Pix Avg 1024) is inconvenient, it is possible to change the aperture setting to f8 and use the ASA 100 speeds, or change the aperture setting to f5.6 and use the ASA 200 speeds. The HRRU software is supplied with some scan speeds only used for factory test purposes, therefore this table shows actual scan speeds available (×= test only ✓= usable) :-

Film Speed ASA	Pixel Average	Live	Stored
800	128	✓	✓
800	256	✓	✓
800	512	✓	✓
800	1024	✓	✓
400	128	×	✓
400	256	✓	✓
400	512	✓	✓
400	1024	✓	✓

200	128	×	✓
200	256	✓	✓
200	512	✓	✓
200	1024	✓	✓
100	128	×	✓
100	256	×	✓
100	512	✓	✓
100	1024	✓	✓
50	128	×	✓
50	256	×	✓
50	512	×	✓
50	1024	✓	✓

Record Rates

There is only one record rate when **Left** (Stored) images are recorded, as distinct from **Live** when up to four different speeds are available, and this varies according to ASA setting. So if using 50 ASA film and the record rate is inconvenient, by changing the lens aperture to either f8 or f5.6, the 100 or 200 ASA settings respectively can be utilised.

Camera Types

The *Stereoscan 400* Series can accommodate a variety of camera types. Each camera type fits onto a camera assembly which slots into the HRRU CRT assembly. To gain access to the HRRU, simply slide the top cladding away to the rear of the HRRU CRT assembly.

- **Polaroid 545**

The lens unit is setup as shown in Figure 1. The lens unit is fitted to the camera body using 4 M4 X 20mm screws.

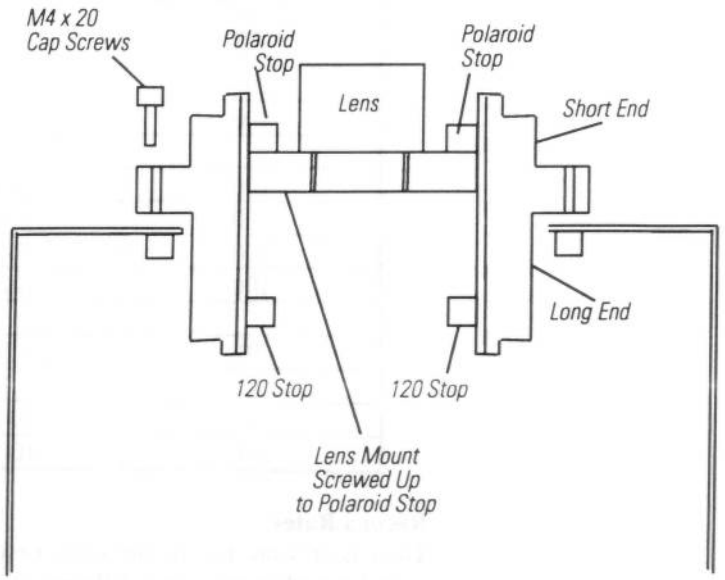


Figure 1 Polaroid Camera Lens Mounting

The camera unit is then inserted into the camera housing with the **red spot** *towards* the operator. It is important to ensure that the unit has been inserted as far as it will go, if this is not done the focus will be incorrect. The unit is clamped in place using the knurled head screws in the upper set of screw holes. The camera back is then fitted to the casting ensuring that the key fits into it's slot, and is locked in place using the two sliding clamps. If the aperture is set correctly, the unit is now ready for use.

- **Polaroid 550**

The setup for this camera back is identical to that for the 545 above, except for the fact that the camera unit is inserted into the camera housing with the **red spot** on top of the casting *away* from the operator.

- **35mm (RICOH)**

This unit complete is inserted in place of the Polaroid camera unit and is locked into place using the knurled head screws. The shutter remote cable is plugged into it's socket on the rear of the camera and the shutter set to 'Bulb' (see the camera instruction booklet).

- The **120mm** camera back will usually be sent with it's own camera assembly, but some early *Stereoscan 400's* may have a camera assembly that is

interchangeable between Polaroid and 120mm. The procedure to change camera backs with this type of assembly is shown in Figure 2 as follows:-

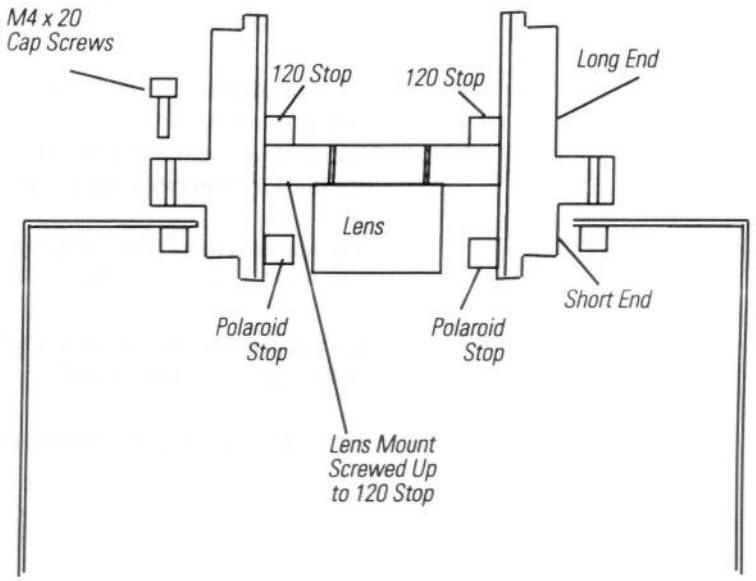


Figure 2 120mm Camera Lens Mounting

1. Remove the Camera assembly from the HRRU assembly by pushing the top cladding back towards the rear of the instrument (it may be necessary to loosen the fixing screws securing the cladding from within the HRRU pod- if they are not already loose enough), and loosening the 4 knurled knoblets. The camera assembly should now be loose enough to pull out of the HRRU CRT assembly.

2. The lens spacer itself will be currently screwed up against a lens positioning stop ring, this must now be screwed clockwise up to the alternative lens stop ring at the opposite end of the lens spacer body, using the tool provided. **These lens stop rings are preset and should not be re-adjusted.**

3. The lens spacer assembly which holds the lens in the correct position must now be reversed. This is done by removing the 4 M4 allen screws securing it to the camera assembly and simply inverting the spacer assembly before refitting it back to the camera assembly.

4. Refit the lens into the spacer assembly, ensuring that the aperture is set to the correct position.

5. The 4 knoblets that secure the camera assembly into the HRRU CRT assembly must be fitted to the lower set of holes (there are two holes per screw) in order to ensure that the camera assembly can be secured into the HRRU CRT assembly correctly.

6. Refit the camera assembly to the HRRU CRT assembly, ensuring that the **red spot** on top of the camera housing is *away* from the operator. It is important to ensure that the unit has been inserted as far as it will go into the housing otherwise focus will be incorrect.

7. The camera should now be fitted onto the casting, ensuring that the key fits into it's slot, and is secured using the two sliding clamps.

8. Ensure that the correct camera type is entered in the HRRU Camera field of the HRRU Settings panel.

9. To swap back again the reverse procedure applies.

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