AUTOSCAN AS3000B-BASED SYSTEM

HARDWARE INSTALLATION GUIDE

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Introduction

About the AS3000B

The AS3000B is a precision-engineered microscope stage which has been designed to facilitate semi-automated microscopy. All three axes of movement are integrally contained in the AS3000B, and re-positioning can be carried out to within 2 microns in the horizontal axes, and within 0.1 micron in focus. The use of dc motors ensures fast and accurate movement.

The AS3000B allows the user to control the microscope stage manually, by using a joystick, or by using a computer. The user has a choice of either running one of our application software suites, or embedding the stage commands into custom software, using our ASDK (Autoscan Software Development Kit). Our systems are available either with or without image processing capability.

This hardware installation guide explains how to unpack, mount and connect your AS3000B. It also explains how to carry out routine maintenance and basic trouble-shooting.

Contacting Autoscan

Autoscan Systems is committed to providing quality products and a high level of customer support. If you have any questions, suggestions, or problems, please contact us directly.

Autoscan Systems Pty. Ltd. (A.B.N. 73 006 275 136)

Street Address : Suite 4/293 Bay Street, Brighton, Vic 3186 Australia
Postal Address : P.O. Box 112, Ormond, VIC 3204 Australia
Telephone: + 61 39 596 8065
Fax : + 61 39 596 8369
email: autoscan@autoscan.com.au

Visit our home page on the world-wide web for information about other products, and for items of general interest in the field of microscopy:

URL : www. autoscan. com. au/-autoscan

IMPORTANT NOTE ABOUT THIS SYMBOL :

Text accompanied by the above symbol indicates important information.
Please take special note, as loss of information or damage to equipment may result if these points are ignored.

Unpacking the AS3000B

The AS3000B is shipped in an aluminium transit case to provide maximum protection. A typical arrangement is shown in Fig. 1.

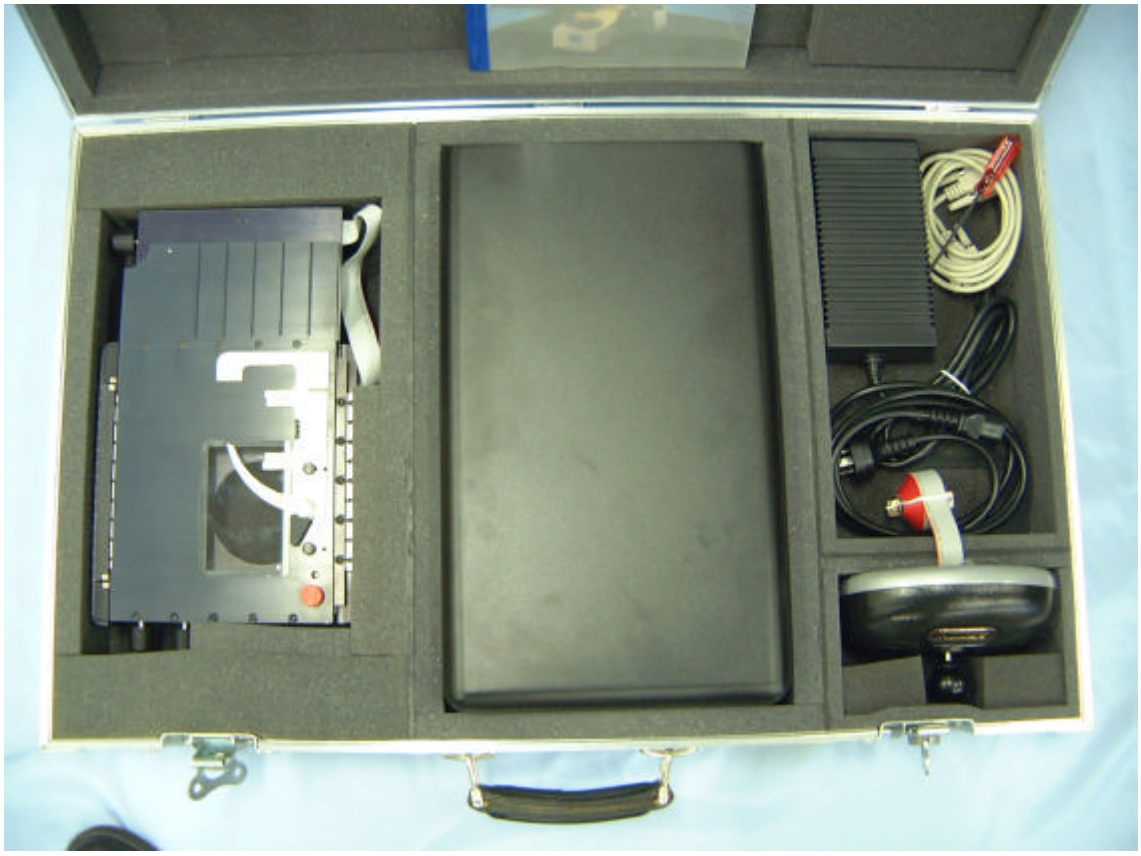

Fig.1 Typical arrangement of system in transit case

Remove the AS3000B carefully. The packing case should contain the items listed in Fig. 2.

Quantity	Item
1	Hardware Installation Guide (this book)
1	AS3000B stage with red shipping screw **(must be removed before use)**
1	Allen key (hex key) driver, 3 mm
1 set	Socket-head mounting screws to attach stage to microscope
1	EL300 Autoscan electronic controller box
1	JS300 joystick/keypad (with attached connection cable and 25 pin D-type connector)
1	Power supply for controller box, with separate power cable
1	Serial communications cable (male and female 9 pin D-type connectors)
1	Stage power ribbon cable (male and female 15 pin D-type connectors)
1	Stage logic ribbon cable (male and female 25 pin D-type connectors)
1	Floppy Disk or CD containing application software
1	User Guide for the application software

Fig. 2 Packing list

Mounting the AS3000B

Take care when handling the AS3000B and your microscope.
In particular, take care not to damage the objectives.

Figure 3 shows a close-up view of a typical stage mounting arrangement, exemplified by the Zeiss Axioplan2 microscope. In this instance, the Autoscan stage is fitted directly (in a matter of minutes) in place of the original Zeiss stage. The AS3000B is designed to fit most popular microscopes. In some cases, you must use an optional mounting plate, or (in the case of Olympus microscopes) a spare stage carrier which has been modified by us.

Please note that, unless noted otherwise, all of the examples shown in this Guide show the Zeiss Axioplan2, but apply equally for all other microscope brands and models.

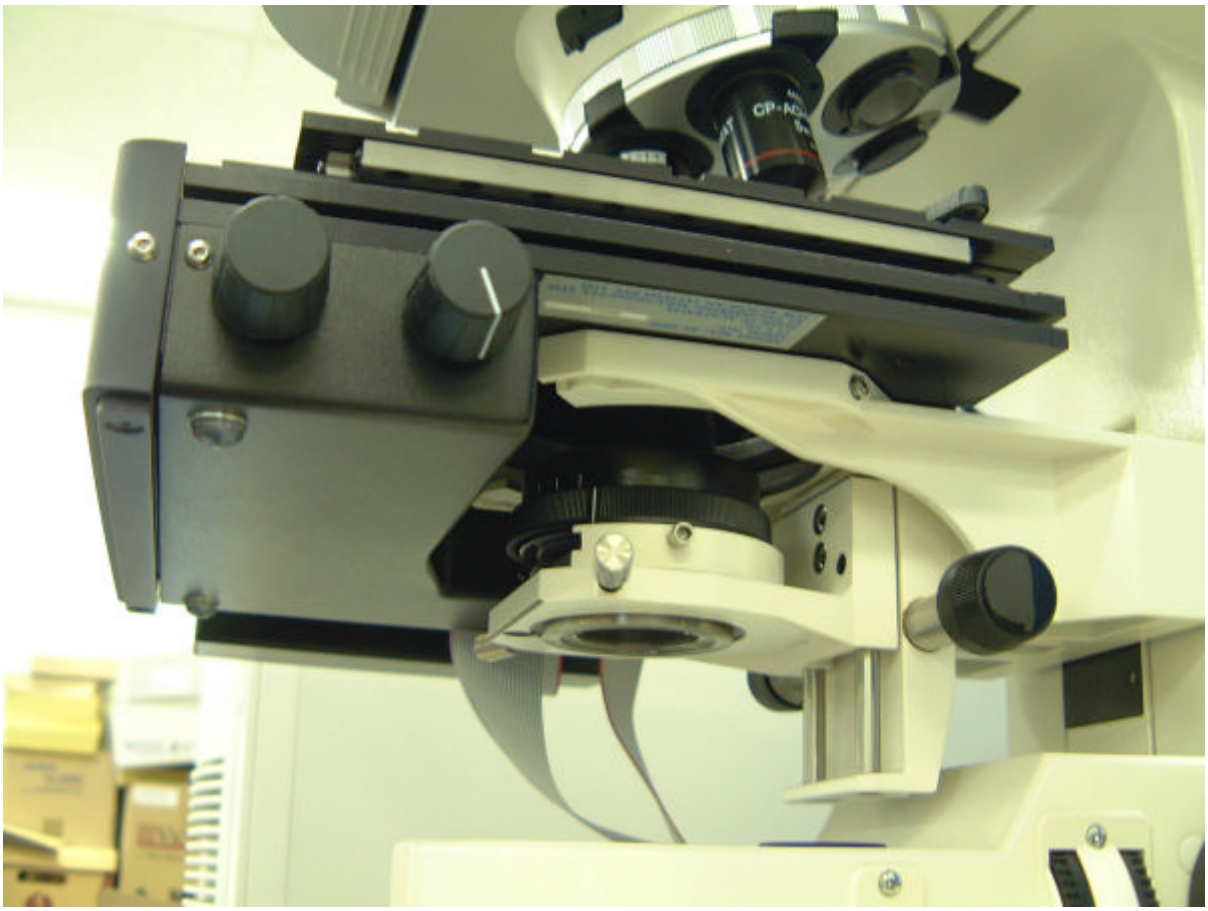

Fig. 3 Typical stage mounting arrangement

To mount the AS3000B, follow these instructions.

1. Remove the standard stage from your microscope. To do so, remove the mounting screws on the underside of the stage. Usually, there are four mounting screws. Store the standard stage in a safe place.
2. If an optional mounting plate is required, use the mounting screws supplied to attach the plate to the underside of the AS3000B.
3. Use the mounting screws you removed from the microscope (or the mounting screws provided with the AS3000B) to fit the AS3000B. Ensure that the AS3000B fits snugly, and take care not to damage the objectives on your microscope. In some cases, you may be able to remove the microscope nose-piece and/or condenser to facilitate fitting.
4. Remove the red shipping screw before using the stage (refer to Fig. 4). It is important that this screw be removed before use to avoid damage to the internal stage mechanism. The screw protects this mechanism in transit.
5. Proceed to mounting the CCD camera. Refer to next section for instructions.

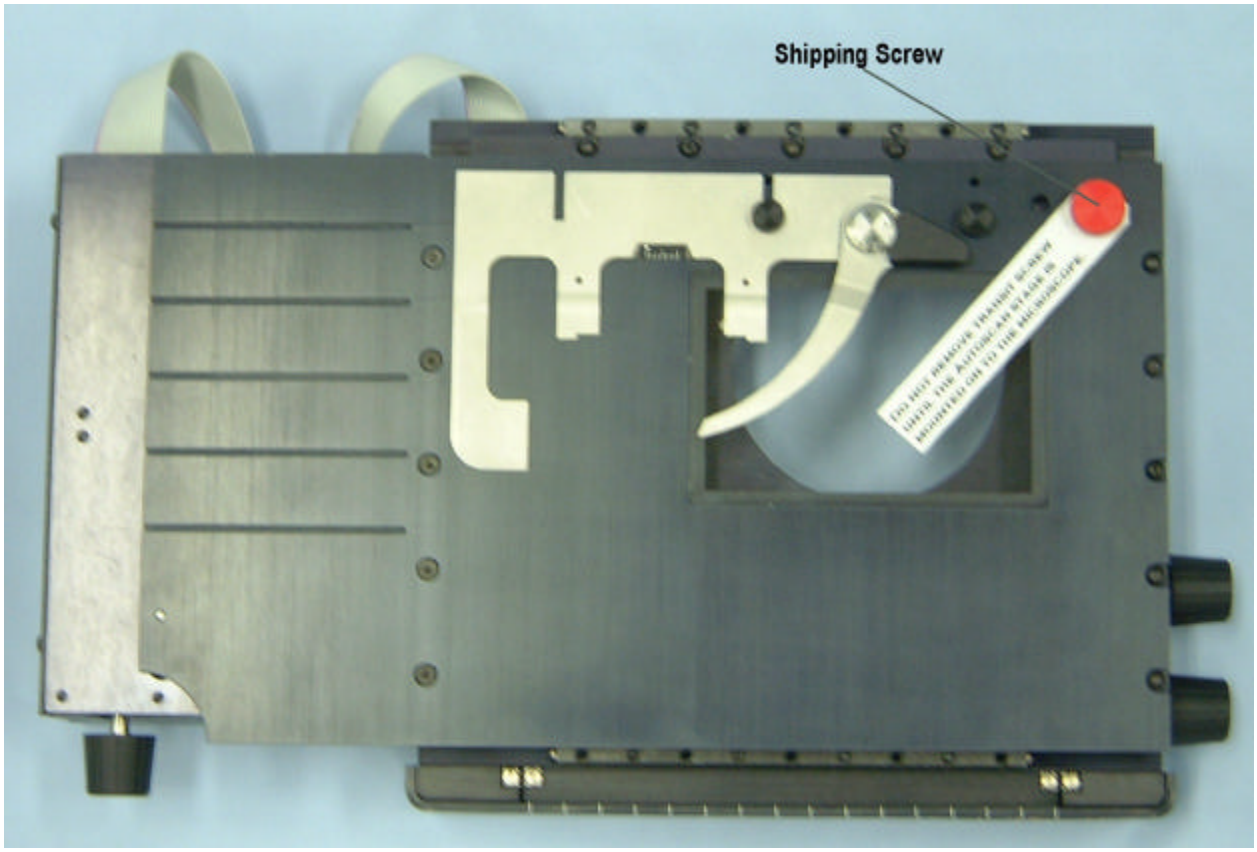

Fig. 4 Shipping screw on AS3000B stage
(must be removed before use !)

To mount the CCD (charge-coupled device) camera :

1. If not already fitted, fit a trinocular head (camera head) to the microscope. Follow the manufacturer's instructions. Please refer to Fig. 5 for an example of a trinocular head.
2. Fit the camera adapter (C-mount adapter) to the top of the trinocular head, and then screw the camera on to the C-mount adapter. The C-mount adapter converts the camera attachment on the microscope to the standard "C-mount" thread which is used on most modern cameras. To mount the CCD camera, simply screw it on to the C-mount. (Please refer to Figs. 6 and 7)
3. Connect the camera power supply and video leads to the camera, and make sure that the camera is mounted in the correct orientation - otherwise the image will not be displayed correctly.

To prevent dust from entering the microscope optics,
ensure that you keep the C-mount adapter covered or capped if you remove the camera.

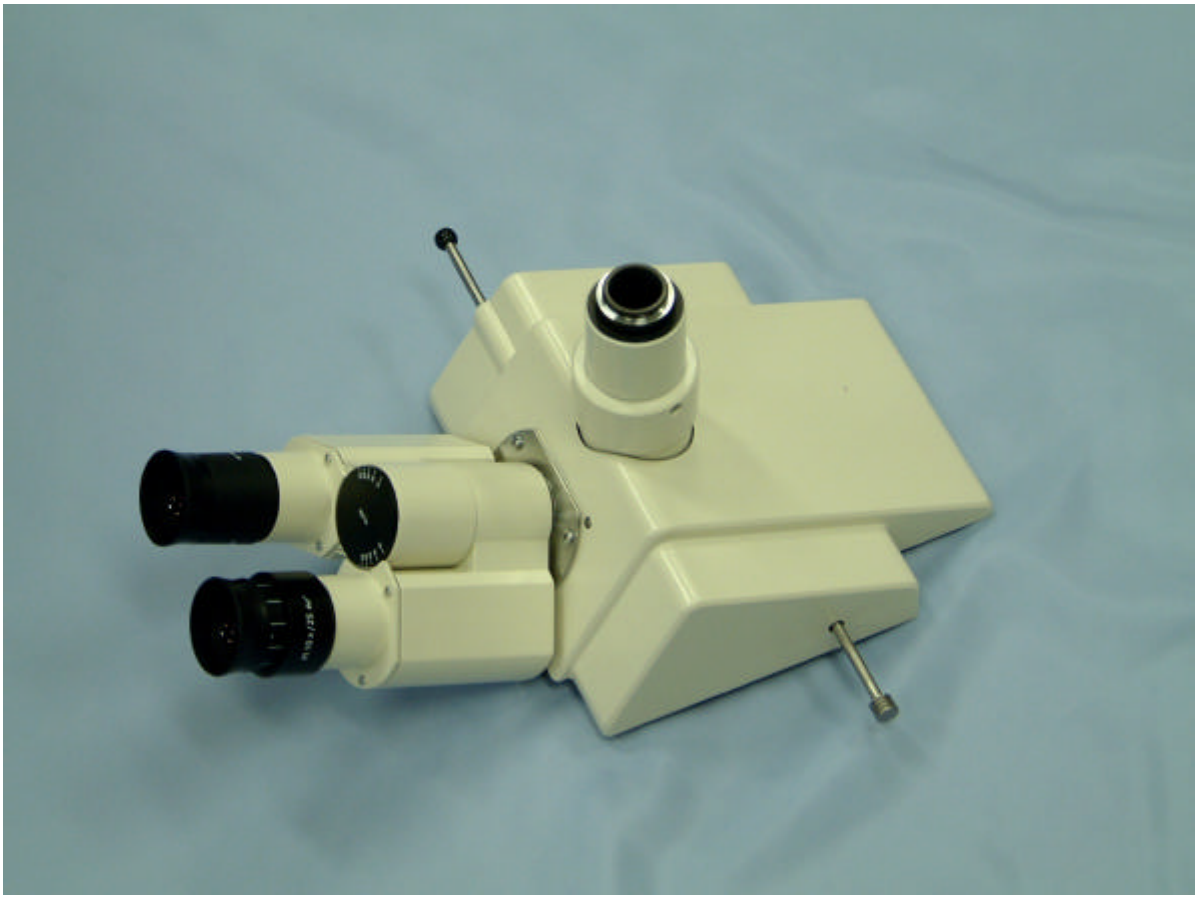

Fig. 5 Trinocular head / camera port

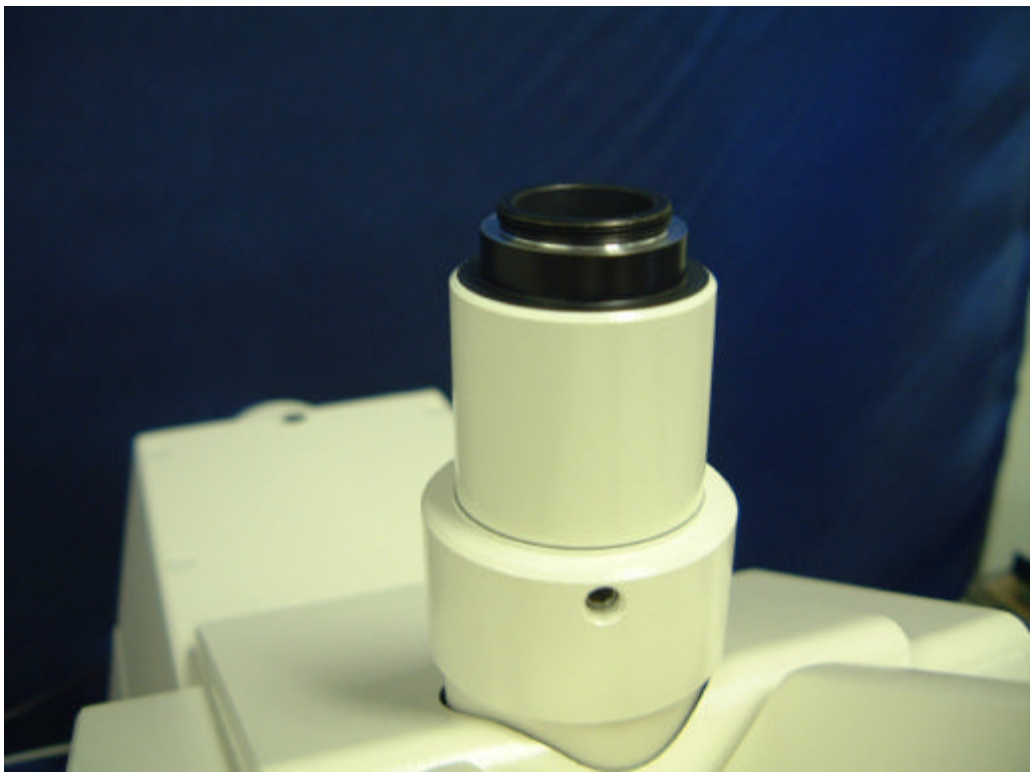

Fig. 6 C-mount adapter fitted to trinocular head

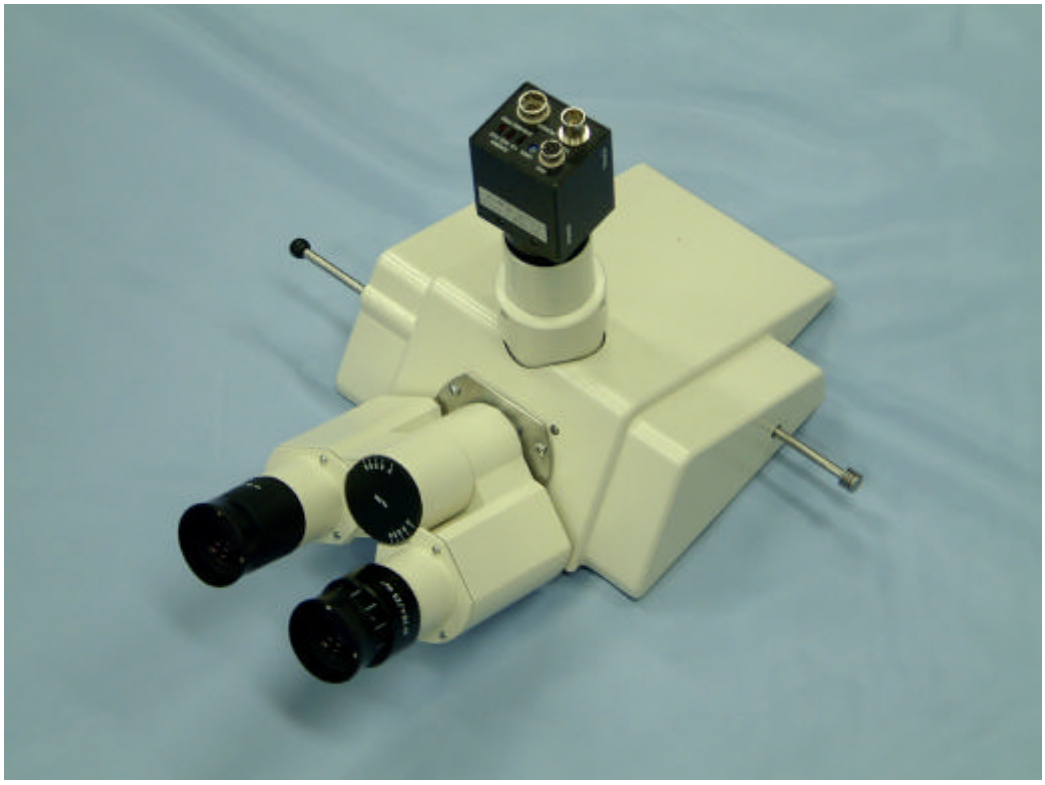

Fig. 7 CCD camera mounted on trinocular head with C-mount adapter

Connecting the AS3000B

Figure 8 shows a view of a complete Autoscan system consisting of an AS3000B microscope stage (mounted on a Zeiss Axioplan microscope fitted with CCD camera), EL300 electronic controller and JS300 joystick/keypad, connected to a computer which is running our AutoScope application software.

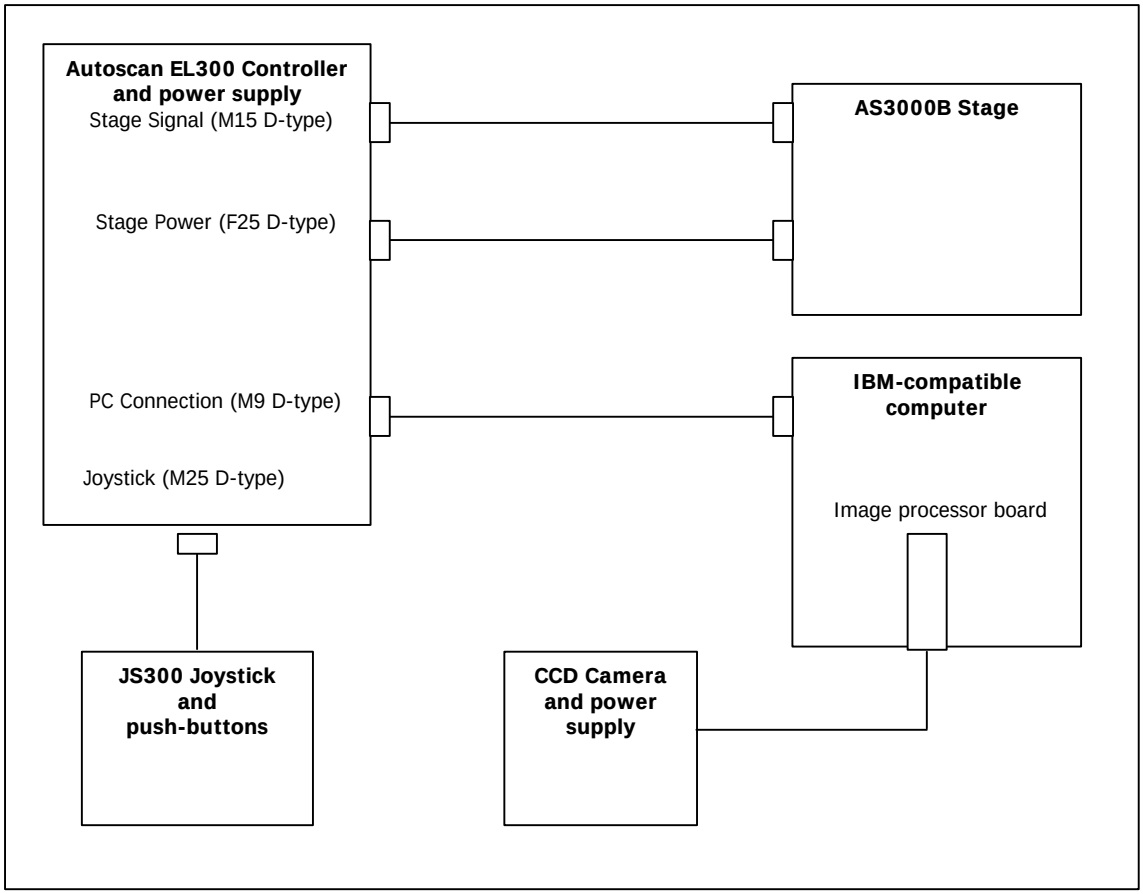

Fig. 8 Overview of typical complete system

The only thing left to do now is to plug in the four cables which connect the EL300 electronic controller with the stage, joystick and computer respectively, and the single cable from the CCD camera to the computer, as shown in Figure 8. Also, the EL300 electronic controller and CCD camera each have a power supply which must be plugged in. This completes the system connections.

Ensure that power is off before connecting any cables.
Check all connections carefully before turning power on.

All connectors are labelled on the back panel of the EL300 Autoscan electronic controller. Note that the EL300 uses a power adapter which converts the high-voltage mains electricity supply to the safe, low voltage used by the controller and the stage system.

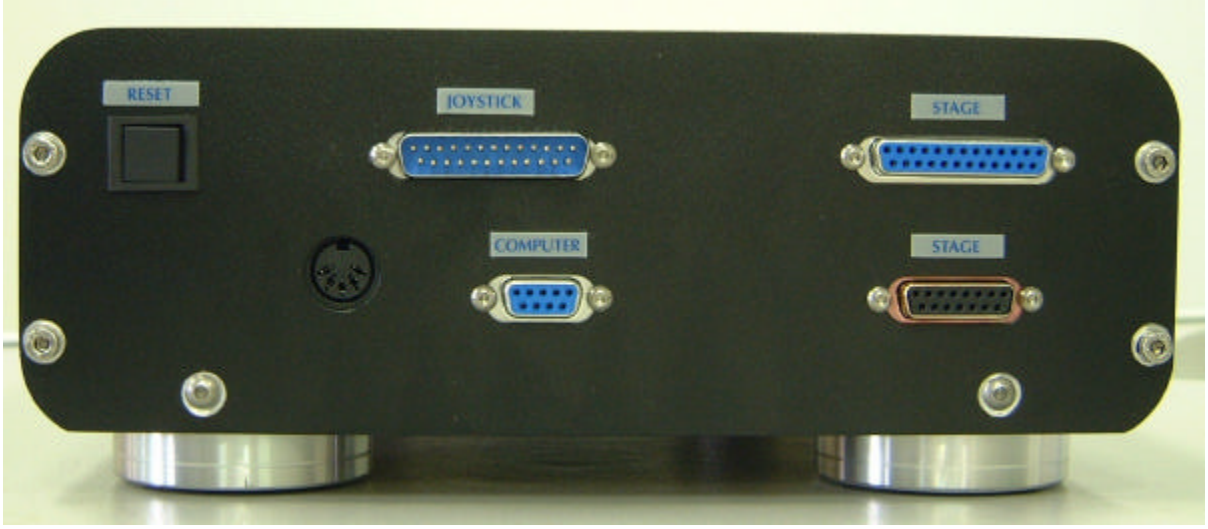

Fig. 9 Cable connections on back panel of EL300 electronic controller

The power supply which provides the electrical energy for the Autoscan stage system is shown in Figure 10.

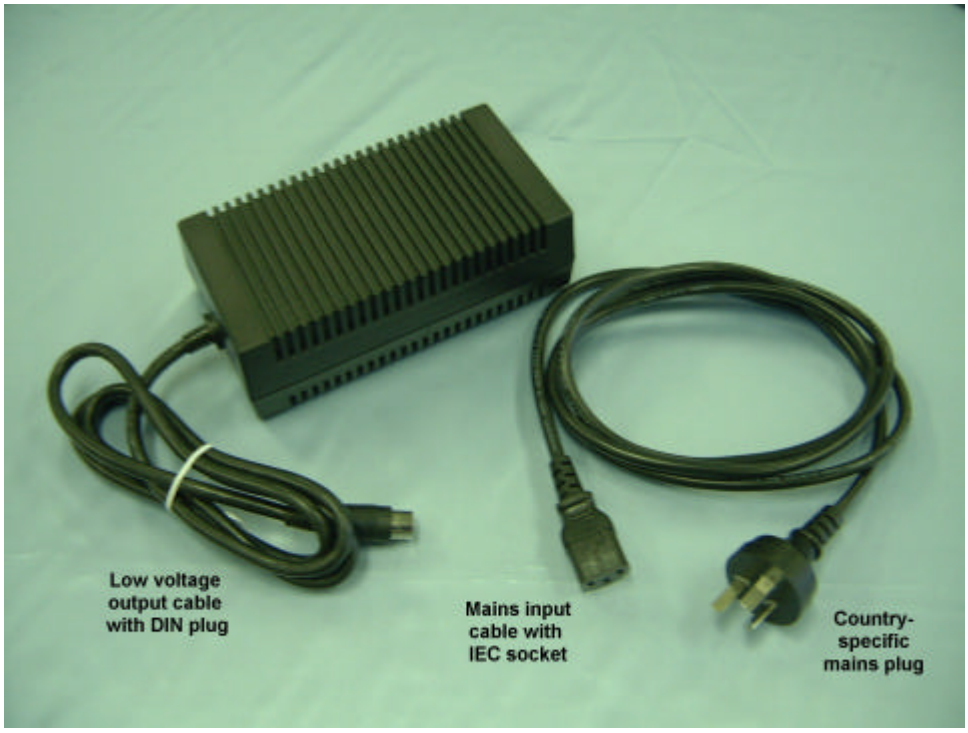

Fig. 10 Low-voltage power supply unit

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CHARACTERISTICS OF THE MAJOR SYSTEM COMPONENTS

AS3000B STAGE

The AS3000B stage is a 3-axis, dc-motor driven, high-precision positioning platform. It incorporates three servo motors which continuously report their location back to the EL300 electronic controller, so that the controller knows the exact stage location at all times. In order to protect the stage mechanism, the AS3000B stage incorporates limit switches. Whenever power is applied to the stage, this will be indicated by an LED indicator, which is situated at the left front corner of the stage.

AS3000B STAGE LIMIT SWITCHES

The limit switches protect the AS3000B stage mechanism from damage through inappropriate stage movement. There are 6 limit switches in total - two for each axis. The limit switches turn off power to the stage motors at the extremes of travel, and prevent further stage movement. You will hear a quiet click whenever a limit switch is engaged. At this point, the stage is said to be “in a limit region”. In joystick movement control, when the stage is in a limit region, the joystick can only be used to move the stage out of the limit region, not further into it. To return to normal behaviour, the stage must be moved out of the limit region, past the point where the limit switch can be heard to click again. This can be done manually (using the manual stage movement knobs), with the joystick, or under computer control.

JS300 JOYSTICK

The JS300 joystick is a true 3-axis joystick, which also incorporates four pushbutton switches. The joystick is used by moving the control shaft left and right to move the stage in the X-axis, forward and backward to move the stage in the Y-axis, and twisting the joystick knob clockwise and anticlockwise to move the stage in the Z-axis. Increasing the shaft deflection increases the stage speed. The pushbutton switches are used for various purposes in the application software programs, but pushbutton “2” has a special function : it initiates the so-called “Turbo” mode. The Turbo mode allows the user to move the stage more quickly, for large movement steps. To use the Turbo mode, hold down Joystick Key 2 while moving the joystick. The joystick contains an LED indicator bar (situated in front of the joystick shaft) which shows that the joystick is powered up. As well as this, the indicator bar changes colour when either joystick key 2 or 4 (to the left and right of the joystick shaft) is pressed.

EL300 CONTROLLER

This unit contains the servo controller which monitors the state of the stage at all times. The servo controller is based on a micro-controller chip (a computer on a chip), and a separate, proprietary, Autoscan “firmware” program, which controls the actions of the EL300. The AS3000B stage motors continuously report on their position to the EL300, and the stage limit switches are continuously interrogated by the EL300. Connections are simple : two cables (a power cable and a logic cable) connect the AS3000B stage to the controller box, one cable connects the JS300 joystick to the controller box, and one cable connects the controller box to the computer. All sockets are marked for easy identification, and all plugs are different. The electronic controller box also contains a power-on LED indicator at the front left corner.

POWER SUPPLY UNIT

This unit is what is known as an “external switch-mode power supply”. It plugs into the mains power anywhere in the world by means of a so-called “IEC connector”. Cables which have these connectors on one end, and the appropriate local plug on the other, are now readily available in most parts of the world. The power supply automatically adjusts for the various supply voltages and frequencies in the various countries around the world. Its output is a safe, low voltage which is applied to the components of the Autoscan stage system.

CONTROL OF THE AS3000B STAGE SYSTEM

The AS3000B stage can be controlled by the user in three different ways :

1. Manual control
In this mode, the user can move the stage by using one of the three manual movement knobs of the AS3000B stage. The movement axes are defined as follows :

X-axis : (left-right movement) knob located at right hand side of stage
Y-axis : (forward-backward movement) knob located at left front of stage
Z-axis : (focus, or up-down movement) knob located at right hand side of stage, behind X knob

Stage movement control is summarised in Fig. 11 :

AXIS	Movement	1 turn =	CW turn of knob =	Movement range
X-axis	left/right	500 microns	top plate to right	75 mm
Y-axis	forward/backward	500 microns	top plate forward	50 mm
Z-axis	up/down	50 microns	top plate down	3 mm

Fig. 11 Summary of AS3000B stage movement control knob actions

To assist in accurate control of stage focus movement, the AS3000B stage also incorporates a focus indicator. This indicator is located at the front of the AS3000B stage and consists of 16 lines and a white wedge-shaped indicator. For each vertical movement of 200 microns of the AS3000B stage top plate (4 rotations of the control knob), the white wedge-shaped indicator will move over by one line.

2. Joystick control

In this mode, the user can control movement of the stage by use of the joystick/keypad unit. The control shaft directions and joystick buttons are identified in Fig. 12.

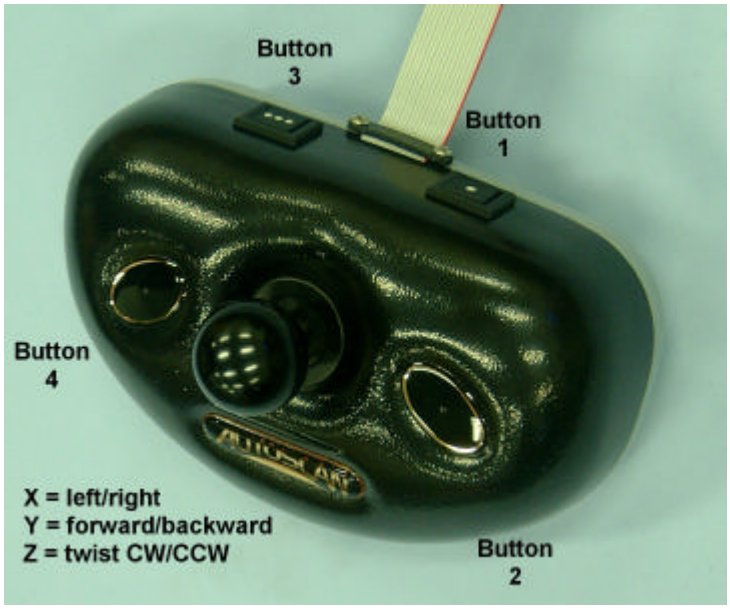

Fig. 12 Joystick control shaft directions and buttons

When using the joystick, move the control shaft left and right to move the stage in the X-axis, forward and backward to move the stage in the Y-axis, and twist the knob clockwise and anticlockwise to move the stage in the Z-axis. Increase the shaft deflection to increase the stage speed, and use joystick key 2 to go into Turbo mode for an even greater range of stage speeds. Fig. 13 summarises the effect of various joystick movements on the stage.

Joystick movement	AS3000B stage movement axis	Top plate moves
Left	X - axis	Right
Right	X - axis	Left
Forward	Y - axis	Backward
Backward	Y - axis	Forward
Clockwise	Z - axis	Up
Anticlockwise	Z - axis	Down

Fig. 13 Effect of joystick on AS3000B stage movement

Movement of the stage is a complicated issue. Imagine looking through a keyhole at a train moving toward the left of your field of vision. There are two ways to interpret what you see :
1. The image of the train is moving to the left, and you are stationary, so the train must be moving to the left.
2. The image of the train is moving to the left, but the train is stationary, so you must be moving to the right.
Einstein had a lot to say about how it is often impossible to say which of these is the reality. The impact of this problem on our systems is that we can define “stage movement” in several ways :

1. Physical movement of the top plate of the AS3000B stage
2. Apparent movement of the image across the field of view
3. Apparent movement of the “keyhole” through which the image is viewed
4. Movement of the internal mechanics of the stage
5. Increase or decrease of the numbers stored in the electronic counter of the EL300 controller box, which represent current stage location.

The above definitions of “direction” are further complicated by the fact that various image reversals can take place in the microscope and camera parts of the system.

3. Computer program control

It is possible to purchase various application software programs from Autoscan. Our programs have been developed under Windows NT, and will function in all Windows-type environments running on IBM-compatible hardware platforms. Among our products are :

1. Trakscan - a program specifically aimed at facilitating the geological technique of Fission Track Dating.
2. AutoScope - a software suite which incorporates image processing capabilites, and is aimed at a variety of applications, including radiation protection and applications in biological disciplines.
3. Irradiate - a software product which facilitates a biological technique called microbeam technology.
4. ASDK (Autoscan Software Development Kit) - this is a kit which allows users to incorporate calls to our stage functions from within their own custom software packages.
5. Device drivers for third party software - we are engaged in a continuous program of developing device drivers which allow use of our stages from within other commercial programs.

Testing the ASSEMBLED installation

To test the completely assembled installation:

1. Check that all connectors are in place.
2. Switch on power to the Autoscan EL300 electronic controller and the microscope.
3. Use the joystick to move the stage through the X, Y and Z axes. Check that the stage actually moves. Note that in the normal speed mode, movement is very slight - you must watch the stage carefully to detect any movement. If the stage moves normally, test the Turbo mode by pressing joystick key 2. If the stage reaches a limit switch, a faint click will be heard as the limit switch engages. The stage will not move any further in that direction. Use the joystick to move the stage out of the limit region.

The above steps confirm that the stage and joystick are properly connected to the EL300 electronic controller, and that the JS300 joystick and EL300 controller are working correctly.

Maintenance

Introduction

The AS3000B is a precision scientific instrument, and should be handled appropriately. Please do not subject the stage to rough handling or exposure to adverse environments, such as high temperature, high humidity, or excessive airborne contamination.

The moving parts of the AS3000B stage should be oiled approximately every 100 working hours. If the AS3000B is used continuously during normal working hours, this equates to approximately once per month.

If you do not wish to carry out this maintenance yourself, please contact Autoscan for details of available maintenance agreements.

Tools

The following tools are required:

- 2mm Allen key driver.
- 2.5mm Allen key driver.
- 3mm (1/8-inch) Flat-blade screwdriver.
- Ethanol.
- Compressed air (if available).
- Light machine oil. We suggest SingerTM or a " 3-in-1" oil.
- Lint-free cloth.
- Soft toothbrush.

Disassembly

Take care when handling the A93000 and your microscope.
In particular, take care not to damage the objectives on your microscope.

To disassemble the AS3000B:

1. Refer to Figures 14 to 16.
2. Remove the AS3000B from the microscope, using the Allen key driver provided.
3. Turn the AS3000B over on to a soft, clean and dry surface.
4. If necessary, remove any adapter plates from the bottom of the stage.
5. Remove the 4 screws from the Y-drive cover at lower left, and put the cover aside.
6. Remove the screws from the main bottom cover, and put the cover aside. (Because two "D-type" connectors protrude through the main bottom cover, you must tilt the cover as shown in Figure 15 to remove it. Figure 16 shows all covers removed. When re-assembling, follow this process in reverse.)

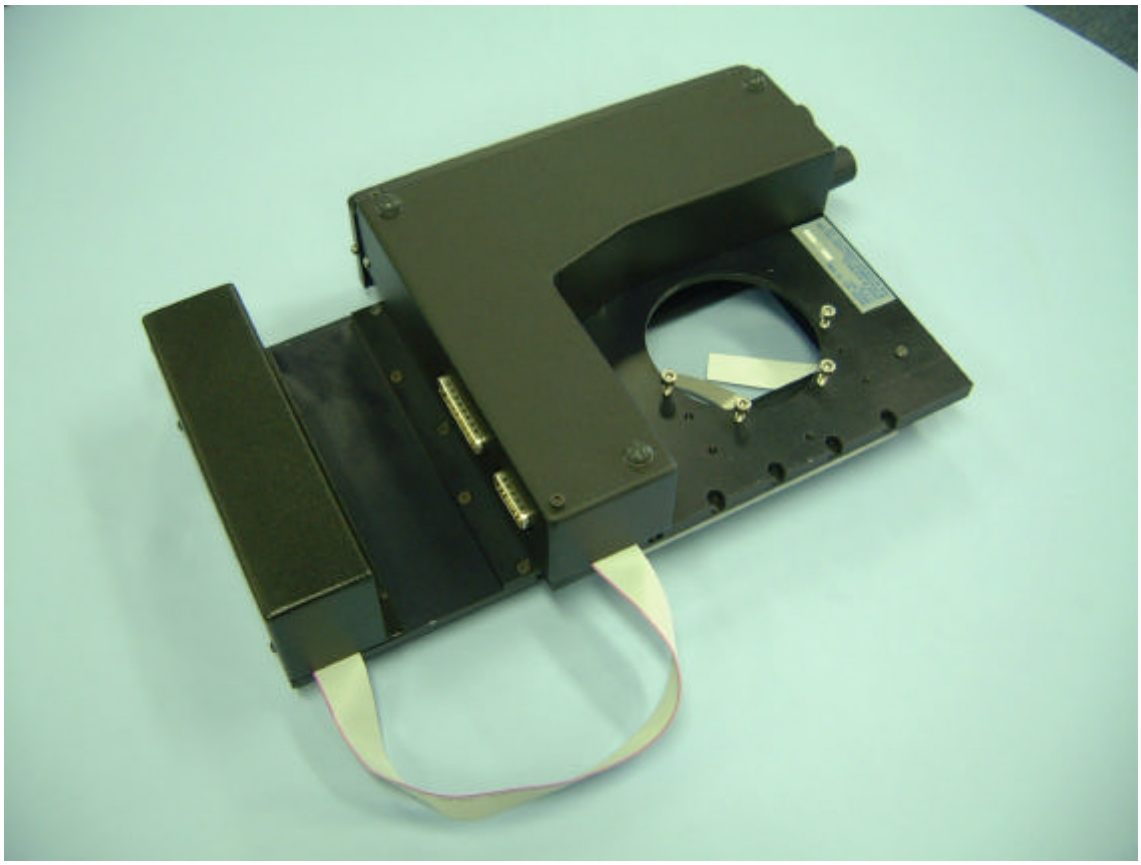

Fig. 14 Underside of AS3000B stage - ready for disassembly

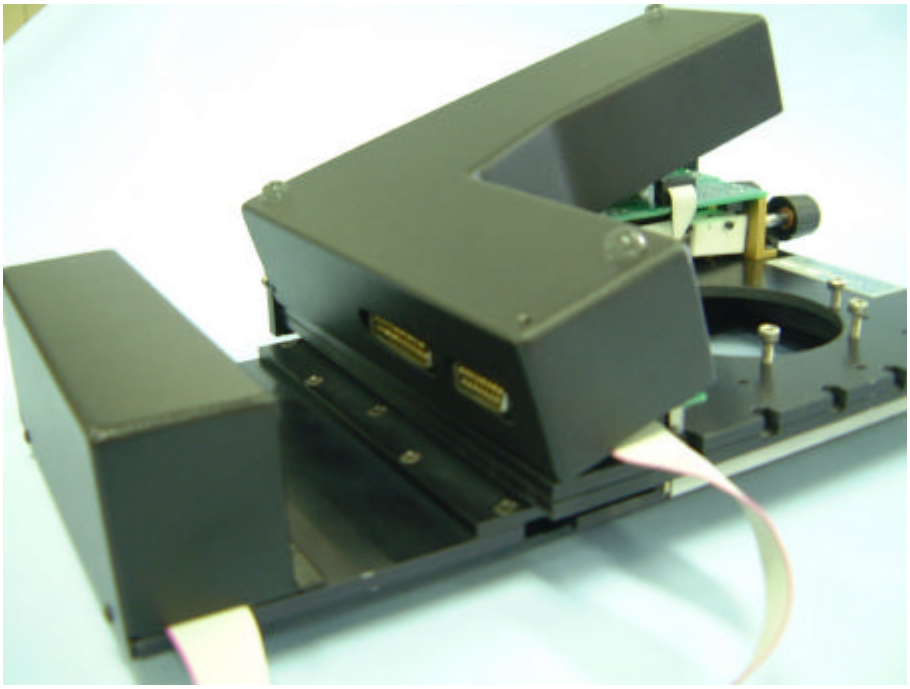

Fig. 15 Removing the bottom cover of the AS3000B stage

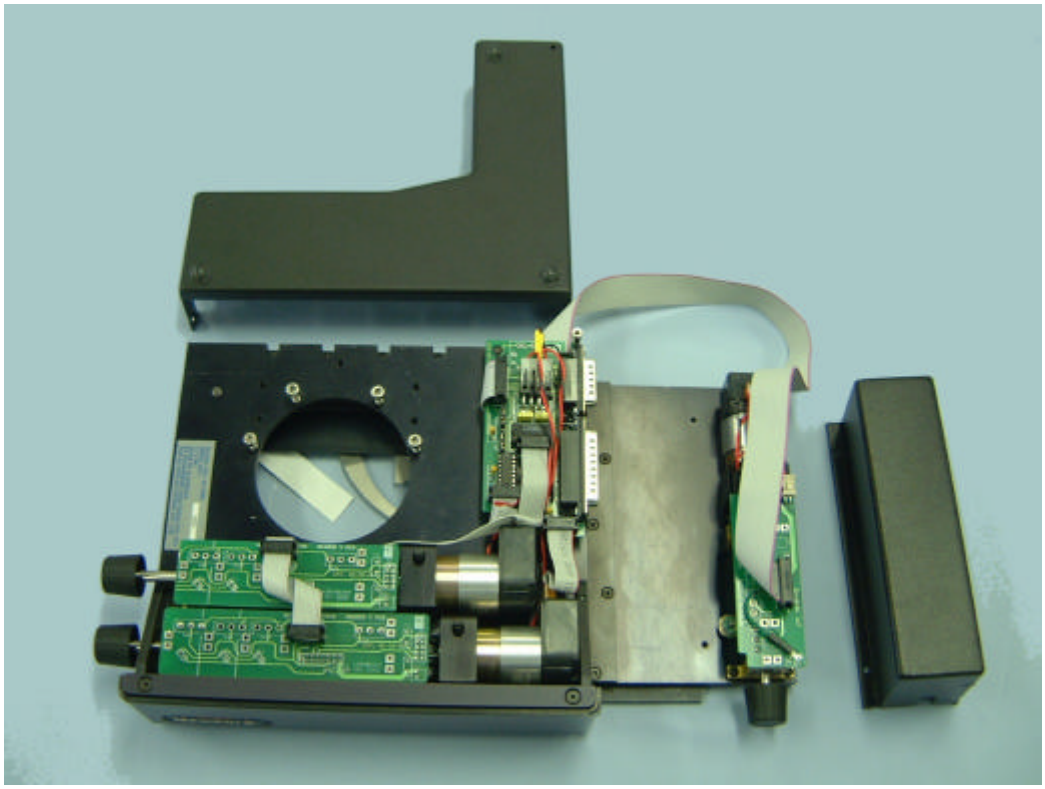

Fig. 16 All covers removed

Cleaning and Lubrication

To clean and lubricate the AS3000B:

1. Please refer to Figure 17.
2. Remove the three green circuit boards (one near each manual drive knob) to expose the leadscrews, ready for lubrication. Be careful not to damage the attached ribbon cables. Each board is held in place by two clips, which clip on to the bearing housing at each end of each leadscrew. Place each of the circuit boards beside its leadscrew to avoid contaminating it with oil.
3. Wipe any accumulated dirt or dust from the drive screws and surrounding area, using a lint-free cloth.
4. Clean the threads on the drive screws using an old toothbrush and a small quantity of ethanol. In particular, make sure to remove any large particles which may jam. Do not use any cleaning agent which leaves a residue. We do not recommend the use of Freon™ or any other environmentally-hostile agents.
5. Clean the linear bearing guides at the front, rear, left and right in the same way. These are the shiny steel bars on which the mechanism slides.
6. Tilt the stage to let any excess ethanol run off. Wipe off any excess.
7. Apply one drop only of light machine oil to each of the three points indicated in Figure 17.
8. Use the knobs to turn the screws, thus working the oil into the threads.
9. Wipe off any excess oil.
10. Replace the three green circuit boards.
11. Clean the covers and refit them. Take care not to over-tighten any screws : finger-tight is sufficient.

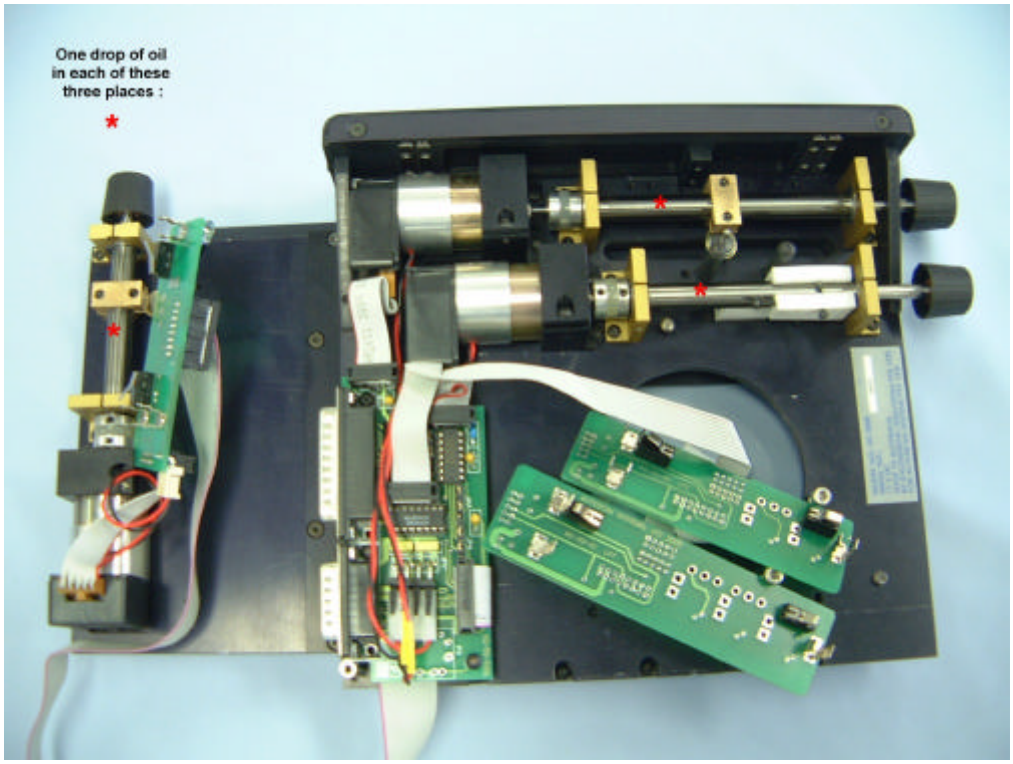

Fig. 17 Disassembled AS3000B stage - ready for cleaning and lubrication

General maintenance checks

Carry out the following general checks whenever you disassemble the AS3000B:

1. Check any loose screws and re-tighten if necessary.
2. Check for wear and loss of accuracy in moving parts. This will be apparent in freedom of movement. Contact Autoscan if this occurs. In some cases this can be rectified by adjustment. In other cases, it must be rectified by replacing worn components.
3. Check that the limit switches operate at the end of travel in each axis. To do so, manually move the stage to the limit of its travel in each axis. You should hear a quiet click when each limit switch operates. The exact position at which this occurs is factory-set.

If you have any doubts or queries, please contact Autoscan Systems for assistance, advice and spare parts.

Trouble-shooting

Trouble-shooting lists some common problems, probable causes and suggested solutions.

Problem	Probable cause	Solution
Stage does not move, software halts	Software awaiting response from Autoscan controller	•Ensure power is on (check the LED light on the front of the stage, listen for the fan in the controller, check the controller) •Check all cables Move stage manually to ensure it is not in limit switch area •Check software is configured for the correct serial port.
Stage moves to one side when switched on	As above	•Check joystick cable, and make sure it is properly plugged into the controller.
Movement in one axis only, or no movement, but software is OK.	No digital data, or no power to one axis.	•Check all cables, especially the two between the stage and the Autoscan controller.
Focus not working.	No digital data, or no focus power.	•Check all cables, especially the two between the stage and the Autoscan controller.
Stage "runs away" when switched on.	No digital data to one axis.	•Check all cables

Fig. 18 Trouble-shooting chart

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