

OptiScan III

Motorised Stage Systems
Manual Version 1.3



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Many thanks for purchasing an OptiScan III – we hope and expect that it will prove to be useful, reliable and an asset to your microscopy work. Please do take the time to read this manually thoroughly before attempting installation and use. This document contains both important safety information as well as advice on how to install and operate the product successfully to avoid damage. If you have any problems with this product, please do not hesitate to contact Prior.

IMPORTANT SAFETY INFORMATION

SECTION I

- **Save this manual as it contains important safety information and operating instructions.**
- Use only as specified by these operating instructions or the intrinsic protection provided by the unit may be impaired.
- Before using the stage system, please follow and adhere to all warnings, safety and operating instructions located on the product and in this User Manual.
- It is safe for use in an ambient temperature from 5 to 40°C with relative humidity (RH) to 80% up to 31°C decreasing linearly to 50% RH (relative at 40°C).
- Do not expose the product to water or moisture while energised.
- Do not expose the product to extreme hot or cold temperatures.
- Do not expose the product to open flames.
- Do not allow objects to fall on or liquids to spill on the product.
- Do not replace detachable mains supply cords by inadequately rated cords.
- Connect the AC power cord only to designated power sources as marked on the product.
- Make sure the electrical cord is located so that it will not be subject to damage.
- Make sure the system is installed so that the front panel power switch is easily accessible.
- For use in a manner not specified in this manual contact Prior before any work is done.

- To reduce the risk of damage, unplug the product from the power source before connecting the components together.
- **DANGER** - never alter the AC cord or plug. If the plug will not fit into the outlet, have a proper outlet installed by a qualified electrician.
- Only suitably rated and approved mains cord-sets should be used as per the country of use.
- Use only the proper type of power supply cord set (provided with the system) for this unit.
- The OptiScan III is class I and must be only connected to a power outlet which provides a protective earth (ground).
- Do not attempt to disassemble the product. Doing so will void the warranty. This product does not contain consumer serviceable components. Service should be performed by Authorised Service Centres.
- Only the exterior of this product should be cleaned using a damp lint-free cloth.
- This warning sign indicates there is a high voltage danger.



In accordance with The Waste Electrical and Electronic Equipment Regulations, this symbol indicates that the product must not be disposed of as unsorted municipal waste but should be collected separately. Refer to your local authority in the EU for return and/or collection systems available in your country.

UNPACKING THE SYSTEM

SECTION 2

The OptiScan III System consists of the OptiScan III Controller as described above and one or more of the following components A-H.

Component	Component Description
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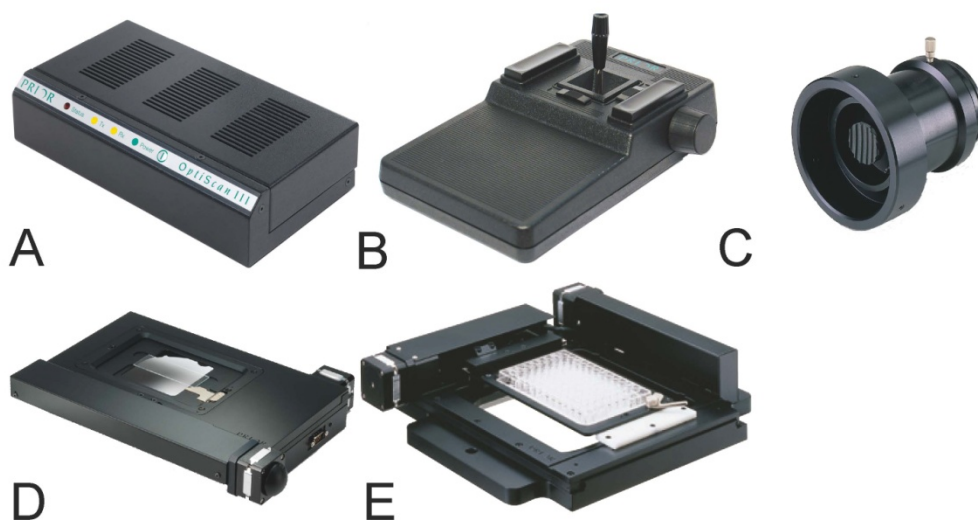
A	Model ES11 Control Unit
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B	Model CSI52DP Joystick
---	------------------------

C	Model PS3H122 Focus Drive
---	---------------------------

D	Model ES111 Stage for Upright Microscopes includes 15 pin cable
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E	Model ES107A Stage for Inverted Microscopes includes 15 pin cable
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2.1 Other Accessories

H122KLC Solid Couple Adapter for Focus Drive on Leica

H122KBIX Direct fine focus coupling kit for Olympus IX/BX Microscopes

H122KON Solid Couple Adapter for Focus Drive on Olympus/Nikon

H276 RS232 cable for PC (9 or 25 pin)

H277 RS422 cable for Macintosh (8-pin Mini Din to 9 way D Type)

Note: Make sure that all of the components that should be included with your OptiScan III System have been supplied. If parts are missing, please contact your local Prior Dealer

INSTALLATION

SECTION 3

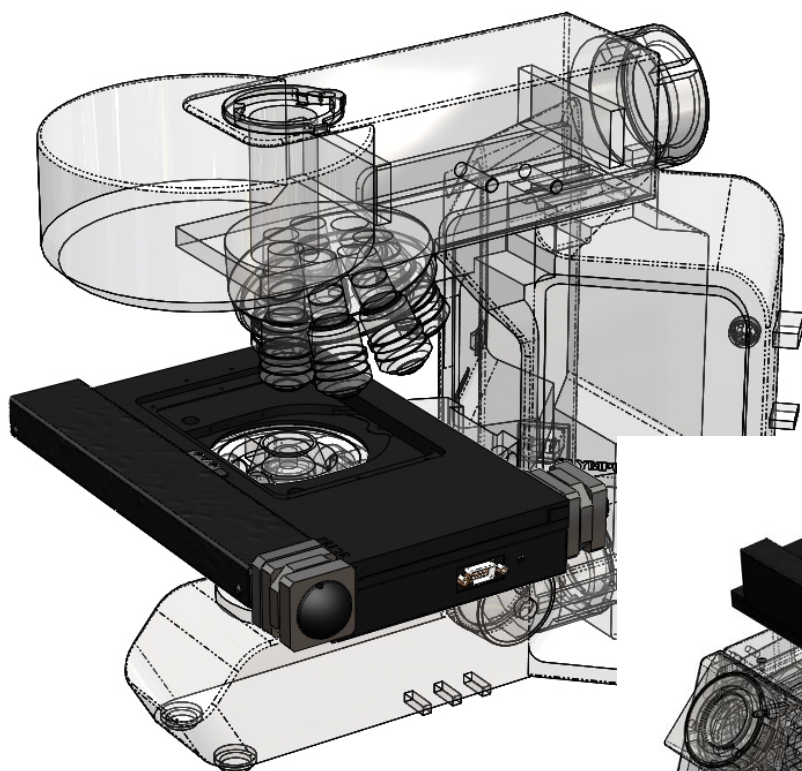
3.1 Removing an Existing Stage

To avoid damage to the optics when removing an existing stage, ensure that the distance between the objectives and stage is maximised, and that the condenser is clear of the stage.

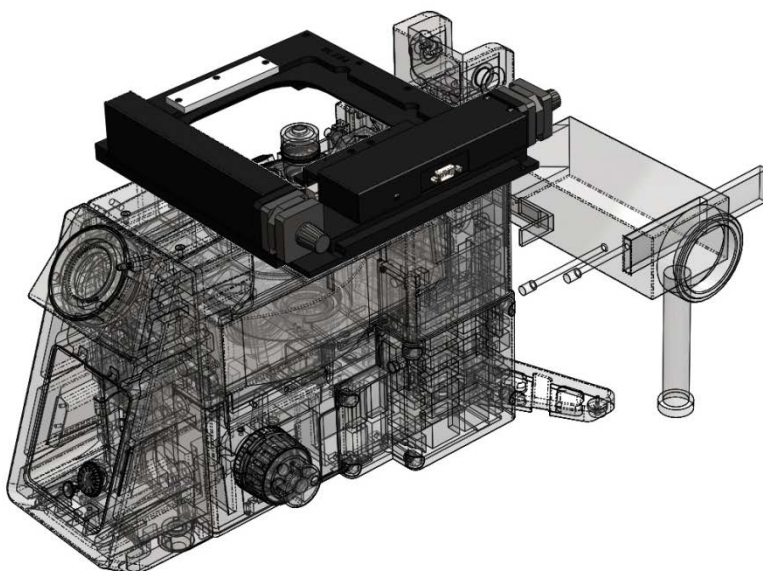
Removal of the stage is normally a straightforward procedure, in most cases just by the removal of fixing screws or the loosening of a clamp screw.

3.2 Fitting the OptiScan III Stage

The Prior OptiScan III stage is supplied with a base plate insert to suit the microscope specified. Place the stage onto the microscope stage mount and attach using the fixing crews or clamping screw supplied. Confirm that the OptiScan III controller unit is switched off before connecting the stage to the controller with the lead provided (see diagrams below).



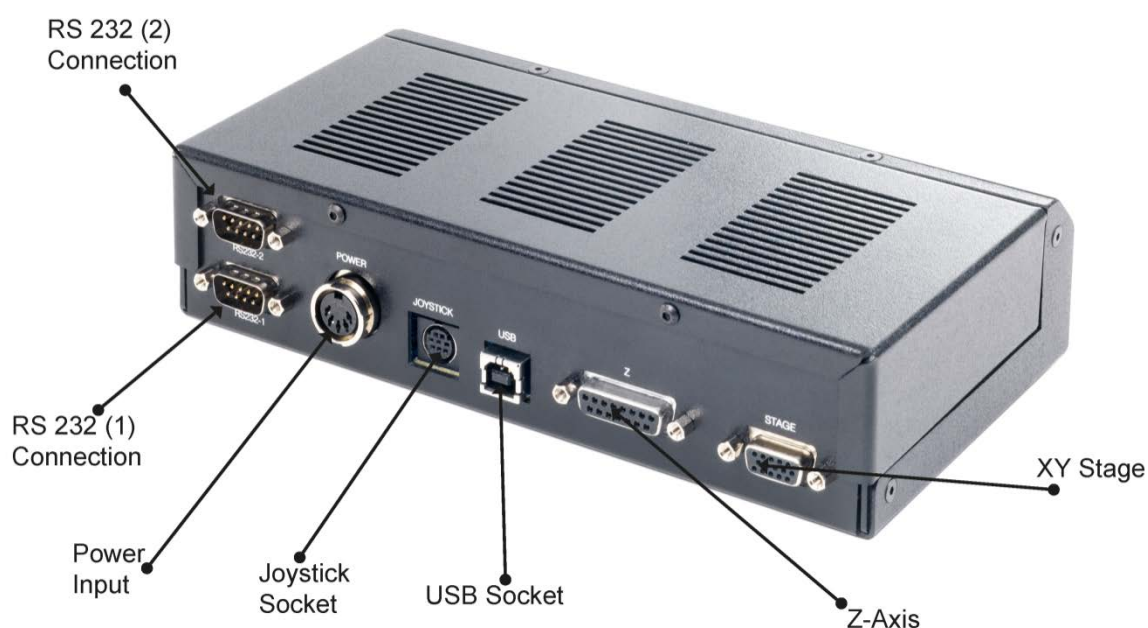
Shows the position of the OptiScan III stage on a typical upright microscope



Shows the position of the OptiScan III stage on a typical inverted microscope

3.3 Cable Connections

The cable connections to the OptiScan III controller are located on the rear panel of the control box, as shown in the illustration below. Before making any of these connections, ensure that the OptiScan III controller is switched off. Each connection is labelled. Do not connect your computer's serial port cable to the 'Z' axis connector on the controller, this may damage your computer and the OptiScan III controller. The RS232 connection from your computer should be made to the RS232-I port on the controller.

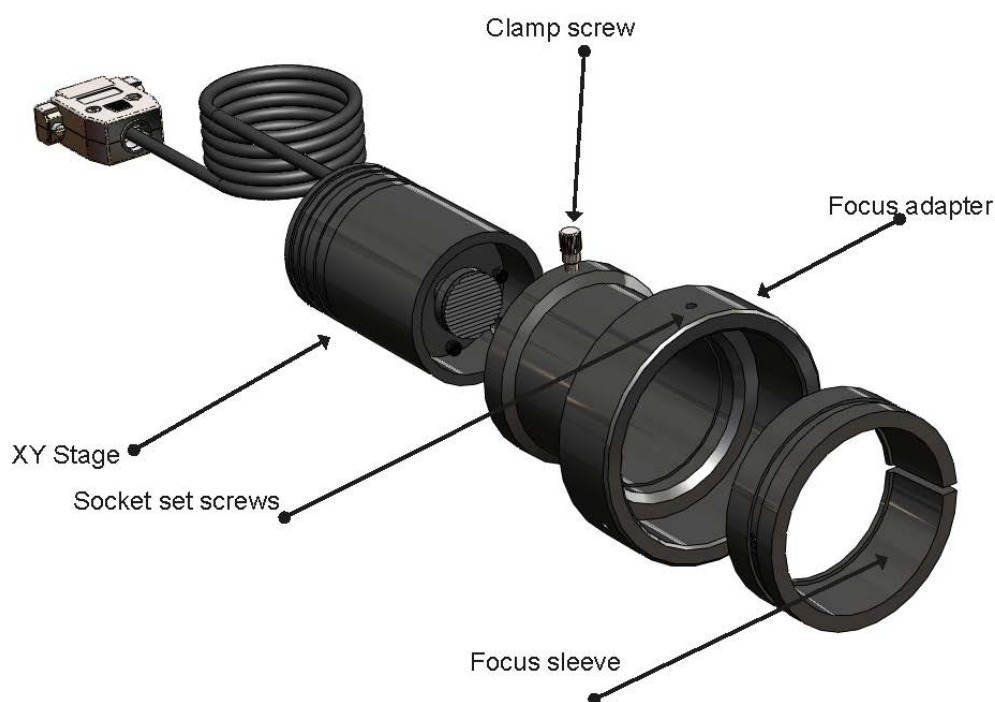


3.4 Focus Drive Installation

For installation procedure for Zeiss Axio range (HI22AXIO and HI22AXIE), Leica DML range (HI22LB), and direct coupling models, see Appendix A.

The following instructions refer to the standard split sleeve mounting.

1. Loosen the clamp screw on the focus motor assembly and remove the focus motor from the focus adapter.



2. Loosen the 3 socket set screws around the periphery of the focus adapter using a 2mm Allen wrench until the focus sleeve is able to fit inside the adapter. Note that it is important to insert the sleeve in the correct orientation with the lip furthest inside the adapter (the chamfered edge of the sleeve will be inserted first). Note the orientation of the sleeve as it has a recess around its outer surface, which will hold the sleeve in when the setscrews are tightened. This recess must line up with the tips of the socket set screws.

3. With the sleeve in place, tighten the 3 socket set screws in sequence until they all just touch the sleeve, ensuring that the split in the sleeve does not line up with any of

the set screw positions. **DO NOT TIGHTEN UP ANY OF THE SETSCREWS AT THIS STAGE.**

4. Push the adapter onto the preferred coarse knob of the microscope as far as it will go. The controller is factory configured to drive the focus motor in the correct direction when mounted to the right hand side of an upright microscope. If the left hand coarse control knob is preferred by the user or the focus drive is to be mounted on an inverted microscope, the motor direction can be reversed by using a PC with a terminal emulation programme e.g. Prior Terminal and changing the settings of the ZD command (see section 6) via RS232 communication.

The inside fitting diameter of the sleeve is designed to be slightly larger than the coarse knob, provided the setscrews have not been tightened and are compressing the sleeve.

5. While holding the adapter in place, tighten the set screws in sequence only enough to secure the unit onto the coarse focus knob. The focus knob will have to be rotated to gain access to all of the screws.

6. Check that the unit has been tightened sufficiently by taking hold of it and turning it. If the adapter is correctly fitted it will stay attached to the coarse knob.

7. Slide the focus motor into the adapter as far as it will go and while applying gentle pressure to the motor, tighten the clamp screw. This will hold the motor in place. The rubber drive bush on the end of the motor spindle should now be pressing against the end surface of the fine focus control knob. This can be confirmed by manually rotating the exposed fine focus knob on the opposite side of the microscope and feeling for the resistance caused by the detent positions of the stepper motor as it rotates. This will not cause any damage to the focus motor.

8. Confirm that the controller is switched off before connecting the 9 way D type plug on the focus motor lead to the socket on the rear of the controller.

GETTING STARTED SECTION 4

Switch the OptiScan III controller unit on using the On/Off switch located on the front panel. There are three LED's on the bottom left of the front panel. The 'status' LED should be illuminated to indicate correct operation. If this is not the case refer to section 7. The 'TX' (transmit) LED will flash rapidly when data is being transmitted by the controller and 'RX' (receive) LED flashes rapidly when receiving data from computer RS232.

The OptiScan III system can be controlled via RS232 serial port, USB connection or by using the joystick. When the components are connected to the controller correctly, the system will automatically configure itself which means that the system can be fully operated after power on.

Control via RS232 will be considered further in Section 6.

4.1 USB Operation

Installing Prior Terminal for Windows

The USB driver software should install automatically on Windows and can be downloaded via the [Prior Website](http://www.prior.com) (www.prior.com) . Ensure the OptiScan III control unit is connected to the computer via the attached USB cable and both are turned on. A screen should appear indicating that the device driver has been installed correctly. Afterwards, open Prior Terminal to check that it is in communication with the computer by giving the command '?'.

If nothing happens then try changing the coms port (using the box in the left hand corner of Prior Terminal' and again type '?'. If there are a large number of coms ports, or for any other reason you don't wish to use this method, open the control panel from the start menu, open "system" or Right-click on **My Computer** and select **Properties**. Click on the **Hardware** tab. Click **Device Manager**. Expand **Ports (COM & LPT)**. You should see **Prior Communication Port -> COM device (COMn)** listed, where *n* is the COM number assigned to the port.

More information on installing and using the software can be found in Appendix C.

4.2 Using Joysticks (CSI52DP)

The joystick unit provided as part of the OptiScan III system is a 3 axis joystick (CSI52DP) used to control the motorized stage and the focus motor.



CSI 52DP joystick – 3 axis, controls stage and focus

The joysticks feature an X, Y joystick, two sliding tensioners and two 'Hot Keys'. Ensure the sliding tensioners are fully home and latched to hold the joystick vertically in the 'off' position. In this position there is no power to the stage motors and the stage does not move. Deflecting the joystick left or right from the central position will cause the stage to move left or right in the X axis. Deflecting the joystick backwards or forwards from the central position will cause the stage to move backwards or forwards in the Y axis. Deflecting the joystick diagonally will cause the stage to vector in 2 axes providing a corresponding diagonal movement.

The joystick provides proportional control. The further the joystick is deflected from the central position, the faster the stage will move. Deflecting the unit to its extreme limit provides the fastest stage movement.

The 'Hot Key' to the left of the joystick can be used to quickly adjust the maximum speed of the stage. This affects both X and Y axes equally. The key to the right of the joystick provides an identical function for the focus motor.

Pressing these buttons once reduces the speed to 50% of maximum. Pressing a second time reduces the speed to 25% of maximum and a third press of the button returns to 100% of maximum speed. This cycle can be repeated by continuing to press the buttons.

The action of the 'Hot Keys' can be reprogrammed using RS232 commands (See Section 5.10)

The CSI52DP provides a digipot control mounted to the side of the joystick unit. This device controls the focus motor on a 3 axis system. It is not proportional, but is designed to closely match the normal response of the fine focus knob on a microscope.

5.1 RS232 Command Set

The OptiScan III controller can accept commands from either serial port, or USB port (with appropriate divers installed on PC). The ports (RS232-1 & RS232-2) default to a baud rate of 9600, this can be increased if desired (see BAUD below). The ports can have different BAUD speeds and different compatibility mode (See COMP Command).

Commands are terminated with a Carriage Return code <CR> (the 'ENTER key of the pc keyboard').

One or more of the following delimiters separates commands from arguments.

COMMA SPACE TAB
SEMICOLON COLON

To go to position (x=100 and y=200) the user could enter any of the following

G,100,200<CR> G 100 200<CR> G 100 200<CR> G, 100, 200<CR>
G,,100,200<CR>

There are two modes of operation these are Standard, and Compatibility.

The main differences between these two modes are as follows:

In Standard mode the controller immediately returns R after any movement command (the user has to query the controller with the \$ command to determine if the stage has stopped moving), unlike Compatibility mode where the R is only returned after a movement has been completed.

In Standard mode movement commands can be stacked. This is not the case in Compatibility mode.

The Macro and Soak commands are only available in standard mode.

Standard mode is the recommended mode for new software development and offers more features.

Compatibility mode is supported for existing customers who do not wish to re-write their existing application code.

All communication is non blocking so commands can always be sent although some will not be performed immediately or indeed at all.

In Standard Mode up to 100 movement commands can be queued. This assumes that each Command calls on 1 resource only. Each axis is defined as 1 resource apart from the stage which is a single resource even though it constitutes 2 axes. Thus stage and focus, are both a single resource. Commands such as G,x,y,z must be treated as 2 commands since it uses 2 resources.

The stage defaults to moving 1 micron per supplied number. This means a move of 1000,0 would move the stage by 1mm in X.

The STAGE, and FOCUS command responses are terminated with the word END. This will enable extra information about the OptiScan III to be added in the future and still be readable by the Application Software.

It is recommended to treat the stage and focus as separate entities. This makes the use of PS, and PZ preferred over P for position on the fly. This will usually be better at the application level so each resource can be treated as a class.

5.2 Macro and Soak

MACRO - a set of commands can be entered and started in a block by the use of the MACRO command.

A macro list can be sent by the application software. It enables consecutive actions to be taken without any communication delay between them.

5.3 Soak Command

Soak - this is an extension to the MACRO command enabling the testing of a controller without tying up a PC. The soak routine continually performs the instructions entered in a loop reporting (along the RS232 port) the number of times round the loop on each pass. To stop the soak test, switch controller off and back on again and the unit will complete the current pass and then stop.

Note MACRO and SOAK can only be used in Standard Mode (COMP,0)

5.4 Differences between the OptiScan III and OptiScan II

Several hardware and software changes have been made between the two generations of the OptiScan controller. These software changes now allow the OptiScan III and ProScan III to use the same command structure.

- Filter wheel and shutter capability removed.
- The focus motor connection has been changed from 9 pin to 15 pin.
- The default SAZ setting changed from 4 – 40. Focus motor will drive at a similar speed in the OptiScan and ProScan.
- USB drivers are now compatible with Windows 7.
- Default Y axis movement direction reversed.
- Sending the 'I' or 'K' command while operating in COMP,I mode now requires a carriage return.
- 'VZ' command now uses microns rather than microsteps.

Command	Arguments	Response	Description
VZ	Z	R	Sets the focus motor into constant speed of z microns/second

- 'CURRENT' command added. See below.

Command	Arguments	Response	Description
CURRENT	a,r,s,t	0	Sets the drive current parameters for the given axis a. Where a = 1,2 or 3 for X Y or Z axis. R= running current in milliamps (1-1500) S= standby current in milliamps (1-1500) T = time to switch to standby current after axis has become stationary (1-1200 ms) Only use after receiving advice from Prior as setting currents higher than that specified for the motor may cause overheating and possibly failure.
CURRENT	A	0	Returns the drive current parameters for the given axis a. Where a=1,2 or 3 for X, Y or Z axis. E.g. "CURRENT,I " returns 1000, 500, 500.

5.5 General Commands

Command	Argument	Response	Description
\$	[a]	decimal number	<p>Reports status as a decimal number and gives motion status of any axis of the controller. After binary conversion the convention is as follows:</p> <p>Z = D02 Y = D01 X = D00</p> <p>OptiScan III treats stage (X and Y axis) as a single resource and as such a move in Y or X will only return 3. (X and Y are kept separate for compatibility with ProScan. If only Z was moving 4 would be returned.</p> <p>Optional parameters "\$, a" where a is the axis or resource.</p> <p>X - X Axis Y - Y axis S - X and Y axis Z-Z axis</p> <p>When the optional parameter is used the binary word is just for the axis requested. Stage is for x,y axis.</p>
?	None	Text string	<p>Reports information about the peripherals currently connected to the controller. E.g. DRIVE CHIPS 00111 means drive chops XYZ are fitted. The information end is always a line saying END. This allows for the addition of extra fields of information without effecting application software. Users should always read lines in until the END is seen. A typical response is shown below:</p> <p>OPTISCAN INFORMATION DRIVE CHIPS 000111 JOYSTICK NOT FITTED STAGE = NONE FOCUS = NORMAL FILTER_1 = NONE FILTER_2 = NONE SHUTTERS = 000 LED = 0000 TRIGGER = NONE INTERPOLATOR = NONE HARDWARE REV B END</p>

Command	Argument	Response	Description
b	96, 19, 38, 15	-	<p>Set the baud rate of the port issuing the command to the value specified by b. As a protection measure if no command is send to the port whilst the controller is switched on, the baud rate will revert to 9600 after switching off and back on again. Allowable values for baud are 9600 (b=96) 19200 (b=19), 38400 (b=38) or 115200 (b=15).</p> <p>WARNING: If Baud rate of the OptiScan III is changed it is important for Application software to check communication with OptiScan III by scanning Baud rate on initialisation. This will avoid a permanent communications failure should the PC Port and OptiScan III port be set at different bauds.</p>
COMP	None	m	Report the Command protocol: Compatibility (1) Standard (0)
COMP	m	0	Sets the controller compatibility mode for users who want to wait for 'R' at the end of the move. Compatibility is on if m=1 and off if m=0 . Setting COMP,1 will result in less flexibility, for example SOAK cannot be used and commands are lost when joystick is active. Compatibility mode is offered for users who wish commands to be compatible with H127/H128 Prior Controllers. Recommendation for new users is to use COMP,0 mode.
DATE	None	Text string	<p>Reports instrument name, version number and compile time. Note that the system description refers to the presence or absence of internal drivers not which peripherals are connected. E.g. ES10XYZ2 is capable of driving but not de facto connected to an XY stage and a focus motor.</p> <p>A typical response is shown below. <i>Prior Scientific Instruments OptiScan ES11XYZ controller Version 0.5 compiled Apr 2 2015 12:08:01</i></p> <p>Application can parse input string for ES10 or ES11 strings to determine what generation controller is fitted.</p>
ERROR	h	0	Sets the reporting of error to readable text is h =1 otherwise error codes are returned.

Command	Argument	Response	Description
I	None	R	Stops movement in a controlled manner. The command queue is also emptied.
K	None	R	Stops movement with no regard for position (not recommended). The command queue is also emptied.
LMT	None	Nm	<p>Reports whether any limit switch is currently active. A limit switch is active if the switch is in contact with the axis hardware.</p> <p>Nm is a two digit Hex number (one Byte) which when converted to binary is as follows:- D07 D06 D05 D04 D03 D02 D01 D00 n/a n/a -Z +Z -Y +Y -X +X</p> <p>eg 05 means stage is in contact with +X and +Y limit switches, 0A indicates contact with both -X and -Y limits. 00 means all axes are not in contact with any limit switch. (Note that the controller knows whether the limit switch is normally low or normally high and corrects accordingly. This does not return the hardware signal level of the limit switch (see STAGE command).</p>
MACRO	None	0	Toggles the macro entering mode. Only available in standard mode.
SERIAL	None	Nnnn	Reports the unit's serial number nnnn - if the serial number has not been set "0" is returned.
SOAK	None	0	Used to soak test the controller and auxiliaries. Only available in standard mode.
VERSION	None	Ddd	Reports the units version number as a 3 figure number. E.g. 041 IS Version 0.41
WAIT	t	0	Inserts a wait of t milliseconds in a macro/soak routine.

5.6 Stage commands

Command	Arguments	Response	Description
B	None	Response	Moves back by one step as defined by the 'X' comment below
B	y	Response	Moves back by y steps
F	None	R	Moves forward by one step as defined by the 'X' command below
BLSH	s,b	0	Sets the stage backlash value for stage move commands sent via the serial port (not joystick moves) to b. s = 1 enables backlash s = 0 disables backlash. B is a number of microsteps of the motor. There are 100,000microsteps per revolution of the motor on a standard OptiScan system.
BLSH	s	0	Enables / Disables the Stage (XY) backlash. S = 1 enables backlash s=0 disables backlash.
BLSH	None	s,b	Reports back s and b values for stage moves sent via the serial port (see above). In COMP 1 mode only s returned.
BLSJ	s,b	0	Sets the stage backlash value for joystick moves to b in microsteps. s = 1 enables backlash s = 0 disables backlash.
BLSJ	s	0	Enables / Disables the stage backlash for joystick moves. S = 1 enables backlash s = 0 disables backlash.
BLSJ	None	s,b	Reports back s and b for Stage (see above). In COMP 1 mode only s returned
J	None	0	Turns ON the joystick (stage and z axes). This command is acted on immediately.
JXD	c	0	Sets the direction of X axis under joystick control. c = 1 Joystick right, moves stage mechanically right c = -1 Joystick right, moves stage mechanically left.
JXD	None	c	Reads c.
JYD	d	0	Sets the direction of Y axis under joystick control c = 1 Joystick forward, moves stage mechanically forward. c = -1 Joystick forward, moves stage mechanically back.
JYD	None	d	Reads d.
L	None	R	Moves Left by u steps as defined by the 'X' command.
L	x	R	Move left by x steps
M	None	R	Moves stage and focus to zero (0,0,0)
O	s	0	Sets the speed of the stage under joystick control. S is percentage in range 1 to 100.
SMS	None	m	Reports the current Stage (x,y) maximum speed setting m
=	None	n	Reports whether any limit switch has been hit since the last call of this command. N is a decimal number which when converted to binary is as follows: D05 D0\$ D03 D02 D01 D00 -Z +Z -Y +Y -X +X Reading this status clears it.
STAGE	None	Test String	Prints information about the currently connected stage. There are 250 microsteps per full step. The information end is always a line saying END. This allows fir te addition of extra fields of information without effecting application software. Users should always read lines in until the END is seen. STAGE=ES110/1 TYPE = 12 X = 102 MM Y=53MM MICROSTEPS/MICRON=100 END

Command	Argument	Response	Description
O	None	s	Reports value of O allowing for joystick speed buttons effect (if the button speed is 1/2 and O is set to 50 the returned value will be 25).
P	None	x,y,z	Reports position of x,y and z axis
P	x,y,z	0	Sets absolute position for x,y and z axis. No axis can be moving for this command to work
PS	None	x,y	Reports position of Stage only (x, and y)
PS	x,y	0	Sets Absolute position of x and y axis. This command will only work is no axis is moving.
PX	None	x	Reports position of X only.
Px	x	0	Sets Absolute position of x axis. No axis can be moving for this command to work.
PY	None	y	Reports position of Y only.
PY	Y	0	Sets absolute position of y axis. This command will only work is no axis is moving.
R	None	R	Moves right by one step as defined by 'X' command.
R	x	R	Move Right by x steps
SAS	a	0	Set the current stage (x,y) acceleration to a. Range is 4 to 100.
SAS	none	a	Reports the current Stage(x,y) acceleration setting a.
SMS	m	0	Sets the current stage (x,y) maximum speed to m. Range is 1 to 100.
X	None	u,v	Reports the current ste size in x and y for the stage, used in conjunction with L,R,FB
X	u,v	0	Sets the current step size for the stage, used in conjunction with L,R,F,B.
SIS	none	R	Set Index of Stage. The stage will move to hardware limits, stop and set absolute position to 0,0. Used only when the mechanical position of the stage bears no relationship to the controller position; i.e. If the stage has been mechanically moved during power off. THIS COMMAND MUST BE DONE ONCE AT INITIAL CONNECTION OF STAGE TO CONTROLLER IN ORDER TO ESTABLISH A UNIQUE REFERENCE POSITION WHICH IS PERMANENTLY REMEMBERED BY THE CONTROLLER
RIS	none	R	Restore Index of Stage. Used to restore accurate mechanical position by seeking hardware limits and returning back to controller position. This is used to to re-establish mechanical accuracy by referencing back to the limits.
VS	x,y	R	Move the stage at constant velocity in X,Y as specified by parameters. Units are in microns/s. VS,0,0 will bring the stage to rest. This can be used to simulate a joystick operation from your application.

5.7 Z-Axis Commands

Command	Arguments	Response	Description
BLZH	s,b	0	Sets the Z backlash value for host moves to b in microsteps. S=1 enables backlash. S=0 disables backlash.
BLZH	s	0	Enables/disables the z backlash. S=1 enables backlash. S=0 disables backlash
BLZH	None	sb	Reports back the Z backlash value for host moves.
BLZJ	s,b	0	Sets the Z backlash value for joystick to b in microsteps. S=1 enables backlash s=0 disables backlash
BLZJ	None	s,b	Reports back s and b for Z axis (see above)
C	None	w	Reports the current step size for the focus motor.
C	w	0	Sets the current step size for the focus motor w
D	z	R	Moves Down by z steps
D	None	R	Moves down one step as defined by the 'C' command.
H	None	0	Turns OFF the joystick (Stage and Z axes) after completion of any current joystick move. Joystick is re-enabled using the 'J' command. The joystick is re-enabled each time the controller is powered up
I	None	R	Stops movement in a controlled manner to reduce the risk of losing position. The command queue is also emptied
J	None	0	Turns ON the joystick (stage and Z axes). This command is acted on immediately.
JZD	d	0	Sets the direction of Z axis under digipot control. D=1 or D=-1.
JZD	None	d	Reads d
K	None	R	Stops movement with no regard for position (not recommended). The command queue is also emptied.
M	None	R	Moves stage and focus to zero. (0,0,0)
OF	s	0	Sets the speed of the focus motor under joystick/digipot controls. S is percentage in range 1 to 100.
OF	None	s	Reports value of OF allowing for joystick speed buttons effect (if the button speed is 1/2 and OF is set to 50 the returned value will be 25).
PZ	None	z	Reports position of Z only
PZ	z	0	Sets absolute position of z axis. No axis can be moving for this command to work. If there is an encoder on Z the position is only set when the current position is in the encoder range (it must have been further down than it is currently).

Command	Argument	Response	Description
SAZ	a	0	Set the current Z acceleration to a. Range is 4 to 100.
FOCUS	None	Test string	Prints information about focus unit. There are 250 microsteps per full step. The information end is always a line saying END. This allows for the addition of extra fields of information without effecting application software. Users should always read lines in until the END is seen. FOCUS = NORMAL TYPE = 0 MICRONS/REV = 100
SAZ	None	a	Reports the current Z acceleration setting (a)
SMZ	None	m	Report s the current Z maximum speed setting (m)
SMZ	m	0	Sets the current Z maximum speed to m. Range is 1 to 100.
SAZ	None	a	Report the current Z acceleration setting
SMZ	None	m	Report the current Z maximum speed setting (m).
U	z	R	Moves up by z steps
U	None	R	Moves up by on step as defined by the 'C' command.
V	z	R	Go to the absolute position z, in steps.
VZ	z	R	Move the focus at constant velocity as specified by parameters. Units are in microns/s. VZ,0 will bring the focus to rest. Tis can be used to simulate a joystick digipot operation from your application. UPR must be set correctly for this to work.
Z	None	0	Sets the stage and focus to absolute position to Zero (0,0,0).
ZD	d	0	d=1 Sets direction of rotation of focus motor. Defaults to 1 and is correct for motor fitted on right hand side of microscope. D=-1 Direction of rotation of focus motor opposite to above.
ZD	None	d	Returns d

5.8 Pattern Commands

Command	Arguments	Response	Description
E	None	R	Sets the origin for the pattern to the current position. Zeroes the pattern X and Y counter.
N	n,m	0	Fixes the number n of X and number m of Y steps for the pattern
N	None	n,m	Reports number of X and Y steps
Q	None	0	Sets the origin of the disc grid equal to the current position. Zeros the disc grid X and Y counter.
S	None	R	Move to next position in rectangular raster
S	?	s	Step number of scan
S	n,m	R	Moves to nth cell in X and mth cell in Y
T	None	R	Move to next field of disc raster scan.
T	?	s	Step number s of circular scan
W	d	0 in comp mode, number of steps in standard mode.	Sets the diameter in mm of a circular dist (range 1 to 327 mm)
w	none	d	reports the disc diameter (in mm)
x	x,y	0	sets the step size in X and Y
X	None	x,y	Reports step size in X and Y
Y	None	R	Move to next position of rectangular snake
Y	?	s	Step number of scan
Y	n,m	R	Moves to nth cell in X and mth cell in Y

5.9 Error Codes

If a command is not valid a response of “E,n” is returned the n specifying an error type as listed below.

Machine or human readable messages are chosen using the ERROR Command

ERROR CODE	ERROR DESCRIPTION
1	NO STAGE
2	NOT IDLE
3	NO DRIVE
4	STRING PARSE
5	COMMAND NOT FOUND
6	NOT APPLICABLE
7	NO FOCUS
8	VALUE OUT OF RANGE
9	NOT APPLICABLE
10	ARG1 OUT OF RANGE
11	ARG2 OUT OF RANGE
12	ARG3 OUT OF RANGE
13	ARG4 OUT OF RANGE
14	ARG5 OUT OF RANGE
15	ARG6 OUT OF RANGE
16	INCORRECT STATE
17	NOT APPLICABLE
18	QUEUE FULL
19	COMPATIBILITY MODE SET
20	NOT APPLICABLE
21	INVALID CHECKSUM
60	NOT APPLICABLE
61	NOT APPLICABLE

5.10 CSI52DP (Joystick Configuration)

CSI52DP 2 axis joystick with digipot for Z axis.

The BUTTON Command described below can be used to change the function of any of the buttons of the joystick.

b=0 Button released.(i.e. changing to a state where no button is pressed)

b=1 Right button pressed b=2 Left button pressed

(Pressing more than one button simultaneously is not allowed.) f defines what action the controller does when it first detects a new state given by b above.

f= 0 Default Button Function

f= 1 Z motor velocity stop (only used in conjunction with f=2 and f=3 below)

f= 2 Z motor constant velocity up

f= 3 Z motor constant velocity down

f= 4 Toggles digipot speed 100%, 50% 25%

f= 5 Toggles X/Y joystick speed 100%, 50%, 25%

f= 6 Toggles joystick speed 100% 10%

f= 7 Toggles joystick speed 100% 2%

f= 8 Moves Z motor up by amount defined by C Command

f= 9 Moves Z motor down by amount defined by C Command

f=10 Moves stage left defined by X Command

f=11 Moves stage right defined by X Command

f=12 Moves stage back defined by X Command

f=13 Moves stage front by amount defined by X Command

f=14 Toggles Digipot Speed 100% 10%

f=15 Toggles Digipot Speed 100% 2% Examples:

Right button(b=1) being pressed moves Z up at constant velocity

Left button(b=2) being pressed moves Z down at constant velocity

Release buttons (b=0) stops Z motor (no buttons being pressed.)

Right button (b=1)toggles joystick speed 100%-2%

A momentary press of Left button (b=2) starts Z motor moving down with constant velocity.

Normal Joystick operation

Left button (b=2) toggles Stage speed 100% 50% 25% Right button (b=1) toggles Z motor speed. 100% 50% 25%

TROUBLESHOOTING SECTION 6

Problem:

Stage will not respond to Joystick or RS232 commands

Suggestions:

Check that the system is properly installed and that there is proper power to the controller. For Installation see section 4.

Check that the controller is switched on.

Check that the green “Running” light is on. If it is not, return unit to your local Prior Scientific dealer for servicing. There is no external fuse that can be replaced.

Set up and run [Prior Terminal Program](#) (Windows Users) see Appendix C and send the '?' command via RS232-I. The controller should report with information about the peripherals currently connected, as shown in section 6 of this manual.

If the controller does not acknowledge the presence of any of the connected peripherals return that peripheral to your local Prior dealer.

Problem:

In one axis (X or Y) the stage will only move in one direction.

Suggestions:

There is an internal switch failure. Return the stage to your local Prior Dealer for servicing

Problem:

The stage will not respond to my Image Analysis Software.

Suggestions:

Check that the Image Analysis Software Program has drivers for Prior systems. If not, consult the software dealer.

Check communication by monitoring the 'TX' (transmit) LED (this will flash rapidly when data is being transmitted by the controller) and the 'RX' (receive) LED (this flashes rapidly when receiving data from computer).

Close down the Image Analysis Software.

Set up and run Prior Terminal (Windows Users) see Appendix C.

Try several basic commands while in Prior Terminal to determine if the stage responds correctly, if so the controller is functioning properly. At this point consult the supplier of the Image Analysis Software. If the stage does not respond to the commands, contact your local Prior dealer for further advice.

Note: Before running commands using Prior Terminal make sure that your microscope objectives and any other objects that may impede the motion of the stage are moved out of the way, to avoid damage.

Problem:

System will not respond to remote RS232 commands

Suggestions:

Set Up Prior Terminal (see Appendix C). Check that the RS232 cable is plugged into the RS232-I port in the back panel of the OptiScan II Controller. Press “Enter” on your computer keyboard several times. If the “TX” and “RX” lights on the front of the controller blink and the system does not respond, then there is an internal problem with the controller. Return the unit to your local Prior Dealer.

If the “TX” and “RX” lights do not blink on and off, then there is a problem with the computer sending the commands.

Problem:

My stage will execute the first command sent, but for each subsequent command the controller returns an error message “E, 5”.

Suggestions:

Make sure that your computer is not sending an extra line feed command at the end of each command being sent. If you are using Prior Terminal, check that the set up is correct using Appendix C.

Problem:

The focus motor turns but the microscope fine focus knob does not.

Suggestions:

The focus drive may not be properly positioned against the fine focus knob.

Loosen the knurled screw that holds the focus motor and press it gently against the fine focus knob. While pressing, re-tighten the knurled screw. Note: If the fine focus knob on the microscope is difficult to turn or the movement rough, then the focus drive may not function until the microscope is properly adjusted.

Problem:

The focus drive does not repeat to the same “Z” position every time.

Suggestions:

Check that the “Z” backlash routine is turned on. Refer to the Command Set for command “BLZH”.

For upright microscopes check that the focus motor is mounted on the right. For inverted microscopes check that the focus motor is mounted on the left.

If the focus drive cannot be mounted on the correct side of the microscope, refer to the command set and use command “ZD” to reverse the rotation of the motor.

SYSTEM SPECIFICATIONS SECTION 7

All dimensions are in mm; all weights are in Kg.

PART NO.	DESCRIPTION	DIMENSIONS (L x W x D)	WEIGHT
ES111	STAGE	294 x 193 x 60	2.2
ES107A	INVERTED STAGE	270 x 284 50	2.7
ES11	CONTROLLER	210 x 120 x 55	0.5
CS152DP	2 AXIS JOYSTICK WITH REMOTE FOCUS	22 x 120 x 45	0.5

Max. Speeds

STAGE	8mm/sec
FOCUS DRIVE	8 revs/sec

Stage Travel Ranges

ES111	125mm x 75mm
ES107A	115mm x 75mm

Power

Universal external power supply Input: 100 – 240V AC, 1.5 A 50/60Hz
Output: 24V DC 3A

Specifications subject to change without notice.

REPLACEMENT PARTS SECTION 8

Description	Part Number
Motorized Stage, 125 x 75 Travel	ESI11
Motorized Stage for Inverted Microscopes	ESI07A
Focus Drive	H122
Focus Drive and Adapter for Zeiss	H122AXIO
RS232 cable for PC (9 or 25 pin)	H276
Solid Couple Adapter for Focus Drive on Olympus/Nikon	H122KON
Direct fine focus coupling kit for Olympus IX/BX Microscopes	H122KBIX
Solid Couple Adapter for Focus Drive on Leica	H122KLC

RETURNS AND REPAIRS SECTION 9

Should you experience problems with your OptiScan III System and want to send it back for service, warranty or otherwise, **a Return Material Authorisation (RMA) number must be obtained from the appropriate Prior Scientific office before returning any equipment.**

For North and South America contact Prior Scientific Inc. and for the rest of the world call Prior Scientific Instruments Limited on the telephone numbers shown below.

Prior Scientific Instruments Ltd.
Unit 4,
Wilbraham Road,
Fulbourn,
Cambridge,
ENGLAND,
CB1 5ET
Tel: 01223 881711
Fax: 01223 881710
email: uksales@prior.com

Prior Scientific Inc.
80 Reservoir Park Drive,
Rockland,
MA 02370-1062
USA
Tel: 781 878 8442
Fax: 781 878 8736
email: info@prior.com

Prior Scientific GmbH
Wildenbruchstr. 15
D-07745
Jena
GERMANY
Tel: +49 (0)3641 675 650
Fax: +44 (0)3641675 651
email: jena@prior.com

Prior Scientific KK
Kayabacho 3rd Nagaoka Bldg 10F
2-7-10, Nihonbashi Kayabacho
Chuo-Ku
Tokyo
103-0025
JAPAN
Tel: +81 (0) 3 5652 8831
Fax: +81 (0) 3 5652 8832
email: info-japan@prior.com

APPENDICES SECTION 10

Appendix A.

Non Standard Focus Drive Installations

Notice:

This installation should only be attempted by a qualified technician. It involves some minor disassembly of critical mechanical components. If you are not familiar with this type of mechanical assembly do not attempt this installation, consult your local microscope representative.

Introduction

The focus drive is compatible with all of the Zeiss Axio type microscopes listed below. However, it is not compatible with the Zeiss Axioskop 2 and Axioplan 2. The focus drive must be attached to the fine focus ball reduction mechanism as follows:

Axioplan..... Left Side	Axiotron 10 Right side	Axiolab Right side
Axioskop Left Side	Axiovert 35 Right side	Standard..... Right side
Axiovert 25 ... Left Side	Axiovert 100 Right side	Axiovert 135.... Right side

Components

The focus drive assembly is comprised of the following:

- Drive motor, motor bracket and switch assembly
- Mounting block
- Anti backlash gear and locknut
- Cover and lead

Also included are screws and hexagon keys needed to install the focus drive unit.

Tools Required:

14mm AF spanner or socket, 1pt Philips screw driver, 1.27mm hexagon key (supplied) 2.5mm hexagon key (supplied) 3.0mm hexagon key (supplied).

Prepare the focus drive:

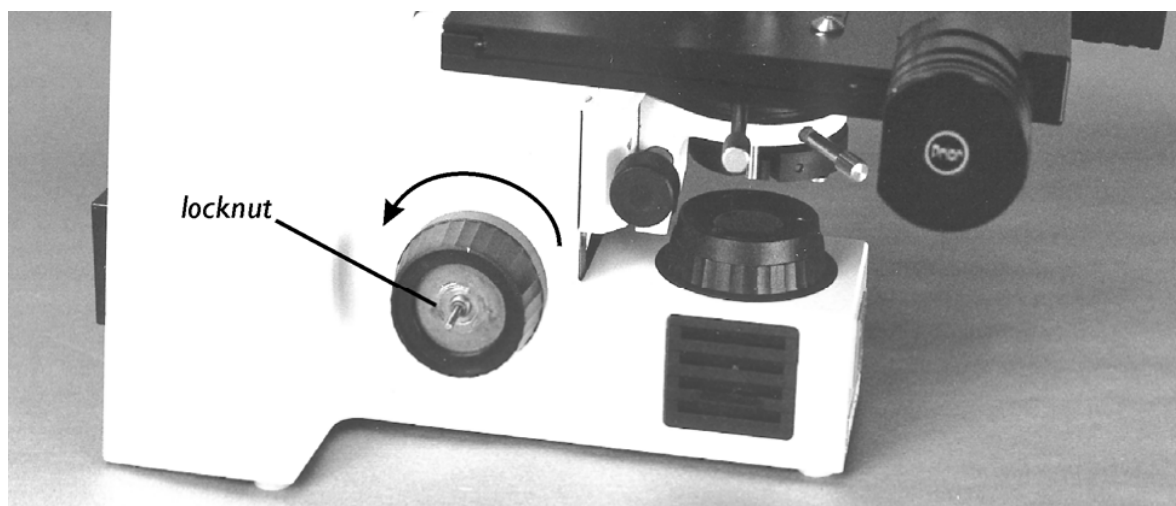
- Remove the cover.
- Remove bag containing anti-backlash gear, locknut and hexagon keys.
- Using 3.0 hexagon key remove the two 4mm cap head screws that hold the mounting block to the motor bracket assembly.

Installation of the focus drive



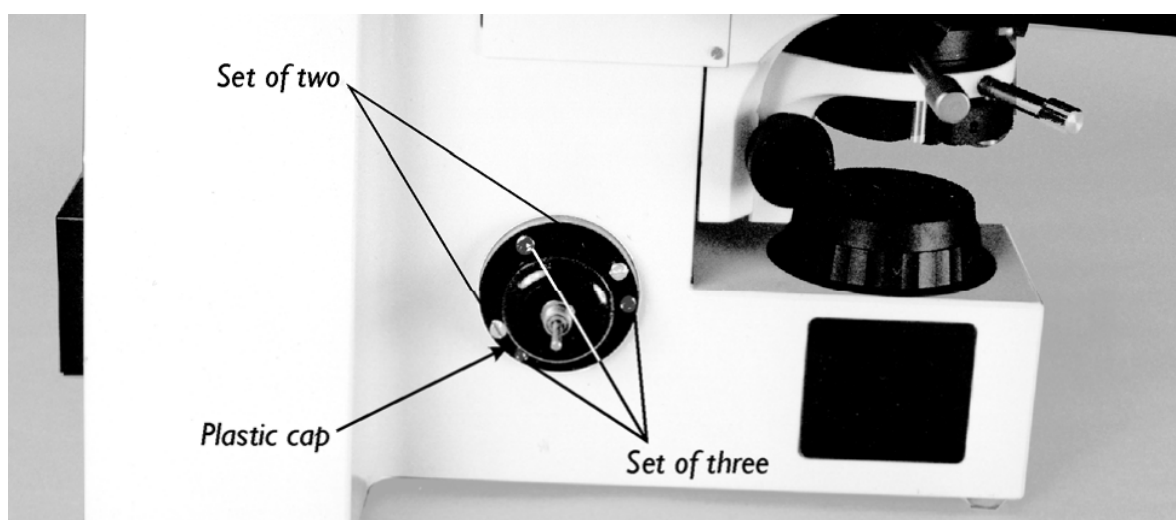
Determine which side the focus drive must go (see introduction).

Remove the fine focus knob by using the 1.27mm hexagon key to unscrew the set screw. The knob can then be pulled off.

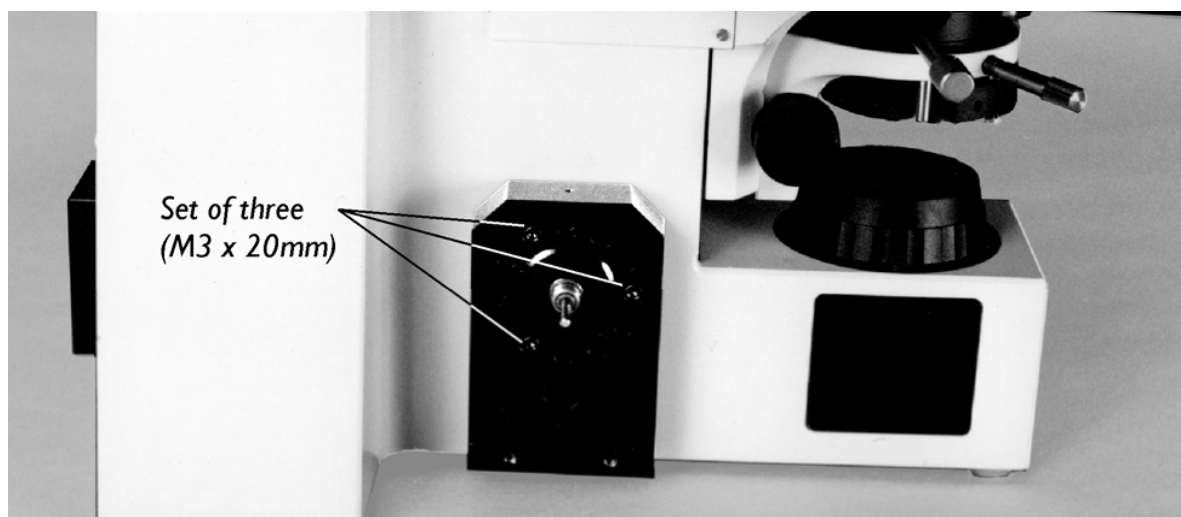


Using the 14mm spanner or socket to remove the lock nut. The coarse knob can now be removed by turning anti-clockwise and unscrewing from the coarse focus shaft.

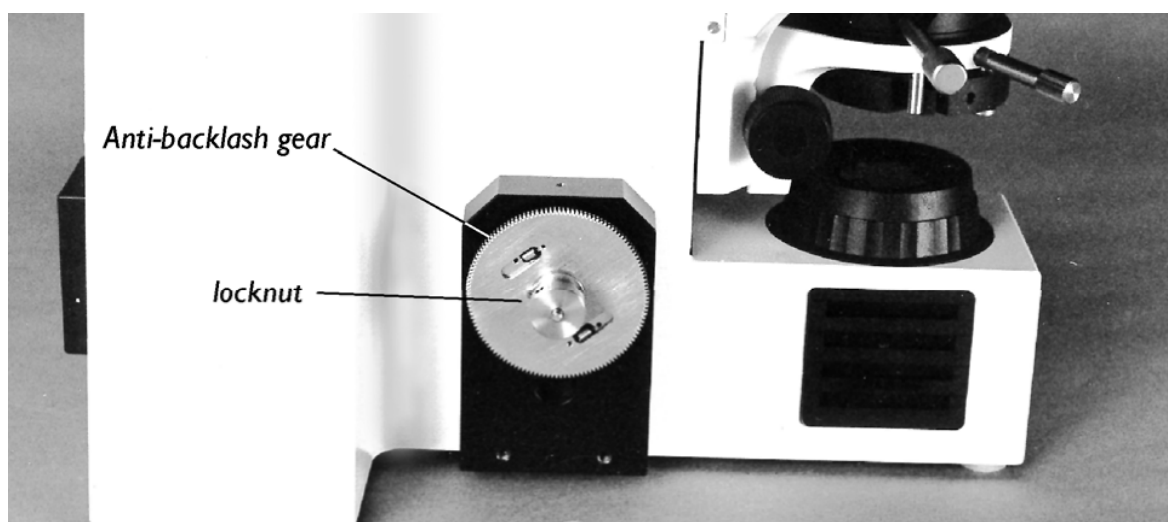
A black plastic cover should now be visible. If this is not the case, check the introduction to ensure you removed the knobs from the correct side. **It is very important that you replace both coarse and fine knobs before removing the knobs on the opposite side.**



The plastic cap is held on with five screws, one set of two screws and one set of three. If the set of two screws are missing then install the two M3 x 6mm cap head screws supplied. Remove the set of 3 screws using the 2.5mm hexagon key.



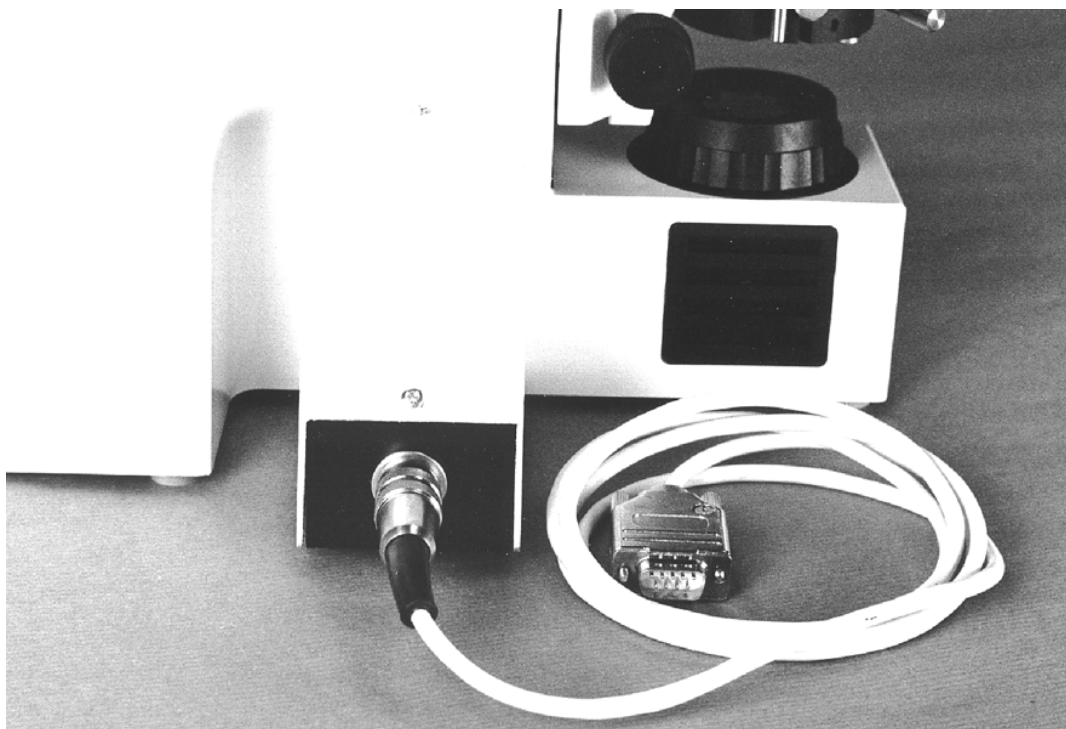
Place the mounting block over the plastic cap and hold in place using the 3 M3 x 20mm cap head screws supplied.



Screw the anti-backlash gear onto the coarse drive shaft, making sure the gear's boss is facing outwards. Screw the locknut into the boss and tighten.



Attach the motor, bracket and switch assembly to the mounting block using the two M4 cap head screws. The anti-backlash gear has two gears, one fixed, the other spring loaded and free to rotate. Rotate this gear approximately 6 teeth before aligning with the motor gear.



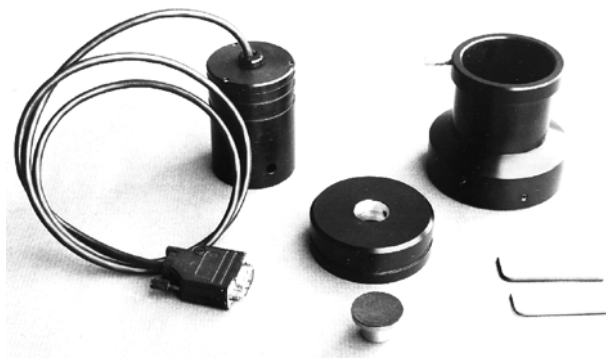
Replace the cover and attach the lead.

If the focus drive unit appears to drive in the wrong direction, i.e. you ask the controller to move up and the stage moves down, then the switch is set to the wrong position. Disconnect the power supply to the focus drive, remove the cover, move the switch and then replace the cover.

The unit will now move in the correct direction.

APPENDIX B

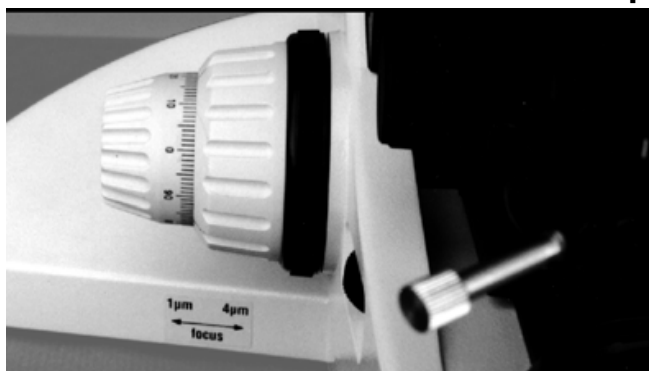
FOCUS DRIVE INSTALLATION FOR THE LEICA DML RANGE HI22LB MOTORISED FOCUS KIT PARTS LIST



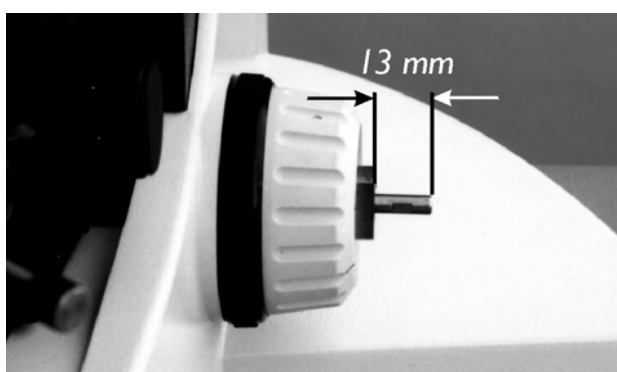
- a. H249 Microstep Focus Motor
- b. HI073 Adapter ring (for Leica DMLB)
- c. HI166 Drive coupling (For Leica DMLB)
- d. H569 Focus motor sleeve
- e. S690 Thumb locking screw
- f. WI401 2mm hexagonal wrench
- g. W347 1.5mm hexagonal wrench

Fitting the HI22LB to the Leica DMLB involves removing the right hand fine focus knob. Note that this has two sensitivity settings depending on whether the fine focus mechanism is pushed to the right (4 microns) or pushed to the left (1 micron). This option is indicated by the label on the front surface of the left hand stabiliser.

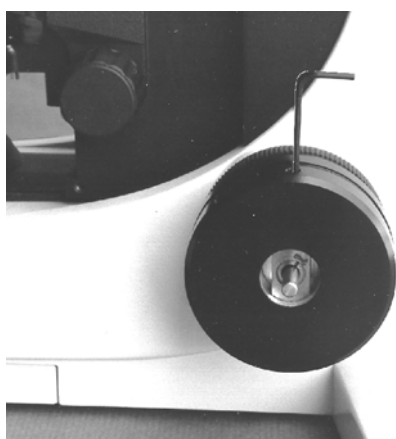
The fine focus must be set at the 1 micron position.



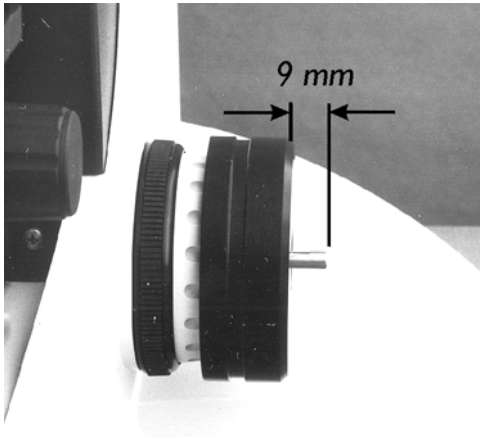
Push the fine focus fully to the left. Note the amount of the vernier scale showing on the left hand knob. Fitting the H122LB is done with the fine focus in this 1 micron position.



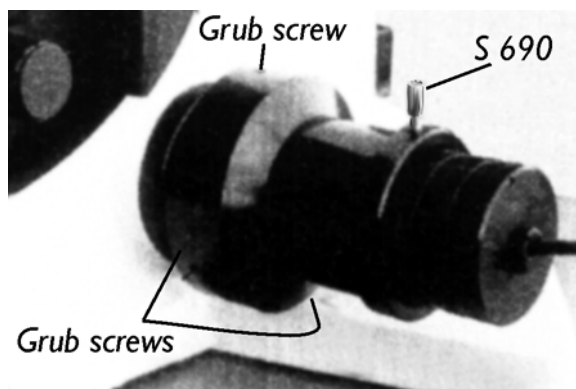
Remove the right hand focus knob using the 1.5 mm hexagonal wrench key inserted down the small hole in the right hand fine focus. Hold the left hand fine focus knob when pulling off the right hand fine focus knob ensuring that there is no lateral movement of the shaft. There should be approximately 13mm shaft length protruding from the brass boss. Ensure that the small spring washer is still on the shaft.



Fit the large adapter ring over the brass boss. Note that the orientation of the adapter ring should be such that the grub screw in the adapter ring screws down onto the centre of the radius (curved part of the brass boss).



Push this fully towards the body of the microscope leaving approximately 9mm of shaft protruding from the adapter ring whilst tightening up the adapter ring using the 2mm hexagonal wrench key.



Fit the drive coupling on the fine focus shaft using the 1.5mm hexagonal wrench key. Orient the shaft so that the grub screw will locate on the flat of the shaft. Push the drive coupling gently towards the adapter ring whilst tightening the grub screw.

Check that the fine focus rotates freely and is still set at 1 micron.

Fit H569 motor sleeve on the adapter ring. Tighten up 3 grub screws in sequence using the 2mm Hexagonal wrench key . It may be necessary to rotate the motor sleeve to gain access to each grub screw. The motor sleeve and adapter ring are now attached to the coarse focus.

Slide the H249 Microstep Focus motor assembly into the motor sleeve and tighten the S690 thumb screw whilst gently pushing the focus motor assembly towards the microscope such that there is a good contact between the rubber surfaces of the drive of the motor and the drive coupling. The fitting is now complete.

The motor is now able to drive the fine focus mechanism of the microscope.

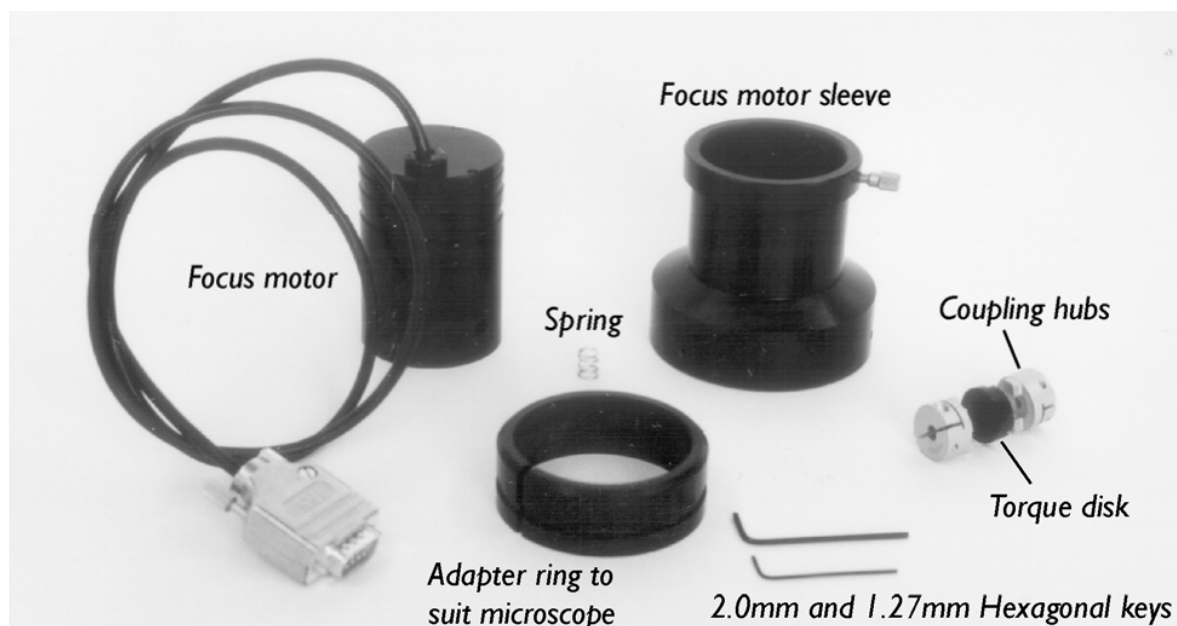
APPENDIX C

Direct Coupling Focus Installation for Leica and DML and DMR Range

Notice:

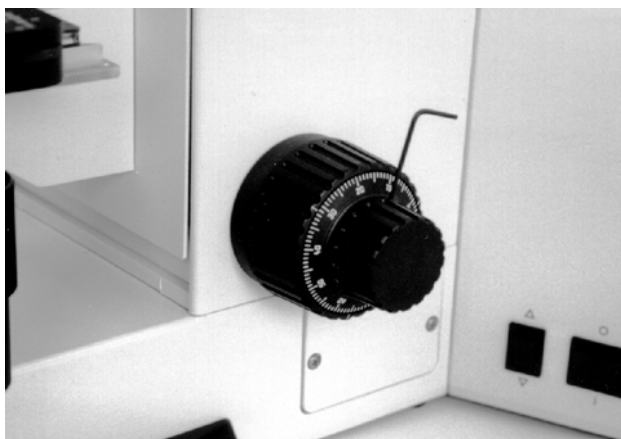
This installation should only be attempted by a qualified technician. It involves some minor disassembly of critical mechanical components. If you are not familiar with this type of mechanical assembly do not attempt this installation, consult your local microscope representative.

Components



Installation on 'DMR'

STEP 1) Using a 1.27mm Hexagonal key, undo the fine focus set screw. The knob can then be pulled off.



STEP 2) Place the spring over the fine focus shaft and place a coupling hub on the shaft whilst holding the opposite focus knob in position, or it may disengage from gears.

Compress the spring by 3-6mm and clamp the hub using the 2mm hexagon key.

Note: Only one of the coupling hubs will fit the fine focus shaft



STEP 3) Push the remaining coupling hub and plastic torque disc together and place on the focus motor shaft.

Tighten using the 2mm hexagon key making sure it does not bind on the motor casing.



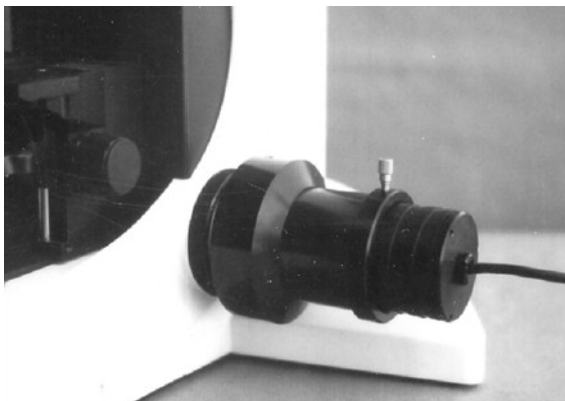
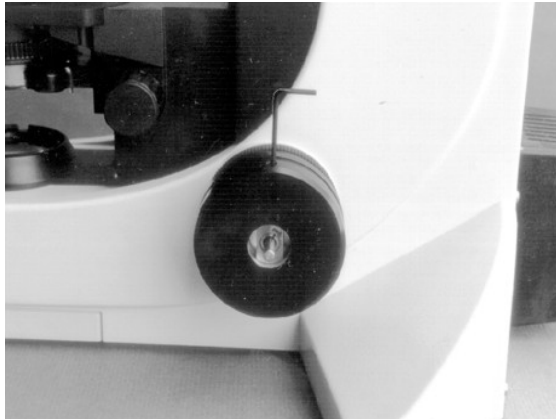
STEP 4) Place the adaptor ring over the coarse focus knob. Align and push the couplings together and slide the focus sleeve over the focus motor and onto the adaptor ring, using the 2mm hexagon key to tighten the three set screws. Again whilst holding the opposite focus knob.



Installation on the 'DML'

Step 1 as for 'DMR' series- then place the adaptor ring over the coarse focus knob and secure the brass shaft using the 2mm hexagon key on the set screw.

Continue with steps 2, 3 and 4 as for 'DMR' series.



APPENDIX D

Installing the software

Prior Scientific has developed its own software allowing the control of Prior products via USB or RS232 commands. Although many users will wish to incorporate our equipment into their own programs, using Prior software means that our products will perform at their peak, and that diagnosing the causes of problems may be easier. Our software, collectively called 'Demo Software', is freely available online. Commands for each product that can be entered into the computer are found in that product's manual.

Set up instructions will differ slightly between different versions of Windows. In this guide it is assumed that you are using Windows 7. Other versions of Windows may require extra steps. Please do not hesitate to contact Prior Scientific at uksales@prior.com for further advice and support. Ensure that you read the manual of the product in addition to this guide to ensure that the product is used effectively and safely.

The 'Control Demo' software is a GUI based program allowing control of the ProScan and OptiScan series of controllers. Prior Terminal is a command link based program in which commands are directly entered – these commands can be found in the relevant product manual. This demo software also includes other pieces of software – for example, controlling the Well Plate and Slide Loaders. These programs are not covered in this manual and are covered in the respective product manuals.



Installing the software is simple.






Go to www.prior.com and click on the image directly above 'Prior Scientific Ltd'. This takes you straight to the UK site.

Go to 'Download Centre'.

Go to 'Software'.

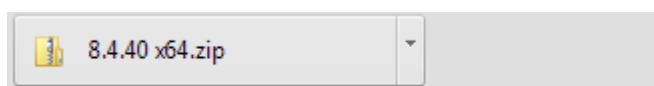
Depending on your system, select either "32 Bit Software Download ..." or "64 Bit Software Download".



32 Bit software download for Window XP, Vista and Window 7 (v8.4.40): Demonstration programs for ProScan, OptiScan and Slideloader; USB Drivers and PCI Card Drivers	
64 Bit Software Download for Windows XP, Vista & Windows 7 (v8.4.40): Demonstration Programs for ProScan, OptiScan and SlideLoader; USB Drivers and PCI Card Drivers	
ProScan III USB driver	
ProScan III Firmware Download (C86D30J42L12S20T716 v0.86) ProScan III Firmware Download : Download and run to upgrade the ProScan III internal firmware, (requires the demonstration software to be installed).	
OptiScan III Firmware Download (v0.3) OptiScan III Firmware Download. Download and run to upgrade the OptiScan III internal	

Click the Zip icon next to the software you wish to download.

It should automatically download.



Click on it and open.

Downloads ▶ 8.4.40 x64						
Name	Type	Compressed size	Password ...	Size	Ratio	Date modified
 PriorSetup64	Windows Installer Package	6,259 KB	No	6,567 KB	5%	06/11/2014 14:07
 setup	Application	184 KB	No	456 KB	60%	06/11/2014 14:07

Double click on 'setup' and ignore any warning messages.



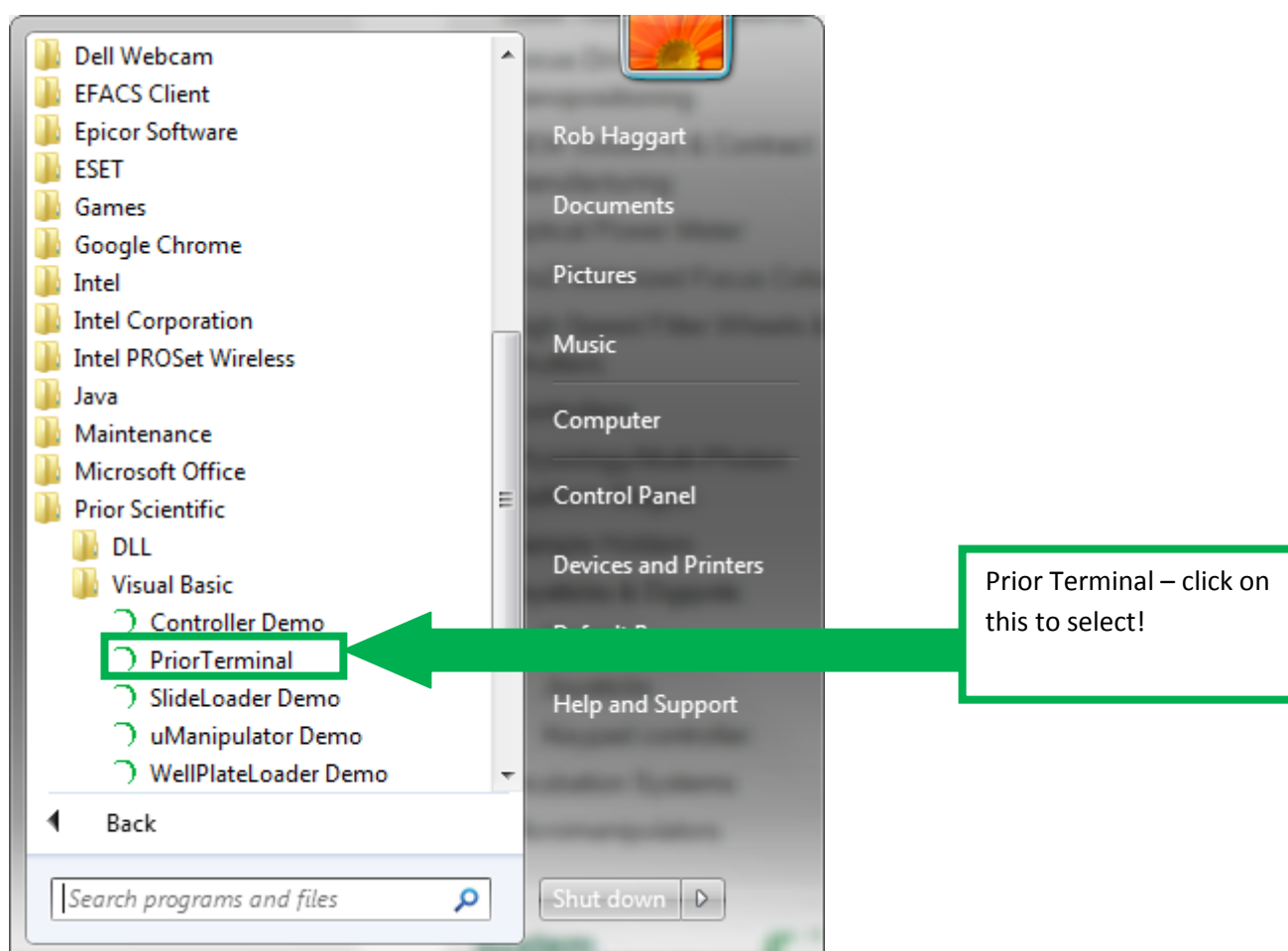
Continue through the installation following the onscreen instructions. The software should install within five minutes. You will get a message informing you that the software has successfully been installed.

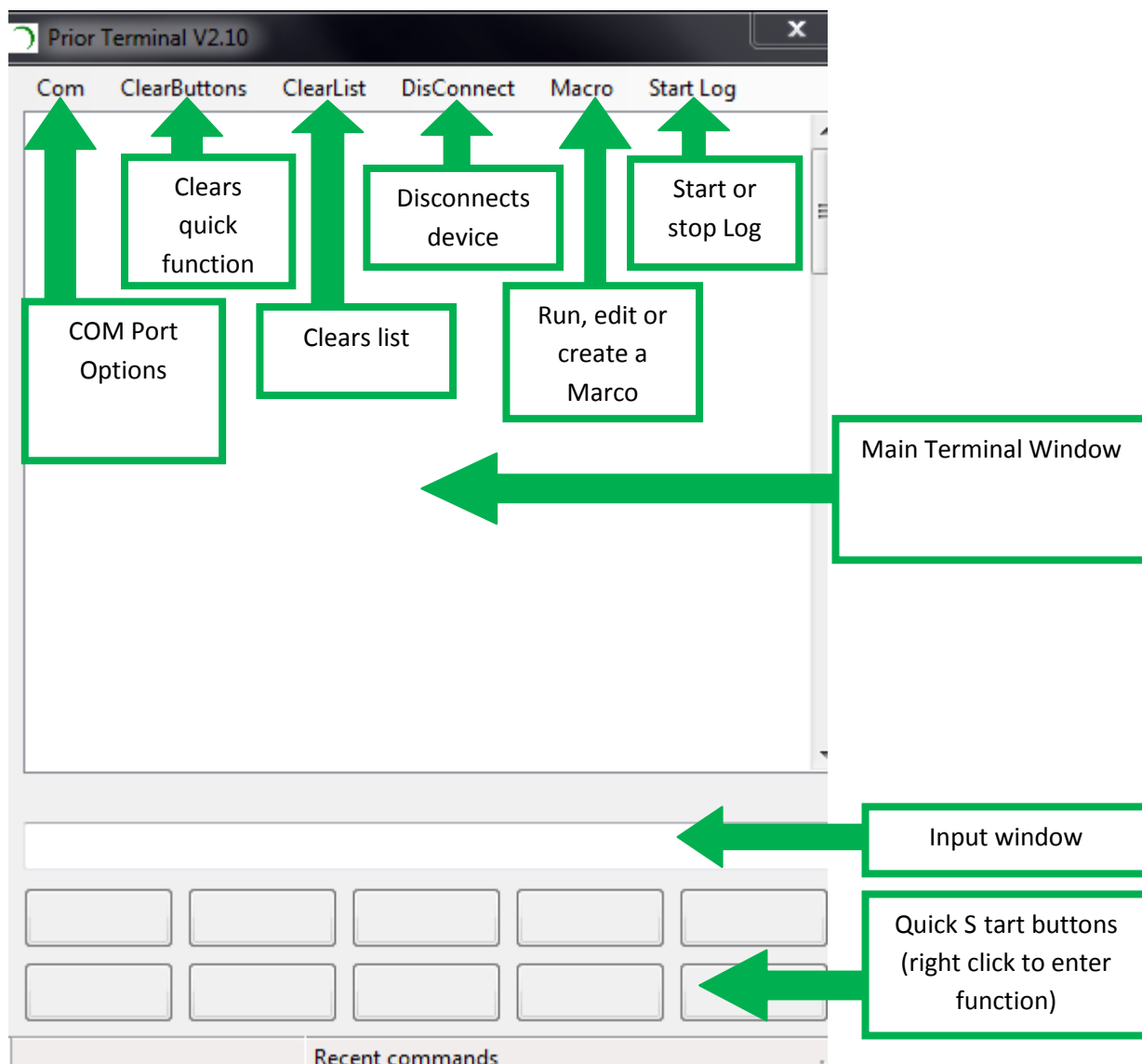
By installing the 'Demo Software', it should now be possible to simply connect your computer and the product in question, as all the USB drivers should automatically have been installed.

Connect your product to the computer via a USB cable.

Prior Terminal

Click on the Windows Start menu and go to 'All Programs'. Go to 'Prior Scientific' and select 'Visual Basic'. From this, go to 'Prior Terminal' and open that program. Other programs are also available. The 'Controller Demo' will be covered later in this guide. Since the other programs are specific to a particular product, instructions for these are covered in the respective manuals.





It is important to select the correct COM Port to allow the system to function. This is done by clicking 'Com', which also allows the Baud Rate Speed to be changed. The default setting is 9600; however some software can change this. A successful connection is indicated in the Status Bar of the Prior Terminal Program. Once Prior Terminal is open, to list what hardware is connected type '?'. From the product manual you should see the correct response this should generate. For example, from the OptiScan III one might get the response:

```
OPTISCAN
INFORMATION DRIVE CHIPS 11111
JOYSTICK ACTIVE
STAGE = ES110/1
FOCUS = NORMAL
END
```

All commands must be terminated with a carriage return e.g the ENTER key .

If this generates the correct response everything is connected properly. If not, try the following tips.

Ensure that the product is on, and that the connections between the computer and product are secure.

Try changing the Baud Speed .

You might be able to swiftly resolve the problem by clicking 'Com' and altering the port. If there are a large number of ports, go to Start Menu > Control Panel > System. Click the 'Device Manager'. Expand the 'Ports' selection to identify the virtual COM Ports. The virtual COM port Number is the one under "USB serial port".

Ensure that this is the port selected by Prior Terminal by clicking the 'Com' button. If this fails to resolve the problem then it is probably the case that the driver is not installed properly. The driver is bundled in the download along with the 'Prior Terminal'. Go to Control Panel > Systems > > Device Manager. Scan for hardware changes, select 'Prior Virtual COM port'. Right click 'Update driver' and select the correct driver. The driver will be located in the 'Prior Scientific' program files as it is automatically included in the Prior Terminal download. **DO NOT SELECT THE PROGRAM FILES X 86 FILE.** Instead, go for C:\Program Files\Prior Scientific\Prior Software (assuming the program is in the C Drive).

All specifications in this manual are subject to change without specification.

Please feel free to contact us regarding any questions, comments or suggestions.

Prior Scientific manufactures a wide range of products designed for a huge range of microscopy applications, from automated systems to illuminators, sample holders, filter wheels, and robotic slide loaders. Contact us or visit www.prior.com to find out more.