RS232 Command Set for HI30 ProScan.

ProScan controllers can accept commands from either serial port. The port defaults to a baud rate of 9600. This can be increased to 38400 if desired (see BAUD below).

Commands and controller responses are terminated with a Carriage Return code <CR> with the exceptions of 'I', 'K', and '#' in compatibility mode.

Commands are separated from arguments by one or more of the following delimiters.

COMMA SPACE TAB EQUALS SEMICOLON COLON

To move a stage to a position of (100,200) 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> G,,100,200<CR>

There are two modes of operation; Standard Mode and Compatibility Mode.

Standard mode is the recommended mode for new software as it offers more features. Compatibility mode is supported for existing customers who do not wish to re-port their existing application code. All communication is non-blocking meaning that commands can always be sent even though there may be a delay prior to their execution.

In Standard Mode up to 100 commands may be queued in the serial buffer of the controller. If a command is sent and there is insufficient space to accept it an error (E18 – Queue Full) will be returned. This indicates that the command has not been accepted and must be resent when the queue is no longer full. It is desirable to read back each command (R<cr>>) before sending any further commands. Sending I<cr>> aborts the current move and empties the queue.

The default convention is that the controller will move each device by 1um per number entered, in other words a requested move of 1000,0 will result in the stage moving 1mm in the X axis. If desired this can be over-ridden by using the scale stage (SS) command.

If the stage scale is changed the resultant movements are determined by the model of stage in use. The controller is fixed at 250 micro-steps per full motor revolution and by setting SS,1 each requested move will be in micro-steps. A requested move of 1000,0 will now result in the stage moving by 4 (1000/250) complete motor revolutions. The actual distance moved by the stage will depend upon the pitch of the ball screw fitted to the stage. A stage with a 2mm ball screw pitch will move 8mm in the X axis while a unit with 5mm pitch screws would move 20mm.

The commands STAGE, FILTER, FOCUS and SHUTTER return a text description the last line of which is always "END". The allows Prior to add supplementary text information without resulting in changes to the users application code (assuming that the application software reads al text up to "END".)

Macro and Soak

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

Example of MACRO

If you wish to close a shutter, move the filter wheel to a new position then open the shutter.

MACRO	0	enter macro mode
8,A,1	R	close shutter A
7,1,4	R	move to filter position 4
8,A,0	R	open shutter A
WAIT 1000	R	wait 1000 msecs
MACRO	0	start the macro

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 the number of complete cycles on each pass. To stop the soak test enter an action and the unit will complete the current cycle and then stop.

Example of SOAK

If you wish to test a shutter, and filter wheel you could use the following routine.

SOAK 0 enter soak mode

8,A,1	R	close shutter A
7,1,4	R	move to filter position 4
WAIT	500	wait 500msecs.
8,A,0	R	open shutter A
7,1,1	R	move to filter position 1
SOAK	0	start the soak

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

General Commands

	Command	Arguments	Response	Description
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?	None	Text string	Reports information about the peripherals currently connected to the controller. e.g. DRIVE CHIPS 10011 means Z and 4 th axis chips missing, SHUTTERS = 110 means shutter 1 not connected. The final line of information 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; PROSCAN INFORMATION DSP_1 IS 4-AXIS STEPPER VERSION 2.7 DSP_2 IS 2-AXIS STEPPER VERSION 2.7 DRIVE CHIPS 010111 (F2 F1 A Z Y X) 0 = Not Fitted JOYSTICK ACTIVE STAGE = H101/2 FOCUS = NORMAL FILTER_1 = NONE FILTER_2 = HF110-10 SHUTTERS = 001 (S3 S2 S1) 0 = Not Fitted
			$FILTER_2 = HFT10-10$ SHUTTERS = 001 (S3 S2 S1) 0 = Not Fitted
			AUTOFOCUS = FITTED
			VIDEO = NONE
			END
=	None	Nm	Reports whether any limit switch has been hit since the last call of the command. Nm is a two digit Hex number (one Byte) which
			converted to binary is as follows:-
			1007 100 105 104 105 102 101 100
			-4 $+4$ -2 $+2$ -1 $+1$ $-\Lambda$ $+\Lambda$
			Reading this status clears it.

Command	Arguments	Response	Description
\$	[a]	Decimal	Reports status as a decimal number and gives motion
		number	status of any axis of the controller. After binary
			conversion convention is as follows:-
			F2 F1 A Z Y X
			D05 D04 D03 D02 D01 D00
			Optional parameters "\$,a" where a is the axis or
			resource
			X - X axis
			Y - Y axis
			S - X and Y axis
			Z - Z axis
			A - A axis (not present on Optiscan)
			F - Filter wheels
			F1 - Filter wheel 1
			F2 - Filter wheel 2
			when the optional parameter is used the binary word is
			just for the axis requested. Stage is for x, y axis, F is for
			filters and would return 0 to 3 depending on if they are in
			use.
BAUD	b	0	Sets the baud rate of the port issuing the command to the
			value specified by b. As a protection measure, if no
			command is sent to the port while the controller is
			switched on, the baud rate will revert to 9600 after
			switching off and back on again twice. Allowable values
			for baud rate are 9600 (argument 96), 19200 (argument
			19) and 38400 (argument 38)
			WARNING
			If the baud rate of ProScan is changed it is important
			for the application software to check communication
			with ProScan by scanning the baud rate on
			initialisation. This will avoid a permanent
			communication failure should the PC Port and
	N	0 0 1	ProScan port be set at different bauds.
COMP	None	0 = Std	Report the Command protocol (Compatibility mode (1) or
		I = Comp	Standard mode (0))

Command	Arguments	Response	Description
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 sent while the joystick is active will be lost.
			Compatibility mode is offered for users who wish the
			Commands to be compatible with earlier H127/H128 Prior
			Controllers.
DATE	None	Text string	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 H29XY1 can drive XY stage and 1 filter
			wheel only.
ERROR	h	0	Sets the reporting of error to 'Human' if h is 1 (readable
			text) else error codes are returned (see Error Description
			Table)
Ι	None	R	Stops movement in a controlled manner to reduce the risk
			of losing position. In compatibility mode this command is
			acted on immediately i.e. there is no need for a <cr>. The</cr>
			command queue is also emptied. In Standard Mode a
			<cr> must be used.</cr>
Κ	None	R	Immediately stops movement in all axes. Mechanical
			inertia may result in the system continuing to move for a
			short period after the command is received. In this case, the
			controller position and mechanical position will no longer
			agree. In compatibility mode this command is acted on
			immediately i.e. there is no need for a <cr>. The</cr>
			command queue is also emptied. In Standard Mode a
			<cr> must be used.</cr>
			This command is normally treated as an emergency stop.
MACRO	None	0	Used to enter and leave the Macro Mode. ONLY
			AVAILABLE IN STANDARD MODE.
SERIAL	None	nnnnn	Reports the units' serial number nnnnn, if the serial number
			has not been set "00000" is returned.

Command	Arguments	Response	Description
LMT	None	Nm	Reports whether any limit switch is currently active. A
			limit switch is active if the switch is in contact with the
			axis hardware.
			Nm is a two digit Hex number (one Byte) which when
			converted to binary is as follows:-
			to binary is as follows:-
			D07 D06 D05 D04 D03 D02 D01 D00
			-4^{th} $+4^{th}$ $-Z$ $+Z$ $-Y$ $+Y$ $-X$ $+X$
			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).
SOAK	None	0	Used to soak test the controller and peripherals. ONLY
			AVAILABLE IN STANDARD MODE.
VERSION	None	ddd	Reports the units software version number as a 3 figure
			number eg 100 is Version 1.00
WAIT	t	0	Inserts a wait of t milliseconds in a macro/soak
			routine.

Stage Commands

Command	Arguments	Response	Description
В	None	R	Moves Back by v steps as defined by the 'X' command
			below.
В	у	R	Moves Back by y steps.
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 50,000 microsteps
			per revolution of the motor on a standard ProScan
			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
F	None	R	Moves Forward by the v step size defined by the 'X'
			command
F	у	R	Moves Forward by y steps.
G	x, y, z	R	Go to the absolute position x, y, z. Z is optional.
GR	x, y,z	R	(Go Relative) Moves by the amount specified by x, y, z.
			Z is optional.
GX	Х	R	Move to absolute position x (y position remains
			unchanged)
GY	у	R	Move to absolute position y (x position remains
			unchanged)
Н	None	0	Turns OFF the joystick (Stage and Z axes) after
			completion of any current joystick move. The joystick is
			re-enabled using 'J' Command (see below) The joystick
			is always enabled on power up.

J	None	0	Turns ON the joystick (Stage and Z axes). This
			command is acted upon immediately.

Command	Arguments	Response	Description
JXD	с	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	с	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	Moves Left by x steps.
М	None	R	Moves stage and focus to zero (0,0,0)
0	S	0	Sets the speed of the stage under joystick control. s is
			percentage in range 1 to 100.
0	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)
Р	None	x,y,z	Reports absolute position of x,y and z axes. This can be
			used whilst any axis is moving to give 'position on the
			fly' Note <cr> (Carriage return) only will also return</cr>
			position.
Р	x, y, z	0	Sets absolute position of x, y, and z axis. No axis can be
			moving for this command to work. If there is a linear
			encoder fitted on the Z axis the position can only be set
			when the current position is within the encoder range
			and it has previously been at some lower position. If
			neither of these conditions has been met an error will be
			reported.

Command	Arguments	Response	Description
PS	None	x,y	Reports position of Stage only (x, and y).
PS	x, y	0	Sets Absolute position of x, and y axis. No axis can be
			moving for this command to work.
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	у	Reports position of y only.
PY	у	0	Sets Absolute position of y axis. No axis can be moving
			for this command to work.
R	None	R	Moves Right by u steps as defined by 'X' command.
R	X	R	Moves Right by x steps.
RES	s,r		Sets the desired resolution for the stage, s is X and Y
			axes, r can be a non integer number setting the
			resolution for the axis in units of microns.
			e.g.
			RES,s,1.0
			Resolution set to 1.0 micron
RES	a		Returns resolution for axis a.
RIS		R	Restore Index of Stage. This command is only effective
			if the SIS command has been used on installation.
			This Command can be used at any time and will re
			synchronise the stage and controller position should the
			stage have been manually moved when the controller
			was off. The stage will hit limits and then return to the
			position stored by the controller prior to the last power
			down. If the stage has not been manually moved this
			command will not normally be needed.

Command	Arguments	Response	Description
SAS	a	0	Sets the maximum stage acceleration to a. Range is 1 to 100.
SAS	None	a	Report current stage acceleration
SCS	с	0	Sets the current stage S-curve value. This is the rate of change of acceleration during the transition from stationary until the stage reaches the full acceleration set by SAS. Range of c is 1 to 100.
SCS	None	c	Report current stage S-curve setting.
SIS		R	 Set Index of Stage. This command would normally only be used on first installation of the system. The stage moves to limits and sets absolute position to 0,0. The controller will always remember this internally as zero even with subsequent uses of Z and P, x , y command.
SMS	m	0	Sets the current Stage (x, y) maximum speed to m. Range is 1 to 100.
SMS	None	m	Report the current Stage (x, y) maximum speed setting m
STAGE	None	Text string	Prints information about the currently connected stage. There are 250 microsteps per full step of the motor. The final line of information 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. Example STAGE = H101/2 TYPE = 1 SIZE_X = 108 MM SIZE_Y = 71 MM MICROSTEPS/MICRON = 25 LIMITS = NORMALLY CLOSED END
SKEW	None	a	Returns the skew angle a, in degrees, that had previously been set by the SKEW,A and SKEW,S commands or the SKEW,A command.

Command	Arguments	Response	Description	
SKEW	А	0	Skew About command, when used in conjunction with	
			SWEW S, can re-align samples which are not perfectly	
			aligned to the XY motion of the stage.	
			Use this command to skew the XY stage movement About	
			this point. The SKEW S command must also be executed to	
			complete this operation.	
SKEW	S	0	Use this command after the SKEW A command AND	
			moving a distance in X and Y axis to define the skew angle.	
			This is equivalent to twisting the stage.	
SKEW	a	0	Sets the skew angle a. IE SKEW 0.5 will skew the stage	
			through 0.5 degrees. SKEW 0 disables skew function	
TYA	None	0	Toggles Y axis of joystick between Y and A axis control	
VS	x,y,u		Sets the stage speed to x, y for the X and Y axes	
			respectively in units specified by u.	
			u = values in microns linear travel per second. This is	
			default if u is omitted, therefore VS,500,500 would set	
			500um/s in both X & Y.	
			u = p are values in microsteps per second based on 250	
			microsteps per full step of motor. VS,500,500,p would set 2	
			full steps per second. To stop this 'virtual joystick' move	
			use VS,0,0.	
			If limits are hit the speed will be set to zero for the	
			appropriate axis.	
Х	None	u,v	Reports the current step size (u and v) in x and y for the	
			stage	
Х	u,v	0	Sets the current step size for the stage.	
XD	С	0	Sets the direction of the X axis move (mechanical) with	
			respect to the software move. Use this command if 'L'	
			command moves stage mechanically right.	
			C=1 or -1.	
YD	С	0	Sets the direction of the Y axis move (mechanical) with	
			respect to the software move. Use this command if 'F'	
			command moves the stage mechanically backwards. C=1 or	
			-1.	
Z	None	0	Sets the stage and focus position to $ZERO(0,0,0)$.	

Z axis Commands

Command	Arguments	Response	Description	
GZ	Z	R	Move to absolute position z	
BLZH	s,b	0 Sets the z-axis backlash value for z-axis move comman		
			sent via the serial port (not joystick moves) to b. $s = 1$	
			enables backlash $s = 0$ disables backlash. b is the number	
			of microsteps per motor. There are 50,000 microsteps per	
			revolution of the motor on a standard ProScan system.	
BLZH	S	0	Enables / Disables the z-axis backlash. $s = 1$ enables	
			backlash $s = 0$ disables backlash.	
BLZH	None	s,b	Reports back s and b values for z-axis moves sent via the	
			serial port (see above). In compatibility mode only s	
			returned	
BLZJ	s,b	0	Sets the z-axis backlash value for joystick/digipot moves	
			to b in microsteps. $s = 1$ enables backlash $s = 0$ disables	
			backlash.	
BLZJ	S	0	Enables / Disables the z-axis backlash for joystick/digipot	
			control. $s = 1$ enables backlash $s = 0$ disables backlash.	
BLZJ	None	s,b	Reports s and b values for z-axis (see above). In	
			compatibility mode only s returned	
С	None	w	Reports the current step size for the z-axis focus motor.	
С	w	0	Sets the current step size for the z-axis focus motor to w.	
D	Z	R	Moves down by z steps.	
D	None	R	Moves down w steps defined by the 'C' command.	
FOCUS	None	Text string	Prints information about z-axis 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 affecting	
			application software. Users should always read lines in	
			until the END is seen to keep in sync.	
			Example	
			FOCUS = NORMAL	
			TYPE = 0	
			MICRONS/REV = 100	
			END	

Command	Arguments	Response	Description	
Н	None	0	Turns OFF the joystick (Stage and Z axes) after	
			completion of any current joystick move. Joystick is re-	
			enabled using 'J' Command below. The joystick is	
			always enabled on power up.	
Ι	None	R	Stops movement in a controlled manner to reduce the risk	
			of losing position. In compatibility mode this command is	
			acted on immediately i.e. there is no need for a <cr>.</cr>	
			The command queue is also emptied. In Standard Mode a	
			<cr> must be used.</cr>	
J	None	0	Turns ON the joystick. (Stage and Z axes) This command	
			is acted upon immediately.	
JZD	d	0	Sets the direction of Z axis under digipot control.	
			d = 1 or -1.	
JZD	None	d	Reads d.	
Κ	None	R	Immediately stops movement in all axes. Mechanical	
			inertia may result in the system continuing to move for a	
			short period after the command is received. In this case,	
			the controller position and mechanical position will no	
			longer agree. In compatibility mode this command is	
			acted on immediately i.e. there is no need for a <cr>.</cr>	
			The command Queue is also emptied. In Standard Mode a	
			<cr> must be used.</cr>	
			This command is normally treated as an emergency stop.	
М	None	R	Moves stage and focus to zero (0,0,0)	
OF	S	0	Sets the speed of the focus motor under joystick/digipot	
			control. 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 $\frac{1}{2}$ and OF is set to 50 the	
			returned value will be 25)	
PZ	None	Ζ	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 an encoder is present on the	
			Z axis, 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	Arguments	Response	Description	
RES	a,r		Sets the desired resolution for the axis.	
			a is the axis, r can be a non-integer number setting the	
			resolution for the axis in units of microns.	
			UPR command must be implemented before using this	
			command for Z axis.	
			e.g	
			UPR,z,400	
			RES,z,0.1	
			Resolution set to 0.1 micron for a focus mechanism of	
			400 microns per revolution of the motor.	
RES	a		Returns resolution for axis a.	
SAZ	a	0	Sets the current Z acceleration to a. Range is 1 to 100	
SAZ	None	a	Report the current Z acceleration setting.	
SCZ	с	0	Sets the s-curve value for Z in units of % in the range 1	
			to 100.	
SCZ	None	с	Returns the s-curve value.	
SMZ	None	m	Report the current Z maximum speed setting m	
SMZ	m	0	Sets the current Z maximum speed to m. Range is 1 to	
			100	
U	Z	R	Moves Up by z steps.	
U	None	R	Moves Up by w steps defined by the 'C' command.	
UPR	a,n	0	Sets the number of microns (n) linear movement per	
			revolution of the motor for the axis a.	
			E.g. UPR,z,100 is set for a motor fitted to the fine focus	
			knob with 100 microns focus movement per revolution.	
UPR	a	n	Returns microns per revolution for the axis a.	
V	Z	R	Go to the absolute position z in the z-axis.	

Command	Arguments	Response	Description
VZ	s,u	R	Sets the focus speed to s in units specified by u.
			u = u Units are microns per second.
			u is the default unit and can be omitted.
			To stop a virtual focus move use VZ,0
			Note that UPR must be set to achieve correct linear
			focus speed.
Ζ	None	0	Sets the stage and focus absolute position to zero
			(0,0,0).
ZD	d	0	d=1 Sets direction of rotation of focus motor for
			commands sent via serial port. Defaults to 1 and is
			correct for motor fitted on right hand side of the
			microscope.
			d=-1 Direction of rotation of focus motor opposite to
			above.
ZD	None	d	Returns d

Command	Arguments	Response	Description
7	w, f	R or a	w defines the filter wheel number 1,2 or3. f is defined
		number.	below.
		If no wheel	If f is a number, command moves filter wheel w to filter
		is fitted E,17	position f.
		will be	If f is 'N', command moves filter wheel w to next filter.
		returned.	If f is 'P', command moves filter wheel w to previous
			filter.
			If f is 'F', command reports current filter position on
			filter wheel w.
			If f is 'H', command performs a home routine.
			If f is 'A' wheel will auto home on controller startup
			If f is 'D' wheel will NOT auto home on startup
			(default)
7	0,f1,f2,f3	R	The first parameter (zero) indicates all filters; the three
			subsequent parameters f1 f2 and f3 are the target
			positions for filter1, 2 and 3 respectively. Filters not
			fitted or invalid filter wheel positions are ignored. This
			feature is only available in COMP 0 mode.
7	С	0	Enables automatic shutter closure during any filter move
			and then re-assert initial shutter state at end of move
7	D	0	Disables automatic shutter closure

Filter Wheel Commands

FILTER	W	Text string	Prints information about filter wheel w. 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 in order to maintain compatibility. Example FILTER_1 = HF110-10 TYPE = 3 PULSES PER REV = 67200 FILTERS PER WHEEL = 10 OFFSET = 10080 HOME AT STARTUP = TRUE SHUTTERS CLOSED = FALSE
			END
FPW	W	n	Reports the number of filter positions for filter wheel w.

Command	Arguments	Response	Description	
SAF	w	a	Report the current filter wheel w acceleration setting.	
SAF	w, a	0	Sets the current filter wheel w, acceleration to a in units of	
			% Range is 1 to 100	
SCF	w,c		Sets the current filter wheel w S-Curve setting. Range is 1	
			to 100	
SCF	W	c	Report the current filter wheel w S-Curve setting c	
SMF	w	m	Report the current filter wheel w maximum speed setting m	
SMF	w, m	0	Sets the current filter wheel w maximum speed to m in	
			units of %. Range is 1 to 100	

Shutter Commands

Command	Arguments	Response	Description
8	s,c[,t]	R	Opens or closes the shutter s (value '1' '2' or '3'), if c
		If shutter s	is 0 the shutter is opened, 1 it is closed. The optional
		is not fitted	argument t is used to open/close the shutter for a time t
		E,20 will be	milliseconds.
		returned	
8	0,s1,s2,s3	0	First parameter is a zero. Subsequent parameters
			define the startup state of shutters s1,s2 and s3
			respectively.
			if s1 is 0 then shutter1 is opened, 1 it is closed etc.
			Default state is all shutters closed.
8	S	c	Returns status c of shutter s
		If shutter s	
		is not fitted	
		E,20 will be	
		returned	
Shutter	S	Text string	Prints information about shutter's' (s is a value
			between 1 and 3). 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 until the END
			is seen in order to maintain compatibility.
			Example
			SHUTTER_1 = NORMAL
			DEFAULT_STATE=CLOSED
			END

Lumen Pro Commands.

Command	Arguments	Response	Description	
LIGHT		a	Reports a the output	t of light from the shutter in %.
			The command autor	matically locates LGG_SHUTTER.
			Error 20 reported if	no shutter detected.
LIGHT	n	0	Sets the output from	the shutter to n, where n can be set
			between 1-100%.	
			The command autor	matically locates LGG_SHUTTER.
			If n is "h" the shutte	er will perform a home routine.
LIGHT	P,n	0	Sets the filter wheel	position P to n % light output.
			i.e., LIGHT,4,45	
			Sets position 4 to 45	5% light output.
			Use 7,n,4 to move f	ilter to position 4, where n is the Filter
			Wheel port which the	ne shutter is attached.
			STANDARD 10 Po	sition Shutter settings are:
			Position % Lig	ght output
			1	0
			2	11
			3	22
			4	33
			5	44
			6	55
			7	66
			8	77
			9	88
			10	100
LIGHT	P, ?	n	Reports n, the %output of position p.	

Pattern Commands

Command	Arguments	Response	Description	
Е	None	R	Sets the origin for the pattern to the current position.	
			Zeros the pattern X and Y counter.	
Е	b	0	If $b = 0$ the stage returns to the origin after completing the	
			final move of the pattern (default setting upon power up).	
			If $b = 1$ the stage will stay at the final pattern position.	
Ν	n,m	0	Defines the number n of X and number m of Y steps for	
			the pattern.	
Ν	None	n,m	Reports number of X and Y steps.	
S	None	R	Move to next position in Rectangular Raster.	
S	?	S	Step number of scan.	
S	n,m	R	Moves to n th cell in X and m th cell in Y in rectangular	
			raster.	
Х	x,y	0	Sets the step size in X and Y	
Х	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 n th cell in X and m th cell in Y in rectangular	
			snake.	
Q	None	0	Sets the origin of the disc grid equal to the current	
			position.	
			Zeros the disc grid X and Y counter.	
Т	None	R	Move to next field of Disc Raster Scan.	
Т	?	S	Step number s of circular scan	
W	d	0 in	Sets the diameter in mm of a circular disc (Range 1 to	
		compatibili	327mm)	
		ty mode.	The parameter X defining the step sizes in x and y should	
		Number	be defined before setting the W value.	
		of fields		
		in		
		standard		
		mode.		

Command	Arguments	Response	Description
W	None	d	Reports the disc diameter (in mm.)

H127/H128 Compatible Commands

The following commands are also available. There are equivalent commands listed earlier to perform the same function. The commands below provide compatibility with previous generations of Prior Controllers H127/H128.

Command	Argumen	Response	Description
	ts		
#	None	bit field	Reports the current state of the controller.
			Returns bit field giving current status of controller
			0 = idle, 1 = busy.
			Format is F2 F1 A Z Y X eg 100000 is filter wheel 2
			moving only 000111 is stage and focus moving.
			This command is acted on immediately in compatibility
			mode there is no need for a <cr>.</cr>
=	None	N <lf></lf>	Limit switch status (see Main Command section above
			for description.) Note the addition of Line Feed <lf></lf>
			before <cr></cr>
10	None	0 <lf></lf>	0 <lf> indicates no AutoFocus fitted (only available with</lf>
			ProScan)
			Note the addition of Line Feed <lf> before <cr></cr></lf>
2D	n		Starts move of relative magnitude n Down at speed set by
			3Z
2E	n		Starts move of relative magnitude n East (Right) at speed
			set by 3X. Move can be interrupted using the 'I'
			Command.
2N	n		Starts move of relative magnitude n North (Back) at
			speed set by 3Y
2S	n	1	Starts move of relative magnitude n South (Forward) at
			speed set by 3Y
2U	n	1	Starts move of relative magnitude n Up at speed set by 3Z
2W	n	1	Starts move of relative magnitude n West (Left) at speed
			set by 3X
3X	p		Sets the X speed (as a percentage of maximum) for use

			with 2E and 2W commands.
3Y	р		Sets the Y speed (as a percentage of maximum) for use
			with 2N and 2S commands.
3Z	р		Sets the Z speed (as a percentage of maximum) for use
			with 2U and 2D commands.
9	x,y,z	0	Sets the Absolute position of x,y and z Axis. (See
			P,x,y,z.)

Command	Argumen	Respons	Description
	ts	е	
AFS	None	0	AutoFocus score. A value zero is returned if Autofocus is not
			implemented.
CC	d, r, s		
FS		None	Focus Score. <cr> only is returned if AutoFocus not</cr>
			implemented.
G3	x,y,z	R	Move to absolute position x,y,z. (See G,x,y,z.)
Н	None		Turns OFF the joystick after completion of any current
			joystick move. This function responds with a "0" in
			Standard mode and a "R" in Compatibility mode. (See J,0)
Ι	None	R when	Stops stage gracefully.
(no <cr>)</cr>		motors	
		stopped	
		(if	
		motors	
		moving)	
		No	
		response	
		at all if	
		motors	
		already	
		stationar	
		у.	
J	None		Turns ON the joystick. This function responds with a "0"
			in standard mode and a "R" in compatibility mode.(See

			J,1)
RP			Same as RIS (Restores Index of Stage)
SAZ	a		Sets the current Z acceleration setting a.(See SAZ)
SAZ	None		Report the current acceleration setting a for Z
SAZ	a		Sets the current Z acceleration to a. Range is 4 to 100 (See SAZ)
SMX	S	0	Sets the current (x, y) maximum speed to s. Range is 1 to 100
SMX	None	S	Report the current (x, y) maximum speed setting s (See SMS)
SMX	S	0	Sets the current (x, y) maximum speed to s. Range is 1 to 100
SRF	w		Report the current filter wheel w acceleration setting
SRF	w, a		Sets the current filter wheel w, acceleration to a. Range is 4 to 100
SRF	w, a		Sets the current filter wheel w, acceleration to a. Range is 4 to 100 (See SAF)
SRX	а		Sets the current Stage (x, y) acceleration to a. Range is 4 to 100 (See SAS)
SRZ			Same as SIS (Sets Index of stage)

Command	Argumen	Respons	Description
	ts	е	
SS	S	0	Sets the value for XY user units to s Entering negative
			number reverses direction of stage.
SSZ	None	S	Reports the Z user units value s
SSZ	s	0	Sets the value for Z user units to s. Entering negative
			number reverses direction of motor.
XYBL	s,b		Sets the XY backlash value for joystick to b in pulses (250
			pulses per full step of the motor). $s = 1$ enables backlash
			s=0 disables backlash.
XYBL	None		Reports back s and b for stage (see above) in form s,b
XYBLPC	s,b		Sets the XY backlash value for host moves to b in pulses.s
			= 1 enables backlash s=0 disables backlash (See BLSH)
XYBLPC	None		Reports back the XY backlash for host moves in form s,b
			(See BLSH)
ZBL	s,b		Sets the Z backlash value for joystick/digipot to b in
			pulses $s = 1$ enables backlash s=0 disables backlash.
ZBL	None		Reports back s and b for Z axis (see above) in form s,b
ZBLPC	s,b		Sets the Z backlash value for host moves to b in pulses. s
			= 1 enables backlash s=0 disables backlash (See BLZH)
ZBLPC	None		Reports back the Z backlash value for host moves in form
			s,b (See BLZH)