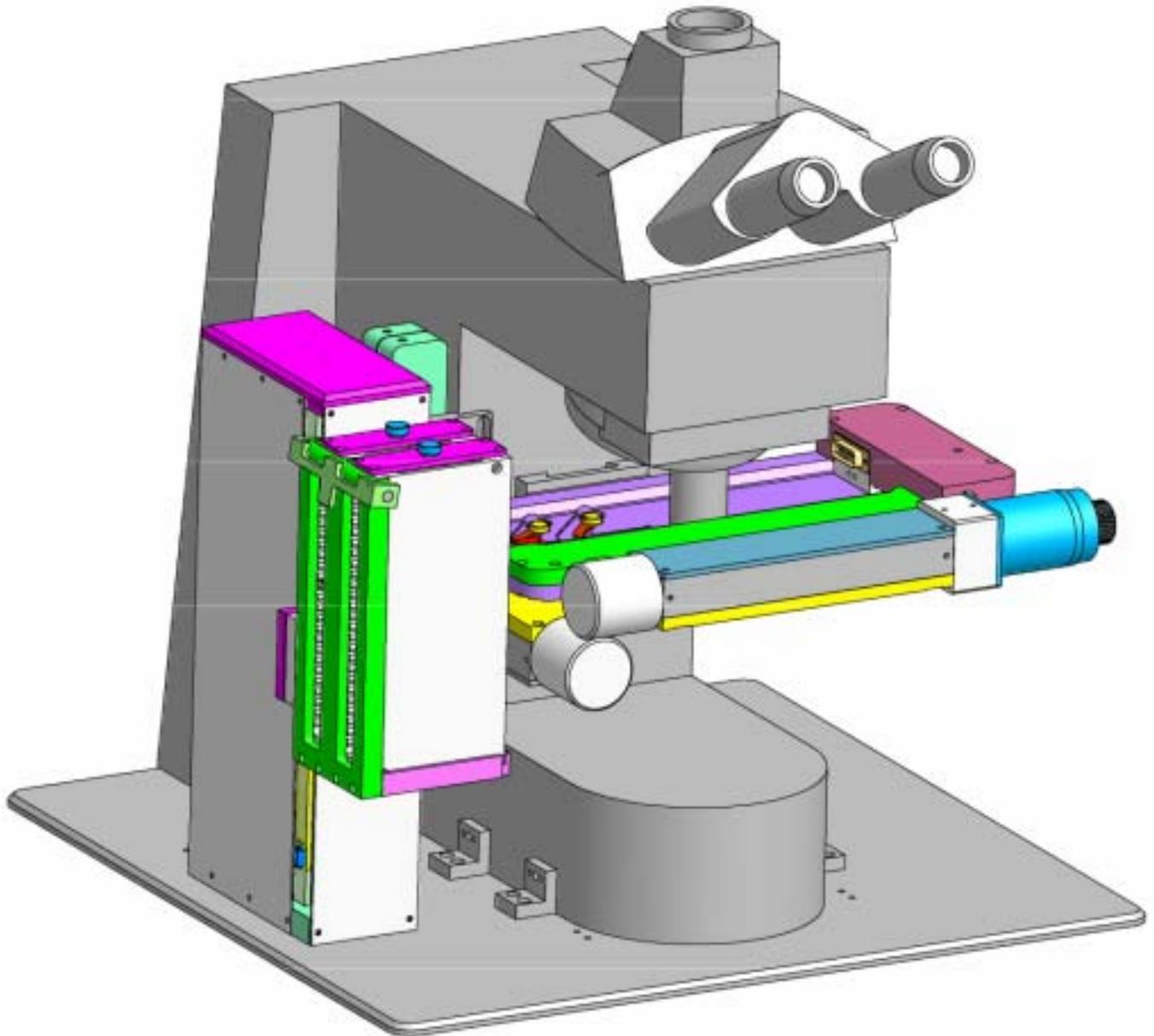


LEP Slide Handler Installation Manual



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Contents

Contents	1
1. Installation	2
1.1. Introduction.....	2
1.2. Components	2
1.3. Required Tools.....	2
2. System Setup.....	3
3. Controller Configuration	5
4. Position Definitions	5
XY Load Cass 1:.....	5
XY Load Cass 2:.....	5
Indexer First Slide:.....	5
Indexer Top Slide:.....	5
Push/Pull Retract:.....	6
Push/Pull Extend Fetch:.....	6
Push/Pull Home:	6
Push/Pull Replace:	6
Indexer offset:	6
Arm Lift Disengage:	6
5. Stage Adjustments	6
5.1. Upper Arm Height	6
5.2. Arm Lift Cam.....	6
5.3. Crash Detection.....	6
6. MAC 5000 Interface Slide Loader Commands.....	8
6.1. Initialize system	8
6.2. Fetch next slide	8
6.3. Unload Slide.....	8
6.4. Get slide	9
6.5. Put slide.....	9
6.6. Select slide	9
6.7. Configure # of cassettes installed	10
6.8. Slide Loader Status	10
6.9. Home Arm	10
Error Codes	11
Example Code.....	12
6. Reference Material	12

1. Installation

1.1. Introduction

The LEP Slide Handler System provides a complete high through put solution to microscope automation.

The slide transfer mechanics provides clean, reliable slide loading and unloading. A single arm function pulls the slide from the cassette to the stage and then returns it again with an opposite pushing motion. The slide is firmly held in place for repeatable positioning. As the slide is scanned, the transfer arm is clear of any interference with the microscope optics.

The system allows the cassettes to be configured depending upon your requirements. Input only, output only or both input and output. This makes the system ideal for screening, analysis, classification and review applications.

1.2. Components

The LEP Slide Handling System is comprised of the following components:

- LEP Slide Handling System (99H010)
 - Slide Handler Stage (89-4005-099)
 - Stage Adapter Ring for Specified Microscope
 - 50 Position Slide Indexer (89-4002-099)
 - System Base Plate with Mounting Clamps for Specified Microscope
- MAC 5000 Controller
 - Base & Communication Modules (995001)
 - XY Stage Modules (73005050)
 - Indexer and Slide Arm Module (73005055)
 - Joystick (73000362)
- (2) 25 Position Slide Cassettes (99H100)

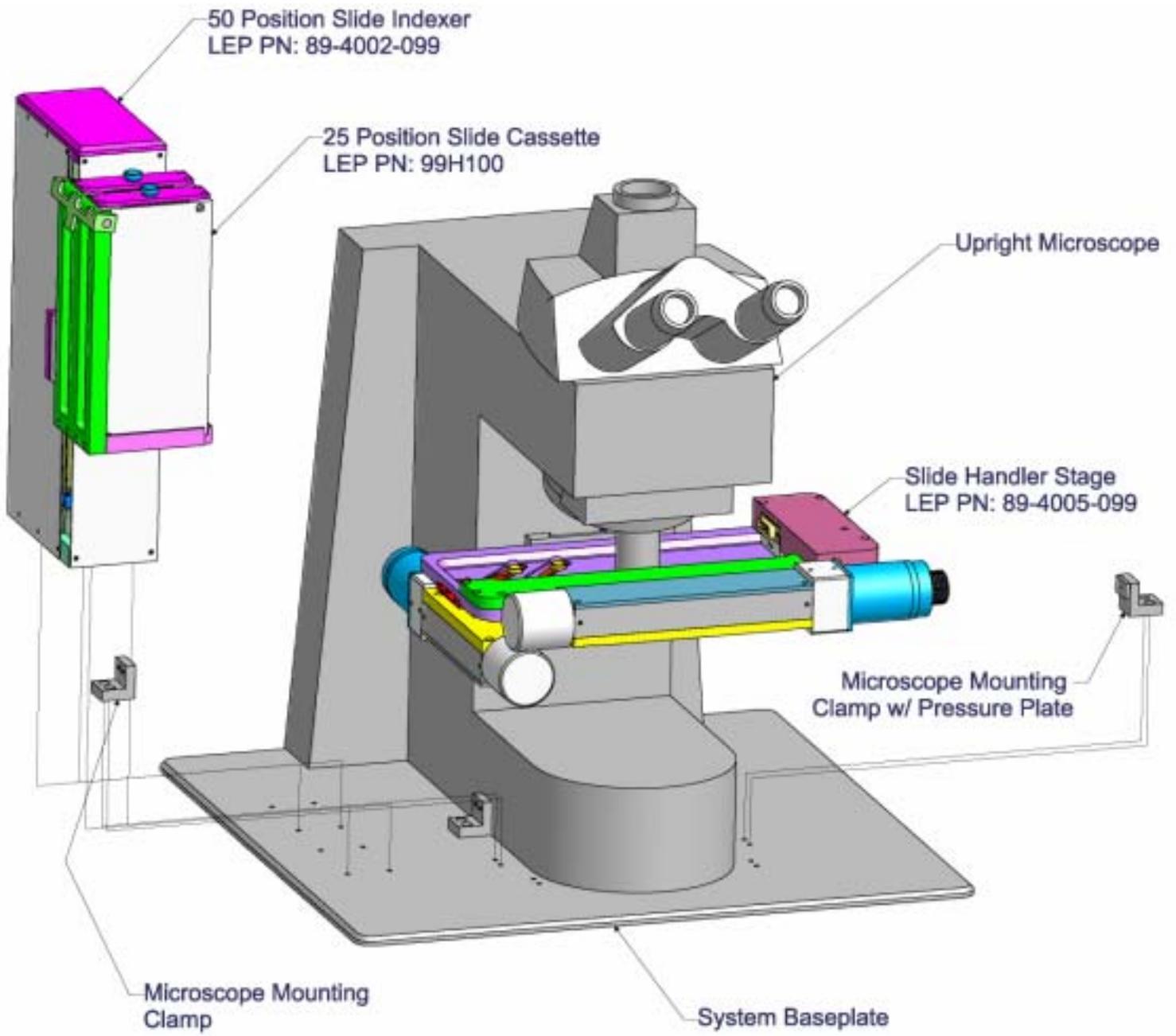
1.3. Required Tools

In order to install the LEP Slide Handler System, the following tools are required:

- Upright Microscope
- 1.5mm, 2.0mm, 2.5mm, and 4mm Hex Wrenches
- Flat Head Screwdriver

2. System Setup

- 2.1. Place the microscope onto the base plate. Install the mounting clamps (pressure plate clamps mount to the right side). Tighten the pressure plates and verify the microscope is being held firmly.
- 2.2. Install the stage to the microscope stage carrier. The stage is installed in the same manner as a manual stage.
- 2.3. Remove the covers on the Slide Indexer. Mount the indexer the System base plate with the provided hardware.
- 2.4. Adjust the indexer (the space between both cassettes) to the optical center of the microscope. Once the positions are set, re-install the covers on the indexer.
Note: The microscope may need to be adjusted to achieve that location.
- 2.5. Set the y-axis limit switch. This is done to prevent a crash from the transfer arm cover to the microscope objective.



3. Controller Configuration

Module Address	Address Software ID	Axis Description	Joystick Jumper Configuration
1	X	Stage X-Axis	JP6 - 1 & 3
2	Y	Stage Y-Axis	JP6 - 1 & 4
4	R	Slide Handler Arm	JP6 - 1 & 3
6	Z	Slide Handler Indexer	JP6 - 1 & 4

Upon power up with no software running, the joystick will control all axes. The joystick x-axis will run x stage and the arm at the same time. Joystick y-axis will run the y stage and indexer at the same time.

4. Position Definitions

Note: This setup is explained using the LEP Run It utility.

The first step is to initialize the system prior to teaching any points. Therefore type the command SLINIT in the command box and press the GO button. At this point the system should go to its limit of operation in all axes. Once initialized, you may begin storing teach points.

Using the Handler tab of the Run-It program you have access to enabling/disabling the joystick function of a particular axis and storing the handler teach points. The general idea is to pick a point to teach from the pull down menu, enable the joystick for the particular axes you are about teach, move to the described position, then press the store button. **Note: You may not teach any point that corresponds to a limit condition for a particular axis.** Also, only the selected point in the drop down menu is actually being stored. For example when teaching the XY Load Cass 1 position, only the X Y position is store, the position of the arm or the indexer is not relevant.

XY Load Cass 1:

This corresponds to the X and Y axis position of the stage when the center slide loading slot in the top plate of the stage is aligned with the center of cassette 1.

XY Load Cass 2:

This corresponds to the X and Y axis position of the stage when the center slide loading slot in the top plate of the stage is aligned with the center of cassette 2.

Indexer First Slide:

This corresponds to the Z-position of the slide indexer slot 1 (of either cassette) is aligned with the Z-position of the of the stage such that a slide can freely slide between slot 1 and the top plate of the stage.

Indexer Top Slide:

This corresponds to the Z-position of the slide indexer slot 25 (of either cassette) is aligned with the Z-position of the of the stage such that a slide can freely slide between slot 25 and the top plate of the stage.

Push/Pull Retract:

As the slide loader arm drags the slide from the cassette to the stage top plate, it will need to stop at the position where the slide reaches the end of the slot. This position corresponds to the Push/Pull retract position

Push/Pull Extend Fetch:

This position corresponds to the position of the slide loader arm to pull a slide from the cassette. The raised area at the end of the arm should be slightly passed the end of the slide so that as the retracts it can drag the slide out of the cassette.

Push/Pull Home:

This corresponds to the "safe" position of the slide loader arm. This position should be taught by moving the arm as far right as possible just off the limit switch.

Push/Pull Replace:

Upon return of the slide to the cassette, the slide loader arm pushes the slide back into the cassette. The taught position corresponds to the slide loader arm position when the slide is fully replaced into the cassette. The end of the arm is just in contact with the edge of the slide.

Indexer offset:

Previously, you have taught the position for the first slide and the top slide when the indexer and stage top plate are aligned. In order to allow the slide loader arm to "fetch" a slide, the arm must move under the slide in the cassette. The offset value corresponds to the indexer movement required to allow the arm to move freely under the slide to push/pull extend fetch position. This is taught by entering a number (e.g. 7500 DC Motor) into the indexer offset field on the Handler tab, selecting the Indexer Offset from the pull down menu, and pressing the STORE button

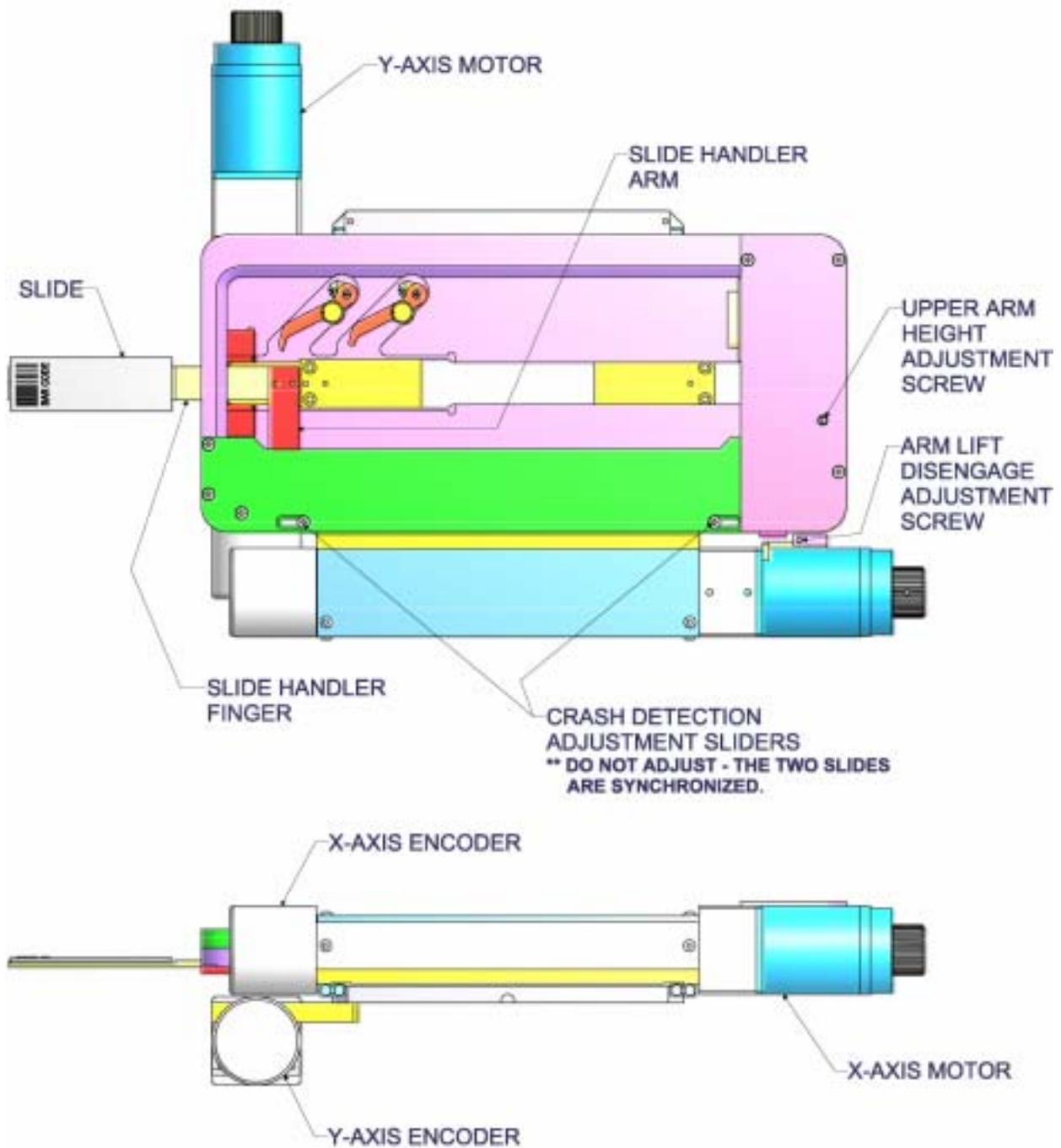
Arm Lift Disengage:

After the slide has been pulled from the cassette and the arm is in the push/pull retract position, the arm needs to be lowered slightly so it can then move to the home position. The method by which the arm is lowered is based on moving the stage to a specific X axis position where a mechanical actuation takes place which lower the arm. This position is near the left end limit. Starting with the X axis at the left end limit, move the stage to the right - you will notice one position where the arm lowers - store this position.

5. Stage Adjustments

Note: Only qualified technicians should attempt any stage adjustments.

- 5.1. **Upper Arm Height** – This screw adjusts the height of the upper limit on the slide finger. The correct position should be set so the finger tab pulls/pushes the slide while the slide is resting on the stage surface.
- 5.2. **Arm Lift Cam** – This screw sets the lower limit of the slide finger. The correct position is when the finger clears the bottom of the slide on the slide retract.
- 5.3. **Crash Detection** – These two slide adjustments set the sensitivity of a potential crash. These two sensors are synchronized. It is not recommended they adjusted in the field.



NOTICE:
ONLY A QUALIFIED TECHNICIAN SHOULD ATTEMPT THESE ADJUSTMENTS.

6. MAC 5000 Interface Slide Loader Commands

Command:
6.1. Initialize system

Format:
SLINIT

Explanation:
Initializes the system. All axes will move to the predefined limits using the speed values stored in X99 (Stage X), Y99 (Stage Y), B99 (Focus), R99 (Slide Arm), T99 (Slide Lift on BioPoint version), Z99 (Cassette Indexer). After each axis has reached the limit, a fine limit search is conducted at 2kHz for more repeatable calibration.

Upon valid completion of the initialization routine, operating speeds will automatically be loaded to each axis. The operating speeds are stored in X98 (Stage X), Y98 (Stage Y), B98 (Focus), R98 (Slide Arm), T98 (Slide Lift on BioPoint version), Z98 (Cassette Indexer)

Command:
6.2. Fetch next slide

Format:
SLNEXT

Explanation:
Fetches the next slide in the ordinal select list.

A slide currently on the will be returned to its original location before getting the next slide on the list.

A positive reply will indicate the ordinal position of the slide being fetched.

Command:
6.3. Unload Slide

Format:
SLUNLOAD

Explanation:
Returns a slide to its original location.

A positive reply will indicate the ordinal position of the slide being unloaded. If no number is indicated with the positive reply, the slide was put on the stage using an SLGET command, and therefore does not have a place in the ordinal list.

Command:
6.4. Get slide

Format:
SLGET *cass slot*

Explanation:
Get the slide at location indicated by *cass* and *slot* and place it on the stage.

Command:
6.5. Put slide

Format:
SLPUT *cass slot*

Explanation:
Puts the slide currently on the stage back into the cassette at position indicated by *cass* and *slot*.

Command:
6.6. Select slide

Format:
SLSELECT *cass slot*
SLSELECT -1
SLSELECT 999
SLSELECT 1
SLSELECT ?
SLSELECT

Explanation:

Argument Function

cass slot Adds the slide at location *cass*, *slot* to the select list.

-1 Clears the select list to no slides.

-999 Adds all slides (dependent on the # of cassettes configured) to the select list.

1 Resets the select list back to the first slide

? Returns the current ordinal position in the select list

No parameter returns the contents of the select list.

Command:
6.7. Configure # of cassettes installed

Format:
SLCONFIG *cass*
SLCONFIG -1
SLCONFIG 0

Explanation:
Defines a cassette as installed.
-1 parameter clears the configuration to no cassettes installed.
0 parameter returns cassettes installed

Note: At this point the number of cassettes is limited to 2. Upon power up the 2 cassettes are configured by default

Command:
6.8. Slide Loader Status

Format:
SLSTATUS

Explanation:
Returns a status code.

N=idle
B=busy
-n= last error code (subsequent call will clear the error)

Note: During a sequence move (e.g. SLNEXT, SLPUT, etc...), if any other command other than SLSTATUS is sent to the controller, the response will be :N BUSY

Command:
6.9. Home Arm

Format:
SLHOME

Explanation:
On the simple slide loader, the arm is first lowered (T0), then brought to home (R0), and finally up (T1).
On the BioPrecision slide loader, the arm is lowered (X3), then brought to home (R0).

Error Codes

- 4 (param out of range) used for cassette or slot range errors
- 10 no slides selected
- 11 end of list reached
- 12 slide get error
- 13 slide put error
- 14 slide range error
- 15 cassette not installed
- 16 motor move error (move not completed successfully due to stall, end limit, etc...)
- 17 initialization error

Point-Id's for Precision Loader

- X1 - pickup point for cass1
- X2 - pickup point for cass2
- X3 - point where arm lowers
- Y1 - pickup point for cass1
- Y2 - pickup point for cass2
- B1 - focus pickup point
- Z1 thru Z25 - slide slots 1 thru 25
- Z26- indexer offset distance (typically 1500-2000 counts)
- R0 - arm home
- R1 - arm retract
- R2 - arm fetch
- R3 - arm replace

Example Code

The following describes a typical slide transfer sequence:

1. The cassette holder moves in the vertical direction until the desired slide is aligned (in the Z-plane) with the top surface of the XY stage (e.g. Indexer first slide)
2. The XY stage moves to the load/unload position near the slide cassette. (e.g. XY Load cassette 1)
3. At this point the "finger" is completely retracted (push/pull home) and is actually below the plane of the slide. (Indexer offset) The finger is now extended out into the cassette and then indexer offset is applied again. At the far end of the finger is a raised surface which acts to pull the slide out of the cassette onto the top surface of the stage until it reaches the push/pull retract position.
4. The stage now moves in the X-axis, until the arm is mechanically actuated (arm lift disengages). The finger then lowers and returns to the home position.
5. The stage is now free to scan the slide.
6. To return the slide to the slot, the stage moves to the XY load/unload position. The finger begins to extend out towards the cassette pushing the slide back into the cassette until the push/pull replace position has been reached. The raised surface which previously acted to pull the slide onto the stage, now acts to push the slide off the stage back into the cassette slot.

Typical commands to transfer slide using Run-It are:

SLGET 1 1 (removes a slide from cassette 1 slot 1)
SLPUT 1 5 (replaces a slide from the stage to cassette 1 slot 5)

6. Reference Material

Programming Manual:

90M026

Software Utilities:

99P012
LEP RunIT

Please contact LEP for download support.

Notes

Ludl Electronic Products designs and manufactures a wide range of automation accessories for microscopes and instrumentation.

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