

Motion Control and Shutters & Filters Control

Practical Automation For Your Microscope

SOFTWARE

The **Motion Control** extension allows IPLab to control motorized microscope hardware, letting you automate your experiments and image acquisition. Now you can conduct 3D imaging, time lapse imaging, multi-well plate analysis, multicolor fluorescent image acquisition (FISH, gene mapping) and GFP studies, all within one unified software environment!

Hardware controlled by Motion Control includes XY stages and Z-axis focus motors, filter switchers and shutters, and motorized microscopes. Motion Control also drives other, not directly supported, hardware via powerful RS-232 and parallel-port commands. This can give IPLab control over all of your microscope's motorized hardware. Simple IPLab scripts can then automate your microscope to perform entire imaging experiments for you.

Shutters & Filters Control lets you automate motorized filter switchers and shutters, without requiring you to buy the entire Motion Control package. "Filter switchers" includes filter wheels, wavelength switchers using rotating gratings, and liquid crystal tunable filters.



Imagine being able to control and program repetitive and complex protocols while saving time and increasing quality control. Using IPLab scripts, a complex experiment that requires movement of your microscope's stage & focus motors, filters, and shutter in a precise manner can be completed easily and accurately with the push of a button. Not only does Motion Control give you faster performance, but it also gives you better accuracy and reproducibility in your experiment.

HARDWARE



Hardware controlled includes these devices and more:

The Motion Control extension controls all of the following:

Automated Microscopes

- **Leica** DM RXA2, DM IRE2, DM IRB/E, DM RXA, and DM RA
- **Nikon** Eclipse E1000, TE2000
- **Olympus** AX70, AX80, BX61, and IX81
- **Zeiss** Axioplan 2ie, 2i, and 2; Axiovert 100M and 200M; and Axiophot 2
- Others

Stages: XY Stages and Z-axis Focus Motors

- **Ludl** XY stages and Z-axis Focus Motors
- **Prior** XY stages and Z-axis Focus Motors
- **Physik Instrumente** piezo-electric Z-motor

The Shutters & Filters Control extension controls:

Shutters and Filter Switchers

- **Ludl** shutters and filter wheels
- **Vincent Associates'** Uniblitz shutters
- **Sutter** Lambda 10-2 and 10-C filter wheels, and DG-4 wavelength switcher
- **Prior** shutters and filter wheels
- **CRI** Micro*Color RGB liquid crystal tunable filter

Other devices with RS232 or parallel interfaces may be controlled as well.

Please check the Scanalytics web site for the latest information on hardware supported by IPLab and Motion Control:
<http://www.scanalytics.com/hardware/index.html>.

AUTOMATED MICROSCOPY

Will Motion Control Drive my XY Stage? My Z Stage (Focus Motor)?

Yes, Motion Control moves XY and Z (focus) stages for you with repeatable precision. Motion Control does the following:

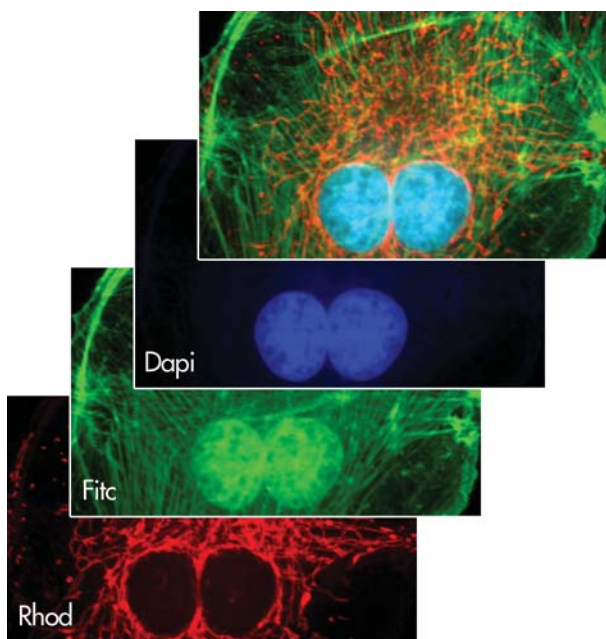
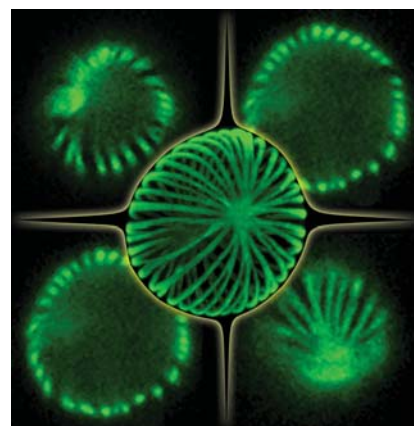
- move distances relative to the current position
(e.g. move 5000 microns in X, -600 microns in Y, and 5 microns in Z),
- move to absolute positions
(e.g. move to the spot at X = 5100 microns, Y=-500 microns, Z=10 microns)
- move to the center of XY stage,
- move to the XY stage's Home position, at its origin (usually one of its corners),
- set any XY or Z position to act as the new origin,
- record the position of XY and Z stages, letting you map interesting regions within your sample or plate, and
- move to recorded positions.

Using Motion Control's built-in tools, you can acquire a mosaic image of large samples. Motion Control can automatically scan the entire sample, taking a picture for each region.

Can Motion Control Allow Me to Acquire 3D Images?

Absolutely. The IPLab-Motion Control package includes built-in 3D acquisition commands. For 3D image capture with minimum hassle, use these built-in 3D Acquire commands to precisely control your focus motor along with your filter switchers and shutters.

Scanalytics also provides the tools for enhancement and deconvolution of your 3D images. IPLab includes 3D enhancement and display tools. Scanalytics also sells the deconvolution programs MicroTome and HazeBuster (from VayTek), as well as the visualization and measurement program VoxBlast (from VayTek). With this software, visualizing images in 3D gives you unparalleled insight into the spatial relationship of components in your specimen.



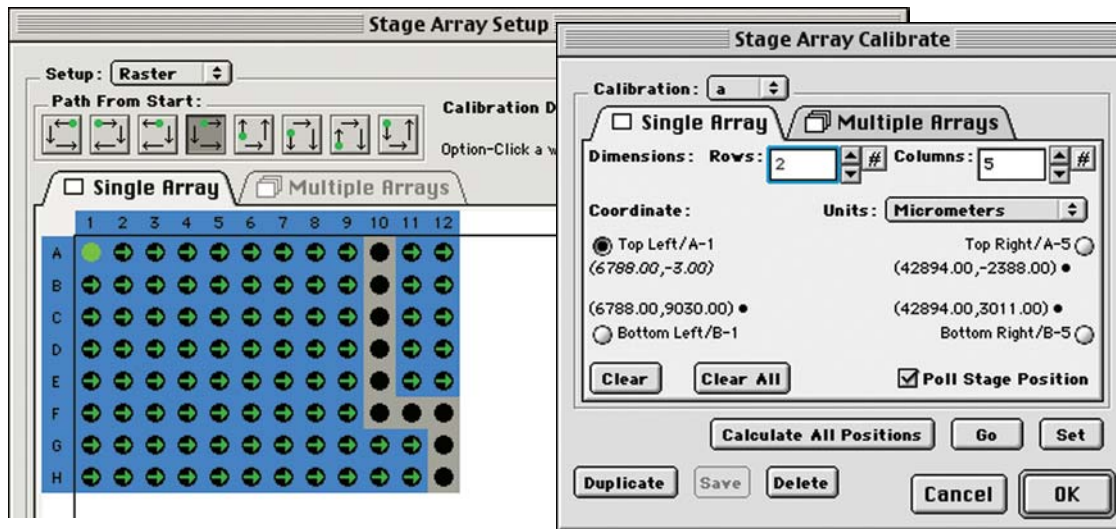
Can Motion Control Do Multifluorescence and GFP?

Yes, using **Shutters & Filters Control**. Motion Control includes the Shutters & Filters Control. Shutters & Filters Control enables IPLab to open and close the excitation shutter before and after camera exposures, limiting photobleaching to the absolute minimum. The filter switcher control lets you acquire multiple fluorescent channels with a single command. Put this all together, and you can acquire multi-probe *and* grayscale images, using multiple lamps, on *any* microscope.

IPLab's image acquisition commands incorporate shutter & filter control, so they can automatically change filters and open and close a shutter. IPLab even has a built-in command to merge three grayscale images or sequences together, so you can show off multiple fluorescent images simultaneously as one color image.

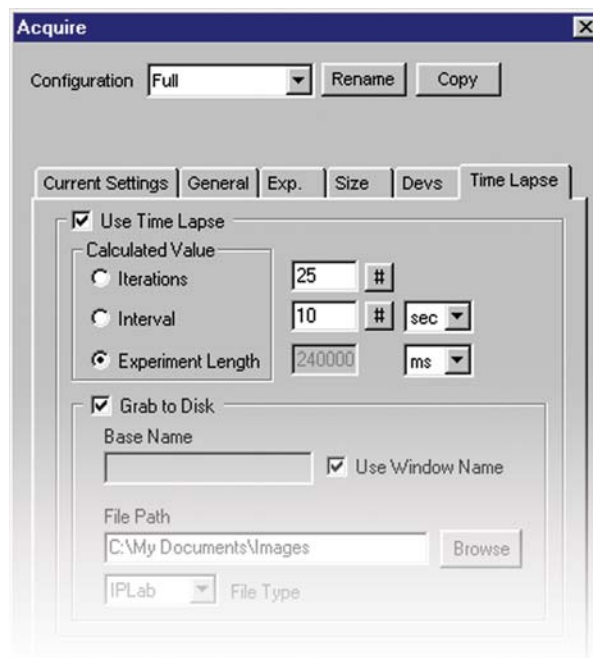
Does Motion Control Support Analysis of Multi-Well / Microtiter Plates and Tissue Arrays?

Yes, Motion Control has the built-in facility to acquire, process, and analyze images from multi-well/microtiter plates. Motion Control's plate-scanning abilities can be used for live-cell assays, live-dead assays, suppression studies, and tissue arrays, among other applications. Motion Control works in conjunction with IPLab's integrated functions for scanning well plates. You can choose the plate-scanning pattern and either select the wells to process or process the entire plate. Once the analysis is completed, data can be saved or exported to Microsoft Excel™ for further study.



What about Time Lapse?

Yes, Motion Control helps collect time-lapsed data. IPLab provides built-in functions for controlling the timing of your image captures. A big problem with time lapse acquisitions is the sinking or sagging of your microscope stage during long time delays. Motion Control allows you to counteract the problem by periodically raising the stage to the correct height. Motion Control's shutter control minimizes photobleaching by driving the shutter on the excitation path of the microscope.



Does Motion Control Do 4D imaging? 6D? n-Dimensional?

Yes! Scanalytics designed IPLab and Motion Control to be extremely flexible. IPLab with Motion Control can acquire images in all of the "dimensions" referred to in 6D or n-D imaging: three spatial dimensions, time, wavelengths, and different multiple stage positions. For example, many customers want to acquire 3D through-focus sequences at half-hour intervals, using three fluorescence filters and DIC. They may wish to study many different samples, different slides, or different wells in a well-plate. Motion Control enables IPLab to do all of this.

Use IPLab and Motion Control to move microscope XY stages or Z-axis focusing knobs. With Motion Control, you can record a list of successive X, Y, and Z positions in a text window. After your positions are set and saved, Motion Control can move one or all of the axes to any of the recorded locations. You can also move the stage to absolute or relative positions. Using scripts, you can automatically image entire samples or groups of samples.

AUTOMATED MICROSCOPY

Will Motion Control Drive My Microscope?

Yes it will. With IPLab and Motion Control, you can control the following features on your automated microscope:

Control for Zeiss Microscopes

For Zeiss Axioplan 2ie, 2i, and 2; Axiovert 100M and 200M; and Axiophot 2 microscopes:

On both Mac and Windows:

- Filter Cube Turret (Reflected-light path)
- Shutter (Reflected-light path)
- Z-axis Motor
- Objective Turret
- Camera Position
- Camera/Oculars
- Halogen Lamp

Also controlled on Macintosh:

- Condenser Turret
- Filter Turrets 1&2 (Transmitted-light path)
- Luminous Field Diaphragm
- Optivar Turret
- Photo Shutter
- Shutter (Transmitted-light path)

Control for Olympus Microscopes

For Olympus AX70, AX80, BX61, and IX81 microscopes:

On both Mac and Windows:

- Filter Cube Turret (Reflected-light path)
- Multiple Filter Wheels
- Shutter (Reflected-light path)
- Z-axis Motor
- Focus Mode
- Auto Focus
- Objective Turret
- Lamp Switch and Voltage
- Neutral Density Filter Wheels
- LBD and IF550 Filter
- Aperture Iris
- Field Iris
- Stage Retraction
- Light Path Beamsplitter
- Observation Mode
- Log On/Off

Control for Nikon Microscopes

For Nikon TE2000 and Eclipse E1000 microscopes:

On TE2000 on both Mac and Windows:

- Filter Cube Turret (Reflected-light path)
- Multiple Filter Wheels
(On Mac: Linked & Auxiliary Filter Wheels)
- Shutters, Uniblitz & Slow (Reflected-light path)
- Z-axis Motor
- Objective Turret
- Lamp Switch and Voltage
- Light Path Beamsplitter
- Analyzer
- Condenser

On E1000 on both Mac and Windows:

- Epi-fluorescence Filter Slider
- Epi-fluorescence Shutter
- Brightfield Lamp Power
- Z-axis Motor
- Objective Turret

On E1000, also controlled on Windows:

- Macro Slider
- Condenser

Control for Leica Microscopes

For Leica DM IRE2 and DM RXA2 microscopes:

On both Mac and Windows:

- Filter Cube Turret (Reflected-light path)
- Shutters
- XY stage and Z-axis Motor
- Objective Turret
- Prisms
- Switchable condenser
- Magnification changer
- Field diaphragm
- Aperture diaphragm
- IC prism turret
- Lamp

Also controlled on Macintosh:

- The DM IRE and DM RXA microscopes



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