Pattern Player™ version 1.2.0
Description of Operations

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Introduction:

Pattern Player™ is a rapid-communication voltage pattern player software program for use with AgilOptics deformable membranes. It allows quick creation, adjustment, and playing of voltage patterns, causing an AgilOptics mirror to simulate a series of prescribed shapes.

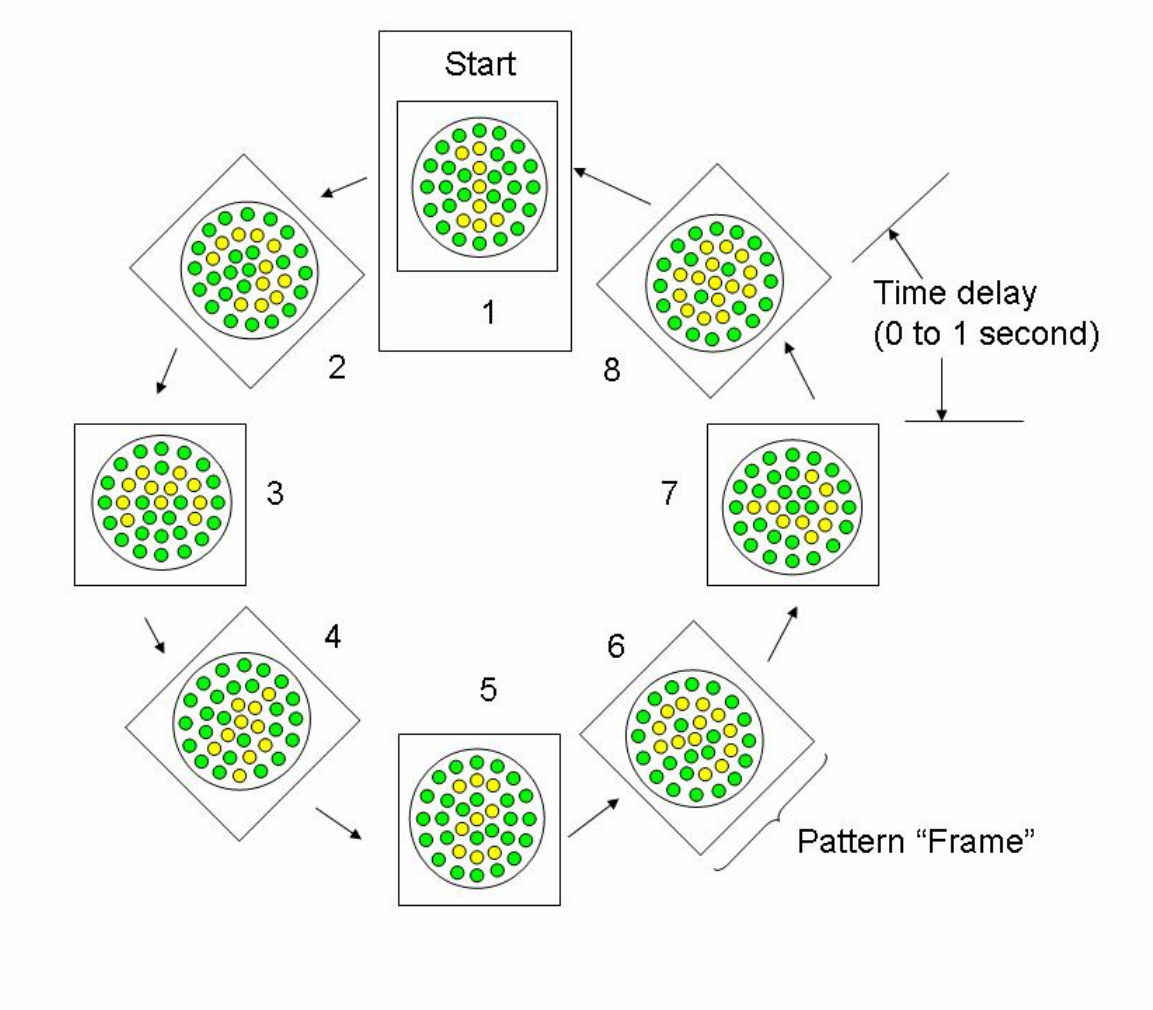
Important Definitions:

frame -	**A frame represents a single voltage pattern that has been placed on the deformable mirror.**
movie -	**A series of frames being played out by Pattern Player on a deformable mirror.**
pattern file -	**A file consisting of a series of voltage patterns.**
sequence -	**The order of voltage patterns in a pattern file or movie.**
voltage pattern -	**A series of voltages that, when placed on a deformable mirror, cause it to take on a prescribed shape.**
GUI -	**GUI stands for Graphical User Interface. The GUI consists of all the various buttons, selectors, and displays that the user can interact with.**

Patterns and Pattern Playback Explained:

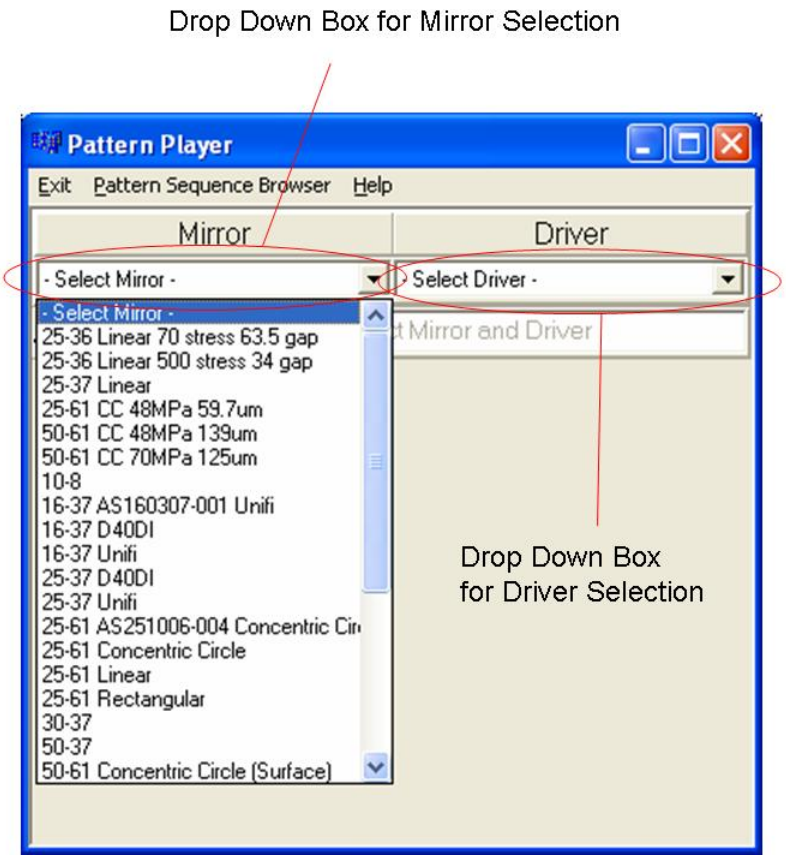
Each pattern for the deformable mirror (DM) consists of a series of voltages. Each voltage represents how strongly the DM is pulled to the actuator pad. The stronger the voltage, the more the DM is pulled. When a voltage pattern is placed on the DM, the deformable mirror takes on the shape of that pattern.

A pattern file contains one or more patterns, in series. When a pattern file is played, each pattern in that file is placed on the mirror, in order. The pattern remains on the mirror for a number of milliseconds equal to the Pattern Delay value on the main GUI. Once the time for one pattern is up, the next pattern is placed on the mirror. Once all the patterns have been played, Pattern Player loops back to the first pattern and plays it again. In this way, the patterns are played continuously.



8 Pattern play loop

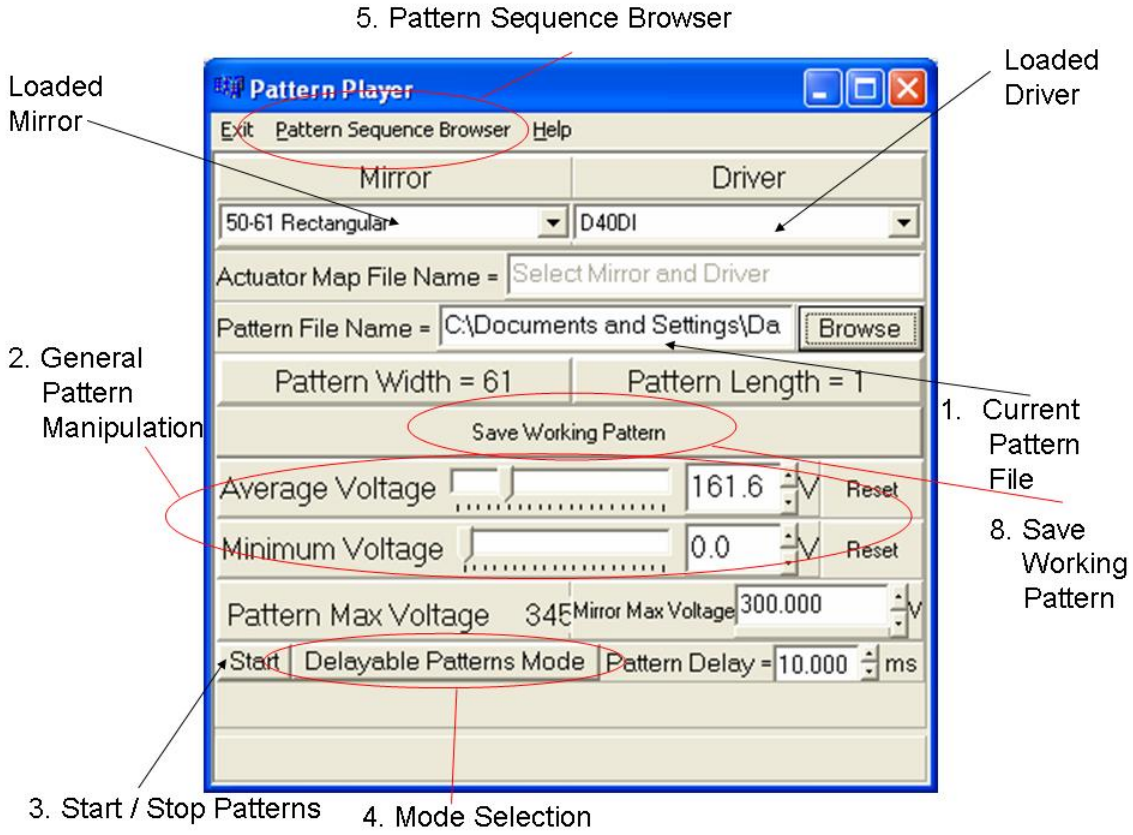
Pattern Player Startup GUI:



When Pattern Player starts, it has a very simple-looking interface. The two main features are the mirror selection drop down box and the mirror driver drop down box. Use these to select the mirror and driver you are using. If you are unsure as to which driver to select, use D64USB if you are connecting to your mirror via USB, or D40DI if you are connecting via the parallel port.

Pattern Player Main GUI:

After the mirror and driver are selected, Pattern Player reveals a few more options:



1. Current Pattern File - The current patterns that Pattern Player will send to the mirror.

2. General Pattern Manipulation – Controls the average and minimum voltage of all of the patterns currently loaded. Understand that the focus of the membrane is approximately the average voltage on all actuators. Adjust the average voltage to change the focus of all of the patterns. Adjust the minimum to increase or decrease the strength of the patterns. Decreasing the minimum flattens the patterns, while increasing the minimum makes the patterns more extreme. The Reset buttons set the Average or Minimum voltages back to their original values.

3. Start / Stop Patterns – Starts and stops the current pattern file running on the mirror.

4. Mode Selection – Choose between *Delayable Patterns Mode*, where a time delay may be used between each pattern and *Fast Patterns Mode*, a mode that writes all the patterns to the mirror as fast as possible. Some slowdown may occur in *Fast Patterns Mode* between full pattern sets. Even with this slowdown, *Fast Patterns Mode* is MUCH faster than *Delayable Patterns Mode*. *Fast Patterns Mode*'s extra speed is dependant upon the processor speed of the computer running Pattern Player.

5. Pattern Sequence Browser – If you'd like to look at the currently loaded pattern file and make changes, use the Pattern Sequence Browser.

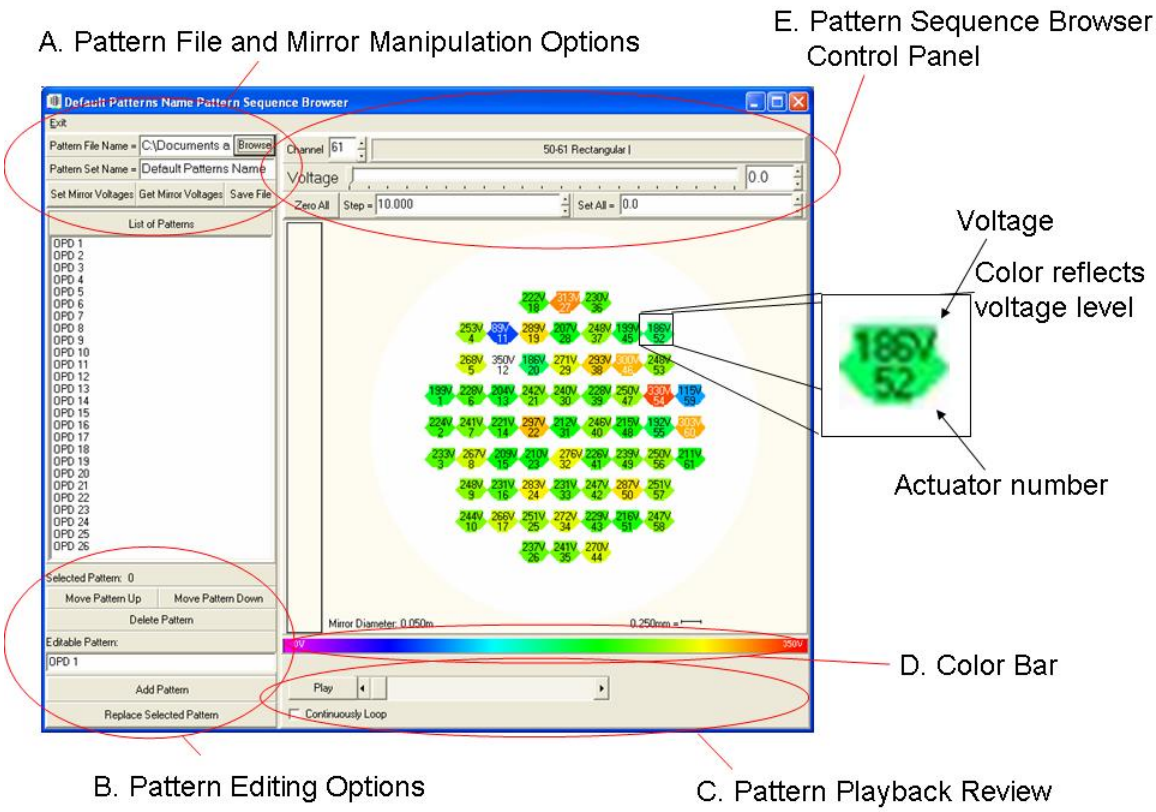
6. Pattern Width – How many actuators the pattern tries to set voltages to.

7. Pattern Length – The number of patterns in the current pattern file.

8. Save Working Pattern – Allows the user to save the current patterns with any changes made to the patterns from the Average Voltage and Minimum Voltage sliders.

Pattern Sequence Browser:

The Pattern Sequence Browser lets you edit the voltages in your current pattern file, adding, removing, or changing the existing patterns to fit your needs.



A. Pattern File and Mirror Manipulation Options:

1. Pattern File Name – The name of the currently loaded pattern file.

2. Pattern Set Name – The name of the pattern set.

3. Set Mirror Voltages – Writes the current pattern from the Pattern Sequence Browser to the first pattern on the Mirror.

4. Get Mirror Voltages – Reads the current pattern from the Mirror and displays it on the Pattern Sequence Browser.

5. Save File – Save any alterations made to the currently loaded pattern file.

B. Pattern Editing Options:

1. **Editable Pattern – The editable pattern can be set as one of the existing patterns by double-clicking on the name the existing pattern in the *list of patterns*.**

2. **Add Pattern – Add the current editable pattern to the end of the *list of patterns*. The name of the new pattern is just above the Add Pattern button.**

3. **Replace Selected Pattern – Replaces the pattern selected in the *list of patterns* box with the current editable pattern.**

4. **Move Pattern Up – Move the currently selected pattern towards the front of the *list of patterns* by one pattern.**

5. **Move Pattern Down – Move the currently selected pattern towards the back of the *list of patterns* by one pattern.**

6. **Delete Pattern – Remove the currently selected pattern from the *list of patterns*.**

C. Pattern Playback Review:

1. **Play / Stop – Start / Stop playing through the patterns in the *list of patterns*. These patterns are played visually only, and no voltages are written to the mirror.**

2. **Scroll Bar – Use the scroll bar to look through the patterns quickly.**

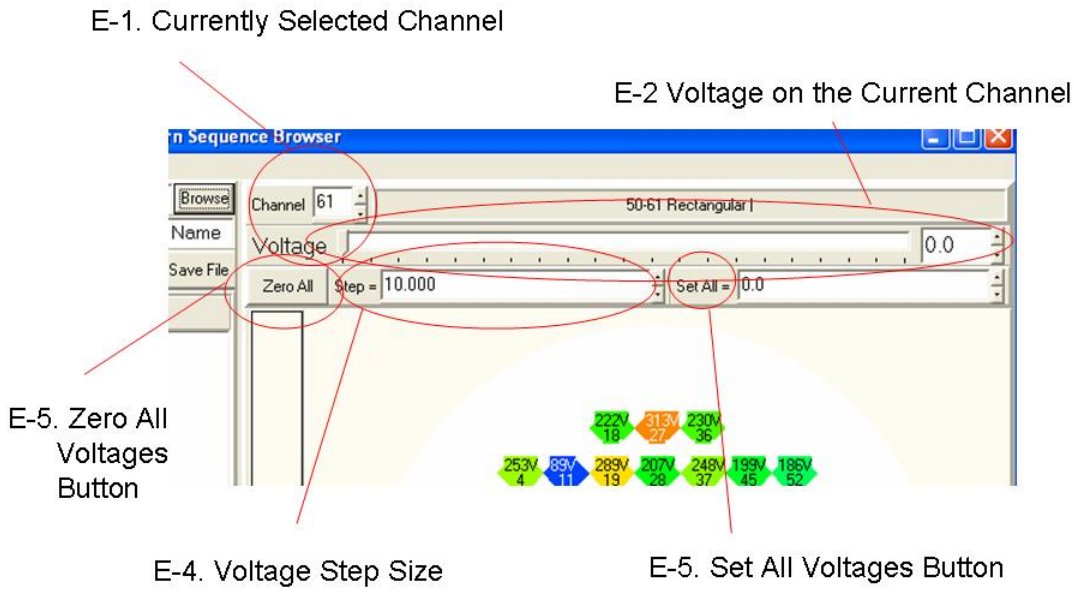
3. **Continuously Loop – When in play mode, whether or not reaching the end signifies stopping play mode.**

D. Color Bar:

Right-click on the color bar and choose “Hide Control Panel” to hide the Pattern Sequence Browser Control Panel.

E. Pattern Sequence Browser Control Panel:

The Pattern Sequence Browser Control Panel gives you a lot more flexibility in altering existing voltage patterns or creating new ones.



Control Panel Controls:

1. Channel – The currently selected channel voltages the user is manipulating.

2. Voltage Scroll Bar – Scroll through voltages on the current channel from the minimum on the left to the maximum on the right.

3. Zero All – Zero all voltages on the mirror display.

4. Step – The voltage amount increase or decreased when using mouse controls on the mirror display.

5. Set All – Set all channels on the mirror to the voltage specified.

6. Right-mouse click – The right mouse button, when used over an actuator image, decreases the voltage on that actuator by the Voltage Step Size.

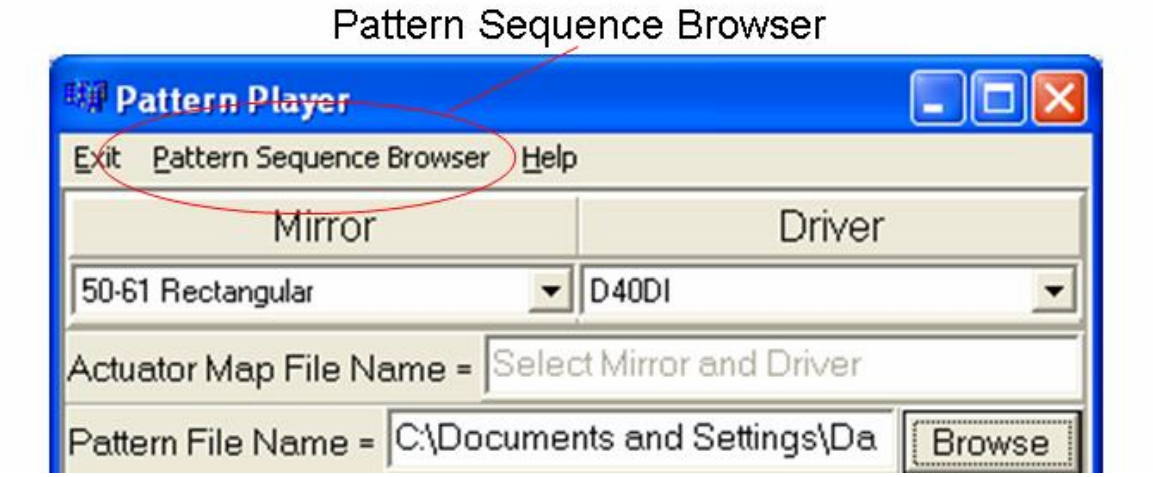
7. Left-mouse click – The left mouse button, when used over an actuator image, increases the voltage on that actuator by the Voltage Step Size.

8. Middle-mouse click – The middle mouse button, when used over an actuator image, sets that actuator to zero volts.

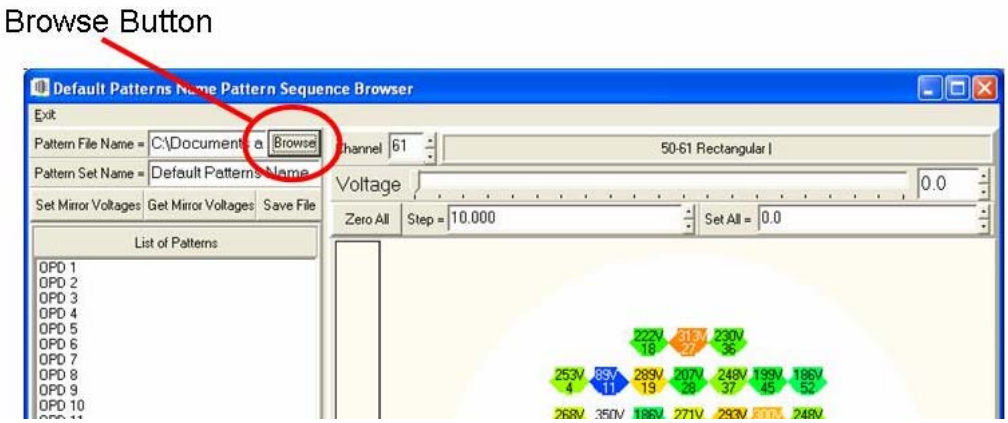
Instructions for Changing an Aeri Pattern:

Changing an Aeri pattern and then running it with Pattern Player requires a few careful steps:

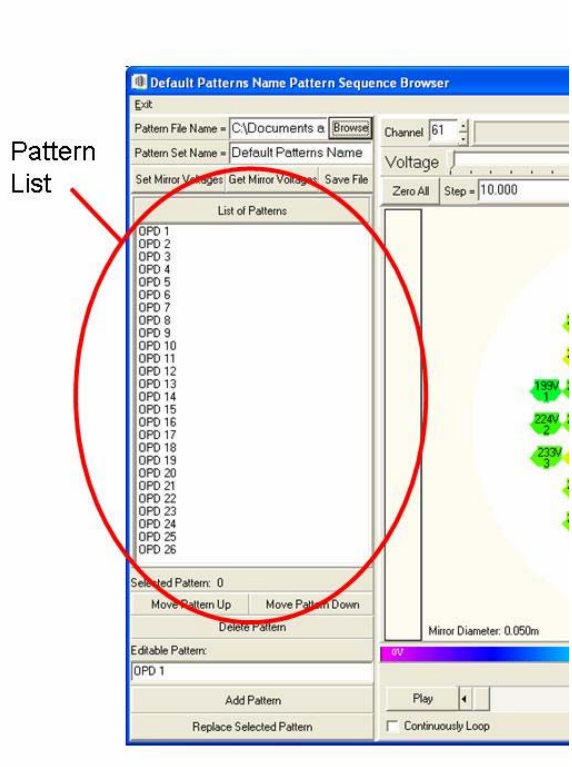
1. Open the Pattern Sequence Browser. The Pattern Sequence Browser can be found at the top of the Pattern Player main GUI, as seen in the picture below.



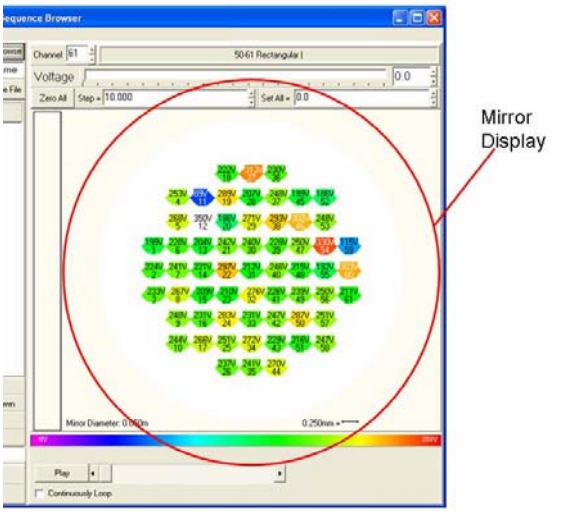
2. Load the pattern file you wish to use by finding it with Browse in the Pattern Sequence Browser.



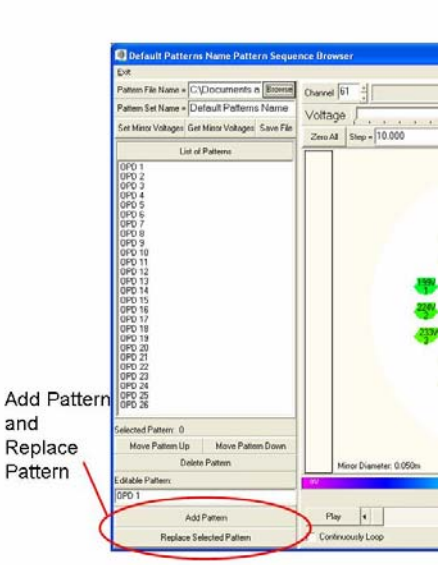
3. Select the pattern you wish to change by double-clicking on it from the list of patterns.



4. Edit the pattern on the mirror display in the Pattern Sequence Browser. Left-clicking on an actuator adds the step voltage to that actuator's voltage. Right-clicking on an actuator subtracts the step voltage from the actuator's voltage. Pressing the middle mouse button while on an actuator sets that actuator's voltage to 0. Follow guidelines in section E.

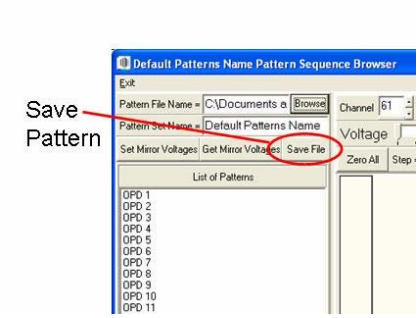


5. Once you have the new pattern you want, add it to the list or replace it on the list of voltage patterns.

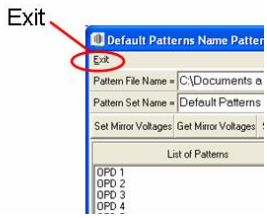


6. Repeat steps 2 through 4 for each pattern you wish to alter.

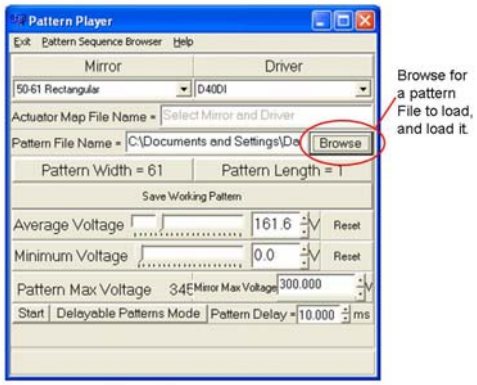
7. Save the pattern in the Pattern Sequence Browser.



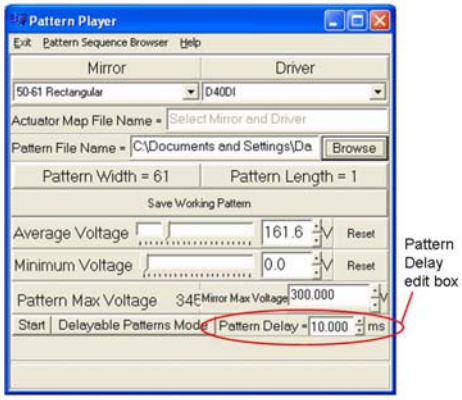
8. Exit the Pattern Sequence Browser.



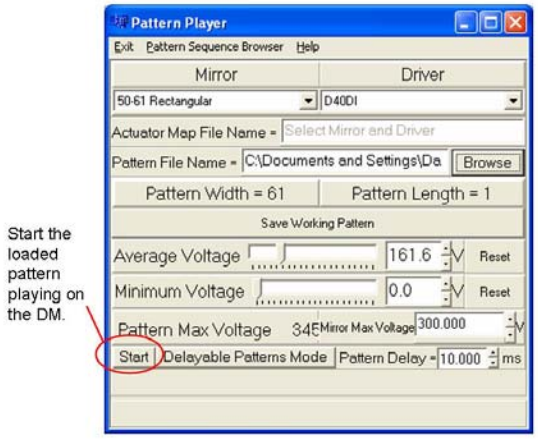
9. Load the pattern in Pattern Player.



10. To alter the speed your patter will run at, change the pattern delay. This can be done while the pattern is running.



11. Your new pattern should now be ready for you to run in Pattern Player. Press “Start” to run it.



Frequently Asked Questions (FAQ):

1. How do I make patterns from scratch? - See Appendix 1 for a detailed walkthrough on creating your own pattern files.

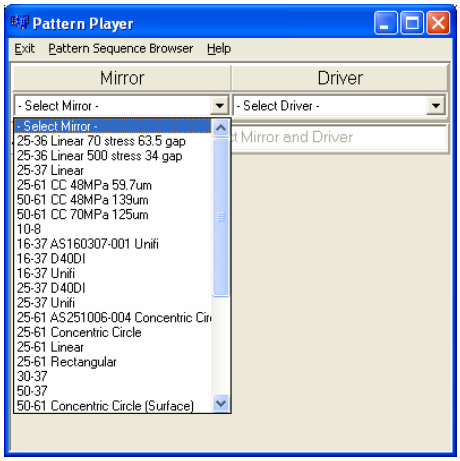
2. Can I advance frames one at a time? – When using an Aeri, there is no way to step through the patterns one at a time. When using a Unifi, the Pattern Sequence Browser can send its current voltage pattern to the mirror. By selecting the pattern you wish to use and sending it to the mirror, you can step through the patterns and view them, one at a time.

3. Can I make the pattern file in Excel? – No. The patterns used by Pattern Player are voltage patterns, and not Optical Phase Difference maps.

Appendix 1.

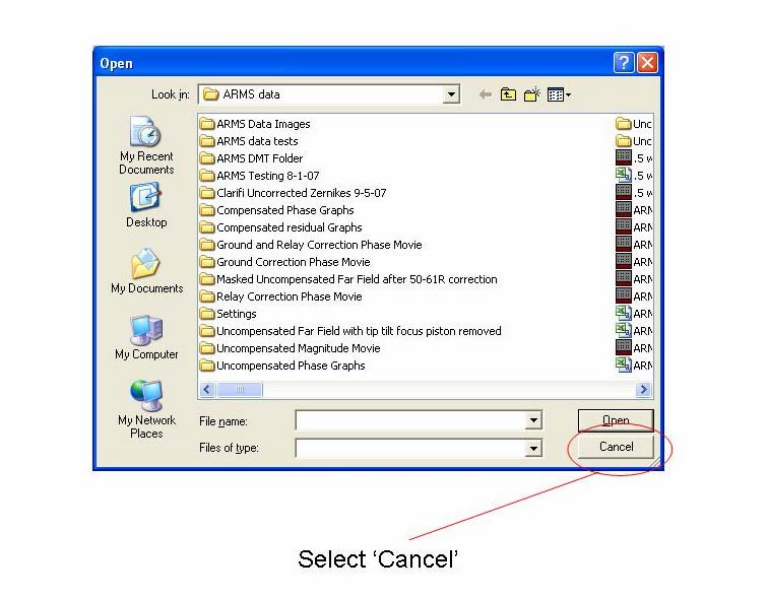
Creating Your Own Patterns

Step 1. Start up Pattern Player and select the mirror and driver you wish to use. See Pattern Player Startup GUI in the Pattern Player Manual for more information on starting Pattern Player.

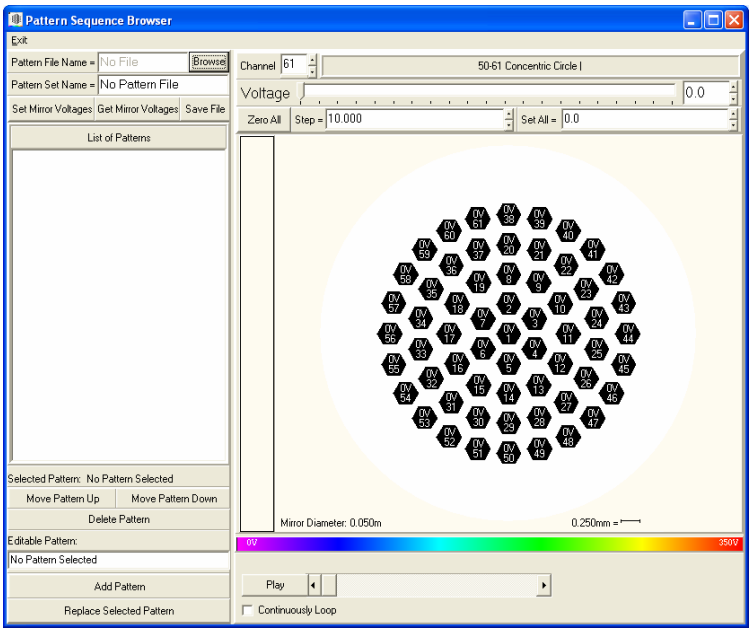


Step 2. Select Pattern Sequence Browser from the top menu in Pattern Player.

3. You will be greeted with a file selection screen. Select 'Cancel', since we don't want to load any files.



4. You will now be greeted with a display that shows your selected mirror on the right. This is the Pattern Sequence Browser. See Pattern Sequence Browser in the Pattern Player manual for more information on how to use the Pattern Sequence Browser.



5. Now we will populate the mirror with voltages. There are many ways to set the voltage on a particular mirror actuator.

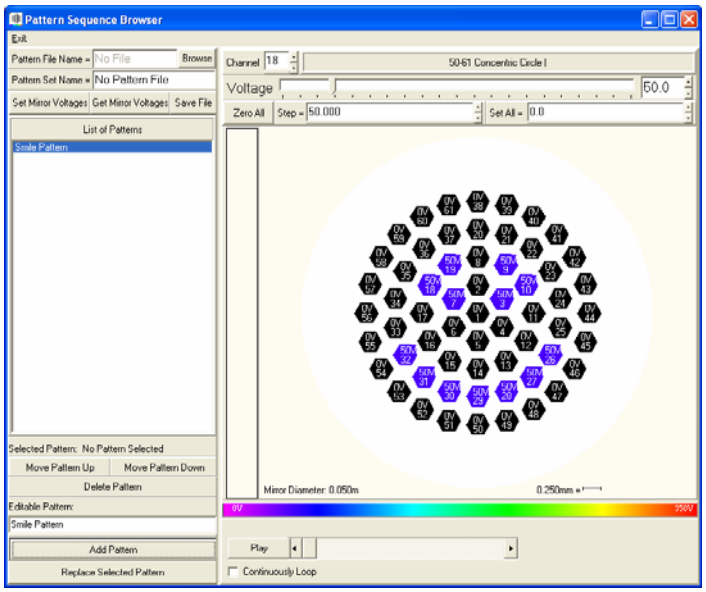
a) Left-click on the actuator. This increases the voltage on the selected actuator by the Step value.

b) Right-click on the actuator. This decreases the voltage on the selected actuator by the Step value.

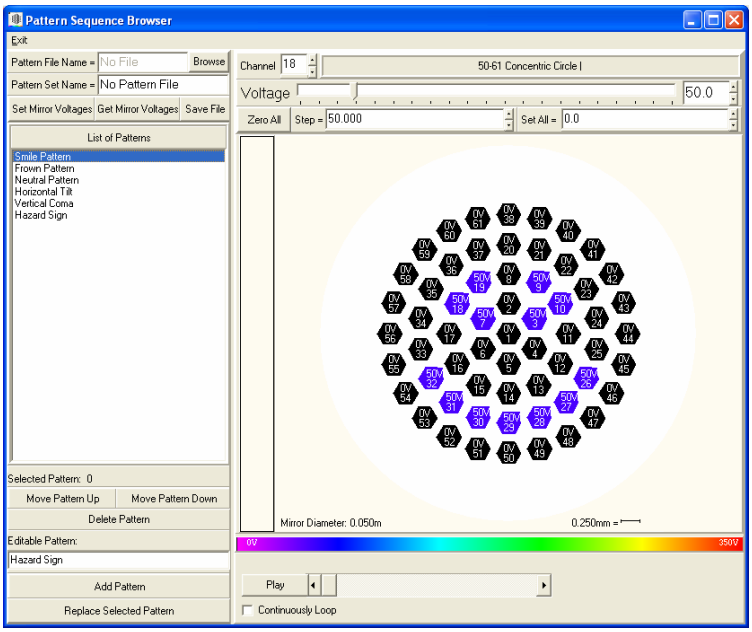
c) Press the middle mouse button while the mouse pointer is on the actuator. This sets the voltage on the selected actuator to 0.

d) Select the actuator by left-clicking on it. Then edit its voltage using either the voltage scroll bar or the voltage scroll bar's edit box.

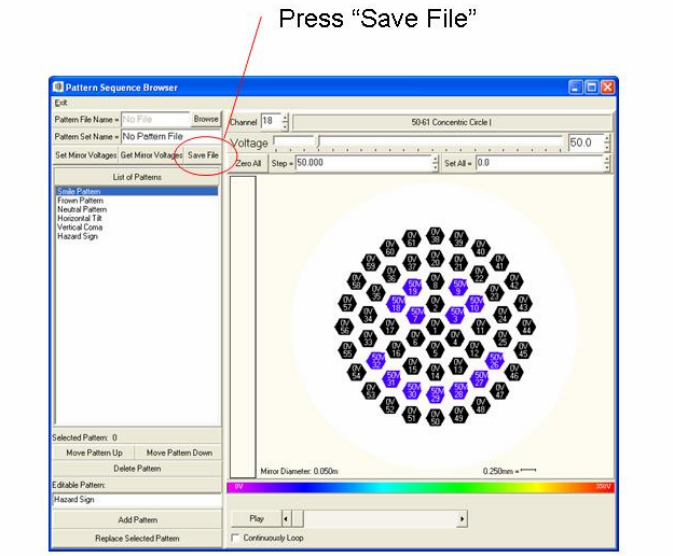
6. Once you are satisfied with your voltage pattern, set it's name in the "Editable Pattern" edit box and press the "Add Pattern" button to add it to your list of patterns.



7. Now you can alter the actuator voltages again without losing your new pattern. Feel free to add as many new patterns as you'd like.



8. Once you have all the patterns you want, it is time to save the patterns to a file. Select "Save File" from the controls in the upper-left of the Pattern Sequence Browser GUI.



9. Set your file name and press ‘Save’. Your file is now saved and ready for use in Pattern Player.