	<h1>Work Instructions</h1>
Version 1.1	Title: Servo Motor Test

1. **Purpose:** To provide instructions on how to test the stability of the servos motors within the WOLF.

2. **Tools Guide:**

- Examination gloves
- Reference cartridge or sorting cartridge

3. **Background:**

The servos motors within the WOLF are responsible for moving the cartridge to be in alignment with the laser. There are three servos motors within the WOLF, each one is responsible for movement along one axis: either the X-, Y-, or Z- direction. If any of the motors are not securely installed or possess a faulty connection, issues with cartridge alignment can arise. This work instruction can be used to assess whether the servos motors are stable.

4. **Procedure for servos motor test:**

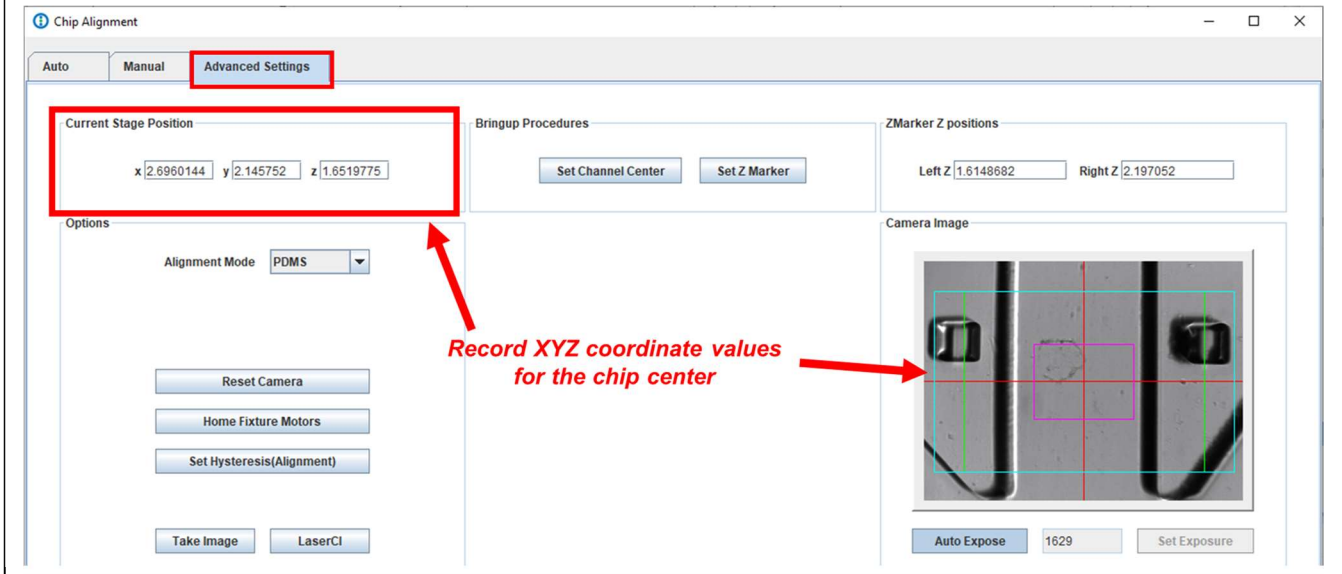
- A. Turn the WOLF on and open WOLFViewer software.
- B. Press “new cartridge” button and follow the prompts to insert either a reference cartridge or sorting cartridge.
- C. Open the “Chip Alignment” pop-up window, and select the “Align” button under the “Auto” tab.
- D. Once aligned, keep the “Chip Alignment” pop-up window open, type the command “ctrl+shift+m” to display the hidden “Advanced Settings” tab.
- E. While in the “Advanced Settings” tab, record the XYZ coordinate values for the chip center (**Figure 1A**).
- F. Proceed back to the “Auto” Tab and click the “Align” button to align the cartridge for a second time.
- G. Go to the “Advanced Settings” tab and record the XYZ coordinate values for the chip center.
- H. Repeat steps G-H three more times to align and record the chip center coordinates from a total of five alignment attempts.

*Note: Do NOT remove/reinsert the cartridge for the duration of this procedure. The goal of this procedure is to test the stability of the servos motors. The action of removing/reinserting the cartridge introduces another variable. If the cartridge must be removed/reinserted at any point, please restart the process, ensuring the cartridge was aligned five consecutive times without removal/reinsertion.*

- I. Calculate the average and standard deviation for X, Y and Z coordinates (**Figure 1B**).
- J. If the differences in chip position are  $< 5\mu\text{m}$  as expressed by  $\text{SD} < 0.005$  for any axis, then the servos motors are deemed stable.
- K. If the differences in chip position are  $> 5\mu\text{m}$  as expressed by  $\text{SD} > 0.005$  for any axis, then replace the faulty servos motor according to “[Procedure WOLF\\_09 Servos Motor Replacement](#)”.

**Figure 1. Determine the stability of the servos motors.**

**Figure 1A.** Within the “Advanced Settings” tab, find and record the coordinate values of the Chip center.



**Figure 1B.** Calculate the standard deviation of each coordinate value (X,Y,Z) to determine the stability and reproducibility of the servos motors.

Align #	Chip Center - Coordinate Values (mm)		
	X	Y	Z
1	2.8726196	1.704071	1.7394409
2	2.8711548	1.70401	1.7417603
3	2.8694763	1.7036133	1.7408752
4	2.8726196	1.70401	1.7398682
5	2.8701156	1.703444	1.739488
<b>Average</b>	<b>2.871</b>	<b>1.704</b>	<b>1.740</b>
<b>St Dev (mm)</b>	<b>0.00143</b>	<b>0.00028</b>	<b>0.00101</b>
<b>St Dev (um)</b>	<b>1.43</b>	<b>0.28</b>	<b>1.01</b>

**9.0 Revision History:**

	ISSUED DATE	Description of Change	Author
A	11/4/2020	V1.0-Initial version created	E. Rubio de la Torre
B	2/9/2020	V1.1-Minor Edits, added background section	E. Leary