

Project Number	P17221
Title of Test	Crossfeed Backlash Measurement
Subsystem	Crossfeed
Administered by	Patrick Burke
Test Date	3/27/2017
Location	Machine Shop

Brief Summary of Test Performed and Purpose of Test

Quantify the assembled crossfeed backlash and precision is within the limits of the engineering requirements on both a small scale and a large scale.

Required Equipment (includes sensors, custom mounting brackets, electrical needs)

1. Dial Indicator mounted on Magnetic Base
2. Assembled Winder frame and crossfeed
3. Laptop to control winder
4. Source of electricity capable of powering the machine

Procedure for test and data collection (machine setup, changes made during test)

1. Small Scale Precision Test
 - a. Position the cross feed at the minimum distance from the front of the spindle
 - b. Fix the magnetic base with dial indicator attached to a suitable mounting surface
 - c. Zero the indicator on a flat face that is perpendicular to the direction of travel
 - d. Move the crossfeed to the predetermined distance in Table 1 using the GUI
 - e. Record the displacement on the dial indicator
 - f. Move the crossfeed back to the original position
 - g. Record the displacement on the dial indicator
 - h. Repeat steps d through g for five trials for each distance called out in Table 1.
2. Large Scale Precision Test
 - a. Position the cross feed at the minimum distance from the front of the spindle
 - b. Move the crossfeed to the maximum travel on the linear slide
 - c. Fix the magnetic base with dial indicator attached to a suitable mounting surface
 - d. Zero the indicator on a flat face that is perpendicular to the direction of travel
 - e. Record the displacement on the dial indicator
 - f. Move the crossfeed to the origin and then back to the maximum travel position
 - g. Record the displacement on the dial indicator
 - h. Repeat steps e through g for five trials for the maximum travel and record in Table 2.
3. Large Scale Repeated Precision Test
 - a. Position the cross feed at the minimum distance from the front of the spindle
 - b. Move the crossfeed to the maximum travel on the linear slide
 - c. Fix the magnetic base with dial indicator attached to a suitable mounting surface
 - d. Zero the indicator on a flat face that is perpendicular to the direction of travel
 - e. Record the displacement on the dial indicator
 - f. Move the crossfeed to the origin and then back to the maximum travel position for 40 iterations
 - g. Record the displacement on the dial indicator at the end of the cycles
 - h. Repeat steps e through g for five trials for the maximum travel and record in Table 2.

Expected Results

Based on feasibility analysis, the measured position should have a positional tolerance of ± 0.006 inches. This distance is the minimum distance per step based on the size of the pulley as well as the minimum degrees per step of the stepper motor.

Summary of Collected Data

Command (mm)	Start (in)	Result (in)	Result (mm)	Difference (mm)	Difference (in)	Average Difference (in)
10	0	0.392	9.9568	-0.0432	-0.002	-0.002
10	-0.001	0.392	9.9568	-0.0432	-0.002	
10	-0.001	0.392	9.9568	-0.0432	-0.002	
10	-0.001	0.392	9.9568	-0.0432	-0.002	
10	-0.001	0.392	9.9568	-0.0432	-0.002	
20	-0.001	0.789	20.0406	0.0406	0.002	0.001
20	-0.001	0.789	20.0406	0.0406	0.002	
20	-0.001	0.789	20.0406	0.0406	0.002	
20	-0.001	0.789	20.0406	0.0406	0.002	
20	-0.002	0.788	20.0152	0.0152	0.001	
30	-0.001	1.176	29.8704	-0.1296	-0.005	-0.004
30	-0.001	1.178	29.9212	-0.0788	-0.003	
30	-0.001	1.178	29.9212	-0.0788	-0.003	
30	-0.002	1.178	29.9212	-0.0788	-0.003	
30	-0.001	1.177	29.8958	-0.1042	-0.004	

Table 1: Recorded Measurements from small scale test

Command	Start (in)	Result (in)	Average (in)
700mm	0	0.008	0.003
700mm	0.002	0.001	
700mm	0.002	0.002	
700mm	0.002	0.002	
700mm	0.002	0.002	
700mm (repeated 40x)	0.002	0.008	0.0045
700mm (repeated 40x)	0	0.001	

Table 2: Recorded Measurements from small scale test

Conclusions (general conclusions from data and how they change current and future design)

The results from the test are within the calculated expected results. Further analysis needs to be done to ensure locational accuracy at intermediate intervals on the cross feed.

Links to Relevant documents (folder path to spreadsheets, pictures, videos, BOM)