

Senior Design Team 5



Sensor Test Team:

Christopher Brink
Omar Izaguirre
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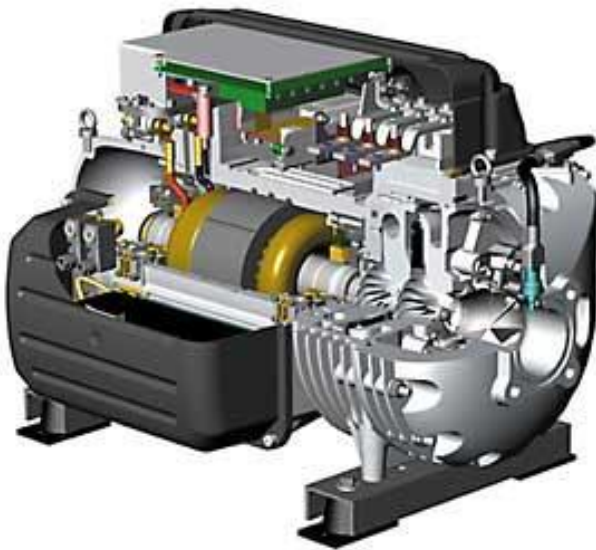
Sponsored by:
Danfoss Turbocor
Kevin Lohman



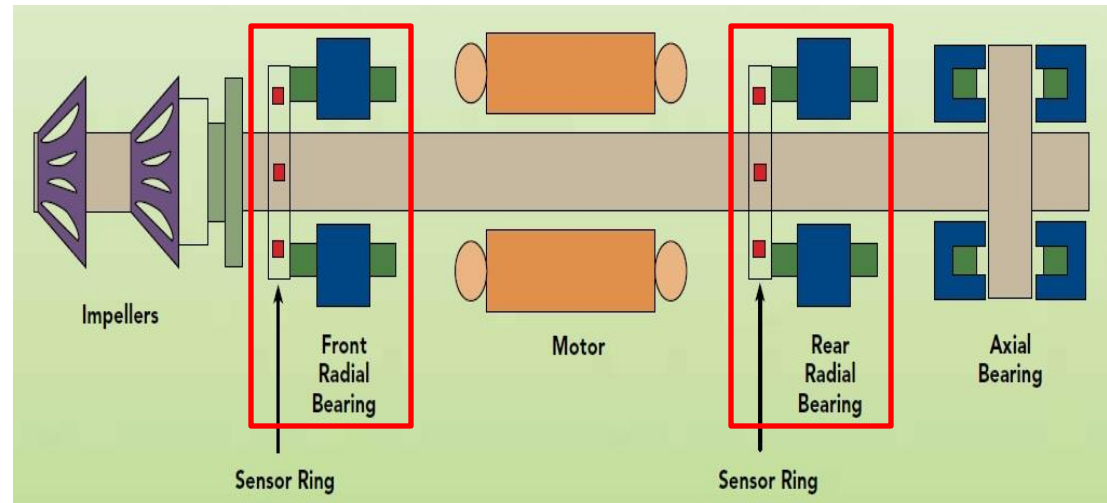
Faculty Advisor:
Dr. Farrukh Alvi



Introduction



Turbocor's Compressor

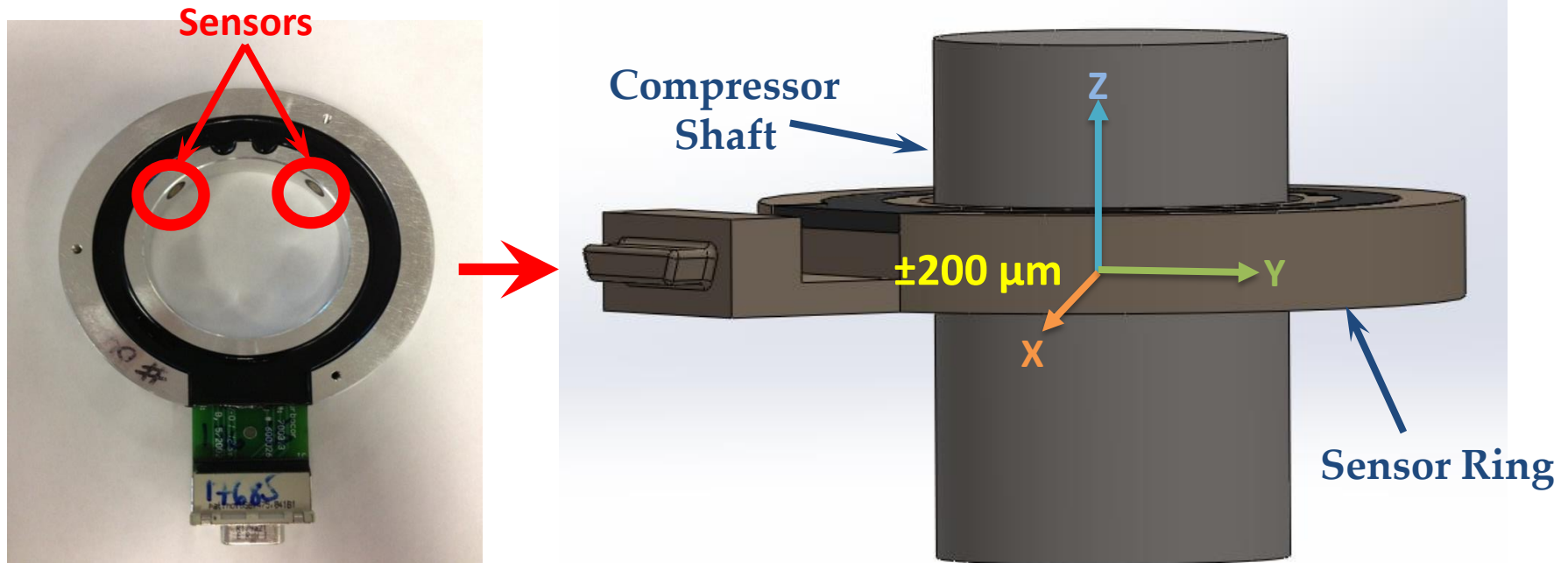


Internal view of compressor

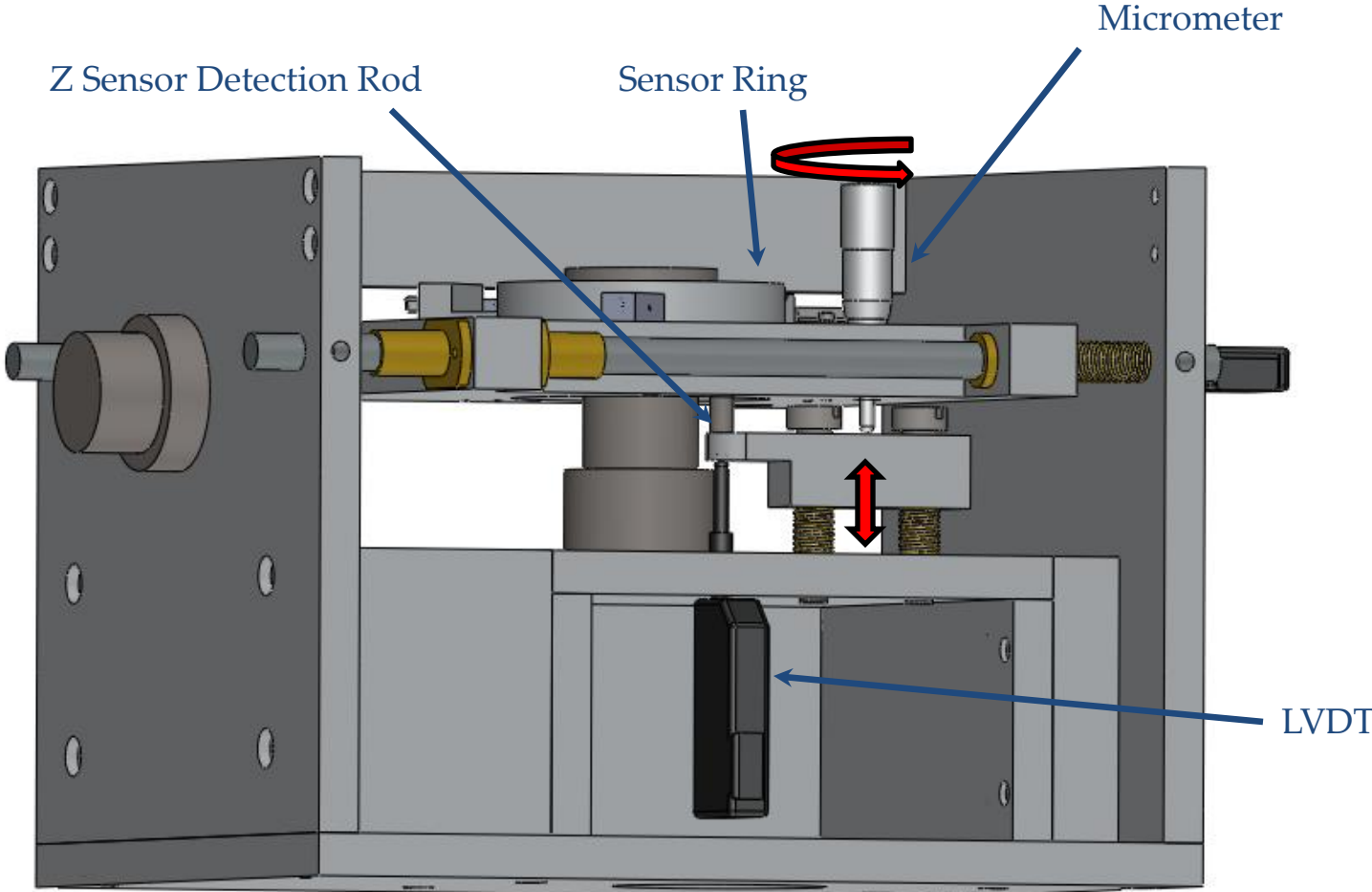
- Compressors used in HVAC systems for large scale structures
- Compressor shaft spins in a magnetic field (virtually no friction)

Project Scope

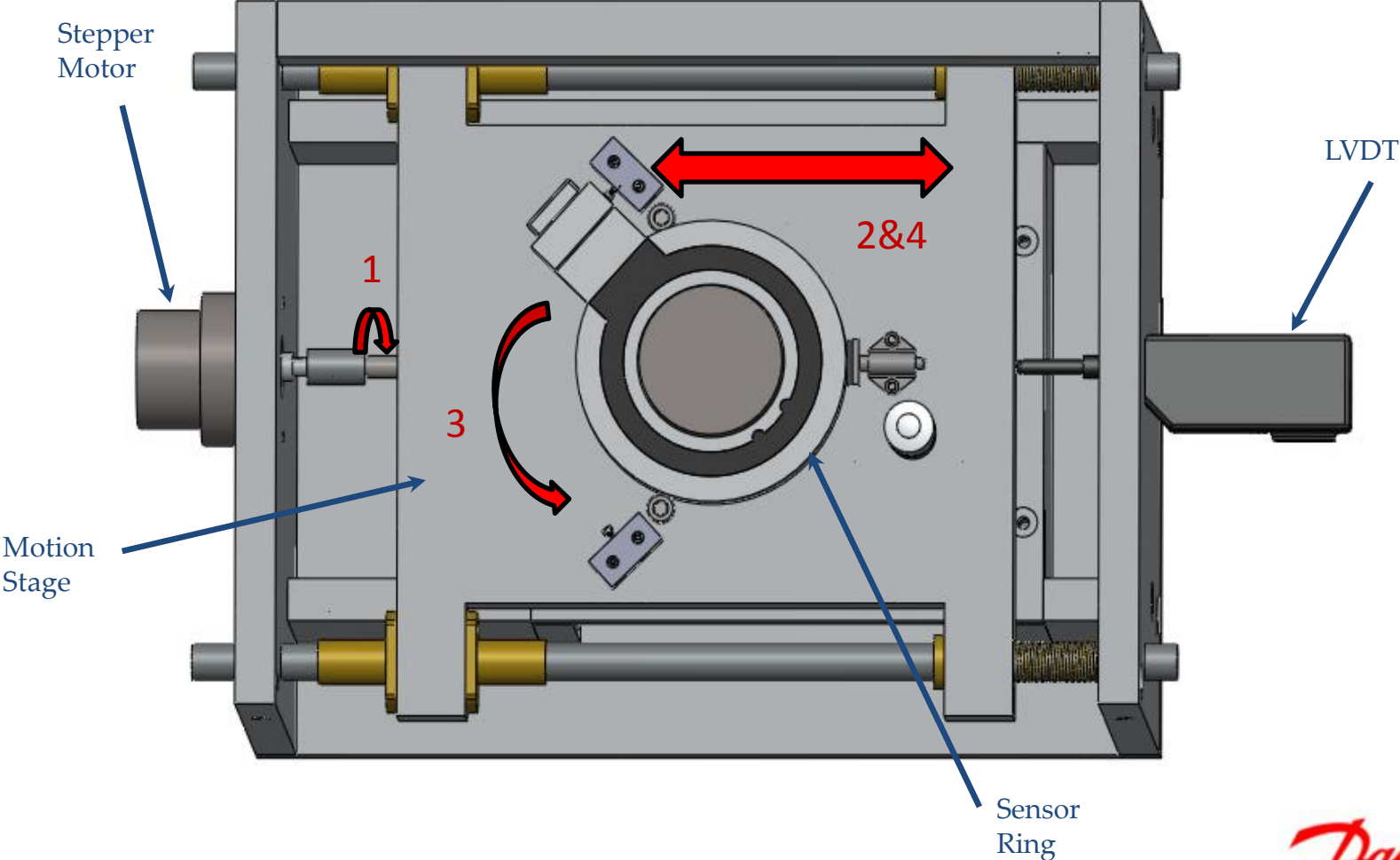
- Sensor ring able to detect displacement between itself and the compressor shaft
- Displacement of $400\ \mu\text{m}$ created for x, y, and z sensors



Z Motion

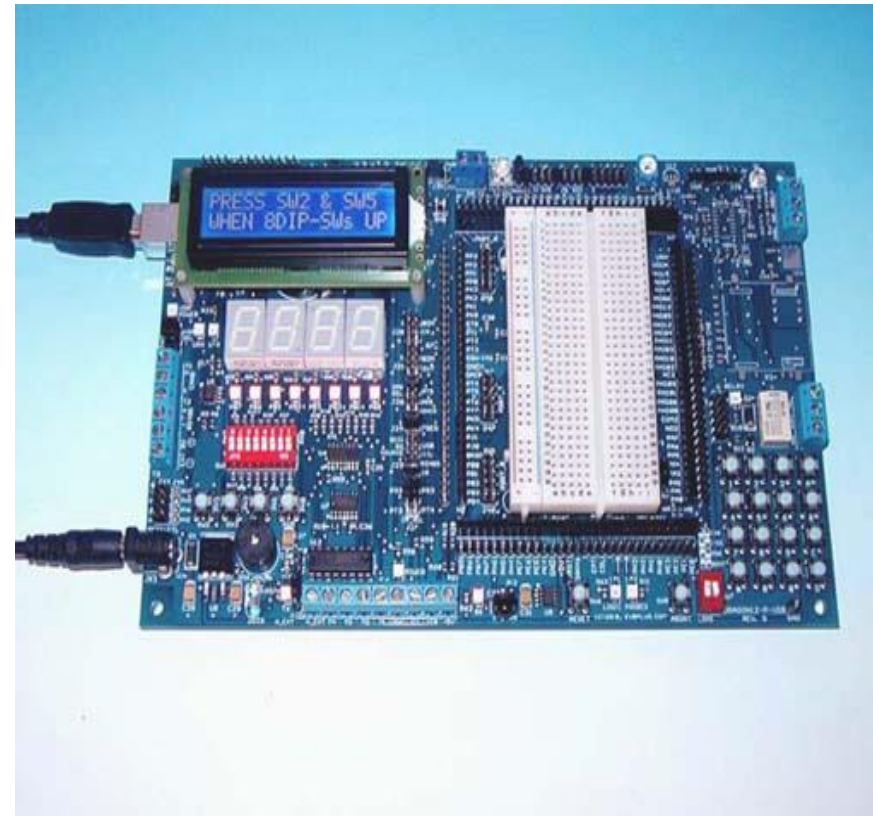


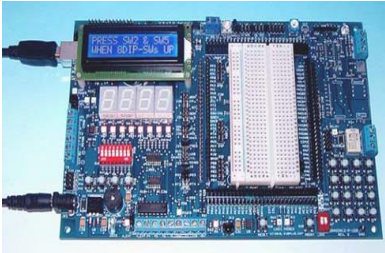
X and Y Motion



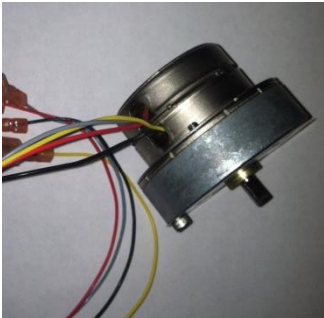
Step Motor System

- DragonBoard HCS-12
 - Utilizes Code Warrior
 - LCD read-out
 - Push-button initiation
- Portscap stepper motor
 - $\frac{1}{4}$ degrees per step
 - 726 total step motion
- All code has been written
- Code “tweaking” after assembly





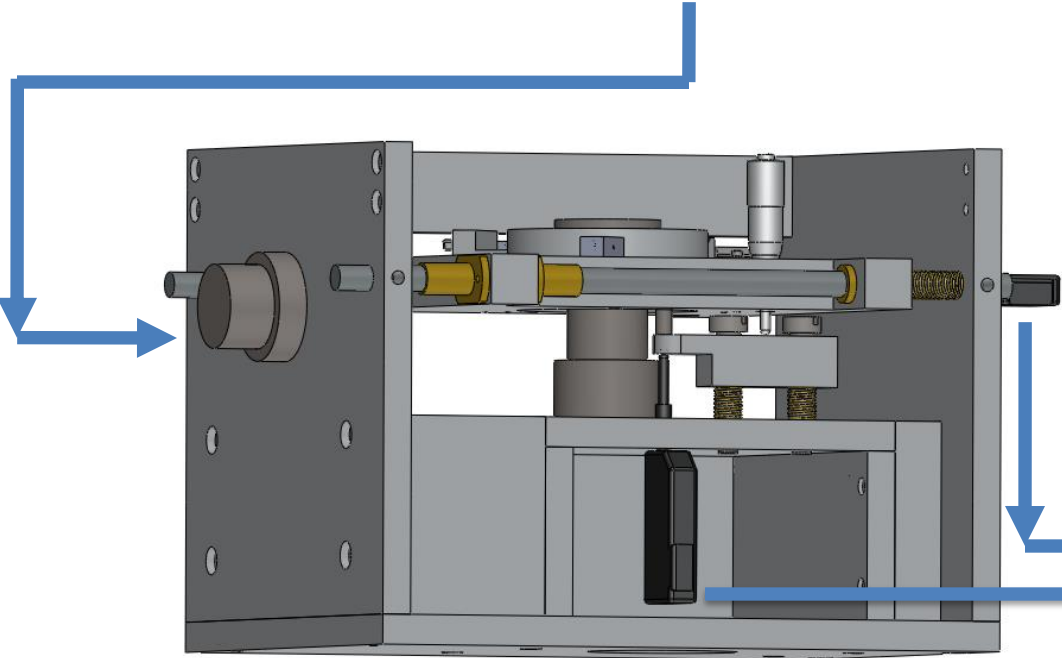
DragonBoard HCS-12



Stepper Motor



Display

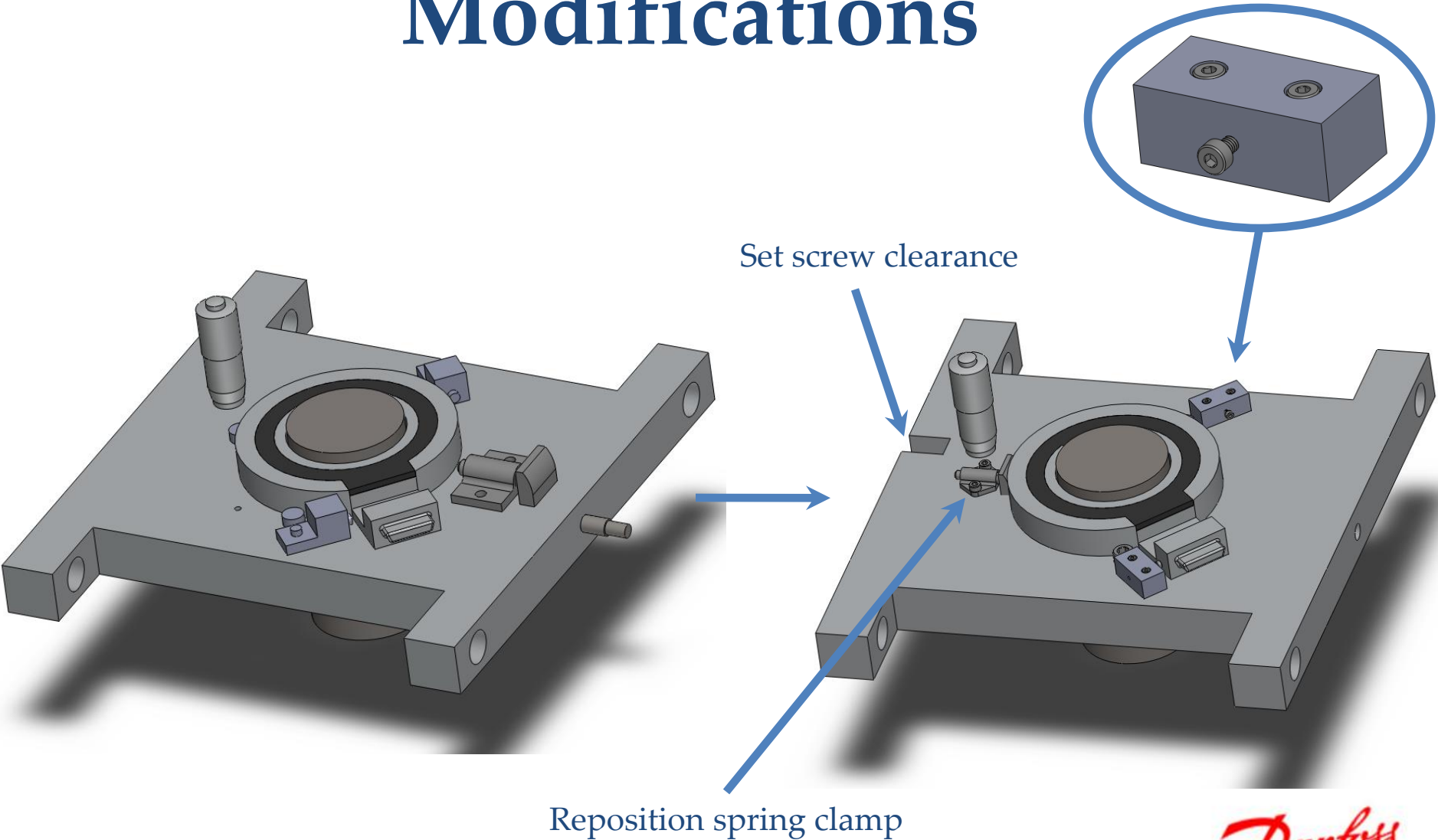


Test Fixture

LVDT Data Acquisition

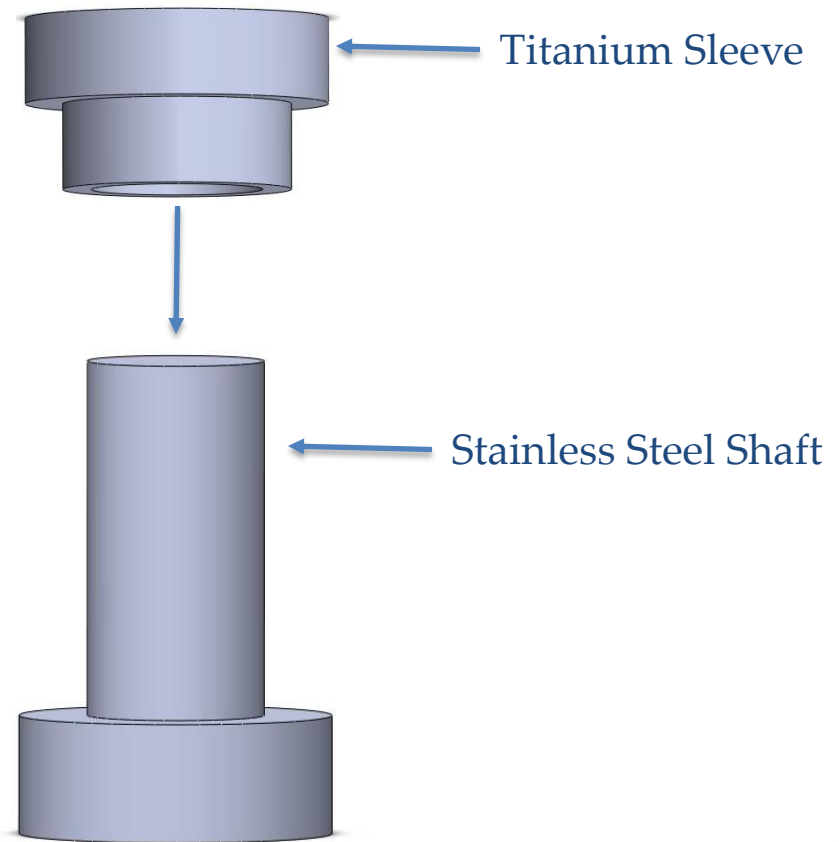


Modifications

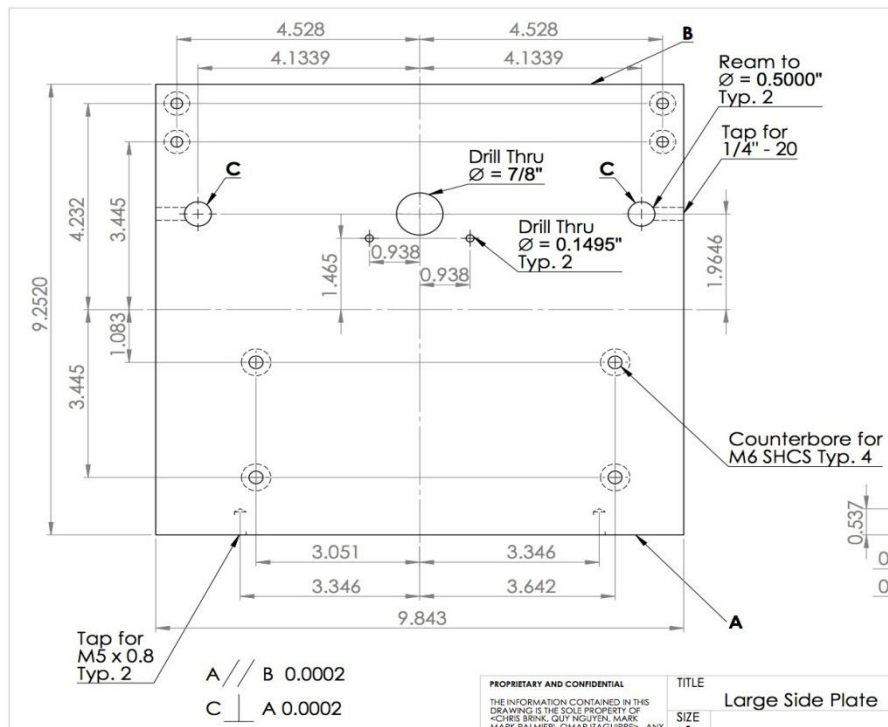


Shaft Correction

- Shaft material
 - Cannot use aluminum
- Titanium target sleeve
 - Mimics actual shaft



Geometric Tolerance



- Misalignment causes errors
- Critical dimensions have tolerances of $\pm 0.00005"$
- Other dimensions have tolerances of $\pm 0.0005"$

Budget

TURBOCOR P/N	DESCRIPTION	VENDOR P/N	QTY	UNIT PRICE	TOTAL PRICE	PROJECT NUMBER	ACCOUNT NUMBER
	Al 6061 5/8" thick 10" width 6' length	1614T973	1	\$ 237.13	\$ 237.13		
	Al 6061 1" thick 10" width 1' length	8975K103	1	\$ 86.09	\$ 86.09		
	303 SS Rod	88915K223	2	\$ 29.34	\$ 58.68		
	18-8 SS Shoulder Bolts	94731A480	2	\$ 21.19	\$ 42.38		
	Al 6061 Rod	8974K731	1	\$ 24.62	\$ 24.62		
	Bellows Shaft Coupler	59925K91	1	\$ 80.28	\$ 80.28		
	Grade 2 Titanium Rod	89145K169	1	\$ 17.49	\$ 17.49		
	LVDT	DONATED	2	\$ -			
	STEPPER MOTOR	DONATED	1	\$ -			
	DRAGON BOARD	DONATED	1	\$ -			
	MACHINING LABOR	DONATED	1	\$ -			
					\$		
					\$		
					\$		
					\$		
					\$		

FREIGHT: A) PREPAID (included)
 B) PREPAID & CHARGE
 C) COLLECT
 D) FIXED AMOUNT

	amount	
TOTAL		\$ 546.67



Future Work

- Machine parts
 - Turbocor
 - Storage & Assembly
- Testing/Calibration
 - Strengthen accuracy of step motor travel
- Open House
 - Test rig demonstration
 - Linear Gage display



Gantt Chart

	Week of Feb. 24	Week of Mar. 3	Week of Mar. 10	Week of Mar. 17	Week of Mar. 24	Week of Mar. 31	Week of Apr. 7	Week of Apr. 14
Drawings								
Tolerancing								
Stepper Motor Program								
LVDT Testing								
Machining								
Assembly								
Testing								

Questions?