**Digital Control Demonstration Hardware**

**Parts List:**

RS-445 Motor (<http://www.ebay.com/itm/like/321913878891?ul_noapp=true&chn=ps&lpid=82>)

Ball bearings (press fit into transmission block)

Optical Encoder (<http://www.mouser.com/ProductDetail/Avago-Technologies/HEDM-5600J06/?qs=RuhU64sK2%252bsVnKP%252bazy66Q%3D%3D>)

Level shifter (<https://www.sparkfun.com/products/12009>) I actually built my own on a breadboard

H-Bridge (<http://www.mouser.com/ProductDetail/Texas-Instruments/LMD18200T-NOPB/?qs=sGAEpiMZZMtKB4wrjsn3lTIANIfSCjOVBeMGSIP0ywE%3d>)

3/8” Aluminum plate for base (acrylic wasn’t stiff or heavy enough)

Acrylic sheet for mounting encoder and rotating inertia (0.25” thick, laser cut)

2x2x4” delrin block for transmission

1.5” diameter aluminum rod for dowel pin hub and motor coupling

Assorted ¼-20 machine screws, socket head cap screws (a few are really long ones), and washers

Rubber feet for supporting plate and for hard stops on the rotating disk

¼” diameter, 1” long precision ground steel dowel pin (<http://www.mcmaster.com/#97395A491>

Prototyping pcbs (get 2 for mounting h-bridge)

15V 3A power supply

Zip ties

Wire and cable terminals

**Tools:**

¼-20 counterbore

Drills

Mill (for delrin block)

Lathe (for motor coupling)

3D printer for mounting brackets

Lathe (for press fit motor coupling)

1/4"-20 tap (bottoming tap is better for motor coupling)

Tool for crimping cable terminals

**Notes:**

The shaft MUST spin true before attaching the encoder. Loosen the bolts and tap the bracket with the mounted dowel pin to adjust the alignment. Angular error and run-out must be eliminated or the encoder will rub internally. This should be measured with a dial indicator and adjusted.

Use an aluminum base plate. The weight helps damp vibration and keep it from moving while the shaft is spinning. Be sure to balance the rotating inertia, bolts, etc. Do this before attaching the indicator flag arm.

The motor will be often be stalled so make sure to choose a power supply that won’t overheat the motor when stalled for a long period of time.

Marty Jacobsen has staff in the BME machine shop (Whitaker basement) that get bored when nobody comes in to use the shop and they are generally excited to build stuff while they have to sit in the shop. It’s either that or do homework. They are the ones who built this one.

**The design is not perfect! The 3D printed parts barely keep the encoder and motor shaft aligned and it is difficult to get everything rotating true and balanced! The motor mount is stiff in Y and Z for example, but can wobble in X. (orientations based on CAD coordinate system in the assembly).**

**Pictures!**

**See associated zip file…**