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# Adding a Variable Speed Drive to a Mini Metal Lathe Feed

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Using the change gears in a mini lathe, the finest feed you can get is 256 threads per inch. This doesn't leave a very smooth finish. So, I set out to slow down the feed rate. I've combined a couple of ideas from others that have done a similar modification. Here is what I came up with, how I did it, the parts used, and the results.



I am driving the feed screw with a DC geared motor from the right side of the lathe. I've also added a variable speed drive that uses Pulsed Width Modulations (PWM). This essentially turns the motor on and off at set intervals (pulses) but still at the same DC voltage preserving the motors torque at lower speeds. The motor is 24 volts and 45 rpm unloaded. I used a 24-volt power supply, laptop power brick and cord. I added a double throw switch between of the variable speed drive and motor so I can reverse the voltage to the motor and

reverse the direction. This allows me to feed in both directions with variable speeds.



Wiring is simple, there is an on/off button and potentiometer already wired into the Speed Controller. You just must attach the power to the Speed Controller making sure to get the polarity correct. You then add a DPDT switch between the Speed Controller and the motor that allows you to reverse the voltage to the motor to change the direction of the feed screw.

I mounted all the electrical components in the plastic project box. Drilled for the switches and potentiometer and used cutoff wheel in my Dremel to cut the opening for the Speed Controller. For safety I did add a fuse between the power supply and the Speed Controller.

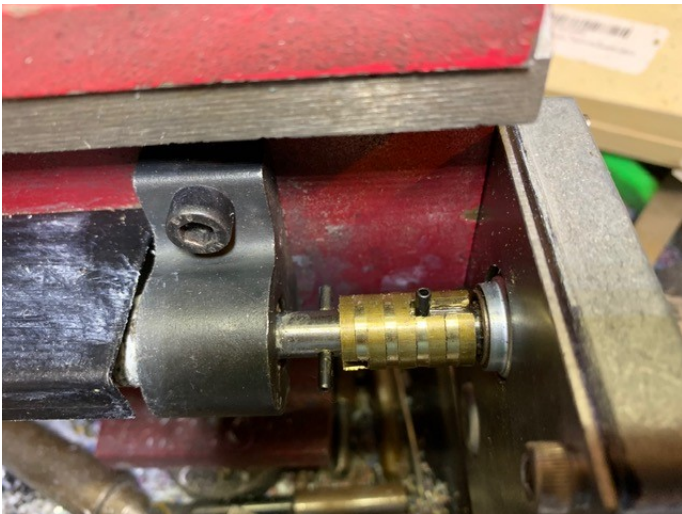
I had to modify the drive screw to be able to connect the motor. I removed the drive screw, mounted it in the lathe chuck, drilled into the right end and tapped for a M6 x 1.0 thread. I made a small shaft to thread into the drive screw, one end matching the motor shaft diameter and the other threaded

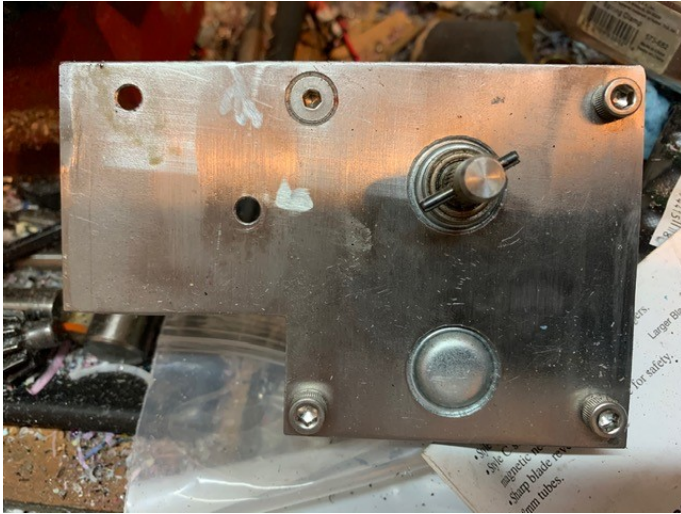
M6 x 1.0. I used Blue LocTite when attaching it to the feed screw so it wouldn't back out when turning in reverse. I cross drilled it with a 3/32" drill to take a 3/32" roll pin.



I then cross drilled the motor shaft and added a 3/32" roll pin.

To connect the two shafts, I used some 1/2" brass rod drilled slightly larger than the motor shaft. Using a cutoff wheel on my Dremel, I cut slits on each end to engage the pins. The one on the motor side was cut deep enough to allow you to pull back the coupler and disconnect from the feed screw.

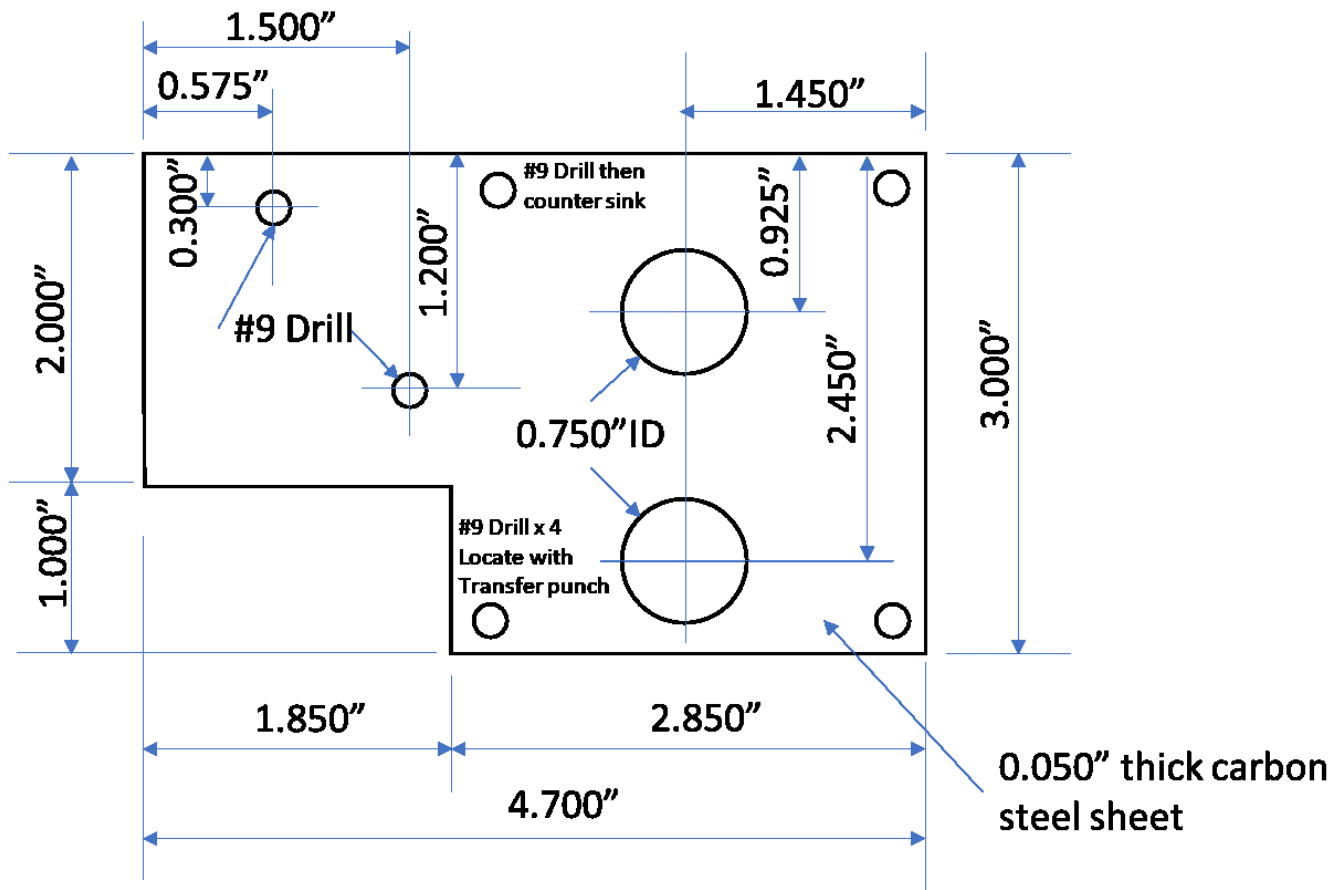




The motor is mounted using a piece of 0.050" sheet steel screwed to the right side of the lathe bed. I started with a cardboard template to get the rough shape then cut out of the steel sheet. I attached the motor to the sheet, aligned the motor shaft to the feed screw using the brass coupler, and clamped the steel sheet to the end of the lathe bed. Make sure the alignment allows the coupler to easily slide back and forth. I then drilled two holes through the sheet and into the lathe bed then tapped the holes in the lathe for mounting.

The motor and gear box mounts with #10-32 tpi screws. The top left screw must be flush with the steel sheet because it sandwiches between the sheet and lathe bed. I countersunk the hole and used a flat head screw. For the others I used Allen cap screws.

Here is a drawing for the mounting plate to attach the motor/gearbox to the right side of the lathe body. The tolerances are not very critical.



Here are the parts  
purchased for this project.



### **Variable Speed Drive:**

[Sydien DC6-60V 6V 12V 24V 48V 30A PWM DC Motor Speed Controller, Stepless Speed Regulation Start Stop Switch with Digital Display - - Amazon.com](#)

*Sydien DC6-60V 6V 12V 24V 48V 30A PWM DC Motor Speed Controller, Stepless Speed Regulation Start Stop Switch with Digital Display - - Amazon.com*

### **Power Supply:**

[Amazon.com: ZCPlus Universal Power Adapter 24 V 6 A AC/DC Power Supply Transformer for LED Strip Rope Light Printer Scanner Router Fax TFT LCD Monitor Radio Camera Computer, US Plug ...: Home Audio & Theater](#)

*Buy ZCPlus Universal Power Adapter 24 V 6 A AC/DC Power Supply Transformer for LED Strip Rope Light Printer Scanner Router Fax TFT LCD Monitor Radio Camera Computer, US Plug ...: AC Adapters - Amazon.com ✓ FREE DELIVERY possible on eligible purchases*

### **Project Box:**

[Zulkit Junction Box ABS Plastic Dustproof Waterproof IP65 Universal Electrical Boxes Project Enclosure with Fixed Ear Black 6.22 x 3.54 x 2.36 inch \(158 x 90 x 60 mm\)\(Pack of 1\) - - Amazon.com](#)

*Zulkit Junction Box ABS Plastic Dustproof Waterproof IP65 Universal Electrical Boxes Project Enclosure with Fixed Ear Black 6.22 x 3.54 x 2.36 inch (158 x 90 x 60 mm)(Pack of 1) - - Amazon.com*

### **Motor and Gear Box and Switch**

[45 RPM 24 Volt DC Molon Gearmotor | DC Gearmotors | DC Gearmotors | Electric Motors | www.surpluscenter.com](#)

*45 RPM 24 Volt DC Molon Gearmotor, DC Gearmotors, 45 RPM 24 VDC MOLON GEARMOTOR, 45 RPM, 24 DC • New MOLON take-offs. Inline parallel shaft gearMolon,*

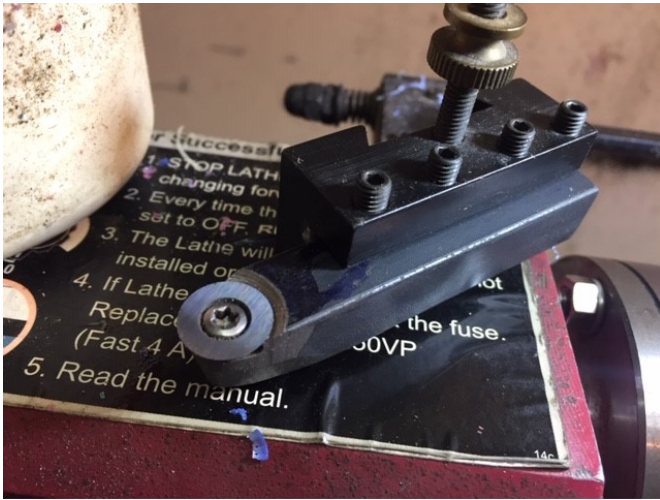
[DPDT-CO 10 Amp Toggle Switch | Toggle Switches | Switches | Electrical | www.surpluscenter.com](#)

*DPDT-CO 10 Amp Toggle Switch, Toggle Switches, DPDT-CO 10 AMP TOGGLE SWITCH, DPDT-CO TOGGLE SWITCH Brand new, maintained toggle switch. Includes66-1624 BOX ,*

## Testing Results

For these tests I used a 12mm, 30-degree carbide insert designed for wood turning. It can be used for rough turning as well as a final finishing pass. It was mounted in a tool holder designed to be used on the mini metal lathe.

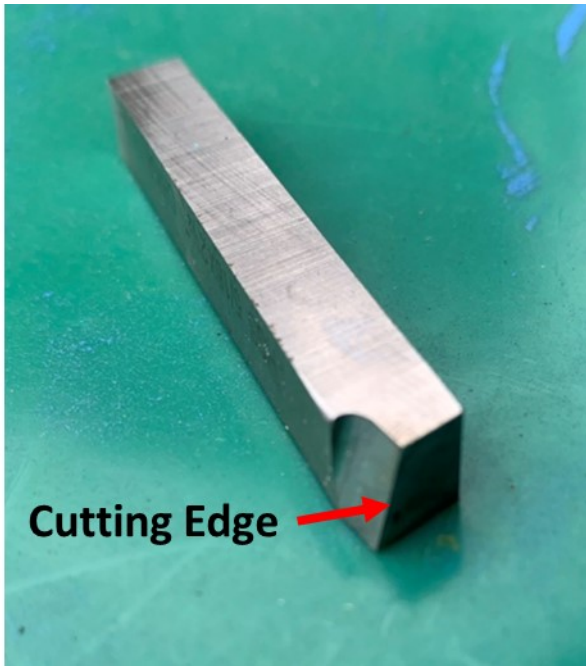
Using the carbide tool starting with a piece of acrylic then ebonite and BOW.



These blanks are "as turned" without sanding. The slower power feed speeds can give an impressive finish even with inexpensive carbide inserts. For final finish I could start with Micro Mesh pads and a finish buffing to complete.

I also tested the slow speed feed using a couple of HSS tools. HSS can be ground to a much finer edge than carbide due to its smaller grain size.

Here is a test using a HSS bit ground as a vertical Shearing tool (think Skew). The finish came out ready for final buffing, no sanding required.



I did the same test using a 15 degree round nose scraper and got similar results.



Slowing down the power feed rate on my 7 x 10 Mini Metal Lathe has made a big improvement in the surface finish. I can control the feed rate independently from the spindle speed to give much better control for different materials. It works for metals, plastics, and wood. It's easily disconnected for threading operations. The change gears do have to be disconnected when using the electric power feed.

There are lots of DC geared motors that can be used for this project. The one I used I found online and had been used by someone else that did a similar modification and was a good value. The speed range is good for this application. The tests above were done at 50% of the motor speed.

At 25% motor speed, heat builds up on the acrylic blank destroying the finish. Below 25% and the motor can stall. I use 100% for rough cuts (0.020") in acrylic and aluminum without issue.

I may look for a larger motor with more torque when I wear this one out. However, this motor hasn't even gotten warm during use. The Controller is way over designed for this application. It can be used for 30 amp loads at startup and 20 amp loads for continuous use. The motor for this build draws less than 1 amp. I'm sure there are other DC Variable Speed Controllers that will work for this modification.

Contact me if you have any questions or recommendations,

Danny Clarke

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