Manual Lathe Standard Operating Procedure

LIMITATIONS

- ❑ This document will focus on only basic turning operations, such as OD turning and Drilling, things like threading, ID turning, knurling, etc. will not be covered
- ❑ This document only covers use of the 5C collet system, with round stock sizes up to $1\frac{1}{8}$" diameter
    - While the 3-jaw chuck is depicted in the hazards, it's use is not covered here as it requires special permission to use
- ❑ This checklist only covers cutting materials ISO grade N, M1, P1-3
    - You can find your material ISO grade here

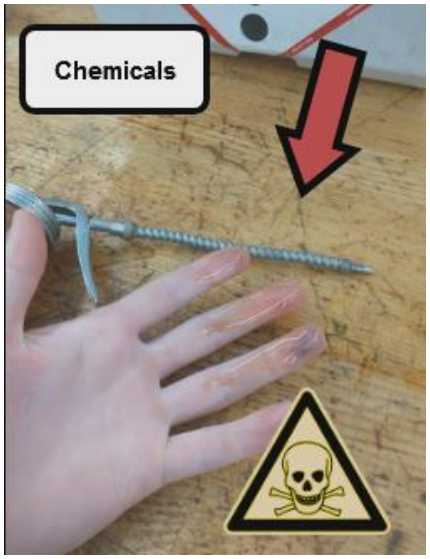
MACHINE SPECIFIC HAZARDS

- ❑ Sharp Objects: metal chips, unfinished parts, machine tools

- ❑ Crushing/pinching: can crush with the carriage on the lathe

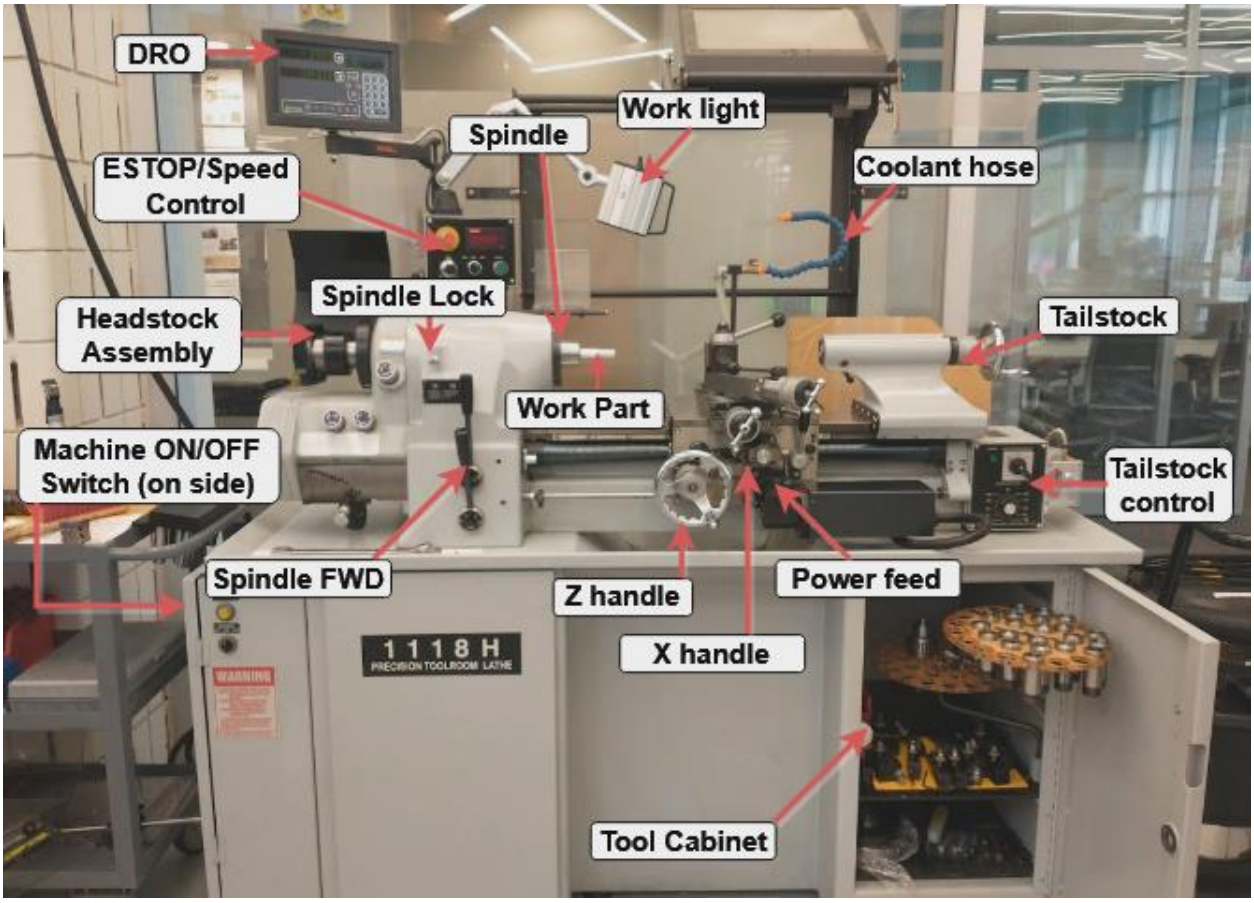
- ❑ Rotating machinery: Lathe spindle

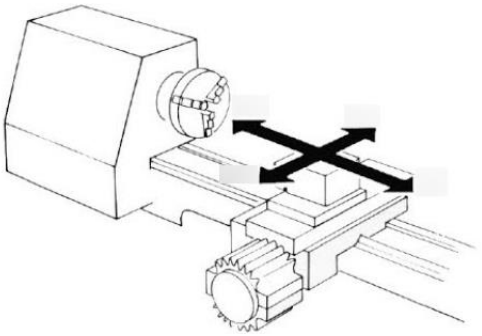
- ❑ Chemicals: coolant

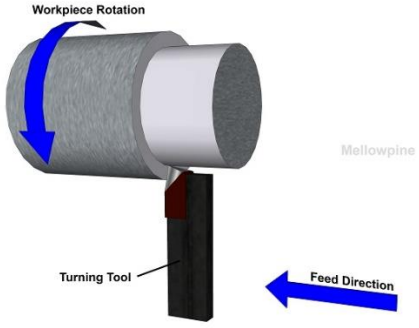


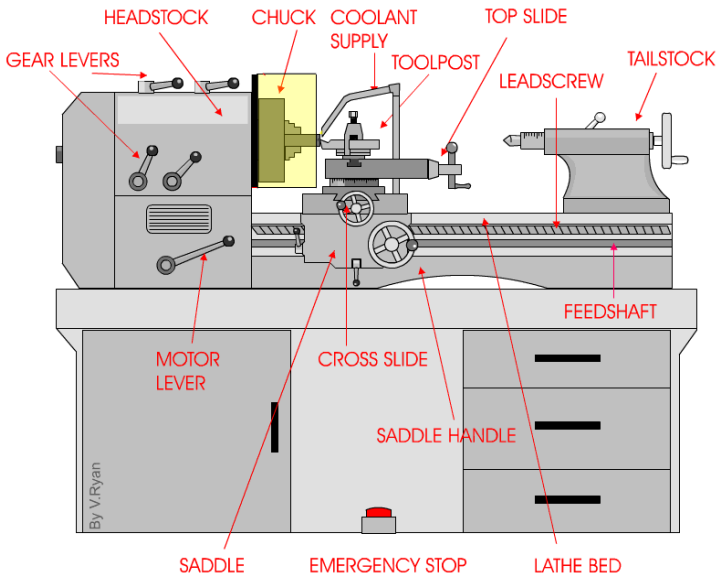
- Heavy Items: fixture plates

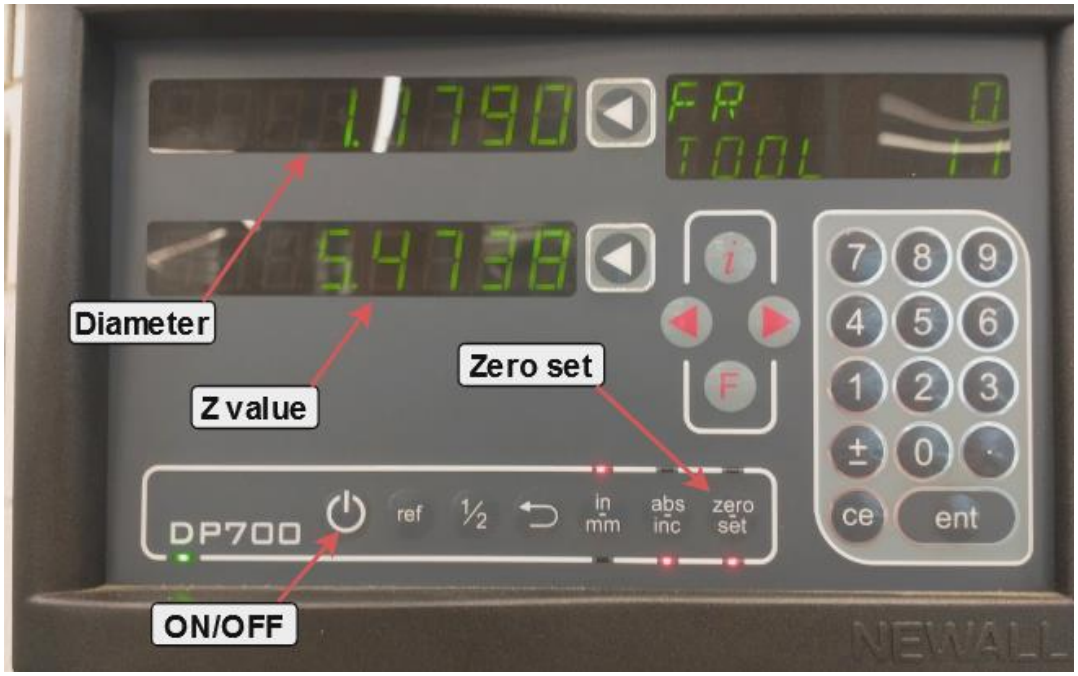
MACHINE CONTROLS


DRO
Work light
Spindle
ESTOP/Speed Control
Coolant hose
Spindle Lock
Headstock Assembly
Tailstock
Work Part
Machine ON/OFF Switch (on side)
Tailstock control
Spindle FWD
Z handle
Power feed
X handle
1118H
PRECISION TOOLROOM LATHE
WARNING
Tool Cabinet




Workpiece Rotation
Turning Tool
Feed Direction
Mellowpine



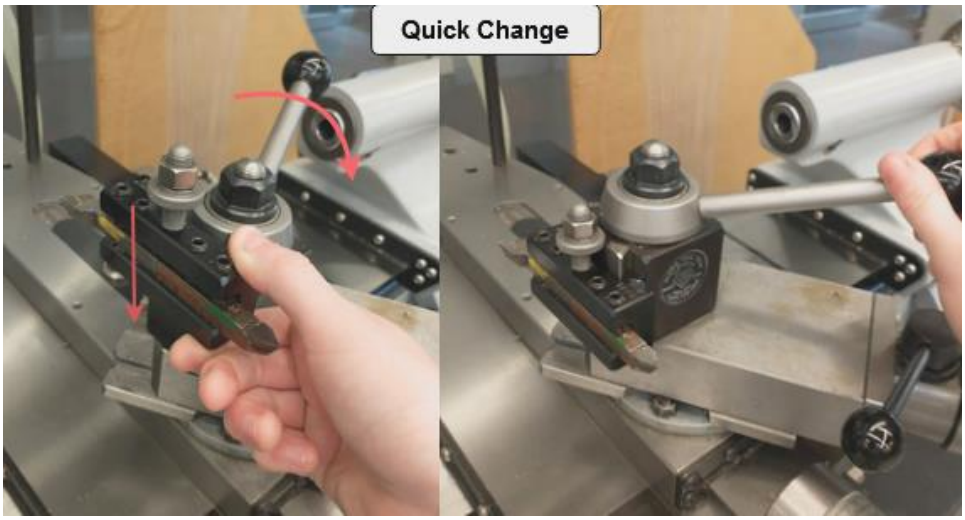


PRE-FLIGHT

Tool Setup

- ❑ Ensure machine is OFF
- ❑ Acquire tool from tool cabinet
- ❑ Ensure quick change jaw is opened

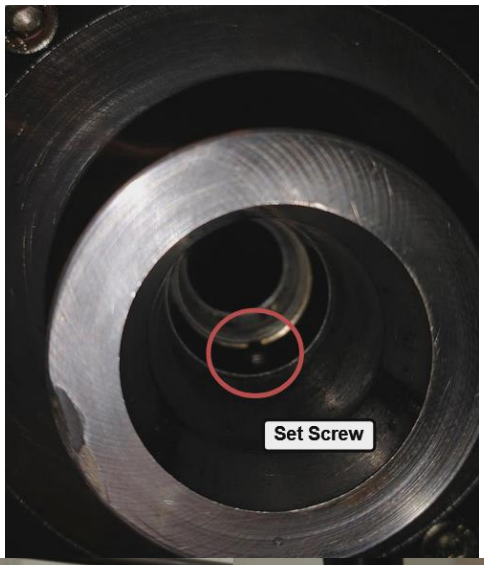
- ❑ Slide tool into quick change jaw when handle is pushed away from you (see 1st image below) and turn the handle towards you to lock it in place (see 2nd image below)
- ❑ Double check that the tool tip is on the centerline of the spindle, you can use visual inspection for this. Find a TA if it is visibly unaligned

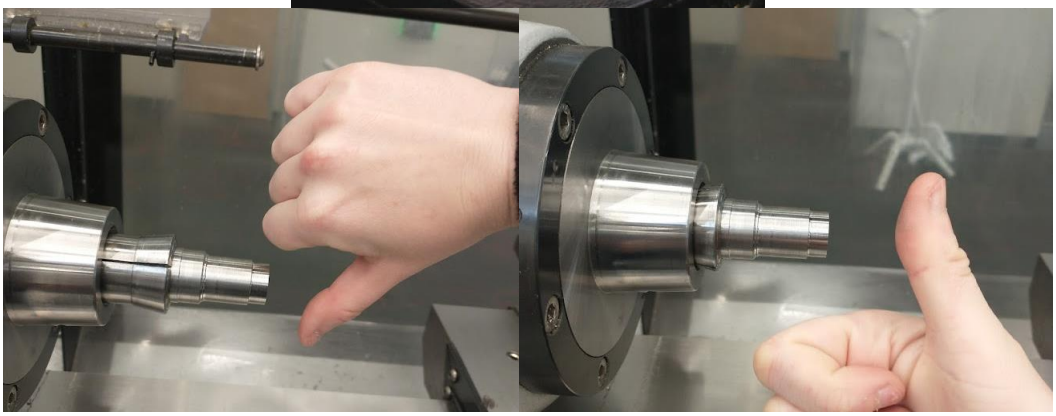


Stock Setup

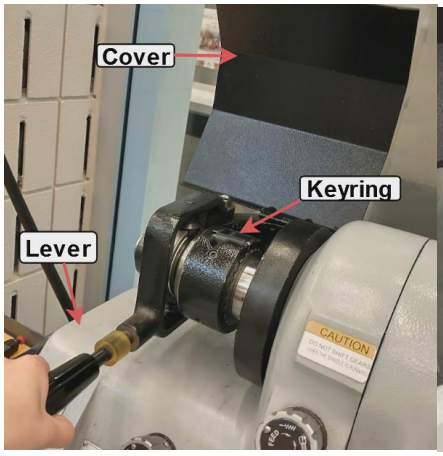
- ❑ Ensure machine is OFF
- ❑ Select your round stock and measure it to find the corresponding 5C collet
    a. NOTE: Any stock that is 1" diameter or larger will have a limited stick in, due to a lip within the 5C collet

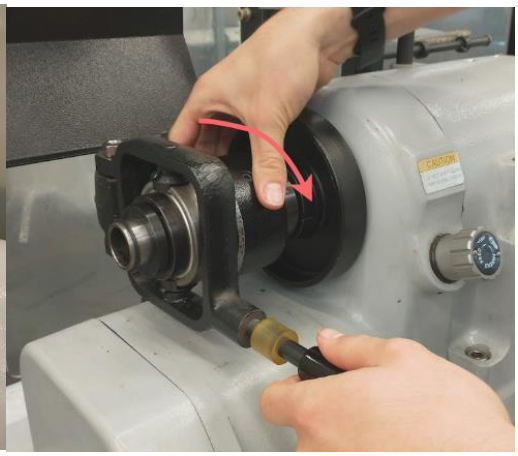
- ❑ Lock the spindle by pushing the "Spindle Lock" button while turning the spindle until the lock falls into place. The spindle should stop turning at this point
- ❑ Slide the 5C collet into the spindle, make sure to have the slot on the side lined up with the set screw INSIDE the spindle

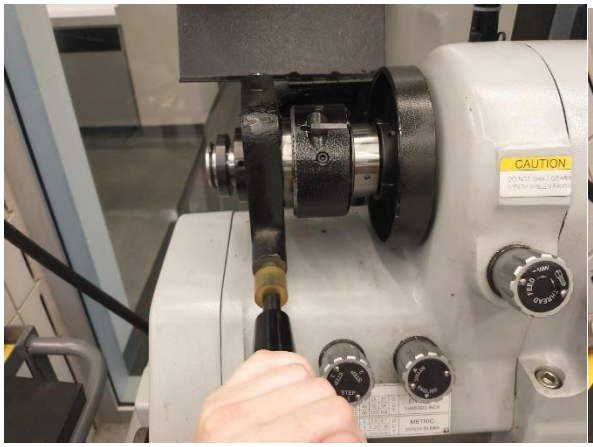




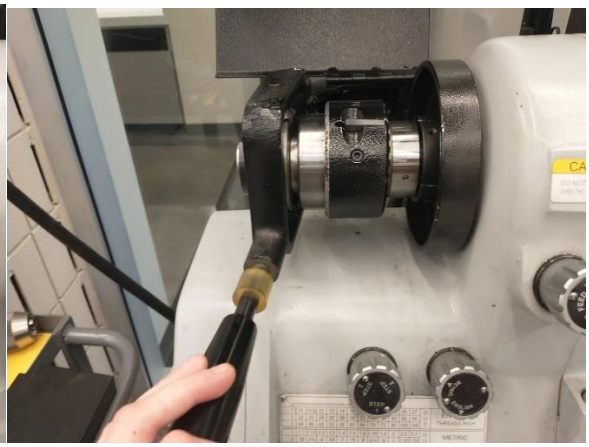
- ❑ Slide your stock into the 5C collet. This should not take too much effort or force, if it does, you need a slightly larger collet
- ❑ Open the protective panel over the headstock assembly, hold the lever forwards (towards the spindle) with one hand, while using your other hand to turn the keyring. You will need to lift the metal “key” in order to do this. As you rotate, towards you, the collet should move into the spindle





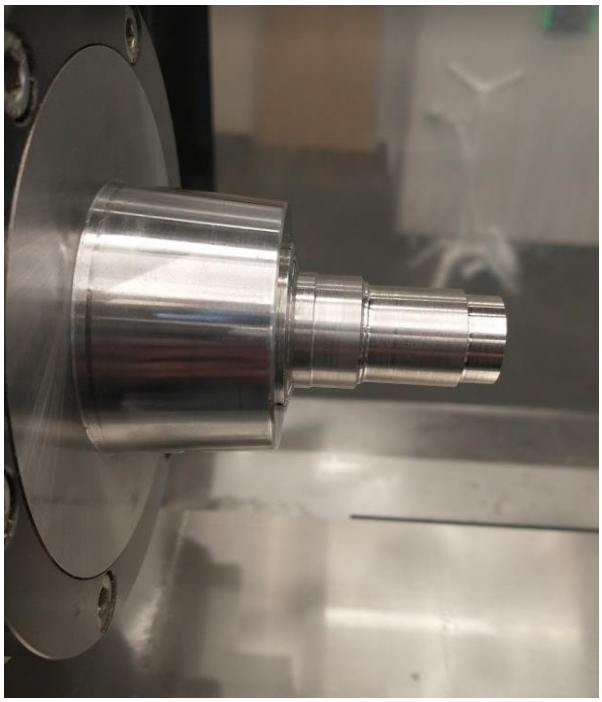


Lever pushed in



Lever pulled all the way back

- ❑ Pull the lever back, if you feel the detent engage, the stock is set. If not, put the lever forward and tighten the keyring more until the detent engages (should make a "cur-chunk" sound)
    a. NOTE if the lever won't move back fully, you may have it too tight. Loosen until the detent engages properly
    b. Below is an example of collet stick out when the lever was successfully "cur-chunked" back

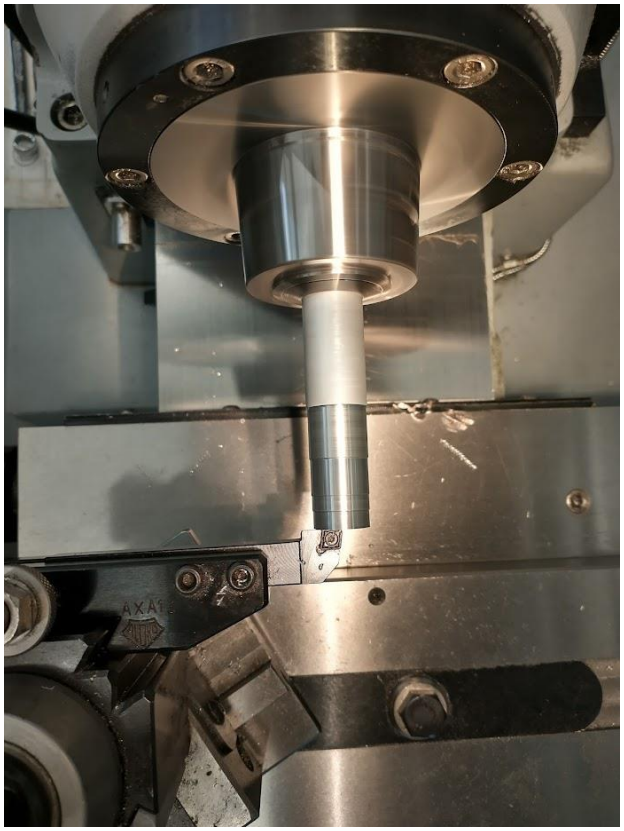


- ❑ Unlock the spindle before using
- ❑ Lower the protective cover over the headstock assembly

OPERATION

Making Datums

- ❑ Turn Machine and Digital Read Out (DRO) ON
    a. Go to the left side of the machine and turn the round ON switch
    b. If the DRO is not already on, the on switch should be on the front
    c. Refer to TURNING section below for general turning instructions before continuing a
- ❑ Double check stock is securely fixtured, and tool is disengaged before ensuring that the spindle forward lever is working
    a. To determine what speeds and feeds you need for your stock, use this resource
    b. Alternatively, you can also look at the feeds and speeds by checking the tool library for the CNC lathes on fusion. The feeds and speeds will be the same
    c. NOTE the RPM control dial has arbitrary markings, i.e. the "3" on the dial stands for ~30%, not 3000 rpm
- ❑ Use X and Z handles to control the movement of the tool post
- ❑ Before turning the spindle on, move the tip of the tool to touch off the top of your part, select "Zero Axis" for the Z axis on the DRO
- ❑ Disengage the tool in X, move in on the Z by 0.020", and perform a cutting pass
- ❑ Turn off spindle in between cuts
- ❑ Repeat until the end surface of your stock is a clean-cut face, and Zero your Z once again. All future cutting passes can now be made relative to this face
- ❑ Similarly with the X (diameter), move the cutting tool to touch off on the surface of your stock
- ❑ Disengage, move in the diameter about 0.040" and perform a cutting pass. Use calipers to measure the diameter of the part once a clean face is made, then enter it into the DRO
    a. NOTE the X value shows the DIAMETER of your part, not the radius. Therefore a cut of 0.040" on the DRO will only remove 0.020" of material from the surface on an OD turning pass
    b. NOTE to enter a value in the DRO, make sure "Set" is selected on the "Zero/Set" button, then hit the arrow next to the X axis, and type the measured diameter. Hit ENTER

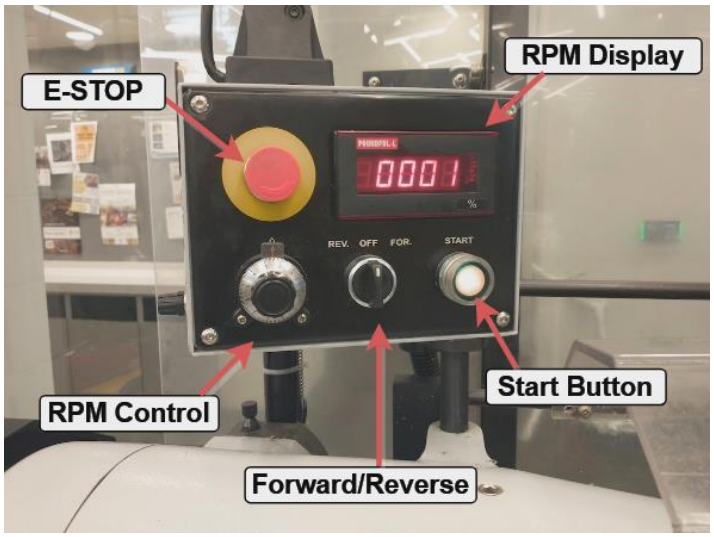


Tailstock

- ❑ Affix the drill chuck into the tailstock, with a center drill attached
- ❑ Disengage cross slide lock on tailstock and move it so that the center drill tool tip is close – but not touching – the stock surface
- ❑ Lock the tailstock, engage the spindle, and use the hand crank on the tailstock to make a drilling operation on the end of your stock
    a. NOTE when using a center drill, only drill up to the top of the large chamfer, but no further. This chamfer is where the live center will rest
- ❑ Remove drill chuck and center drill, replace with a live center that mates with the chamfer of the hole you just drilled
- ❑ Re-tail stock and engage spindle forward to ensure it is making solid contact with the stock

Turning

- ❑ If not done already, disengage EMERGENCY STOP and hit the START button. Ensure the spindle is not locked



- ❑ Lower the clear plastic stock guard, and turn on the work light if necessary
- ❑ Use X and Z jog handles to move tool, take note of where the tool is relative to your datums using the DRO
- ❑ When turning Spindle ON or OFF, use the "Spindle FWD" lever. To the right is ON, to the middle is OFF.
- ❑ When performing and OD pass, do not take larger passes than 0.050" off the diameter
- ❑ If performing a large pass, you can engage the power feed using the power feed lever
    a. NOTE power feed must be VERY closely monitored as it can cause a crash with the spindle if you aren't careful
- ❑ Only cut in the direction of the tool's cutting surface (towards the spindle for right hand tools, away from the spindle for left hand tools)
- ❑ When cutting operation is complete, disengage spindle and hit EMERGENCY STOP

POST-FLIGHT

<u>Tool Unloading</u>

- ❑ Turn machine OFF, along with the lamp, if used
- ❑ Engage E-STOP
- ❑ Disengage tool from work part
- ❑ Release the quick release handle and remove tool
- ❑ Return tool to lathe tool cabinet

<u>Stock Unloading</u>

- ❑ Disengage tailstock if used, remove live center and return to cabinet
- ❑ Double check that EMERGENCY STOP is engaged, lock the spindle and open the protective cover on the head stock assembly

- ❑ Move the lever towards the spindle (should hear a “cur-chunk” when the detent disengages)
- ❑ Perform the stock loading procedures in reverse
- ❑ Turn the key ring to looses the 5C collet until you can remove it by hand
- ❑ Lower the cover back over the headstock assembly

Cleanup

- ❑ Return all tools, 5C collets, and unused stock materials to their respective home locations
- ❑ Remove large strands of chips by hand, USE CUT GLOVES IF NECESSARY and dispose of in the metal recycling bin
    a. NOTE the most important area to clean is the cross slide, as it is the linear rail that aligns everything on the lathe
- ❑ Use the shop vac to clean up any remaining chips on the floor or the machine, wipe important surfaces, such as the lathe bed with a rag
- ❑ Perform a 5 min shop job