

AWJ Quick Start Guide

1. Generating Cutting Path for a Single Part using *FlowPATH*

- a. Turn ON main machine power switch on the back side of the machine. This initiates the computer boot sequence (the typical Windows start process)
- b. Insert USB storage device into the extension cable on the front of the computer (this cable prolongs the life of the machine USB port)
- c. Open *FlowPATH* AWJ path trajectory generation software
- d. Load the .dxf (**d**rawing **e**xchange **f**ormat) or .dwg (**d**rawing) file from USB device
- e. Understand the workspace lines
 1. The red-dotted square is the maximum cutting area (i.e. the table size ~51x51")
 2. The white grid squares (2 x 2") represent the current coordinate system (similar to G54). Bottom left is (0,0) (similar to G28)
 3. Solid lines are cut paths (various colors)
 4. Blue dotted lines are rapid transverse (non-cutting) paths
- f. Delete all unnecessary lines and comments imported with the .dxf
- g. **Select all** (top right menu bar or Ctrl-A) and **Move** (right menu bar) the part model to bottom left corner of white grid with ~0.1-0.25" of clearance along X and Y axes
- h. If your part can fall through the table slats, add tabs to your part by clicking the **Draw Tab Lines icon**, then the **Snap Nearest icon** on the left hand side of the screen
 1. Click along an outside edge to place the tab and make sure it faces the proper direction
 2. If the color of the tab cut lines are not consistent with other cut lines, adjust it using the following step
- i. Adjust the cutting speed by selecting all relevant cutting lines and clicking the appropriate cutting speed from the bottom menu bar
 1. 40-60% for tight tolerances or nice edge surface finishes
 2. 80-100% for looser tolerances and no crucial edge surfaces (sheetmetal parts)
- j. Automatically generate cutting path and adjust transverse lines
 1. **Select all** (Ctrl-A) **lines**, then Click **Autopath (AP)** from right menu bar
 2. Check path offset. Ensure cut path is on the inside of internal features (like holes). Ensure cut path is on the outside of external features (like the part profile). If it's not, good luck changing it. ☺
 3. Check lead-in/lead-out lines. Linear parts should have straight leads on corners, if possible, to prevent cusps. Curved parts benefit from having arc leads. **These settings must be changed before auto-pathing.**
 4. Check traverse lines
 - a. Drag lead-in/outs when necessary to suitable location by selecting **Edit** → **Drag Lead-in/out**, then clicking and dragging the lead-in/to a new location
 - b. **CAUTION: NEVER TRAVERSE OVER PREVIOUSLY CUT PART LINES, AS DOING SO CAN BREAK THE EXPENSIVE CARBIDE**

MIXING TUBE IF THE PREVIOUSLY CUT PART TIPS UP INTO THE PATH OF THE MOVING WATER JET NOZZLE.

- k. Once path set-up is complete, use **File** → **Export Path as...** to save file as **.ORD**
 1. Do NOT save the FlowPATH file / session
 2. Do not use “Export 5.x Path as...” (this is an older file version)

2. Nesting Multiple Parts using *FlowNEST*

- a. To cut multiple parts from one piece of stock, an **.ORD** file should be generated for each part
- b. Open *FlowNEST*
- c. Select **Edit** → **Part Data** or click the **Part Data icon** to begin the part selection process
 1. Select **Add** to display the Part Data dialog box
 2. In the Part Data dialog box, adjust the quantity of each part as needed and leave the other parameters as the default unless you’re feeling adventurous ☺
- d. Select **Edit** → **Sheet Data** or click the **Sheet Data icon** to select/define the stock from which the parts will be cut. Select Add to open the Sheet data
 1. Select **Use the rectangle defined above** and enter the length and width. The stock size you enter should be smaller than the size of your actual stock to ensure the nozzle doesn’t collide with any clamps or weights used to secure workpiece.
- e. Select **Nest** → **Execute** or click the **Execute icon**
- f. Save the cutting path as an **.ORD** file by clicking on **Save path**

3. Part Loading & Clamping

- a. Be careful not to hit the AWJ nozzle or pinch your fingers when loading larger or heavier workpieces
- b. Water jet bricks can be used to support small or thin parts which cannot be easily tabbed or supported to prevent falling into the tank. Only use water jet brick when necessary, as it’s expensive and using it makes a mess in the tank because the plastic floats on top of the water.
 1. **CAUTION: The weight of the part is NOT enough to prevent movement, so use F-clamps, but make sure they are positioned with enough clearance so the AWJ cutting head will not collide with them when cutting.**
- c. When finished and unloading the part, wipe off the F-clamps so they don’t rust while being stored wet

4. Machine Startup

- a. Turn ON the labeled water and air valves located in NW corner of the room.
- b. Turn ON main machine power switch on the back side of the machine. This initiates the computer boot sequence (the typical Windows start process).
- c. Ensure the four valves above the pump are rotated to ON position (the Sanitary Drain valve is throttled back to 45°). These valves should already be ON but always visually double check.

5. Cutting the Part using *FlowCUT*

- a. Open *FlowCUT*
- b. Open the *FlowPATH .ORD* file you wish to cut
 1. Specify the material properties
 - a. Thickness
 - b. Material type

- c. Tool radius should be already set to 0.0175" (half the mixing tube diameter)
 - d. Scale should be 1 unless you purposely want to change it
 - e. Pierce will update automatically (do not change)
2. Use **Preview** (bottom menu) to view simulated paths
 3. Click **Run Machine** when ready to cut
 - a. Click **OK** when Apply Model screen pops up (use default settings)
- c. Homing Machine
1. Rotate E-stop knob on controller and push **Drive Power button** to energize the servos. All three lights should be illuminated and you should hear the buzz of the motors.
 2. Select the **home icon** on the bottom right and select Yes to home the Z-axis
 3. Select the other **home icon** to home the X & Y-axes
 - a. In the Homing Dialog screen, select **Go to machine home** and hit OK
 - b. **CAUTION : Be cautious and stay clear of the moving arm above the tank**
- d. Ensure the stock is properly secured with clamps and weights
- e. Homing Part
1. Hand jog the jet using the key pad arrows for X and Y axes and the page up/down keys for the z axis
 2. The X and Y axes are eyeballed by splitting the nozzle down the middle similar to checking the zero with the edge finder on the milling machine
 3. The jet nozzle should be ~ **0.1"** above the part for the Z axis. Use the smallest step on the FLOW step gauge found on top of the controller to verify height is set properly
 - a. **CAUTION: Approach the final Z height slowly and ALWAYS move the step gauge out of the way before bumping the Z closer. Running the fragile carbide mixing tube into the step gage or workpiece will destroy it**
 4. When you are positioned correctly for home, click the **X,Y-axes home icon** again
 5. Click **Set current position as user home** (similar to setting a G54 work offset on the CNC) and click **OK**
 - a. If this is done correctly, a red dot should appear at the corner the workspace
 6. If you hand jog away from your new home position before starting the program, the machine will throw a warning: Do you want to set the current jet position as new Home Position?
 - a. Click **No**, otherwise the current position will be the new **Home**
- f. Starting Machine
1. Double check your set-up: the bottom of the screen will list your selected material, and material thickness
 2. Verify that **Water** and **Abrasive** in the right menu are set to **Auto** and **Feedrate is 100%** (or lower if you are cautious)
 3. When ready, click the **green light icon** next to Pump to activate
 4. Once full pressure has been reached on the large gage above the AWJ pump, click **Cycle Start** (Play button with nozzle image)
 5. **Machine does not feed hold!**

- a. If you need to stop the program hit **ESC key** or if it's an emergency, use any of the **E-STOP buttons**
 - b. If you stop in the middle of a program, you can continue by selecting **Cutting** → **Cut From Point** → (choose a point near/before where you stopped the program previously)
- g. After program finishes, click **OK** to clear the note stating that the program is finished (**the pump will make a LOUD noise upon shutdown**)
 - 1. Home Z-axis or jog up to clear any obstruction
 - 2. Hand jog nozzle away from part so you can unload finished parts (edges will be sharp and need deburring)
- h. Shutdown Procedures
 - 1. Home Z-axis in FlowCUT and wait until full retraction occurs to provide maximum clearance upon restarting machine
 - 2. After returning home, push **E-Stop button** on controller to deactivate servos
 - 3. Close **FlowCUT** and **FlowPATH** programs
 - 4. Run through the typical Windows Shutdown
 - a. **Start Menu** → **Shutdown**
 - b. Wait until fully off (black screen) before proceeding
 - 5. Turn the black power switch on the backside of the machine to OFF (**the abrasive hopper will make a LOUD noise**)
 - 6. CLOSE incoming air and water valves, leave the pump valves ON
 - 7. Rinse parts with water hose (mounted on wall) and turn OFF its shutoff valve
 - 8. Remove material from the top of the tank and discard or return to material rack

6. Important Notes

- a. Always wear safety glasses and ear protection when operating the machine.
- b. Always CLAMP YOUR MATERIAL SECURELY before running the program; the buoyancy force produced by the water is quite large and can shift any parts not clamped securely, destroying the part and possibly damaging the cutting head.
- c. The splash zone around the machine is approximately 3ft; remove any items that could potentially be damaged.
- d. The red dot trail showing that path of the cutting jet can be cleared by pressing **F12**.
- e. Be careful when jogging the machine, as the carbide mixing tubes are very brittle and easily broken if bumped into anything.
- f. Be careful all geometry in your imported .dxf or .dwg file is on **ONE PLANE**, as negative Z-moves will plunge the mixing tube into the workpiece.
- g. When servicing the machine **ALWAYS** position the AWJ nozzle over a large sheet of material so you don't accidentally drop parts into the tank while (dis)assembling, as once you drop them, it's too late to do anything about it.
- h. A little prayer goes a long way when using this machine (as in life ☺)!