GCode for the EBF Machine

General Notes

- The code you will use from the VCarve export should only be machine movement code.
- All G#, M#, S, F or T codes from the export should be removed and replaced as necessary.
- Text in black below are actual machine commands.
- Text in red is explanatory text only and is not required in the GCode file. Any text within () is ignored by WinCNC

Header

(This section is made up of notes for the operator. None of this code actually makes the machine do anything)
(Name-of-project JDW 20190401 - This can be whatever you want it to be)
(Tools - The list below is for reference so that you can check that the right tools are in the right tool slots in the machine. You will use “T1”, “T2” etc in the actual code so you need to make sure that you’ve instructed the machine to pick up the right tool.)
(T1 .250 end mill)
(T2 .375 end mill)
(T3 .500 end mill)
(T4 5mm end mill)
(T5 .1 end mill)
(T6 .750 dovetail cutter)
(ALL TOOLS 1.00 stick out from face of tool holder - This is the goal but isn’t necessary)

(The following are the actual commands that the machine will execute in the header. Extra line spaces have no effect and are present to aid visualization)

G20 (Make the machine use inches)
G40 (Cancels cutter radius compensation in case one was set - handled by software)
G80 (Cancels canned cycle in case one was set)
M11C7 (Turns the vacuum table on - may be redundant, but avoids and abort)

T1 (Tells the machine to get Tool 1 or whichever tool you need. Will invoke TU and TC macro.)
S10000 (Spin that tool at 10,000 RPM. Adjust this as required for your endmill. Generally bigger tools = slower speeds)
M3 (Start the spindle - will invoke the SPINON macro)

M11C4 (Air blast cooling for spindle on)

M11C2 (Dust hood down)
G04 (Tells the machine to wait for the Enter key to be pressed before beginning the job)

(Your gcode movement instructions exported from VCarve will go here. It's important to check your rapid movement and safe movement heights in VCarve before export as those heights will be in this code. VCarve also makes the machine move to X0 Y0 before moving to the first cut area. This code isn't necessary and can be removed if you wish but if you're unsure, just leave it in.)

Tool Changes

(If executing a tool change mid project. Make sure that the last line of the code before the tool change includes raising the tool to a safe movement height above the material. If you exported multiple toolpaths from VCarve, the name you gave each toolpath will be shown at the point in the file where the toolpath changes, so it is helpful to give your toolpaths descriptive names. You may need to remove other VCarve G#, M#, S, F or T commands between movement commands)

T2 (Tells the machine to go get tool 2, or whichever tool number you input here. The T# command will automatically stop the spindle and execute the machine commands necessary to get the new tool without damaging the machine)
S10000 (Spin the tool at 10,000 RPM. If you do not specify a S#, the new tool will spin at the same speed as the previous tool.)
(Can a new feed speed also be inserted here?)
M3 (Start the spindle)

Footer

T0 (Tells the machine to stop spindle, unload tool, and position spindle at the back of the machine.)
(We should insert a move to the machine park location here)
M12C7 (Turn the vacuum off)
M2 (Tells WINCNC that its the end of the program)

EBF Checklist

Prior to Turning On the EBF

- ☐ Check the oil in the vacuum pump (sight glass on back of the unit)
- ☐ Check dust collector bags outside and make sure they are not all full. Change if

necessary.

- ☐ Move the control cabinet out to be clear of the machine and the metal shop door
- ☐ Make sure that the large air compressor outside is on - check the circuit breaker and the large on/off lever outside
- ☐ Make sure that compressed air is supplied to the table. Connection is on the front lower left corner of the machine near the floor. The regulator is on the wall to the left o fthe machine and should read at least 70PSI.
- ☐ Load cutters/endmills into the tool holders and tool holders are in the correct slots. 1-8 left to right.
- ☐ Adjust the dust hood if necessary via the allen head screws on the sides. This should not normally be necessary.

Turning Machines On

- ☐ Make sure the Circuit Breaker on the Main Panel is on. (Circuit breaker feeds a transformer that supplies the correct power to the EBF)
- ☐ Turn on the local power disconnect via the lever to the left of the machine.
- ☐ Make sure the rotary switch on back of the control cabinet is to ‘Marche’ (It stays in this position)
- ☐ Power on the control cabinet (black switch on left side - up)
- ☐ Open the cabinet and reset/push the power button on the computer.

Setting Up To Cut

- ☐ Launch WinCNC
- ☐ Make sure nothing is in the way of the machine’s movement either on or next to the machine.
- ☐ Press “Home” on WinCNC
- ☐ Issue a “G92 X0 Y0 Z0” command on the machine. This sets the initial 0,0,0 position.
- ☐ Move spindle out of the way so that you can position your spoil board/fixture. Use the arrow keys on WinCNC, the arrow keys on the keyboard, or issue a G00 command.
- ☐ Use existing positions or move rubber gaskets to suit material being vacuumed to the table.
- ☐ If using the machine pins for positioning
    - ☐ Be sure fixtures and spoil boards are clear of the pins.
    - ☐ Click “Pins Up” in WinCNC.
    - ☐ Position base board against side and front pins
- ☐ If not using the machine pins, position spoil board/fixture as needed on the table.
- ☐ Position your material on your spoil board/fixture
- ☐ Load your tool table in WinCNC if needed. Not frequently used.
- ☐ Touch-Off each tool.
    - ☐ Place the touch-off button on the machine base (aluminum) on the side of the machine - the spot is marked. Load each tool one by one (T#) and move tool to touch-off position using the command “G00 X2 Y17” and then click the “Set Tool”

button on the WinCNC screen. Do this process for each tool using the T# command to change between tools.

- ☐ Determine the number of vacuum zones required and turn the switches to on (up) on the front of the machine. The zones are 1-4 front to back on the machine (2 vacuum holes per zone) and the switches are correspond to zones 1-4 from left to right.
- ☐ Cover any holes in the vacuum table that are not being used. These will be loose but will ensure that chips don't get down into the vacuum tubes.
- ☐ Turn on the vacuum by pressing the "Vacuum" button on WinCNC.
- ☐ Check security of raw material
- ☐ With your last tool (after touching off all tools) move the touch-off button to a suitable place on top of your material.
- ☐ Jog the Spindle to over top of the touch-off button, or move the button to underneath the spindle
- ☐ Press the "Set Material" button to set the Z height. As long as you touched off all of the other tools first, all machine will now know where the top of your material is for all tools.
- ☐ Jog the spindle to where you want your material X and Y zero to be.
- ☐ Note down the X and Y coordinates. This is no mandatory but is valuable if you need to restart your toolpath for some reason.
- ☐ Issue the command "G92 X0 Y0" to set the work piece zero position.
- ☐ Turn on main workshop dust collector. Make sure that all of the other gates in the shop are closed and that the gate above the machine near the bottom right corner is open. Turn on Vacuum (if not already on)
- ☐ Save your GCode file from your flash drive to the computer. There is a USB hub on the left side of the machine.
- ☐ Load your GCode from the computer hard drive in WinCNC. (File, Open, yourfile) but DO NOT PRESS ENTER YET! Pressing Enter will start the toolpath.
- ☐ If you have copied the suggested header into your GCode, the machine will turn on the vacuum table if it isn't already on, grab the first tool in your file, drop the dust hood, start the coolant, and wait for you to press Enter before it begins.
- ☐ Press Enter - Cutting will begin

Post Cut

- ☐ If you used the suggested Footer code, the T0 command turns off the spindle, returns the last tool used to the tool changer, and M12C7 turns off the vacuum table.
- ☐ If you did not use the suggested Footer
  - ☐ Wait till the spindle stops spinning before doing anything.
  - ☐ Jog the machine out of the way of your material as needed
  - ☐ Turn the vacuum off via the button in WinCNC
  - ☐ Issue the T0 command to return the last tool used
- ☐ Turn dust collection off
- ☐ Press the "Parking" button to move the machine to sit over top of the parking space at

the back of the machine. IF you turn off the computer, the spindle will drop quickly, so the parking position has had a pad added.

- ☐ Lower the spindle Z height to just over the pad in the parking position.
- ☐ Remove your material
- ☐ Vacuum top, under and around machine
- ☐ Empty dust collection bag if full
- ☐ Restore/adjust tools in tool holders and tool order as needed.
- ☐ Disconnect air line
- ☐ Exit WinCNC
- ☐ Shut down Windows
- ☐ Turn off cabinet (black switch on side of cabinet down)
- ☐ Turn off power at the local breaker box
- ☐ Turn of EBF Breaker in the breaker box.
- ☐ Clear any custom fixtures and make machine ready for next user
- ☐ Move the PC cabinet back out of the way and so that the metal shop door can be opened.