

V2 Software Overview Tutorial



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Revision History

First Release: October 2017 (JD)

Second Release: September 2018 (KN) added Windows 10 Driver information & New Display

Introduction

The purpose of this tutorial is to introduce users to the Pocket NC V2 user interface. The topics covered in this tutorial are interface navigation, machine controls, loading and running programs, editing the tool table, conducting tool length measurements using the tool probe feature, and changing the display units.

Software needed: web browser, Chrome, Firefox, Safari are recommended. No internet connection is required.

Hardware needed: computer/Chromebook, USB/mini USB cable

Section 1: Startup and Shutdown

Plug the power cord into the Pocket NC and plug it to a power outlet using the included C13 power cord.

Connect the Pocket NC to the computer using the mini USB/USB adapter cable included in the toolkit.

If you are running Windows 10, the Beaglebone driver installs itself automatically when plugged into the computer, but there is a problem with the RNDIS driver that prevents the communication with the Beagleboard. The RNDIS driver can easily be updated with the generic Microsoft driver.

1. Go into the device manager.
2. The Beaglebone Board should show up as a device, right click on the device and select "Update Driver."
3. Next click "Browse my computer for drivers" > "Let me pick from a list" > "Network Adaptors" > "Microsoft" > "USB RNDIS Adaptor." Note in some cases this may also be named Remote RNDIS or may be under the Microsoft Corp folder.
4. You may need to unplug the USB and replug in the USB to reboot the Beagleboard.

5. Turn on the machine and start using.

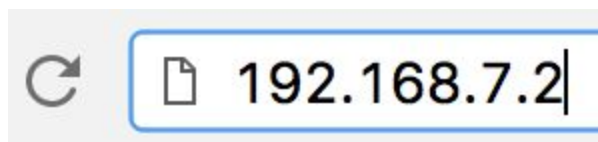
The drivers for MacOSX and Windows 7, 8, and 8.1 should be preinstalled on the Beaglebone. If you need a different driver follow click on [this link](#) to view the available Beagleboard drivers.

Download and install one of the following web browsers:

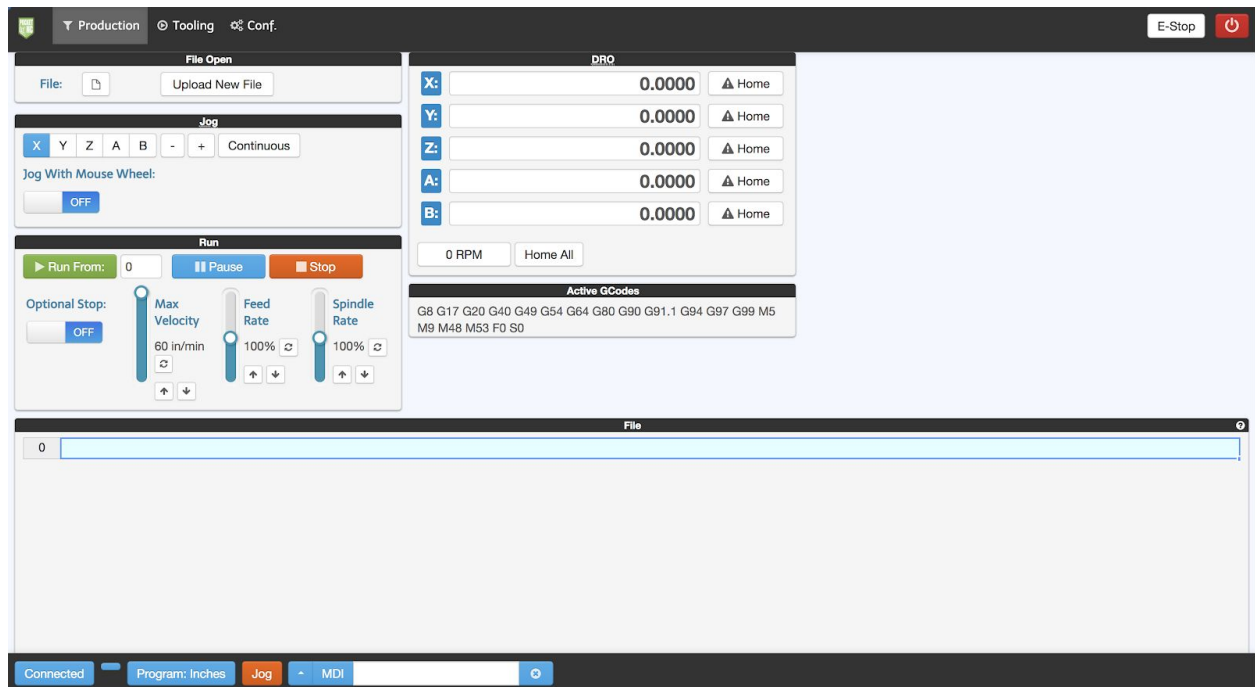
- Google Chrome
- Firefox
- Safari

Section 1.1: Startup:

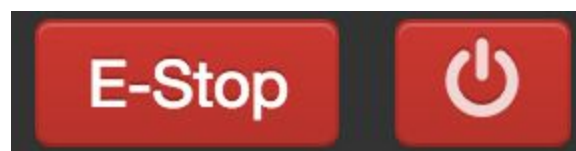
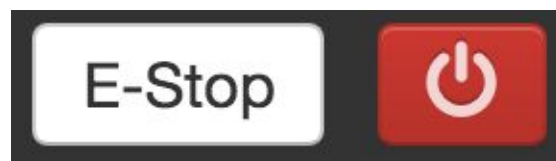
- Turn on your machine.
- Connect to your computer using the mini USB port.
- Wait about 30 seconds for the machine to fully boot before attempting to connect to it.
The red, E-stop button will blink when the machine is fully booted.
- Open your web browser and type the Pocket NC's IP address, "192.168.7.2" into the search bar.



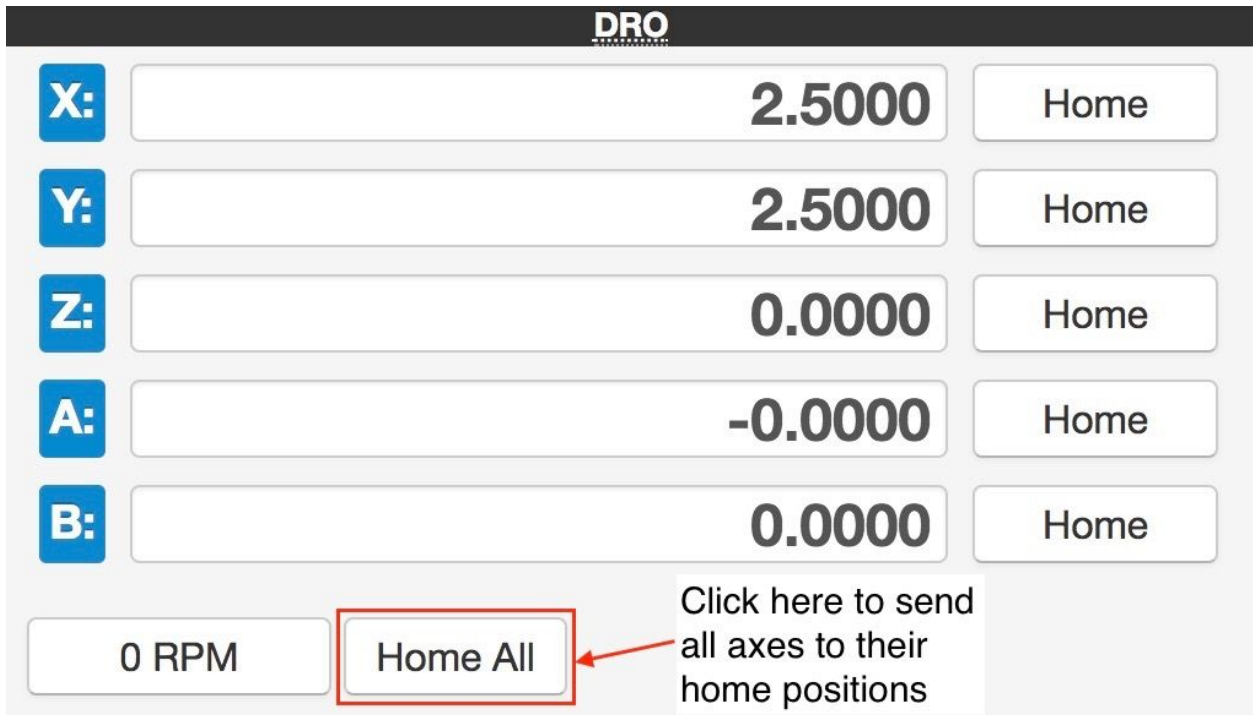
- The User Interface will open in the “Production” screen.



- By default the power to the axes will be off, in order to enable the axes click on the “E-Stop” button in the upper right corner of the screen. You will note that the E-stop (red button) on the Pocket NC mill will blink until the motor power is enabled and will be solid after the motors are active. The E-Stop button turns to red to indicate it’s on.



- Before running any programs the machine must be homed. Click the “Home All” button in order to send all axes to their home positions. The screenshot below shows the coordinates of the machine’s home position.



The screenshot displays the DRO (Digital Read Out) control interface. At the top, the text "DRO" is visible. Below this, there are five rows representing different axes: X, Y, Z, A, and B. Each row consists of a blue square with a white letter, a text input field, a numerical value, and a "Home" button. The X-axis shows a value of 2.5000, the Y-axis shows 2.5000, the Z-axis shows 0.0000, the A-axis shows -0.0000, and the B-axis shows 0.0000. At the bottom left, there is a "0 RPM" button. To its right is a "Home All" button, which is highlighted with a red rectangular border. A red arrow points from a text box to the "Home All" button. The text box contains the instruction: "Click here to send all axes to their home positions".

Axis	Value	Home Button
X:	2.5000	Home
Y:	2.5000	Home
Z:	0.0000	Home
A:	-0.0000	Home
B:	0.0000	Home

0 RPM **Home All** Click here to send all axes to their home positions

Section 1.2: Shutdown

- When you are done operating the machine, click on the power button symbol in the upper right corner of the screen this shuts down the machine, but also safely shuts down the Beaglebone Board. A pop-up asks you if you would like to completely shut down the V2 machine.
- Shut off the power button on the Pocket NC and unplug the machine from the computer.

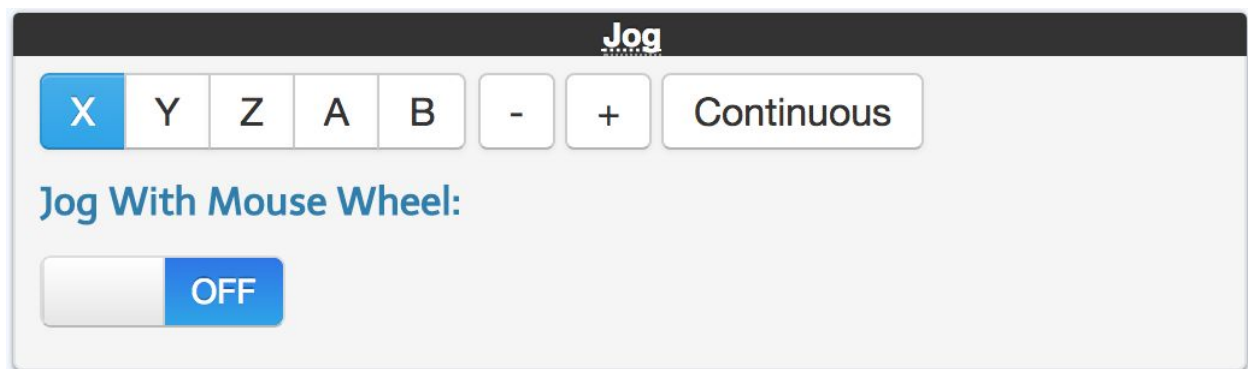
- The computer may generate an error message warning you to eject the BeagleBone before unplugging it. You may eject the BeagleBone from the computer if desired, but it is not necessary.

Section 2: Production Tab

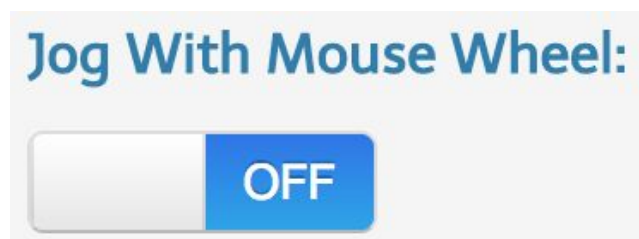
For startup procedure and homing see [section 1](#) of this document

Section 2.1: Jogging

There are a number of ways that the user can control the machine axes. The user can select the axis he would like to move by clicking on the axis buttons. The user can then jog that button using the plus (+) and minus (-) buttons.



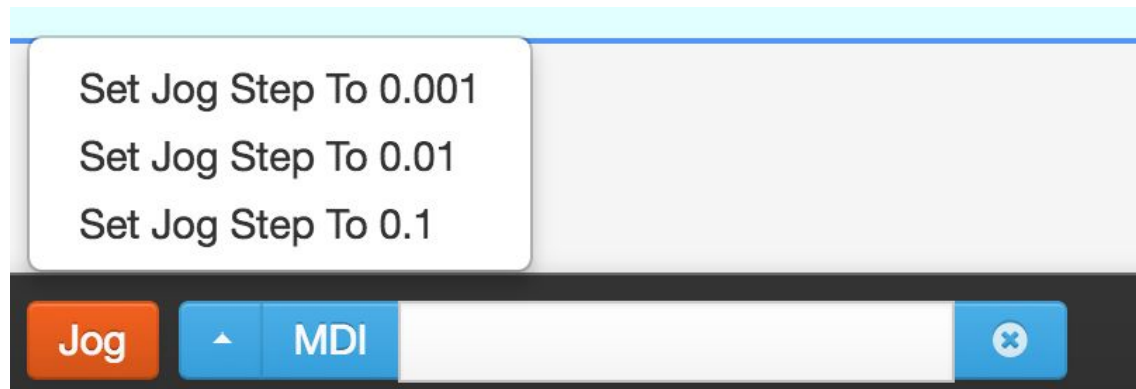
The user can also jog the axes using the mouse wheel by turning enabling the “Jog With Mouse Wheel” button and selecting the desired axis of motion by clicking on the respective button.



Jog With Mouse Wheel:

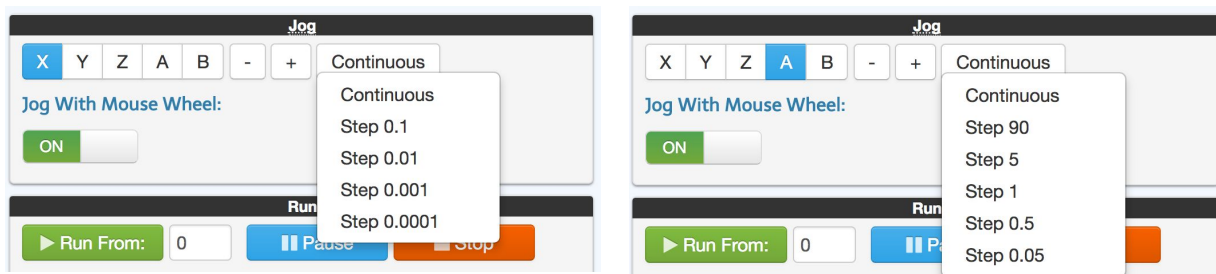
ON

Finally, the user may also use keyboard controls to move the axes. The arrow keys control the X and Y axes, the “Z” and “X” keys are used to control the Z axis, the “A” and “S” keys control the A axis, finally, the “B” and “N” keys are used to control the B axis. The settings for the keyboard controlled jogging are located in the “Jog” menu at the bottom of the page. Click on the “Jog” button to bring up a list of the available step sizes. The available step sizes can be adjusted in the machine configurations.



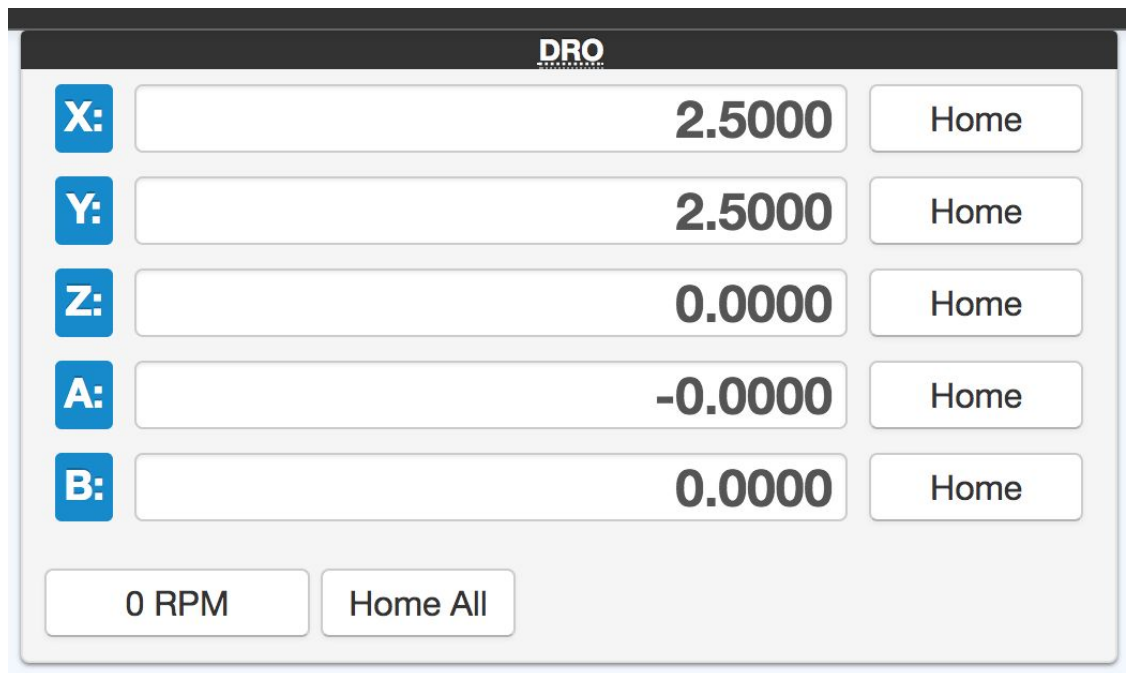
Section 2.1.1: Step Size

The step size can be changed by clicking on the step size readout and choosing the desired step size from the dropdown list. Note that the rotary axes have different step size options than the linear axes. The step size units are inches, centimeters, or millimeters for the linear axes and degrees for the linear axes. The user can change the units of the linear axes in the “Configurations” tab. The units in the images below are inches.



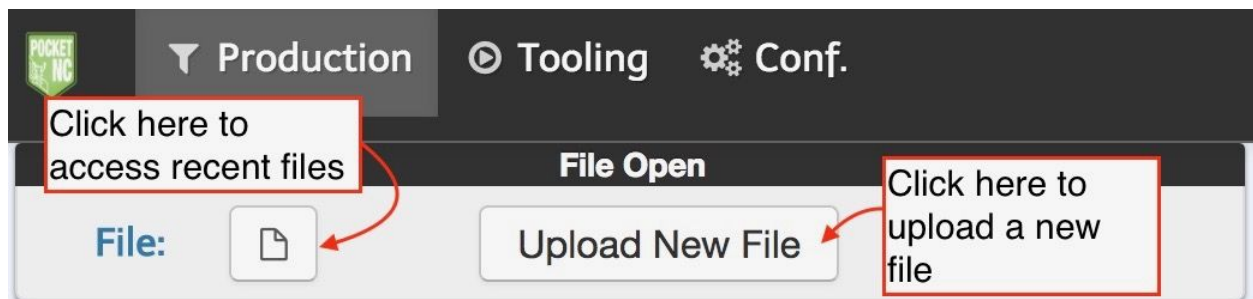
Section 2.2: DRO Interface

The digital readout (DRO) allows the user to see the position of each of the machine axes. The user may also use the DRO to home axes individually.



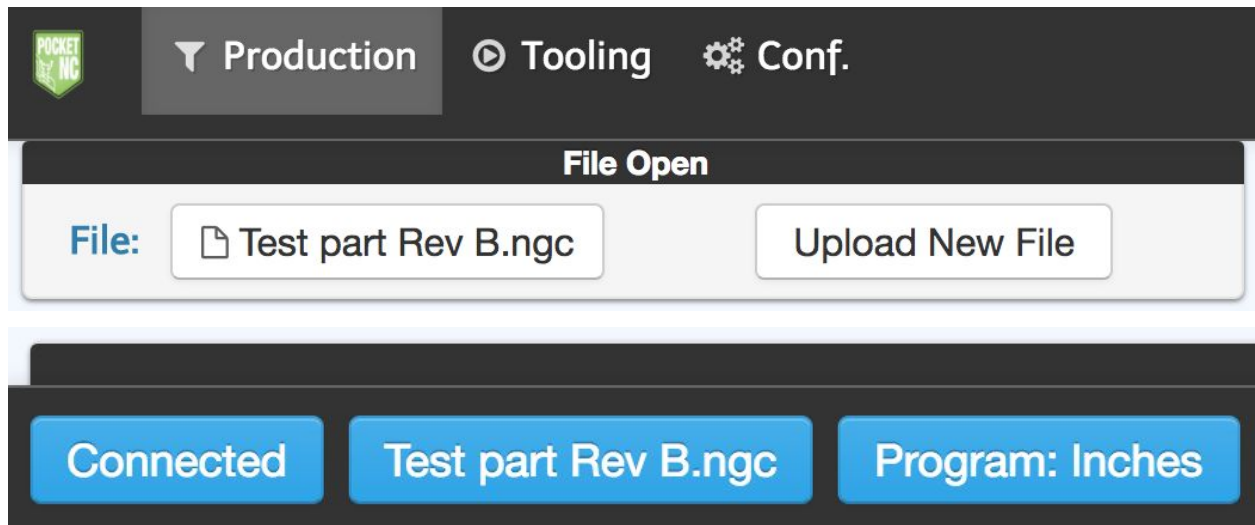
Section 2.3: Loading a Program

Upload a machining file to the BeagleBone by clicking on the "Upload New File" button.



Select your .ngc file from the file directory on your computer or USB flash drive. Note that G-code files must be 2.5MB or less to transfer. This is also the maximum file size that the Pocket NCs' processor can handle when it comes time to check the Gcode for errors before running it.

After the file has been successfully uploaded, the file name will appear in the in the file window on the left side of the screen as well as in the file display window at the bottom of the screen.

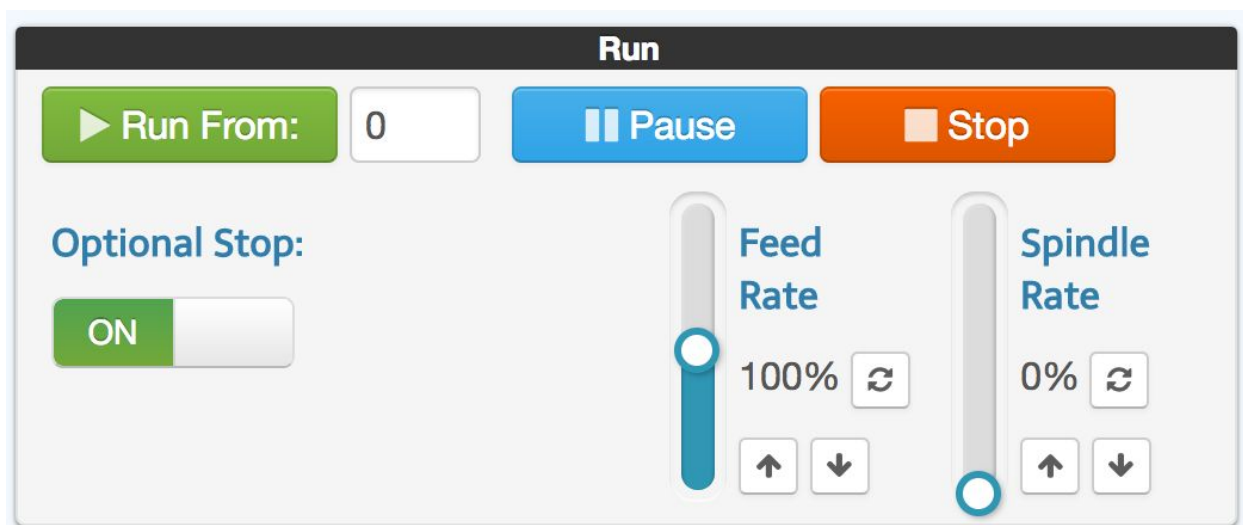


Once the file is loaded, the code will be displayed in the “File” display area at the bottom of the screen. The user can view the file before running it and while it runs using this interface.

File	
0	%
1	(AXIS,stop)
2	(1)
3	N10 G20
4	N15 G90 G94 G40 G17 G91.1
5	N20 G53 G0 Z0.
6	(CONTOUR1 2)
7	N25 M9
8	N30 G49

Section 2.4: Running a Program

Run the program by clicking the green “Run From” button.

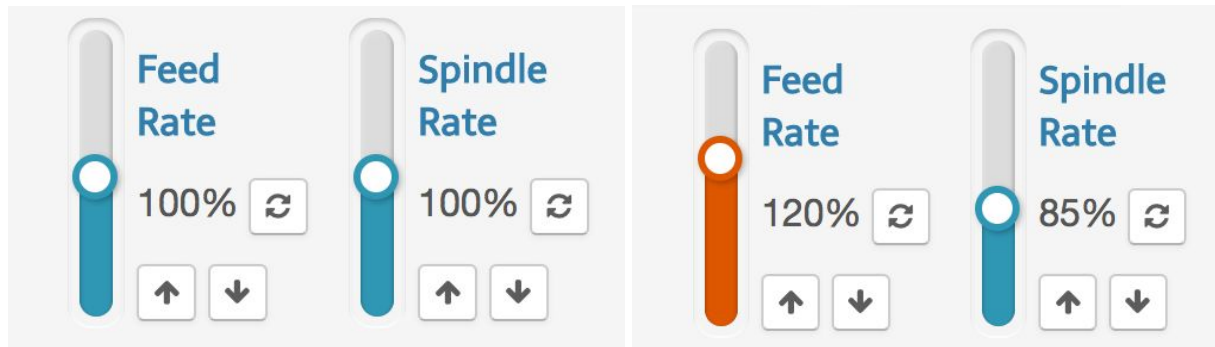


If you have a M0 or M1 command at the start of your code, the program will be paused. Click the blue "Pause/Resume" button or push the green "Pause/Go" button on the machine in order to start the program. The user may pause the program at any point by clicking the "Pause" button or pushing the green button on the machine. The user can stop the program by clicking the "Stop" button or pushing the red, emergency stop button on the machine.



Section 2.4.1: Spindle Rate and Feed Rate Control

The user can change the feedrate and spindle speed while the program is running by toggling the Spindle Rate and Feed Rate controls. The arrows adjust the speed in 5% increments. The reset button resets the value of the spindle or feed rate to 100% of the program value.



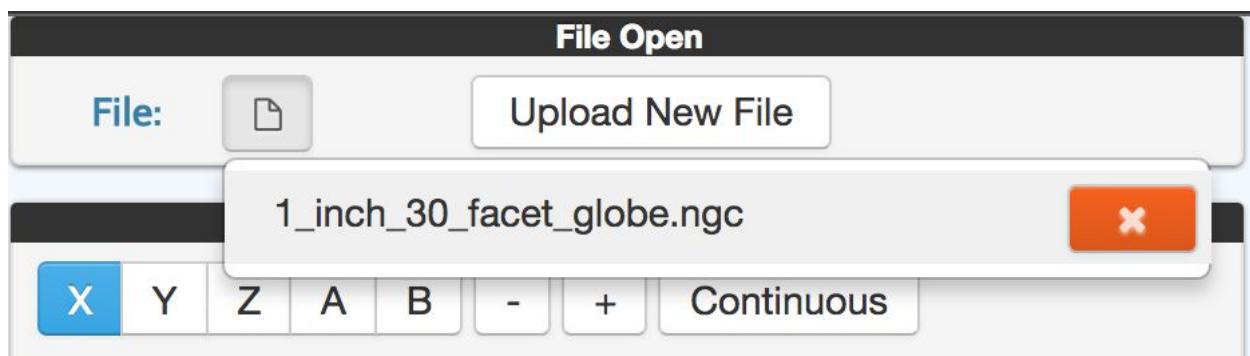
Section 2.4.2: Optional Stop

The user can choose whether or not to have the program stop for optional stops in the program by toggling the optional stop button on or off. This allows the user to include optional stops for part checks and turn them off once the program is proved.



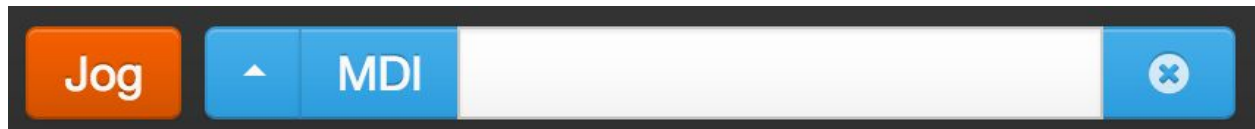
Section 2.5: Deleting a File

Click on the file button to access the files that have already been loaded. Click on the orange "X" to delete a file from the BeagleBones' memory.

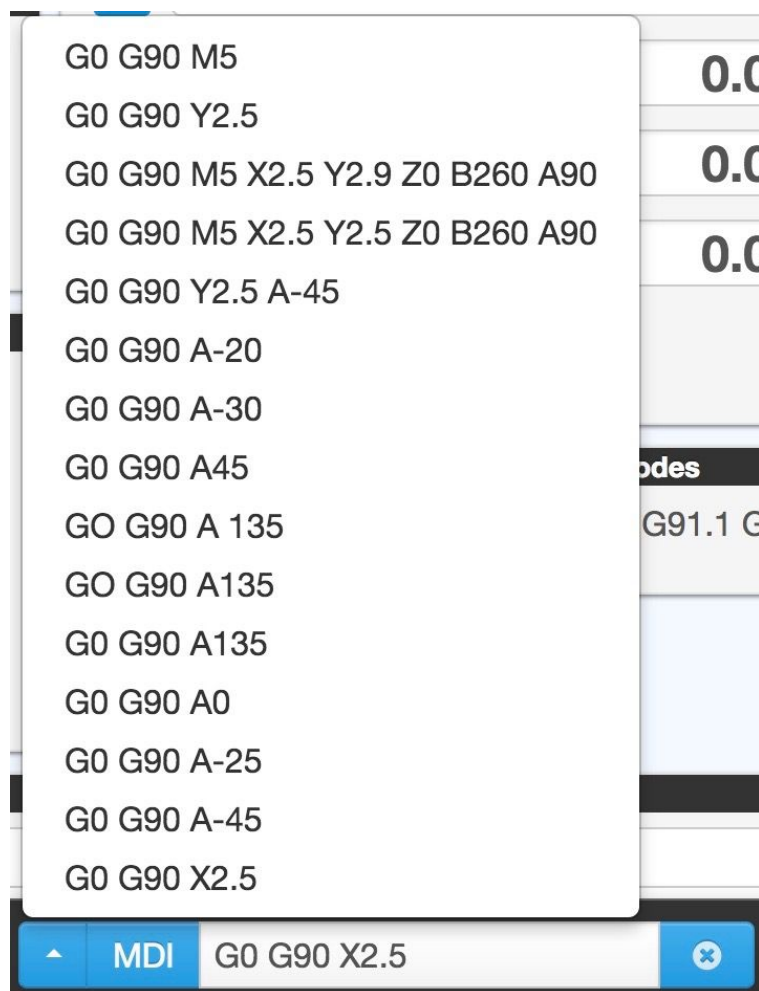


Section 2.6: MDI Interface

The MDI interface allows the user to give the Pocket NC commands directly by typing in lines of G code.



Recently used codes can be accessed by clicking on the arrow to the left of the MDI window.



Section 3: Tooling/Tool Table

The Tooling tab contains the tool table, work offset table, and a second digital readout screen.

Section 3.1: Tool Table

A screenshot of the tool table is shown below. By default, the Z Offset for all of the tools will be preset to 5.00 inches. This number will change when you measure the tool length offset for your tool. You may manually edit the “Diameter” and “Description” columns if desired.

Tool Table				
	Z Offset	Diameter	Description	
1	5.00000	0.12500		Measure Tool 1
2	5.00000	0.12500		Measure Tool 2
3	5.00000	0.12500		Measure Tool 3
4	5.00000	0.12500		Measure Tool 4
5	5.00000	0.12500		Measure Tool 5
6	5.00000	0.12500		Measure Tool 6
7	5.00000	0.12500		Measure Tool 7
8	5.00000	0.12500		Measure Tool 8
9	5.00000	0.12500		Measure Tool 9
10	5.00000	0.12500		Measure Tool 10

Section 3.1.1: Tool Measurement

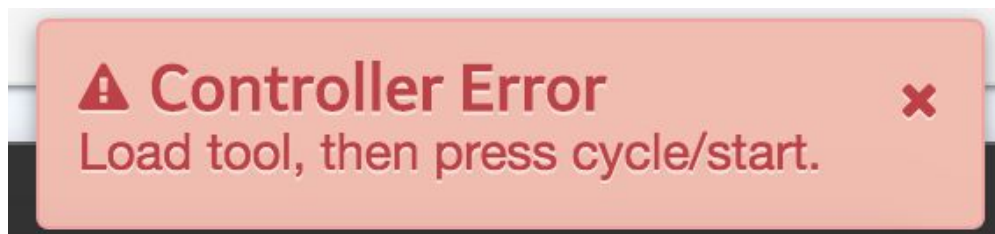
Do not run the probe cycle for any tool sticking out more than 1.5 inches from the end of the extended tool holder or for a tool larger than ¼ inch diameter. Doing so will cause a crash and may result in damage to your machine and/or a broken tool.

Install the tool that you wish to measure.

Click on the “Measure Tool xx” button for the tool for which you wish to set the tool length offset.



The following prompt will appear in the bottom right corner of the screen.



Double check that your tool is installed correctly then switch back over to the Production tab and click on the “Resume/Pause” button or click on the green button on the machine to run the probe cycle.



Section 4: Configurations

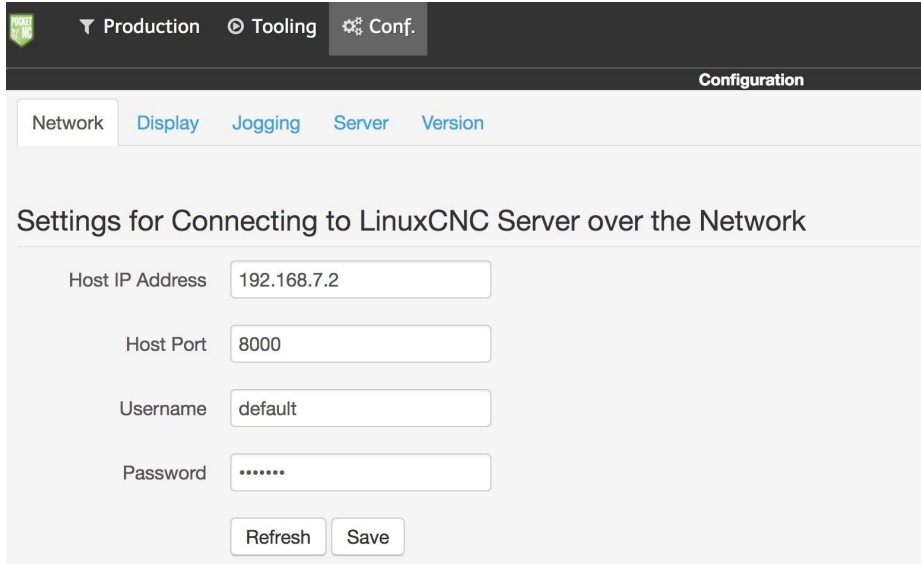
The configurations tab allows the user to make changes to the Pocket NC software settings.

Section 4.1: Network

The network settings displays the machine’s IP address, Host Port, Username and Password. The username and password are both set as “default.”

The Network tab is for configuring your Pocket NC to be on a network. By default, your Pocket NC is configured to connect to 192.168.7.2, the address that is automatically assigned when plugged in to your computer via USB. Advanced users can connect the Pocket NC to a network via ethernet. The IP address assigned to the Pocket NC can be changed in the Network tab so that it can be accessed by other computers on the network. Once on the network, there are serious safety and security considerations to account for. Setting up your machine this way is not recommended unless you fully understand the ramifications of doing so.

Note: changing the IP address in the network tab does not change the Pocket NC’s IP address, but rather indicates to the UI what address to connect to. If you’ve configured your Pocket NC to be on a network, set its IP address here.



Production Tooling **Conf.**

Configuration

Network **Display** Jogging Server Version

Settings for Connecting to LinuxCNC Server over the Network

Host IP Address

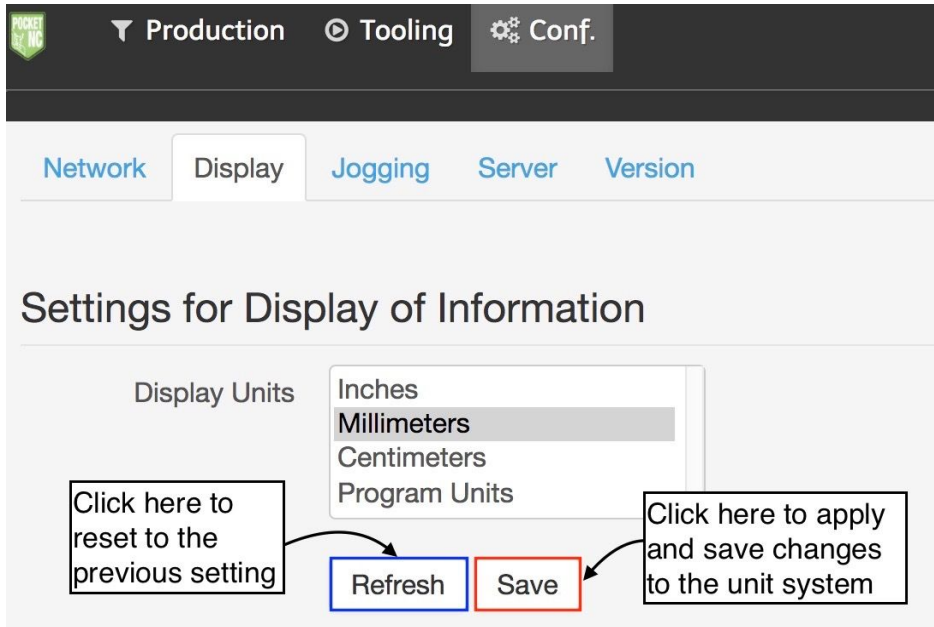
Host Port

Username

Password

Section 4.2: Display/Changing Unit System

The unit system of the interface may be changed using the “Display” tab. Select the unit system that you would like to use then click “save.” The numbers throughout the interface will update to reflect the new unit system.



Production Tooling **Conf.**

Network **Display** Jogging Server Version

Settings for Display of Information

Display Units

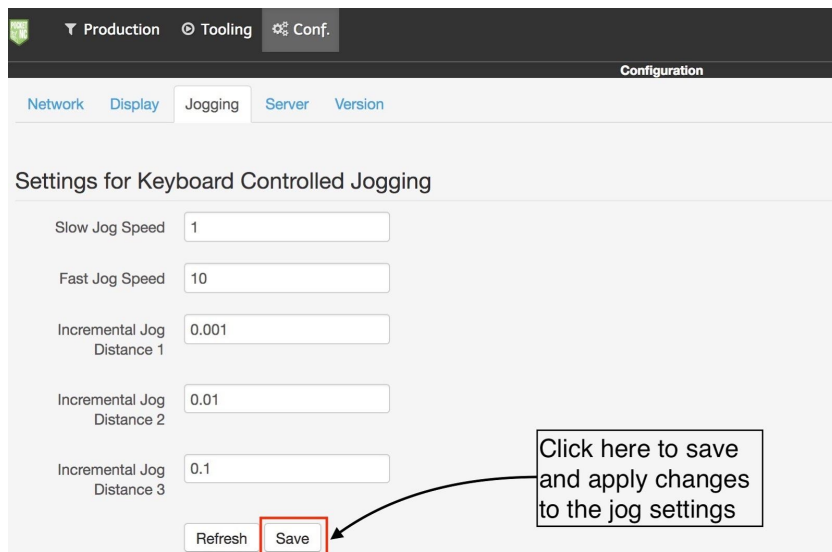
- Inches
- Millimeters**
- Centimeters
- Program Units

Click here to reset to the previous setting

Click here to apply and save changes to the unit system

Section 4.3: Jogging

The settings for the keyboard controlled jogging may be changed using this screen. Please note that these settings only apply to the keyboard controlled jogging they do not affect the jog settings for the mouse wheel jogging or the manual jog using the +/- buttons.



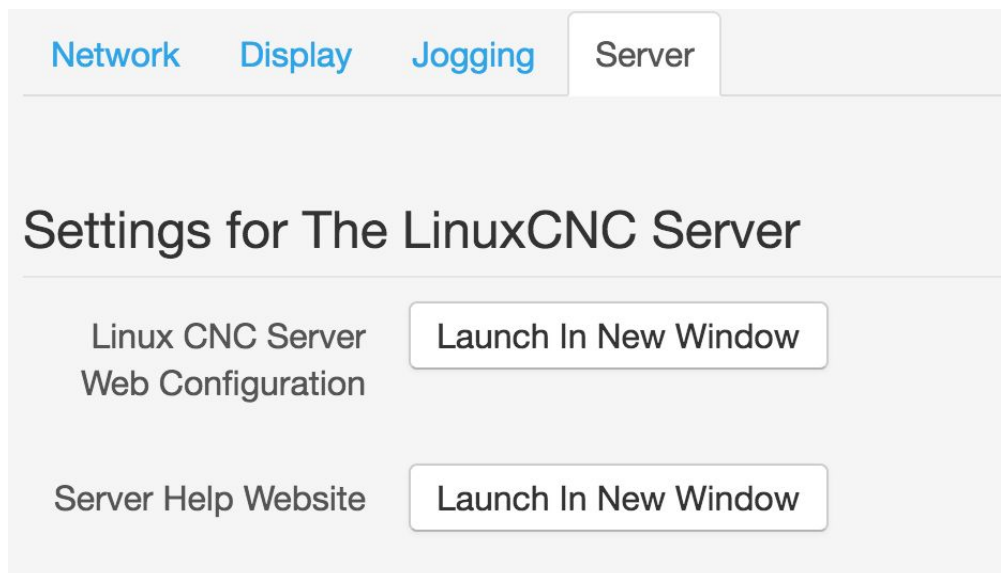
The screenshot shows the 'Configuration' page with tabs for Network, Display, Jogging, Server, and Version. The 'Jogging' tab is active, displaying 'Settings for Keyboard Controlled Jogging'. The settings include:

- Slow Jog Speed: 1
- Fast Jog Speed: 10
- Incremental Jog Distance 1: 0.001
- Incremental Jog Distance 2: 0.01
- Incremental Jog Distance 3: 0.1

At the bottom, there are 'Refresh' and 'Save' buttons. A red box highlights the 'Save' button, and an arrow points to it from a text box that says: 'Click here to save and apply changes to the jog settings'.

Section 4.4: Server

The “Server” tab contains links to the configuration and support pages for the LinuxCNC operating system running on the Pocket NC’s BeagleBone computer.



The screenshot shows the 'Server' tab selected in the configuration menu. The page title is 'Settings for The LinuxCNC Server'. It contains two rows of links and buttons:

- Linux CNC Server Web Configuration with a 'Launch In New Window' button.
- Server Help Website with a 'Launch In New Window' button.

The Linux CNC Server Web Configuration link opens a new window that displays all of the settings that the Pocket NC is using to for running its specific configuration of Linux CNC. These values are set during the manufacturing and calibration process. These are advanced settings, we recommend that only experienced users change them. Any changes made here are at your own risk and may result in adverse impacts on the Pocket NC's functionality.

① 192.168.7.2:8000



LinuxCNC Configuration Page:

This tab allows editing of the INI file which controls the high-level behavior of the linuxcnc system. This is where the machine setup is described, such as how many axes of motion will be controlled, what kind of user interface will be used, and how fast motors will turn.

A list of all available commands is available in the [linuxcnc INI Configuration Documentation](#).

INI File Sections:

Section: AXIS_0
 General parameters for the individual components in the axis control module. The axis section names begin numbering at 0, and run through the number of axes specified in the [TRAJ] AXES entry minus 1.

NAME	VALUE	COMMENT	HELP	ACTION
AXIS_1				
AXIS_2				
AXIS_3	BACKLASH	0.000		
AXIS_4				

Backlash in machine units. Backlash compensation value can be used to make up for small deficiencies in the hardware used to drive an axis. If backlash is added to an axis and you are using steppers the STEPGEN_MAXACCEL must be increased to 1.5 to 2 times the MAX_ACCELERATION for the axis.

The “Server Help Website” link opens a new window with an extensive library of support documentation for the LinuxCNC operating system that the Pocket NC mill runs.

① 192.168.7.2/external/linuxCNCDoc//linuxCNCDocumentation/www.linuxcnc.org/docs/html/index.html

This documentation refers to LinuxCNC version **2.5.2**.

- Other languages available: [Deutsch](#) [Español](#) [Français](#) [Polski](#)
- [LinuxCNC Document Overleaf](#)
- [LinuxCNC G Code Quick Reference](#)
- [LinuxCNC Wiki Community](#)
- Getting Started with LinuxCNC
 - [System Requirements](#)
 - [Getting LinuxCNC](#)
 - [Updating LinuxCNC](#)
 - [Stepper Quickstart](#)
 - [Stepper Configuration Wizard](#)
 - [Mesa Configuration Wizard](#)
 - [Running LinuxCNC](#)
 - [Stepper Diagnostics](#)
 - [Linux FAQ](#)