Mesa Configuration Tool

John Thornton

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CONTENTS:

The Mesa Configuration Tool creates LinuxCNC configuration files for 5i24, 5i25, 6i25, 7i76e, 7i80db, 7i80hd, 7i92, 7i92T, 7i93, 7i95, 7i96, 7i96S, 7i97 and 7i98.

CHAPTER

ONE

DESCRIPTION

The Mesa Configuration Tool is designed to create the configuration files needed by LinuxCNC for Mesa Electronics motion control cards.

1.1 Requirements

Debian or Debian based OS with Python 3.6 or newer.

Debian 10 (Buster) has Python3.7

1.2 Highlights

- Fully editable ini file by the user, when loaded and saved custom sections and key value pairs and comments are not lost.
- Flash Mesa cards and read the config on the card as well as other card operations
- Information about all the cards as well as the manuals for the cards, some cards have additional information.
- Add MDI commands to the ini file
- Add a Smart Serial card and configure the I/O
- Add customs HAL commands
- Change Motion, Debug, Thread Period Options
- Add a VCP Panel
- Add and configure the Classicladder PLC options
- Get Motherboard, CPU, and NIC information about the PC
- Test the Thread Period
- Check the configuration for errors at any time during the creation
- Load a configuration at startup
- Create a backup of the entire configuration directory with a date and time stamp
- Board layout image of all the daughter boards as well as the selected board
- Wiring diagram for the Smart Serial connection
- HAL funtion assistant to help create custom HAL code

CHAPTER

TWO

INSTALLING

Mesa Configuration Tool

Note: Tested on Debian 10, 11, 12, 13 and Linux Mint 20.2 but it should work on other Debian type OS's.

Note: Requires Python 3.6 or newer to work.

2.1 Install with apt

The advantage of using apt to install the Mesa Configuration Tool GUI is when a new version of MesaCT GUI is released apt will know a new version is avaliable when you run *sudo apt update*. This will allow you to install the new version of MesaCT GUI along with other Debian software.

The first command will ask for your password. Neither command will print anything in the terminal.

For a PC to create an apt sources file for MesaCT GUI copy and paste this command in a terminal

```
echo 'deb [arch=amd64] https://gnipsel.com/mesact/apt-repo stable main' | sudo tee /etc/
↪apt/sources.list.d/mesact.list
```

For a Raspberry Pi 64 bit create an apt sources file for MesaCT GUI copy and paste this command in a terminal

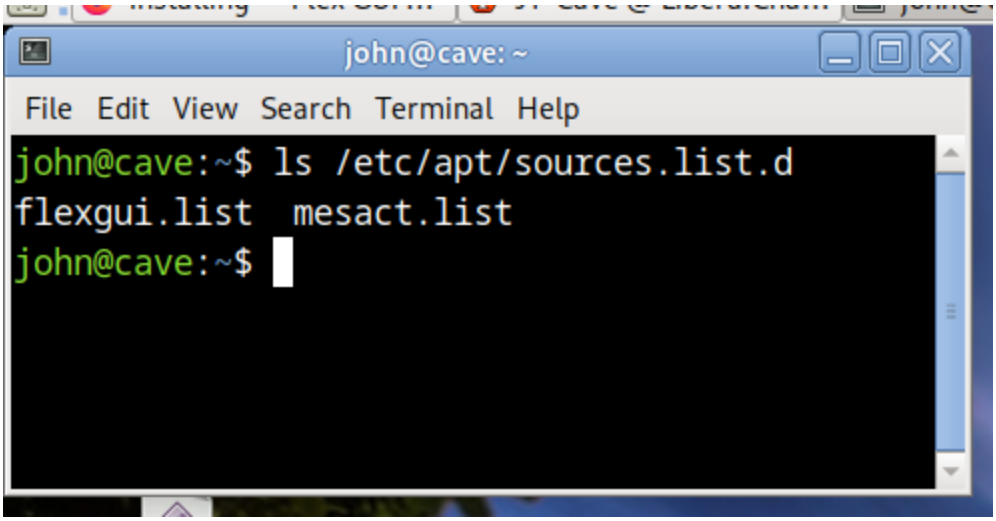
```
echo 'deb [arch=arm64] https://gnipsel.com/mesact/apt-repo stable main' | sudo tee /etc/
↪apt/sources.list.d/mesact.list
```

For a Raspberry Pi 32 bit create an apt sources file for MesaCT GUI copy and paste this command in a terminal

```
echo 'deb [arch=armhf] https://gnipsel.com/mesact/apt-repo stable main' | sudo tee /etc/
↪apt/sources.list.d/mesact.list
```

To check the above command worked you can list the file with this command

```
ls /etc/apt/sources.list.d
```



Next get the public key for MesaCT GUI and copy it to trusted.gpg.d

```
sudo curl --silent --show-error https://gnipsel.com/mesact/apt-repo/pgp-key.public -o /
↪etc/apt/trusted.gpg.d/mesact.asc
```

If curl is not installed you can install it with the following command

```
sudo apt install curl
```

Next update apt

```
sudo apt update
```

If you have MesaCT GUI installed you can see what packages can be upgraded with the following command

```
apt list --upgradable
```

If MesaCT GUI is not installed you can install it with the following command

```
sudo apt install mesact
```

2.2 Manual Install

If you don't have an internet connection you can install the Mesa Configuration Tool using the deb file. Download and copy the .deb file to your computer.

Latest Version of the Mesa Configuration Tool is in the Releases

Select the one that suits your OS and download.

Open the File Manager and right click on the file and open with Gdebi then install.

Warning: The graphical Gdebi does not work on the LinuxCNC chosen desktop so you have to use the terminal to install a deb file.

If you don't have Gdebi installed you can install it from a terminal

```
sudo apt install gdebi
```

If the graphical version of gdebi has problems you can run it from a terminal in the directory where you downloaded the deb with n.n.n replaced by the version your installing.

```
sudo gdebi mesact_n.n.n_amd64.deb
```

If you don't have LinuxCNC installed then the mesact Configuration tool will show up in the Applications > Other menu otherwise it will be in the CNC menu.

If you have problems try running from a terminal with:

```
mesact
```

To flash firmware to the mesact you need to install mesaflash from the LinuxCNC repository.

To uninstall the mesact Configuration Tool right click on the .deb file and open with Gdebi and select *Remove Package*.

To check for newer versions Help > Check for Updates

To upgrade the mesact Configuration Tool delete the .deb file and download a fresh copy then right click on the .deb file and open with Gdebi and select *Reinstall Package*

CHAPTER

THREE

BASIC USAGE

You can left click Check Config at any time to see if there are any errors.

Build Config will check for errors before build the configuration files.

3.1 Machine Tab

1. Enter a Configuration Name
2. Select Linear Units
3. Select Max Linear Velocity
4. Select the Mesa Board
5. Ethernet Boards you must select the IP Address 10.10.10.10 is recommened.
6. Boards like 5i25/6i25, 7i80, 7i92, 7i93, 7i98 to enable the Axes Tab and the I/O Tab you need to select a firmware then select a daughter card.

3.2 Display Tab

1. Select a GUI
2. Select Position Offset
3. Select Position Feedback

3.3 Axes Tab

1. Select Axis
2. Enter Scale, Minimum Limit, Maximum Limit, Maximum Velocity, Maximum Acceleration
3. PID Settings select Default Values
4. Following Error select Default Values
5. For a Step and Direction select your drive or manually enter the Step Time, Step Space, Direction Setup, Direction Hold times
6. For a Servo System select Default Values in Analog Output and enter the Encoder Scale
7. Left Click Check Config to see if there are any errors

3.4 I/O Tab

The selected board will configure the Inputs and Outputs avaliable and if input debounce is avaliable.

#. Click Select for the I/O you want to use and select what you want it to be used as.

3.5 Spindle Tab

Used to configure an Analog PWM or Stepgen Spindle. For Digital Run, CW and CCW type spindles use outputs.

3.6 SS Cards Tab

If you have a Smart Serial Card attached you can configure it here.

#. Select the Smart Serial Card and the page changes to that card where you can make selections for that card

3.7 GPIO Tab

Under Construction ATM, going to be where you could use the GPIO of a pin directly. For example if you have an unused GPIO you could make it either and input or output and use it.

3.8 Tool Changer Tab

Yet to come

3.9 Options Tab

Here you can select various options for your configuration and whether to check for Mesaflash at startup or not.

3.10 PLC Tab

If your going to be using the Classicladder PLC you can set number of items created for each type of bit.

3.11 Pins Tab

Displays the Terminal Block and pins for the selected card.

On most cards the Raw Output clicking Get Card Pinout will get a list of pins.

3.12 PC Tab

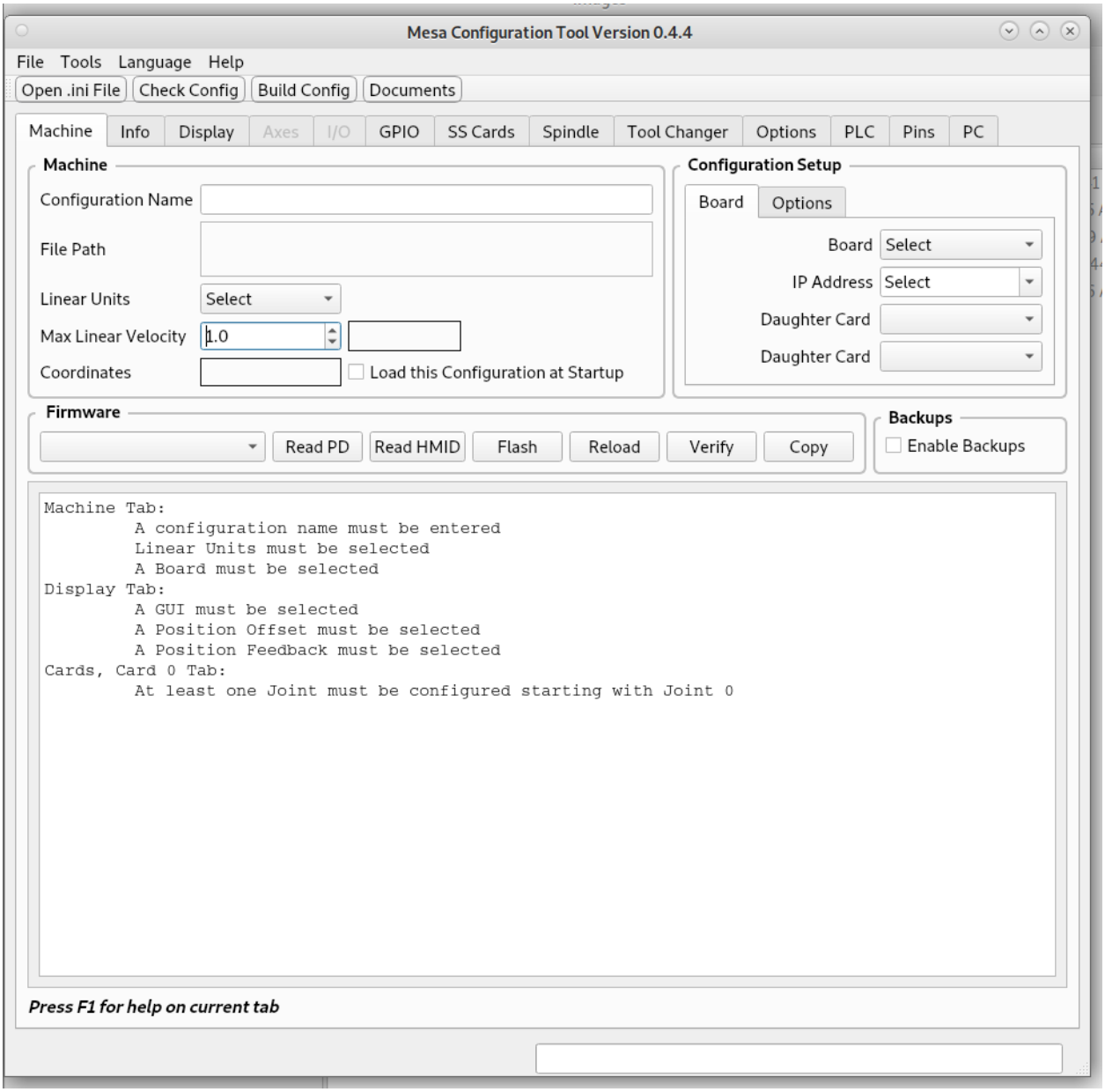
You can get information about the PC CPU and NIC on the PC Info Tab.

If your using a Mesa Ethernet card you can test your NIC speed and get the Packet Time and compare that to Threshold to see if your NIC and CPU are fast enough at the current Servo Period.

CHAPTER

FOUR

MACHINE TAB



4.1 Menu

4.1.1 File

- *Open .ini File* - Opens a file selector so you can pick an ini file to load, same as the Tool Bar button

4.1.2 Tools

- *Check Config* - Checks the Configuration for errors
- *Build Config* - Builds the Congiguration after checking for errors

4.1.3 Language

Select the language to use, currently German is mostly translated.

4.1.4 Help

- *Tab Help* - Displays help information for the current tab, same as F1

4.2 Tool Bar

- *Open .ini File* - Opens a file selector so you can pick an ini file to load
- *Check Config* - Checks the Configuration for errors
- *Build Config* - Builds the Congiguration after checking for errors
- *Documents* - Opens the PDF Documents

4.3 Machine Group

- *Configuration Name* - Any letter or number or underscore. Spaces are replaced by an underscore.
- *File Path* - Displays the full path to the configuration.
- *Linear Units* - Select base units for the configuration.
- *Max Linear Velocity* - Set the Maximum Linear Velocity for all axes combined in Linear Units per second.
- *Coordinates* - Displays the current configuration Coordinates by Axis

4.4 Configuration Setup

- *Board Tab*
- *Board* - Select the main board being used.
- *IP Address* - If the main board is an Ethernet Board select the IP address of the board.
- *Daughter Card* - After selecting the firmware you can select a daugher card for which header you're using. The header numbers are added to the Daughter Card when a board is selected. At this time only one daughter card is supported.
- *Options Tab*

After selecting a *Firmware* the Options are populated. Select a lower amount to free up GPIO on some boards.

- *Step Generators*
- *PWM Generators*
- *Encoders*

4.5 Firmware

After selecting a board the Firmware combobox is populated with firmware for that board after you download the firmware. If you don't have an internet connection on the PC you can download the firmware files from here and copy the directory to your .local/lib/libmesact/boardname.

- *Read PD* - Read Pin Descriptions, gives more information than Read HMID
- *Read HMID* - Shows General Configuration Information
- *Flash* - After selecting a firmware this will flash the board
- *Reload* - After flashing firmware this will reload the new firmware
- *Verify* - After the board boots up this will verify the selected firmware
- *Copy* - Copies the contents of display window to the clipboard

4.6 Backups

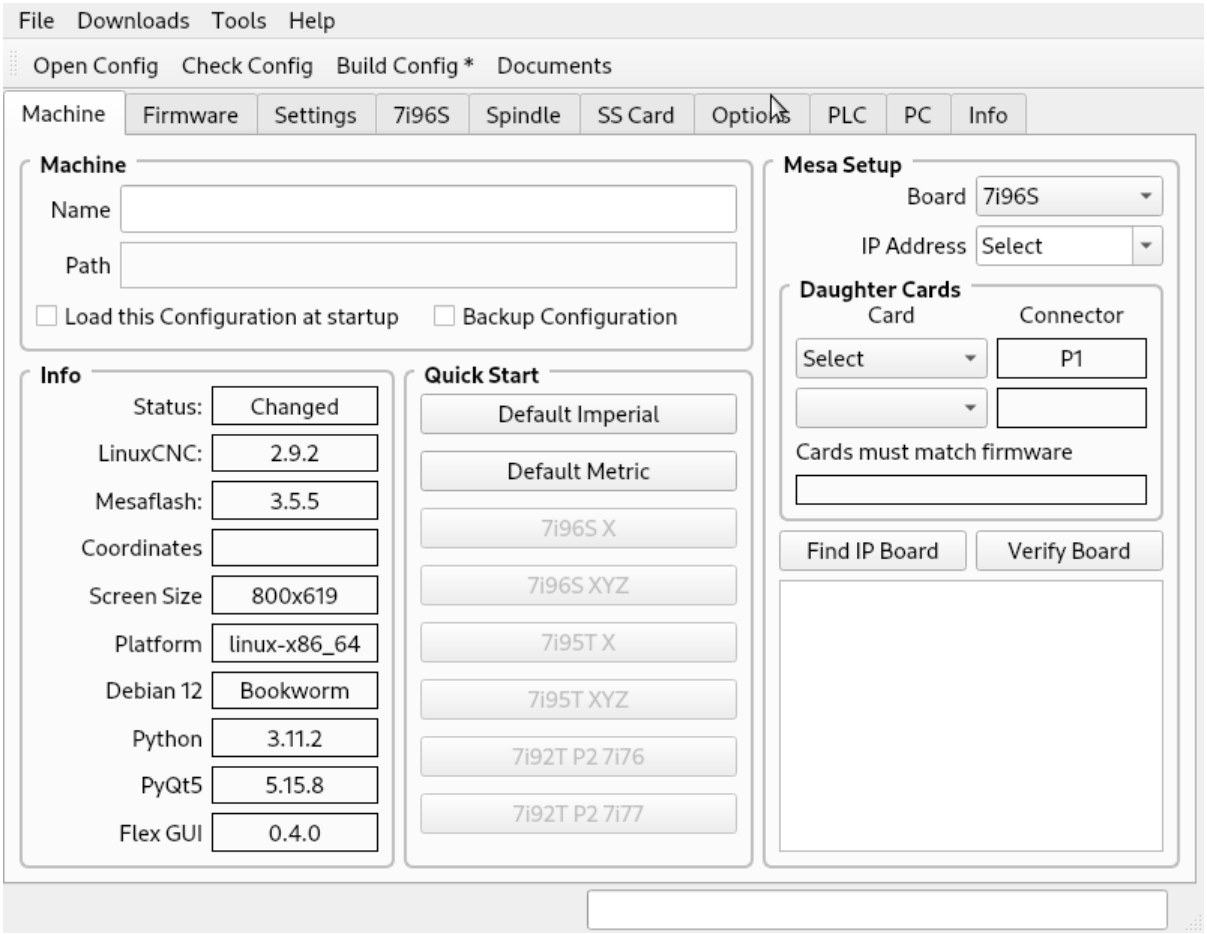
- *Enable Backups* - When this is checked a backup copy is saved to a .zip file in the backups directory before building a new configuration. The backup file is named with the date and time of the save.

CHAPTER

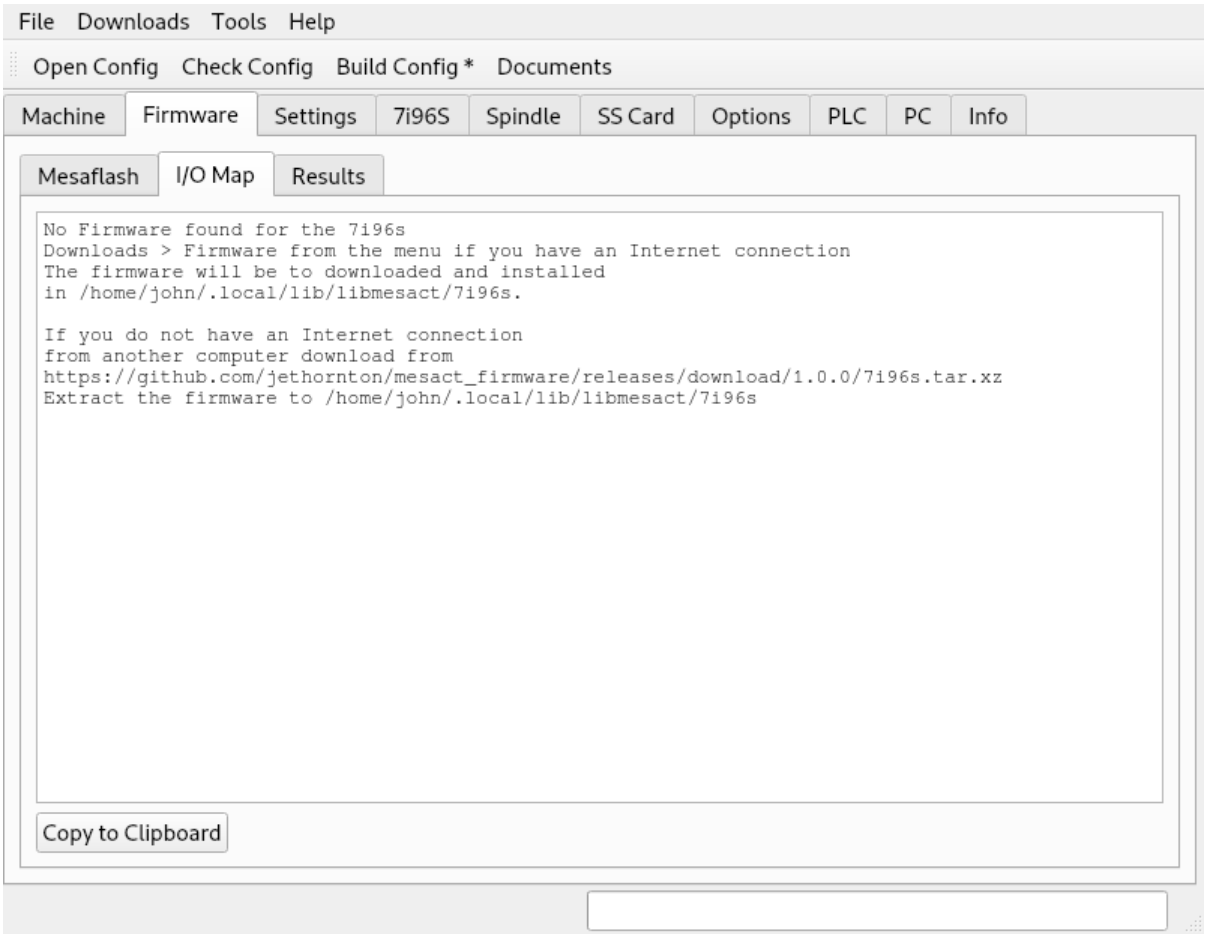
FIVE

FIRMWARE

Flashing firmware to a Mesa board is done by first selecting a board from the Machine tab in the Mesa Setup group box.

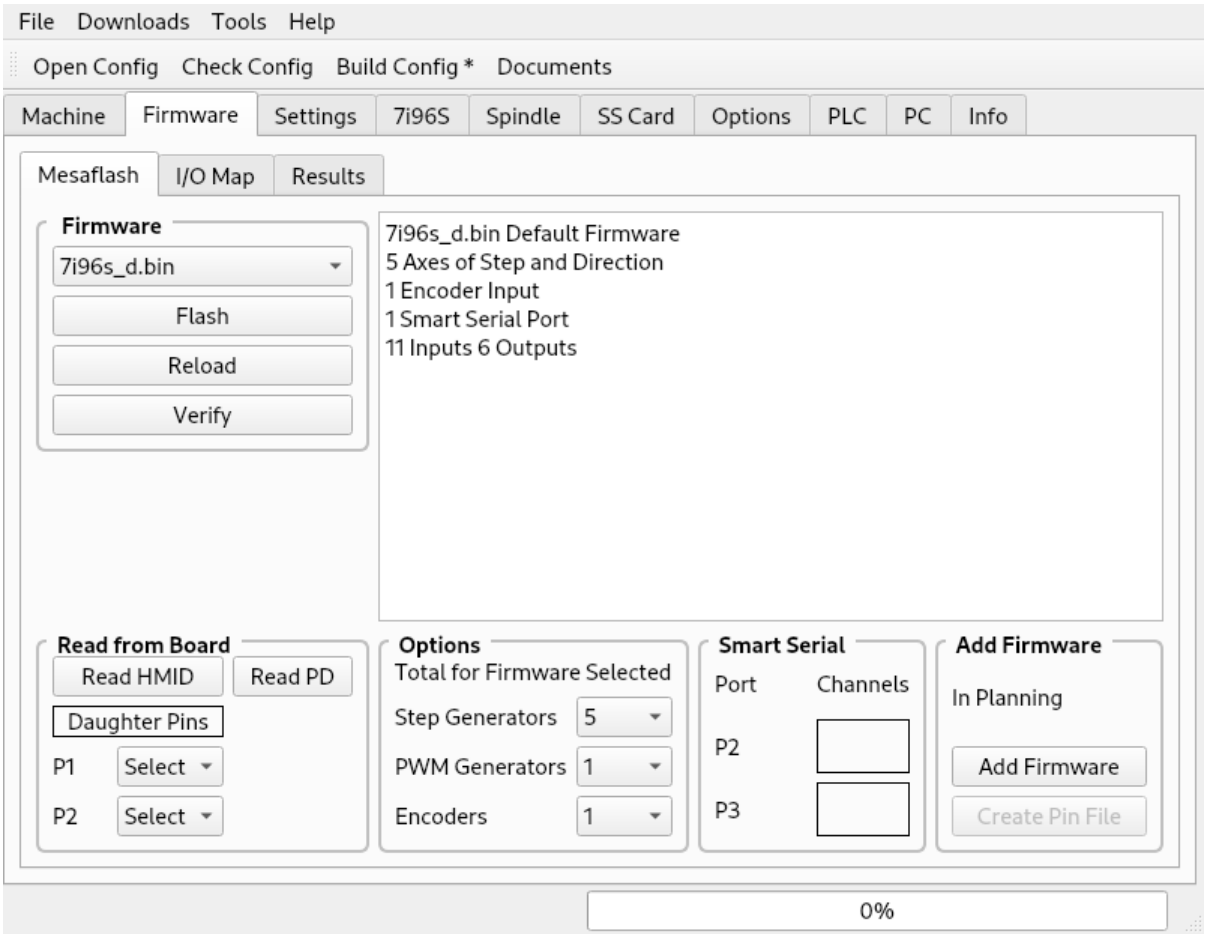


If you have not downloaded the firmware for that board instructions are shown on the I/O Map tab



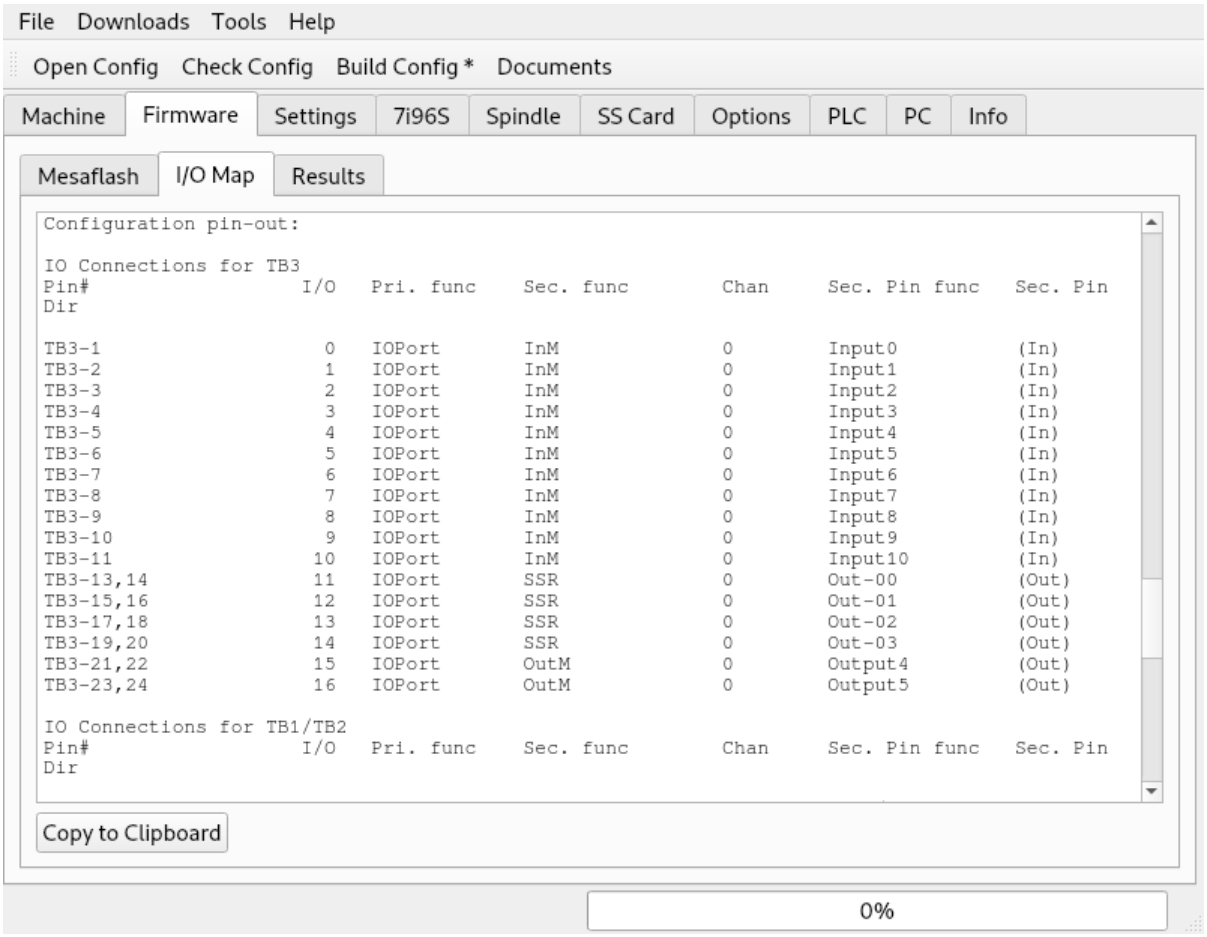
If you have internet connected to the PC select Downloads > Firmware after selecting a Mesa board in the Mesa Setup group box.

Now you can select the firmware you want to flash into the Mesa board from the Mesaflash tab.



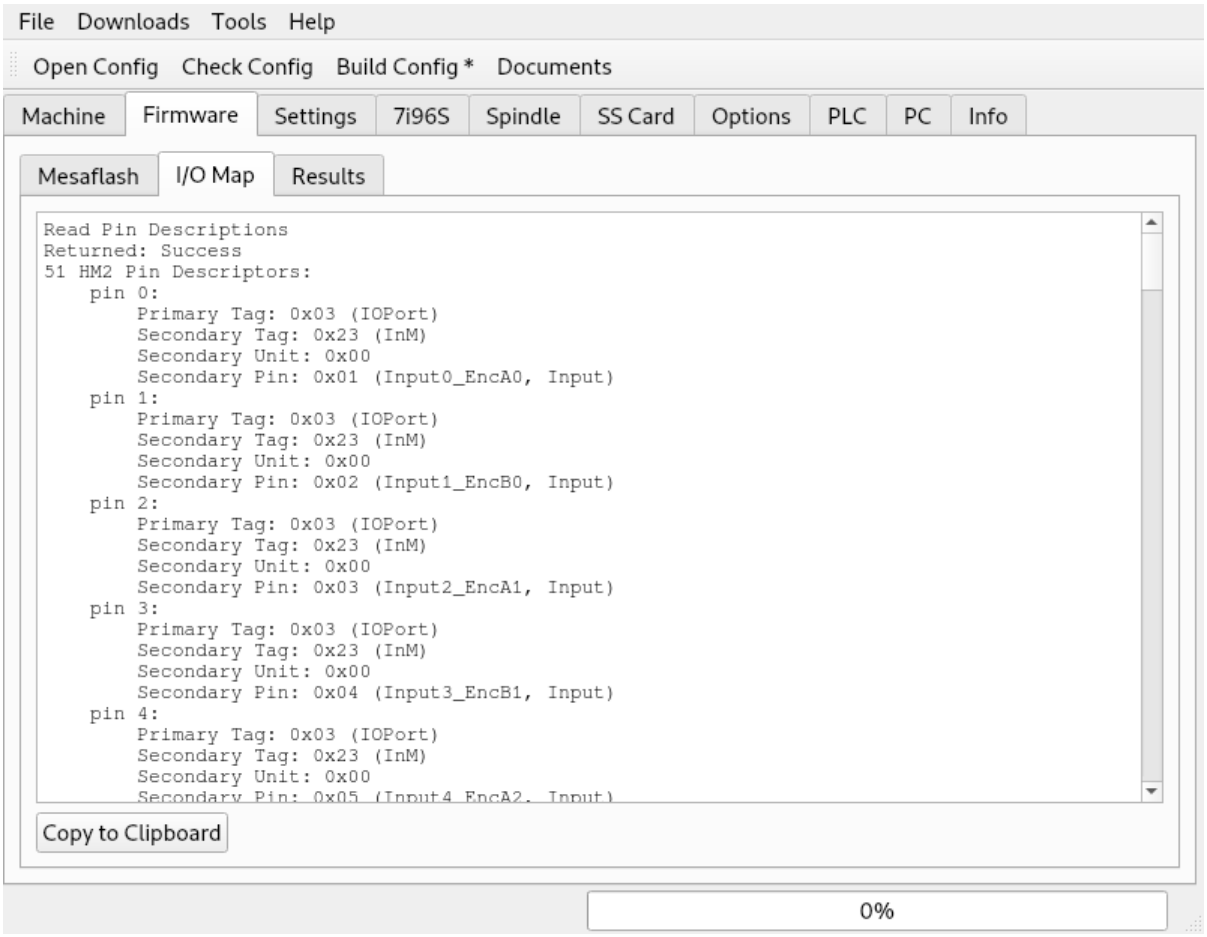
You can now Verify that the selected firmware is already flashed to the board or Flash then Reload then Verify the firmware.

After selecting a firmware you can view the I/O Map of that firmware.



The Read HMID will read the I/O map from the board if it is conneced.

The Read PD will display the I/O map in a pin description style.

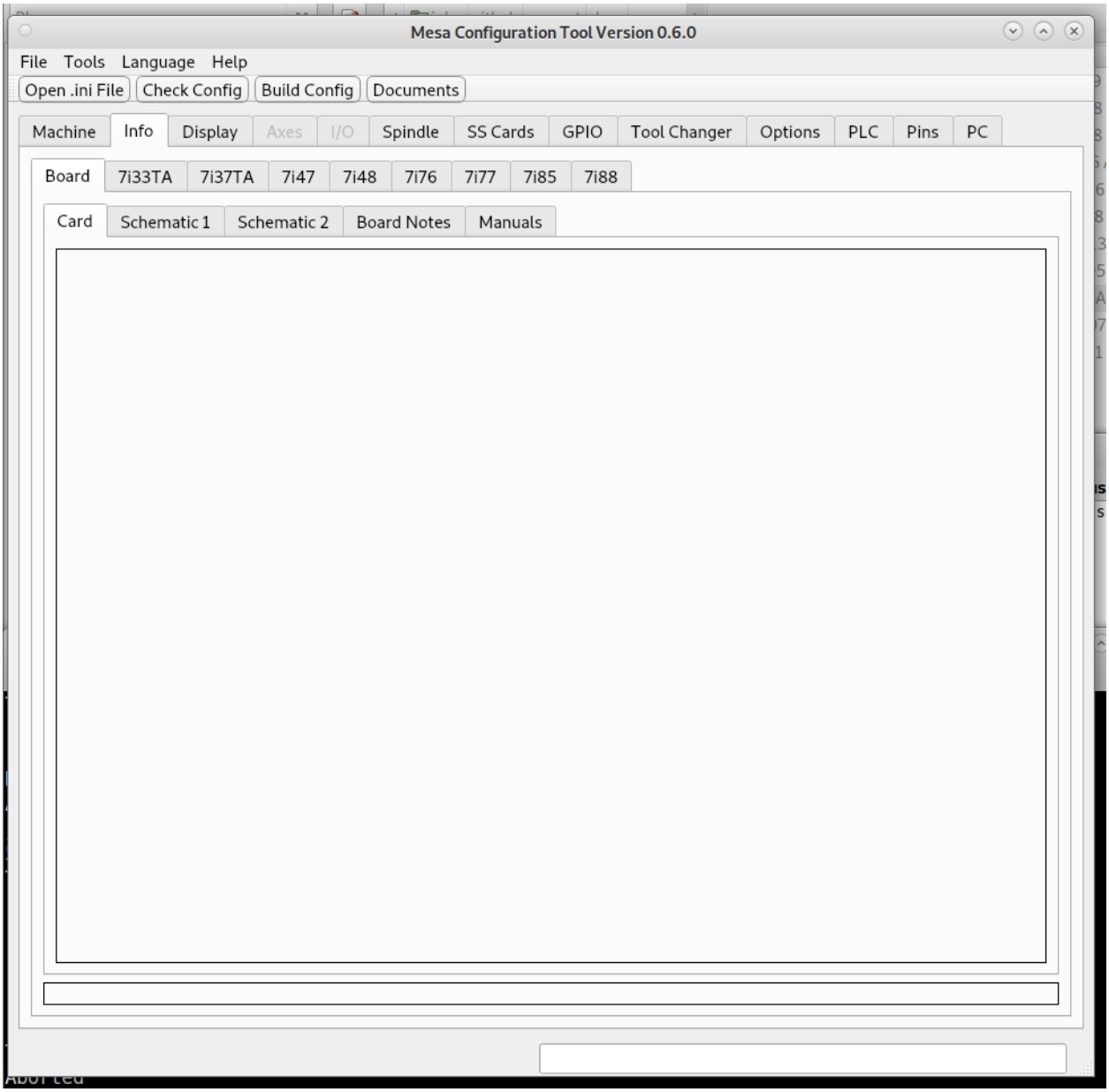


The Options, Smart Serial and Add Firmware are for future use and not used now.

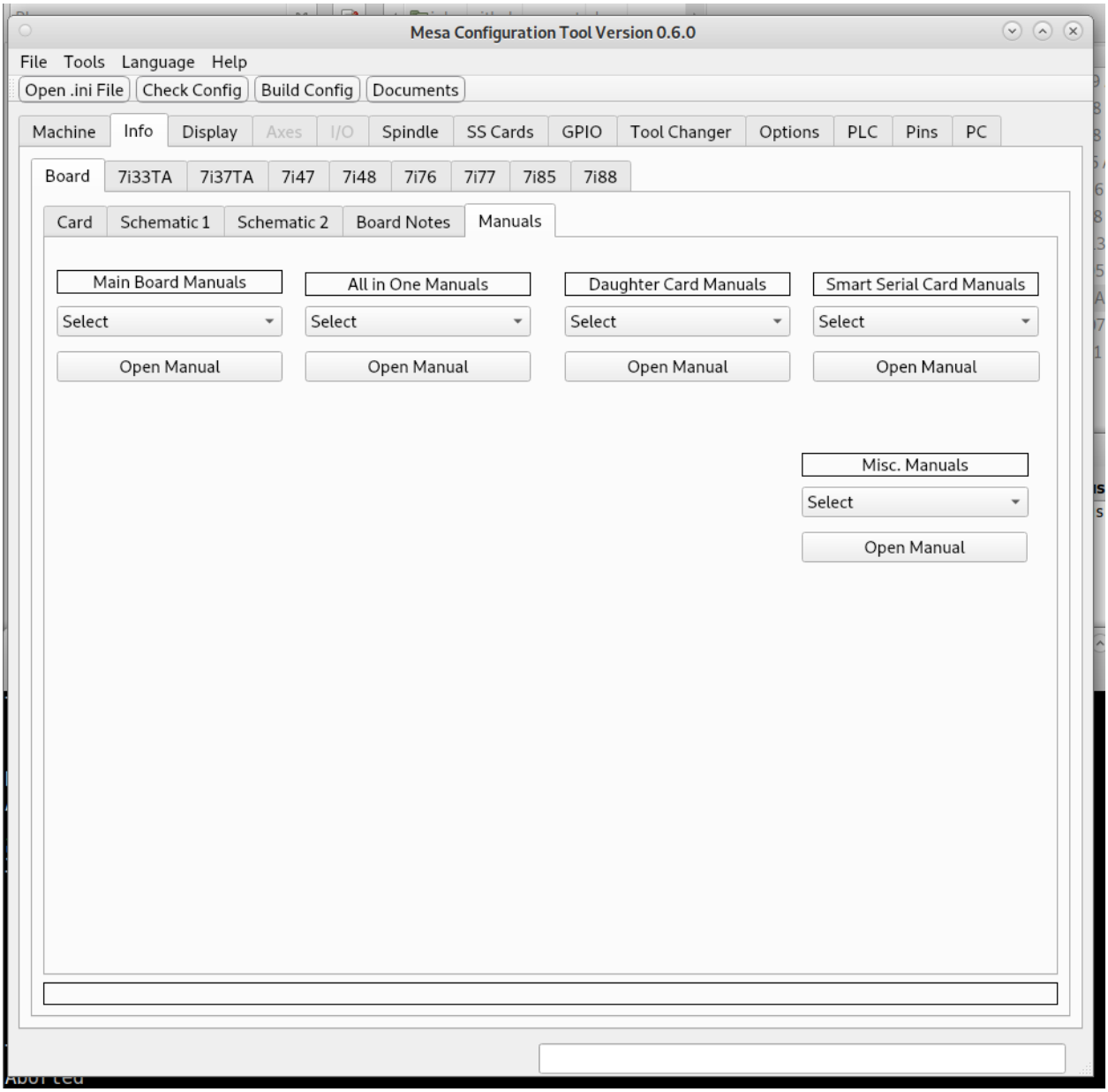
CHAPTER

SIX

INFO TAB



The Info Tab will have a diagram of the current board selected and may have connection schematics and board notes. Also there are diagrams of most daughter cards.

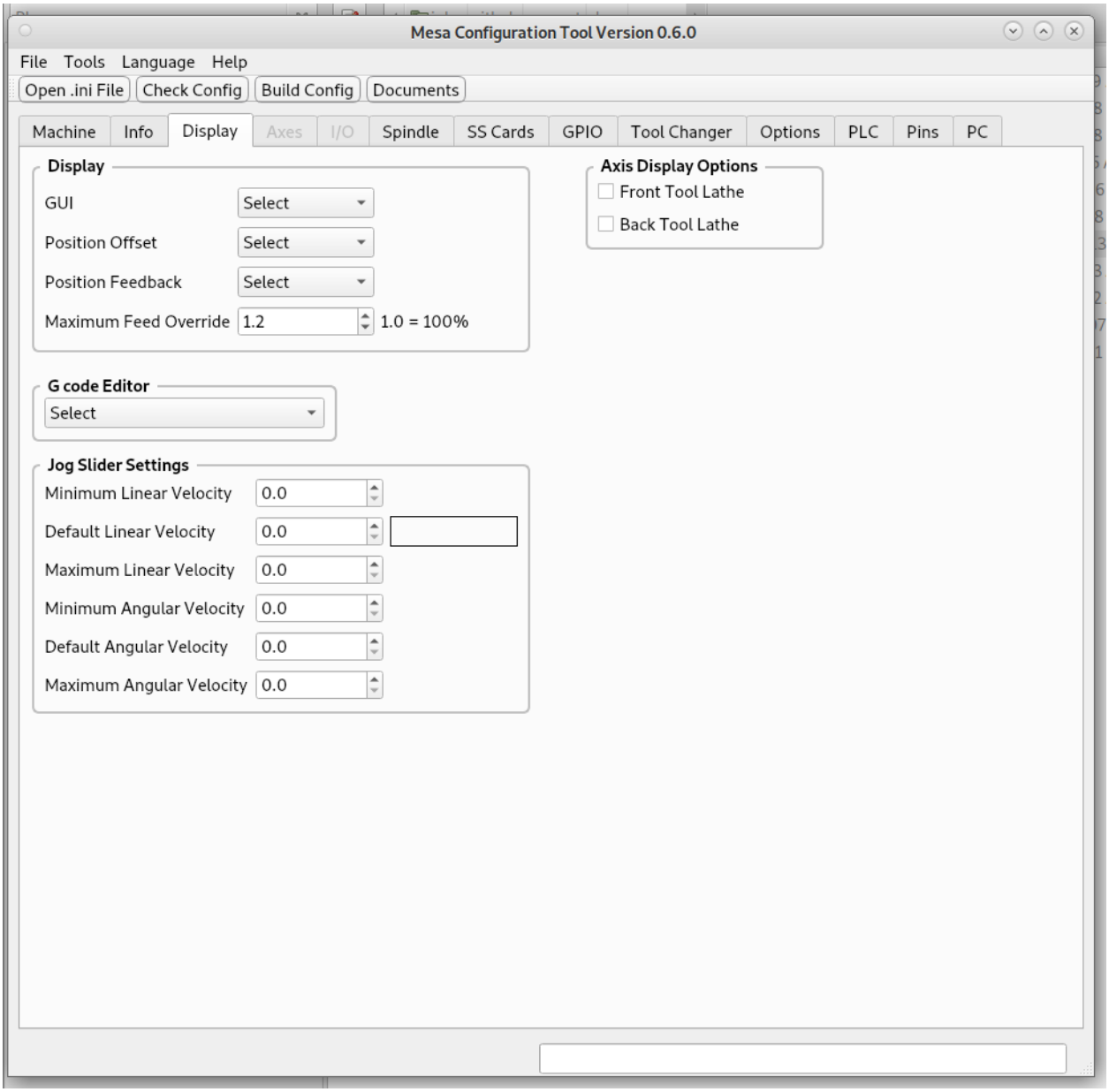


Mesa PDF manuals can be opened on the Manuals tab

CHAPTER

SEVEN

DISPLAY TAB



7.1 Display Group

- *GUI* - Select the GUI you want to use
- *Position Offset* - Typically Relative is selected which includes any offsets
- *Position Feedback* - Typically Commanded is selected, a servo system when Actual is selected may bounce around and make the feedback change a lot.
- *Maximum Feed Override* - Typically 1.2 is used

7.2 G code Editor Group

- *G code Editor* - Select from the installed editors

7.3 Jog Slider Settings

- *Minimum Linear Velocity* - The approximate lowest value the jog slider
- *Default Linear Velocity* - The default velocity for linear jogs, in , machine units per second
- *Maximum Linear Velocity* - The maximum velocity for linear jogs, in machine units per second
- *Minimum Angular Velocity* - The approximate lowest value the angular jog slider
- *Default Angular Velocity* - The default velocity for angular jogs, in machine units per second
- *Maximum Angular Velocity* - The maximum velocity for angular jogs, in machine units per second

7.4 Axis Display Options

- *Front Tool Lathe* - Normally a lathe is Front Tool that is when the tool holder is on the users side of the spindle
- *Back Tool Lathe* - A Back Tool Lathe the tool holder is on the opposite side of the spindle from the user side.

CHAPTER

EIGHT

AXES TAB

8.1 Axis Group

1. Select the type of Axis
2. Enter the Scale which is the number of pulses to move one user unit. (user unit is either inch or mm)
3. Enter the Minimum Limit for the Axis (usually 0 for X or Y and the amount of travel for the Z axis as a negative number
4. Enter the Maximum Limit for the Axis (usually max travel for X or Y and 0 for Z)
5. Enter the Maximum Velocity in user units per second
6. Enter the Maximum Acceleration in user units per second per second
7. If the direction is backwards after testing check Reverse Direction

8.2 PID Settings Group

- Usually the Default Values are correct
- If you change the Tread Period in the Options tab generate the PID settings again.

The physical meaning of P=1/servo_period (1000 for a 1 ms servo period) is that any position errors are corrected before the next servo thread invocation.

Anything greater than P=1/Servo_period means you will over-correct.

Anything less than P=1/Servo_period means you will under-correct.

Anything greater than P=2/Servo_period means you will have oscillations.

If you are using PID feedback for a stepgen P=1/Servo_period is pretty much necessary. PID is still used with stepgens without encoders as it has advantages over the built-in position mode

In addition you can use a bit of FF2 (FF2= seconds between position read and new velocity write) usually about 0.0001 for Ethernet cards

8.3 Following Error Group

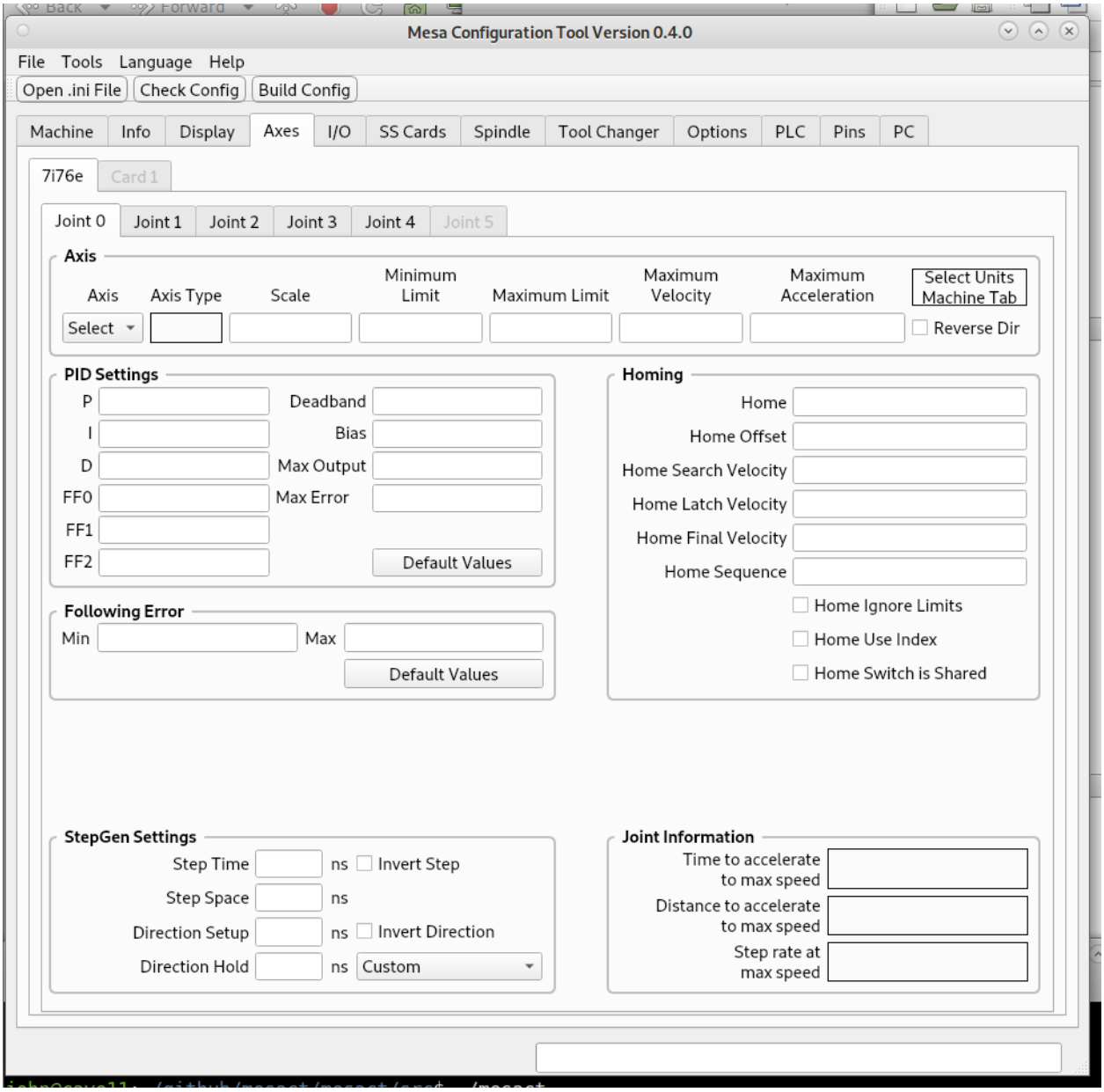
1. Usually the Default Values are correct

8.4 Homing Group

All entries are optional with the exception of a gantry configuration with two or more axes with the same Axis Letter. In this case you must enter the Home Sequence for all Joints used by the gantry.

1. Home is usually 0
2. Home Offset can be used to move the joint off of a home switch
3. Home Search Velocity is the “fast” speed to find the home switch
4. Home Latch Velocity is the “slow” speed to get an accurate location of the home switch
5. Home Final Velocity is the speed that joint moves to home positon, if left blank the a rapid move is used
6. Home Sequence defines the order that the axes home, it must start 1 or 0 and is negative in the case of a gantry

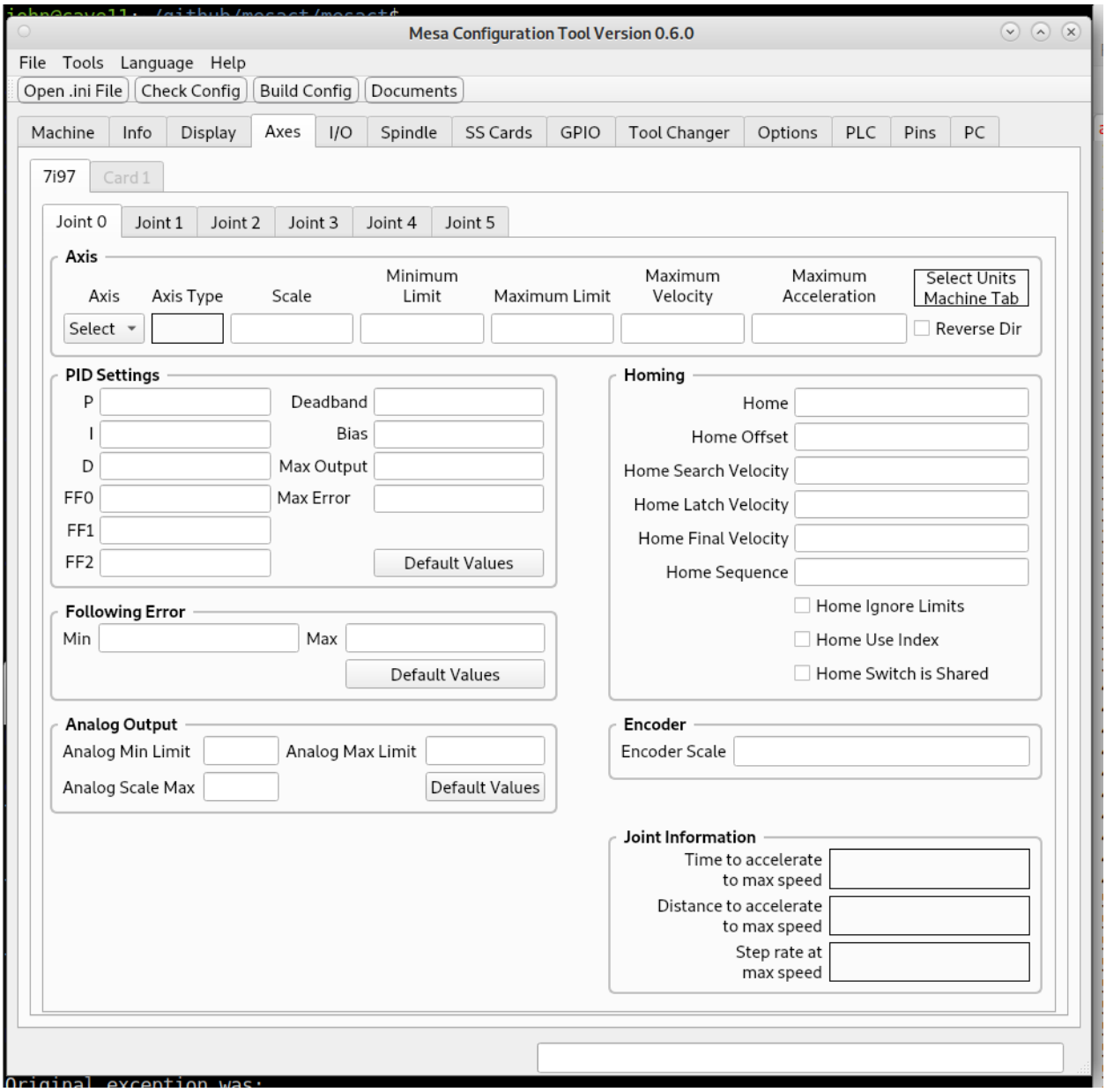
Step and Direction Drives



8.5 StepGen Settings Group

Either enter in the values for your drive or select your drive from the combo box. The Custom can be changed for your drive name if desired.

Analog Drives



8.6 Analog Output Group

Usually the Default Values are correct

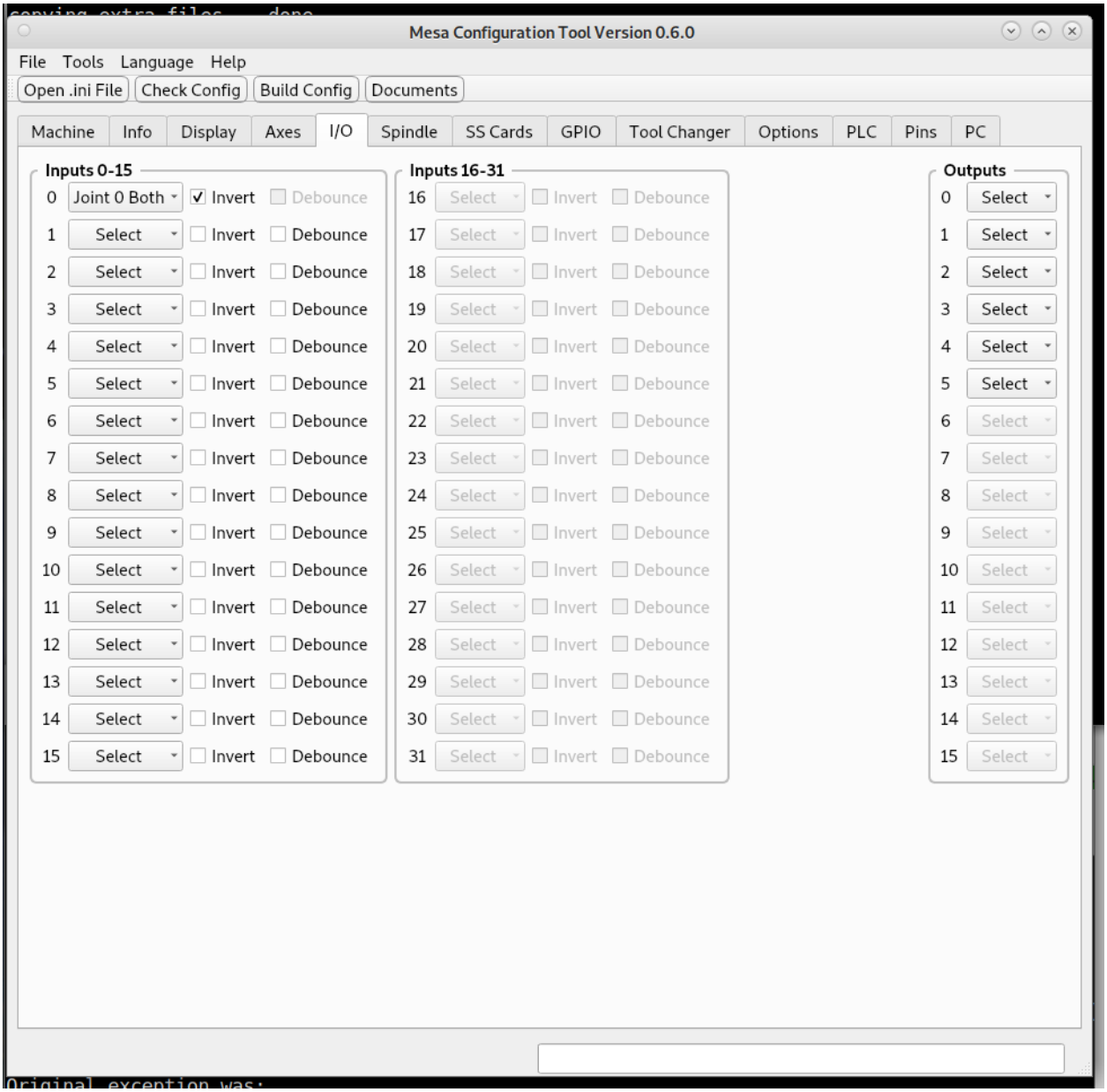
8.7 Encoder Group

Enter the scale for your encoder for one user unit

CHAPTER

NINE

I/O TAB



9.1 Inputs

Select the input function from the combo box. To deselect pick Select from Not Used.

If you need to invert the sense of the input check Invert.

Some cards have a built in debounce function. If you check Debounce then Invert is not avaliable and the same goes if you check Invert then Debounce is not avaliable.

Inputs are enabled based on the board in the case of an all in one board or the daughter card.

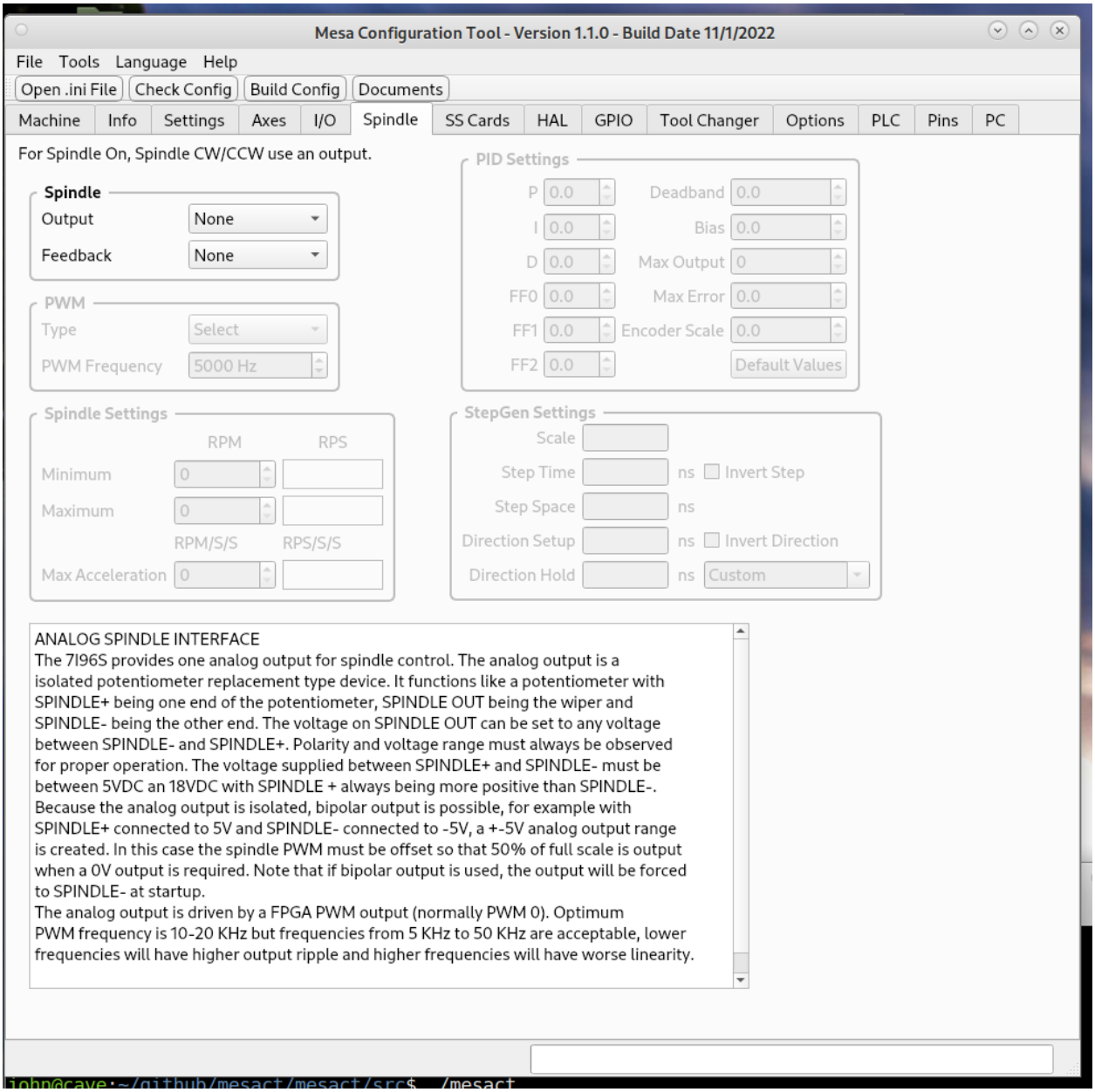
9.2 Outputs

Select the output function from the combo box. To deselect pick Select from Not Used.

CHAPTER

TEN

SPINDLE



On the Spindle Tab you can create Analog, Digital or Stepgen spindle.

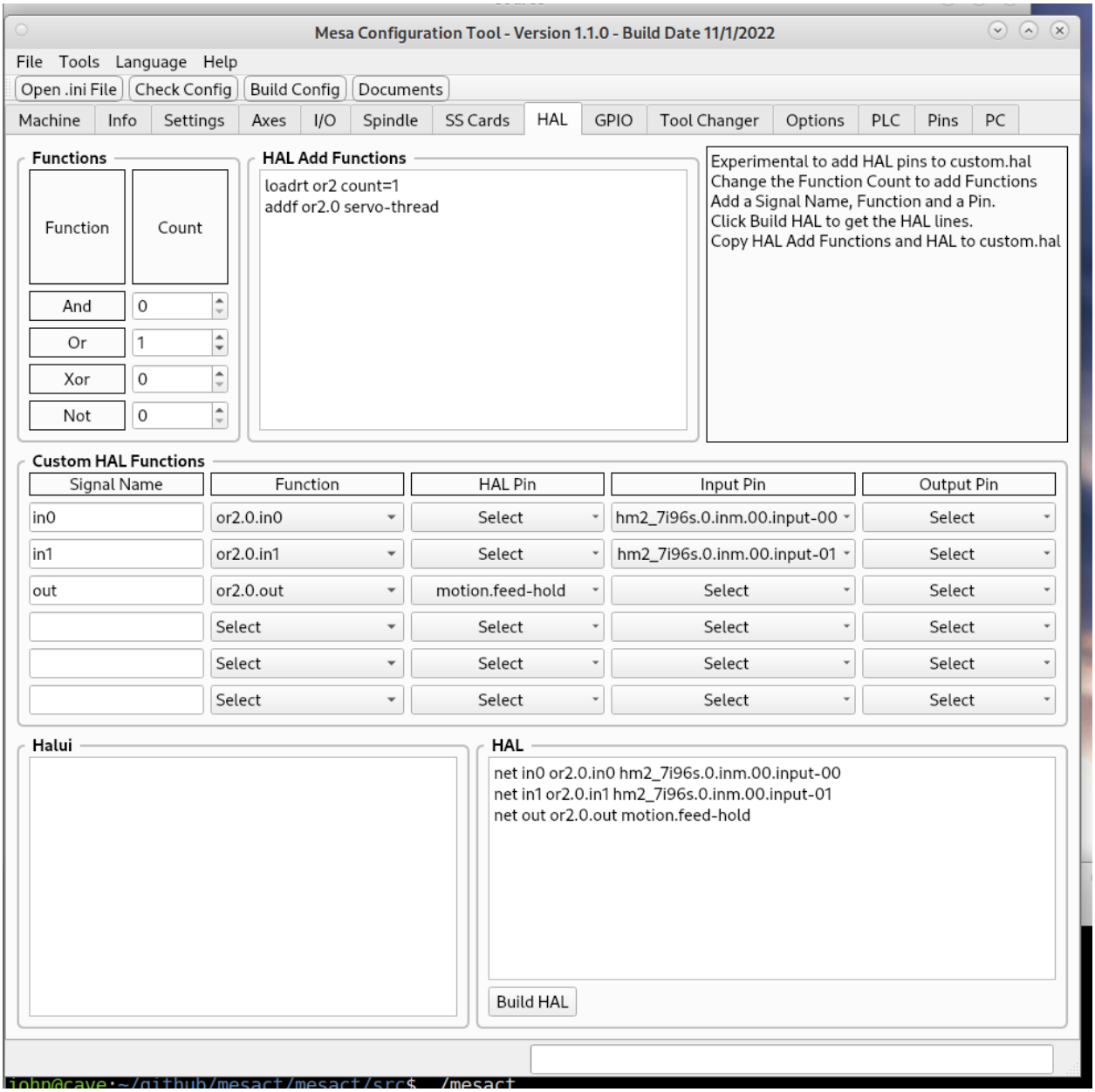
For a Digital Spindle select the outputs to be used on the I/O tab or on the SS Cards tab.

Notes about the card if any are shown in the lower window.

CHAPTER

ELEVEN

HAL



Build custom HAL commands and copy and paste them into your custom.hal file.

1. Change the count of a function to greater than 0 and in the HAL Add Functions window the commands to add the function and add function to the servo-thread are shown.
2. Create a signal name, pick the function and select a pin.
3. Click on Build HAL to get the code to copy and past to your custom.hal file after the HAL Add Functions code.

Note: This section does not check for duplicate functions that may be in another hal file.