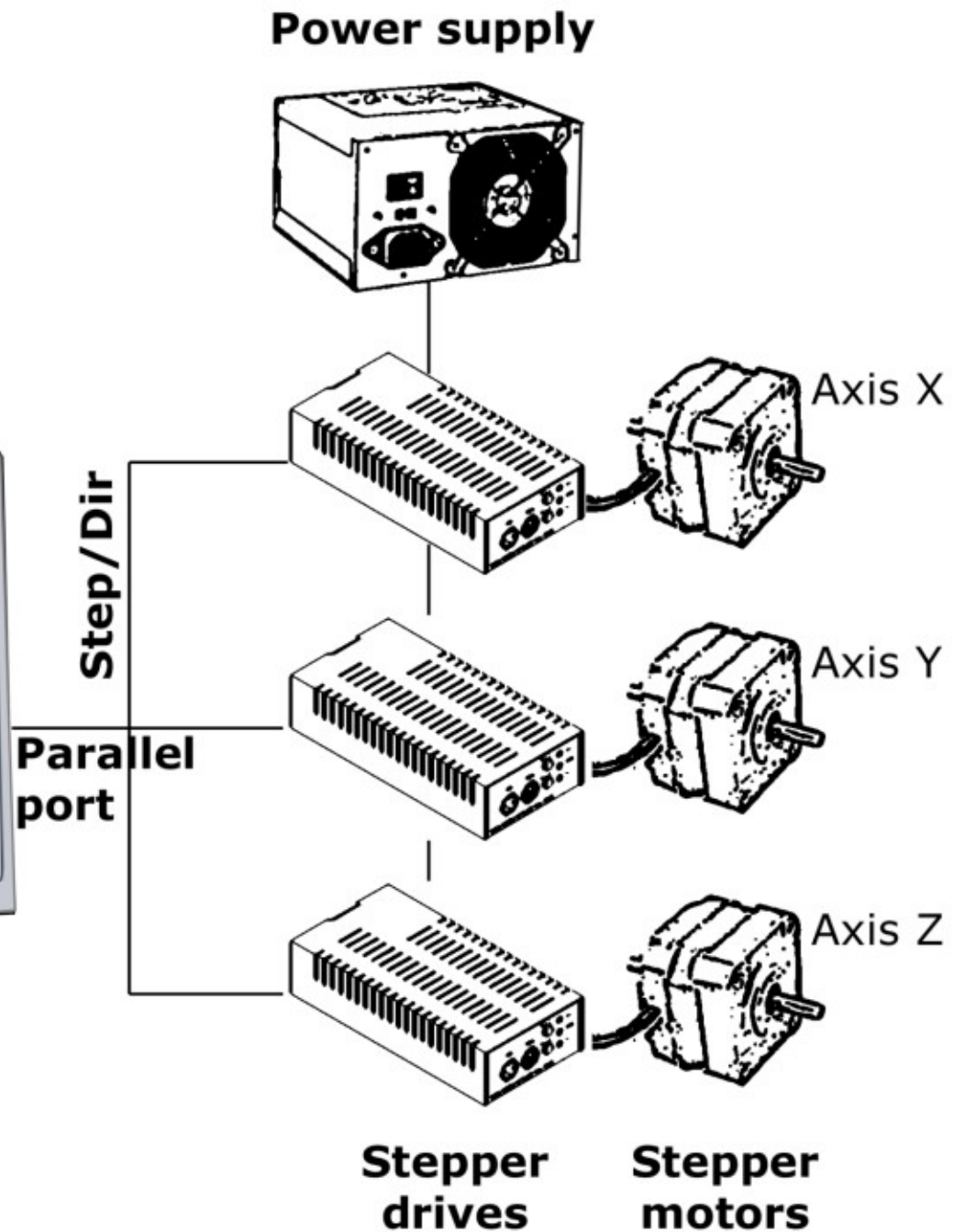


Linux PC emc2 installed



TkEMC

File View Settings Units Scripts Help

ON MIST OFF < SPINDLE OFF > ABORT

AUTO FLOOD OFF BRAKE ON

Tool: 1 Offset: 0.0000 Work Offsets: X0.0000 Y0.0000 Z0.0000 (mm)

X -52.0000

Y 56.1280

Z 10.0000

override limits

- relative
- machine
- actual
- commanded
- joint
- world

continuous

- home +

Axis Speed: 1 Feed Override: 100 Spindle speed Override: 100

MDI: _____

G1 G17 G40 G21 G90 G94 G54 G49 G99 G64 G51 M2 M5 M9 M48 F225 S1600

Program: /home/fuve/emc2/mc_files/3D_Chips.ngc - Status: idle

Open... Run Pause Resume Step Verify **Optional Stop**

```

N6871Y56.061Z-28.146
N6881Y56.105Z-27.894
N6891Y56.11Z-27.838
N6901Y56.128Z-27.634
N6911G0Z10.
N6931M9
  
```

TkEmc BackPlot

X-Y X-Z Y-Z 3D SETUP RESET

keystick

F1 Estop On/Off	F5 MDI Mode	F9 Spndl Fwd/Off	ESC Aborts Actions
F2 Machine On/Off	F6 Reset Interp	F10 Spndl Rev/Off	TAB Selects Params
F3 Manual Mode	F7 Mist On/Off	F11 Spndl Decrease	END Quits Display
F4 Auto Mode	F8 Flood On/Off	F12 Spndl Increase	? Toggles Help

ESTOP Override: 100% Tool: 0 Offset: 0.0000

MANUAL LUBE OFF LUBE OK

SPINDLE STOPPED BRAKE ON MIST OFF FLOOD OFF

--- HOMED X SELECTED Speed: 60.0 Incr: continuous

Relative Act Pos:	--X--	--Y--	--Z--
	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000

Sherline Steppermod Minimill

Program View Settings Info Editor Backplot Tools Offsets Help

MANUAL **AUTO** MDI FEEDHOLD ABORT ESTOP PUSH

X-Y X-Z Y-Z 3D Show Setup

X -0.0000

Y 0.0000

Z 0.0000

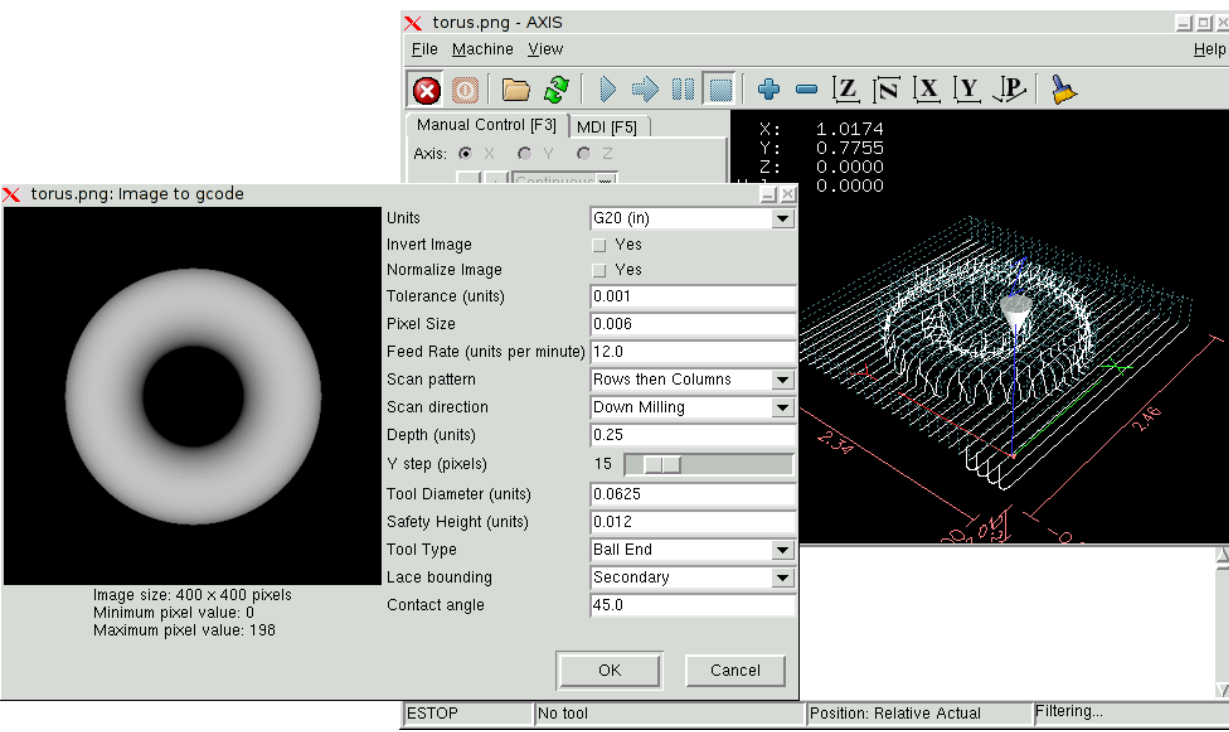
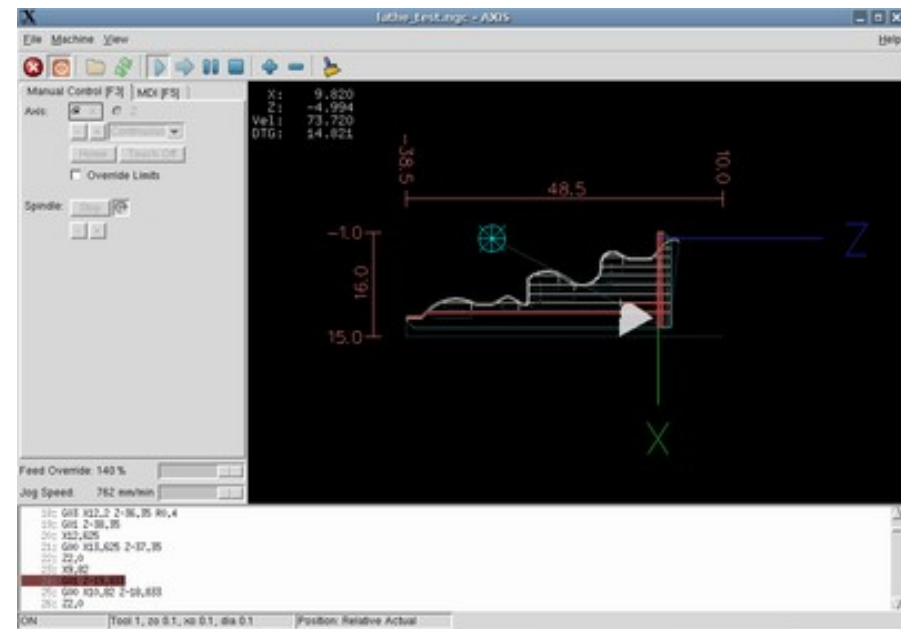
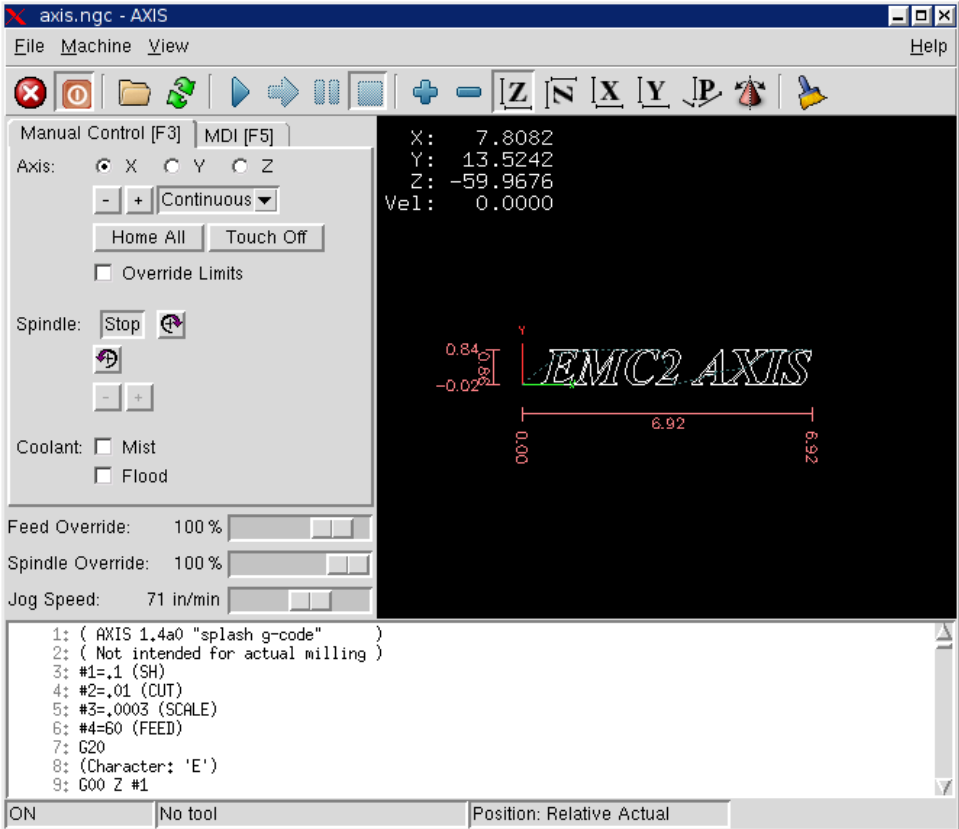
Feed Override: 100

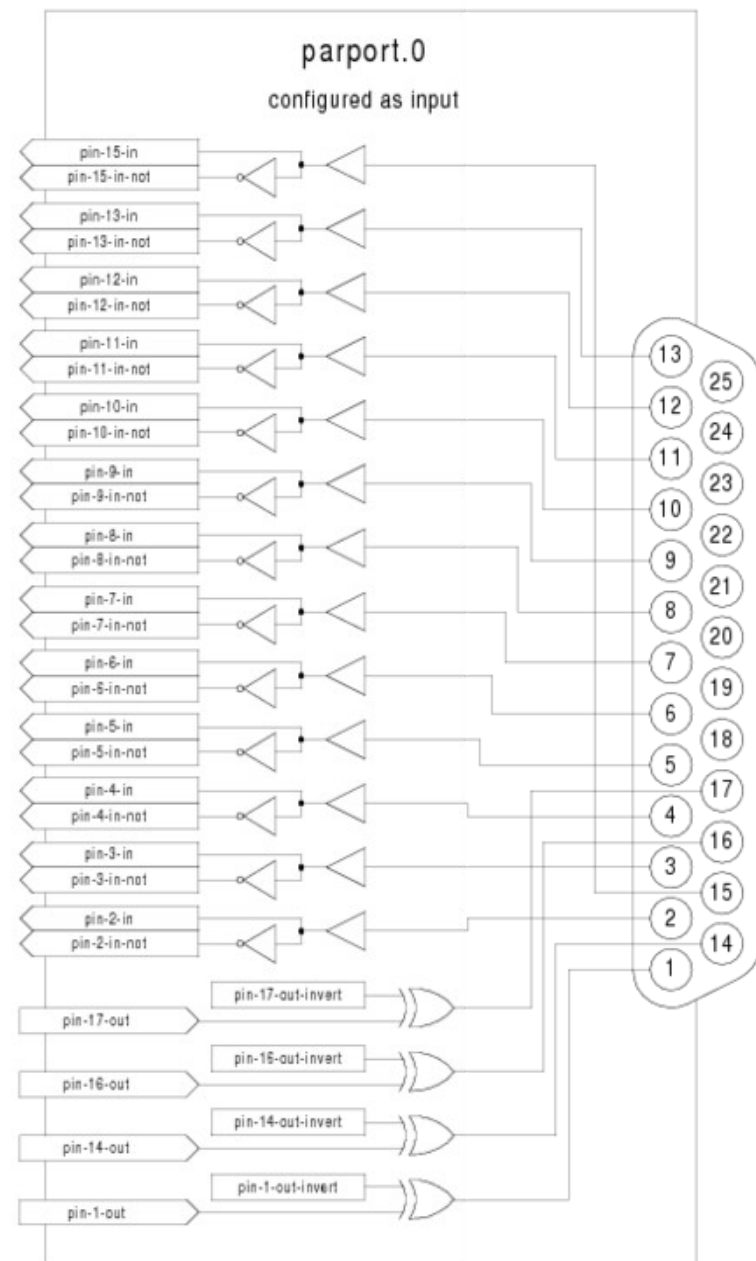
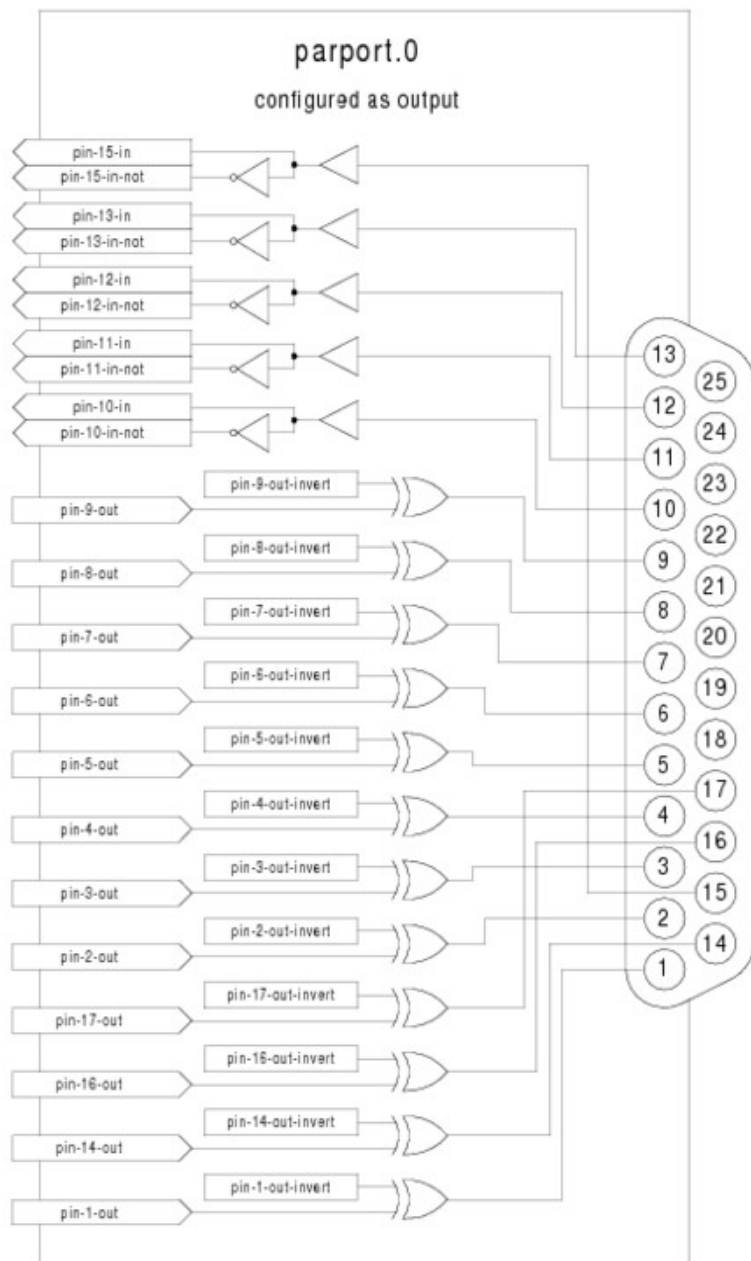
-- MESSAGES --

Open... Run Pause Resume Step Verify idle

```

n149 z1.75 y1.6
n150 x0
n151 g1 y2
n152 z1.25 y1.6
n153 y2
n154 g0 x0 y0 z0
n155 m2
n156
n157
  
```



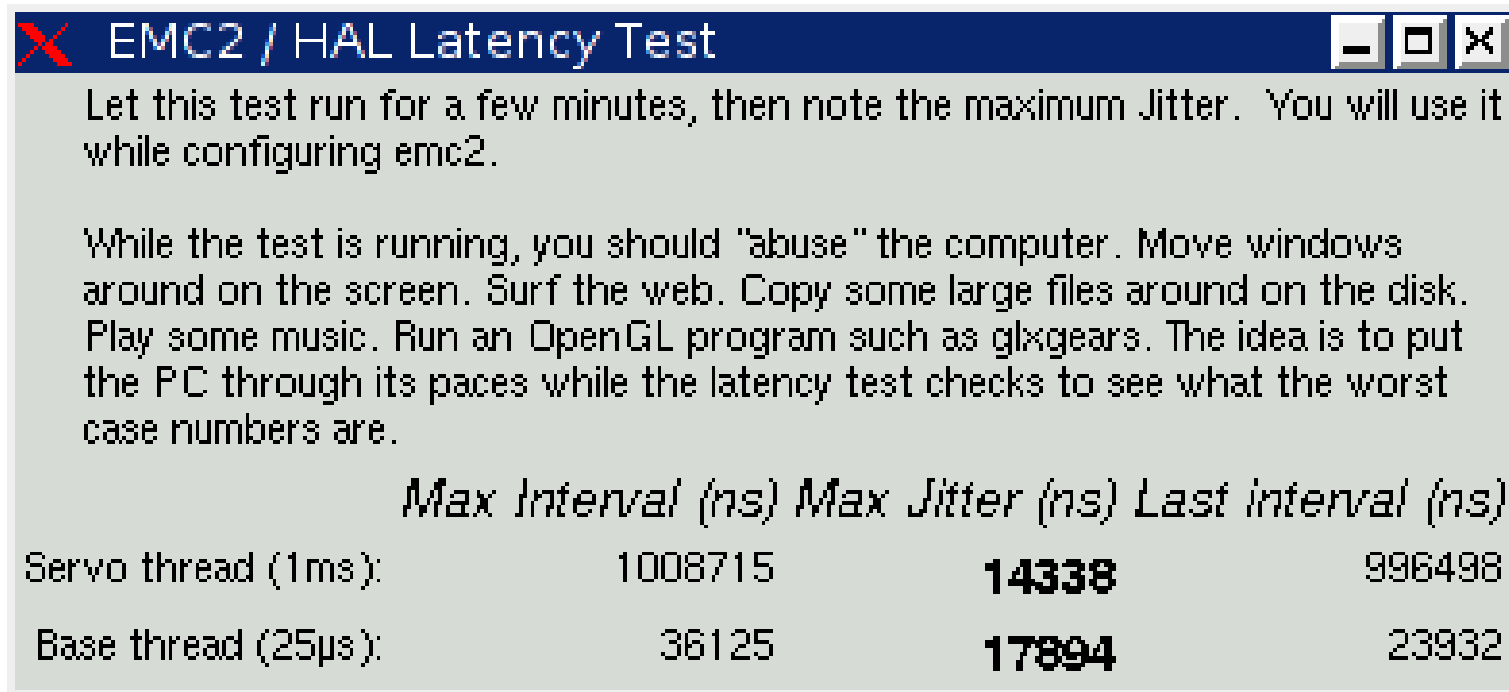


The HAL driver supports the bidirectional port, and allows the user to set the data group as either input or output. **If configured as output, a port provides a total of 12 outputs and 5 inputs. If configured as input, it provides 4 outputs and 13 inputs**

run:

latency-test

from a terminal



Let this test run for a few minutes, then note the maximum Jitter. You will use it while configuring emc2.

While the test is running, you should "abuse" the computer. Move windows around on the screen. Surf the web. Copy some large files around on the disk. Play some music. Run an OpenGL program such as glxgears. The idea is to put the PC through its paces while the latency test checks to see what the worst case numbers are.

	<i>Max Interval (ns)</i>	<i>Max Jitter (ns)</i>	<i>Last interval (ns)</i>
Servo thread (1ms):	1008715	14338	996498
Base thread (25µs):	36125	17894	23932

15-20 microseconds is GOOD

30-50 microseconds is NOT AS GOOD

=>100 microseconds is BAD

EMC Configuration Wizard

EMC2 Stepper Mill Configuration

Basic machine information

Machine Name:
Configuration directory:
Axis configuration:
Machine units:

Driver characteristics: (Multiply by 1000 for times specified in μ s or microseconds)
Driver type:
Step Time: ns
Step Space: ns
Direction Hold: ns
Direction Setup: ns

Parport Base Address: Min Base Period: 30000 ns
Latency test result: ns Max step rate: 33333 Hz
 Onscreen prompt for tool change

EMC2 Stepper Mill Configuration

Parallel Port Setup

Outputs (PC to Mill):	Invert	Inputs (Mill to PC):	Invert
Pin 1: ESTOP Out	<input type="checkbox"/>	Pin 10: Both Limit + Home X	<input type="checkbox"/>
Pin 2: X Step	<input type="checkbox"/>	Pin 11: Both Limit + Home Y	<input type="checkbox"/>
Pin 3: X Direction	<input type="checkbox"/>	Pin 12: Both Limit + Home Z	<input type="checkbox"/>
Pin 4: Y Step	<input type="checkbox"/>	Pin 13: Both Limit + Home A	<input type="checkbox"/>
Pin 5: Y Direction	<input type="checkbox"/>	Pin 15: Probe In	<input type="checkbox"/>
Pin 6: Z Step	<input type="checkbox"/>		
Pin 7: Z Direction	<input type="checkbox"/>		
Pin 8: A Step	<input type="checkbox"/>		
Pin 9: A Direction	<input type="checkbox"/>		
Pin 14: Spindle CW	<input type="checkbox"/>		
Pin 16: Spindle PWM	<input type="checkbox"/>		
Pin 17: Amplifier Enable	<input type="checkbox"/>		

Include custom PyVCP Panel
 Include custom HAL configuration

Output pinout presets:

EMC2 Stepper Mill Configuration

X Axis Configuration

Motor steps per revolution:

Driver Microstepping:
Pulley teeth (Motor:Leadscrew): :
Leadscrew Pitch: rev / in
Maximum Velocity: in / s
Maximum Acceleration: in / s²

Home location:
Table travel: to
Home Switch location:
Home Search velocity:
Home Latch direction:

Time to accelerate to max speed: 0.0333s
Distance to accelerate to max speed: 0.0167in
Pulse rate at max speed: 8000.0Hz
Axis SCALE: 8000.0

EMC2 Stepper Mill Configuration

Spindle Configuration

PWM Rate: Hz Enter 0 Hz for "PDM" mode
Calibration:
Speed 1: PWM 1:
Speed 2: PWM 2:

Cycles per revolution:

Step Timing Calc

Required Direction Setup	1	<u>uS</u>				
Required Direction Hold	20	<u>uS</u>				
Worst Case Latency	18	<u>uS</u>				
Recommended BASE_PERIOD	22.5	<u>uS</u>				
Actual BASE_PERIOD (after testing for lockup./slowdown)	22.5	<u>uS</u>				
<u>stepgen.steplen</u>	1	periods				
<u>stepgen.stepspace</u>	1	periods				
<u>stepgen.dirsetup</u>	1	periods				
<u>stepgen.dirhold</u>	2	periods				
Maximum step rate	22222	steps/sec				
Do not change these cells – they do the calculations!						
	method 1	method 2	method 3	method 4	best method	actual
Base Period	18.5	22.5	19	38	22.5	22.5
<u>steplen</u>	1	1	1	1	1	1
<u>stepspace</u>	2	1	2	1	1	1
<u>dirsetup</u>	2	1	1	1	1	1
<u>dirhold</u>	3	2	2	1	2	2
step period	55.5	45	57	76	45	45
					2	

EMC config files

/home/user/emc2/

INI

The ini file overrides defaults that are compiled into the EMC code. It also provides sections that are read directly by the Hardware Abstraction Layer.

HAL

The hal files start up process modules and provide linkages between EMC signals and specific hardware pins.

VAR

The var file is a way for the interpreter to save some values from one run to the next. These values are saved from one run to another but not always saved immediately. See the Parameters section of the G Code Manual for information on what each parameter is.

TBL

The tbl file saves tool information. See Tool File section of the G Code Manual.

NML

The nml file configures the communication channels used by the EMC. It is normally setup to run all of the communication within a single computer but can be modified to communicate between several computers.

.emcrc

This file saves user specific information and is created to save the name of the directory when the user first selects an EMC configuration.²

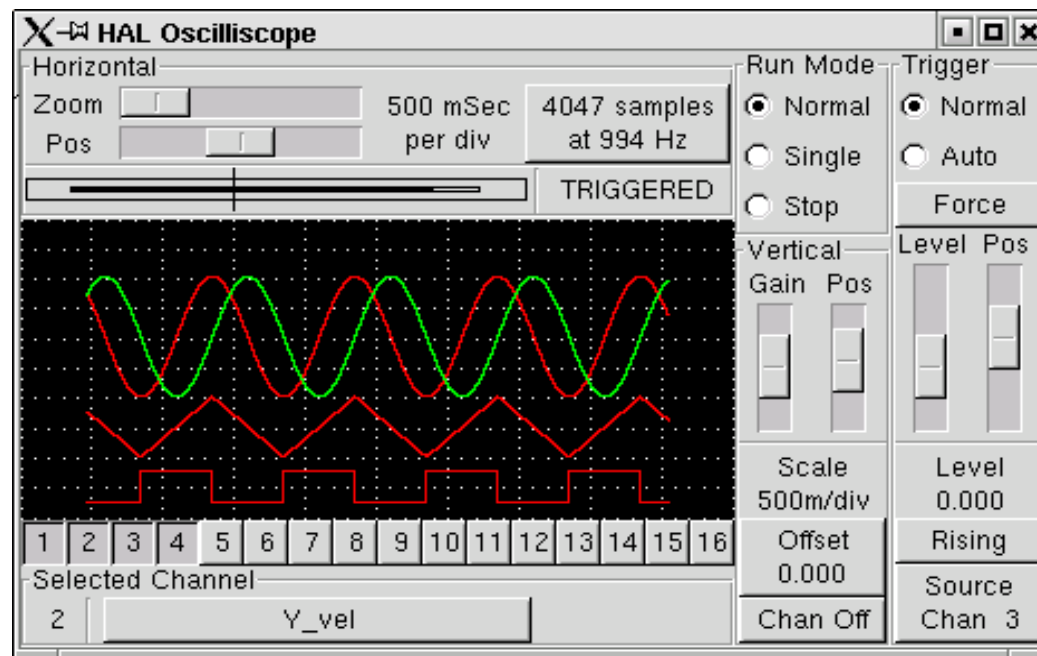
HAL

Hardware Abstraction Layer

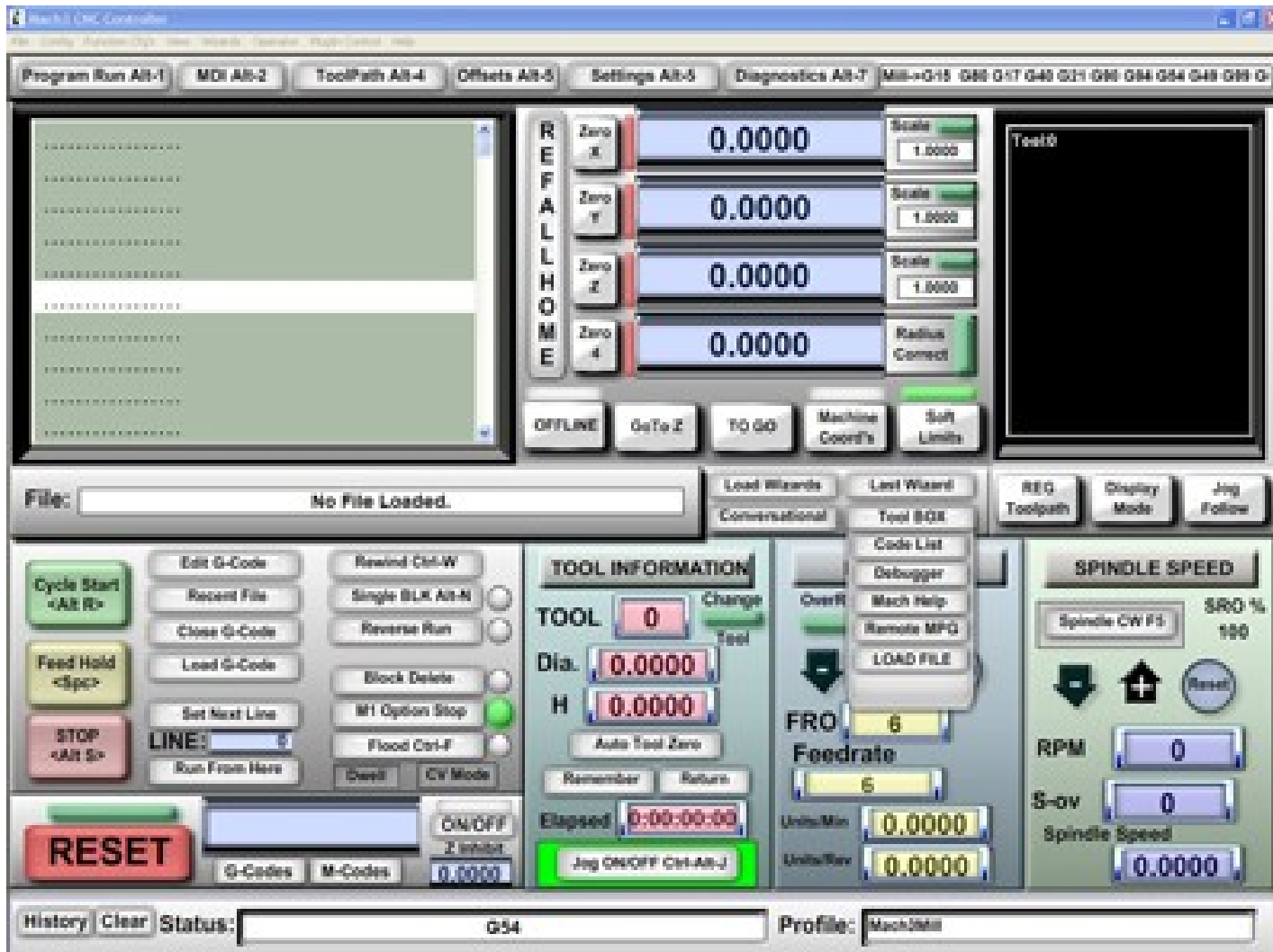
Linkage between EMC signals and hardware pins

Halmeter

Halscope



Examples of Commercial CNC Controllers



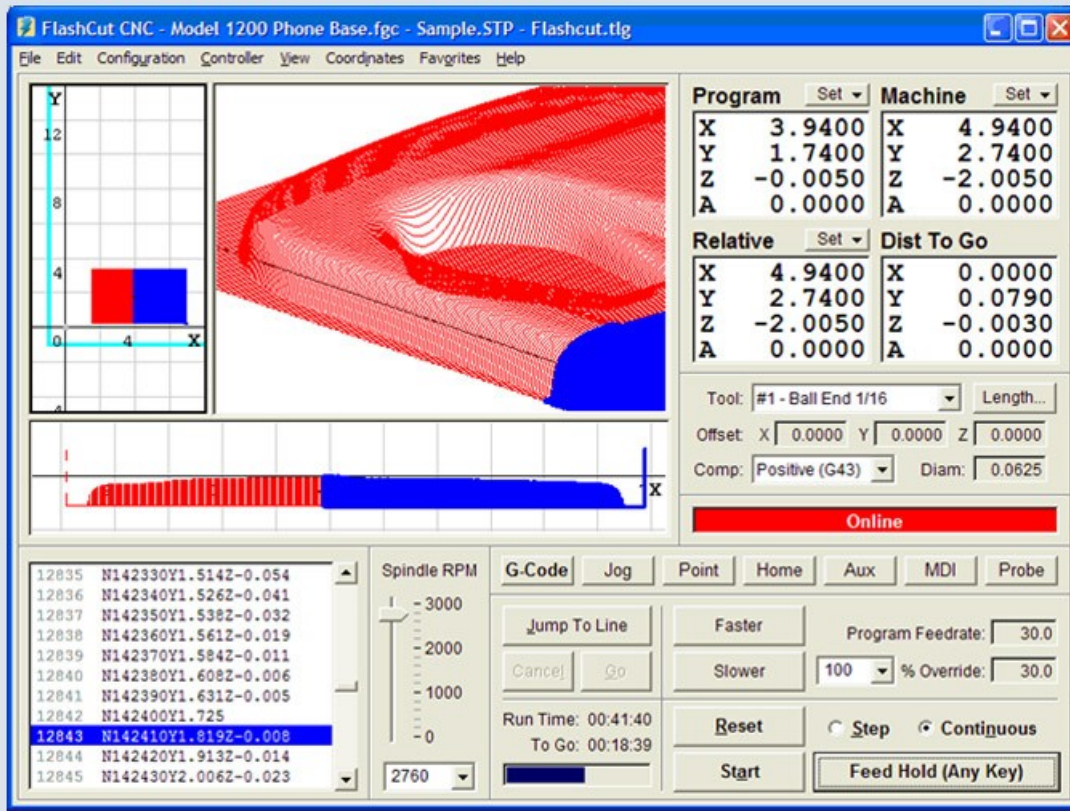
Mach 3

Windows 2000/XP
Operating System

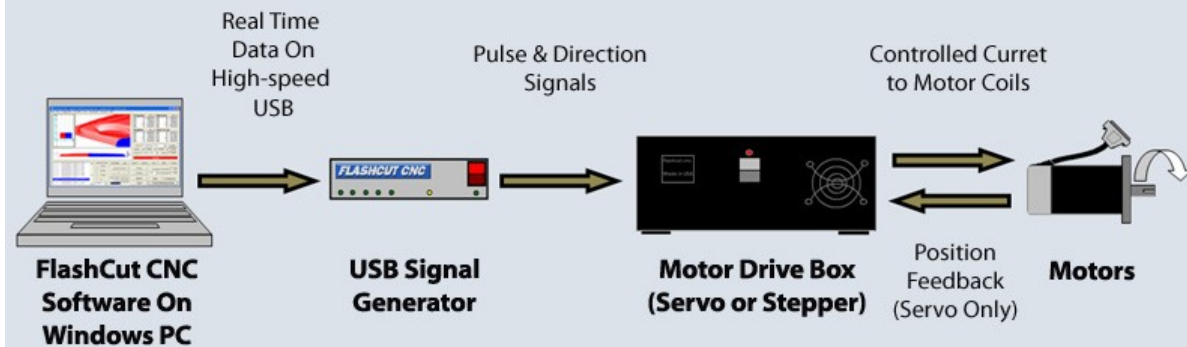
1Ghz CPU

512MB RAM

\$185



Flash Cut CNC





FANUC
Robotics