LinuxCNC Lathe

Generated by Doxygen 1.9.3

Chapter 1

Lathe documentation

1.1 Features

1.2 ToDo

- Document estop latch
- Document probe

1.3 References

- Mesa 7i96 Manual
- Mesa 7i85s Manual
- G540 Manual
- Minarek VFD docs

Chapter 2

Module Index

2.1 Modules

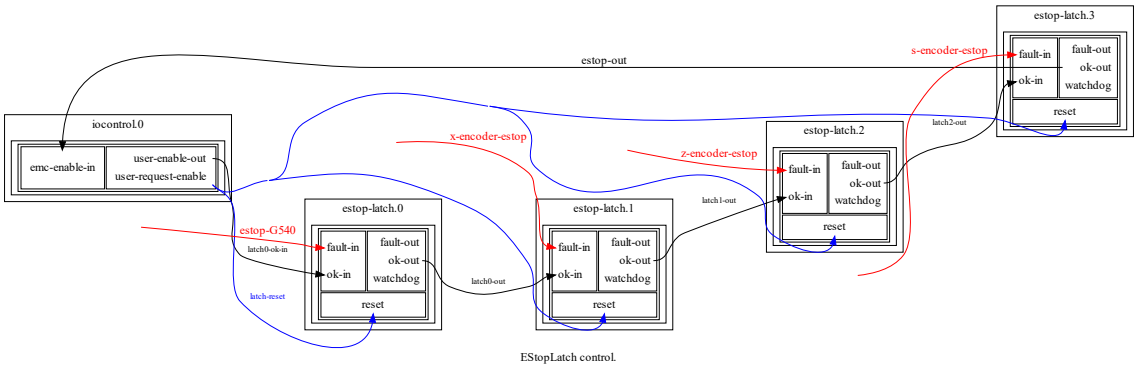
Here is a list of all modules:

Chapter 3

Module Documentation

3.1 EStopLatch

This diagram illustrates the .hal components for the estop latch logic of my lathe.



3.2 HAL

The configuration .ini specifies a HAL section.

```
TWOPASS = on
HALUI = halui
HALFILE = latheMesa.hal
HALFILE = LatheSpindle.hal
HALFILE = estop-chain.hal
HALFILE = custom.hal
POSTGUI_HALFILE = postgui_call_list.hal
SHUTDOWN = shutdown.hal
```

HALFILE

- latheMesa.hal Traditional configuration file with basic stepper control.
- LatheSpindle.hal Configures the spindle components including encoder and pid/pwmgen for the VFD.
- estop-chain.hal Estop logic for G540 and encoder quadrature faults which will stop the machine.

- custom.hal (Empty)

POSTGUI_HALFILE These files are loaded post GUI, in the order they appear

- postgui_call_list.hal - Contains the following list of files to load after the GUI.
  - spindle_postgui.hal - Filters spindle speed for pyvcp display.
  - joypad_jog_speed.hal - Logitech joypad jogging speed functionality.
  - joypad_xz.hal - Connects joypad to joystick controls for lathe.
  - joypad_extras.hal - Connnects jogging to the digital joypad, program run, pause, resume and manual/auto modoe of operation.

SHUTDOWN

- shutdown.hal (empty)

3.3 Probes

This file illustrates the .hal components for the tool length and touch off probes for my machine.

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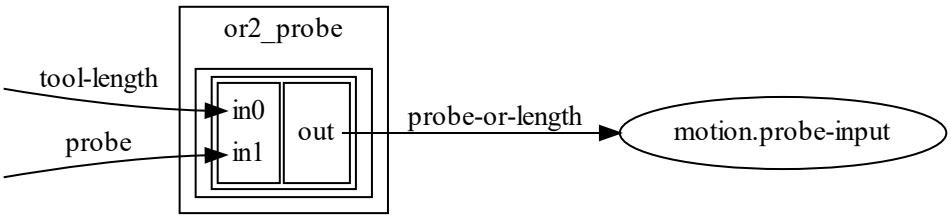
There are two probes:

- tool length
- touch off



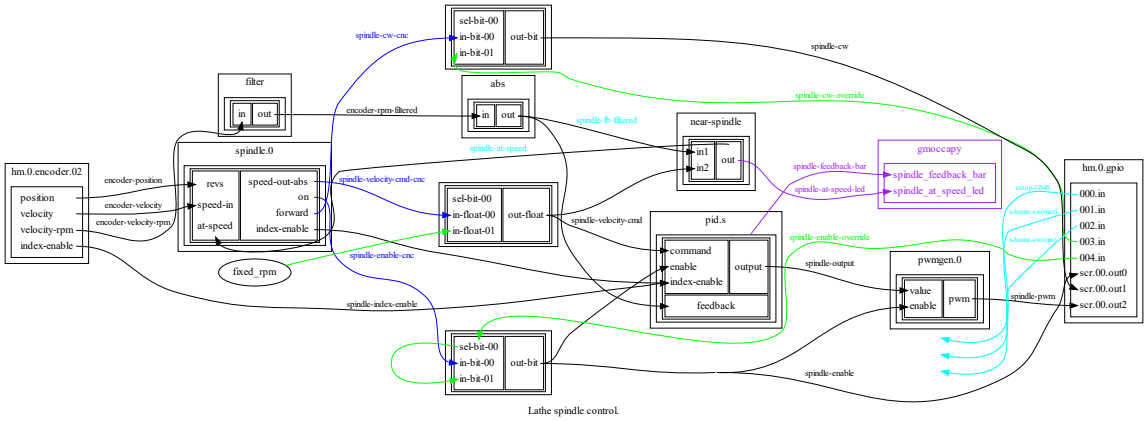
Router Probes.

3.4 SpindleControl

This file contains the doxygen description and diagram illustrating the .hal components I use with the Minarek VFD 0-10V control.

This file contains the doxygen description and diagram illustrating the .hal components I use with the Minarek VFD 0-10V control.

The basic operation of the spindle control is to convert the spindle speed-out-abs [RPM] into the spindle-pwm signal. While the basic operation can be implemented with just the spindle and pwmgen components, several refinements are made. This implementation include a quadrature encoder with index to measure the shaft position and velocity. To improve the accuracy of the spindle speed, a PID loop uses the velocity command and the measured velocity from the encoder to adjust the pwm. To detect when the spindle is ready, a near component compares the velocity command and measured encoder velocity. To allow the old enable/forward/reverse switch on the lathe to still function these signals are multiplexed to allow either the cnc control or switches to control the spindle.



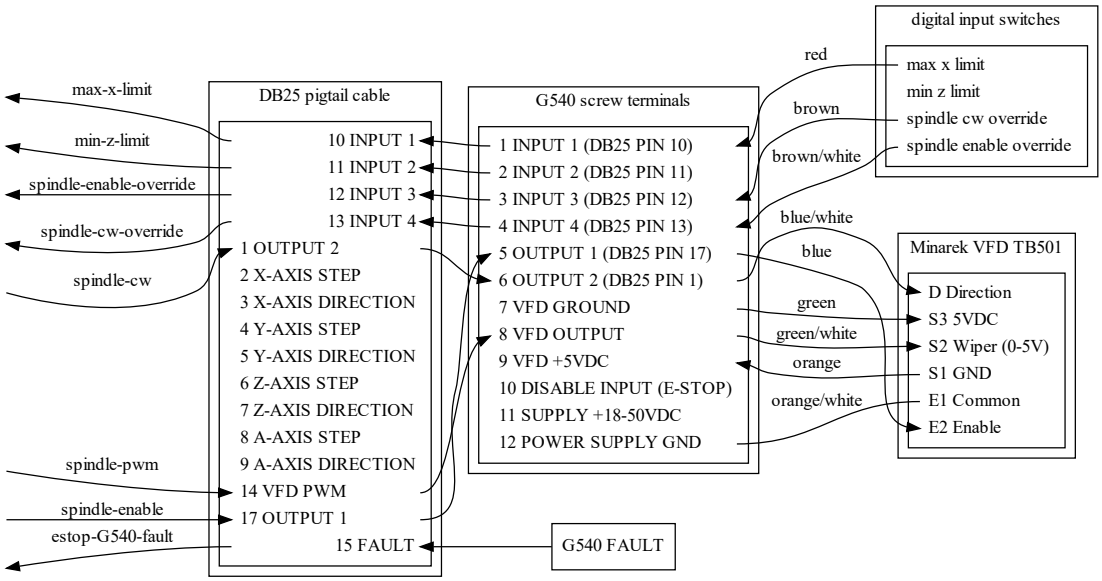
3.5 G540

This file illustrates the wiring for the Gecko G540 used with my lathe spindle.

This file illustrates the wiring for the Gecko G540 used with my lathe spindle.

I wired a parallel port cable pig tail between Mesa boards and the G540, I am NOT loading a parallel port component. This illustrates the hardware connections.

An 8 wire conductor cables (four colored pairs) runs from control box to VFD. Two wires run to the max x limit switch (red/black).



Lathe Spindle Wiring Connections.

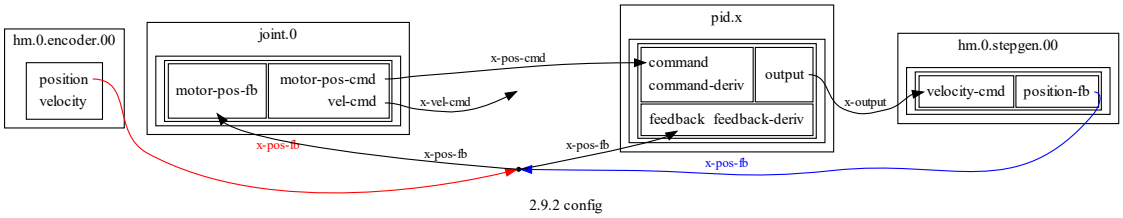
3.6 Stepper_control

3.6.1 PNCConf

Diagram showing default pncconf configuration. Notice the default configuration requires an edit of the .hal file to select whether the x-pos-fb signal is from the encoder.position or stepgen.position-fb. This does not show the enable and index-enable pins and signals.

This choice will simultaneously change:

- pid control - stepgen position or encoder measurement for pid loop.
- Display of joint position - Motor command or encoder measured position.



2.9.2 config

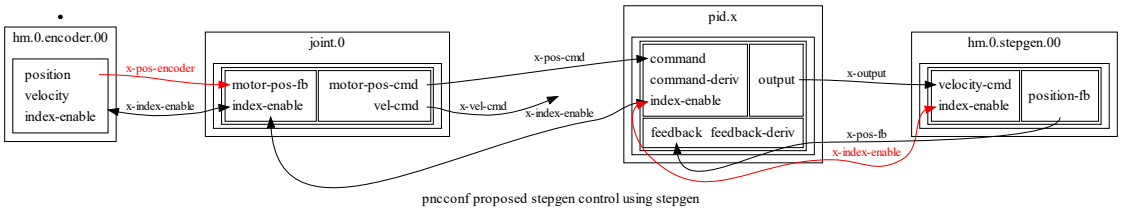
3.6.2 StepperControlProposed

Proposed diagram showing x-pos-fb <= stepgen position-fb choice.

- Always use the encoder position as the joint position feedback instead of the stepgen position. (requires new signal x-pos-encoder when stepgen position is used for pid feedback)

This diagram does not show the enable pins and signals. It does show the index-enable signal and pins because previously Pncconf did NOT connect -index-enable to the stepgen. Not having stepgen index-enable connected causes problems with HOME_USE_INDEX and using encoder position into joint motor-pos-fb when x-pos-fb <= stepgen position-fb.

```
#
# If you want to use x-pos-fb from the stepgenposition-fb with HOME_USE_INDEX or the encoder position as
      joint fb,  then you will need to use a bit file that supports stepgen.00.index-enable.
# This is required when using stepgen posititon for feedback and doesn't hurt when you use the encoder for
      feedback.
#
net x-index-enable  <=> joint.0.index-enable  <=>  hm2_7i96.0.encoder.00.index-enable <=>
      pid.x.index-enable <=> hm2_7i96.0.stepgen.00.index-enable
#
# Enable/Disable BOTH the following TWO lines to use the encoder to close the control loop.
# Use both the encoder position and velocity.
# This should be the optimal configuration.
net x-pos-fb         <= hm2_7i96.0.encoder.00.position  => pid.x.feedback        => joint.0.motor-pos-fb
net x-vel-fb         <= hm2_7i96.0.encoder.00.velocity  => pid.x.feedback-deriv
#
# Enable/Disable BOTH the following TWO lines to use stepgen position to close the control loop.
# Add a new signal from encoder position so it can be used independent of pid fb signal.  This allows
      encoder to be used as DRO without closing the control loop.
# Do not use the encoder x-vel-fb is you are using the stepgen position for x-pos-fb.
#
#net x-pos-fb         <= hm2_7i96.0.stepgen.00.position-fb  => pid.x.feedback
#net x-pos-encoder    <= hm2_7i96.0.encoder.00.position  => joint.0.motor-pos-fb
```



pncconf proposed stepgen control using stepgen

3.6.3 StepperControlProposedEncoder

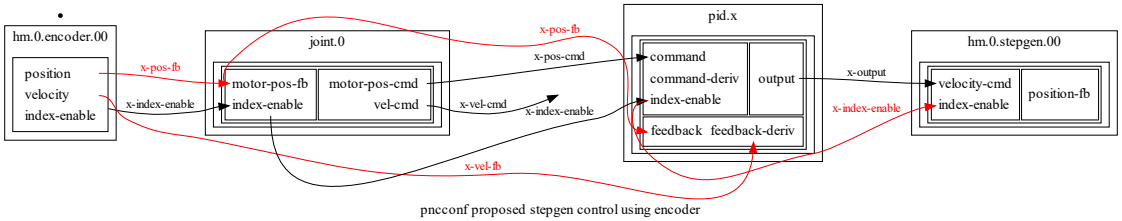
Proposed diagram showing x-pos-fb <= encoder position choice.

- Always use the encoder position as the joint position feedback instead of the stepgen position. (requires new signal x-pos-encoder when stepgen position is used for pid feedback)
- When using the encoder position as pid feedback, also use encoder velocity as an input to the pid feedback derivative.

This diagram does not show the enable pins and signals. It does show the index-enable signal and pins because previously Pncconf did NOT connect -index-enable to the stepgen. Not having stepgen index-enable connected causes problems with HOME_USE_INDEX and using encoder position into joint motor-pos-fb when x-pos-fb <= stepgen position-fb.

```
#
# If you want to use x-pos-fb from the stepgenposition-fb with HOME_USE_INDEX or the encoder position as
      joint fb,  then you will need to use a bit file that supports stepgen.00.index-enable.
```

```
# This is required when using stepgen posititon for feedback and doesn't hurt when you use the encoder for
      feedback.
#
net x-index-enable  <=> joint.0.index-enable  <=>  hm2_7i96.0.encoder.00.index-enable <=>
      pid.x.index-enable <=> hm2_7i96.0.stepgen.00.index-enable
#
# Enable/Disable BOTH the following TWO lines to use the encoder to close the control loop.
# Use both the encoder position and velocity.
# This should be the optimal configuration.
#net x-pos-fb         <= hm2_7i96.0.encoder.00.position  => pid.x.feedback        => joint.0.motor-pos-fb
#net x-vel-fb         <= hm2_7i96.0.encoder.00.velocity  => pid.x.feedback-deriv
#
# Enable/Disable BOTH the following TWO lines to use stepgen position to close the control loop.
# Add a new signal from encoder position so it can be used independent of pid fb signal.  This allows
      encoder to be used as DRO without closing the control loop.
# Do not use the encoder x-vel-fb is you are using the stepgen position for x-pos-fb.
#
net x-pos-fb         <= hm2_7i96.0.stepgen.00.position-fb  => pid.x.feedback
net x-pos-encoder    <= hm2_7i96.0.encoder.00.position  => joint.0.motor-pos-fb
```



pncconf proposed stepgen control using encoder

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