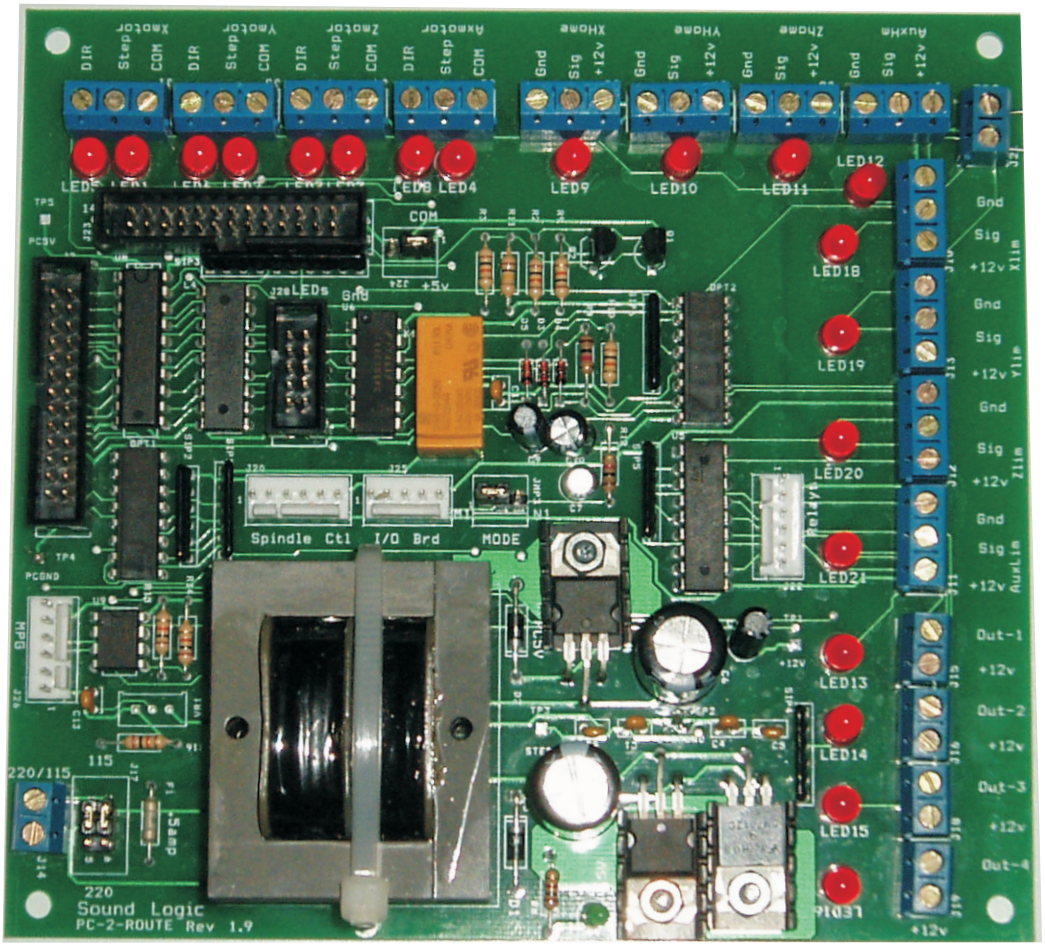
Sound Logic

PC-2-Route Model M2

PC parallel port break-out board
For Mach3 users

General User's Guide



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IMPORTANT INFORMATION

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Disclaimers of Liability

Sound Logic or **James T. Cullins** assumes no responsibility or liability for any damage done to persons , PC, Gecko drives, equipment being controlled, loss of time or loss of work incurred while using the PC-2-Route interface board.

PC-2-Route
Rev. 1.9

The following items have been added or changed from 1.8 to 1.9.

1 - Added a connector for the Xylotex driver board.

Now you can connect directly to the Xylotex driver board. The step and direction signals have been mapped to be the same as you would find on the Xylotex parallel port cable.

This gives the Xylotex users the ability to use a full function breakout board with their drives.

2 - Changed the 110/220 connector to a set of jumpers. Now there is no need to solder or unsolder the jumpers.

3 - The voltage regulators are now mounted on the board with heat sinks.

4 - Test points Tp1, Tp2 and Tp3 have been moved.

NOTE: If you are going to use the new **Gecko G203** drives please change the jumper J24 to the common ground side. J24 has three pins. The two to the right are for common 5 volts. The two to the left are for common ground.

The Gecko G203 is the only current Gecko drive that uses common ground.

PC-2-Route
Rev. 1.9

Purpose:

To interface the PC parallel port to the Gecko stepper motor drives and to control four solid state relays for powering on aux devices such as spindle, vacuum pump, and coolant pump from 115VAC.
The interface uses a transformer with dual primary and secondary windings and optical-isolators to totally isolate the PC parallel port from the stepper motor power supply and the equipment being controlled.
Operates on 115 volts AC or 220 volts AC (jumper selectable) 50hz or 60hz. **NOTE**: The 1.9 board has jumpers to change the voltage selection.

Features:

PCB:

Fr4 material

Solder mask on both sides Silkscreen (legends) on the topside.

Plated through holes

Inputs and outputs are optical-isolated.

Isolated 5 volts and grounds for the PC parallel port IO.

All outputs are buffered.

Mode select jumper for M1 or N1 operation.

See **Mach1&2 features**

Connectors:

A. All terminals are labeled as to their function.

12 - three terminal screw type terminals for attaching the step, direction signals to the Gecko drives and home and limit proximity sensors or switches.

J1 26 pin header for the ribbon cable to connect to the printer parallel port.

J23 26 pin header to connect to a Xylotex drive.

Sound Logic PC2Route connections to the parallel port.

J2

Pin1	Out1
Pin 2	X Step
Pin 3	Y Step
Pin 4	Z Step
Pin 5	A Step
Pin 6	X dir
Pin 7	Y dir
Pin 8	Z dir
Pin 9	A dir
Pin 10	ESTOP
Pin 11	X Home
Pin 13	Z Home
Pin 12	Y Home
Pin 14	Out2
Pin 15	A Home
Pin 16	Out3
Pin 17	Out4 charge-pump pin
Pin 18 26	PC Ground

!J20 6 pin single inline connector to Spindle speed control.

Pin1 +18 dc unregulated
Pin2 buffered out1 step
Pin3 buffered out 2 dir.
Pin4 PCgnd
Pin5 +12v isolated form PC
Pin6 Gnd isolated form PCJ22 connection for a relay PCB containing 4 relays
Pin 1 = 12vdc All coils
Pin 2 = K1 coil
Pin 3 = K2 coil
Pin 4 = K3 coil
Pin 5 = K4 coil
Normally open contacts are connected to screw terminals.

!

Encoder

! J26 6 pin single inline connector for quadrature encoder input.

Pin1 isolated GND
Pin2 isolated Gnd
Pin3 isolated to Pin 12 of parallel port (in1)
Pin4 isolated to Pin 13 of parallel port (in2)
Pin5 isolated to Pin 15 of parallel port (switch)
Pin6 isolated +5v

! J24 The jumper can be set to ground or +5 volts. The default will be +5 volts for the Gecko drives except for the G203. When set to ground the ground will be connected to the PC ground.

!

Transformer:

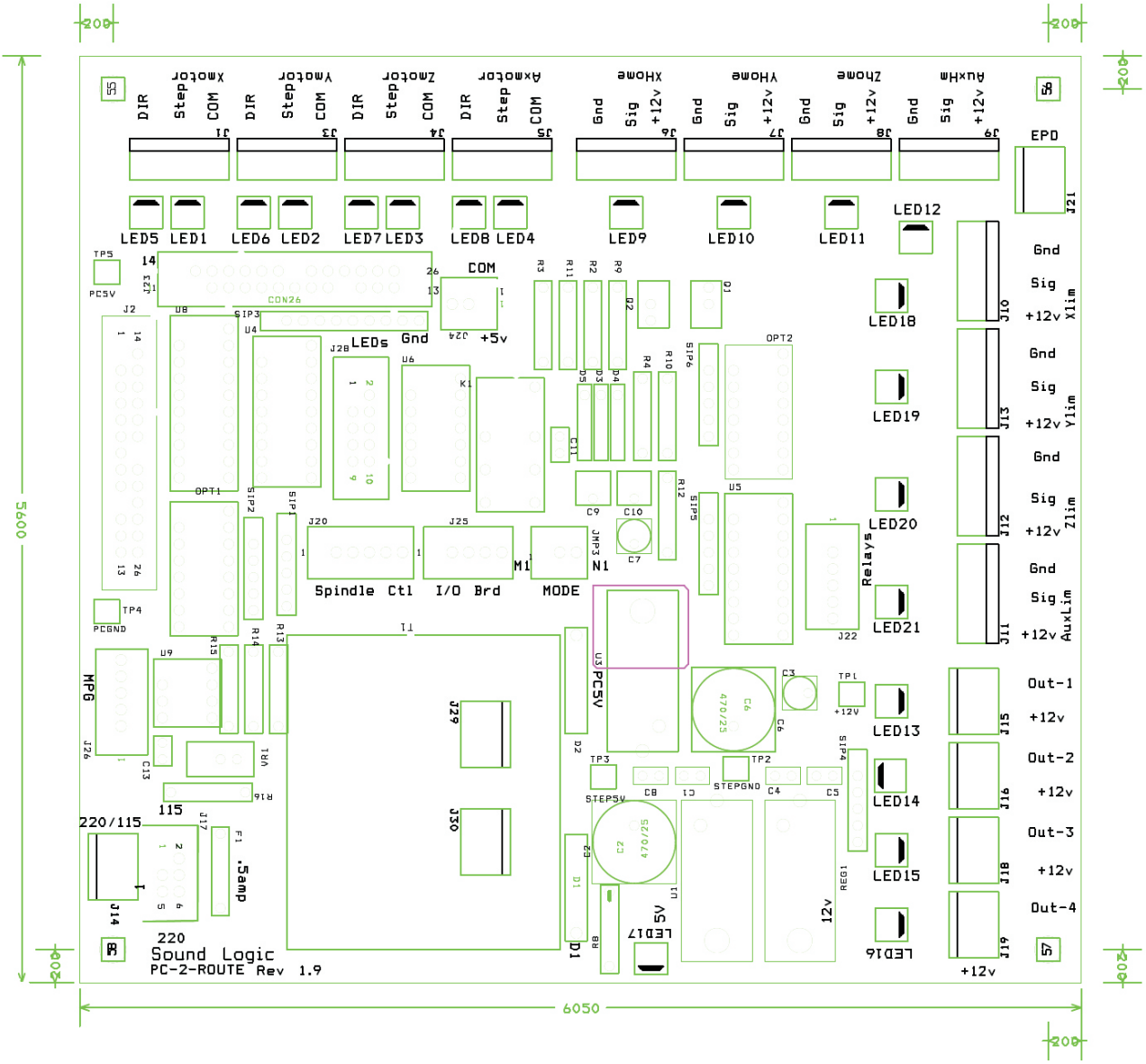
! Dual primary windings allow operation at 115 VAC or 220 VAC. The voltage is selected using a six pin jumper block.

115 VAC jumpers between the middle two pins and pins 1 and 2.
220 VAC jumpers between the middle two pins and pins 5 and 6.
This is indicated on the PCB.

! Dual secondary.

Winding one supplies 5volts via a regulator for the PC side optical-isolators.
Winding two supplies 5volts for the machine side optical- isolators and 12volts for the Solid State relays and proximity sensors. Both are regulated.

The grounds of these two power supplies **MUST NOT BE CONNECTED TOGETHER OR TO EARTH** doing so will destroy the isolation and expose the sensitive electronics in the PC to the inductive spikes form the motors.



PC board layout

This is the actual PC board layout taken from the layout design program.

In the PDF file you should be able to zoom in and see the details.

Power Supply

The power supply transformer has a dual primary. It can be configured for either 110 VAC or 220 VAC by the use of the jumpers J17. There are six pins. The two pins in the middle are common. Pin 1 and 2 are used for 110 VAC, Pins 5 and 6 are used for 220 VAC.

Before powering it up for 220 VAC, make sure that the jumpers are correct. If not, the fuse will blow.

The power supply transformer has a dual secondary winding. One side provides a regulated 5 VDC to power the optical isolators in the Gecko drives pr any other drivers that require 5 VDC. The negative side of the 5 VDC power supply is common to the common side of the PC . The PC is totally isolated from the motor and relay circuits.

The second winding provides power to a 5 VDC power supply to driving solid state relays. The 5 VDC power is also used with an optical isolator to convert the 12 VDC signal from the proximity sensors back to 5 VDC before it goes back to the PC as a limit signal.

The secondary winding also provides power to a 12 VDC regulated power supply. The 12 VDC power is used to provide power to the proximity sensors and to drive solid state relays.

Step and Direction Pin Layout

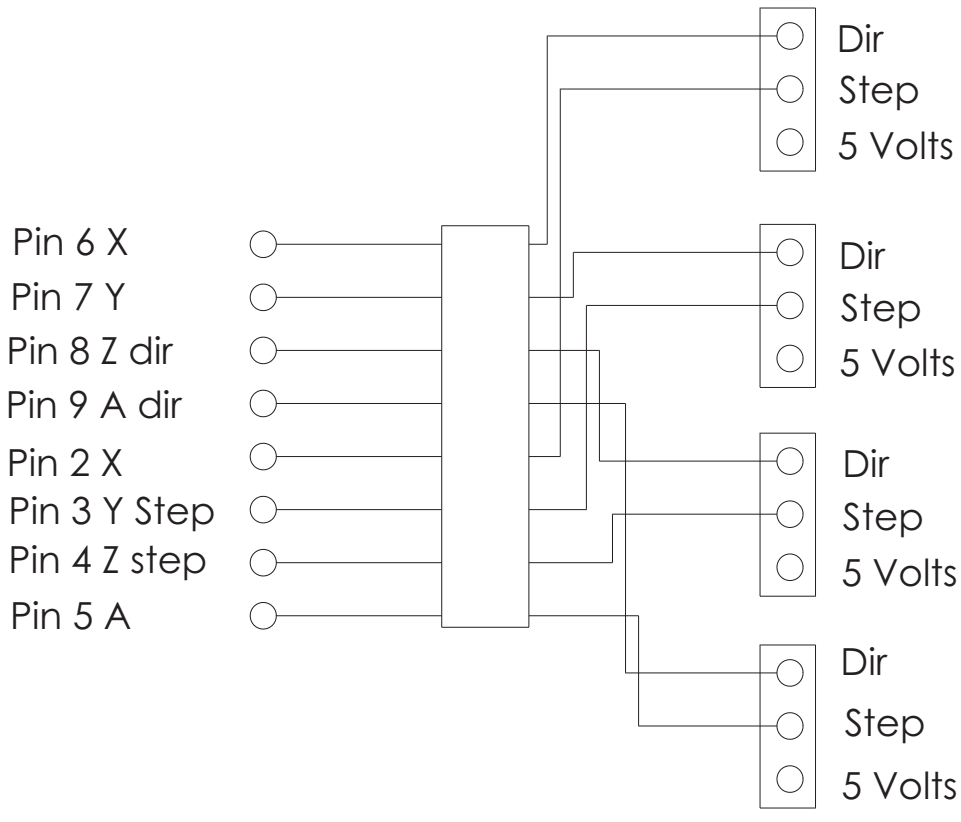
The Step and Direction signal come in from the parallel port on pins 2 through 9. The input signal goes through a buffer to insure that the breakout board will work with either a 5 volt signal coming from a PC or a lower 3.2 volt signal coming from a laptop or a newer PC.

The outputs then go to J1 through J5. Each Step and Direction line has a LED which can be used to assist in troubleshooting.

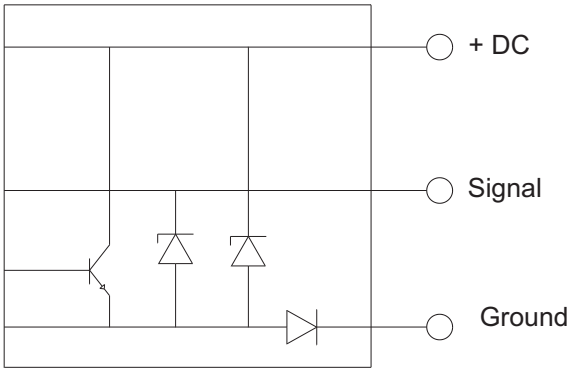
The lights on the Step lines will seem very dim at high speeds.

The board also has a 10 pin connector (J28). J28 can be connected to an external LED board. Sound Logic has developed a LED board that has an adjustable count down chip for the step signals. This allows the user to see step signal blink.

The external LED board can be very helpful in trouble shooting problems. The signals are the same step and direction signals going to the stepper motor drives.



NOTE: All output signals as well as all home and limit signals are optically isolated to protect both the board and the host computer



NPN Inductive Proximity Sensor

NOTE: The break-out board was designed to use **NPN** inductive proximity sensors.

Mach1 supports home and limit switches. J6, J7,J8, and J9 are the primary connections for the X, Y, Z, and Aux proximity sensors. J10, J11, J12, and J13 are the secondary connections for the proximity sensors. The signal line is connected internally on the board between the primary connectors and the secondary connectors. For example the signal line for the X Home (J6) is connected to the signal line on J10 (X lim).

The extra four sets of screw terminals (J10 - J13) enable you to easily use a second proximity sensor on any axis. Mach 1 will know which sensor has been detected by the direction that the axis was moving.

Testing the PCB:

Before connecting the PC or the Gecko drives or switches.

1. Power up the interface (the AC line 110 or 220 must be connected). The Green LED will light.

!

!**2. Clip the ground clip of your meter or scope to TP4 (Pcgnd) and the + lead to TP5 (PC5v) to read the +5 volt for the PC side. Note: there are two separate 5 volt supply's. One is to power the Gecko drives. The second one is used on the limit input side to power the chips. This keeps the grounds separate when powering the Gecko drives.**

!**3. Move the ground clip to TP2 (Step GND) and the + lead to TP3 (Step5v) to read the 5 volts then to TP1 (+12v) to test the 12 volts on the controlled equipment side.**

!**4. If readings are correct continue the tests.**

!**5. Locate the HOME sensor connectors J6, J7, J8 and J9. Connect a jumper from pin-2 to pin-3 for each axis, note the LEDs located by each connector should illuminate.**

!**6. Locate the Limit sensor connectors J10, J11, J12, and J13. Connect a jumper from pin-sig to pin-gnd for each axis, note the LEDs located by each connector should illuminate.**

!**7. The HOME and LIMIT switches share a pin for each axis. If the axis is homing the program sees the input as a home otherwise it sees it as a limit and caused Mach2 to halt the program and blink the ESTOP icon. (See Mach2&3 manuals)**

!**8. Power down the interface.**

Testing the PCB:

9. Connect the 25pin printer port cable to J2 and the other end to the parallel port of the PC. Power up the interface.

NOTE: In the next step you will need to have loaded the **Sound Logic XML file**.

The file is located on the download section of the www.campbelldesigns.com web page.

The purpose of the XML file is to set the correct port and pin assignments for Mach2 or Mach3. Mach needs to know what the breakout board needs in the way of parallel port pin assignments.

10. Before you are ready to run your machine you will need to set the steps per unit (inch or metric), speeds, and acceleration according to your machines requirements. See Mach 2/3 help files.

Once you have the XML file you can make a copy and put a copy in your Mach 2/3 folder.

When you are ready to start Mach2 or Mach3, you will need to click on the Mach2 or Mach3 icon, **not Mach2/3 mill** and you will see a drop down list of profiles (XML files). Select Sound Logic. You will still need to tune your motors and set your parallel port address.

Here is a recommended quick test.

With Mach 2 or Mach3 running with the correct XML file. The parallel port cable connected to the breakout board, and AC power applied to the breakout board.

I am assuming that your default parallel port address of 0x378 is correct. You can check the address by looking at the ports and pins entry under the Mach config drop down list.

The quick test would be to click on the diagnostic menu. Now put a jumper across any of the home or limits inputs (sig and Gnd). The led on the board should come on and the corresponding yellow light on the diagnostic page should come on. If the yellow light does not come on, you will need to find out why.

One possibility is an incorrect parallel port address. The most likely problem is a bad parallel port cable. The cable must be an all wire (25 wire) straight through cable.

Testing the PCB:

Connect the Home and Limit switches.

Power up the PC-2-RouteN interface.

Manually operate the switches to verify they are wired properly. Monitor the diagnostic page in Mach 2 or Mach 3 and note the switch input are operating and that the ESTOP light comes on. Check each switch.

NOTE: If you are using **normally closed** home/limit switches you will need to tell Mach. To tell Mach, click on the config/ports and pins then the input signals. There is a column labeled active low. You will need to set all three entries for that axis to the red X (de-active).

NOTE: If you wish, you can run several normally closed switches in series.

Power down the interface.

16. Make sure the X, Y, And Z axes are in the middle of their range.

17. Connect the Gecko drives according to the Gecko installation sheet.
WARNING! If you are running in **N1** mode (Not using Mach2/3). Connect the relays after the axes are completely checked out. The external devices should be off until the program is running to PREVENT ACCIDENTS. See **Mach2/3** for exception.

18. Power up the PC-2-RouteN interface and the Gecko drive.
The LEDs on the drives should light.

NOTE: contacts of K1 relay on the PC2Route PCB are connected to the ESTOP pin 10 and PC ground.

19. Another contact on K1 supplies 5 Volt to the Geckos drives.

NOTE: You will not be able to click on the Mach reset button and get it to reset unless there is a jumper (short) on the EPO screw terminal on the breakout board or you have an external normally closed EPO switch. For an externally closed switch the switch must be pulled out.

NOTE: When using drives that use common 5 volts, pressing the EPO button removes the 5 volts from the drives. This in affect stops the drives. This also drops the 12 volts from the output screw terminals in affect turning off all pumps and other outputs connected to the four outputs. All this assumes that the mode switch is in the M1 position.

Testing the PCB:

20. Jog each axes to limit switches. Note LEDS and Mach2 Diagnostic page input indicators.

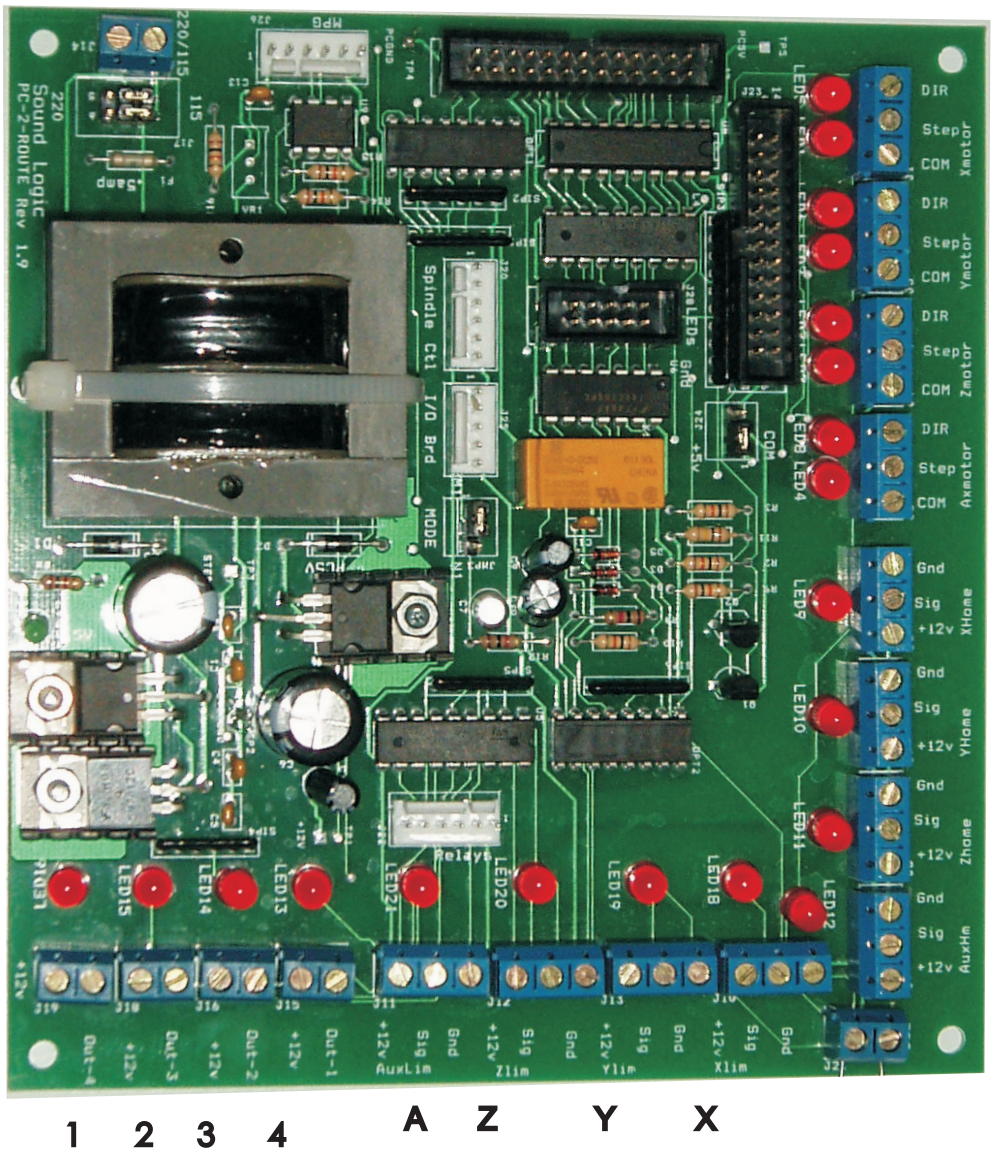
21. Note that Out4 LED is lit when Mach2 is running and the ESTOP has been cleared. You can use Out4 to turn on the power supply to the Gecko drives via a solid-state relay. Out1 is for Spindle Out2 for Flood and Out3 for Mist.

These outputs are used to drive solid-state relays that apply power to the devices they control. They may be tested using M codes or the icons in Mach2 diagnostic page or program page. If you need help writing the macros, please drop Bob Campbell (**bob@campbelldesigns.com**) a note an he will send you a sample.

22. Load one of the sample programs and run it.

Mach2&3 feature

Jmp3 is used to select the mode of operation. The PC parallel port will set some of the output pins (pin 1, 14, 16 and 17) high when you power it up.
In N1 mode the outputs are enabled at all times. If external devices are left on and the PC is powered on, the devices will start. This could cause serious injury.
Selecting Jmp3 to M1 mode and setting up Mach2/3 charge-pump to Pin 17 will inhibit all 4 outputs until Mach2/3 program is running and the ESTOP is cleared.
Mach2/3 will send a 12.5khz signal to pin 17 this will be sensed and will enable out1, out2, and out3 for output. Out4 will be on as long as the 12.5khz signal is detected.



Dir
Step
5 Volts
X motor

Y motor

Z motor

Aux motor

X Home

Y Home

Ground
Signal
12 VDC
Z Home

Aux Home

Disclaimer:

Sound Logic or James T. Cullins assumes no responsibility or liability for any damage done to persons, PC, Gecko drives, equipment being controlled, loss of time or loss of work incurred while using the PC2Route interface board, all versions.

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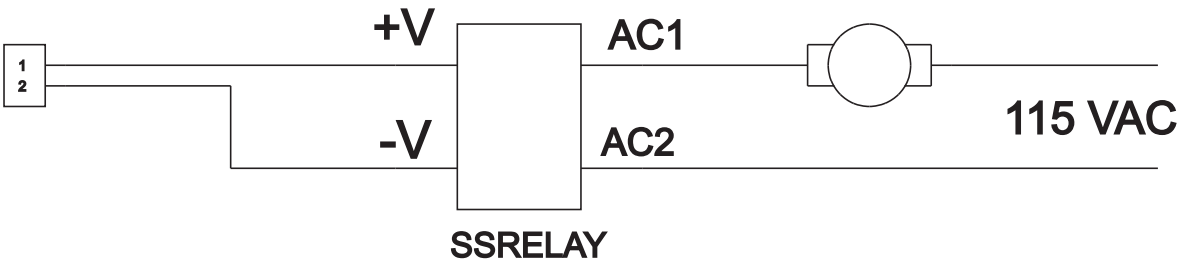
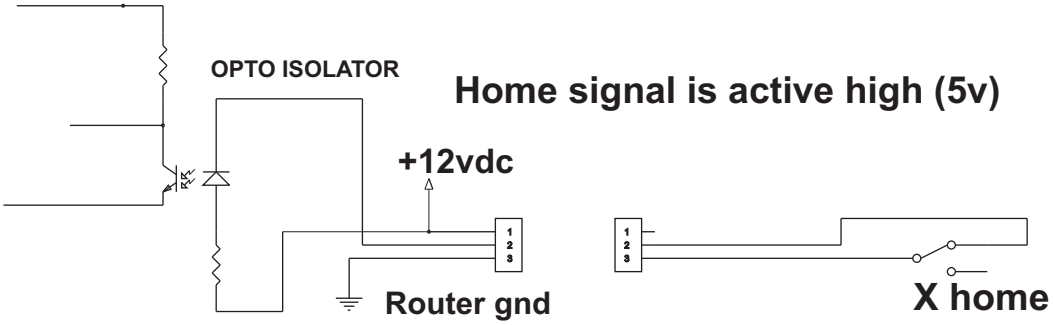


The above circuit is a sample of a solid state relay used with the pc-2-route break-out board. The break-out board provides 12 VDC to power the relay.



The above circuit is a sample of a micro switch being used in place of a proximity switch as a home limit switch.

Xylotex interface

Connector J23 pin connections

IDC pins 18 to 25 are connected to the PC ground.
Pin 26 is open.

The step and direction signals are buffered and passed to the Xylotex board through a 26 wire ribbon cable.

3	**Step X**
5	**Dir X**
7	**Step Y**
9	**Dir Y**
11	**Step Z**
13	**Dir Z**
15	**Step A**
17	**Dir A**

We can provide a ribbon cable with the breakout board on request.
Please specify the length of the ribbon cable needed.