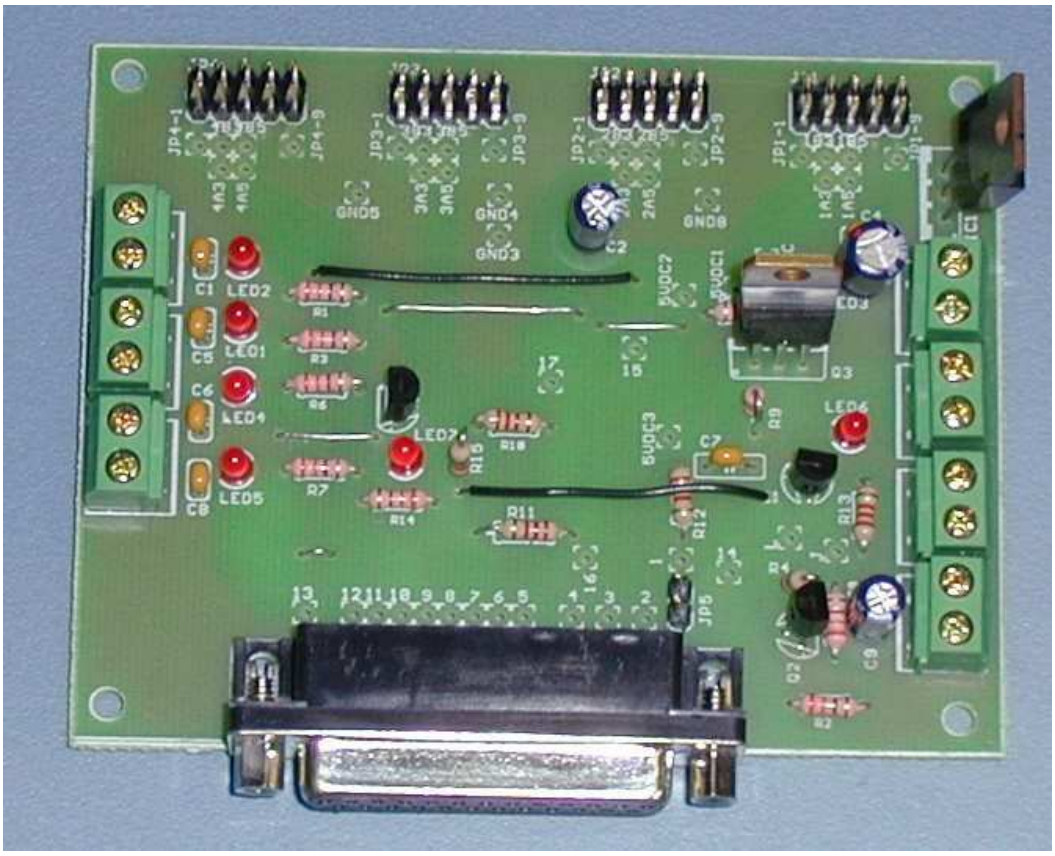
11/12/2005*

3 and 4 Axis BOB Board Data

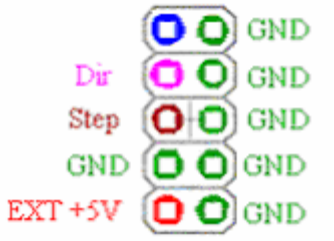
Introduction

This is a simple interface ("Breakout Board") board compatible with the modular single channel driver boards. It can be utilized for 1 to 4 axis drive machines. It provides a clean wiring method to utilize a commercial off the shelf printer cable. If you're not wise in electronics, the board should be built in stages and tested during each stage to eliminate problems. LED's are indicators for certain operations. LED2 for the X1-1 switch input, Led 1 for the X2-1 switch input, and LED4 for the X2-2 switch input, and LED 5 for the X3-1 switch input. There is an onboard latch for Emergency stop. LED7 will be on when a momentary switch shorts Wago connector X6. To reset that latch, a momentary short between Wago connector X7 resets the latch.
Wago connector X5 is a driver output that can be used to control a spindle relay. LED6 indicates the state of that driver. LED1 is a 5V power indicator for the board.



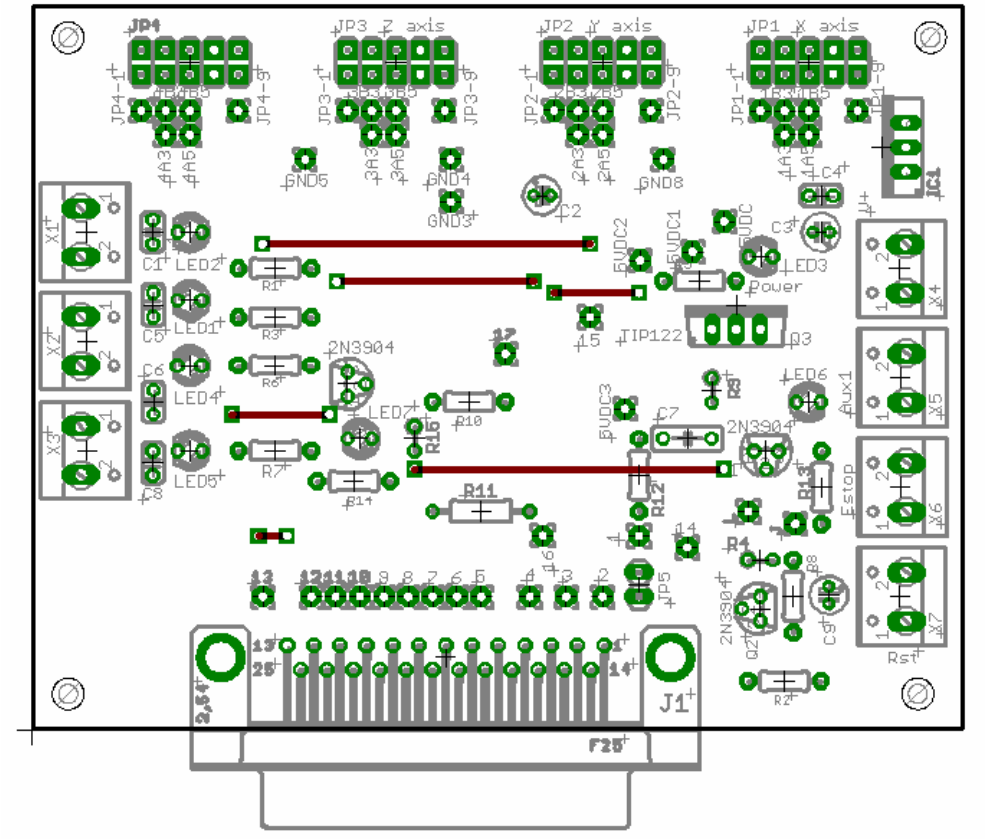
Axis Outputs

JP1 – JP4 are IDC pin headers that are wired to make it simple to connect via a short ribbon cable to a corresponding single axis driver. There is no requirement to use a ribbon cable, you can discretely wire it with 3 wires (4 if you use pin 1 as enable), just make sure to include one ground wire.

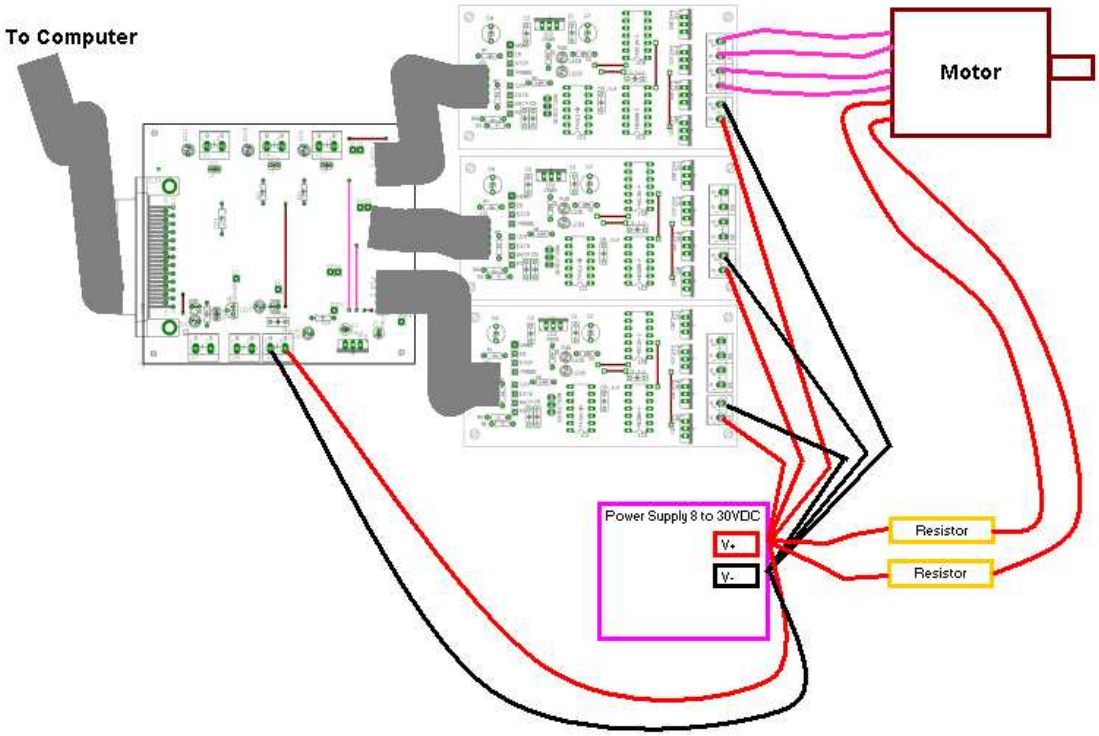


BOM

Part	Value	Device	Description	Digikey
C1, C5, C6, C8	0.1uf	C-US025-024X044	CAPACITOR	BC1133CT-ND
C2, C3, C9	10uf	CPOL-USE1.8-4	POLARIZED CAPACITOR	P11250-ND
C4, C7	0.01uf	C-US025-024X044	CAPACITOR	BC1095CT-ND
IC1		7805	VOLTAGE REGULATOR	296-1974-5-ND
J1		F25HP	SUB-D Connector	182-725F-ND
JP1 - JP4	X axis	PINHD-2X5	PIN HEADER 10 Pins	WM6810-ND
JP5		PINHD-1X2	PIN HEADER 2 Pins	WM6402-ND
LED1 - 7		LED3MM	LED	67-1066-ND
Q1, Q2, Q4	2N3904	2N3904	NPN Transistor TO92	2N3904D26ZCT-ND
Q3	TIP122	TIP122	NPN Transistor TO220	TIP122FS-ND
R1, R2, R3, R5, R6, R7, R8, R9, R14	330 ohm	¼ Watt Resistor	RESISTOR, American	330QBK-ND
R4, R10, R11, R12, R13, R15	2.2K ohm	¼ Watt Resistor	RESISTOR, American	2.2KQBK-ND
X1 - X7			WAGO SREW CLAMP	281-1435-ND



Wiring a simple 3 axis system



Only one Motor hookup is shown for clarity. The other two axis are wired the same as the one illustrated With the exception it would wire to the associate second and third driver boards. As depicted above the power supply wiring is done with the power supply as the common point. In other words there are three wires on each of the positive and negative terminals each wire running independently to the associated driver board. Wiring in this method helps to eliminate potential problems that can manifest it wired sequentially. When wiring the electronics to control your motors, the wires should be neatly routed and separated. By this I mean the wiring from the X axis driver to the x axis motor should not be routed with any other wiring. Same for Y and Z axis's. Board power wiring should be routed independently of all motor wiring. Computer signal wire routing should be independent of power and motor wiring.

Using the onboard 5VDC

By installing IC2 (7805 5VDC on board regulator) an external DC supply form 8VDC to 35VDC can be used. That power supply is connected via the X4 Wago connector. Observe polarity when connecting.

Software Setup

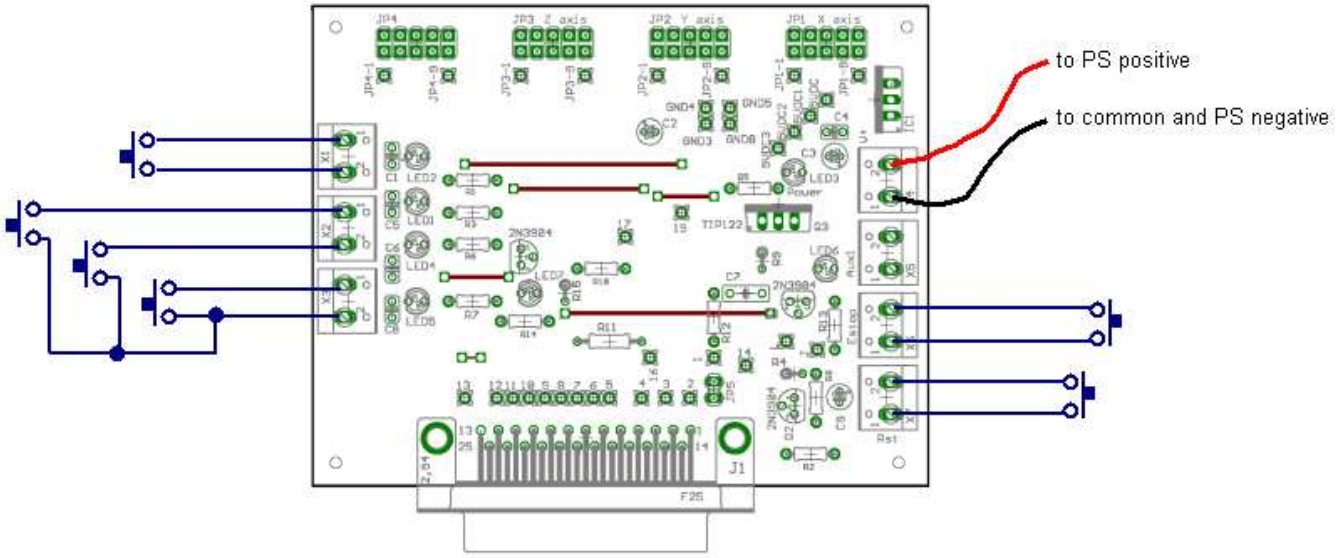
Pin 1 Aux1 output, Pin 2 X step, Pin 3 X dir, Pin 4 Y step, Pin 5 Y dir, Pin 6 Z step, Pin 7 Z dir, Pin 8 A step, Pin 9 A dir, Pin 11 X2-2, Pin 12 X2-1, Pin 13 X3-1, Pin 15 X1-2. Where X1, X2 and X3 are the connections for the switch arrangement. If you are interfacing to a stepper driver board that uses the Enable pin 1 of the IDC board (such as my 3977 boards) Pin 1 of J1 through J4 must be wired utilizing the available pads of the BOB

Optional Logic Probe

Many times getting a board running a simple logic probe that visually gives an indication of a high or low logic state is helpful. Components for the spindle driver and LED7 can be used as a logic probe by leaving out the jumper JP5 and soldering a probe wire on PAD1. By installing a wire in the PAD1 to use as a test lead the LED will illuminate when the test lead is connected to a logic hi.

Switch Wiring Options

The board has four switch inputs via X1, X2 and X3. Depending on software and machine setup, these switch inputs can be used as home or limit switches. For example Mach2 and TurboCNC can utilize Home, Limit- and Limit+ switches wired in parallel.

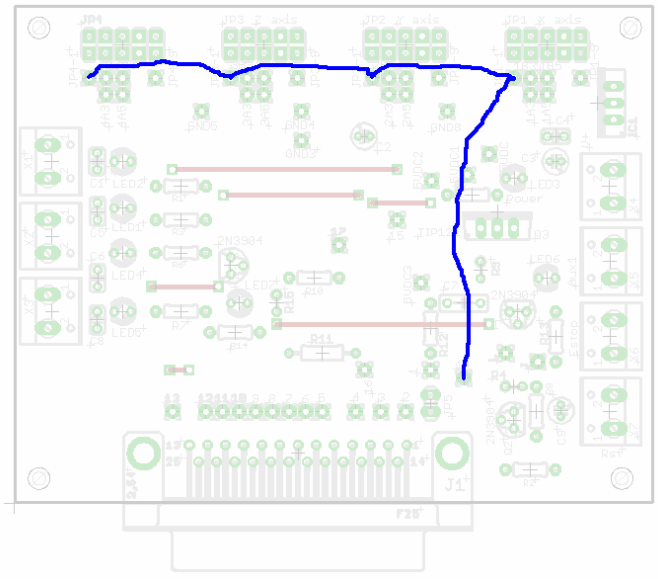


Estop Circuit

Q1, Q2 and Q4 make up a latching circuit that with a momentary short between the Estop terminals on the board will latch up until the RST terminals are shorted. This circuit can be useful to send a signal back to an input pin on the computer. To get the signal back to the PC a wire jumper from either pad J or L to one of the input pads is required. Pad L will be a logic Hi when the latch is set, Lo when reset. Pad J is the inverse of Pad L. Normally pads 10 or 15 would be used as inputs back to the computer.

Wiring a Common Enable

In this illustration four jumper wires are added connecting each motor driver Pin 1 to each other and to pin 14 of the DB25 connector. Pin 14 is an output signal from the PC. Many software packages have the ability to enable and disable the axis motor drivers.



Questions and answers

1. Q. What is the function of JP5, I remove it to use the logic probe, but what does it enable/do?

   A. JP5 when inserted connects pin 1 of the db25 to the Aux driver which doubles as the troubles shooting probe. i.e. if you want to use the aux channel for troubleshooting, don't connect a relay to X5, remove JP5 and use either the pad labeled pin 1 or the associated post on JP5.

2. Q. How does the E-Stop function. When I short the X6-1/2 terminal the led7 turns on, but does not latch,

   A. Something is wrong, as it should latch. led7 should stay illuminated until rst (x7) is shorted. The fact that the led lights, means half the latch and led driver works. Check C2, Q2, R13 and R8. When you short X6, the junction of R13 and R8 should go to near 5V.

3. Q. So what is the function of the reset button? Should it send a signal to the computer? I am testing with "Parallel port monitor" but I see no indication, and I see no connection in the schematic to the parallel port. I know it has something to do with pad J and L.

   A. You need to jumper either pad J or pad L to one of the input pin pads for the PC. Depending on software it could be 10, 11, 12, 13, or 15.
   See http://pminmo.com/pport/pport.htm for help on the data direction of the PC parallel port.

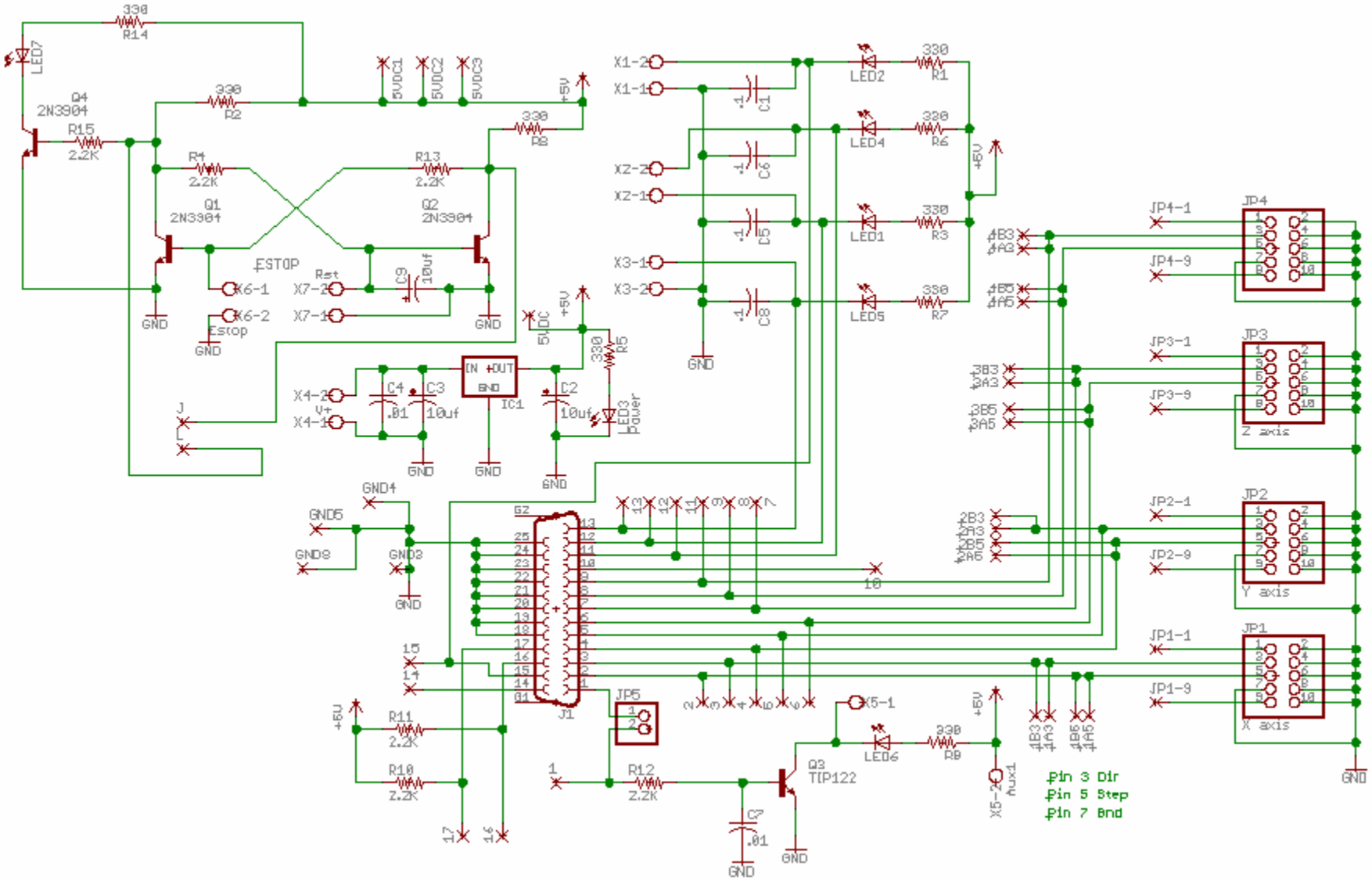
4. Q. I also see in the photos on the site from "David Anderson" he has a jumper from pad 14 to pin 1 on all the axis headers what is this jumper for? Is this the "Enable" and if so do I need to use it for either the "Old Discrete Unipolar" or the "L297 unipolar" boards?

   A. Most of the boards on my website use pin 1 of the 10 pin axis connectors as enable. They need to be pulled logic low or ground. By connecting pin 14 to each of the pin 1's, you can disable/enable all the drives via software. The Old Tachus 42 version of the Discrete Unipolar board does not, the L297 Unipolar and newer version of the discrete board does use the enable signal.

5. Q. What does the Logic Probe do?

   A. A logic probe allows a person to check logic states. All this stuff works on two states of logic, HI and LO. Think of an on off light switch. A logic probe provides a visual indication of the state of the point you probe. All the signals coming from the PC to the interface board and drivers are logic level signals, so if something isn't working properly, a logic probe makes it easier to troubleshoot. If everything is working, you don't need the probe. With this board Led6 will illuminate on a logic HI, be out on logic LO.

*Revised 8/12/06 – BOM update


330
R14
LED7
Q4
2N3904
R15
2.2K
330
R2
5VDC1
5VDC2
5VDC3
+5V
330
R8
R4
2.2K
R13
2.2K
Q1
2N3904
Q2
2N3904
ESTOP
Rst
X6-1
X7-2
C9
10uf
GND
X6-2
X7-1
Estop
GND
GND
5VDC
+5V
330
R5
X4-2
V+
X4-1
C4
.01
C3
10uf
IN +OUT
GND
IC1
C2
10uf
LED3
power
J
GND
GND
GND
X1-2
X1-1
.1
C1
LED2
330
R1
X2-2
X2-1
.1
C6
LED4
330
R6
+5V
.1
C5
LED1
330
R3
X3-1
X3-2
.1
C8
LED5
330
R7
GND
GND4
GND5
GND9
GND3
GND
G2
J1
15
14
17
16
+5V
R11
2.2K
R10
2.2K
JP5
1
R12
2.2K
Q3
TIP122
C7
.01
GND
GND
LED6
330
R9
X5-1
X5-2
Aux1
+5V
4B3
4A3
4B5
4A5
Pin 3 Dir
Pin 5 Step
Pin 7 Gnd
JP4-1
JP4-9
JP4
JP3-1
JP3-9
JP3
Z axis
JP2-1
JP2-9
JP2
Y axis
JP1-1
JP1-9
JP1
X axis
GND