TurboTaig Instruction Manual

Version: 2.2
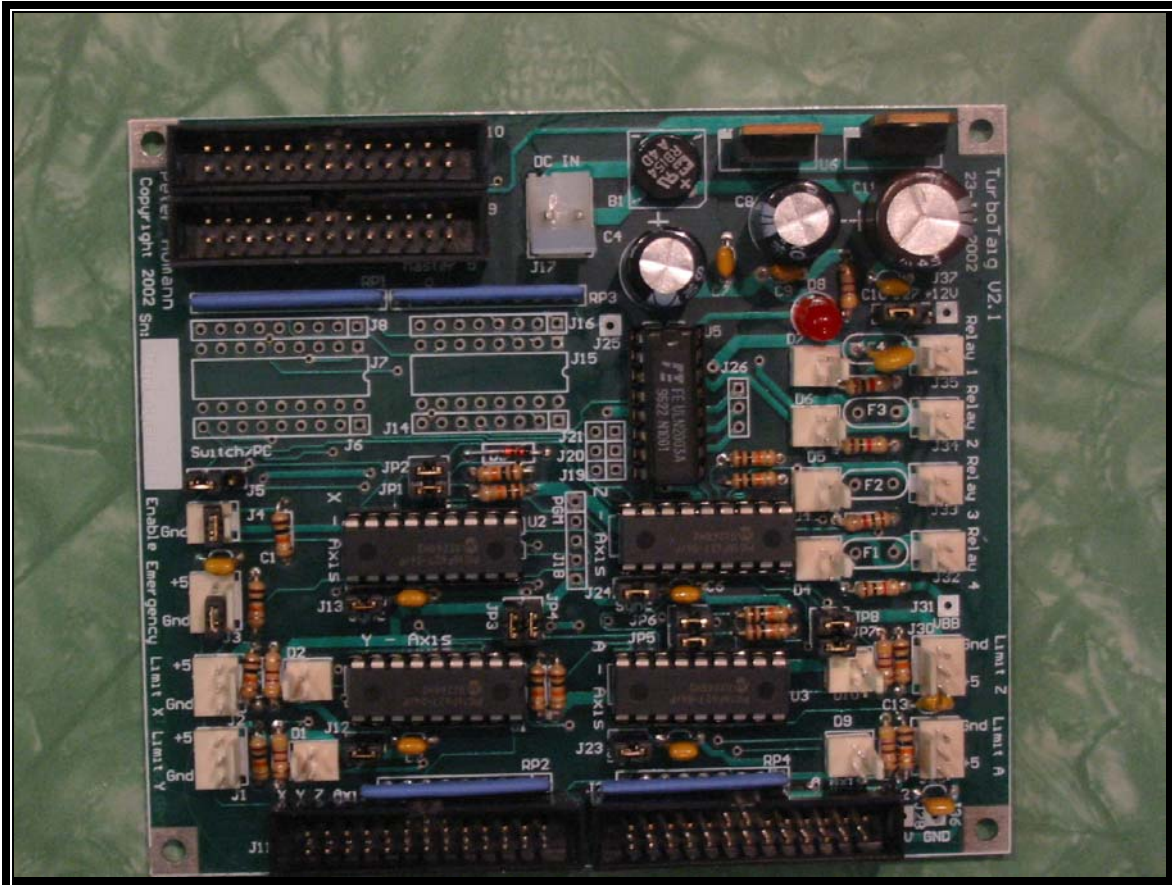
Peter Homann
20 View St
Highett 3190

homann@smartchat.net.au

http://people.smartchat.net.au/~homann

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Introduction

The TurboTaig board is an add-on upgrade to the Taig Microproto CNC Controller. The Standard controller drives three or four Stepper motors, depending on the controller version. The standard controller requires the software to provide a four-signal phase input into the controller for each stepper motor. As a consequence, sixteen printer port pins are required to control four stepper motors.

The Turbotaig board interfaces to control software via the more popular step/direction control scheme. Only two printer port lines are required per stepper motor. Just this feature allows the four axes Taig mill to be used with computers with only one printer port.

The main advantage of the TurboTaig board is that the Taig CNC mill may be used with a range of control software, both Windows or DOS based, such as Mach1, TurboCNC and others.

In addition to the step/direction to phase drive conversion, the TurboTaig board provides facilities for driving 5V relays, in addition to processing limit switch inputs.

The board easily mounts inside the enclosure with very little modification as can be seen in Figure 1.

Specification

- Controlled by four onboard Microcontrollers
- PCB
    - FR4 Material
    - Double Sided, Plated through holes
    - Silk-Screened on Component Side
    - Solder Mask on Both Sides
- 8V – 16V dc or ac power requirements (Derived from Taig controller 8Vdc low voltage power supply)
- Converts 4 axes step/dir signals to 4 wire phase signals.
- Inputs to control up to four 5V relays.
- Emergency Stop Input
- Processing for four limit/home switches (both mechanical and 5V optical switches)
- External or computer controlled enable/disable input.
- Uses a single computer printer port only.

- 4 onboard Yellow SMD LEDs for relay state indication
- 4 bicolor (Yellow/Green) LEDs for limit switch and enable state indication.
- Headers for connecting external Relay and limit indicator LEDs.
- Cables Included
    - 1 of 26Pin IDC to 25 Pin DB25 ribbon cable
    - 2 of 26Pin IDC – 26 Pin IDC Turbotaig to controller ribbon cable
    - 1 of DC input power Cable
    - Matching female connectors for on-board headers for relays LEDS and limit switches.
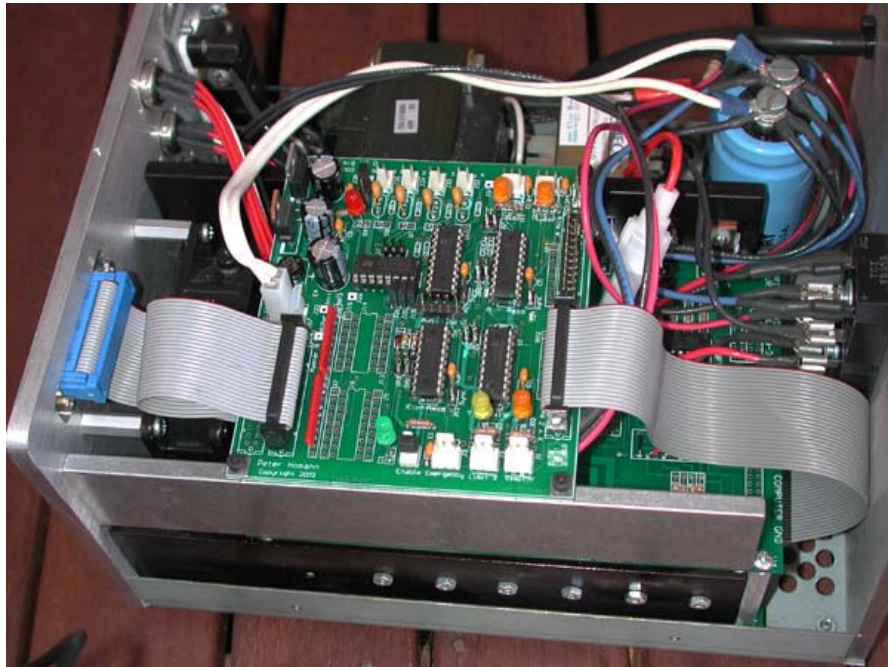
TurboTaig Board Mounting

Figure 1 TurboTaig Installation

Place the board one-third to midway along the heat sink as shown in the photo above. Use the board as a template to mark where the 4 holes are to go. Drill and tap for M3 or 1/8" bolts.

Mount the board to the heat sinks with the provided spacers to lift the board off the heat sink.
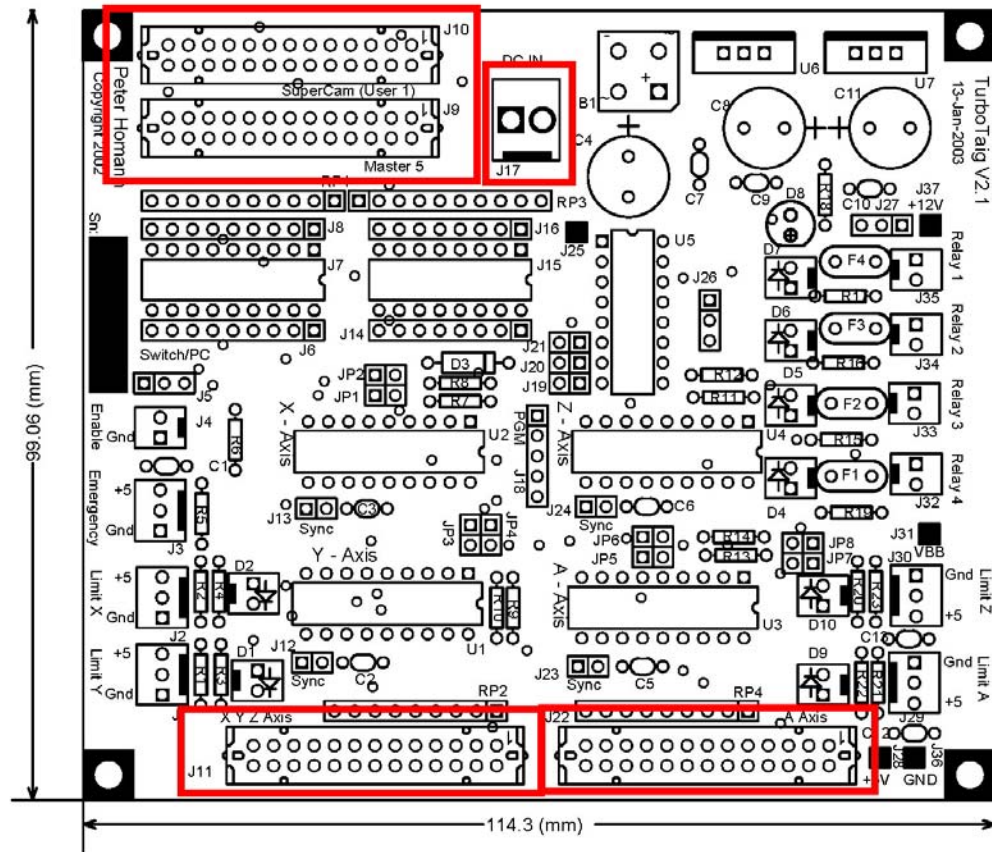
Power and Ribbon Cable Connection.

Figure 2 Ribbon Cable Connector Location

Use the component overlay diagram above to locate the connectors.

Power Cable

The power cable connects between J17 of the Turbotaig board and the large capacitor connected to the 8Vdc power supply as depicted in Figure 1. The connector has two wires. It does not matter which wire goes to which connector as the Turbotaig board has a bridge rectifier and therefore it can use AC or DC voltage.

Ribbon Cables

The ribbon cable with the 25pin D connector replaces the existing XYZ axis connector and cable. The ribbon cable for the A axis on 4 axis controllers is no longer used. The 26 pin IDC connector on the new ribbon cable plugs into the TurboTaig board, to either J10 or J9. J10 is used if you are going to use

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Supercam software in User 1 mode to drive the Turbotaig board. For any other software, such as Mach1, Master5, TurboCnc, EMC or other step/dir software, use J9. Table 1 below details the printer port pin assignments for J9 and J10

Printer Port Pin Allocation		
Printer Port DB25	**J9 - Mach 1/Master 5**	**J10 – SuperCam (User1 mode)**
Pin 1	*Out* - Relay 3	Not Used
Pin 2	*Out* - X Direction	*Out* - X Step
Pin 3	*Out* - X Step	*Out* - X Dir
Pin 4	*Out* - Y Direction	*Out* - Y Step
Pin 5	*Out* - Y Step	*Out* - Y Dir
Pin 6	*Out* - Z Direction	*Out* - Z Step
Pin 7	*Out* - Z Step	*Out* - Z Dir
Pin 8	*Out* - A Direction	*Out* - Relay 1
Pin 9	*Out* - A Step	*Out* - Relay 3
Pin 10	*In* - Emergency	Not Used
Pin 11	*In* - X Limit Switch	*In* - X Limit Switch
Pin 12	*In* - Y Limit Switch	*In* - Y Limit Switch
Pin 13	*In* - Z Limit Switch	*In* - Z Limit Switch
Pin 14	*In* - Out - Relay 4	*Out* - Relay 2
Pin 15	*In* - A Limit Switch	*Out* - Relay 4
Pin 16	*Out* - Relay 1	Not Used
Pin 17	*Out* - Relay 2	Not Used
Pin 18	Ground	Ground
Pin 19	Ground	Ground
Pin 20	Ground	Ground
Pin 21	Ground	Ground
Pin 22	Ground	Ground
Pin 23	Ground	Ground
Pin 24	Ground	Ground
Pin 25	Ground	Ground
Legend*:* ***In*** – Signal to Computer*,* ***Out*** – Signal from Computer		

Table 1 Printer Port Pin Allocation

The two remaining IDC cables connect the Turbotaig board to the 2 driver boards of the controller. The longer of the two ribbon cables connects between J11 (XYZ Axis) and the lower Controller board. The shorter cable connects between J22 (A Axis) and the upper controller board (Four axis controllers only).
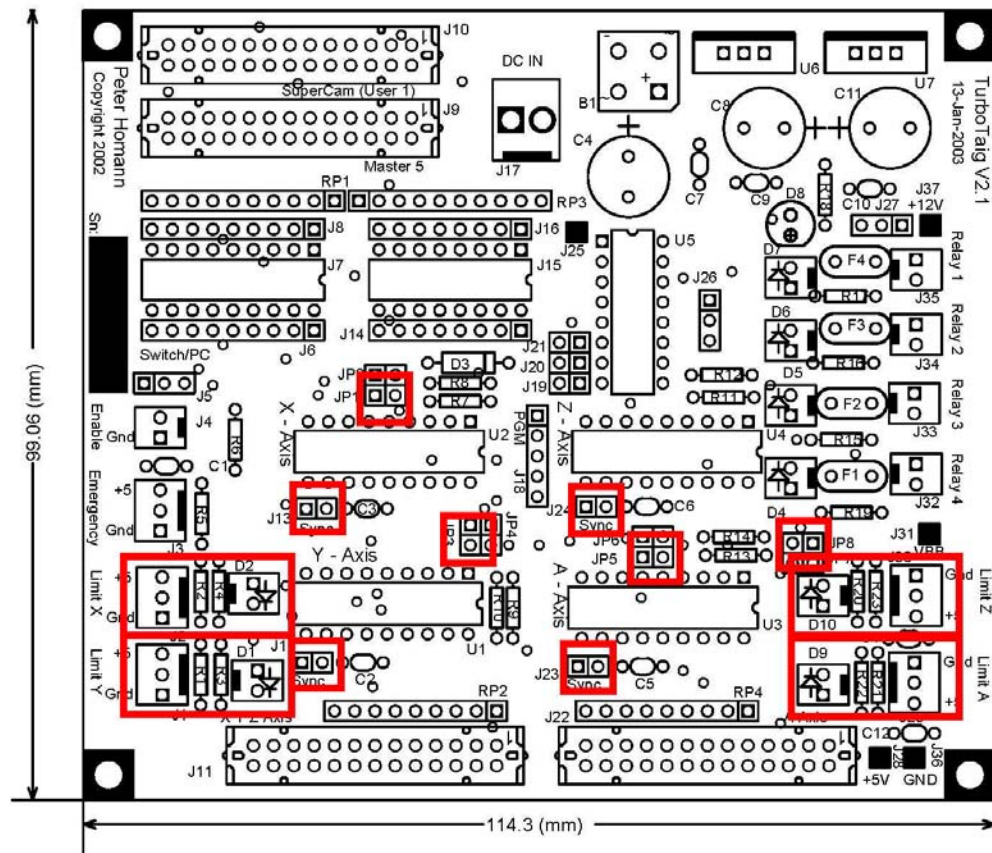
Limit Switch Setup

Figure 3 Limit Switch Connectors and jumpers

Limit switch connectors

Any limit switches to be used are connected via the three pin connectors J1, J2, J29, and J30. The connectors will accommodate simple N/C or N/O switches connected between pins 1(gnd) and center pin of the connector. Alternatively the connector can supply 5V for connection to opto interrupter style switches as well.

Limit Switch LED Connectors

Use the component overlay depicted in Figure 3 to locate connectors, D1, D2, D9 and D10. These are for connecting bi-color LEDs that are used to indicate the status of the limit switches in addition to the enable status of the TurboTaig board. Connect the anode of the LED to pin 1 of the connector, the cathode to pin 2. The anode is the longer of the two LED leads. Pin 1 of the connectors is

identified as a square solder pad on the component overlay. Pin 2 is the round solder pad.

Limit Switch Invert Output Jumpers

Use the component overlay depicted in Figure 3 to locate jumpers J1, J3, J5 and J8.

These jumpers, when installed will invert the state of the limit switch output to the printer port. The switches are normally active hi. That is, when the limit switch is grounded the limit LED will illuminate, and a logic 1 will be output to the printer port. With the jumper installed the signal to the printer port will be active lo. That is, when the limit switch is grounded, the LED will illuminate and the output to the printer port will be 0V.
Note: The orientation of Jumper J3 and J4 is vertical. All other jumpers are horizontally oriented

Limit Switch Sync Jumpers

Use the component overlay depicted in Figure 3 to locate jumpers J12, J13, J23 and J24. These work in conjunction with the limit switches. If the jumper is not in place, the limit switch works as described above. If the jumper is installed the limit switch functionality is modified as follows.

When the limit switch is closed the LED will illuminate either RED or GREEN.

RED indicates that the limit switch is closed and that the stepper is positioned at phase 0. The limit output to the printer port will be active. (Hi or Lo depending on the Limit Switch Output Invert Jumper.)

GREEN indicates that the limit switch is closed and that the stepper is positioned at phases 1 to 7. The limit output to the printer port will be inactive. (Hi or Lo depending on the Limit Switch Output Invert Jumper.)

Using this feature improves the repeatability when using the limit switches as home position switches. As the axis moves and the limit switch closes, the Led turns Green; the axis continues to move until phase 0 is reached, a maximum of 7 steps. The Led will turn Red and the limit output to the printer port will become active. The computer should then stop moving the stepper.
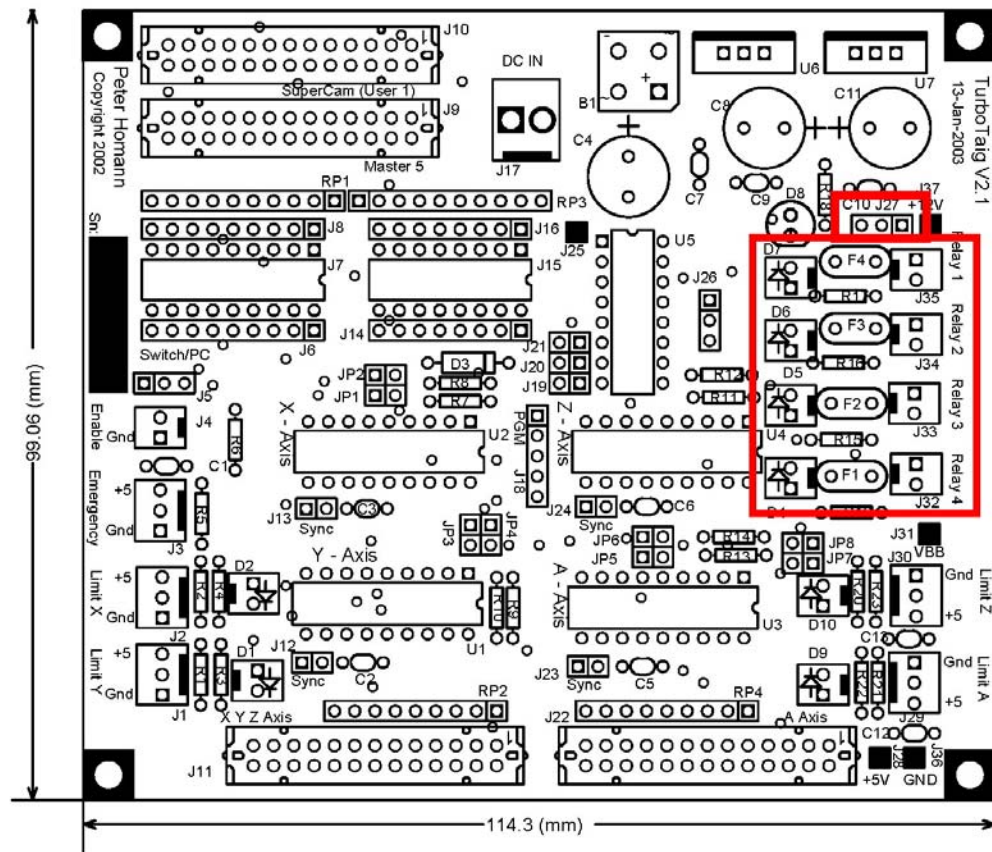
Relay Coil Drive Setup

Figure 4 Relay Coil Connectors and Jumpers

Relay voltage Jumper.

Jumper J27 determines the voltage supply for the relays. If the board is powered from the 8VDc supply of the controller, this jumper should be set to the 5V position, as 8Vdc derived from the Taig Controller power supply will not drive 12V relays. For 5V the jumper is positioned between pins 2& 3 of the connector.

Relays Coil Connectors

Use the component overlay depicted in Figure 4 to locate jumpers J32, J33, J34 and J35. These connectors are connected to the coils of the relays being used. The poly-switches in line with the coils are rated at 170mA. The poly-switches are there to protect the drive circuitry when the relay coils outputs are

inadvertently shorted. Relays with a coil current of less than 100mA are preferred.

Relay Switch LED connectors

Use the component overlay depicted in Figure 4 to locate the Relay LED connectors D4, D5, D6 and D7. These LEDs illuminate whenever the coil relay is energized. Connect the anode of the LED to pin 1 of the connector, the cathode to pin 2. The anode is the longer of the two LED leads. Pin 1 of the connectors is identified as a square solder pad on the component overlay. Pin 2 is the round solder pad.

Relay Input Invert Jumper

Jumpers J2, J4, J6 and J7 are used to invert the relay coil activation signal. With jumper removed the relay is activated by a 5V signal from the printer port. With the jumper installed the relay is activated by a 0V signal from the printer port. Note: Try to set up you system so that the jumper is installed. This is for safety reasons. If the relays are activated by a 5V signal, they may turn on if the printer cable is not plugged into the computer.
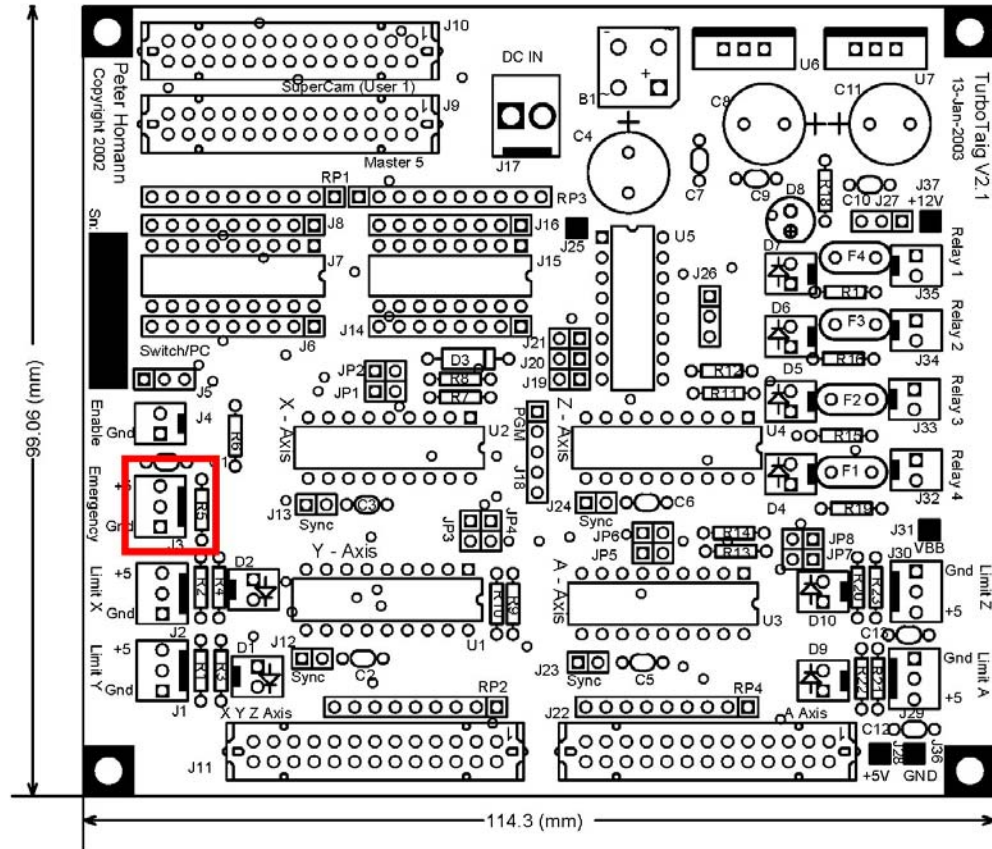
Emergency Switch Input

Figure 5 Emergency Switch Connector

Use the component overlay depicted Figure 5 to locate the Emergency Stop connector J3 The emergency signal connects directly to the printer port. It is usually an active high signal. That is, an emergency situation exists if the signal is not at 0V. This way, the software will trigger an emergency stop when the printer port cable is not plugged in. If this signal is not used, a jumper can be placed between the GND and center pin of J3.
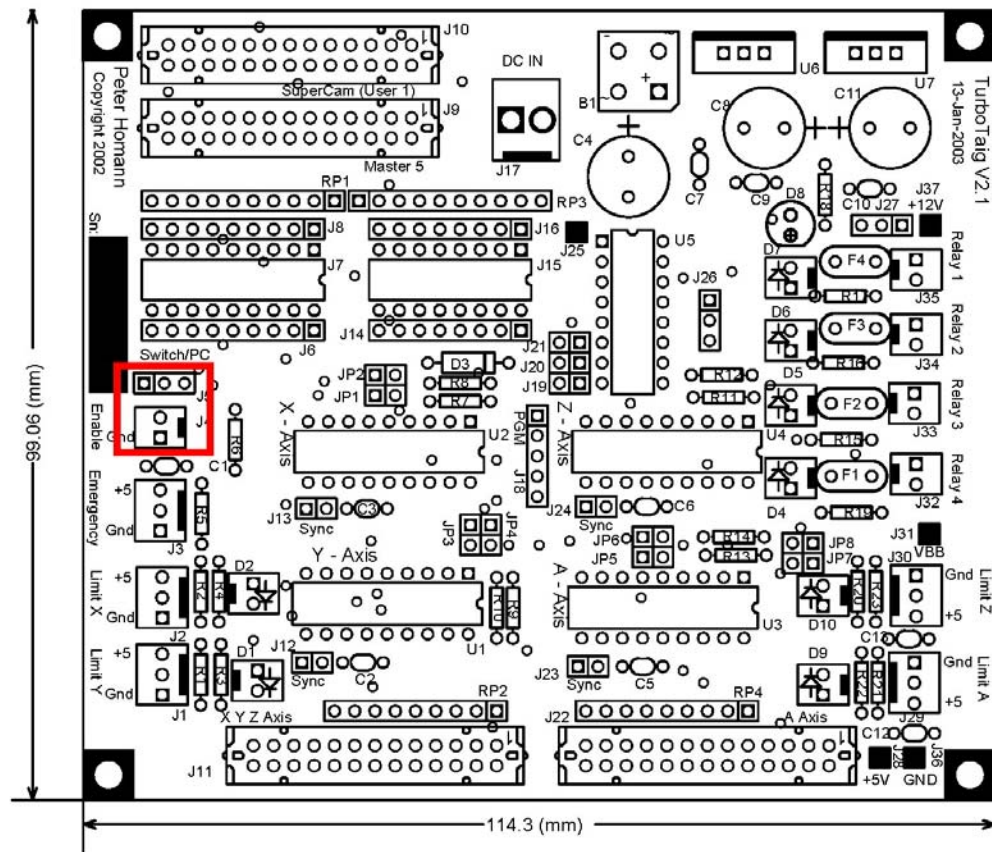
Enable Input

Figure 6 Enable Switch and Source Jumper

Use the component overlay depicted in Figure 6 to locate the Enable switch connector J4 and the PC/Switch selector jumper J5.

Enable source Jumper

Jumper J5 selects where the TurboTaig board enable signal is to come from. If the jumper is in the PC position, the enable signal comes from the relay 4 input signal. It is an active lo (0V) signal. The board will be disabled when at 5V. When in this position, only three relays can be driven as the 4th relay control signal is used as the enable signal.

When J5 is set to the Switch position, an external switch will need to be connected to J4. When the switch is in the closed position the enable signal will be grounded, enabling the board.

Enable switch connector

The logic 0 enable signal can come from the enable switch connector J4 or from the computer. If the enable signal is logic 1 (disabled) all relays will be turned off, and the limit switch LEDs will flash between RED and GREEN indicating that the board is disabled.