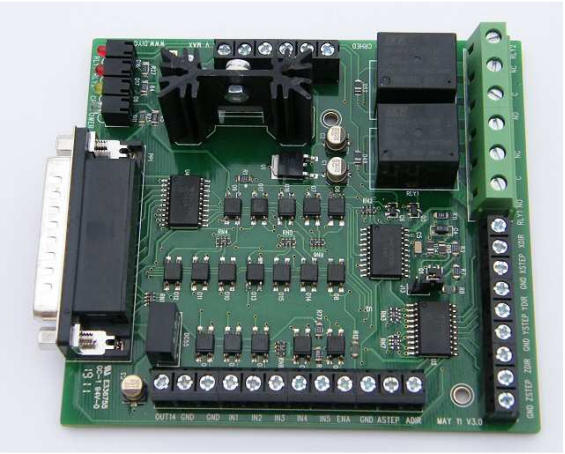
Optoport V3

C R H Electronics Design



Optoport V3

Optical isolated Parallel port interconnection board with high voltage regulator, charge pump and relay control circuits

By C R Harding

Specification

- Full optical isolation of all inputs and outputs.
- Four XYZA Axis outputs to stepper control boards.
- Integrated Charge pump logic line protects all outputs.
- Five logic input lines with built in pull-ups.
- Onboard high voltage regulator (70V Max).
- Reverse power polarity protection
- LED status indicators for Power, CP, Relays 1 & 2.
- DC/DC isolated power convertor
- Double buffered Charge pump and step signal lines for computers with weak drive levels
- Up to 40Khz step signal frequency.
- Board size 91 X 108 mm. FR4, Immersion gold, 1oz copper, RoHS compliant.
- Two 10A control relays with 2 way contacts.
- Surface mount components for greater reliability and 20% more compact than previous versions
- 5V & 12V spare power output rails (100mA max)

Manual V3.0 June 11
Hardware V3.0 June 11

The Optoport board is an optical isolated parallel breakout board with the addition of a charge pump circuit and relay control outputs. It is always a worry when connecting equipment signals together that there are not offset voltages or ground differentials that could effectively damage the computer

ports or worse. By using Opto-isolating buffers on all signals between the two pieces of equipment you effectively remove the direct ground connection and any other offset voltages present. The worst case scenario is that the optical units themselves or buffer chips may be damaged; it would take thousands of volts to break the barrier that they provide. Unlike the basic parallel brake-out boards the Optoport board has designated X, Y, Z & A motor control step and direction pins that will need to be matched in the user software. The step signals are now double buffered to improve performance and stability if the computer used has weak drive level. The chart fig1 gives the pin-out reference used in the design. The Charge pump circuit uses the 12 KHz signal on pin one of the parallel port generated by the CNC software when the program is up and running correctly, this signal is also double buffered to improve stability. The logic level obtained from the signal controls either an enable or sleep pin on the stepper motor drive board or boards. This effectively prevents any false movement of the motors while the machine is being powered up or down or even a software crash condition. Version 3 hardware has a charge pump override jumper J13. This can be used for test purposes or connected permanently if your software does not support a charge pump signal.
The charge pump signal is gated into the buffer chips so that they are disabled without this signal present. This means that driver boards that have no enable signal pins are still made safe by having their input signals removed. This charge pump signal is also gated into both relay outputs so no false triggering of the relays can occur while the software is not running. Unlike the basic parallel boards the Optoport has its own high voltage pre-regulator circuit. This enables higher power rail voltages from stepper motor boards to a 70V maximum. The 12Volt output from this circuit is then passed to standard 5V regulator to drive the IC's. An external 5V and 12V terminals are made available to feed other circuits, sensors, etc. The Optoport board has five signal inputs. All of the inputs have a pull-up resistor to power creating a logic high condition. You may wire micro switches directly between input and ground to create a logic changing input with no additional components. The inputs on this latest version are low impedance eliminating noise problems from adjacent wiring that sometimes effected the older versions of the board. Do not apply more than 5Volts to these inputs if being driven from other sources.

Notes : The control software must have the charge pump signal set to pin1 and be present for the board to be enabled unless the override link is on.

Parallel Port Pin	Optoport Output	Input/Output
1	Charge pump signal	Out
2	X Direction	Out
3	X Step	Out
4	Y Direction	Out
5	Y Step	Out
6	Z Direction	Out
7	Z Step	Out
8	A Direction (4th Axis)	Out
9	A Step (4th Axis)	Out
10	Input 1	In
11	Input 2	In
12	Input 3	In
13	Input 4	In
15	Input 5	In
14	Output	Out
16	Relay2	Out (SPDT)
17	Relay1	Out (SPDT)
18-25 computer ground	Isolated ground reference	

Connections

A typical system wiring setup is shown in Fig 2. The latest board has a DC/DC power convertor eliminating the USB cable needed on previous versions. This provides power for part of the input isolators and the first set of buffers. A standard parallel port 25 way male to female lead provides all the signal information. Power for the Optoport is usually taken from the stepper motor supply rail or voltage source. The minimum requirement is 15V with a maximum of 70V. If this voltage range is not available then a separate power supply will be required. It is also recommend not to use the board to supply external 5 and 12 volt power if the input voltage is over 50volts due to the increased power drop in the regulator circuit.
Fig3 is a simple limit and stop switch serial circuit using two ports back to the computer. All switches are normally closed; any switch operation breaks the ground circuit and lets the input go high. The E-stop button is on it's own input. Configure controlling software to stop on change of input signal pins. Other inputs could be used for home switches or separate banks of limit switches for each axis.

The software manual usually describes these functions in more detail.
Fig4 shows connecting relay output two to controlling spindle motor and Relay one a coolant pump. The pump or motor is simply connected to the normally open connection and power applied to the common. Activating the relay closes the contacts completing the circuit. Utmost care should be taken handling the Optoport board when there are live mains connections connected to the PCB as the relay terminals are exposed on the underside of the board. It is better to bolt the board down to the case or a side panel with a small gap to stop fingers being inserted underneath.

Fig2

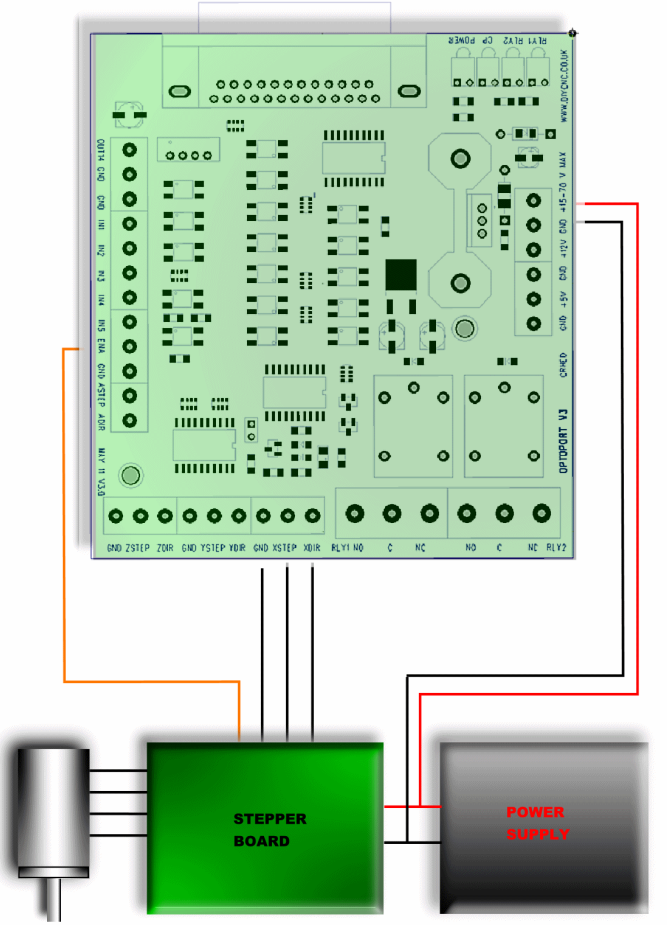


Fig3

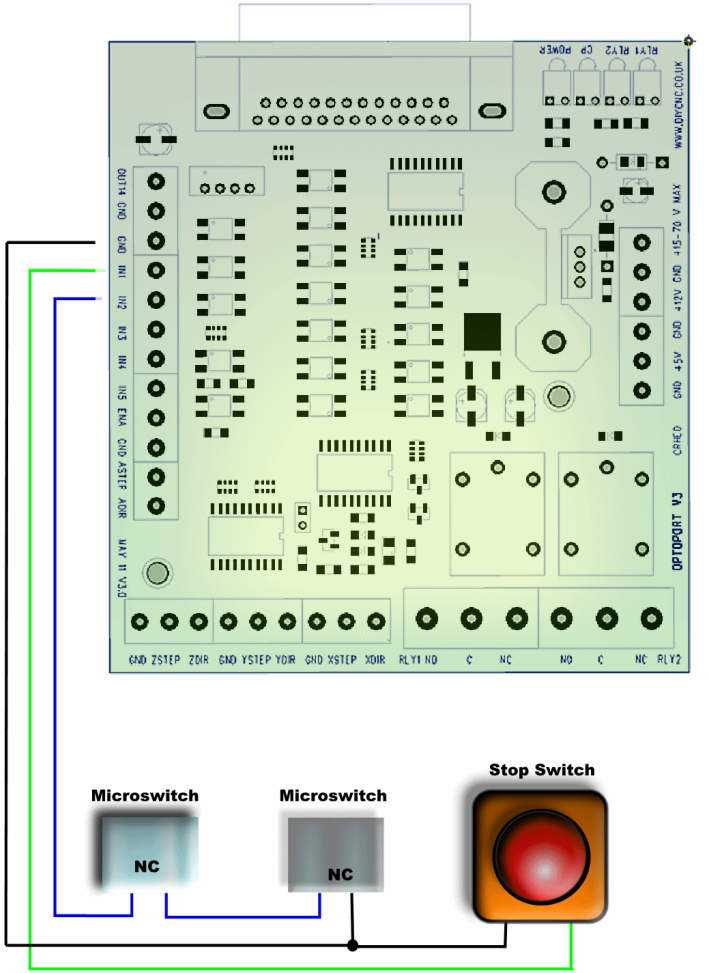
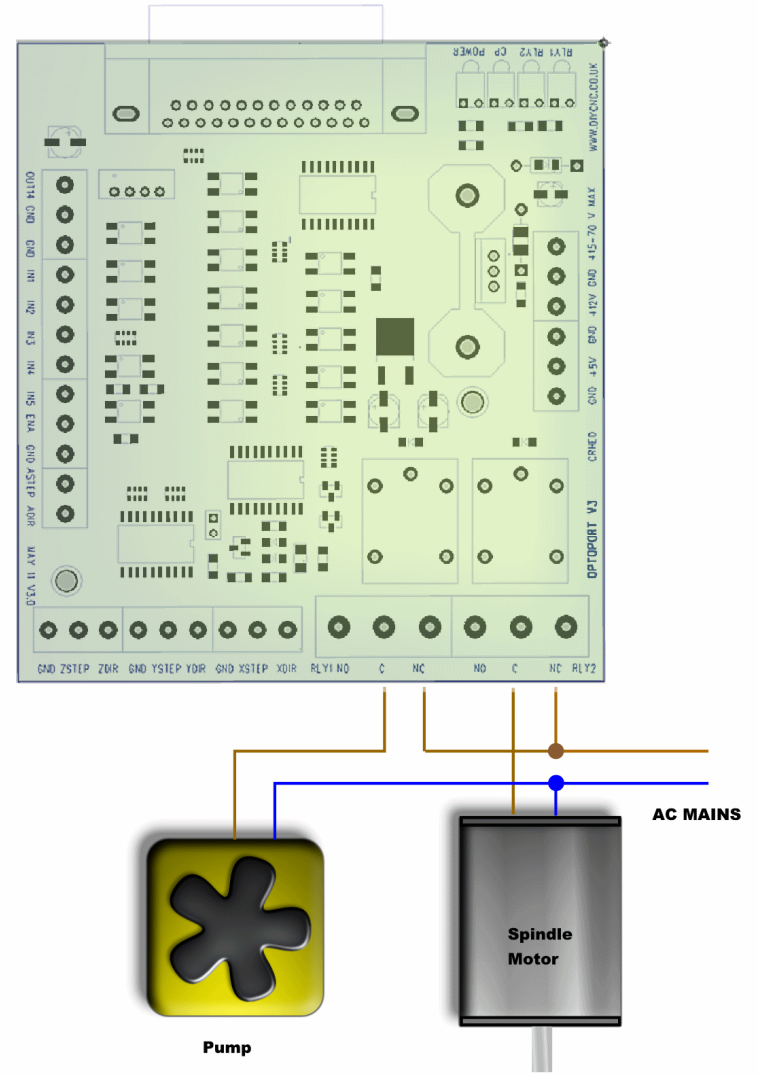

Microswitch
NC
Microswitch
NC
Stop Switch
OPTOPORT V3
GND ZSTEP ZDIR GND YSTEP YDIR GND XSTEP XDIR RLY1 NO C NC NO C NC RLY2

Fig4


GND ZSTEP ZDIR GND YSTEP YDIR GND XSTEP XDIR RLY1 NO C NC NO C NC RLY2
OPTOPORT V3
AC MAINS
Spindle
Motor
Pump

Contact Details

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Dimensions