

Assembly manual for of the opto interrupt PC boards. CS-1T, CS-1M, CS-1B & CS-1V

What are the opto interrupt boards (here after called Opto's) ,and what do they do?

There are four opto PCB's (**P**rinted **C**ircuit **B**oards) . CS-1T (T for top), CS-1M, CS-1B and CS-1V (V for Vat). These are well made and professionally etched by an industrial PCB manufacturer .They slide into the main column aluminium profile to provide a optic sens path for the stage in the Z- travel direction ,(up / down).

How the OPTO INTERRUPT switches work:

The U-Shape (black component) has a ultraviolet (**UV**) transmitting LED (**L**ight **E**mitting **D**iode) in one vertical leg, and a optical UV transistor receiver switch in the other leg. When the printer is switched on, a constant beam of UV light is projected in between the two tiny 0.3mm slots inside the legs. The transistor receiver side keeps the SIG middle line low / off as long as the beam is not interrupted. A 0.3mm thick x 50 mm long aluminium blade is attached to a carriage that travels up and down the main column of the printer. This thin blade is aligned with the white center line on the Opto PCB's and slides exactly through the center between the two sensory legs to interrupt this UV beam. This cause the receiving transistor switch the middle **SIG** line ON / pull high to **5V+**. This is **HIGH** signal is sent to the Arduino Micro controller for processing.

If the top opto switch is interrupt or triggered, The Micro controller knows to stop the carriage as not to damage the hardware, thus its called the **Top limit Opto Switch** . If the middle opto is triggered it knows to slow down and not to splash the Stage into the resin , thus the name **Middle Slow down Opto switch**. The bottom one is calibrated to be exactly 0.1mm (100 Microns) above the VAT floor. If the bottom opto is triggered it knows to stop , thus the name **Bottom Limit Opto Switch** .

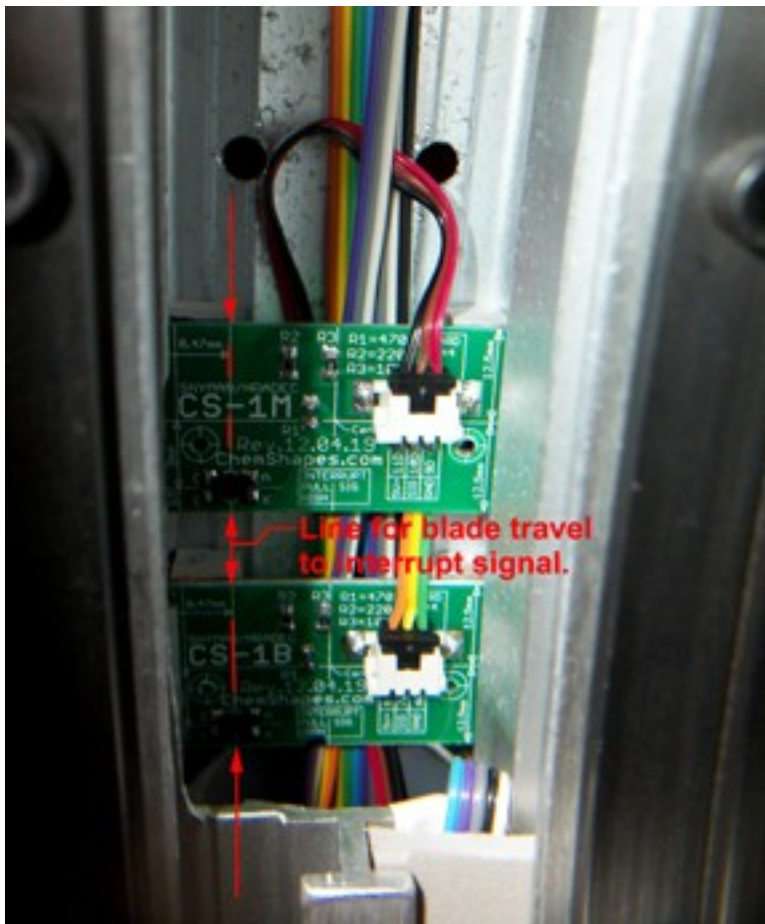
So the main function of the OPTO switches is to tell the Micro controller where the stage is, to calibrate the heights at the startup initialization process. The blade travel path or line is indicated with a white line through the center of the opto interrupt switches on the boards, 8.47mm from the left side. Also see the manual “[How does the CS-1 work](#)”.

And also read the introductory “Solder Tips” on pages 1-3 here:

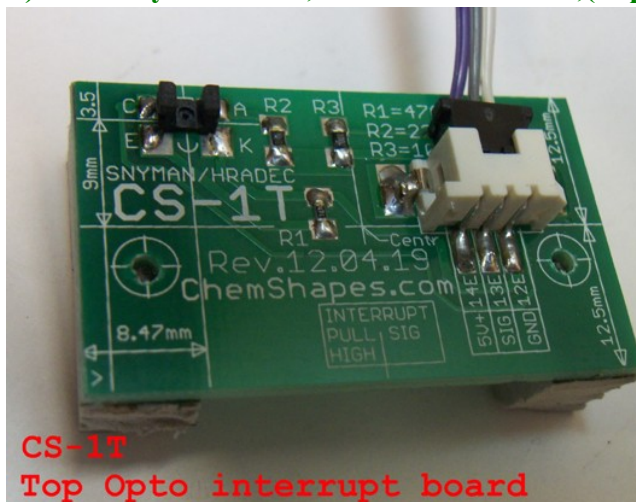
http://www.chemshapes.com/wp-content/uploads/2011/06/Chemshield_assmbly_-instructions..pdf

The opto boards are simple and straight forward .The component values and location are pretty much self explanatory on the boards. The main column opto board's headers/connectors are all flat (parallel to the boards) , and the vat header stands up 90 deg. They are all surface mount connectors SMD's a acronym for a **S**urface **M**ount **D**evelopes.

See the boards installed in the column below.



3) Assembly of CS-1T, CS1-M and CS-1B ,(Top, Middel and Bottom Opto boards).



CS-1T
Top Opto interrupt board

3.1-) A **very small** dab of “Super Glue “ can be used to hold the components in place, apply with the tip of a toothpick... Note!! **DO NOT** let it run into the the solder holes or between the solder pads and wire leads. Use common sense here.

The top opto PCB has (6x) components.

Solder the SMD's resistors first:

R1 = 470 Ohm (Current limit for Arduino).
marked “471”

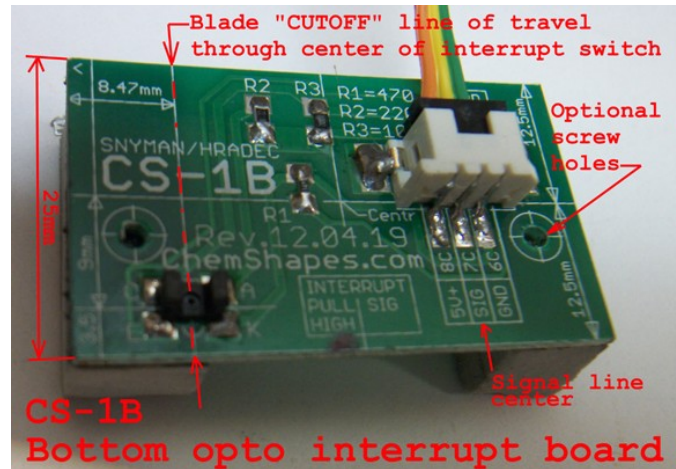
R2 = 220 Ohm (Current limit for UV Led in the Sensor) , marked “2210”

R3 = 10 K-ohm Pull up resistor for the opto switch ,marked “102”

3.2-) Solder the black U-Shaped opto interrupt switch. The blade travel path or line is indicated with a white line through the center of the opto interrupt switch on the board, 8.47mm from the left side. There is a embossed “boss” pin on the underside for correct alignment and polarity into the PCB . A half circle “)” and a square “]” marked on the white center line on the PCB indicate the orientation. The flat end of the boss pin goes to the “]” side and the round end goes to the “)” side in the slot.

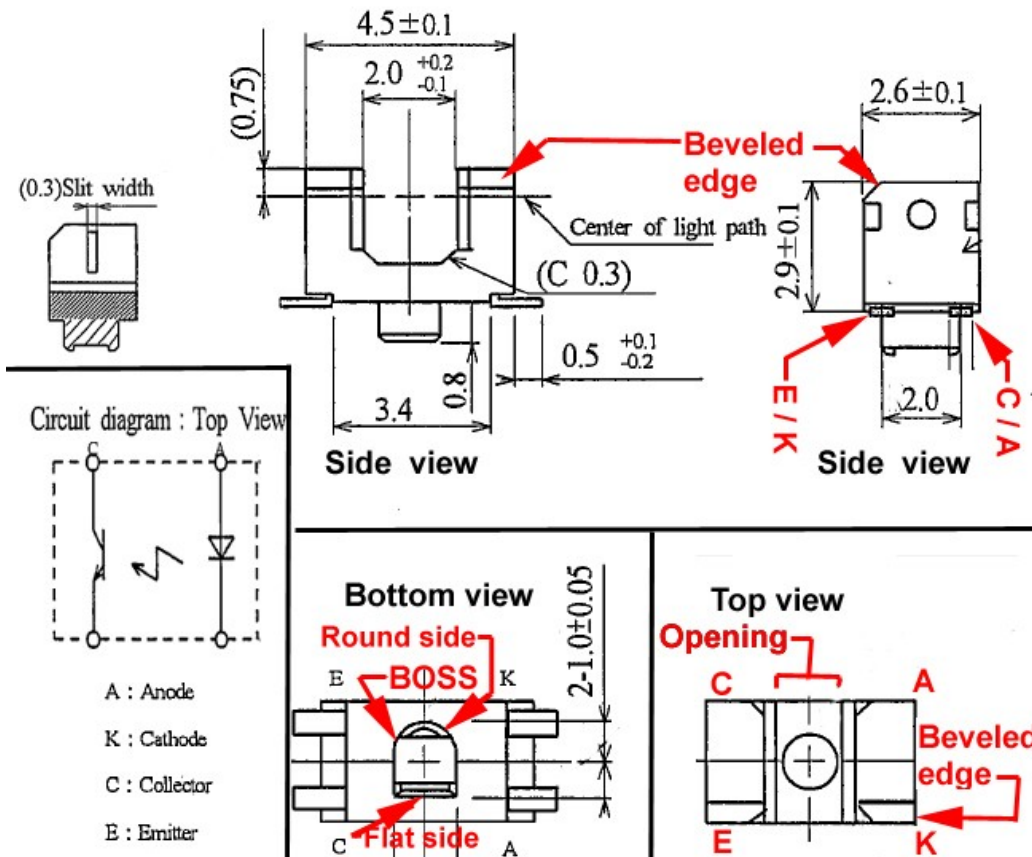
3.3-) The white Surface mount PCB Header/connector

Orientate the 3 position connector as per picture , use a little super glue if needed, center it on the pads, then solder just the middle signal wire to hold it in place .Now solder the 2 side main holding terminals on the side of the connector then the rest of the terminals , 5v+ and GND.

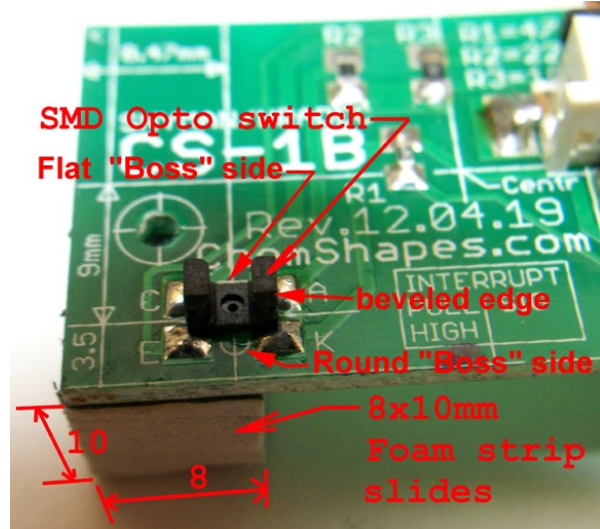
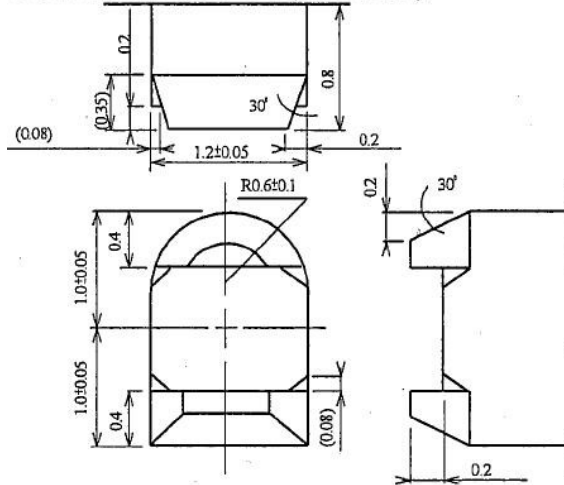


The Optical Interrupt switch data:

The data sheet if needed : http://www.sharpsma.com/webfm_send/1200



Details of boss dimensions (Scale : Free)

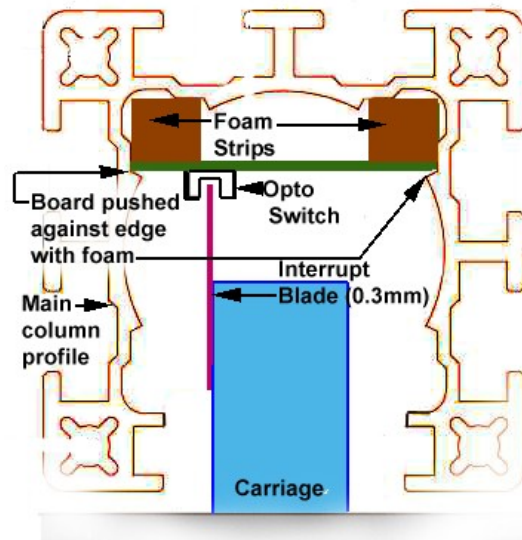


The Embossed pin on the bottom Detail:

3.3-) The Foam strips.

2x Strips of foam gets glued onto CS-1T , CS-1M and CS-1B

Cut 2 foam strips 8mm wide x 10mm deep x 25mm long and glue with contact cement to the underside of the PCB on both sides(see picture) These are used for pushing the PCB onto a ridge in the aluminium column profile and parallel align them inside the column. This will force enough pressure to keep them firmly in place without shifting . We have provided 2 optional screw holes in the PCB. Small self tapping screws can also be used to secure it even more so it does not move . It can also be used for other means of mounting on different hardware. If you drill them bigger for any reason, be careful not to damage the copper traces adjacent to them. I have found that the foam alone works good enough, and it makes it super easy to slide for calibration and fine adjustments.



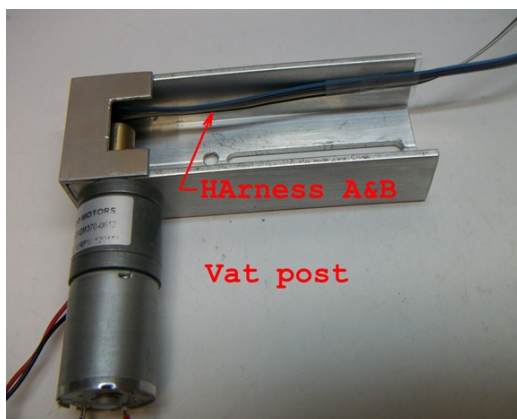
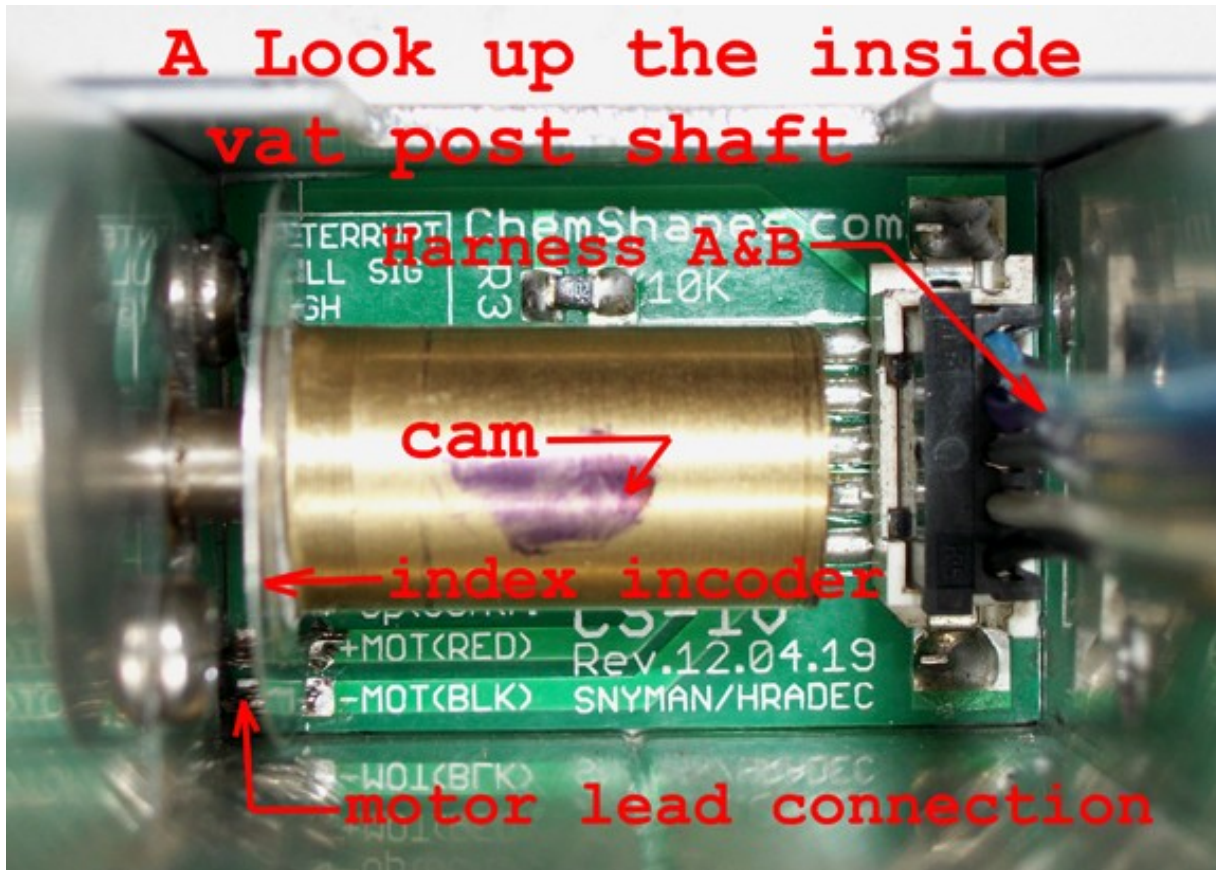
Opto PCB's pushed against profile corner edge with foam strip

6) Assembly of CS-1V , Vat release Opto in the Vat post.

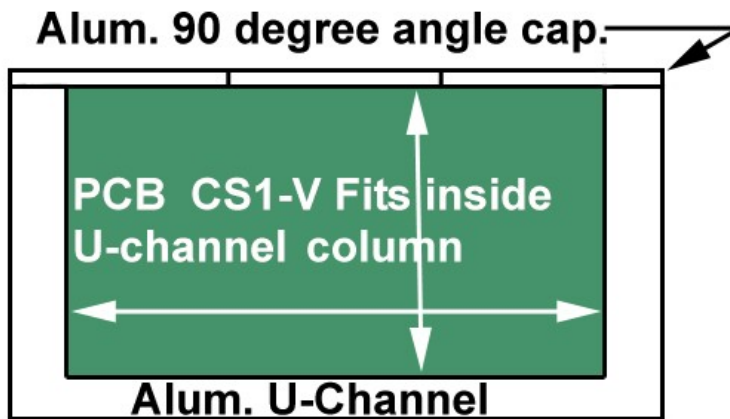
6.1-) The 3x SMD resistors:

Use the same assembly instructions as for the first 3 opto boards.

6.2-) This board uses a 5x position 90 degree connector. It also has two boss pins for the right orientation. See picture. Make sure the boss pins goes all the way into the holes. Orientate and solder the same way as the 3 position connectors.



6.2-) The white Surface mount PCB Header/connector:
 Orientate as per picture , use a little super glue if needed, center it on the pads and sweat solder just one wire lead the GND. in the middle to hold then do the 2 side main holding terminals and then go back to the rest of the terminals .

6.3-)Very Important:

The CS-1V PCB gets glued onto an angled aluminum cap on the inside of the vatpost with contact cement. It fits snug inside the 3x legs of the aluminium U- channel ...Make sure there is no solder tails or wires that sticks over the edge of the board!!! . It can cause a short and damage the electronics. All the traces ,components and solder should stay at least 0.5mm (to the inside) from the edge of the board.

Bottom view of vat post**6.4-) Solder the 2x DC Motor leads onto the pads**

Black on mot -

Red on mot+

~The end ~

This was compiled by TJ. Snyman , ChemShapes .

Please report any errors to : snyman@cfl.rr.com.