# MAGNETIC SWITCH

for sea kayak by Damiano Visocnik

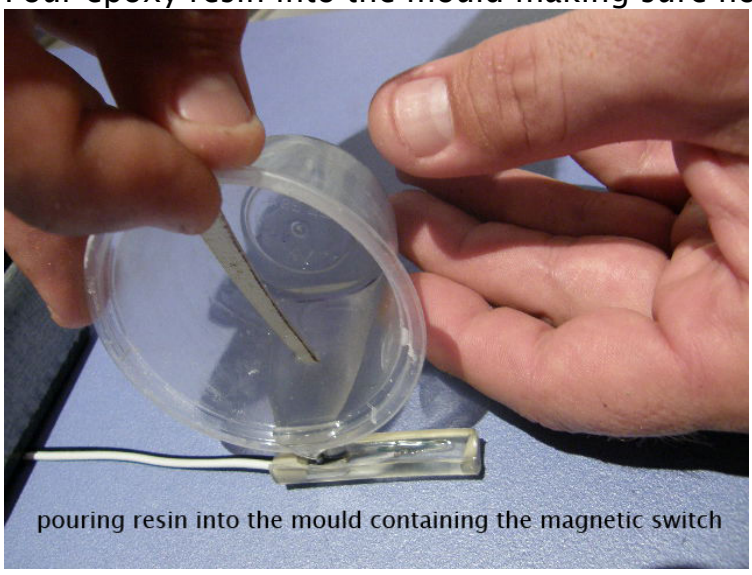
After trying out various types of switches for the operation of my electric bilge pump and after several ones failing (water ingression) I have designed one without internal moving parts.
The typical toggle switches that are commercially readily available generally work quite well as long as the waterproof booth covering the toggle does not get damaged and pierced.
A through hole toggle switch requires drilling the deck of the kayak and it leaves a large hole in the deck once removed (if repositioned).

My design of a magnetic switch is based on Silvio Testa's (QSKC president) version.
The switch is made up of two parts:

a) the magnetic activator (magnet) above deck
b) the magnetic switch below deck

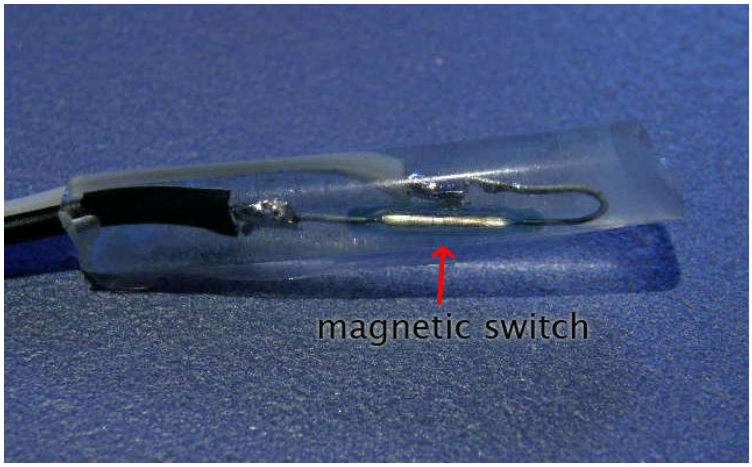
## Manufacture of the switch.

The magnetic switches can be purchased ready made but the units I have seen are rather bulky.
Some electronic components stores sell very small glass ampoules that contain a tiny ferrous flexible blade that can be triggered and closed (turned on) with a magnet.
Solder the ends of the ampoule to some quality figure of eight electrical wire.
Find a suitable small container that will act as mould. I used a piece of clear PVC hose, cut in half, lengthwise.
Position the ampoule horizontally making sure that the flexible blade is facing up correctly.
The magnet will not close the blade (make contact) if it is positioned on its side.
Seal the ends of the container with something (hot glue gun, chewing gum etc.) that will contain the resin making sure you seal well around the wires.
Pour epoxy resin into the mould making sure no wires are left exposed.



pouring resin into the mould containing the magnetic switch

Once the resin has cured remove the now hard switch unit from the mould.




Clean up the edges and the surface that will be attached to the underside of the kayak's deck.

The magnet part is made up from a rare earth magnet, a piece of steel (bolt head) and a plastic cap.
I purchased my cap at a hardware store (cap used for the end of a chair's leg).
You can use the cap of a soft drink too.
Find a decent size of steel that will fit into the cap. I cut off a head of a large bolt.
With the cap facing up, place a spacer at the bottom, high enough to later allow for drilling a hole into the cap. I used a small strip of non corrugated cardboard coiled to support the nut.
The cardboard will soak in the resin and seal the nut/rear earth magnet.
Position the piece of steel and then the rare earth magnet.
The whole assembly should still be below the rim of the cap.
Pour epoxy resin into the cap.

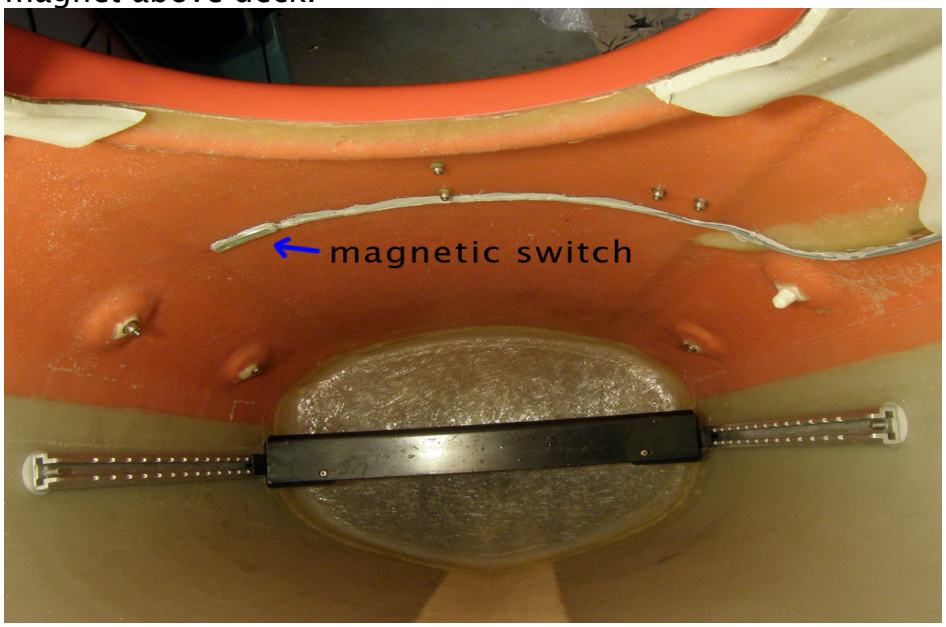


Remove any air bubbles with a pin.
Once the resin has cured, carefully drill a hole right on top of the cap just large enough to fit the bungy cord found on the foredeck of your kayak.

## Installation of the switch.

I find that the best position for a magnetic switch is on the deck in front of you.
I use the bungy cord of the foredeck to slide the magnet into on-off position.

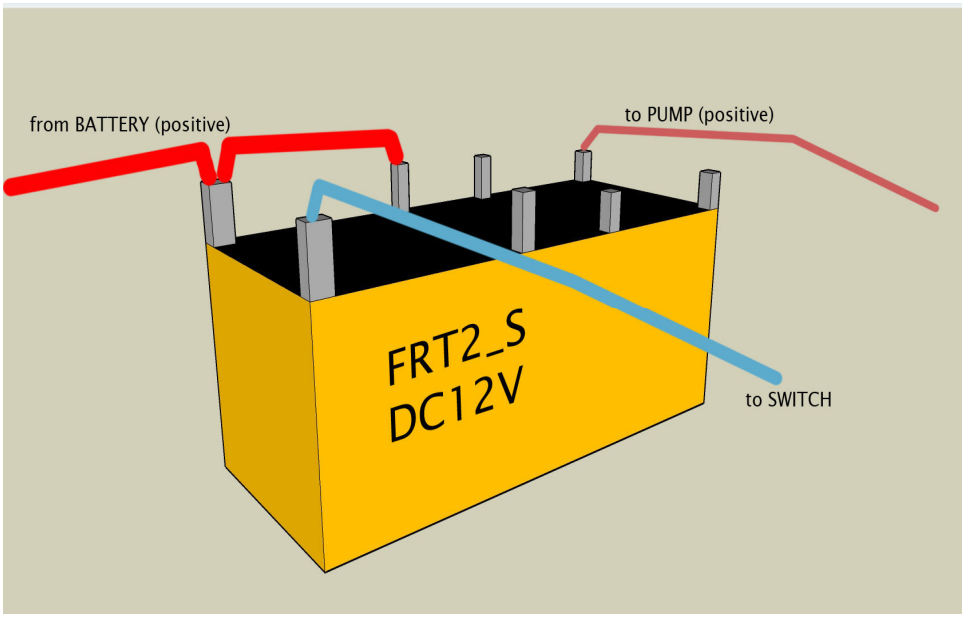

The magnetic switch will be positioned directly under the deck in the same position of the magnet above deck.



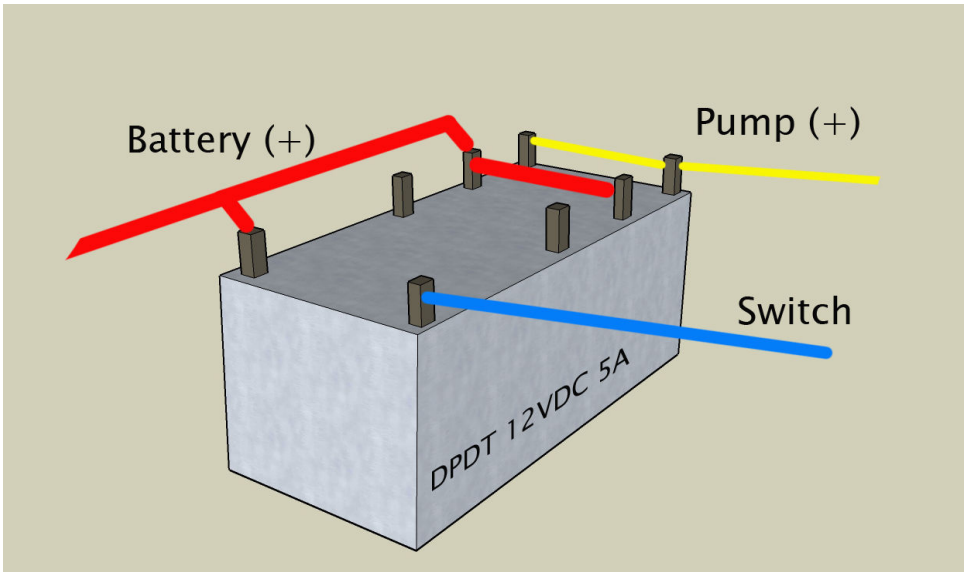

When the magnet and the switch are together the circuit will be closed (ON) and the electric bilge pump activated.
To switch off the pump simply slide the magnet to the side, away from the switch.
There are no holes, no mechanically moving parts, no chances of corrosion.
The magnetic switch is not rated (strong enough) to handle the 1.9 A bilge pump.
A relay will be necessary to handle to load of the pump. I positioned my miniature relay next to the battery, inside the waterproof box. Some electrical knowledge is necessary to wire up the relay correctly to the switch. The wiring of the relay is probably the most intimidating task, although very simple if you have a diagram.

There are two types of mini relays available locally: from Jaycar or from Dick Smith Electronics. The wiring up of the relays is specific to each one:

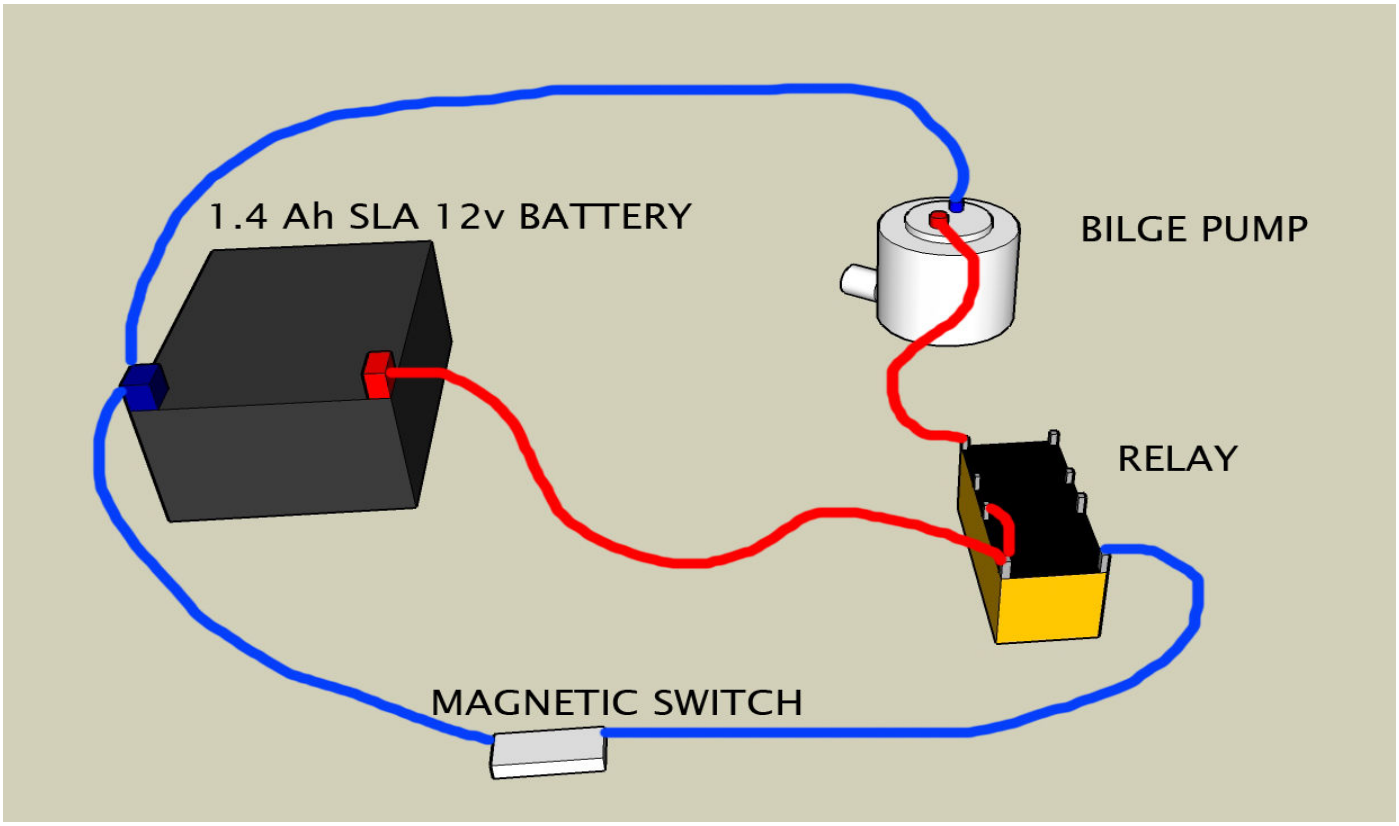
1) Jaycar one: (FRT2-S part. CAT. NO. SY4059)




2) Dick Smith Electronics one: (DPDT 12VDC 5A part. # P8032)




The best location for the relay is probably in the Pelican box next to the battery
A wiring diagram for the whole system should be like this:




I have omitted the fuse between the battery and the bilge pump.
It is not essential to the operation of the pump but is advisable in case something short circuits and will protect the pump or battery from damage.

My knowledge on electronics is very limited and this document has been compiled with the assistance of an electrical engineer.
Any use of a different relay then the ones specifically mentioned in the document might need a different wiring up.
Please do not ask me to help you there because I really could not…

Links: Jaycar:
http://www.jaycar.com.au/productView.asp?ID=SY4059&CATID=&keywords=relay&SPECIAL=&form=KEYWORD&ProdCodeOnly=&Keyword1=&Keyword2=&pageNumber=&priceMin=&priceMax=&SUBCATID=
**Dick Smith Electronics**: http://www.dse.com.au/cgi-bin/dse.storefront/47a9555502ee0d02273fc0a87f9c068d/Product/View/P8032

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