

The Automatic Bilge Pump  
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This idea came from Cliff at Galaxy Hobbies. It is common in combat ships that often are holed and need to prolong that sinking feeling.

To do this you will need:

1 – Tip 120 Darlington Transistor. Radio Shack Part # 276-2068

1 – 680 OHM resistor, ½ Watt, 5% tolerance. Radio Shack # 271-1117

2 – Brass or copper strips. ¼ “ x 1 ½ “. (This is variable as you can use any conductive material)

1 – 2 inch square metallic heat sink (very important). I used 1/8<sup>Th</sup> x 1 ½ “ x 1 ½ “ aluminum

The idea is to mount the 2 sensor strips about ¼ “ apart with the tips at the level you want the pump to start when the water touches them. The transistor has 3 legs. The base leg is connected to the resistor, which is connected to one of the sensors. The collector leg is connected to the ground-side of the pump motor. The emitter is connected to the ground-side of the battery. The way this works is we are controlling the ground-side of the pump motor. When the water touches the two sensors, it causes the transistor to allow current to flow from the collector to the emitter which completes the ground for the pump motor and the pump motor starts.

There are several things that came up during this project that are “must knows”. The first is, we used a automobile windshield wiper pump (available at Schucks). These motors have a very fragile impeller. It will plug with debris and will burn up if it is allowed to run dry. To prevent this the pump intake should be ½ inch below the sensors so it will not run dry or cavitate and overheat. A fine screen or some type of filter must be used on the intake to prevent debris from jamming the pump. We used a brass tube with #60 holes drilled on the bottom side and plugged the end of the tube. We drilled around 20 holes over two inches. The next thing to remember is the size of all the tubing should be as big as the pump ports. This means a discharge through the hull that may not be to scale. But remember the idea is to remove water as fast as possible. Big Lines + Low Resistance = Max Water Flow.

The next thing is the heat sink. VERY IMPORTANT! The transistor creates a ton of heat. The flat side of the transistor should be touching the heat sink and fastened with a small metal bolt. The last thing we did (and I don't know if it's necessary or not but it looks good) is we mounted the two sensors with nylon

bolts. Since the transistor works on electrical leakage between the two sensors, this eliminates any leakage through the mounting system and prevents false starts of the pump motor which will burn up the impeller. This is done by putting a nylon bolt (we used 6-32) through the mounting plate (in our case plywood). A nylon nut is then run up the bolt to the mounting plate. The sensor is then slid over the bolt and a second nylon nut is used to secure the sensor. We pre-soldered the wires to the sensor.

I have attached a diagram of the bilge pump schematics. If anyone has any questions, please don't hesitate to ask me.

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