QUASAR KIT No. 1080

LIQUID LEVEL SENSOR / CONTROLLER

General Description

This circuit is a simple but very useful device that can be used when you need to control the level of a liquid in a container, or simply of the presence of a liquid depending on the way the circuit is used.
The circuit incorporates a relay which can be used to control a pump that will top-up the liquid in the container if it drops below a certain level automatically. The circuit will turn the pump off once the liquid has been topped-up to a preset maximum level. Works with both metal and non-metallic containers. The circuit operates from a 12 VDC power supply.

Technical Specifications - Characteristics

Working voltage: 12V DC
Current: 60 mA

How it Works

The circuit is basically an electronic switch with very high sensitivity which uses two sensor inputs to determine the presence of liquid in a container. If both sensors are connected to ground (i.e. point 4 on the schematic below) the output transistor is turned off and the relay is also switched off. If either of the two sensors is disconnected from point 4, the output transistor is turned on and the relay is energised. To reset the circuit both contacts must be connected back to earth.
This feature is very useful if the circuit is used to keep the level of a liquid in a container from dropping too low or from overflowing. The pump is connected to the appropriate Normally Open or Normally Closed relay output to control the fluid level.
The sensors which detect the liquid level must be of stainless steel to protect them from corrosion and they should be placed in the container so that their lowest parts are at exactly the heights we want the minimum and maximum level to be.

If you need to control liquid between minimum and maximum levels see kit 1081 (http://www.quasarelectronics.com/1081.htm).

Construction

First of all let us consider a few basics in building electronic circuits on a printed circuit board. The board is made of a thin insulating material clad with a thin layer of conductive copper that is shaped in such a way as to form the necessary conductors between the various

components of the circuit. The use of a properly designed printed circuit board is very desirable as it speeds construction up considerably and reduces the possibility of making errors. Quasar Kit boards also come pre-drilled and with the outline of the components and their identification printed on the component side to make construction easier. To protect the board during storage from oxidation and assure it gets to you in perfect condition the copper is tinned during manufacturing and covered with a special varnish that protects it from getting oxidised and also makes soldering easier.

Soldering the components to the board is the only way to build your circuit and from the way you do it depends greatly your success or failure. This work is not very difficult and if you stick to a few rules you should have no problems. The soldering iron that you use must be light and its power should not exceed the 25 Watts. The tip should be fine and must be kept clean at all times. For this purpose come very handy specially made sponges that are kept wet and from time to time you can wipe the hot tip on them to remove all the residues that tend to accumulate on it.

DO NOT file or sandpaper a dirty or worn out tip. If the tip cannot be cleaned, replace it.

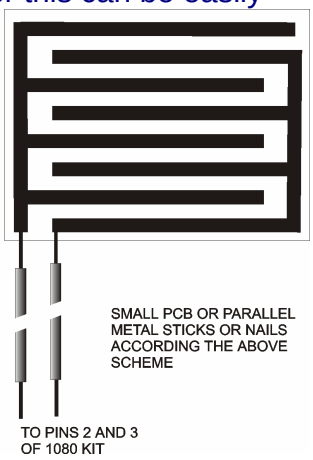
There are many different types of solder in the market and you should choose a good quality one that contains the necessary flux in its core, to assure a perfect joint every time.

DO NOT use soldering flux apart from that which is already included in your solder. Too much flux can cause many problems and is one of the main causes of circuit malfunction. If nevertheless you have to use extra flux, as it is the case when you have to tin copper wires, clean it very thoroughly after you finish your work.

In order to solder a component correctly you should do the following:

- Clean the component leads with a small piece of emery paper.
- Bend them at the correct distance from the component's body and insert the component in its place on the board.
- You may find sometimes a component with heavier gauge leads than usual, that are too thick to enter in the holes of the p.c. board. In this case use a mini drill to enlarge the holes slightly. Do not make the holes too large as this is going to make soldering difficult afterwards.
- Take the hot iron and place its tip on the component lead while holding the end of the solder wire at the point where the lead emerges from the board. The iron tip must touch the lead slightly above the p.c. board.
- When the solder starts to melt and flow, wait till it covers evenly the area around the hole and the flux boils and gets out from underneath the solder. The whole operation should not take more than 5 seconds. Remove the iron and leave the solder to cool naturally without blowing on it or moving the component. If everything was done properly the surface of the joint must have a bright metallic finish and its edges should be smoothly ended on the component lead and the board track. If the solder looks dull, cracked, or has the shape of a blob then you have made a dry joint and you should remove the solder (with a pump, or a solder wick) and redo it.
- Take care not to overheat the tracks as it is very easy to lift them from the board and break them.
- When you are soldering a sensitive component it is good practice to hold the lead from the component side of the board with a pair of long-nose pliers to divert any heat that could possibly damage the component.
- Make sure that you do not use more solder than it is necessary as you are running the risk of short-circuiting adjacent tracks on the board, especially if they are very close together.
- When you finish your work cut off the excess of the component leads and clean the board thoroughly with a suitable solvent to remove all flux residues that may still remain on it.

The circuit is very simple and its construction should not present any problem even to the most inexperienced beginners. Solder the pins first of all, then the resistors and the relay, and finally the transistors and the diode. Make sure that you do not mistake TR4 for one of the other three transistors as it is of a different type and will not work in another part of the circuit. Make also sure that you do not reverse the diode as this will in effect short circuit the relay and the device will not work. Connect the two liquid level sensors via long flexible cables to their respective pins (2 & 3) and place them in the container so that their lowest parts are exactly at the depths that you want the minimum and maximum levels. You must also, depending on the type of container you are using, provide some sort of connection between the earth (4) of the circuit and the mass of the liquid. In a metal container this can be easily done by means of a wire that connects the negative supply pole with the container. In non conductive containers there should be a third electrode immersed in the liquid and deeper than the others.
Connect the power supply and the circuit is ready to use. The two sensors which detect the liquid level must be of stainless steel to protect them from corrosion.
You can use the kit as a simple rain detector if you make a small "pcb sensor" with parallel lines in 1mm distance between them (see picture). Connect it with a cable to the kit at pins 2 and 3 and place it horizontally outdoors. When the first raindrops fall on the small "pcb sensor" the circuit will be activated.



Adjustments

This kit does not need any adjustments, if you follow the building instructions.

Warning

Quasar kits are sold as stand alone training kits.
If they are used as part of a larger assembly and any damage is caused, our company bears no responsibility.

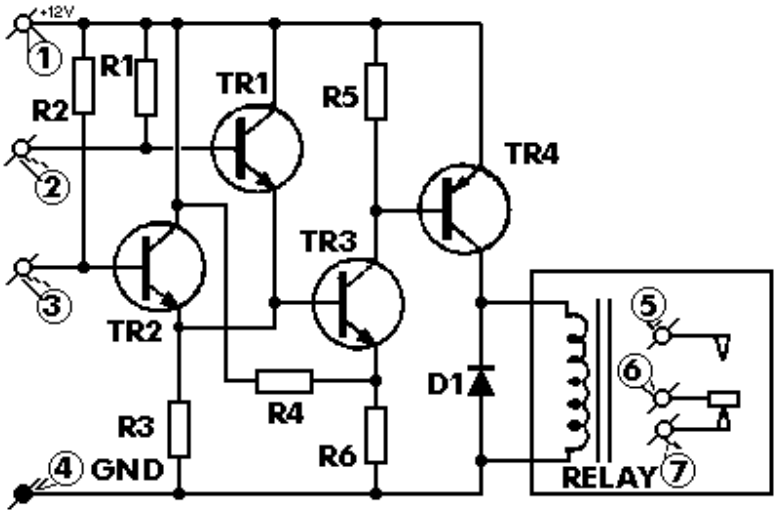
While using electrical parts, handle power supply and equipment with great care, following safety standards as described by international specs and regulations.

If it does not work

Check your work for possible dry joints, bridges across adjacent tracks or soldering flux residues that usually cause problems.
Check again all the external connections to and from the circuit to see if there is a mistake there.
- See that there are no components missing or inserted in the wrong places.
- Make sure that all the polarised components have been soldered the right way round. -
Make sure the supply has the correct voltage and is connected the right way round to your

circuit.
- Check your project for faulty or damaged components.
If your project still fails to work, please contact us for information about our Get-You-Going service.

Schematic Diagram



Parts List

All components including printed circuit board, assembly instructions including schematics and detailed parts list are supplied when you purchase the kit.

Ordering

For pricing info and online ordering please visit:

http://www.quasarelectronics.com/1080.htm

For further info please contact us by e-mail:

mailto: sales@QuasarElectronics.com