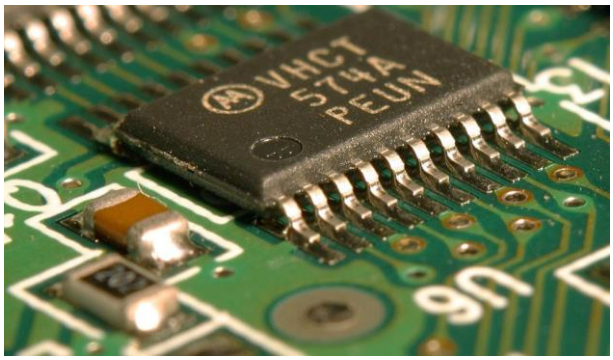
Electronics solved

TROUBLESHOOTING PCBs

We are having problems with a PCB. What can we do to work out where the problem is?

There are a number of things to check over to work out where the problem is. They are:

a) use a battery tester to check the condition of the batteries, as many projects won't function with low battery level (especially ones with Receiver and Transmitter);
b) are you using the supplied battery holders? For example, swapping a 6AA battery holder for a 9 volt battery clip will not work, as the 9 volt battery can't supply enough current to power most motors (making a good PCB seem faulty);
c) check the instructions: if the PCB requires adjusting, has that been carried out?
d) most teaching units have a "Trouble-shooting" section which may help;
e) download our troubleshooting guide **Troubleshooting Electronics** which is a sheet of general and helpful hints found under Technical Info: https://www.scorpiotechnology.com.au/technology-kits/ ;
f) visually inspect the components fitted to the PCB, to ensure that (1) parts are fitted in the correct locations, and (2) parts that are polarised are fitted the correct way around
Hint: if someone else has a working unit, you can do a visual comparison of both PCBs, to confirm that component placement and component orientation are correct.
g) turn the PCB over and using a magnifier inspect the soldering for solder bridges, dry solder, etc.;
h) if everything looks correct so far, then the next step is to start checking the components. Transistors are often a problem (as they can be easily damaged), and the easiest way to check those is by using an In-circuit Transistor Tester (we have a kit to make one - TRANT). If those all check as being functional, move on to the next components until you locate the damaged part. That part then needs to be de-soldered and replaced.



TROUBLESHOOTING TOOLS

What are the tools / equipment I require for troubleshooting electronics projects?

The usual ones required are:

- a multimeter
- a third hand (a PCB holder with magnifier)
- a solder sucker or solder pump
- an in-circuit transistor tester (to allow checking transistors without removing them)
- An LED Tester

Test & Troubleshooting kit - *Carry pouch, a Digital Multimeter, Transistor Tester, LED Penlight, Mini LED Tester and a bundle of 6 alligator clips with wires.*

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SUBSTITUTING BATTERY HOLDER

I've bought one of your kits and I would like to substitute a 9 volt battery clip for the supplied battery holder – will that work?

In most cases no. When considering changing battery holders you need to consider both voltage and current (milli-amp) usage of the motor. It is easy to overlook the current need. *For example:*

- A good 9 volt battery only provides 500 mAh, whereas an alkaline AA battery can supply 2,000 mAh or more.
- MOT17 can draw up to 1 amp (1,000 mA) under load – more than the 9 volt battery can supply.
- The MOT17 has a no load current draw of 250 mA, and it is easy to think the 9 volt battery provides enough power as the wheels will spin when holding the motor / vehicle in the air. But as soon as you put it on the ground it won't go anywhere, as the motor is under load and draws a lot more current.
- Under load at maximum efficiency MOT17 draws 1 amp – when not at max efficiency it will draw more mA out of the battery

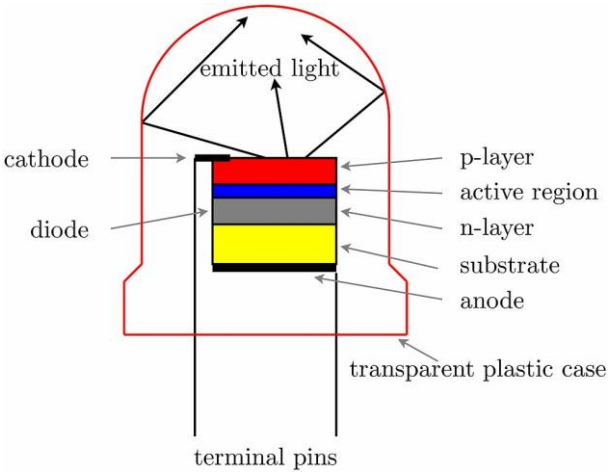
HIGH INTENSITY LEDS

I would like to make a simple LED circuit project for Junior students. What resistance would be required for a 3 Volt circuit – single High Intensity LED (white)? Would I need a protection diode?

The forward operating Voltage (the Voltage required to make a LED light) of a white High Intensity LED is typically 3.2 Volts. I believe that you would like to operate the LED's at 3 Volts. As 3.2 Volt is the typical Voltage, you will find that most of the LED's will require that Voltage to operate, but some will operate at a slightly lower Voltage and some will require a slightly higher Voltage.

If you use two new 1.5 Volt batteries to power the LED you will find that a brand new battery actually measures about 1.65 Volts, so two batteries will give you 3.3 Volts. The LED will probably last for a while until the battery Voltage drops, although if you are unlucky enough to get a LED that requires a slightly higher Voltage it may not work at all. Running the LED from two 1.5 Volt batteries will not require a resistor. A higher Voltage would require a resistor.

No protection diode is needed because the LED is a Light Emitting **Diode** and will not be damaged if the Voltage connected to it is reversed.



Construction and function of a light emitting diode (LED)

REFERENCES:

Picture credits:
http://commons.wikimedia.org/wiki/File:LED_Device.jpg
https://upload.wikimedia.org/wikipedia/commons/1/1b/Integrated_circuit_on_microchip.jpg

WHAT'S NEW?

Check out our website for new catalogues and updates.

- Chemistry clearance
- Primary clearance
- Whiteboard accessories
- Other catalogues are on the way

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