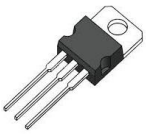
TRANSISTORS

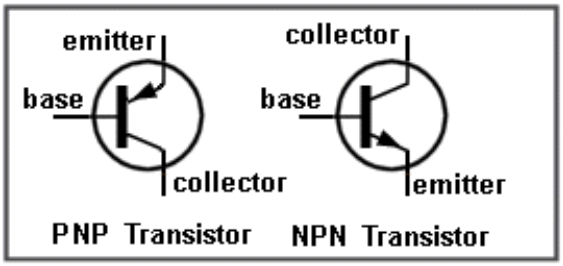


Transistors were invented by three US physicists John Bardeen, Walter Brattain and William Shockley in 1947. Their work was the key to advances in technology such as space exploration, transistor radios, computers and the internet. All these devices were made possible by miniaturisation.

Dr. J Bardeen(left), Dr. W Brattain(right), and Dr. W Shockley(centre)

The Nobel Prize in Physics 1956 was awarded to them jointly *"for their researches on semiconductors and their discovery of the transistor effect"*.

A transistor is a semiconductor that either switches electric current on and off or amplifies an electric current so that a much larger current can pass between its collector and emitter pins. There are two basic types of junction transistors, these are NPN and PNP, where N stands for negative and P for positive. These transistors have opposite polarity between the collector and emitter.



PNP transistors allow current to pass between collector and emitter when a small Negative voltage is connected to the base.
NPN transistors allow current to pass between collector and emitter when a small Positive voltage is connected to the base.

Transistors have many uses including switching, voltage/current regulation, and amplification. Transistors are also found in pacemakers, hearing aids, cameras, calculators, and watches. Most spacecraft also rely on microchips, and therefore transistors.

The word transistor is derived from the words "**trans**mitter" and "res**istor**".

FURTHER INVESTIGATION:

- Students search for transistor based devices to determine their importance in our world. Record information gathered in a meaningful way.
- List any electronic items that do not have transistors.
- Determine which transistor based device(s) make the most difference to our lives. How would our lives be different without these devices? Try not using any electronic devices for a day. Did this change what you normally do?
- Working in a group plan a device that could be found in the future. Prepare a poster (or other method) to sell or announce this new device.

SCORPIO TECHNOLOGY

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Investigate the statement that *"Transistors are the most significant invention in the 20th century".*

COMPONENT RECOGNITION

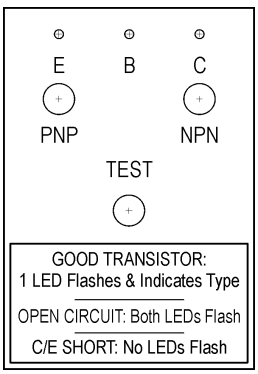
Different transistors may look the same, but if any transistors are wrongly placed in the incorrect position or orientation the PCB won't work. The back of the transistors (the metal face, without writing) must face towards the top of the PCB.

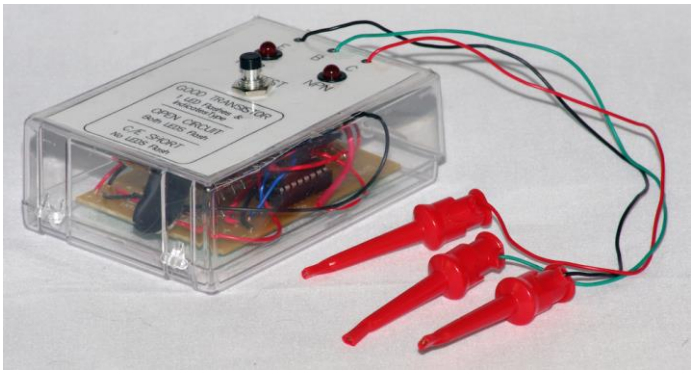
The transistors have 3 leads (legs). The Emitter (E), Base (B) and the Collector (C). Connect the leads as per the markings, and refer to the instructions to identify the leads for each type of transistor – connecting these correctly is critical.

TROUBLESHOOTING

Faulty transistors can be checked with a multimeter but we find that our In-circuit Transistor Tester is easier to use.

Locating a faulty transistor on a circuit board, crowded with soldered in place components, can be a difficult proposition. An in-circuit TRANSISTOR TESTER detects a faulty transistor, within an assembled PCB so that only the faulty transistor needs to be removed and replaced. This avoids damage to other components and/or the foil pattern, due to excessive soldering iron heat.





Level:	Intermediate kit
Type:	Electronic, PCB
Construction time:	3-6 hours approx..
Scorpio Code:	**TRANT**
Cost: (NB: Check online catalogue for current price)	1-19 kits $17.64 ea 20+ kits $17.05 ea

REFERENCES:

http://www.nobelprize.org/educational/physics/transistor/index.html
http://www.pbs.org/transistor/teach/teacherguide_html/lesson1.html
http://www.explainthatstuff.com/howtransistorswork.html
http://www.livescience.com/46021-what-is-a-transistor.html
http://www.pbs.org/transistor/teach/teacherguide_html/lesson3.html
www.eceway.com
http://www.reuk.co.uk/What-is-a-Transistor.htm

"I fear the day that technology will surpass our human interaction. The world will have a generation of idiots."
Albert Einstein

Inspirational projects for teaching Design, Creativity & Technology

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