

Tiles For Tales: Design and Build a Tile

1. Design Tile



Sketch a simple scene, and then plan how to illustrate it with coloured LEDs. Keep it simple - don't use too many LEDs, (less than 6 to begin with). Every LED introduces 2 wires that need to be connected, and the wiring can quickly get complicated.

Think about which LED's will be grouped together and colour of LED's.

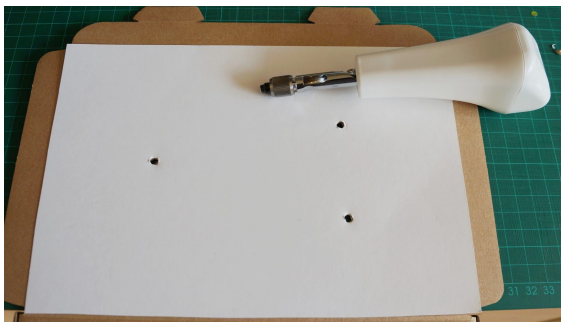
2. Decorate Tile

Cut card to match the size of the front of the cardboard box and decorate the card based on your earlier design. Felt works well, as does coloured paper and pens to create the design.

If you use any wet materials, it's essential that you allow sufficient time for them to completely dry, also avoid using conductive materials like tin foil.



3. Position LEDs



Plan where your LEDs will go and their colours. The next step is to cut holes for them.

Put your decorated card over the top of the cardboard, and use the X-Cutter on a cutting mat to cut circular holes for them.

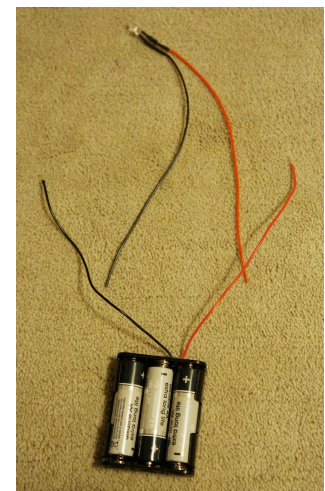
TAKE CARE: cutter is sharp - use on the cutting mat.

4. Introduction to Circuits

LEDs shine when connected to a source of power, in our example we'll be using three AA batteries in a battery box to power the tile. The red wire is positive and black wire is negative.

In this example the LED will shine when the black bare wires are touched together and the red bar wires are touching, the circuit is completed and the LED shines.

If you connect them the other way round (red to black) the LED won't shine, so it's important connection LEDs the right way round.



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5. Making connections

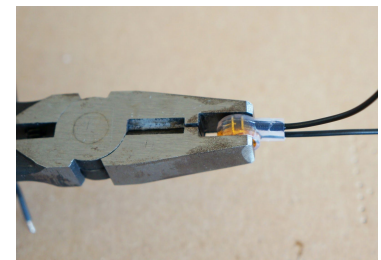


We'll use gel crimps, these are commonly used in telecom applications to make connections without the need to strip wires, solder or use breadboard.

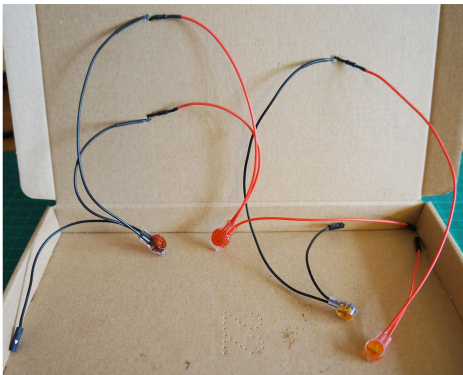
There are two way crimps to link two wires together, and three way crimps that link three wires together.



Wires are inserted into the crimp, take care to push them right to the back. Then use the crimp tool to squeeze the crimp closed. This pushes the metal crimp into the wires and makes a reliable connection.



6. Build and test LED circuit



Thread the coloured LEDs into the holes through card and cardboard. We used LEDs pre-wired with a resistor to protect the LED, and with a red (positive) and black (ground) connecting wires.

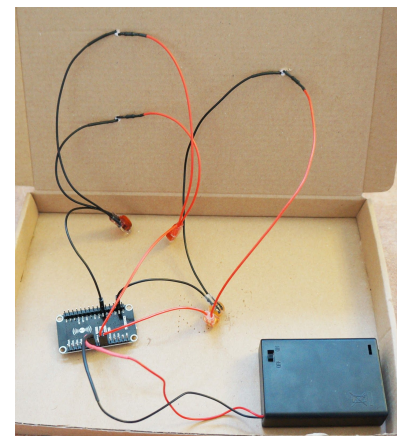
If you want two or more LEDs to shine together they need to be connected in parallel, like the example circuit on the left hand side above. This photograph shows two separate circuits, the left hand circuit controls two LEDs, the right hand circuit controls a single LED.

7. Add Processor and Power

The last step in building the tile is to get a processor and a battery pack and connect them. The processor we use is the NODEMCU, it will receive commands from ScratchX and respond by switching LEDs on and off.

Connect red wires of LED circuits to pins numbered 12,13 and 14 (digital pins 1, 2 and 3) these can be switched on and off in Scratch and pins 4 and 5 (pwm pins 1 and 2) these can also be brightened and dimmed. Connect black wires to GND pins on the chip.

Connect the battery pack, the black wire to GND and red wire to VIN pin.



The current version of TileNet gives control over 5 pins, three digital pins (on/off) and 2 pwm pins (dimnable). All LEDs connected to the same pin will have the same behaviour. LEDs that operate together (connected to a single pin) should all be wired in parallel. This means they will all be equally bright when switched on.