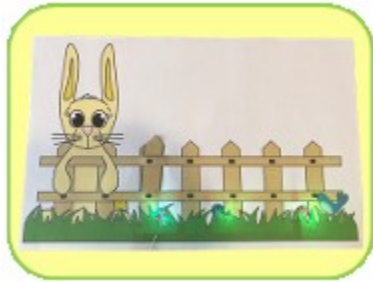


Pull-Tab Easter Egg Hunt Instruction Sheet



During our investigation we found creating a pull-tab switch out of a fence post an ideal way to show what a little imagination can do. Feel free to follow our design or challenge your older kids to design a switch of their own.

Step 1 - Supplies:

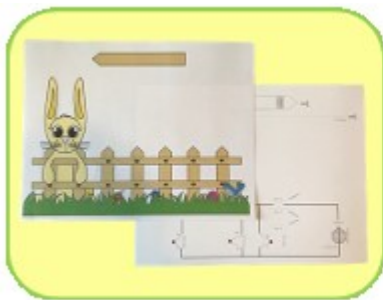


Image 1



Image 2

1.1 You need to print your circuit template double sided. **Image 1** above shows the front and back of the template printed separately only to show you what both sides look like.

You will also need 3 flashing LEDs, a coin cell battery, a 3/4" piece of foam tape, a 3/4" piece of scotch tape, and around 36" of copper foil tape with conductive adhesive (**Image 2**).

We're using flashing LEDs, but your kids can choose any colors available. It's always more fun for the kids when they can add a little of their own style to these projects.

Step 2 - Testing:

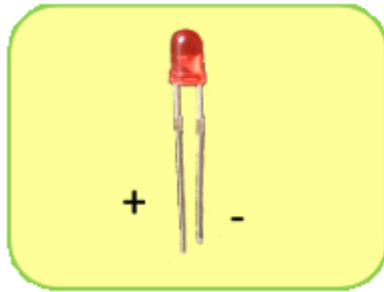


Image 3



Image 4

2.1 Test your battery and LEDs. The longer leg of the LED is positive, and the shorter leg is negative (**Image 3**). You can also use the flat side of your LED to determine which leg is negative as it's the leg closest to that side. We had a hard time finding the flat side during our investigation though, so we always looked at the leg length when testing.

2.2 Polarity is important with LEDs so be sure to place the positive leg on the positive side of the battery and the negative leg on the negative side. If both the battery and LED are working you should see the LED light up (**Image 4**).

If the LED doesn't light up, try switching the direction of the LED legs. If it still doesn't work, you either need a new battery or a new LED. It's a lot easier to replace a bad battery or LED now before you start the project, so these tests are very useful.

Step 3 - Build:

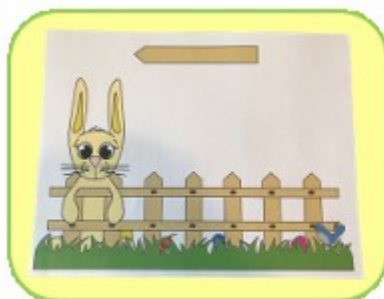


Image 5

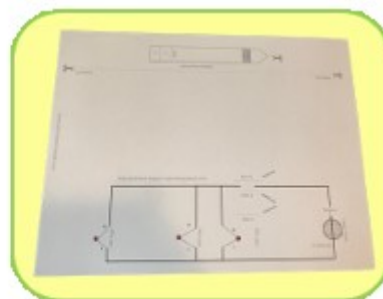


Image 6

Let's take a quick look at how our picket fence switch works before starting our step by step directions.

On the front of our template the first full fence post, to the right of the bunny, will be covered by a movable post that acts as the switch (**Image 5**).

The back of our template is where the fun begins. The spare fence post located at the top of the template will be cut out and lined with copper tape in the area marked. The three dotted lines, next to the knife symbols, are the slots for you to weave the post through before securing it to the bottom of the template. Moving the post up or down, depending on its current position, will align the fence post copper strip with the copper in the circuit which will close the circuit, allowing the LED lights to turn on and off (**Image 6**).

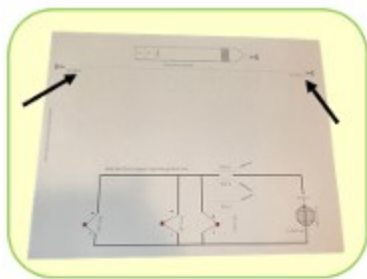


Image 7

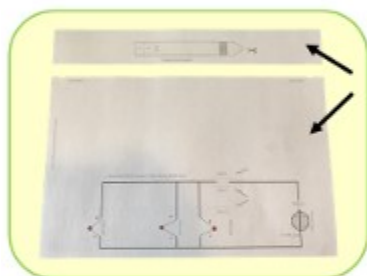


Image 8

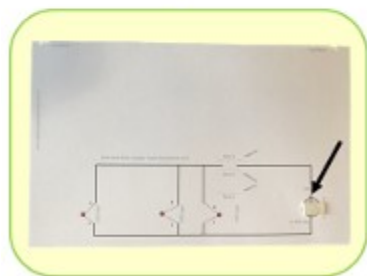


Image 9



3.1 Locate two scissor symbols, one at each end of the horizontal dotted line, on the back of the template, near the top. Cut along the dotted line to remove the strip that contains the fence post switch and set aside for later (**Image 7 & 8**).

3.2 Attach the 3/4" piece of foam tape to the gray battery circle located on the bottom right hand side of the template. Make sure to attach the foam tape horizontally so there will be enough adhesive material to stick to the battery after the copper tape is attached (**Image 9**).

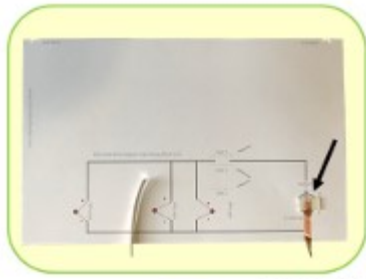


Image 10

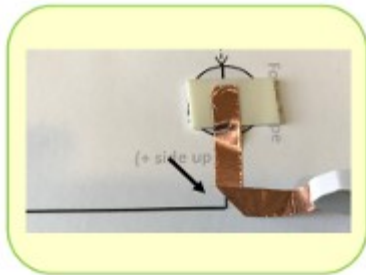


Image 11

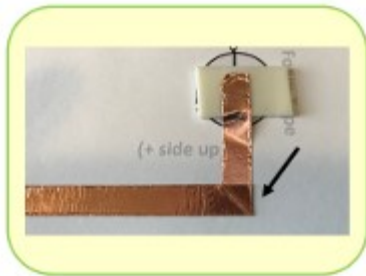


Image 12

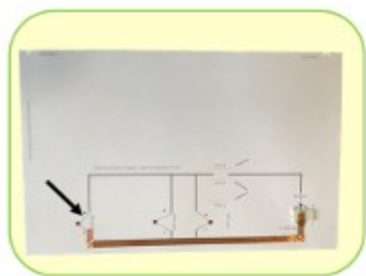


Image 13



3.3 It's time to attach the copper tape along the outer pathway of the circuit. Start near the top of the foam tape, and follow the solid black line downward in a counter-clockwise direction, peeling the backing off as you go. Be sure to leave a small gap near the top of the foam tape to prevent the chance of a short circuit with the other end of the tape as it comes back around and is attached to the top of the battery (**Image 10**).

Note: During our investigation we found that if you remove the backing all at once the copper tape will twist and stick to itself.

3.4 Corners can be tricky but we're using copper tape that's conductive on both sides. A little twist in the tape at the corners shouldn't be a problem.

3.5 When you reach a corner the trick is to bend the copper tape in the opposite direction from where you want to go first, creating a diagonal fold (**Image 11**).

3.6 Hold this folded section in place with your finger as you bend the copper tape back over the fold to continue going in the right direction. You should see a nice corner form but don't worry if it's messy. It gets easier with practice (**Image 12**).

Note: We found it easier to create clean corners by removing the excess white backing material each time we reach a corner.

3.7 Continue to place the copper tape along the outer black line until you reach the LED gap. Use your fingers to cut the tape and then continue to place the tape along this line from the other side of the gap (**Image 13**).

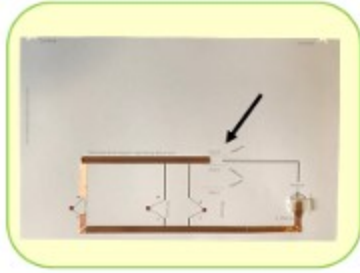


Image 14



Image 15

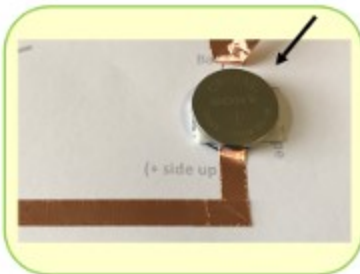


Image 16

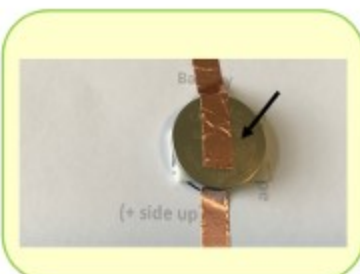


Image 17



3.8 This next section of copper tape will stop at the gap near the knife symbols. Again, use your fingers to cut the tape to form a gap in the circuit. This gap will only be connected when the fence post switch is moved up or down (**Image 14**).

3.9 Continue to attach the copper tape until you reach the end of the black line just above the Battery label (**Image 15**).

3.10 Attach the battery, positive side up, to the foam tape (**Image 16**).

3.11 Continue running the copper tape along the dotted black line, and across the battery to its far edge. Be sure to stop at the edge so it doesn't touch the copper tape from the beginning of the circuit (**Image 17 & 18**).

Note: If this end of the copper tape touches the section of copper tape under the battery it will short circuit.

3.12 You just completed the outer pathway of the fence post circuit. It's time to connect the first LED to the gap along the outer pathway. It's easier to trouble shoot a problem in the circuit now before additional pathways are added.

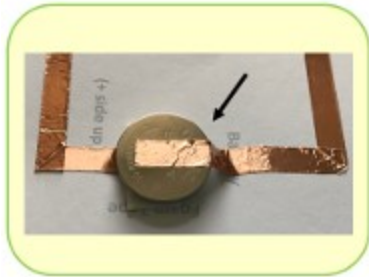


Image 18

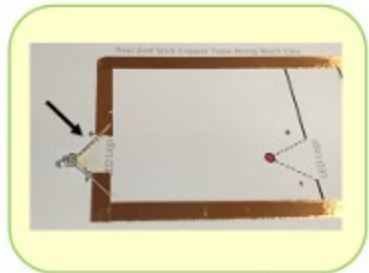


Image 19

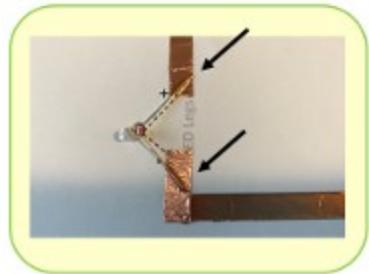


Image 20

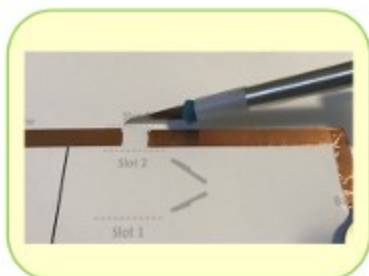


Image 21



3.13 Bend the LED legs wide enough to connect to the copper tape on both sides of the gap, line the legs up with the dotted lines and the LED to the red circle (**Image 19**).

3.14 Tear off two small pieces of copper tape and use them to cover the LED legs and stick them to the existing copper tape (**Image 20**).

Note: Remember that polarity matters. The positive leg needs to connect to the side marked positive and the negative leg needs to connect to the side marked negative.

3.15 It's time to build the switch so we can test this section of the circuit. Use scissors or a hobby knife to cut along the dotted slot lines located near the knife symbols (**Image 21**).

Note: During our investigation we found widening the slots with a slight side to side motion of the knife allowed the fence post to move up and down easier.

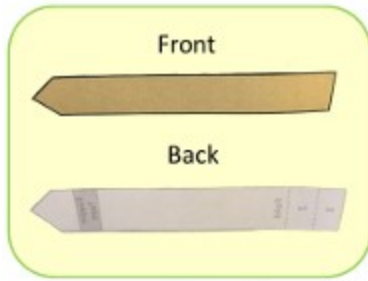


Image 22



Image 23

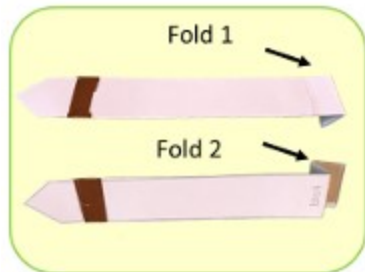


Image 24

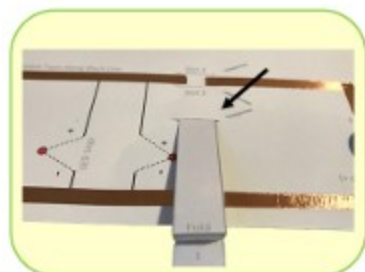


Image 25



3.16 Cut the fence post out of the template section we removed in step 3.1 (Image 22).

3.17 Wrap a strip of copper tape around the post until the gray rectangular area is covered with two layers of copper tape. The thicker post will help ensure a connection with the copper tape in the circuit when the switch is moved up or down, depending on its position (Image 23).

Note: During our investigations we noticed that some rolls of copper tape felt thicker than others. Add additional layers of copper tape as needed until a connection is created.

3.18 Carefully fold the fence post along the dotted lines at the bottom of the post. Fold the bottom of the post inward, at the first dotted line, so sections 1 & 2 touch each other. The bottom of the post should line up with the second dotted line (Top post, Image 24).

3.19 Now fold the post backward at the second dotted line. The bottom of the post will have an accordion style fold in it (Bottom post, Image 24).

3.20 Weave the fence post through the slots from step 3.15, starting from the back.

3.21 With the brown side of the post facing the template, gently guide the top of the fence post through Slot 1 so it comes out at the front of the template (Image 25).

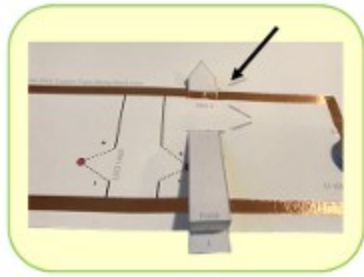


Image 26

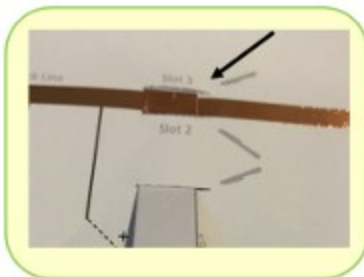


Image 27

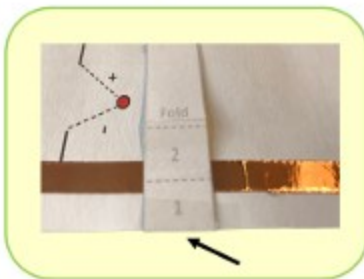


Image 28

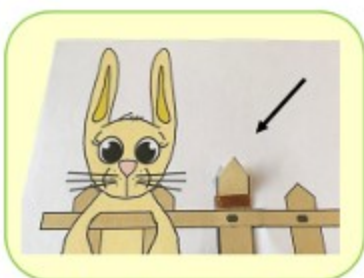


Image 29



3.22 From the front of the template, guide the fence post through Slot 2 so it's at the back of the template again (**Image 26**).

3.23 Finally, guide the fence post through Slot 3 so the tip of the post is at the front of the template (**Image 27 & 29**).

Note: Be careful not to pull the bottom of the fence post through the slots.

3.24 Unfold the bottom of the fence post and line it up with the bottom of the template. Use the $\frac{3}{4}$ " piece of scotch tape to attach the bottom of the post to the bottom of the template. This will keep the post securely in place when you need to open and close the circuit (**Image 28**).

3.25 You are now ready to test the outer pathway of your circuit. From the front of the template gently move the fence post up or down, depending on its current position, so the strip of copper tape lines up with the circuit on the back. The fence post copper strip will form a bridge over the gap in the template, creating the connection needed to close the circuit.

Note: The copper strip on the fence post in our picture will need to be moved downward until it is hidden behind the top horizontal rail of the fence (**Image 29**).



Image 30

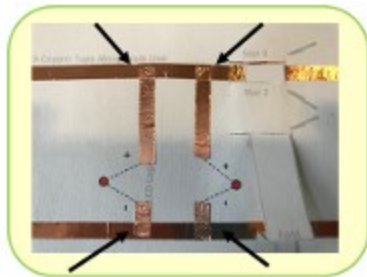


Image 31

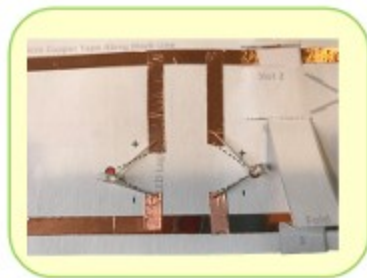


Image 32

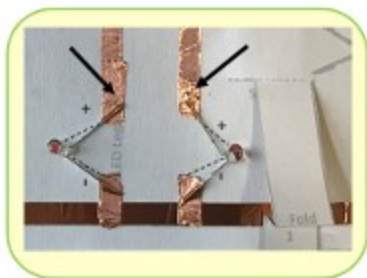


Image 33



3.26 Once you see the LED light up you will be ready to build the other two pathways in the circuit (**Image 30**).

Note: If your LED doesn't light up, you should press the fence post against the template firmly to make sure there is a connection. If that does the trick, wrap additional layers of copper tape around the fence post until that section is the right thickness.

If the LED still didn't light up, you should check out our trouble shooting tips at the beginning of this post, next to the investigation tab.

3.27 Attach the copper tape to the remaining two pathways that cut vertically through the circuit. Start at the top of each line and be sure to overlap the piece of copper tape already in place so a connection is formed (**Image 31, top arrows**).

3.28 Run the copper tape down along both black lines. When you reach the gap in each pathway use your fingers to cut the tape and then continue placing the tape along the black line on the other side of the gap. Each pathway is complete when the copper tape overlaps the horizontal copper tape along the bottom of the circuit (**Image 31, bottom arrows**).

3.29 It's time to connect the remaining two LEDs. Bend the LED legs wide enough to connect to the copper tape on both sides of the gaps, line the legs up with the dotted lines and the LEDs to the red circles, one LED per pathway (**Image 32**).

Note: Remember that polarity matters. The positive leg needs to connect to the side marked positive and the negative leg needs to connect to the side marked negative.

3.30 Tear off two small pieces of copper tape and use them to cover the LED legs and stick them to the existing copper tape (**Image 33**).



Image 34



Image 35

3.31 Congrats! You have just finished creating your fence post switch template. Move the fence post switch up and down to watch the LEDs light up the hidden Easter eggs on the front of the template (**Image 34 and 35**).

Note: Now that you have a working circuit you may want to use some scotch tape to secure the LED bulbs to the back of the template. You can also poke a small hole through the template near each LED if your kids would like the LEDs to shine a little brighter from the front.