

Investigating The Design Context

Subsection: Establishing The Design Problem

Topic: AQA Controlled Assessment Task

Context

Teaching children the value of money, and how to spend and save, is now part of the school curriculum.

Design task

A local bank wishes to encourage young children to save their pocket money. You have been asked to design and make a novelty device which will make it fun for children to use and save their money.

I have chosen this task because I feel that children need to learn to save their money as it is an important skill that will help them with later life. Also I can design many different products within the brief, this task will allow me to create a high quality electronic product that is quite complex and demonstrate my knowledge of electronics, such as a money box which counts how much money it is holding. Furthermore, this task has many different potential clients and is marketable to many people

There are many possible materials which I could use to make my product casing, I will most probably use wood as it is easily shaped and cut using a variety of tools.

The Product that I could make would be a money box. This money box could have many inputs, I think that a very useful input would be a sensor to decide how much money has been entered, this could then be paired with something else to keep a running total of the money in the box The money box could have many different outputs. One of these could be an LCD screen which shows the amount of money in the box, also there could be a speaker which plays a tune when money is entered

What Now?

Now that I have chosen my task, I can evaluate what problems I could possibly solve with it.

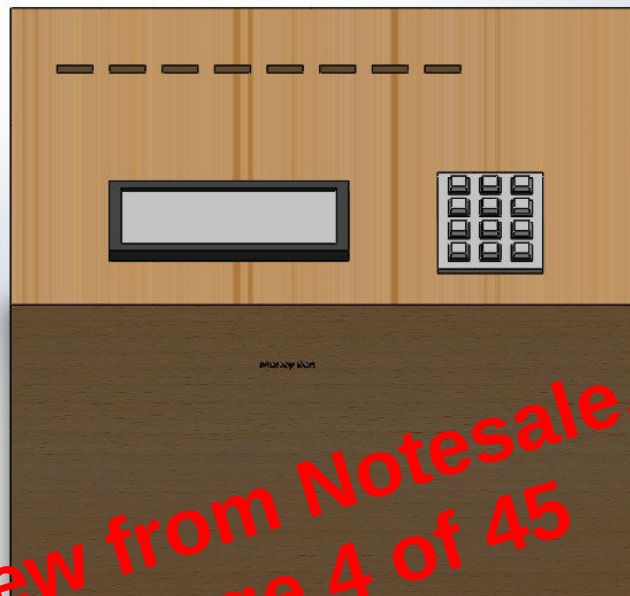
Investigating The Design Context

Subsection: Establishing The Design Problem

Topic: Initial Design Idea

When a coin is entered into one of the slots it will pass an opto-switch, this will detect which type of coin has been entered, provided that the coin has been entered in the correct slot. This will then send a signal to a microcontroller which will add the value of the that coin to the total in the box.

There will be an LCD, which will display many things related to the money box, such as the total amount of money, the value of the most recent coin entered, messages like please enter code etc.



The main input will be a keypad to enter the code which will be sent to a microcontroller to open the back door of the money box.

The box will be made of mdf or plywood, this is because these materials are easy to cut and shape and will also provide a good finish.

One of the outputs of my money box will be a speaker that plays a sound when a coin is entered, this will be to make the box fun to children.

The box will have a locking door at the back which will use a servo motor which pushes something into a slot that keeps the door shut.



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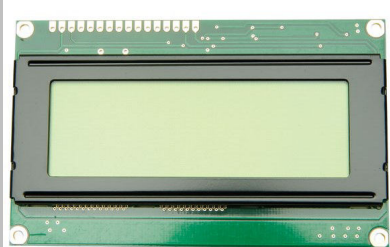
Subsection: Investigating The Problem

Topic: Primary & Secondary Research Into Possible Input And Output Components



The keypad would be used to enter numbers to be used by a micro-controller

I would use a keypad to enter the code and open the door.



The LCD will also be used to show which coin has been entered.

I will use an LCD to display how much money is in the money box, this will be stored by a small amount of memory in the circuit.

I will use a speaker to output a certain sound for each different type of coin, this will help to create the fun atmosphere that will entice young people towards my product.



The speaker that I use will need to be small enough to fit within the inside of my money box so that it isn't an eyesore on the outside

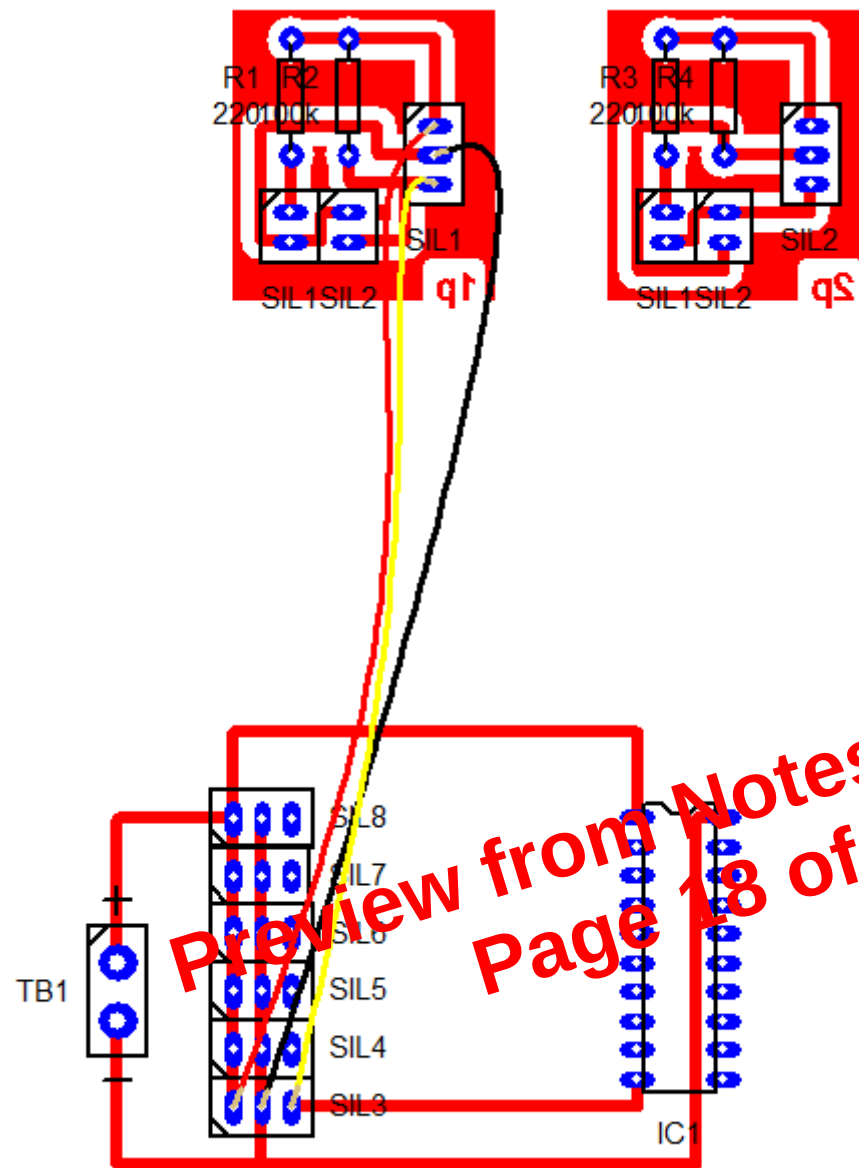


I will use an opto-switch to sense the coins entering the slots, it will then output a signal that will allow the LCD to output which coin has been entered and also the speaker will know which sound to play

Development of design proposals (including modelling)

Subsection: Circuit development

Topic: Development Of Circuit PCB



Each opto switch circuit has 3 wires that connect it to the main pcb. There is a positive power connection, a ground connection and an output that goes to the micro-controller which allows it to detect input coins.

This is the part of my circuit that detects when the user enters a coin, the opto switch part of the circuit is connected off board so that each opto switch can be moved to the appropriate place in the money box where they can detect the individual coin inputs.

Making

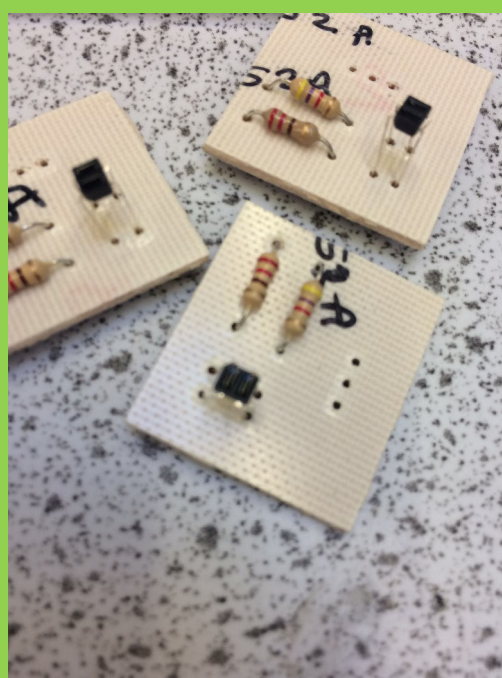
Subsection: Producing A High Quality Product

Topic: Diary Of Making



The first thing that I did when I started to make my product was to print the PCBs for the opto-switch circuits, all of them were printed on one long strip and then cut into the individual squares.

I then started to attach the different components to these opto-switch PCBs, firstly I drilled the appropriate holes where the wires for components needed to go using a pillar drill. I then started with the resistors and put them all through the individual holes. At first I found that I had been using the wrong resistors for the opto-switch circuits so I swapped the 4k7 resistors for (insert correct resistor here) resistors, this worked much better when tested.



Once I had soldered all of the resistors I added the opto-isolators and soldered them into place.

Making

Subsection: Producing A High Quality Product

Topic: Diary Of Making



Next I started to make my final container. I wrote a cutting list of all the pieces of my container. I cut two sides, a bottom and a top, the top I cut from thinner 6mm plywood instead of the 9mm plywood that I chose for the rest of my container because I decided I wanted to laser cut the holes for the different components in the top.

I decided that I wanted to use the CNC router to cut the hole for the back door and the keypad - so I used 2D design to design the cut and I put the back piece of wood into the CNC router to be cut. This was successful and I got the result I wanted.

Once all of the sides and bottom were ready, I used PVA wood glue to stick them together, I used a combination of clamps and tape to hold the shape, whilst also using try square to make sure that all of the sides were at right angles

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Testing and Evaluation

Topic: Modifications for commercial production

Subsection: Testing And Evaluating

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