WARNING

This is not a toy. It is an educational kit and must be used under adult supervision. This product is not suitable for children under 3 years. It contains sharp or small parts that could be dangerous for young children.

BATTERY SAFETY

- Batteries can be hazardous - especially rechargeable batteries and alkaline batteries
- Never use rechargeable batteries in your kit
- Always take care that the battery leads do not touch together and short-circuit the battery. This can result in the battery getting hot and even melting the battery box
- Always remove the battery from your kit when you have finished using it
- Always store batteries safely where they cannot touch any metal objects
- Never dispose of batteries in a fire. Put them in a special battery collection unit or in the normal household waste

Designed, manufactured and supplied by <ßÖ}ã§ÇãÇëN9ì Ltd.

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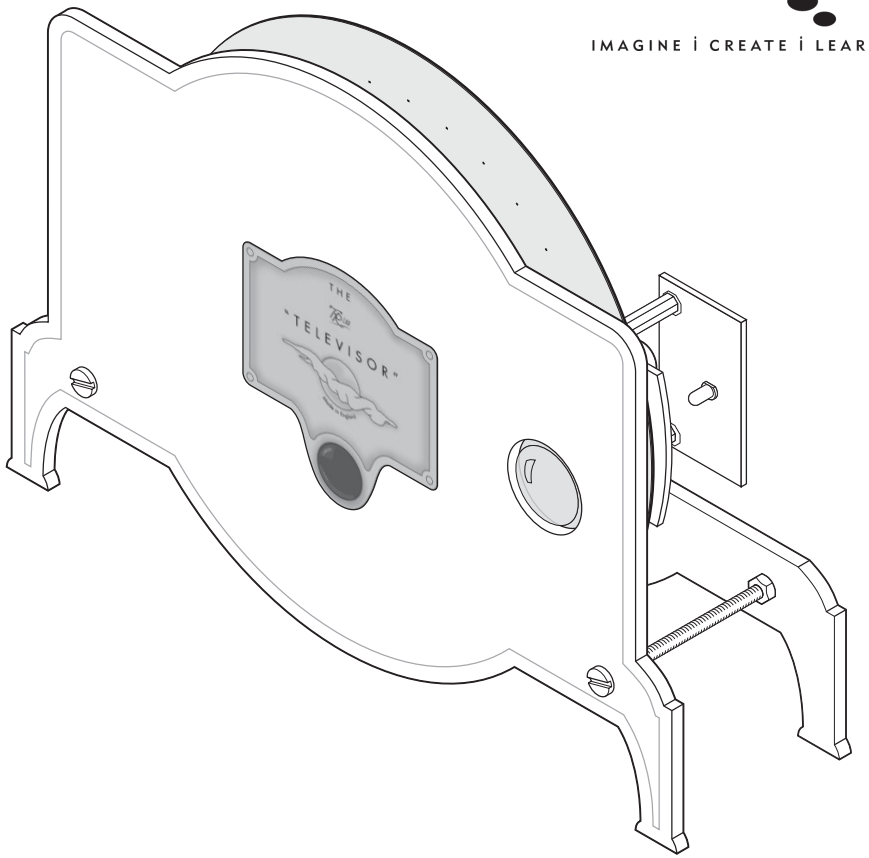


THE TELEVISOR

THE TELEVISOR

Introduction

John Logie Baird (1888 – 1946) devised the first practical television system capable of sending moving images via wire or radio. The first television broadcasts using his partly-mechanical *televisor* as a receiver started up in 1929 using BBC transmitters. Several thousand *televisors* were either purchased complete or built by enthusiastic amateurs from the many plans and kits of parts that quickly became available. Despite the tiny picture size of the *televisor* and its very low resolution, these early broadcasts inspired commercial developments that led to all electronic television broadcasting from Alexandra Palace in 1936.

THE BAIRD TELEVISOR WHICH WAS SOLD FOR THE RECEPTION OF THE LOW DEFINITION PROGRAMMES. THE OPERATOR IS SEEN ADJUSTING THE FRAMING OF THE PICTURE

In an astonishing competition at Alexandra Palace during 1935, Baird's technology - now much further technically advanced - competed head to head against the Marconi/EMI all-electronic system. Sadly for Baird, the BBC adopted the (by then) superior all electronic system. Both companies broadcast to all electronic receivers – making the original *televisors* completely redundant.

The *televisor* you have just purchased works in exactly the same way as the original, but uses modern components such as an LED instead of a neon lamp for picture illumination. It is about one third of the size of the commercial televisor – but the performance is as good. With its low resolution picture quality, it is perhaps difficult now to understand the excitement it caused in the early 1930s. But, of course, it was the first time that the dream of transmitting and receiving moving pictures had been realised - and this engendered a real sense of magic.

Using the new *televisor* is a unique experience because you will be seeing images similar to those seen by the earliest TV viewers some 80 years ago – something quite close to time travel!

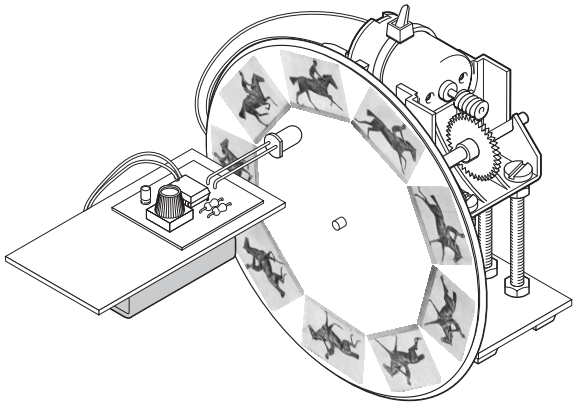
MORE OLD TECHNOLOGY

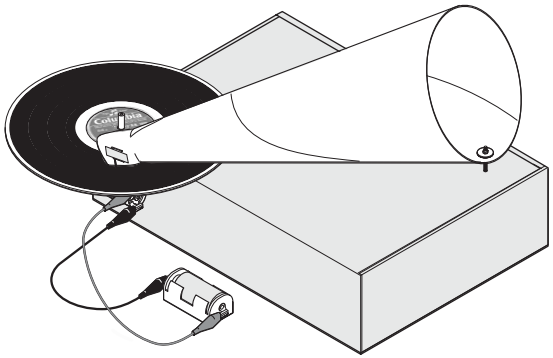
If you have enjoyed the *televisor,* you might be interested in modern versions of other classic technologies – e.g., watch the earliest movie sequences from 125 years ago; send text in code using WW2 Enigma machines; listen to the sound from antique 78rpm records; watch John Harrison's famous H5 clock working on your computer as a screen saver – and many more.

For further details, ask your supplier or visit the TR website at: *www.mutr.co.uk*

Moving Pictures

See into the past itself by bringing to life the people and animals as Muybridge photographed them over 125 years ago. The kit contains the parts for a modern tachyscope whose wheel is powered by an electric motor.



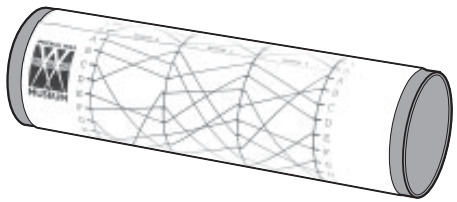


Gramophone

Listen to music from the past by making your very own gramophone in minutes. The Gramophone kit includes two original 78 records and is battery operated.

Enigma Machine

Code and de-code messages using the same principles as the famous Enigma machine. The printed code strips are wrapped around a cylinder to replicate the rotors of the Enigma. Includes components to make two machines.



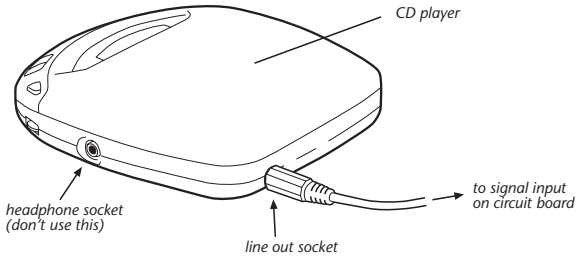
1. Set the televisor up in a darkened room but with sufficient light to see what you are doing.

   Switch ON the *televisor* by sliding the switch on the battery box and the switch on the circuit board to ON. The disc will start to spin and the LED will light up. Looking at the viewing screen, you should see a test card. If you do not see the test card, adjust the picture brightness and/or the sync/speed until the test card appears. The signal for this is stored inside the *televisor* circuit. Just seeing the test card is the first element of *televisor* magic!

   - If the disc does not spin when both switches are ON, make sure the red and black wires from the battery box are connected correctly to the circuit board (see step 1 in *assembling the televisor*). Also make sure that the batteries are working and inserted correctly in the battery box.

   - If the disc spins but the LED does not light up, tighten the screws connecting the LED board to the circuit board.

2. Switch OFF the televisor at the battery box. Connect the ***signal input*** on the televisor circuit to the ***line out*** socket on a CD player using the lead provided. The signal input should NOT be connected to the headphone socket on a CD player.



3. Switch ON the televisor and play the CD. The televisor disc will start spinning automatically when the CD is playing. The CD contains a sequence of still images plus some movie footage with sound. As each track begins the televisor will attempt to stabilise the picture. If the picture fails to stabilise, turn the sync/speed knob until the picture is stable. You may also need to re-adjust the brightness from time to time.

   Note: to hear the sound you will need to connect a pair of headphones or an earpiece to the audio out socket.

Despite the fact that the picture is built up from 30 lines of scanning - as opposed to the current electronic standard of over 500 – you can pick out quite a lot of detail and certainly recognise familiar faces. You will also see a number of things that the original *televisors* suffered from:

- occasional wobble of the picture (lack of synchronization)
- appearance of flickering and scan lines (disc holes are not perfectly in alignment)
- slightly wedge shaped picture (the picture appears at the end of a segment of a circle)
- secondary pictures at the top and bottom of the main one (a picture is seen wherever light from the LED falls behind the disc)

test card image

How it works

Baird's television system drew on some existing ideas – notably an invention called a nipkow disc (pronounced nipcov). However, like Marconi in the context of radio, Baird was the first to put it all together and achieve commercial success.

In principle, the *televisor* is both simple and ingenious. The description that follows provides a simplified outline of how the overall system worked but ignores some of the alternative transmitting and receiving systems that Baird experimented with.

First of all, a subject or image has to be turned into an electrical signal which is converted back into a picture at the receiver. In the Baird system, there was no camera as we know it. Instead, the subject was placed inside a darkened room and scanned with a spot of light. The light reflected from this spot was picked up by photocells and the variations in light intensity turned into an electrical signal. An illustration from a contemporary book shows how this worked: a light source was placed behind a disc with 30 holes arranged in a spiral (the nipkow disc). Lenses in these holes focused light onto the subject as a moving spot. As each lens passed across the light, the spot produced scanned vertically down part of the subject. One complete turn of the disc covered the whole of the subject with 30 scans. In practice, the disc turned at high speed to capture movement.

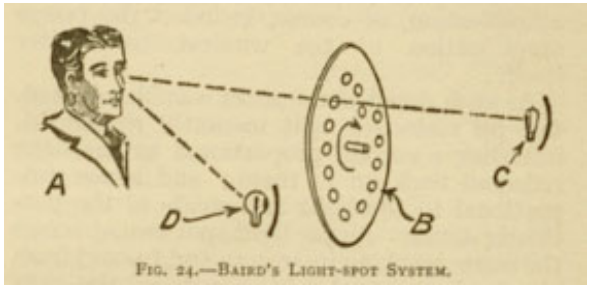
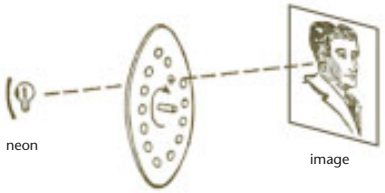


FIG. 24.—BAIRD'S LIGHT-SPOT SYSTEM.

A beam of light from the source **C** shines through the spiral of holes in disc **B** onto the object **A** to be transmitted. Light reflected back from **A** shines on to the light-sensitive cell, **D**. The rotary action of the disc causes the light spot to move continuously to and fro across **A** in parallel lines at a very rapid rate. In this way the entire object is explored and flashes of light from portion of it are thrown, in regular order, onto the cell, **D**.

Because the features of a human face don't give much contrast under these conditions, presenters were given special bizarre makeup - despite which they appeared normal on the *televisor* picture.

The TV signal would be sent to the receiver either by wire or by radio. At the receiving end, the signal was amplified and turned back into light by means of a neon - the only type of lamp could respond to the rapid changes. To complete the system, a nipkow disc of 30 holes turned at the same speed as the transmitter disc front of the neon. The astonishing thing about the *televisor* lies in the fact that it consists basically of a spinning disc – the mechanical part – and a single lamp varying in brightness!



nipkow disc

In practice, things were slightly more complicated. At any point in time, the holes in the spinning receiver disc had to be in the same position as those at the transmitter – i.e., the two had to be synchronized. If this was not achieved the received picture could wobble, divide in two – or drift up and down. (Many similar effects were seen in later black and white electronic TVs.) Baird's solution to the problem was to send a synchronisation signal that changed the speed of the receiver's disc motor – speeding it up or down by tiny amounts.


Synchronisation problem

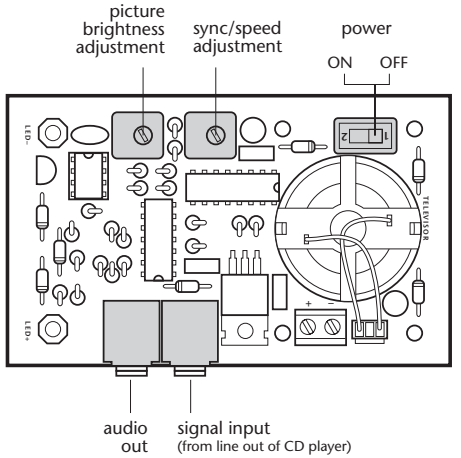
The modern *televisor*

The new *televisor* is identical in principle to the original but uses modern circuitry and components. The 'programmes' are taken from still images or movie footage converted to a thirty line format using a computer. Because of their low resolution, they can be stored on an audio CD ROM. Baird himself recorded TV images on 78rpm records!

When the CD is played, the signal passes through an amplifier on the *televisor* and causes the brightness of a light emitting diode (LED) to vary –creating the picture when viewed through the spinning disc. (It is intriguing is to see the picture and then look round at the side of the *televisor* to see nothing between the LED and the disc.) Most of the electronics of the new *televisor* provides synchronization with the CD signal. A circle of black and white stripes on the back of the disc pass in front of a tiny sensor which feeds back the position of the holes to control the speed of the motor and keep the disc in the correct position. As each track of the CD is played, the first thing you will see is a number countdown. This gives the nipkow disc time to synchronize each time. As it does so, the picture wobbles wildly – just like it did on the original when the synchronization was slightly out.

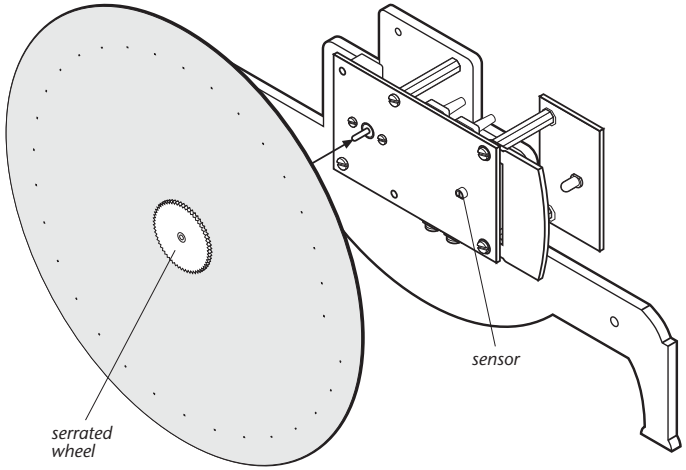
Using the *televisor*

The adjustment controls and connectors in the televisor circuit are shown below.

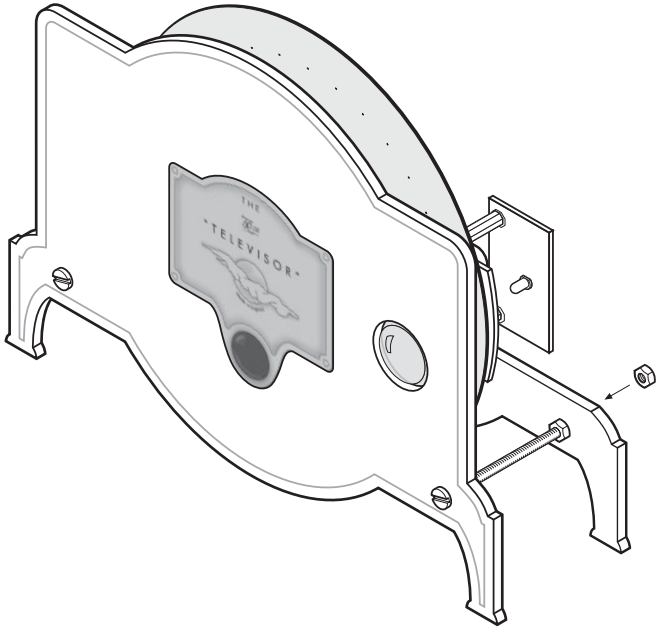


• Power	ON/OFF slide switch. Note: there is also an ON/OFF switch on the battery box. Both switches must be ON when using the televisor.
• Sync/speed adjustment	turn this to adjust the disc speed and stabilise the picture
• Picture brightness adjustment	turn this to adjust the picture brightness
• Signal input	connect this to the 'line out' socket on a CD player using the lead provided
• Audio out	connect this to an earpiece or a pair of headphones

7. Carefully press the black televisor disc onto the motor spindle. Make sure the serrated wheel faces towards the front of the televisor as shown. The disc should be pushed on so that it is as close to the sensor as possible without touching it.

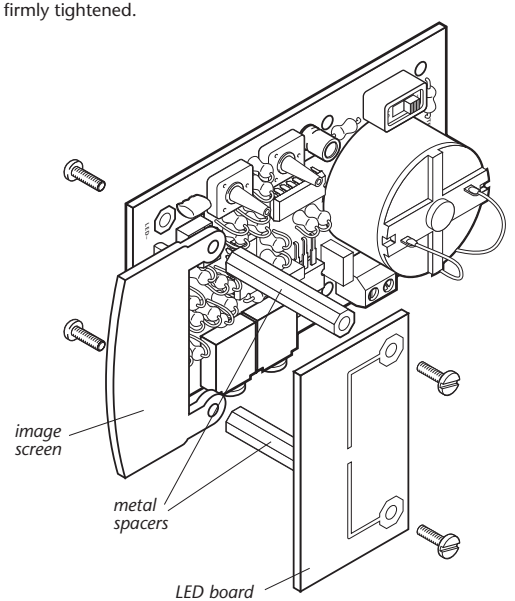


8. Attach the back plate to the front plate by slotting the ends of the long screws through the holes in the back plate and screwing on two nuts. Finally, peel the backing off the sticker and stick it to the front of the televisor.

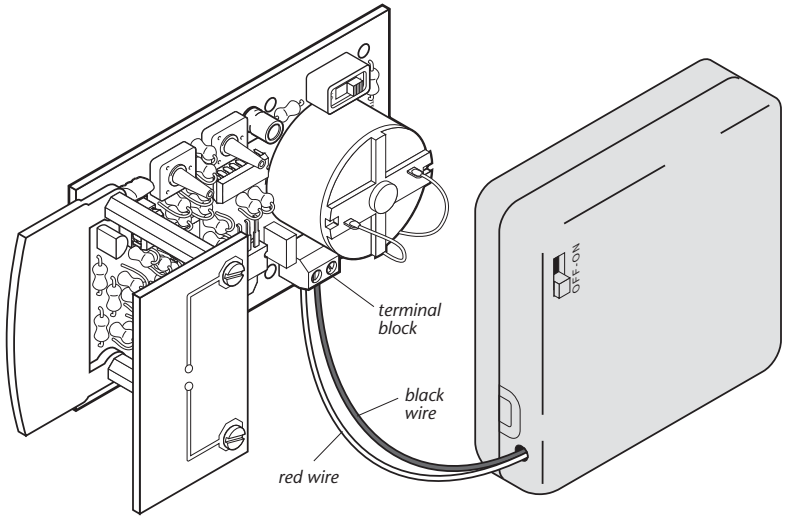


Assembling the *televisor*

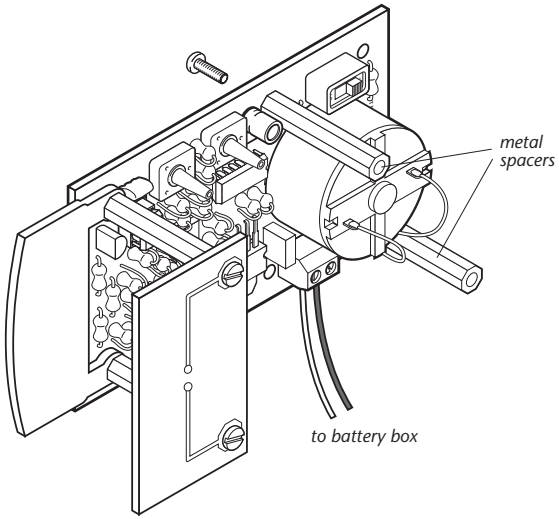
1. Fix the LED board and the image screen to the circuit board using two metal spacers and four small screws. Ensure the screws are firmly tightened.



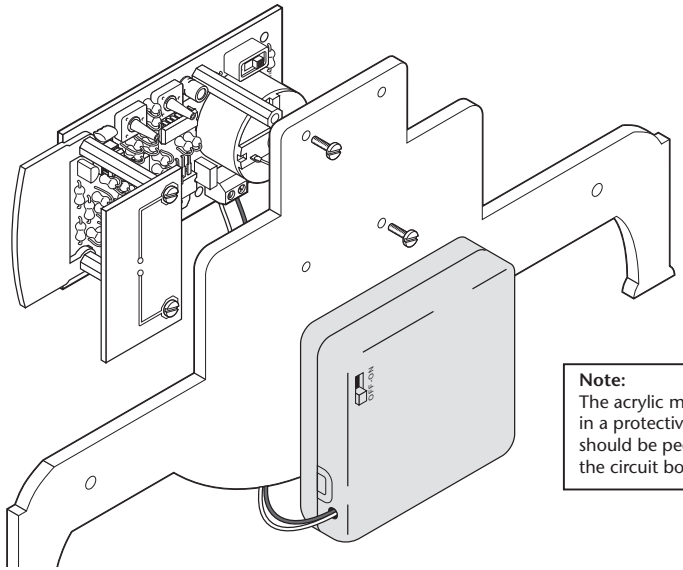
2. Connect the battery box to the circuit board by inserting the wires into the terminal block and tightening the screws. Ensure the red (positive) wire is to the left of the black (negative) wire.



3. Screw two metal spacers to the circuit board in the positions shown using two small screws.

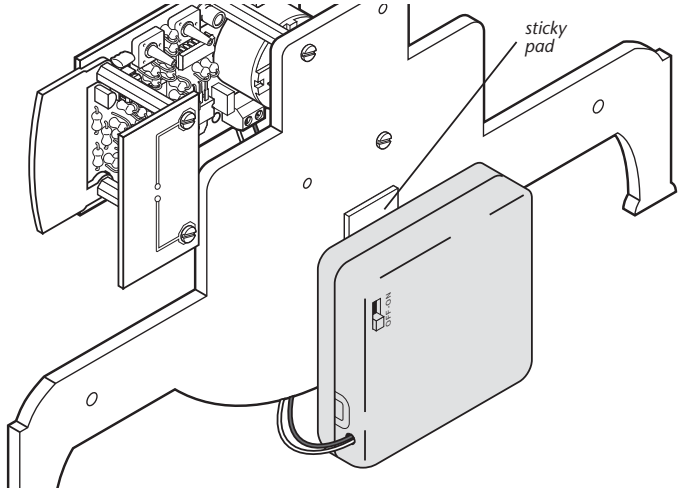


4. Attach the circuit board to the acrylic back plate using two small screws.

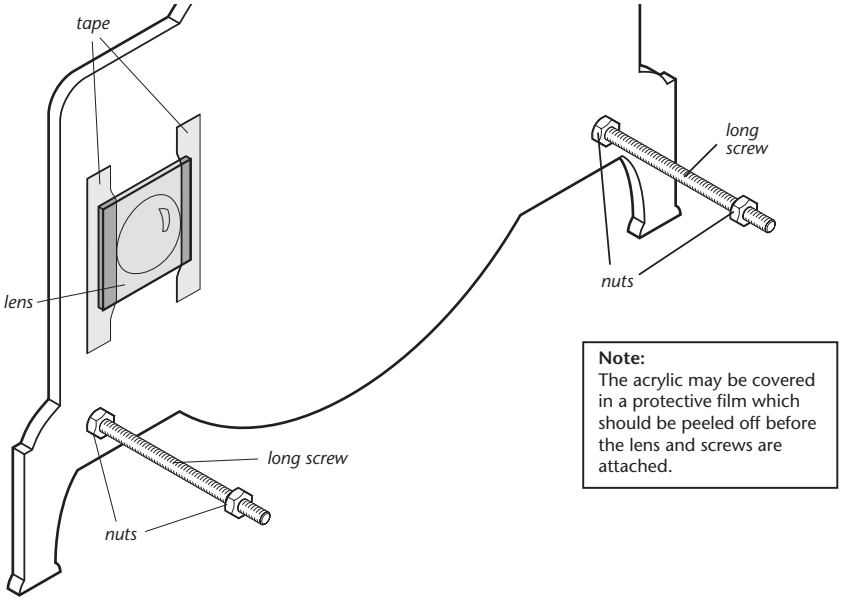


Note:
The acrylic may be covered in a protective film which should be peeled off before the circuit board is attached.

5. Make sure the switch on the battery box is OFF. Slide open the battery box and insert 4 x AA batteries. Close the battery box and stick it to the back plate using two self-adhesive sticky pads.



6. Stick the plastic lens to the front plate of the televisor using superglue or adhesive tape. The convex part of the lens should fit into the round hole in the front plate. Poke the two long screws through the small holes in the front plate and screw two nuts onto each thread as shown.



Note:
The acrylic may be covered in a protective film which should be peeled off before the lens and screws are attached.