Rainbow LED badges

This badge was designed by Richard, G0REL, for use at the 21st World Scout Jamboree in Chelmsford in 2007. It is very simple and quick to make when the component parts have been prepared in advance. Rainbow LEDs contain several LED light sources and a controller which cycles through a number of colours. In 2007 the LED illuminated a dove which was the symbol for the Jamboree. Since then a number of different logos have been used for other events. Some were better illuminated with the LED in the upper position (eg the *dove, campfire* and *ganske imponerende* badges) while others (eg the *hand* and *tent* badges) looked better with the LED in the lower position. The *snowflake* looks best in the centre. The location of the LED determines which cell(s) is/are omitted. The parts list and the tools required are the same for all. The instructions for preparation are the same but the two versions of Fig 1 show the different upper and lower positions of the hole for the LED. Although the instructions for the construction are very similar, they are given separately to avoid confusion.

Parts list

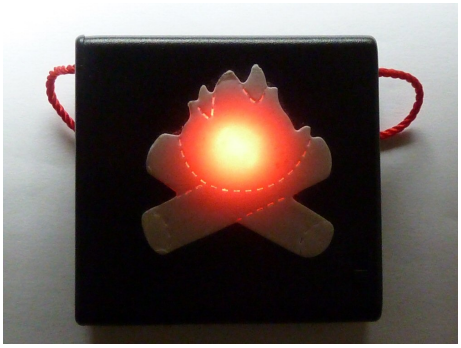
4 x AA battery box with switch [Rapid 18-2909]
10mm Rainbow LED [Rapid 55-0780]
3 AA cells [Rapid 18-1905 for 1000]
neck cord (eg. ScoobieDoo)
foam board 5mm thick for tent [Rapid 06-0032 for 10 A3 sheets]
- - - - - 3mm max for Sizzix punch
glue "Tuff and Tacky"

Tools for Preparation

Boxes
- 9.5mm drill for LED hole (lip & spur or 'jobber' drill for plastic)
- 4mm drill for neck cord hole (size to suit cord)
- drill stand
- machine vice (70mm opening required)
- blocks of wood to support plastic box while drilling

Foam board
- modelling knife
- steel rule
- cutting sheet
- 10mm dia hollow circular punch

Neck cord
- scissors



Tools for Construction

- fine nosed pliers
- side cutters
- soldering iron & stand
- solder
- small screw driver (Pozidrive no. 0)

Preparation of box

1 - Open battery box and position with the lead exit at the bottom right. [Fig 0]
3 - Lift out the metal connector on the bottom left. Keep - it is required later.
4 - Drill a 5mm hole on the left to match the hole for the wires on the right
5 - Drill a 9.5mm hole through the front of the box in the position shown in Fig 1L or Fig 1U

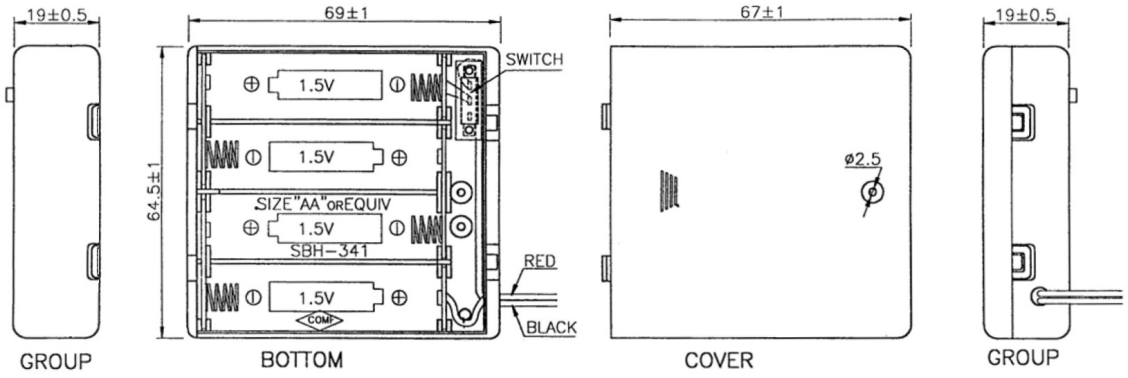


Fig 0 - Battery box as supplied

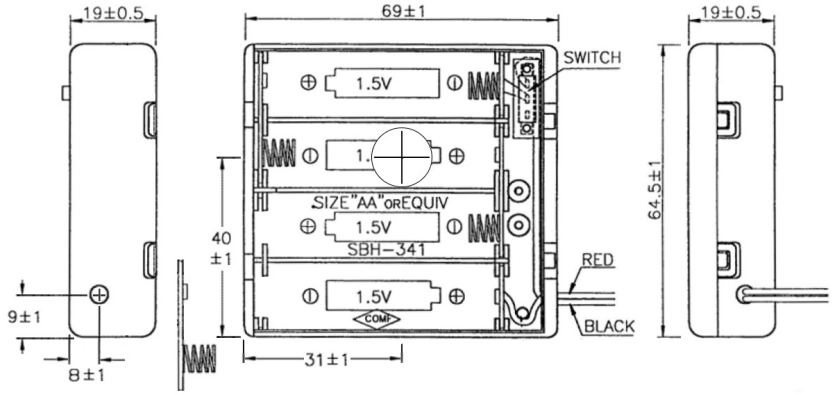


Fig 1L - Drilling drawing - LED in lower position

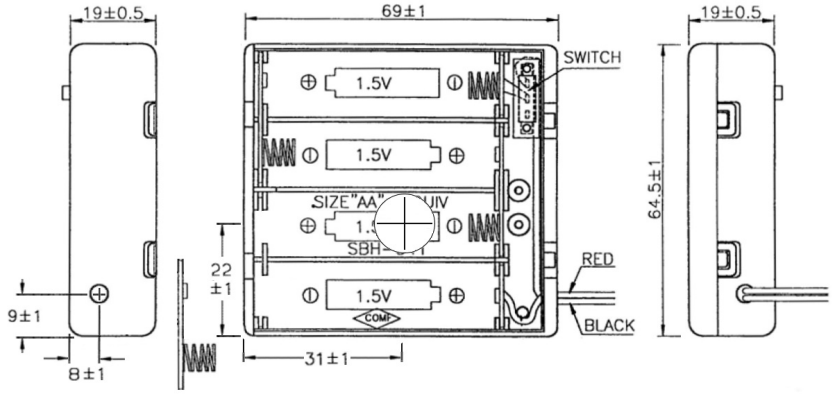


Fig 1U Drilling drawing - LED in upper position

Preparation of foam shapes

1 - Cut out the shape from the foam board
2 - Cut a 10mm dia circular hole in rear sheet of the foam board for LED
3 - Remove some of the foam so that the LED can poke through.

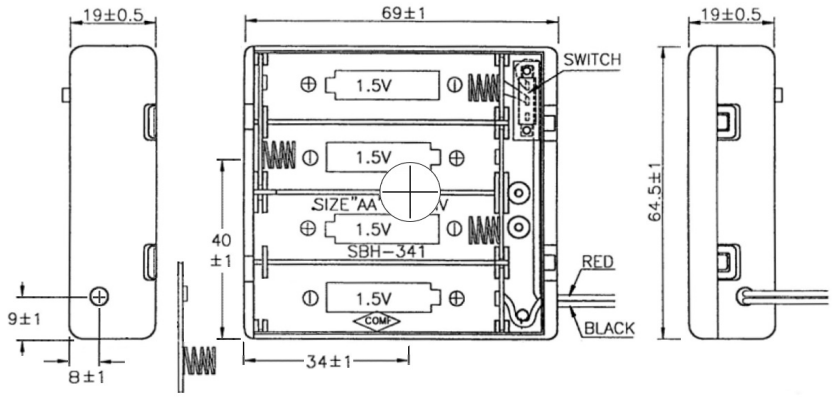


Fig 1C Drilling drawing - LED in centre position

When preparing a battery box for the LED in the centre position, the divider between the two middle cells must be cut away to allow the large hole to be drilled. The plastic is easily cut with a pair of side-cutters and the unwanted bit removed using a pair of pliers.

Construction - LED in lower position

1 - Open battery box [Fig 1L]
2 - Feed the wires back into the box.
3 - Lift out the battery connector at the bottom right.
4 - Unsolder the red wire.
5 - Cut, strip and solder the black wire where the red wire was removed.
6 - Replace the connector taking care that it is correctly orientated. [Fig 2L]
7 - Thread the neck cord through both holes and tie a knot inside the box [Fig 3L]
8 - Replace the battery contact removed during preparation, trapping the cord.
9 - Lift out the battery connector at the centre right.
10 - Using fine nosed pliers, bend the connector as shown.
11 - Replace the (now bent) connector.
12 - Form the leads of the rainbow LED [Fig 5]
13 - Position the LED in the hole with long lead toward the spring. [Fig 4L]
14 - Insert three AA cells and switch ‘on’.
15 - Check that the LED lights and then switch ‘off’.
16 - Solder the short lead to the bent connector and the long lead to the spring. [Fig 4L]
17 - Apply glue to the underside of the shape.
18 - Position so that the LED enters the recess
19 - Hold in position until the glue has set.
20 - Switch ‘on’ and check that it is working.
21 - Fit the lid and tighten the screw.

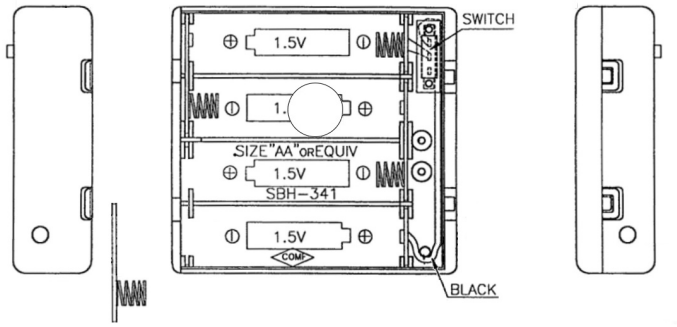


Fig 2L - Wiring diagram

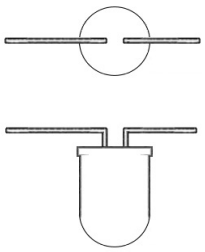


Fig 5 - LED leads

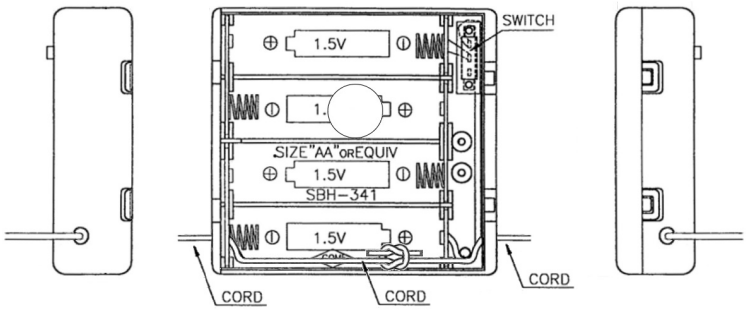


Fig 3 L - Inserting neck cord

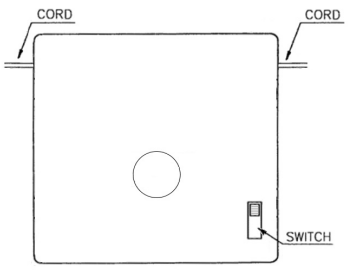


Fig 6L - Front

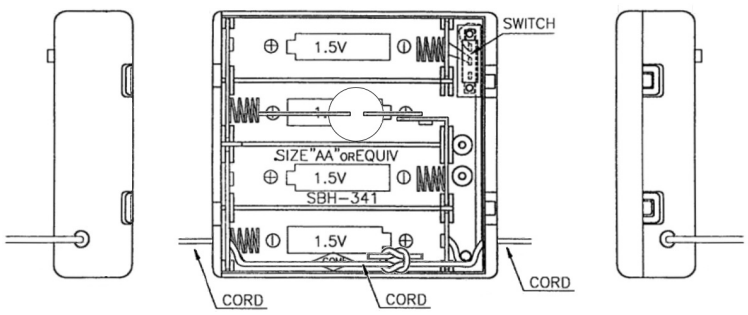


Fig 4L - LED

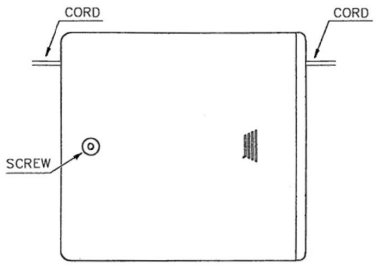


Fig 7 - Back

Construction - LED in upper position

1 - Open battery box [Fig 1U]
2 - Feed the wires back into the box.
3 - Lift out the battery connector at the bottom right.
4 - Unsolder the red wire.
5 - Cut, strip and solder the black wire where the red wire was removed.
6 - Replace the connector taking care that it is correctly orientated. [Fig 2U]
7 - Thread the neck cord through both holes and tie a knot inside the box [Fig 3U]
8 - Using fine nosed pliers, bend the connector removed during preparation as shown
9 - Replace the battery contact, trapping the cord (bottom left).
10 - Form the leads of the rainbow LED [Fig 5]
11- Position the LED in the hole with long lead toward the spring. [Fig 4U]
12 - Insert three AA cells and switch 'on'.
13 - Check that the LED lights and then switch 'off'.
14 - Solder the short lead to the bent connector and the long lead to the spring. [Fig 4U].
15 - Apply glue to the underside of the shape.
16 - Position so that the LED enters the recess
17 - Hold in position until the glue has set.
18 - Switch 'on' and check that it is working.
19 - Fit the lid and tighten the screw.

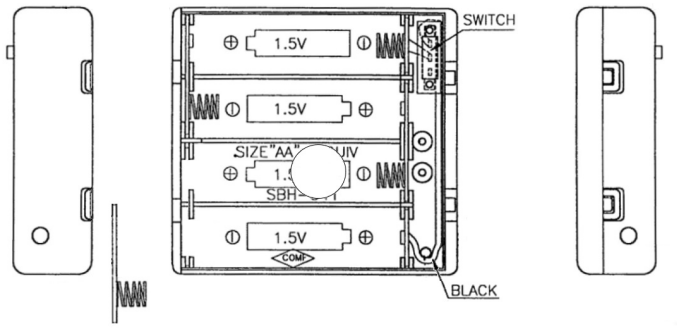


Fig 2U - Wiring diagram

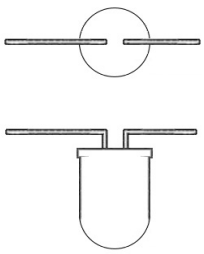


Fig 5 - LED leads

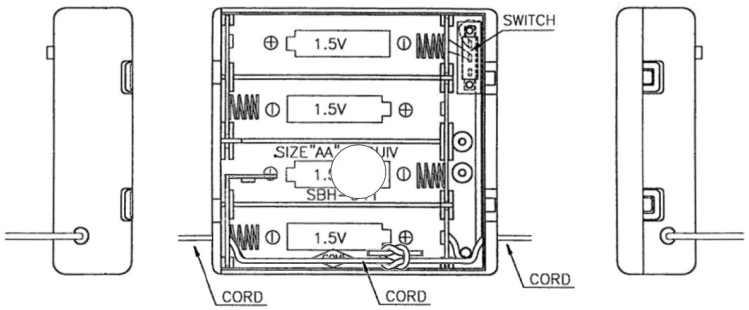


Fig 3U - Inserting neck cord

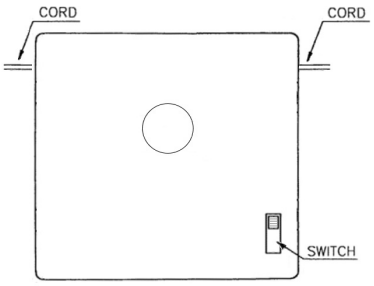


Fig 6U - Front

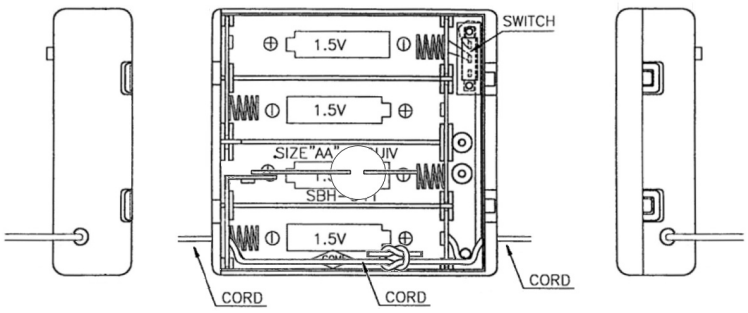


Fig 4U - LED

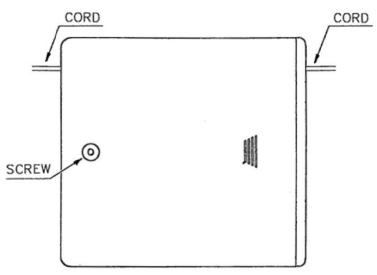


Fig 7U - Back

Construction - LED in centre position

1 - Open battery box [Fig 1C]
2 - Feed the wires back into the box.
3 - Lift out the battery connector at the bottom right.
4 - Unsolder the red wire.
5 - Cut, strip and solder the black wire where the red wire was removed.
6 - Replace the connector taking care that it is correctly orientated. [Fig 2C]
7 - Thread the neck cord through both holes and tie a knot inside the box [Fig 3C]
8 - Using fine nosed pliers, bend the connector removed during preparation as shown
9 - Replace the battery contact, trapping the cord (bottom left).
10 - Form the leads of the rainbow LED [Fig 5C]
11 - Position the LED in the hole with long lead toward the spring. [Fig 4C]
12 - Insert two AA cells and switch 'on'.
13 - Check that the LED lights and then switch 'off'.
14 - Solder the short lead to the bent connector and the long lead to the spring. [Fig 4C].
15 - Apply glue to the underside of the shape.
16 - Position so that the LED enters the recess
17 - Hold in position until the glue has set.
18 - Switch 'on' and check that it is working.
19 - Fit the lid and tighten the screw.

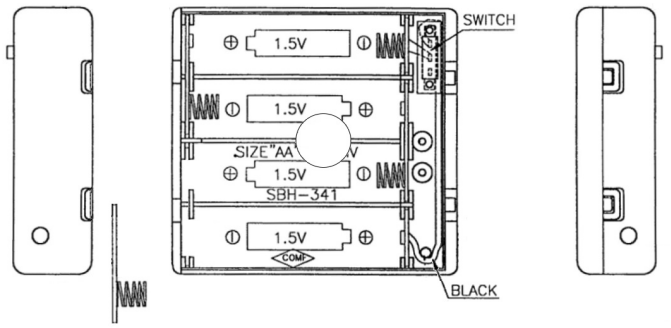


Fig 2C - Wiring diagram

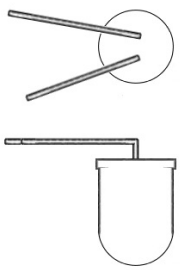


Fig 5C - LED leads

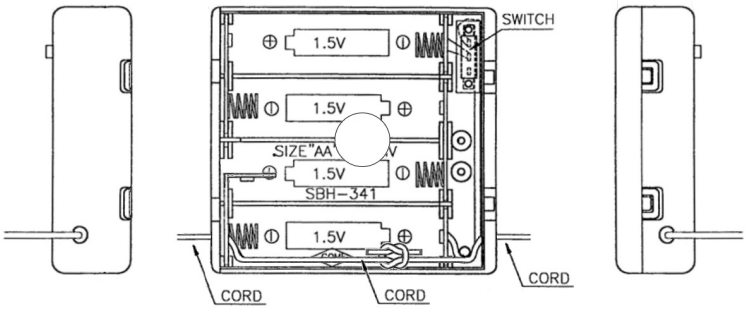


Fig 3C - Inserting neck cord

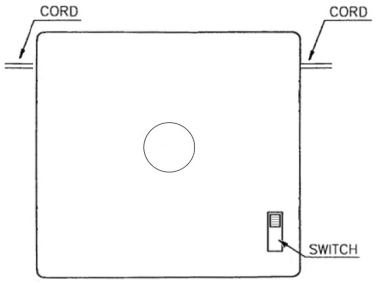


Fig 6C - Front

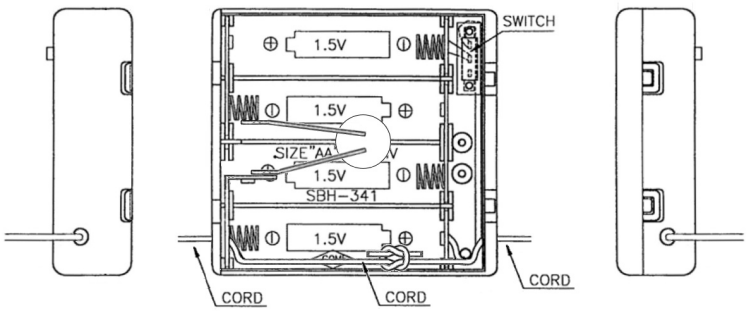


Fig 4C - LED

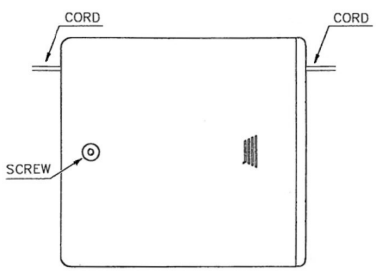


Fig 7C - Back

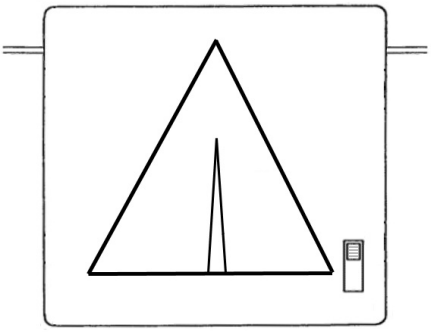


Fig 8L - Completed tent badge

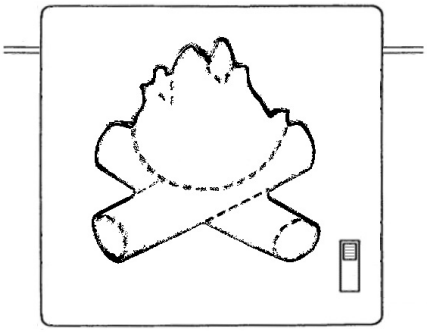


Fig 8U - Completed campfire badge

Notes

Lip and spur or ‘jobber drills’ are use to drill the holes in the plastic box because ordinary metal drills tend to grab and tear.

Specially cut wooden blocks are used to hold the irregular shape of the box in a machine vice while drilling. This leads to better control. Clamping the vice removes the need for marking out which speeds the work when there are many to be prepared.

Foamboard comprises a thin sheet of expanded polystyrene with thin card on either side making a light but rigid building material for models, etc. which is easily cut with a modelling knife. Complex shapes (eg. the campfire) can be cut from 3mm board using a red series (max depth range) Sizzix Die Cutter.

The 10mm dia hollow circular punch is a short length of steel tubing which has been sharpened at one end by making the end of the bore conical. The other end is set in a wooden handle for safe use.

Pressing too hard with this punch will result in a hole right through to the front of the foam board.

Any glue that sticks paper to plastic can be used.

---

v1.4 - Centre LED position added
v1.3 - Pictures added
v1.2 - Notes on foamboard and Sizzix Die Cuts added.
v1.1 - Original version.

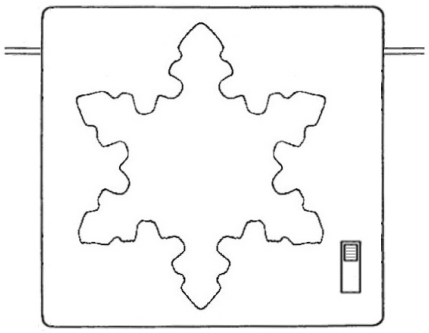


Fig 8C - Completed snowflake badge