SPECIAL SUPPLEMENT - ULTRA HI-FI DESIGN

electronics today

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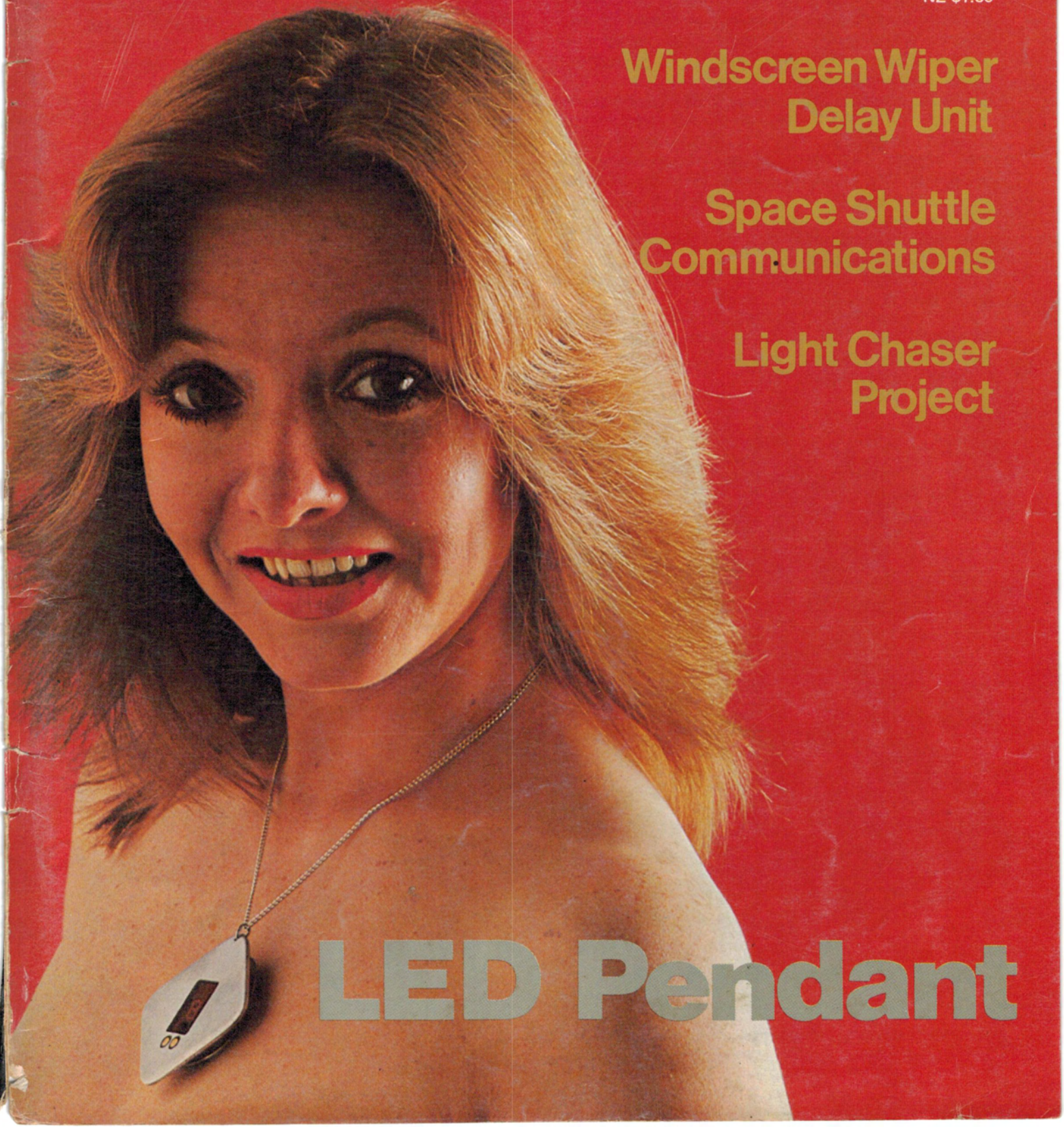


Windscreen Wiper Delay Unit

Space Shuttle Communications

Light Chaser Project

LED Pendant

LED Pendant

WANTING TO IMPRESS upon one's partner that electronics is not a boring useless occupation, has inspired many an electronic engineer to build egg-timers and liquid overflow indicators, etc. for their loved ones.

However, such devices, appreciated though they may be, cannot usefully be exhibited at parties and pubs to achieve maximum admiration. An obvious solution is electronic jewellery.

Before LEDs became commonly available it was possible to build illuminated jewellery using miniature catheter bulbs. But the current drain still involved the inelegant strapping-on of bulky power supplies and concealed switches.

Nowadays, by using LEDs and CMOS 'chips', it is possible to build a piece of self-contained jewellery that doesn't even need an on/off switch.

Electronic jewellery may take virtually any form that the designer seeks – the main limitation being availability of miniature resistors which are often hard to find in this country.

The example shown was in fact built using 1/8th watt resistors obtained from the UK. IRH manufacture a range of 1/4 watt resistors which are marketed via A & R-Soanar and only minor changes are needed to the mechanical details shown to accomodate these.

The operation is as follows. Upon touching the contact plates the seven-segment LED flashes between the two sections of the design for about eight seconds and then switches off again.

The pendant is not limited to letters that the seven segment display can handle. There is nothing to stop the reader from hard-wiring LEDs into dot patterns of any desired form.

(The prototype shown here was designed to flash the initials BJ).

Project 552

Mechanical Construction

Because one of the design aims was to keep the width to a minimum a common pc board design is impracticable. Therefore the components are hard wired and we do mean *hard* wired.

The front panel is cut from 16 SWG aluminium with a window for the seven-segment display and two holes below, with sufficient clearance for the heads of 8BA cheesehead screws, filed smooth. The red perspex window and the 8BA screws are fixed to the front panel using epoxy resin. Then the front is sanded down and polished. The epoxy insulates the contacts from the aluminium and also provides mechanical anchorage.

Electronic Construction

When the front facia is finished, the electronics can be mounted with super glue or epoxy resin (having first centralised the display over the window).

Great care must be taken to prevent shorts. Tinned copper wire and PTFE sleeving to suit, was used to hard wire the circuit as in the wiring diagram. Small pieces of tin plate were stuck down with double sided sticky pads for the battery contacts.

The sticky pads serve a dual purpose. They insulate the contacts from the front panel and also provide the tension to ensure good electrical contact.

Fig. 1a is the monostable and astable multivibrator which is the basic circuit. Fig. 1b and 1c show alternative circuits for BJ and AL respectively.

HOW IT WORKS - ETI 552

The prototype was designed with the initials BJ in mind, which was very convenient as the segments b, c, d and e remain on the the monostable period and segments a, f and g flash at 1 Hz to complete the letter B (Fig. 1 a, b).

To illustrate the technique involved in obtaining different combinations of letters, a further circuit (Fig.1 c) was designed to accommodate the letters A, L. This requires a further transistor Q3 and resistors R9 and R10 to give an inverse function. This circuit will be described in detail.

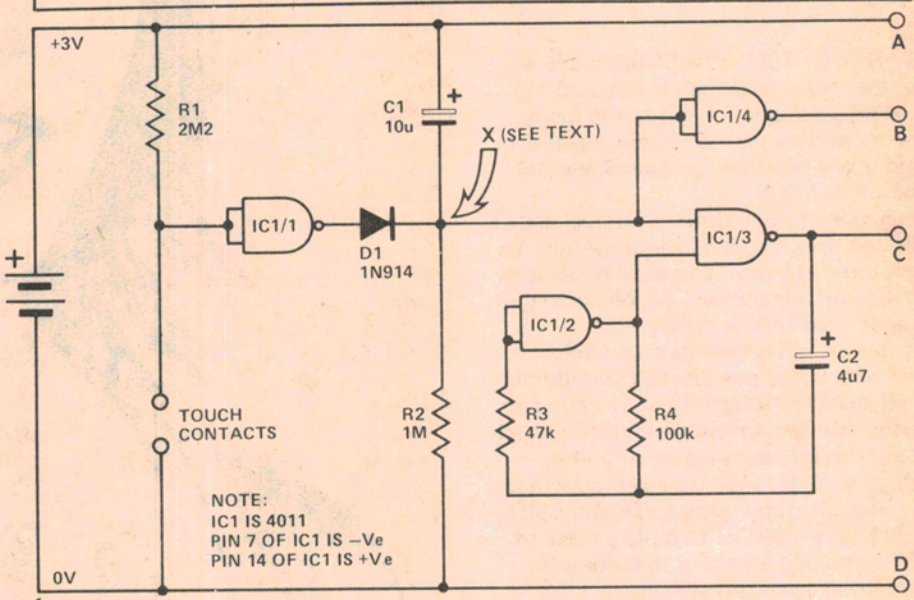
Under quiescent conditions no measurable current is drawn. When the touch plates are joined by a finger, inverter 1 discharges C1, this point X goes high for about 8 seconds, as C1 charges down. Then, via inverter 4, Q1 turns on and lights LED segments e and f. These remain on for the monostable period.

The output from the astable (gates 2 and 3) is initially low after the beginning of the monostable period, so that Q2 is switched on. This lights segments a, b, g and c, but Q3 is switched off via Q2, so that segment d is off. Thus the letter A is formed.

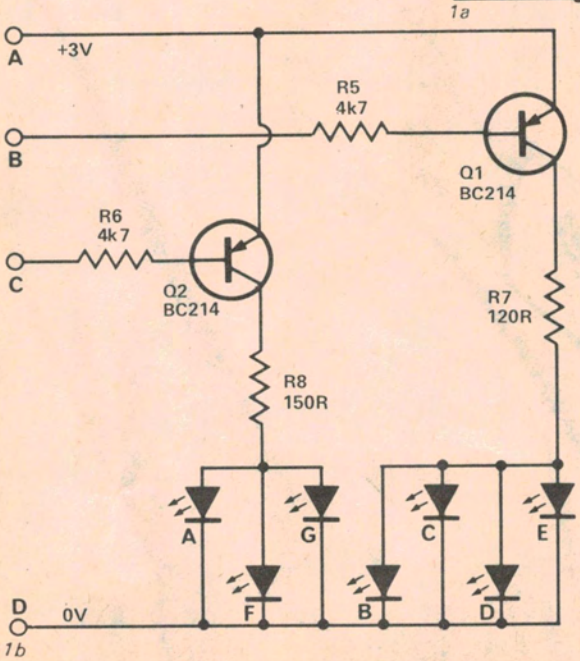
When the astable changes over Q2 is switched off, turning Q3 on, and lighting segment d. Thus with segments e and f on, the letter L is lit up.

Resistors 7, 8, 11 and 12 are chosen so that all segments have the same current and thus the same intensity. In this case about 2 mA per segment forms a compromise between battery drain and visibility.

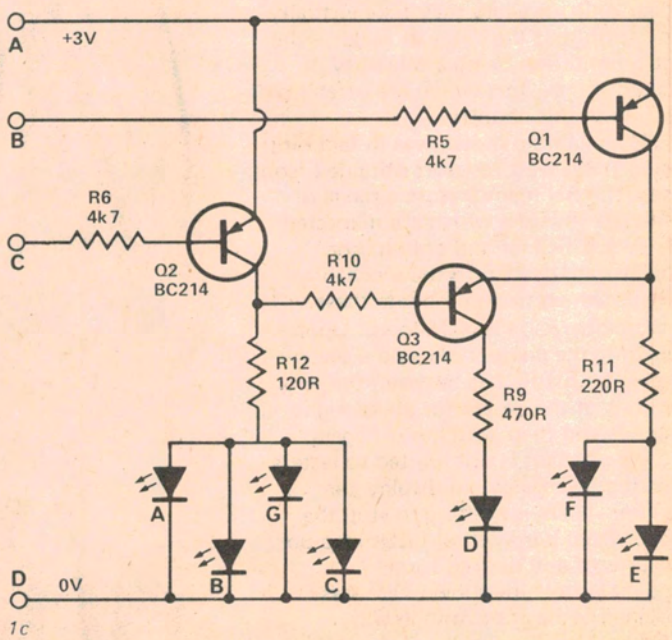
The batteries are Mallory MS76H 1.5 volt cells and in the prototype a life of two months was typical, with approx two minutes usage a day.



1a



1b

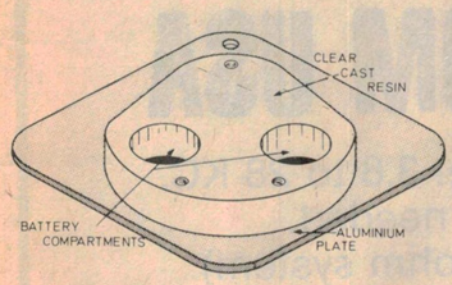


1c

Finishing It Off

When all the wiring is complete the battery compartments need to be constructed. Make up two tubes of the same external diameter as the batteries from cellophane or plastic and position them on the facia over the battery contacts, then pour quick-set epoxy around the tubes. When the epoxy has set remove the tubes and you have two battery compartments.

Make up another cellophane or plastic tube about 37 mm in diameter. Place this around the finished electronics and battery compartments and pour more clear cast over to cover everything to the depth of the battery compartments. When this has set a thin sheet of aluminium can be screwed down with countersunk self-tappers. (This sheet forms the common connector for the two cells).



LED Pendant as seen from rear after potting, note battery compartments.

PARTS LIST – ETI 552

Resistors all 1/8 W 5% or smaller

R1	2M2
R2	1M
R3	47k
R4	100k
R5,6	4k7
R7	120R
R8	150R

Capacitors

C1	10µ 6V3 tantalum
C2	4µ7 16V tantalum

Semiconductors

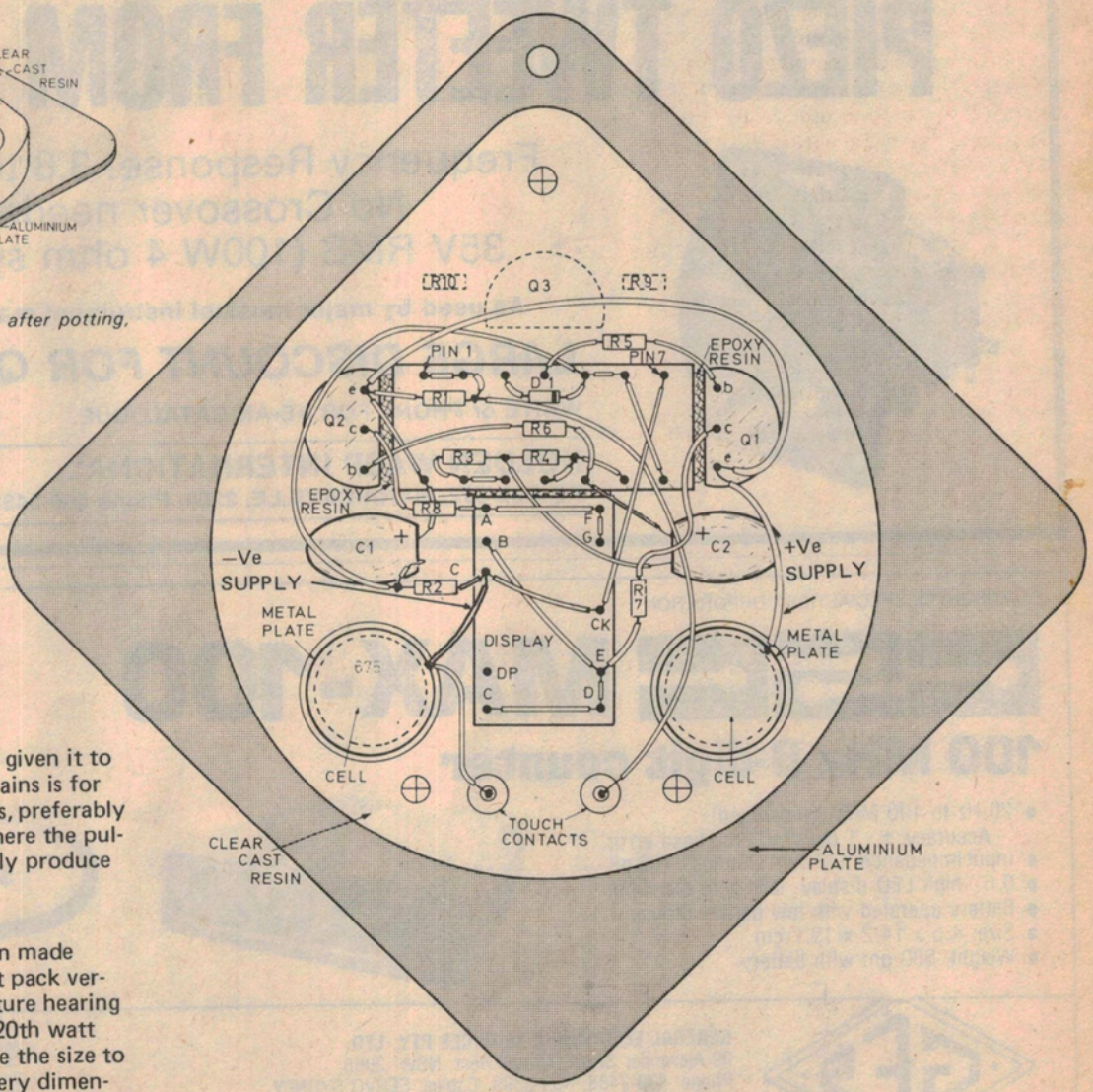
IC1	4011
D1	1N914
Q1,2	BC214
DISPLAY	7-segment common cathode type

Additional components for the circuit shown in Fig. 1(c)

R9	470R
R10	4k7
R11	220R
R12	120R
Q3	BC214

Miscellaneous

Piece aluminium 14 B&S 50 mm square, piece red perspex 21 mm x 12 mm, epoxy resin, 2 off 6 BA brass cheese-head bolts, 19 B&S tin plate, 28 B&S tinned copper wire, PTFE sleeving, 2 off Mallory MS76M cells.



Component layout, shown at twice times life size.

Presentation

Having built the device, and given it to your loved one, all that remains is for you to reap your just rewards, preferably in dimly lit surroundings where the pulsating red glow will hopefully produce the desired effect!

Note

This project could have been made much smaller by using a flat pack version of the 4011 and miniature hearing aid type transistors, and 1/20th watt resistors. This would reduce the size to almost the display and battery dimensions. But by using commonly available components a respectable size has been achieved.