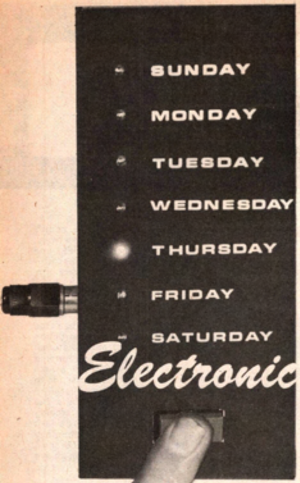


ALTHOUGH one might find various odd applications for this device, the main intention in its design was to help an elderly person, as it is often more important for such a person to know the day of the week, than the exact date. The routine of a senior citizen's life often revolves on a weekly basis, with, for example, a regular visit to a day centre, or a call from the home help. An elderly person can be very absent minded, and may forget what has been said within minutes, and so it is hoped that this device will provide a graphic visual stimulus more easily remembered, and also be around to prompt the memory when necessary.

The mechanical design of the unit is specifically intended to give an easy action, with a microswitch pushbutton, and a clear l.e.d. display against large lettering. For safety, the unit is powered by a battery of manganese-alkaline cells rather than mains. This gives a life of at least one year, although it may be possible to improve on this, using mercury hearing aid cells.

LOGIC

The device makes use of CMOS integrated circuit logic to achieve extremely low power consumption, the display being enabled only by the pushbutton when viewing is required. The generation of one pulse per

Electronic DAY INDICATOR

By M. H. George

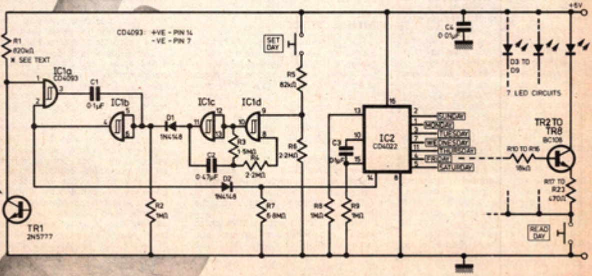


Fig. 1. Day indicator circuit diagram. No on/off switch is used, as the low current unit remains on permanent standby

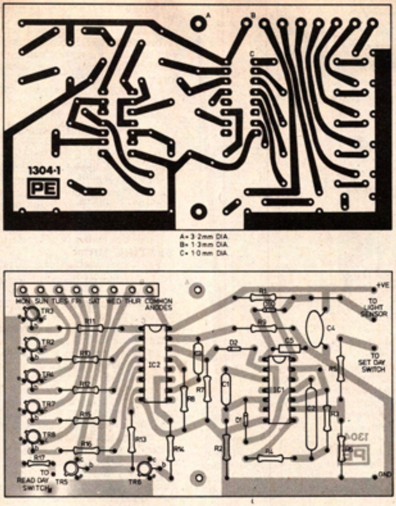


Fig. 2. Printed circuit and component layout of prototype. Note that on the prototype, resistors R18 to R23 have been eliminated by placing R17 in series with the Read Day switch.

COMPONENTS . . .

Resistors

R1	820kΩ*	R7	6·8MΩ
R2	1MΩ	R8	1MΩ
R3	1·5MΩ	R9	1MΩ
R4	2·2MΩ	R10–R16	18kΩ (7 off)
R5	82kΩ	R17–R23	470Ω (7 off)
R6	2·2MΩ		

All resistors ¼W 10%. *see text.

Capacitors

C1	0·1μF	C5	0·01μF*
C2	0·47μF		
C3	0·1μF		
C4	0·01μF disc type		

Semiconductors

TR1	2N5777
TR2–TR8	BC108 (or equivalent) (7 off)
D1–D2	1N4148
D3–D9	TIL209 l.e.d. (7 off)
*D10	1N4148

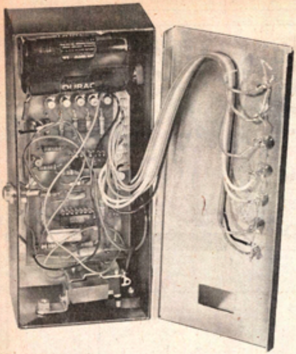
Integrated Circuits

IC1	CD4093
IC2	CD4022

Miscellaneous

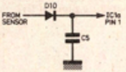
Metal box 164 × 74 × 50mm.
Microswitch pushbutton
Microswitch (to mount internally)
Battery holder
4 × MN 1500 (HP 7 size) cells
Printed circuit board
Eight way printed circuit connector, or Veropins
14 way d.i.l. socket
16 way d.i.l. socket
Two way connector (for sensor)*

*see text



day is effected by observing the dark to light transition at dawn. Phototransistor TR1 forms a potential divider with R1, and the switching level is set by a Schmitt trigger. This in turn feeds a monostable which provides a short pulse output during the dark to light transition. This pulse advances a ring of seven counter, as can be seen in Fig. 1. Provision is also made for presetting the day, with an internal pushbutton.

Because of the exceptionally high input resistance of CMOS devices, a small capacitor, isolated by a diode at the Schmitt trigger input, immunises the input from transient phenomena such as lightning flashes. On the prototype, the use of a 0·01μF capacitor gave an input time delay of 15 seconds.



CONSTRUCTION

All the components except the l.e.d.s are mounted on a fibreglass printed circuit board, the layout of which is shown in Fig. 2. The CMOS integrated circuits should be fitted last, preferably in sockets, observing all the usual precautions when handling these devices. The eight way printed circuit connector is a convenient way of coupling to the front panel display, but may well be replaced by Veropins. It is preferable that the case be isolated from the circuit, although not essential. Practically any connector can be used to plug in the light sensor unit, but some will automatically earth the box, as in the case of the prototype, which used a phono plug and socket. The *press to display* pushbutton should be an easy action microswitch with a large button, and the *press to set day* switch is a microswitch which should be mounted where it cannot be operated accidentally. The general layout of the prototype is shown in the photograph.

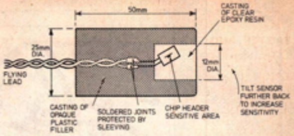


Fig. 3. Light sensor unit construction

In the prototype, the light sensor (2N5777) had two flying leads soldered to it, and was cast in clear epoxy resin. This was then cast into an opaque body filler such as Plastic Padding, to complete the assembly. As can be seen in Fig. 3, for maximum sensitivity, the sensor transistor had to be mounted at a slight angle to expose the sensitive area to incident light.

SETTING UP

The main problem concerns the value of resistor R1. This will depend upon the location of the sensor, its encapsulation, and the transfer voltage of the CMOS gate. Initial tests with the 2N5777 showed that it might be too sensitive, and the original method of encapsulation was to reduce this sensitivity. But under freak weather conditions when the sun rose early in the morning, followed by a thick cloud build-up, and then the day finally brightening up once more, the gadget recorded two days, indicating a lack of sensitivity. In the prototype, this was cured by increasing R1 to 5·6MΩ, but a more satisfactory method is to tilt the sensor in its casting, so that the sensitive area "looks out" at an oblique angle (as in Fig. 3). R1 should not be reduced below 680kΩ in order to minimise battery drain. Care should also be taken to see that the device does not respond to bright moonlight.

The Day Indicator has been in successful use for some months, and even on dark mornings the reading was found to advance at about 8.30 a.m. A good direction to aim the sensor is East, but it certainly should be pointed well away from artificial sources of light.

Once the device has been preset to the correct day, operation simply consists of pressing the pushbutton and observing which l.e.d. lights up. ★