AUTOMATIC EMERGENCY TORCH

Just don't think that this is yet another addition to other emergency light circuits published in EFY earlier. This circuit is a hit different. Its main features are:

1. Very reliable operation.

2. As transformer is not used, it is compact and cost-effective.

3. The torch bulb glows automatically at power off and goes out on restoration of power.

4. Since Ni-Cd battery is used, no maintenance is required. Also, battery life is very long, nearly 4-5 years (though this depends on frequency of usage and also on ampere-hour rating of the battery used).

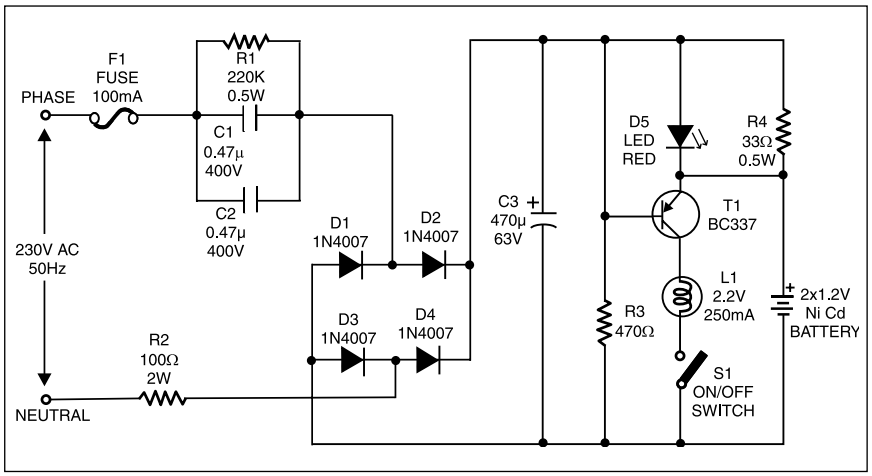
Sounds interesting, doesn't it? Read on then. The circuit is very simple, comprising just a handful of components. This implies that the circuit operation also is very simple. The circuit consists of two parts:

1. Power supply for charging the Ni-Cd battery.

2. Switchover circuit which detects mains failure and switches the bulb 'on'.

In the power supply section, capacitors C1 and C2 function as non-dissipating, reactive impedances which limit the current to a safe value. With the values of capacitors as shown, the maximum current that can be drawn is limited to about 70 mA at 230V AC. Resistor R2 limits the initial surge current and resistor R1 assists in discharging the capacitors after switch off. Diodes D1 through D4 form a conventional bridge rectifier while capacitor C3 is the filter capacitor. Fuse F1 is for protection and is very helpful in the event of any component giving up the ghost. This supply charges the battery as long as mains is present.

In the 'switchover' section, transistor T1 is used as switch. Normally, when AC mains supply is present, the rectifier output



charges the battery through resistor R4 and LED D5 combination at about 50mA rate. The glowing LED (D5) also gives an indication of mains presence. Further, due to the LED (D5), base of transistor T1 is about 1.6V (drop across D5) more positive than its emitter. This voltage is more than sufficient to keep the transistor at cut-off.

As soon as the mains voltage fails, the base of transistor T1 is pulled low through resistor R3 which drives transistor T1 to saturation thereby turning the bulb 'on'. Since the transistor is in its saturated state, the voltage drop across it is very low. Hence the bulb glows with full brilliance. The bulb can be switched off by the ON/OFF switch, when not required. With this bulb (2.2V, 250mA) the torch can work continuously for about two hours. The batteries should be charged for about 14 hours after they are discharged.

You can verify following voltages in the circuit:

1. Base voltage of the transistor must be 1.8V to 2.0V, i.e. about 0.6V less than the battery voltage.

2. Emitter voltage must be equal to the battery voltage.

3. Collector voltage must be 2.0V to 2.2V, i.e. nearly equal to the battery voltage.

All above voltages should be checked with AC mains off. If any of the above-mentioned voltages is absent it indicates that the transistor is bad and it should be replaced by a good one.

Here is a word of caution now. Since the circuit is not isolated from AC mains. it may be hazardous to touch any component when the mains supply is on, especially if the supply wires (live and neutral) get interchanged. It is strongly recommended to use an all-plastic enclosure (including the reflector for the bulb) for the circuit. Also the ON/OFF switch used should have a plastic lever. Take proper care and precautions while building, testing and using the circuit, and never ever allow the supply wires to interchange. It is advisable to provide a plug for the mains input on the box itself so that it can be plugged directly into a mains outlet. This reduces the chances of mains supply wires getting interchanged.

With proper precautions and a little care, it is hoped that this small circuit will help make life a bit more comfortable.