MEDICAL EQUIPMENT BATTERY STATUS INDICATOR

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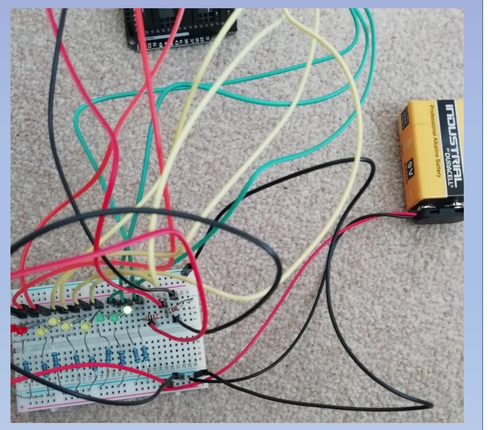
Project Introduction

Multiple medical instruments and devices use batteries, from Glucometers, Ventilators and Electric Operating Tables to even medical tools like Sternal Saw. Batteries of variable capacity or strength can be used in various environments from hospitals, clinics to field hospitals and ambulances where there may not be direct supply of electricity. Batteries are stored form of portable energy; it makes medical devices portable and convenient to use. The performance and failure of all medical devices rests on type of battery used; single-use (primary) or rechargeable (secondary) and the manufactures. Some third party assembled batteries have significant shorter life as opposed to a good manufacturer of the same size and type of battery. Identification of such batteries are difficult for end user of biomedical practitioner, which increase the risk of failure of device or instrument at unexpected time. However, batteries have a certain lifespan and their performance deplete with time.



How it works?

The LED's are connected in series with the resistors. The LED's are also connected to the digital pins of the Arduino board. To measure the battery a pull-down resistance must present as this type of resistance maintains a low logical state that is at 0V. It is highly important to use this type of resistor since, when the battery connected to be measured is not present, an indeterminate state is created at the input of the analog pin, which causes it to oscillate and maybe until some LEDs light up.
The positive end of the battery is connected to the pull-down resistance and to the analog input A0. And the negative end is connected to the Arduino ground (GND).

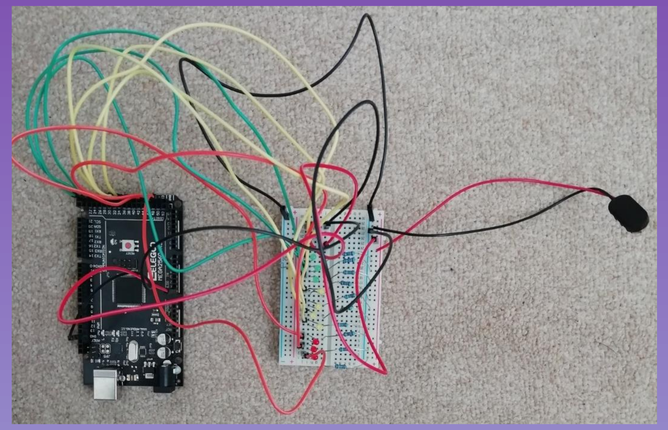
Project Aims

To design, assemble components, program code, and build a fully operational circuit with low cost and low power consumption that is economical, energy efficient, durable, and reliable which will be used to assist the user to give ample warning on a battery-operated equipment's particularly a medical equipment's battery status to avoid a sudden breakdown in the equipment's operation. This will allow the user enough time to switch to alternate power supply or change or recharge the medical equipment's batteries.

Moreover, a lot of equipment go into sudden death in households so to design a circuit that can display or give a warning for failure so that the user has ample time for changing or recharging the batteries in the equipment. This warning will help the user to deduce a timeframe of how long the batteries of the equipment last, therefore, mitigating the risk at the user end and making the equipment user friendly.

Table of results

9 V Battery Voltage Levels/V	Potential Divider Battery Voltage/V	Battery Percentage Remaining/%	LED Status
9.0	4.50	100	First Green LED ON
8.1	4.05	90	Second Green LED ON
7.2	3.60	80	Third Green LED ON
6.3	3.15	70	First Yellow LED ON
5.4	2.70	60	Second Yellow LED ON
4.5	2.25	50	Third Yellow LED ON
3.6	1.80	40	Fourth Yellow LED ON
2.7	1.35	30	First Red LED ON
1.8	0.90	20	Second Red LED ON
0.9	0.45	10	Third Red LED ON



Recommendations / Future work

A) The designing, building, and testing of this whole project should really be performed in the laboratory as it is a great and fun project to carry out. Also, with the right test equipment present, a more detailed and in-depth analysis of the battery's voltages and life can be carried out. The results obtained will be a very useful as a reference guide for batteries used in various medical equipment and devices by non-technical people such as doctors, nurses and any other member of the medical team.

B) A larger and longer breadboard is recommended so that the components can be spaced out apart and so a cluttered system does not arise. Also, so that the circuit will work properly as the components will not be touching each other and so any unnecessary redesigning of the whole circuit system will not be required.

C) A LCD operated battery status indicator circuit is highly recommended as it will give an accurate visual presentation of the supply and output voltages and current and how changing one variable affects the other. Moreover, it is an added advantage for non-technical personnel who just need the status values of the battery in operation to identify when a replacement or recharge is needed.

Project Objectives

- To investigate and research the development of an electronic circuit for indicating and warning of the status of primary or secondary batteries and review its suitability and benefit for use in some medical equipment.
- To apply knowledge learnt and skills gained in the engineering program to tackle new challenges and obstacles that may encounter during the research, design, assemble and build phase.
- To plan, research and present the findings and solutions of this circuit design problem in a professional technical report.
- To utilize this project in a systematic approach for setting deadlines and milestones to finish early and submit before the due date so that the examiner has extra time for marking.
- To carry out this project in such a way that it will create an impression that is expected from a professional engineer. Thus, increasing value to my University research portfolio.