International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

Automatic Battery Charging System with Auto Cutoff

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Abstract - This task proposes a programmed battery accusing framework that includes an autoslice off component to ensure safe and efficient battery charging. The framework uses a microcontroller to screen the battery voltage and current during the charging system. Sensors are utilized to recognize the battery's state and decide the ideal charging rate. When the battery arrives at its full limit, the microcontroller triggers a transfer or change to separate the charging circuit, forestalling cheating. This element expands the battery's life expectancy as well as upgrades security by decreasing the gamble of warm out of control or blast due to cheating. The proposed framework gives a financially savvy and solid answer for battery charging applications in different fields, including car, environmentally friendly power, and versatile gadgets.

Keywords-Charging, Battery charge,Rechargeable battery.

I.INTRODUCTION

The goal of this project is to provide innovative solutions for reducing the shortfall of force that occurs without human intervention.The 'auto' in this context refers to a battery charger that is automatically controlled. Cheating batteries shortens their lifespan and endangers humans. The project is primarily focused on computerizing the charging of batteries. All of humanity is responsible for saving energy resources. That is, power is a human-created energy resource. These days, the lack of force is being undermined by the inappropriate use of human culture. An automatic switch-off charger is an electrical device used to charge batteries. When the battery is fully charged, this charger will automatically stop charging. This prevents the battery from charging to its full capacity. If the battery voltage falls below the predetermined value, the circuit will charge the battery. It has been observed that, regardless of the level of release, most battery management centers routinely interface the batteries and allow them to charge without automatically disengaging them when they are fully charged to avoid overcharging and potential explosion. Sometimes, in order to provide prompt assistance and meet the needs of clients, the battery charger's charge setting is adjusted to increase the charging current and shorten the charging time. Such practices shorten the battery's useful life.

II. METHODOLOGY

1. Requirement Analysis: Understand your charging system's requirements, such as the type and capacity of batteries to be charged, the voltage and current

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requirements, safety issues, and if the charging system should be portable or stationary.

2. Choose a Battery Charger Type: Determine which type of battery charger is best for your application. Trickle chargers, rapid chargers, and smart chargers are three common varieties. Choose one that corresponds to your battery type and charging requirements.

3. Circuit Design: Plan the charging circuitry. This includes choosing components like diodes, resistors, capacitors, and voltage regulators. Ensure that the circuitry can produce the necessary voltage and current to properly charge the battery.

4. Safety Measures: Include safety elements in your design to prevent overcharging, overcurrent, and short circuits.

5. Auto Cutoff Mechanism: Use the auto cutoff mechanism to stop charging once the battery has reached full capacity. This can be accomplished using a variety of techniques, including voltage sensing, current sensing, and temperature sensing. You can, for example, use a voltage divider circuit to monitor battery voltage and disconnect the charger when it reaches a predetermined level.

6. Microcontroller Integration (Optional): If you require advanced control and monitoring capabilities, you can incorporate a microcontroller into your design. The microcontroller can monitor parameters like battery voltage, current, and temperature and adjust the charging process accordingly.

7. Testing and Validation: Once the charging system is built, thoroughly test it to ensure that it operates safely and effectively. Test for various scenarios such as different

8. Documentation and Compliance: Keep a record of your design, including schematics, bills of materials, and operating instructions. Ensure that your design meets all applicable safety standards and laws.

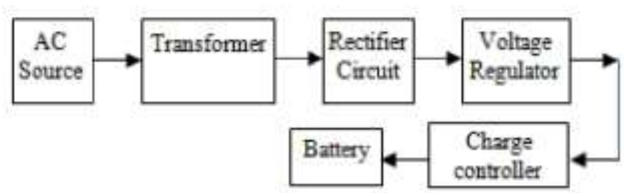
9. Continuous optimization and refinement of your design based on feedback and performance evaluations. Consider elements including efficiency, charging time, and usability.

10. Deployment and Maintenance: Place your charging system in its intended application and provide instructions for proper operation and maintenance. To guarantee that the system remains reliable and safe, inspect and repair it on a regular basis.

2.1 Hardware Description

2.

3. Block Diagram



Circuit Diagram

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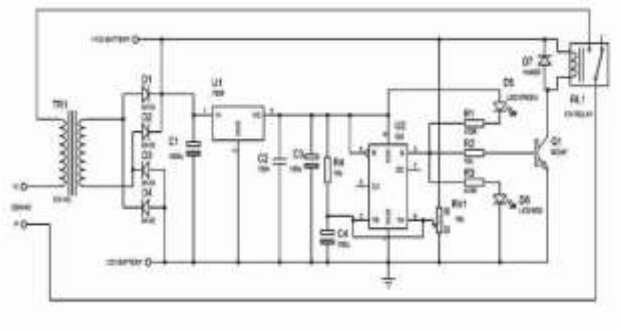

2.2 Explanation of hardware components

2.2.1 Transformer

Input Voltage (Primary Voltage): This is the voltage given to the transformer's primary winding. In your case, the voltage is 230V alternating current.

The output voltage (secondary voltage) is the voltage delivered by the transformer's secondary winding. In your case, the voltage is 12V AC.

Power Rating (VA or watts): The transformer's power rating specifies the maximum power it can handle. It is usually measured in volt-amperes (VA) or watts. The power rating can be calculated using the following formula:Power (VA) = Voltage (V) x Current (A).To accurately calculate the power rating, you must first determine the maximum current that your load will draw from the transformer.

Transformers are intended for specific frequencies, typically 50 or 60 Hz. Ensure that the transformer frequency matches.

Isolation: Transformers can create electrical isolation between the primary and secondary circuits.Ensure that the transformer provides the necessary level of isolation for your application.

Transformers have efficiency ratings that show how well they convert input power to output power. Higher efficiency transformers are often preferable because they use less energy.

Temperature Rating: Transformers have a maximum temperature rating that ensures safe operation.

2.2.2 555 Timer IC:

Supply Voltage (Vcc): The 555 timer IC can operate on a wide range of supply voltages, typically ranging from 4.5V to 15V DC. However, there are variations of the 555 timer IC that can function at lower or higher voltages.

Operating Modes: The 555 timer IC can operate in three modes.

Monostable Mode (One-shot): When triggered, it generates a single pulse of a defined duration.

Astable Mode (Oscillator): Produces a continuous square wave output.

Bistable Mode (Flip-flop): Functions like a standard flip-flop or toggle switch.

Timing Components: The timing of the 555 timer IC in monostable and astable modes is determined by external resistors (R) and capacitors (C) attached to particular pins (typically 6, 7, and 8).

Output Current (Iout): The highest output current of the 555 Trigger and Threshold Voltages (Vth and Vtrig): These voltages determine when the 555 timer activates or resets its internal flip-flop. Typically, these values are set to around one-third and two-thirds of the supply voltage.

Temperature Range: The 555 timer IC is available in three different temperature ranges: commercial (0°C to 70°C), industrial (-40°C to 85°C), and military (-55°C to 125°C) grades.

Package Types: The 555 timer IC is available in a variety of package types, including DIP (Dual Inline Package), SOP (Small Outline Package), and SOIC. The package type impacts the IC's physical size and pin layouts.

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Pin Configuration: The 555 timer IC normally has eight pins, each performing a specific function such as power supply and trigger.

2.2.3 Relay :

Coil Voltage: This is the voltage required to power the relay and trigger the switch contacts. For a 12V relay, this is normally 12 volts DC, though there are other versions that work at different voltages.

Contact Ratings: This specifies the maximum voltage and current that the relay contacts can tolerate. For example, a common specification could be 12V DC, 10A, which means the contacts can safely switch loads up to 10 amps at 12 volts DC.

Contact Configuration: Relays can have many contact configurations, including ordinarily open (NO), usually closed (NC), and changeover (CO) contacts. The contact configuration governs how the relay operates when it is not electrified.

Contact Material: The material used for the relay contacts can affect their performance.

Contact Resistance: This specification describes the resistance of the relay contacts when closed. Lower contact resistance leads to improved electrical conductivity and less power loss.

2.2.4 Lead acid battery:

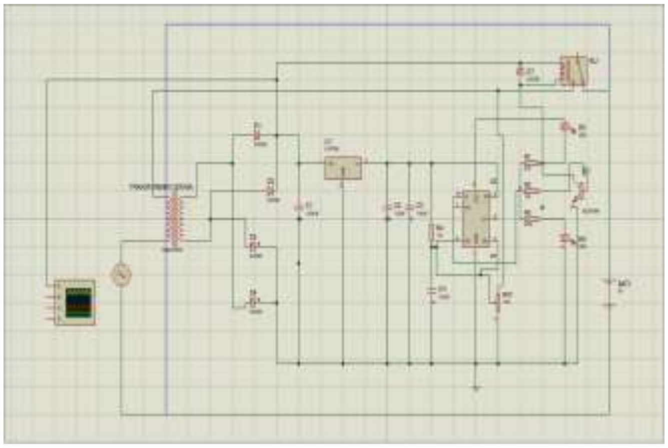
Battery Type: There are several types of lead-acid batteries, including flooded, sealed (AGM - Absorbent Glass Mat)

Voltage: The voltage at which lead-acid batteries function varies based on their arrangement. For example, a 12-volt battery is commonly utilized in automotive applications, whereas 6-volt and 24-volt batteries are also employed in a variety of other applications. Make that the charger is intended to supply the proper voltage for your battery.

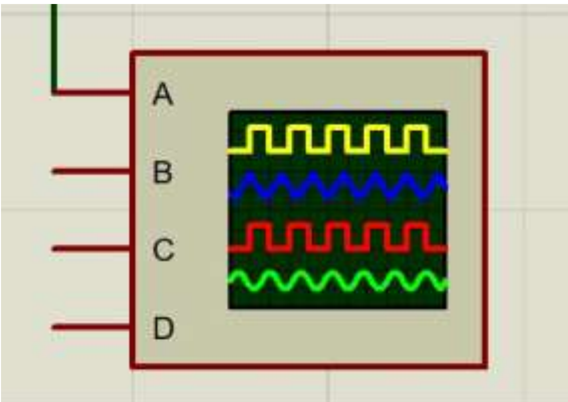
Current Rating: The charging current should be proportional to the battery capacity. Typically, the charging current is stated as a proportion of the battery's capacity, such as C/10 would have a charging current of 10 amps.

Charge Stage: To effectively charge the battery and avoid overcharging, the charging system should include many stages (such as bulk, absorption, and float). Each stage employs a specific voltage and current profile matched to the battery's requirements at that level of charging.

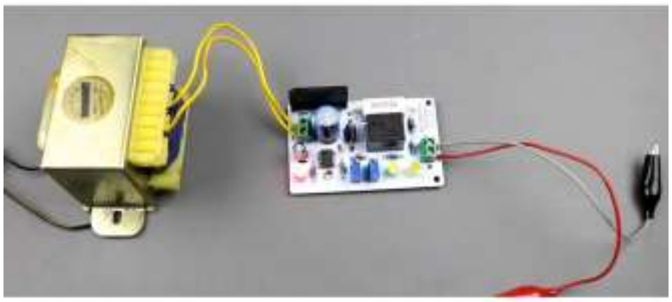
Simulation:



Simulation Output:



Hardware Output:



III CONCLUSION

The automatic battery charging technology with auto-cutoff enables efficient and safe charging while preventing the battery from overcharging.
Its sophisticated functionality maximizes battery life and improves user convenience.

IV REFERENCES

[1] Udezue, CU, J.Eneh, A Unachukwu, I. Onyemelukweand H Onyeka. 12V Portable Battery Charging System, Pacific Journal of Science and Technology 17(1): 5-11. May 2016.

[2] K.K. Vijeh, “Current, voltage and temperature govern Li-Ion battery charging ", Online Source, National Semiconductor Corp., May 28, 2003.

[3] Design and Implementation of an Automatic Battery Charger with Overcharge Protection by M. F. Islam, M. S. Ali, M. A. Islam, and M. H. Rashid. (International Journal of Electrical and Computer Engineering)

[4] Design and Development of an Automatic Battery Charger with Overcharge Protection by S. Sengupta, S. Mukherjee, and S. Chatterjee. (International Journal of Science and Research)

[5] Automated Battery Charging System Using Solar Energy with Overcharge Protection by P. Kannan, R. S. Meena, and S. Arumugam. (International Journal of Engineering Research and Technology)

[6] Smart Battery Charger with Overcharge Protection and Energy Optimization" by M. R. Karim, M. Z. Anuar, and M. S. Mat. (IEEE International Conference on Power, Energy and Communication Systems)

[7] Design and Development of a Microcontroller-Based Battery Charger with Overcharge Protection by A. P. Thakur, A. Gupta, and V. K. Sharma. (International Journal of Advanced Research in Electronics and Communication Engineering).