



## Design and Construction of a 20amps 12v Inverter Battery Charger

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### Introduction

The construction and actualization of an improved 20 Amps solar battery charger for home and industrial usage was carried out. High-capacity batteries used in power tools and heavy machinery can be charged with this sturdy and effective battery charger. With the use of diodes, relays, and transistors, essential safety features like reverse polarity protection, thermal shutdown, and overcharge protection are integrated to enable charging in challenging circumstances. The charger's rugged enclosure is dust and moisture resistant, able to endure the rigors of laboratory environments. Furthermore, a user-friendly interface provides real-time charging status and battery health, increasing ease of use and monitoring through the application of power meter which display the charging voltage and current. The overall goal of this charger design is to increase laboratory productivity, decrease equipment downtime, and improve the reliability of power delivery to mission-critical laboratory applications. The charger's manufacturing process adheres to industry performance and safety standards to ensure the charger's longevity and functionality under a variety of demanding operating circumstances.

### Materials and Methods

Some materials required for the construction of the battery charger are listed below.

- Variable Resistors (50k $\Omega$ )
- Fixed resistors (150 $\Omega$ , 2.2k $\Omega$ )
- GBJ 2520 (bridge rectifier)
- Transformer (10A, 14V)
- Capacitor (1000uF, 50V)
- Transistor (Bc 547)
- Relay (12V)
- LED (red, green)
- Diode (1N4007)

The two wires utilized in the construction of the 12V 10A charger are black and green, and they represent the coil, which was linked with the output 14VAC at the secondary (fig 1.). The input from the primary side of the transformer is connected to 220VAC. A 1000uF capacitor was also connected across the positive and negative terminals of the outputted DC. The first leg of a 10k  $\Omega$  variable resistor is connected to the positive terminal of the DC voltage via a 150 $\Omega$  resistor, while the NPN transistor BC 547 is connected to the middle terminal of the variable resistor and the negative terminal of the DC voltage is connected to the last terminal of the variable resistor. The positive terminal of the DC voltage is connected to the positive terminal, common terminal, and negative terminal of the 1N4007 diode. The emitter of the BC 547 was linked to the negative terminal of the DC voltage, and the collector terminal connected to the positive terminal and negative terminal of the 12VDC relay. The blue LED's positive terminal joined to the normally open (NO) relay terminal; (fig. 1), the green LED's positive terminal was connected to the normally connected (NC) relay terminal; and the two LEDs' negative terminals were connected to the negative terminal of the 12VDC via a 2.2K $\Omega$  resistor. The charger's positive terminal also linked to the 12VDC relay's normally connected terminal, while the charger's negative terminal was connected to the bridge rectifier's GND terminal. Whereas the green LED indicates a fully charged battery, the blue LED indicates charging.

### Results and Discussion

The plate 1 below shows the image of different sections of the total circuit which include the transformation section, rectification section, voltage and current sensing section and the voltage charger output section.

### Conclusion

This 12V DC charger is a popular power supply device that transforms wall outlet alternating current (AC) into 12 volts of direct current (DC). It can be used to charge a variety of electronic devices and batteries, especially lead-acid batteries, which are frequently found in backup power supplies, solar power systems, and automobiles.

**Keywords:** Battery Health, Current, Voltage, Overcharge Protection, Power Meter