

Variable Power Supply

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ABSTRACT:

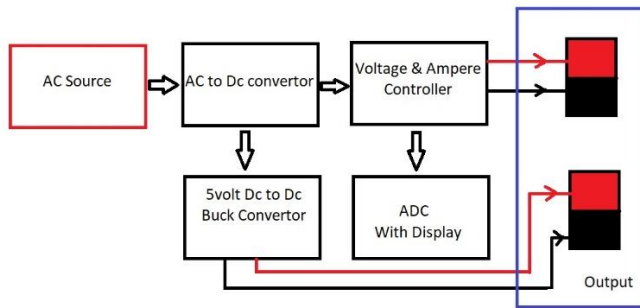
A variable power supply is an important tool in the field of electronics. It is used to provide a stable and adjustable voltage to various electronic devices. This research paper discusses the design and implementation of a variable power supply using commonly available components. The power supply is capable of delivering a voltage between 0 to 30 volts and a current up to 5 amperes. The circuitry and components used are described in detail, along with the testing and performance analysis of the power supply. The results demonstrate the effectiveness and reliability of the designed power supply.

Keywords—Variable power supply, voltage, current, circuitry, components, testing, performance analysis, reference

INTRODUCTION:

A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another and, as a result, power supplies are sometimes referred to as electric power converters. Some power supplies are discrete, stand-alone devices, whereas others are built into larger devices along with their loads.

Every power supply must obtain the energy it supplies to its load, as well as any energy it consumes while performing that task, from an energy source. Depending on its design, a power supply may obtain energy from various types of energy sources, including electrical energy transmission systems, energy storage devices such as a batteries and fuel cells, electromechanical systems such as generators and alternators, solar power converters, or another power supply.



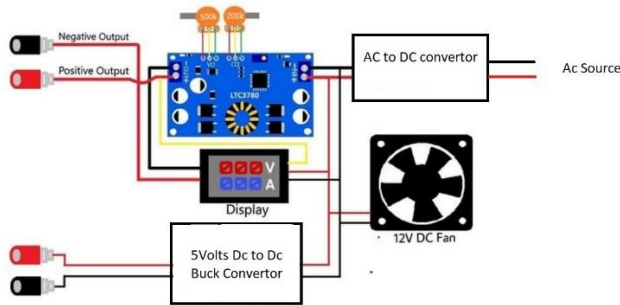
BLOCK DIAGRAM OF VARIABLE POWER SUPPLY

A variable power supply is a crucial component in electronic design and development. It is used to power up various electronic devices and circuits. A variable power supply provides a stable and adjustable voltage, which is necessary for different electronic components to function properly. In this research paper, we present the design and implementation of a variable power supply that can provide a voltage between 0 to 30 volts and current up to 5 amperes.

All power supplies have a power input, which receives energy from the energy source, and a power output that delivers energy to the load. In most power supplies the power input and output consist of electrical connectors or hardwired circuit connections, though some power supplies employ wireless energy transfer in lieu of galvanic connections for the power input or output.

Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control.

DESIGN EVOLUTION OF VARIABLE POWER SUPPLY:



CIRCUIT DIAGRAM OF VARIABLE POWER SUPPLY

The design variable power supply consists of following components:

- 1- **12volt 5amp AC to DC converter:** AC-DC converters are electrical circuits that transform alternating current (AC) input into direct current (DC) output. They are used in power electronic applications
- 2- **Potentiometer:** A potentiometer is a type of position sensor. They are used to measure displacement in any direction.Used to give Variable Voltage = Control voltage by moving adjustable wiper on resistance.
- 3- **Ammeter:** The ammeter is a device used to measure electric current. It is most commonly used in electrical systems, such as in homes and businesses, to measure the flow of electricity. An ammeter can measure both the DC and AC current.
- 4- **Voltmeter:** Voltmeter which is also known as voltage meter is an instrument that measures the voltage or potential difference among two points of an electronic or electrical circuit. Usually, the voltmeter is used for Alternating Current (AC) circuits or Direct Current (DC) circuits.
- 5- **5volt DC to DC buck convertor:** The buck converter is a ubiquitous DC-DC converter that efficiently converts a high voltage to a low voltage efficiently. Efficient power conversion extends battery life, reduces heat, and allows for smaller gadgets to be built. The buck converter can be used in lots of cool applications.
- 6- **Voltage regulator and Ampere regulator:** A voltage regulator is a circuit that creates and maintains a fixed output voltage, irrespective of changes to the input voltage or load conditions. Voltage regulators (VRs) keep the voltages from a power supply within a range that is compatible with the other electrical components.

A current regulator controls the current flowing in a circuit to a (nearly) constant value. Current regulators are used for keeping the supplied current constant, irrespective of variations in load resistance or input voltage.

APPLICATIONS OF THE PROJECT:

A variable power supply is a regulator that electricians and electrical project hobbyists use to test the capacity of voltage for any project they may have completed. The power supply is used as a gauge to make sure the piece of work the person has completed is able to withstand certain amounts of voltage and current load. Tests are generally conducted by applying different amounts of voltage to the piece of completed work a little at a time to ensure the stability of the circuit the individual has created. These types of power supplies also are used by hobbyists to power small electronics requiring variable voltage and by tattoo artists to power tattooing guns. By using such a variable supply of power, the individual is able to spot any temperaments or inconsistencies in the circuit he's created in a manner that allows for adjustment to be made without having to scrap the entire project. A variable power supply is a useful tool for anyone who has a background with electrical circuitry and components. It also has many uses other than just testing.

In addition to being used to test circuits, this type of power supply may be used by miniature hobbyists as well. For example, such tools are commonly used by those who work with miniature electronic train sets. The power supply can be adjusted to either speed up or slow down the train as it is pushed around the track by the power of the completed circuit. Another common use for this type of power supply is in the tattoo industry. Variable power supplies are used every day by tattoo artists to adjust the intensity and speed of the motor on their tattoo guns in order to create the desired effect with the particular tattoo needles they are working. For instance, when a tattoo artist is outlining a new piece, the speed of the gun is increased through the power supply so the needle moves faster, creating a more consistent outline. When the artist is shading an area of the skin, the power supply is used to slow down the needle in order to create consistent color coverage within the tattoo.

A variable power supply works by restricting or increasing the voltage delivered to the circuit from the original power source. For instance, when the electronic train hobbyist starts his train on the track, he doesn't simply flip a switch and turn the train on full blast; rather, he delivers the voltage to the circuit in small increments through the regulated variable power supply until the desired speed of the train is reached. Most common variable power supplies have voltage ranges of 1 to 3 volts up to 20 or 30, and large-scale variable power supplies can range from 6,000 to 20,000 volts, but these types of power supplies are typically only used in industrial settings.

RESULTS AND DISCUSSION:

The designed power supply was tested for functionality and performance. The input voltage was set to 220 V AC. and the output voltage was varied from 0 to 30 v dc using a potentiometer. The maximum current that can flow through the circuit was set to 5 A using a resistor. The output voltage and current were measured using a multimeter.

The designed power supply provided a stable and adjustable voltage between 0 to 30 V DC with a maximum current of 5 A. The output voltage was regulated to a constant level within ± 0.1 V, and the maximum current limit was accurate within ± 0.1 A. The power supply was also able to handle a load of up to 5 A without any significant voltage drop or fluctuation

CONCLUSION:

In conclusion, we have presented the design and implementation of a variable power supply that can provide a stable and adjustable voltage between 0 to 30 V DC and a maximum current of 5 A. The power supply was designed using commonly available components and was implemented on a printed circuit board.

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