

Design Of Microcontroller Based Universal Power Supply With Multiple Input/output

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Abstract-

This paper presents the design of microcontroller based universal power supply with multiple input/output. This module is build to obtain both AC as well as DC outputs without bothering of the type of input supply available. This will avail various kind of power supply, thus the operator will get multiple output from a single kit. The control of whole assembly of switches and relay arrangement is implemented into a microcontroller 8051.simulation and practical experiments have been made through mat lab/ Simulink and prototype device respectively the result shows that this kit can improve the availability of multiple supply at a single place.

Index terms- bridge inverter; microcontroller; rectifier; control unit;

1. INTRODUCTION

In many industry, colleges and testing firms we require AC(single phase), DC, 3phase, variable dc, to run different machines and equipment. Hence due which separate power supply is required to run the equipment's according to their input supply.

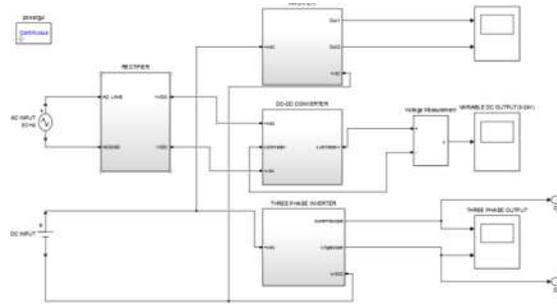
Due to which number of power supply units increases in a lab due to which space as well as cost increases.

Hence to overcome this problem we have come with an idea of universal power supply.

Which can be operated by dc or ac as per the availability of the power supply. And provide desired output i.e AC, DC, 3phaseAC, variable DC.

This unit will consist of inverter, phase converter, rectifier, dc-dc converter and whole assembly will be controlled by control unit consist of microcontroller and switches.

If ac output is required then microcontroller will give command to inverter section out of other sections as result we will get ac output. Similarly if dc output is required then controller will give command to dc-dc converter section therefore at output we get dc. Similarly 3 phase output will get as controller will give command to phase converter section.



Fig([a])project block diagram

A. Design of AC /DC switching/controlling

It consists of an AC relay. This directly connected to supply cable.

If Ac current will pass through the supply cable the AC relay will get operated and it will connect the supply directly to the transformer.

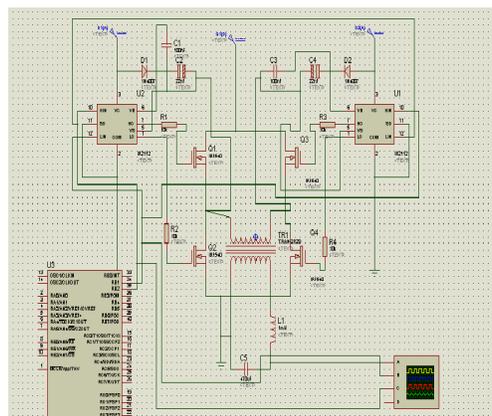
If the DC supply is given to the cable the AC relay will not operate. due to which the DC supply will directly bypass and get connected to inverter section then AC output from the inverter will be given to the transformer so whether AC or DC is connected we will get AC supply at the transformer output.

B. Inverter

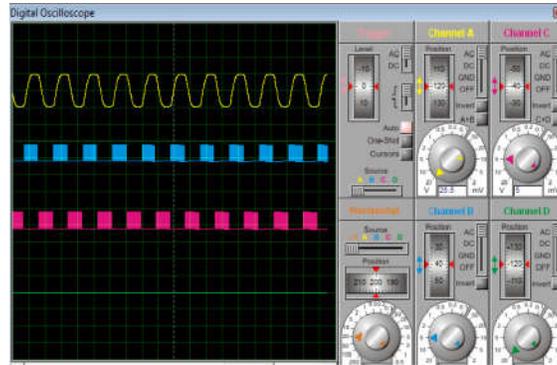
Inverter is a combination of electronic component or arrangement of electronic switches and passive components to achieve alternating current from direct current.

In simple words it converts DC supply into AC supply.

In this project if dc supply is applied to the switcher section will directly switch dc source to inverter circuit which will act as an input to the transformer.



Fig([b])inverter circuit diagram(protues)



Fig([c])inverter wave form

C. Rectifier

Rectifier is a combination of electronic component or arrangement of diodes to achieve direct current from alternating current.

Later filter is used to convert pulsating DC into pure DC.

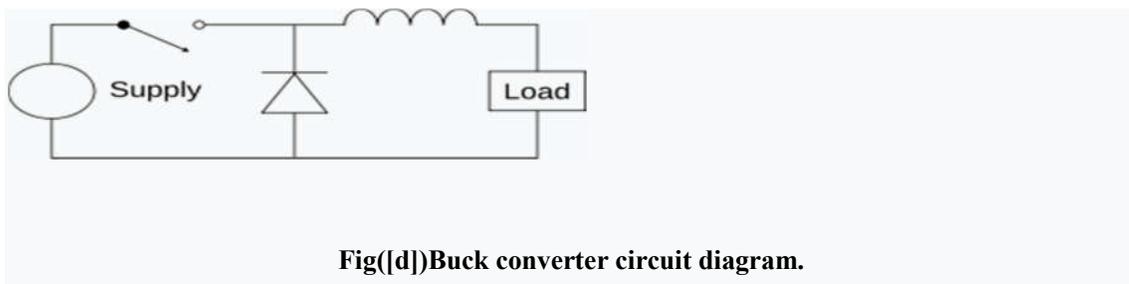
In simple words it converts AC supply into DC supply.

Role of rectifier in this project is if dc supply is needed at the output the controller unit will give the signal to switch and switch will directly connect supply from transformer directly to the rectifier and from rectifier and filter unit dc output will get.

D. DC to DC converter

Buck converter

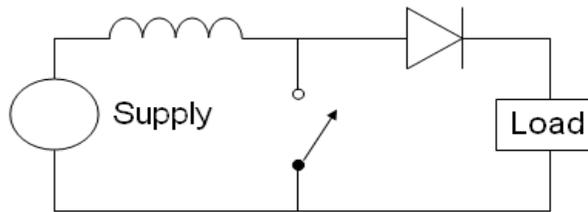
A **buck converter (step-down converter)** is a DC-to-DC power converter which steps down voltage (while stepping up current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) typically containing at least two semiconductors (a diode and a transistor, although modern buck converters frequently replace the diode with a second transistor used for synchronous rectification) and at least one energy storage element, a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).



Fig([d])Buck converter circuit diagram.

Switching converters (such as buck converters) provide much greater power efficiency as DC-to-DC converters than linear regulators, which are simpler circuits that lower voltages by dissipating power as heat, but do not step up output current.

Boost converter



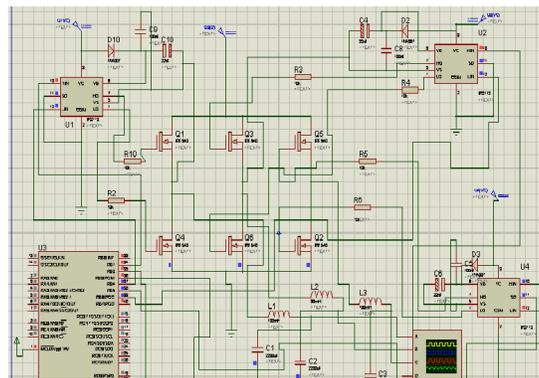
Fig(e)Boost converter circuit diagram

A **boost converter (step-up converter)** is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element: a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).

E. Three phase Inverter

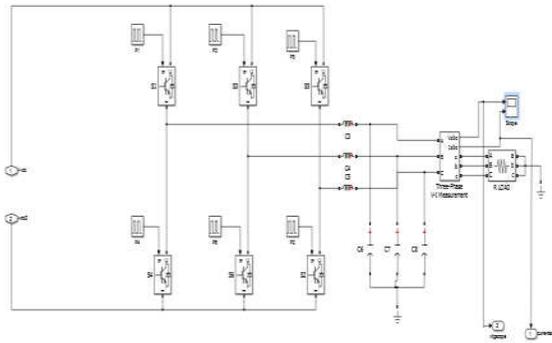
A 3phase Inverter is a device that converts electric power provided as DC to 3phase output.

Role of phase Converter: if user requires 3phase supply at the output the controller directly switch output from transformer directly to 3phase converter which will give desired 3phaseAC output.

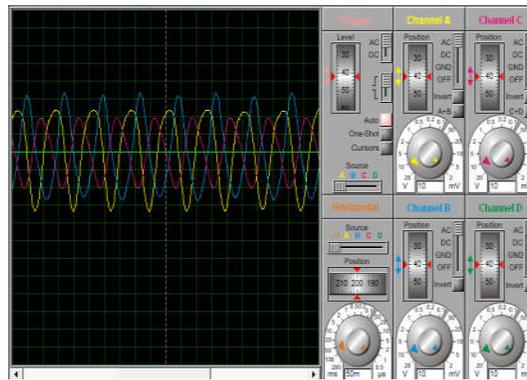


Fig(f)three phase converter circuit diagram(mat lab)

AC to DC. The filter is connected to reduce the harmonics present in the AC and gives the pulsating DC, the fuse is connected to protect the circuit and the resistor is connected to limit the current and then the converter circuit is connected in which the six IGBT switching device is connected to convert DC to three phase AC.



Fig(g)Single phase to three phase converter



Fig(h)single phase to three phase converter wave form

F. Control unit

Control unit is a heart of this system which consists of microcontroller and switches this unit is programmed in a such a way that it sense the input from user i.e press the button of desired output ac, dc, 3phase, variable dc. And operate switches of converters to get desired output.

Microcontroller

Microcontroller is a dedicated device which can be programmed for a specific type of task .

Microcontroller is being used almost in all the electronic applications like elevators, mobile etc. counters, memory and etc Microcontroller is being used almost in all the electronic applications like elevators, mobile etc

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