KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Electronics & Communication Engineering

Report on: Dual DC Power supply

Course No: ECE-2200

Group: 10

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Date of Submission:

❖ **Dual Dc Power Supply**

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❖ **Dual Dc Power Supply**

1: Objectives

Main objectives of this project is to design and fabricate a DC power supply which is:

-Adjustable (24V to -24V)

- Fixed Output (5v to -5v)

-Regulated

-Light Weight & Lower Cost

2: Introduction

Some electronic circuits require a power supply with positive and negative outputs as well as zero volts (0V). This is called a 'dual supply' because it is like two ordinary supplies connected together as shown in the diagram.
Dual supplies have three outputs, for example a ±9V supply has +9V, 0V and -9V outputs.

Dual power supply units are common equipment in electrical engineering and electronics. They supply positive polarity (*+Vcc*) as well as negative polarity (*-Vcc*, not connected to ground!) and ground potential. In particular cases both the positive and negative rails are required for the proper operation of our circuit. For example, some Op-Amps need dual power sources.

A simple (and cheap/sloppy) way to make a dual power supply is to use two resistors in series, connected in parallel with two capacitors. Then connect a battery to this circuit. Typical values in a setup like this one would range around ~100k-1M resistors and ~47uF-4700uF depending on the intended current draw. The top branch will be *+Vcc*, the middle branch *ground,* and the bottom branch is the *-Vcc*.

❖ **Dual Dc Power Supply**

4: Components

- Transformer- 1 piece (220V to 240V,1A)
- Diode-4 pieces(1N4007)
- Polar Capacitor-4 pieces(1000uF,1000uF,10uF,10uF)
- Non-polar Capacitor-2 pieces (0.1uF)
- Regulator IC-4 pieces(LM7805,LM7905,LM7809,LM7909,LM7812,LM7912,LM7824,LM7924)
- DC Voltmeter -3 pieces

3: Circuit Diagram

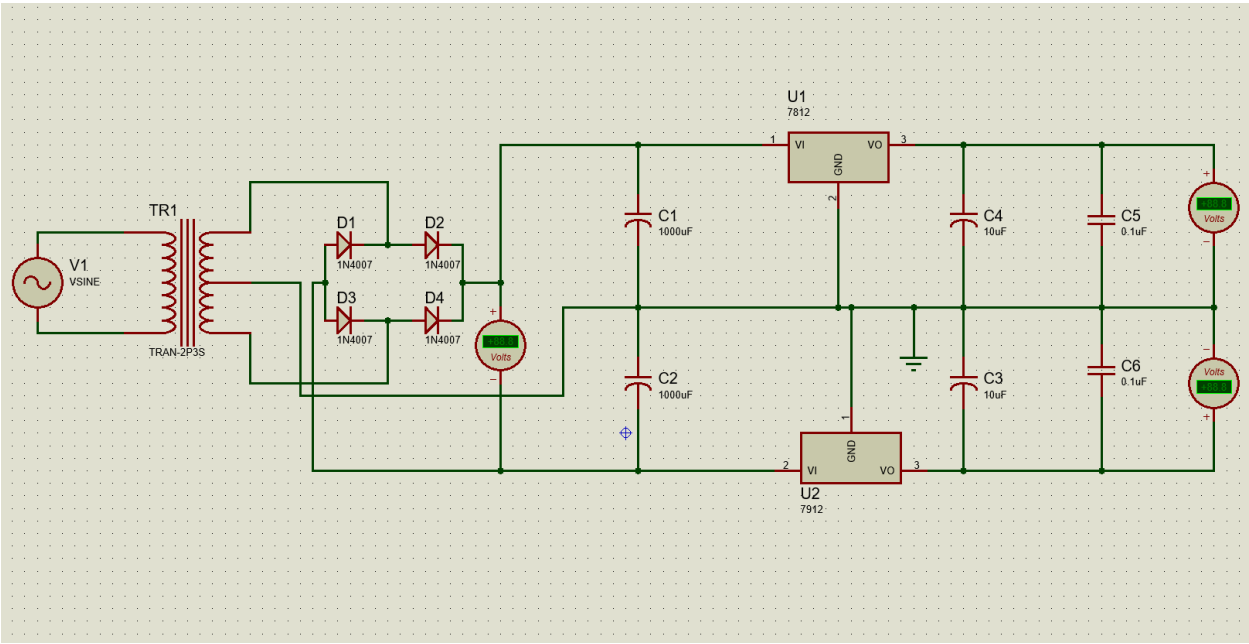


Fig-1.1: Circuit diagram of Dual DC power supply.

5: Circuit Analysis

Step-I: Converting 220v AC into 12v AC using Step Down Transformer

The primary terminals of the centre tapped transformer is connected with household supply (220V *ac*, 50Hz) and output is taken from secondary terminals of the transformer. The centre tapped describes the voltage output of a center tapped transformer. For example: A 24V centre tapped transformer will measure 24V *ac* across the outer two taps (winding as a whole), and 12V *ac* from each outer tap to the center-tap (half winding). These two 12V *ac* supplies are 180 degrees out of phase with each other, thus making it easy to derive positive and negative 12 volt *dc* power supplies from them. The advantage of using a centre tapped transformer is we can get the both +12V and -12V *dc* supply using only one transformer.

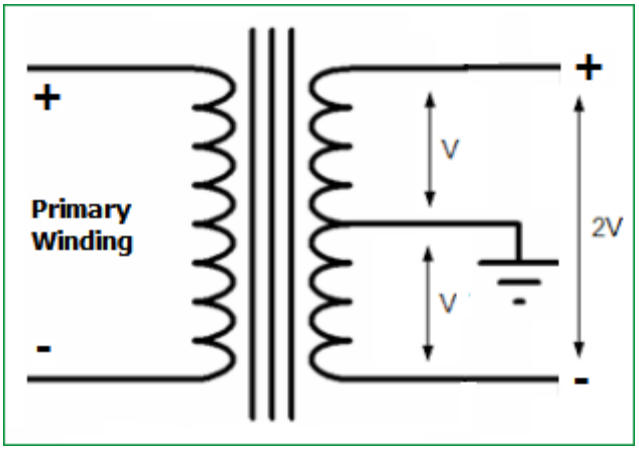


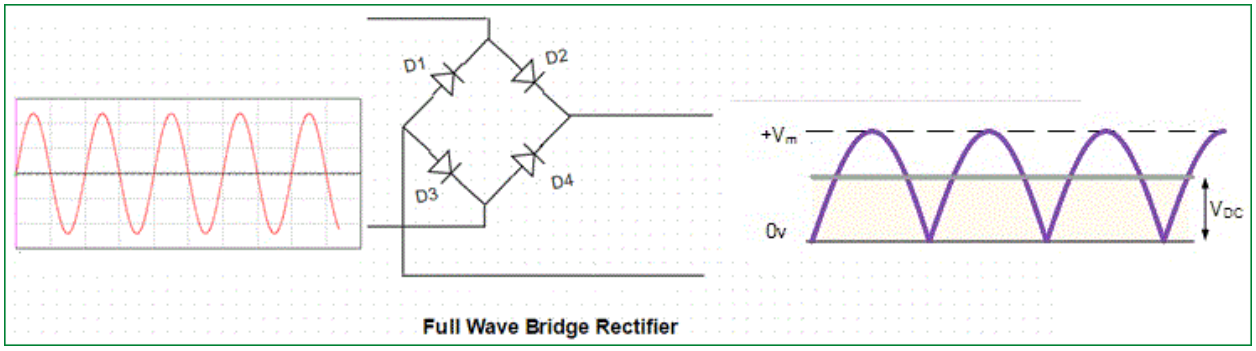
Fig-5.1: Center Tapped Transformer

Step – II: Converting 12v AC into 12v DC using Full Bridge Rectifier

The outer two terminals of the centre tapped transformer are connected to the bridge rectifier circuit. Rectifier circuit is a converter, which converts *ac* supply in to *dc* supply. It is generally made up of diode switches as shown in Circuit Diagram.

To convert *ac* into *dc*, we can make two types of rectifiers, one is half bridge rectifier and second is full bridge rectifier. In half bridge rectifier, output voltage is half of the input voltage. For example, if input voltage is 24V, then

output *dc* voltage is 12V and number of diode used in this type of rectifier is 2 . In full bridge rectifier, number of diodes is 4 and it is connected as shown in figure and output voltage is same as the input voltage.



Full Wave Bridge Rectifier

In this Dual Power Supply Circuit, Diode bridge rectifier is made up of 6A four power diodes. Rating of this diode is 6A and 400V. It is not necessary to use this much of high current capacity diode but because of safety and flexibility purpose, high current capacity diode is used. Generally, because of surges in current, it is possible to damage the diode, if we used low ampere rating diode.

The output of rectifier is not pure *dc*, but it contains ripples in it.

Step-III: Filter the Ripples from the output:

Now, *dc* output which contains peak to peak ripples can't be connected directly to the load. So, to remove ripples from the supply, filter capacitors are used. Now, two filter capacitor of rating 1000uF used as shown in circuit diagram. The connection of both capacitors are such that the common terminal of the capacitors is connected directly to the centre terminal of the centre tapped transformer. Now, this capacitor will get charged upto 12V *dc* as both are connected with the common terminal of a transformer. Furthermore, the capacitors will remove the ripples from the *dc* supply and give a pure *dc* output. But, the output of both the capacitors are not regulated. So, to make the supply regulated, output of the capacitors are given to the voltage regulator ICs which is explained in next step.

Step-IV: Regulate the 12v DC Power Supply

The next important thing is to regulate the output voltage of the capacitors which will otherwise be varying as per the input voltage change. For that depending upon the output voltage requirement, regulator ICs are used**.** If we need the output voltage +12V then IC 7812 is used. If required output voltage is +5V, then 7805 IC is used. Last two digits of the IC gives output voltage rating. Third last digit shows voltage is positive or negative. For positive voltage (8) and for negative voltage (9) number is used. So IC7812 is used for +12v regulation and IC7912 is used for -12v voltage regulation.

Now connection of two ICs are done as shown in circuit diagram. The ground terminal of both ICs are connected with the centre tap terminal of the transformer in order to create a reference. Now, the output voltages are measured between the output terminal and ground terminal for both ICs.

6: Data analysis:

IC Number	Minimum Input Voltage,Vin (v)	Output Voltage,Vout (v)
7805	13.2	5
7809	21.8	9
7812	29	12
7815	34	15
7818	40	18
7824	51.8	24

Table:6.1- Data table for Vin-Vout of Dual DC Power Supply

7: Discussion:

In this project, a Dual DC power supply has been made which provides 5-24 V Dual DC output voltage source.Here first of all we used an AC main source then we stepped down the AC votage as we required. Then we rectified the AC voltage passing through the bridge rectifier we got DC voltages. To remove the ripples from DC we used capacitors and got pulsating DC voltage.

After that to regulate the DC voltage we used different IC's to regulate the voltage and got our required dual DC output.

We used different values of IC's to get various types of output voltage so that we can easily regulate.

8. Conclusion:

The dc power supply that we have that we have created provides us regulated and adjustable dual power supply. Here we sometimes got some fluctuated output voltage which may b the instrumental error or measuring error. As rating of the equipment is suitable for this circuit and the total cost is quite low from the market cost. At a whole this project was interesting and we learned some more new things.

10: References:

- Electronic Devices & Circuits-

  -by Jacob Millman, SatyabrataJit (2nd Edition)

- Internet-
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