Variable Regulated Power Supply

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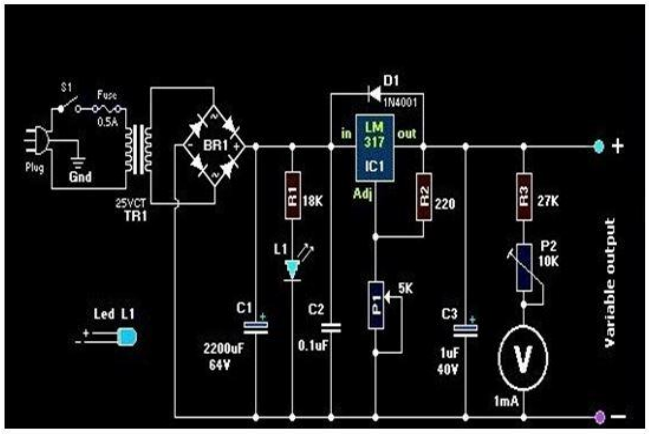
Abstract **-** Almost all basic household electronic circuits need an unregulated AC to be converted to constant DC, in order to operate the electronic device. All devices will have a certain power supply limit and the electronic circuits inside these devices must be able to supply a constant DC voltage within this limit. That is, all the active and passive electronic devices will have a certain DC operating point (Q-point or Quiescent point), and this point must be achieved by the source of DC power. The DC power supply is practically converted to each and every stage in an electronic system. Thus a common requirement for all this phases will be the DC power supply. All low power system can be run with a battery. But, for long time operating devices, batteries could prove to be costly and complicated. The best method used is in the form of an unregulated power supply –a combination of a transformer, rectifier and a filter.

I. INTRODUCTION

VARIABLE REGULATED POWER SUPPLY" plays a very important role in the laboratory functions and that is mainly to the electronics labs. As in electronics all the instruments, components work on a particular regulated dc supply ,so a project which can provide this supply by converting the alternating current to direct current that too into a great range of regulated power keep its own preference.

As it can produce a range of 0-30 v direct current by regulating and converting alternating current is has a vast application too. Such converters are also known as "Switch Mode Power Supply" (SMPS). AC to DC converters generally comprise a rectifier bridge to rectify the AC current of the input line and a regulating device supplying on output of one or more regulated DC voltages. Just the simple ac current is applied and through potentiometer you get the desired regulated dc power supply.

II. H CIRCUIT DIAGRAM



III. WORKING

The 110V-AC coming from the powercord is fed to the transformer TR1 via the on-off switch and the 500mA fuse. The 30v ac output (approximately) from the transformer is presented to the BR1, the bridge-rectifier, and here rectified from AC (Alternating Current) to DC (Direct Current). If you don't want to spend the money for a Bridge Rectifier, you can easily use four general purpose 1N4004 diodes.The pulsating DC output is filtered via the 2200µF capacitor (to make it more manageable for the regulator) and fed to 'IN'-put of the adjustable LM317 regulator (IC1). The output of this regulator is your adjustable voltage of 1.2 to 30 volts varied via the 'Adj' pin and the 5K pot meter P1. The large value of C1 makes for a good, low ripple output voltage.Why exactly 1.2V and not 0-volt? Very basic, the job of the regulator is two-fold; first, it compares the output voltage to an internal reference and controls the output voltage so that it remains constant, and second, it provides a method for adjusting the output voltage to the level you want by using a potentiometer. Internally the regulator uses a zener diode to provide a fixed reference voltage of 1.2 volt across the external resistor R2. (This resistor is usually around 240 ohms, but 220 ohms will work fine without any problems.Because of this the voltage at the output can never decrease below 1.2 volts, but as the potentiometer (P1) increases in resistance the voltage across it, due to current from the regulator plus current from R2, its voltage increases. This increases the output voltage.

D1 is a general purpose 1N4001 diode, used as a feedback blocker. It steers any current that might be coming from the device under power around the regulator to prevent the regulator from being damaged. Such reverse currents usually occur when devices are powered down.The 'ON' Led will be lit via the 18K resistor R1. The current through the led will be between 12 – 20mA @ 2V depending on the type and color Led you are using. C2 is a 0.1µF (100nF) decoupler capacitor to filter out the transient noise which can be induced into the supply by stray magnetic fields. Under normal conditions this capacitor is only required if the regulator is far away from the filter cap, but I added it anyway. C3 improves transient response. This means that while the regulator may perform perfectly at DC and at low frequencies, (regulating the voltage regardless of the load current), at higher frequencies it may be less effective. Adding this 1 µF capacitor should improve the response at those frequencies. R3 and the trimmer pot (P2) allows you to 'zero' your meter to set voltage. The meter is a 30 V type with an internal resistance of 85 ohms. If you have or obtained a meter with a different Ri(internal resistance) you will have to adjust R3 to keep the current of the meter to 1mA. Just another note in regards this meter, use the reading as a guideline. the reading may or may not be off by about

0.75V at full scale, meaning if your meter indicates 30 V it may be in reality 31 or 29 V. If you need a more precise voltage then use multimeter the regulator.

List of Components -
BR1 = Bridge Rectifier, 100V
C1 = 2200 µF, 63V
IC1 = LM317, adjustable regulator
C2 = 0.1 µF
V = Meter, 30V, Ri = 85 ohm1.
C3 = 1µF, 40V
TR1 = Transformer, 25V, 2A
Plug = 3-wire plug & cord
R1 = 18K, 5%
S1 = On-Off toggle switch
R2 = 220 ohm, 5%
R3 = 27K, 5%
Fuse = 110V, 500mA, slow-blow
P1 = 5K, potentiometer
P2 = 10K, 10-turn trim-pot
Fuse Holder, wire, solder, case, knob for P
Red & Black Banana Jacks

IV. RESULT

V. APPLICATION

- A modern computer power supply is a switch-mode power supply that converts AC power from the mains supply, to several DC voltages. Switch-mode supplies replaced linear supplies due to cost, weight, and size improvement. The diverse collection of output voltages also has widely varying current draw requirements.
- Electric vehicles are those which rely on energy created through electricity generation. A power supply unit is part of the necessary design to convert high voltage vehicle battery power.
- Both commercial and military avionic systems require either a DC-DC or AC/DC power supply to convert energy into usable voltage.
- Cost cutting - As we know that a bridge rectifier is costly so we can use 4 diode in its place so that it would help in Cutting cost considerably.

VI. CONCLUSION

0 to 5V power supplies are useful to observe transfer characteristics of Semiconductor devices and we can switch to any voltage whenever we want between the range of 0-5 volt we can jump from one volt to 5 volt directly in case of other power supplies they have potentiometer which has more power losses and we have to go through entire stages from one voltage level two other voltage level while transferring from lower level to high level for example from zero volt to 5 volt we have to go through all 5 voltages.

VII. ACKNOWLEDGEMENTS

We are grateful to DEPARTMENT OF ELECTRONICS ENGINEERING, VISHWAKARMA INSTITUTE OF TECHNOLOGY, PUNE for having provided us with the facilities needed for the successful completion of this Survey paper.

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