**RESEARCH FILE**

**UNIVERSAL POWER SUPPLY**

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**Submitted By: -**

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**Introduction**

Almost all electronic devices need a power supply to operate. A device that provides electric current to the load is called a power supply. It converts the electric current into the right current, voltage, and frequency to power up the load. A dual power supply is a type of power supply that provides a negative and a positive voltage to the load. It is a regular DC power supply. The circuit containing tubes or transistors needs a dual DC power source.

The 12V and 5V dual power supply is a simple circuit that provides 12V and 5V DC voltage at the output after processing through a few steps. The circuit uses voltage regulator ICs 7812 ,7805,7912 and 7905 which belongs to the 78XX series, as its main components, and a few other components which regulate the voltages to 12V and 5V respectively.

**Hardware Requirement:**

The hardware required to build an easy and cost-effective circuit is as follows:

|  |  |  |
| --- | --- | --- |
| S. No. | Components | Quantity |
| 1. | Step down transformer | 1 |
| 2. | Bridge Rectifier | 1 |
| 3. | Regulator IC L7812 and L7805 | 1 |
| 4. | Regulator IC L7912 and L 7905 | 1 |
| 5. | Capacitors 1000µF, 0.1µF, 100µF & 0.1µF | 2 each |
| 6. | Resistors 2KΩ & 1KΩ | 2 each |
| 7. | LED Yellow, Green 5mm | 1 each |

Component Description:

**Capacitor: -** A Capacitor is a device that stores [electrical energy](https://en.wikipedia.org/wiki/Electrical_energy) in an [electric field](https://en.wikipedia.org/wiki/Electric_field). It is a [passive](https://en.wikipedia.org/wiki/Passivity_(engineering)) [electronic component](https://en.wikipedia.org/wiki/Electronic_component) with two [terminals](https://en.wikipedia.org/wiki/Terminal_(electronics)). The effect of a capacitor is known as [capacitance](https://en.wikipedia.org/wiki/Capacitance). While some capacitance exists between any two electrical conductors in proximity in a [circuit](https://en.wikipedia.org/wiki/Electric_circuit), a capacitor is a component designed to add capacitance to a circuit. The capacitor was originally known as a condenser or condensator.

**A picture containing electronics

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**Transformer: -**

A transformer is a device that transfers electric energy from one alternating-current circuit to one or more other circuits, either increasing (stepping up) or reducing (stepping down) the voltage.



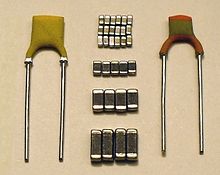
**Diode: -**

diode, an electrical component that allows the flow of current in only one direction. In circuit diagrams, a diode is represented by a triangle with a line across one vertex.

**Diagram

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**Ceramic Capacitor: -**A ceramic capacitor is a fixed-value capacitor where the ceramic material acts as the dielectric. It is constructed of two or more alternating layers of ceramic and a metal layer acting as the electrodes. The composition of the ceramic material defines the electrical behaviour and therefore applications.



**Resistor: -**A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit. Resistors can also be used to provide a specific voltage for an active device such as a transistor.



**Led: -**A light-emitting diode (LED) is a [semiconductor](https://en.wikipedia.org/wiki/Semiconductor) [light source](https://en.wikipedia.org/wiki/Light_source) that emits light when [current](https://en.wikipedia.org/wiki/Electric_current) flows through it. [Electrons](https://en.wikipedia.org/wiki/Electron) in the semiconductor recombine with [electron holes](https://en.wikipedia.org/wiki/Electron_hole), releasing energy in the form of [photons](https://en.wikipedia.org/wiki/Photon). The colour of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the [band gap](https://en.wikipedia.org/wiki/Band_gap) of the semiconductor.

**A picture containing tube

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## **Circuit Diagram:**

The 12V and 5V dual power supply circuit diagram is given below:

Diagram

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## **Working Principle:**

The circuit provides regulated DC output after processing the input signal in a few steps.

**Transformer:** The transformer is a basic part of a power supply circuit. It steps down the input signal of 110, 230V AC to 15V AC signal. A device that works on the principle of electromagnetic induction is called a transformer. It transfers electrical energy from one circuit to another. It generally increases or decreases the AC voltage.

**Rectifier:**The rectifier circuit mainly consists of diodes, it converts the bidirectional AC signal into a unidirectional DC signal by eliminating the one side of the AC signal and allowing only unidirectional current to pass through.

**Filter:** The DC signal after rectification consists of AC ripples and voltage fluctuations is fed into capacitor C1 which removes most of the AC ripples from the signal.

I**C 7812:**The filtered signal is fed into voltage regulation IC which receives the unregulated DC voltage at its input and provides regulated 12V DC at its output.  
In the end, the capacitor C2 is used to filter out the high-frequency ripples remaining in the output signal to provide a ripple-free 12V DC output.

**IC 7805:** Further the 12V DC signal is again filtered and fed into the IC 7805 which takes in the input signal and provides regulated 5V DC at its output and the signal is again filtered to remove the high-frequency ripples by using capacitor C4.  
LED1 and LED2 indicate the presence of 12V DC voltage and 5V DC voltage at the output respectively.

**IC 7912:**The filtered signal is fed into voltage regulation IC which receives the unregulated DC voltage at its input and provides regulated 12V DC at its output.  
In the end, the capacitor C2 is used to filter out the high-frequency ripples remaining in the output signal to provide a ripple-free 12V DC output.

**IC 7905:** Further the 12V DC signal is again filtered and fed into the IC 7805 which takes in the input signal and provides regulated 5V DC at its output and the signal is again filtered to remove the high-frequency ripples by using capacitor C4.  
LED1 and LED2 indicate the presence of 12V DC voltage and 5V DC voltage at the output respectively.

**Working of the circuit: -**

Diagram

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## **Applications:**

* The dual power supply is used to power up the op-amp since OP-AMPS needs to swing bipolar output voltages.
* Dual power supplies can be used in the power banks, cell phone charging circuits or in the battery-less power circuits etc.
* The dual power supply is also used in generators.
* Hence, there are a number of applications that take advantage of 5V and 12V dual power supplies.
* **5 volts**  
  When your load is a digital circuit of the TTL family or various microcontrollers. They only need a constant voltage level of 5V. So, we have to use a DC voltage regulator circuit.  
    
  When the current is less than 100mA. We may use the transistor and Zener regulator. (Easy and economical). But most if the current is less than 1A.  
  We often choose the IC-7805 regulator. Because it’s easy to find, cheap
* **12 volts**  
  When we use general loads such as audio amplifier ICs, relay drive circuits, or even a CMOS digital chip. We can use a 12V power supply circuit.  
    
  We may use an unregulated power supply in some circuits that do not require high accuracy. Just have a small ripple voltage, such as a relay drive circuit.  
    
  If a circuit that requires a constant voltage level should be 12 volts regulator, too.

