

## GLP-F020

اسم القسم: هندسة تقنيات الأجهزة الطبية / اسم المختبر: النظم الالكترونية الطبية / المرحلة: الثالثة / رمز المختبر: BL

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سجل التجارب للعام الدراسي 2023-2024

### Experiment No.2: **Integrated Voltage Regulation**

#### **Objectives:**

The objective of an adjustable voltage regulator circuit, often implemented using devices like the LM317, is to provide a stable and regulated output voltage that can be adjusted to a desired level.

#### **What is the Voltage Regulator?**

The voltage regulation in a power supply system can be achieved using an electrical or electronic device called a voltage regulator. There are different types of voltage regulators such as Fixed voltage regulators and Variable voltage regulators. These are again subdivided into many types as Electronic voltage regulators, Electro-mechanical regulators, Automatic voltage regulators, linear voltage regulators, Switching regulators, LM317 voltage regulators, Hybrid regulators, SCR regulators, and so on.



## LM317 Voltage Regulator

The LM317 is a three-terminal adjustable voltage regulator IC, and its principle of operation involves maintaining a stable output voltage regardless of changes in the input voltage and load conditions.

Three-Terminal Device:

Input ( $V_{in}$ ): This is the input voltage that needs to be regulated.

Output ( $V_{out}$ ): This is the regulated output voltage.

Adjust (ADJ): This terminal is used to adjust the output voltage.

the highest input voltage of LM317 is 40V, the output voltage can be adjusted in range from 1.25 V to 30V, the biggest current is 100mA.

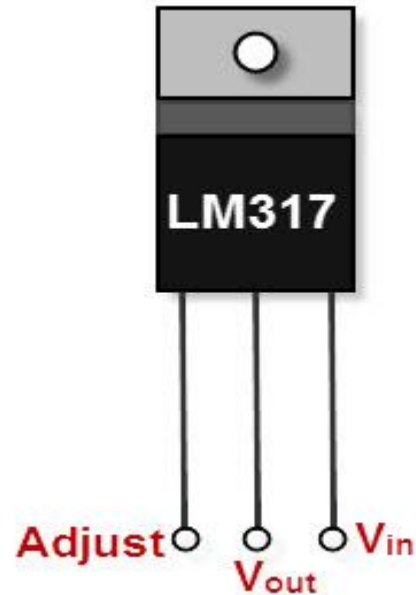
One of the primary features of the LM317 is its ability to provide a variable and adjustable output voltage. By connecting external resistors, the output voltage can be set to a desired level within a specified range. The output voltage ( $V_{out}$ ) can be calculated using the formula:

$$V_{out} = V_{ref} * \left(1 + \frac{R_2}{R_1}\right) + I_{adj} * R_2$$

Where:

- $V_{ref}$  is the internal reference voltage (approximately 1.25V).
- $R_1$  and  $R_2$  are external resistors.
- $I_{adj}$  is the adjustment terminal current (typically very small, around 50 $\mu$ A).

the LM317 regulates the output voltage by adjusting the current flow through an internal pass transistor based on feedback from the voltage



across a resistor network. This feedback mechanism ensures a stable and adjustable output voltage, making the LM317 a versatile component for various voltage regulation applications.

### Equipment and Tools:

1. Analog Circuit Experimental Box
2. Oscilloscope
3. Function Generator

### The method of work:

1. Connect the experimental circuit according to figure below:
2. Draw the input and output voltage waveforms.
3. Change the variable resistor, then draw the output voltage waveform.

