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SIMULATION DESIGN PERFORMANCE FOR POWER SUPPLY AND A VARIABLE VOLTAGE TO FREQUENCY CONVERTER

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Abstract. This paper presents the experimental results and the information of a power supply of range 0 - 5 volts which is further supplied to a voltage to frequency converter circuit. The main purpose for the construction of the power supply and the voltage-to-frequency converter circuit is to observe the relation between the input voltage and the output frequency generated which is observable on the screen of the oscilloscope. The simulation for designing a voltage to frequency converter circuit is easy, it gives early information about the design circuit consumes very less amount of power and hence have wide range of applications. A 555-analog timer (vibrator also called as an oscillator) is used. It is a dual in-line package (DIP) of 8 pins IC. The project is been constructed by using a potentiometer of 300 kilo-ohm resistance and a capacitor of value 0.1uF.

Keywords: *V to F Converter, 555 timer, Power supply design, Proteus Simulation.*

Introduction

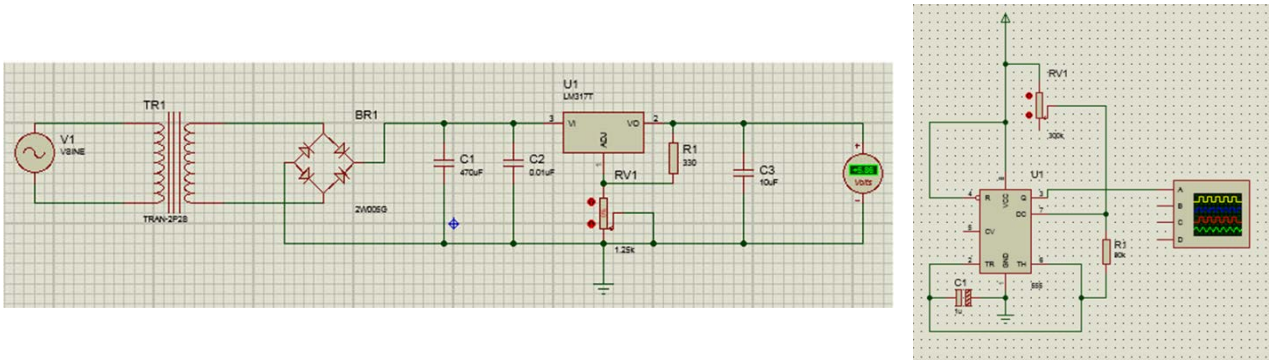
There are a lot of studies regarding the power supply. Power supply detects the exact requirement as per application to electrical device, Consumers have to know different power supply incompatibility The power supply discussed in this paper is a variable DC power supply of range 0-5 volts [1] and [2]. Also various research works have been carried out on voltage-to-frequency converter [3]where the inputs are given in terms of voltage and the outputs are in the form of frequencies which can be varied by changing the values of the passive elements present in the circuit are resistors, capacitors, etc.. The construction of both the circuits power supply and voltage to frequency converter is done on Proteus simulator tool. This tool facilitates us with all the types of circuit simulations as well for the PCB board simulations. The students can construct various types of circuits and can also convert it to PCB board appearance for the simulations. This software is user friendly and can be used by all the learners.

A voltage to frequency converter circuit is an oscillator wherein the output frequency obtained (on the screen of the oscilloscope) is linearly proportional to the initial input voltage given to the circuit. Voltage to frequency converters can take both AC or DC voltage

inputs and gives the output frequencies or the pulse signals generated by using oscillating parameters like amplitude modulation (AM) or frequency modulation (FM) techniques.

Simulation Implementation for circuit system

A variable DC power supply is constructed that gives 0 volt to 5 volts DC output. A simple full wave rectifier is used along with a voltage regulator (LM317T) which gives constant output that can also be increased by using a pair of voltage divider resistor with one potentiometer to get variable output [4] and [5].



a) b)

Figure 1. (a)Circuit Diagram of the 0-5 volt power supply and b) Circuit Diagram of the voltage to frequency converter.

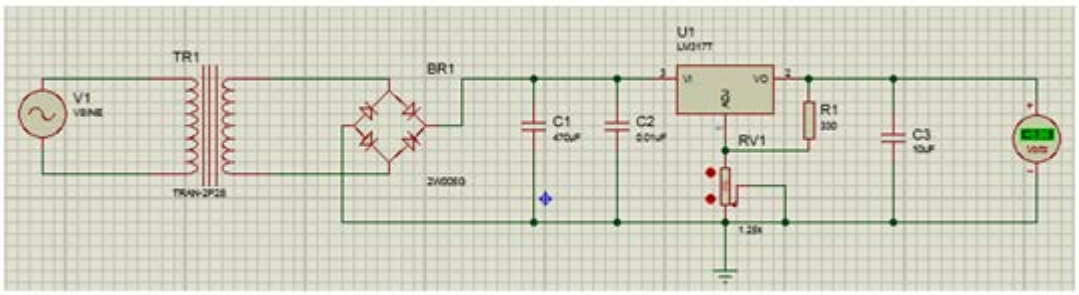


Figure 2. Circuit diagram of the power supply.

A variable DC power supply is constructed that gives 0 volt to 5 volts DC output. A simple full wave rectifier is used along with a voltage regulator (LM317T) which gives constant output that can also be increased by using a pair of voltage divider resistor with one potentiometer to get variable output [4] and [5].

An amplitude of 300nm and 50Hz frequency is supplied to the circuit. A bridge configuration circuit is used which rectifies the output of the transformer. The circuit consists of 3 capacitors, a voltage divider resistor of 330 kilo-ohm resistance, a voltage regulator (LM317T) and a resistor. The output generated is displayed by using a DC voltmeter.

V to F Simulation System Design

Here we choose the proteus software for simulation study as many applications can be implemented after successful simulation study [6]. Motor drivers supply the exact required power to the motors. It is a high voltage twin H-Bridge factory only settle for

commonplace TTL voltage levels. It drives desires forward and reverse perform with speed management like DC Motors [7], and Stepper Motors. The L298 accepts TTL inputs. High performance can be achieved through brushless dc motor and it is perform well in

A voltage to frequency converter consists of components like an analog input amplifier (555 timer IC) [8] and [9], a resistor and electrolytic (aluminium) capacitor network, a power supply and a display device to display the outputs generated.

Figure 3 shows the circuit diagram of a voltage to frequency converter. As shown in the figure, 555 analog timer is used. An electrolytic capacitor (material of the capacitor used = aluminium) of value 0.01uF is used. A resistor (R1) has value of 30 kilo-ohms and an active potentiometer of value 300 kilo-ohms is connected as shown in the figure 3. An output displaying device, the oscilloscope is also connected in the circuit to the output terminal (pin number 3) of the IC and a power is supplied to the circuit.

All the readings are taken at time interval of 100ms and the voltage applied is 5 volts.

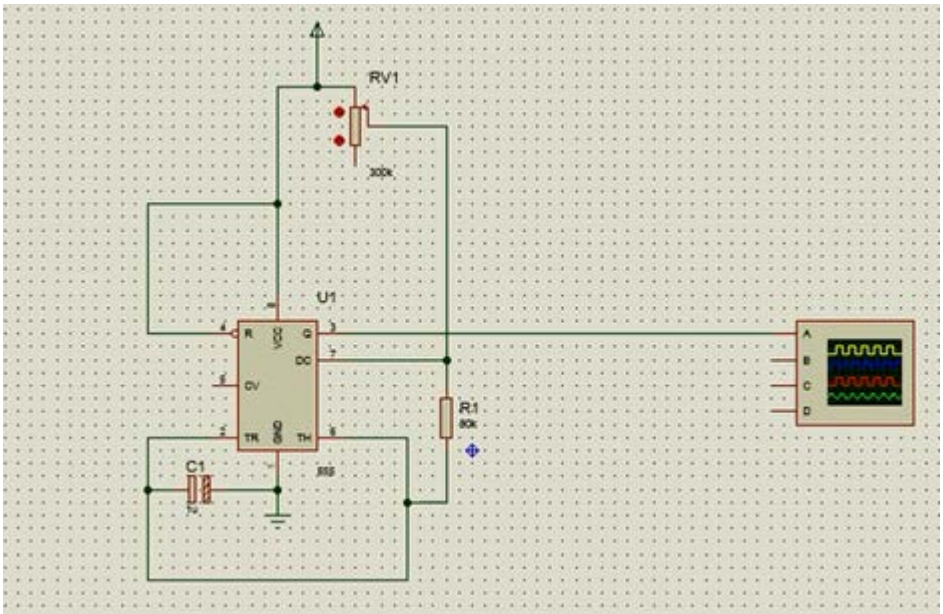


Figure 3. Circuit diagram of voltage to frequency converter.

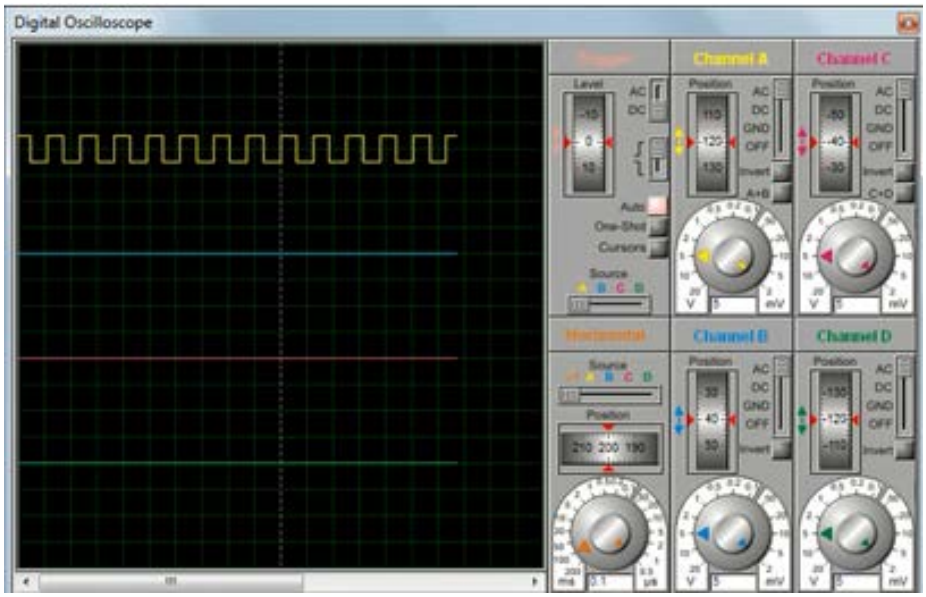


Figure 4. Output signal on the oscilloscope when the potentiometer has its maximum positive value.

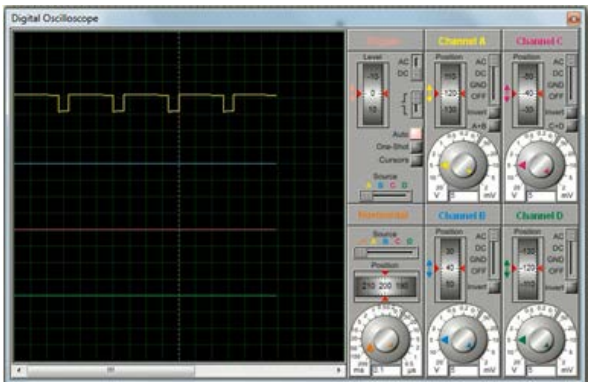


Figure 5. Output signal on the oscilloscope when the potentiometer has its maximum negative value.

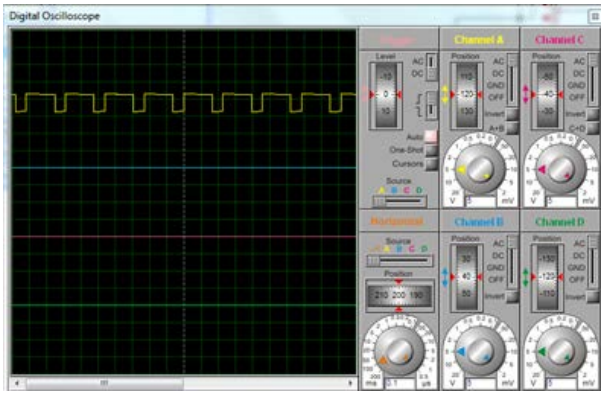


Figure 6. Output signal signal on the oscilloscope when the potentiometer is 50% value.

In figure 4 output is displayed on the screen of the digital oscilloscope when 5 volt input voltage is applied to the circuit and the potentiometer have maximum positive value. The frequency of the output signal can be varied by changing the value of the potentiometer. In figure 5, the output displayed, on the screen of the digital oscilloscope is when the potentiometer is having its maximum negative value and the voltage supplied to the circuit is kept constant. In figure 6, we can observe the output signal on the oscilloscope when the potentiometer is on the middle position and all the other parameters are kept constant.

Conclusions

From all the above presented results, we can conclude that the output obtained in terms of frequency when 5 volts voltage is applied to the input terminals of the circuit is linearly proportional. The frequency of the input signal can be varied by changing the voltage applied to it. A voltage to frequency converter can be used in many measuring instruments, communication systems such as a frequency synthesizer, FM modulation, and in the locked loop also in instrumentation and in automation market.

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