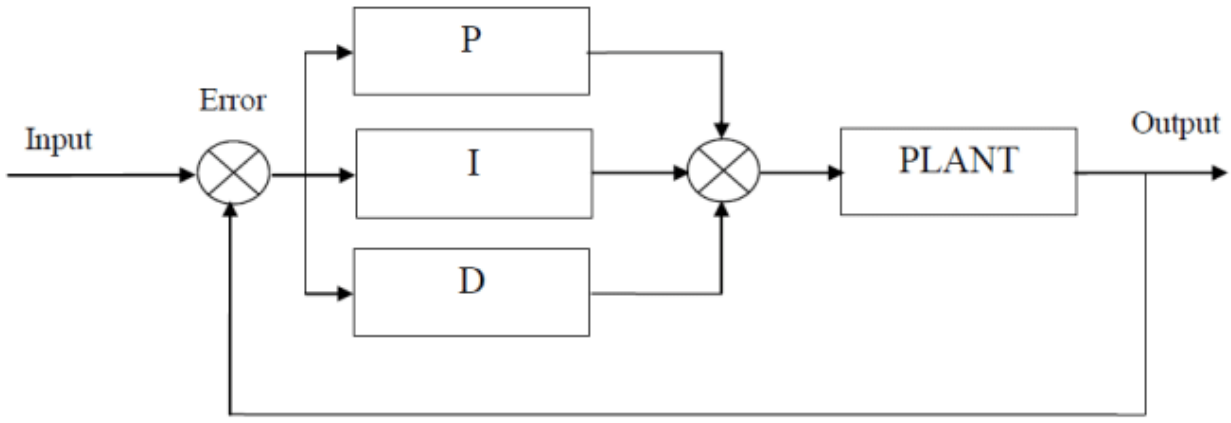
INTRODUCTION

The term PID stands for proportional integral derivative and it is one kind of device used to control different process variables like pressure, flow, temperature, and speed in industrial applications. In this controller, a control loop feedback device is used to regulate all the process variables. These three controllers are combined in such a way that it produces a control signal. As a feedback controller, it delivers the control output at desired levels. Before microprocessors were invented, PID control was implemented by the analog electronic components. But today all PID controllers are processed by the microprocessors. Programmable logic controllers also have the inbuilt PID controller instructions. Due to the flexibility and reliability of the PID controllers, these are traditionally used in process control applications.

This type of control is used to drive a system in the direction of an objective location otherwise level. It is almost everywhere for temperature control and used in scientific processes, automation & myriad chemical. In this controller, closed-loop feedback is used to maintain the real output from a method like close to the objective otherwise output at the fixe point if possible. In this article, the PID controller design with control modes used in them like P, I & D are discusses

PID controllers are found in a wide range of applications for industrial process control. Approximately 95% of the closed-loop operations of the industrial automation sector use PID controllers.



PROPOSED CIRCUIT

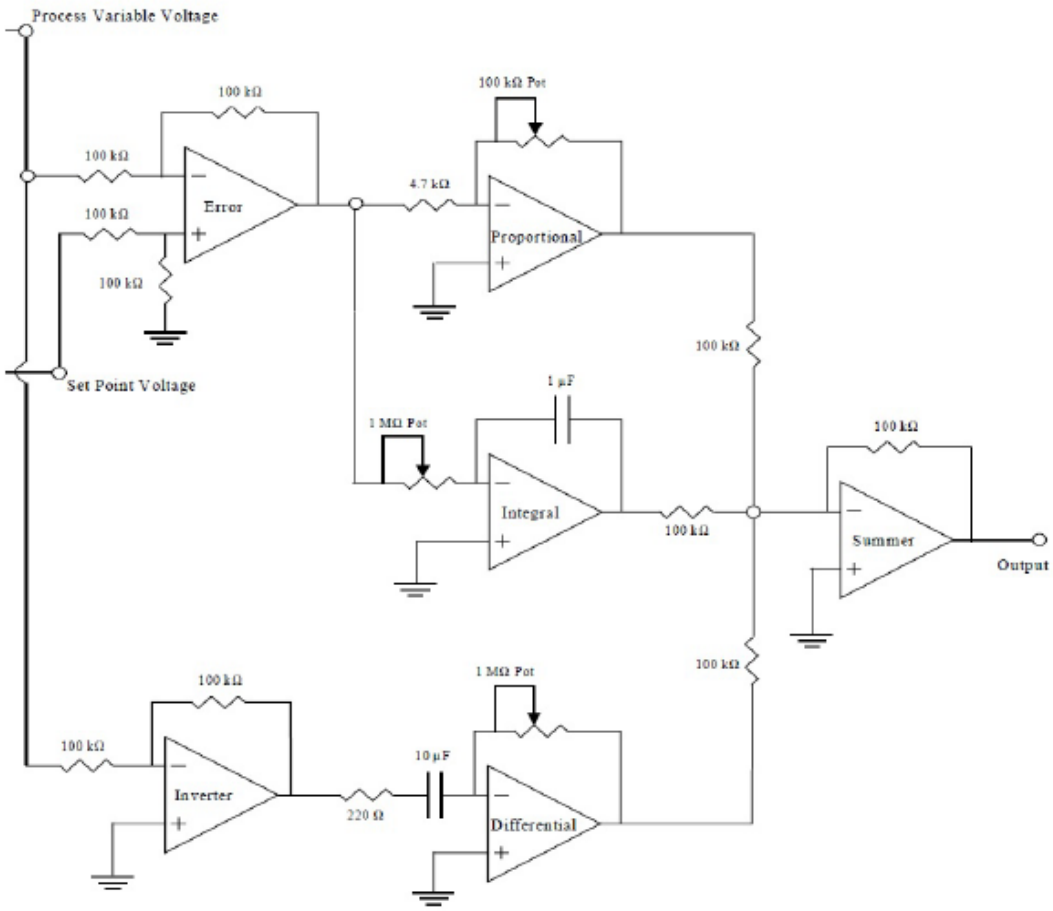


Figure 14: Analog PID schematic.

WORKING

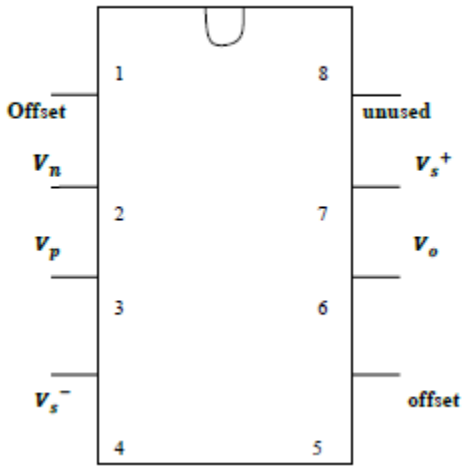
The components are assembled together and the connections were made as per circuit diagram on the bread board.

The supply voltages for the 741 op-amps are not shown in the circuit diagram. Supply voltage of ±15V was given to the IC's. Then inputs were supplied using function generator and the required waveforms were traced on the tracing paper. Finally, after the testing the components were removed from the bread board and fabrication was started. Thus, fabrication of PID controller was completed.

dedicated as input buffer, while one for output buffer. The process variable and set point variable are given at the input and we get the same values of input at the output terminals. Next, both the inputs are subtracted using another op-amp IC which uses four equal resistors of 10k each. This generates an error signal at its output. The output of this is given to each of the individual controllers viz., proportional, integral and derivative. The controllers are nothing but three signal inverters with two resistors in proportional control and one capacitor and one resistor in both integral and derivative controls with their position exchanged in each. The output of the three controllers is summed up using a summer circuit and then passed through a buffer circuit. By using the buffer circuit, we are isolating

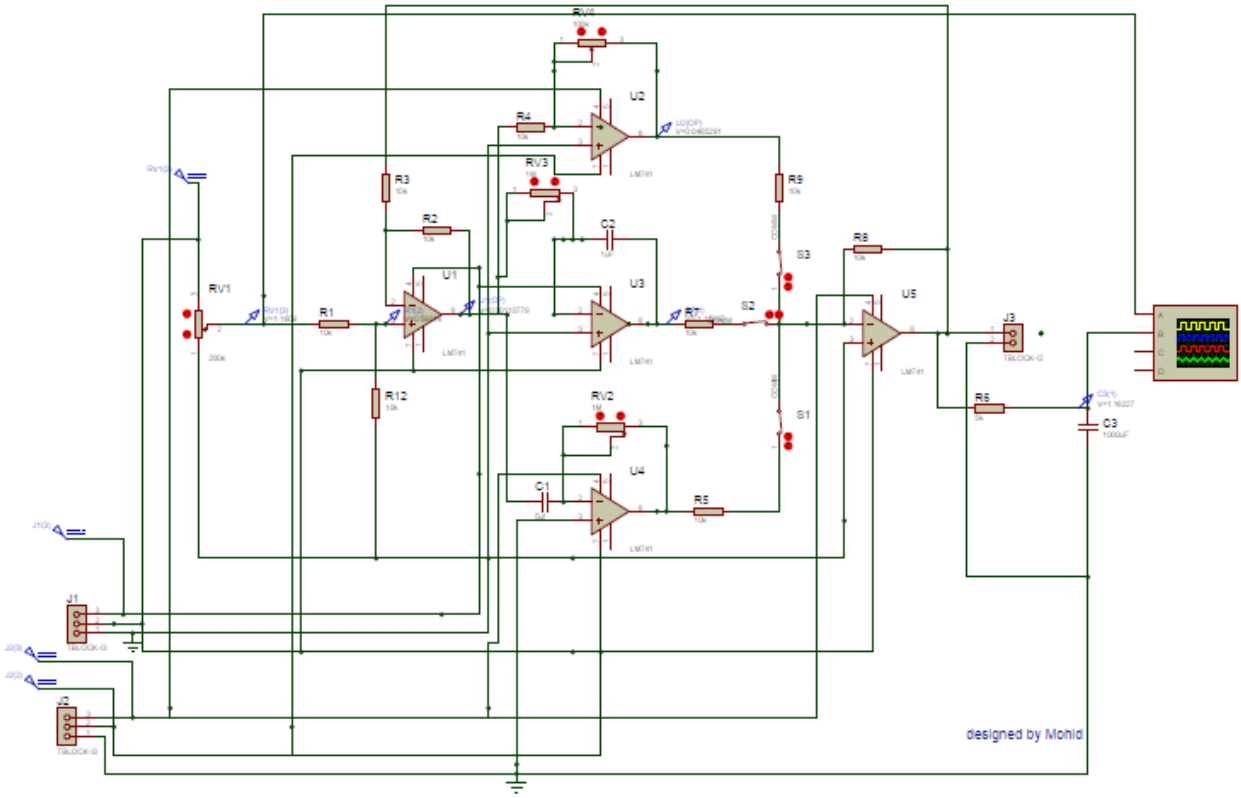
the whole control circuit from outside loads. The controls of the variables are achieved using the three potentiometers as shown in figure. As we can see that proportional term contains a 100 pot, derivative and integral terms contain 1M pots, which is done in order to achieve required range of values of and In the derivative control, we find a small resistor of 10k. This is given in order to save the capacitor from short circuiting because we know that uncharged capacitor when connected to a voltage source acts like a short circuit initially. So, this resistor limits the short circuit current.

The pin configuration of 741 IC is as shown below.

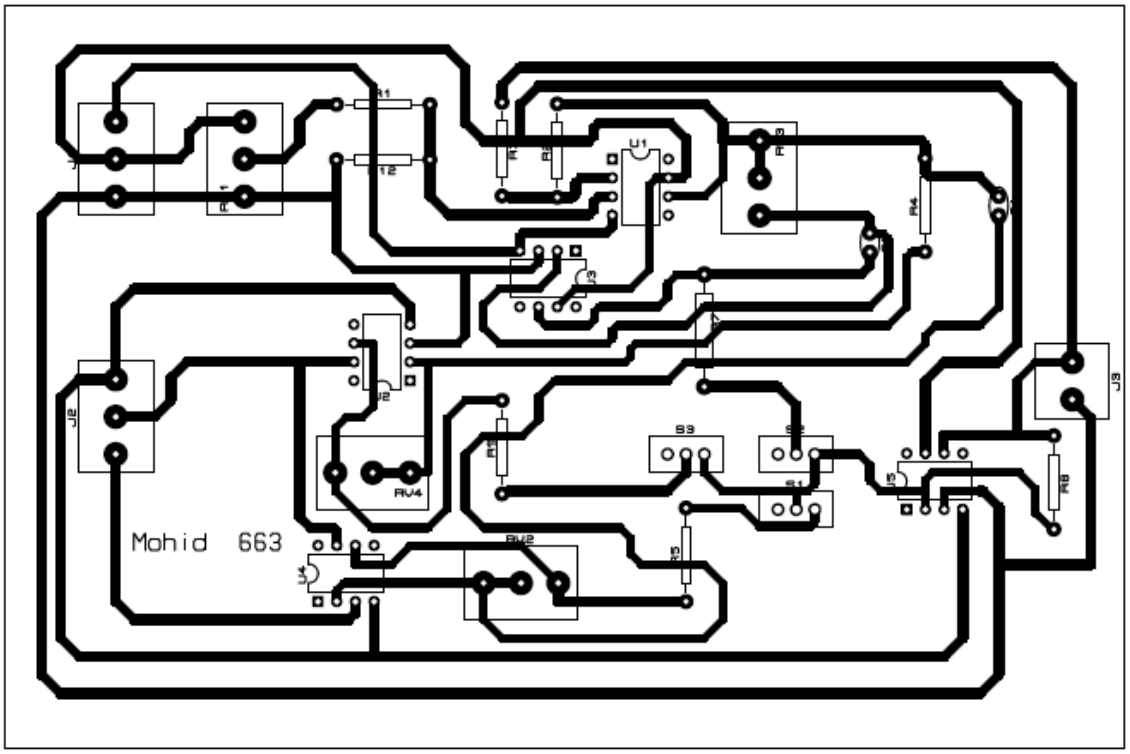


SNAPSHOTS

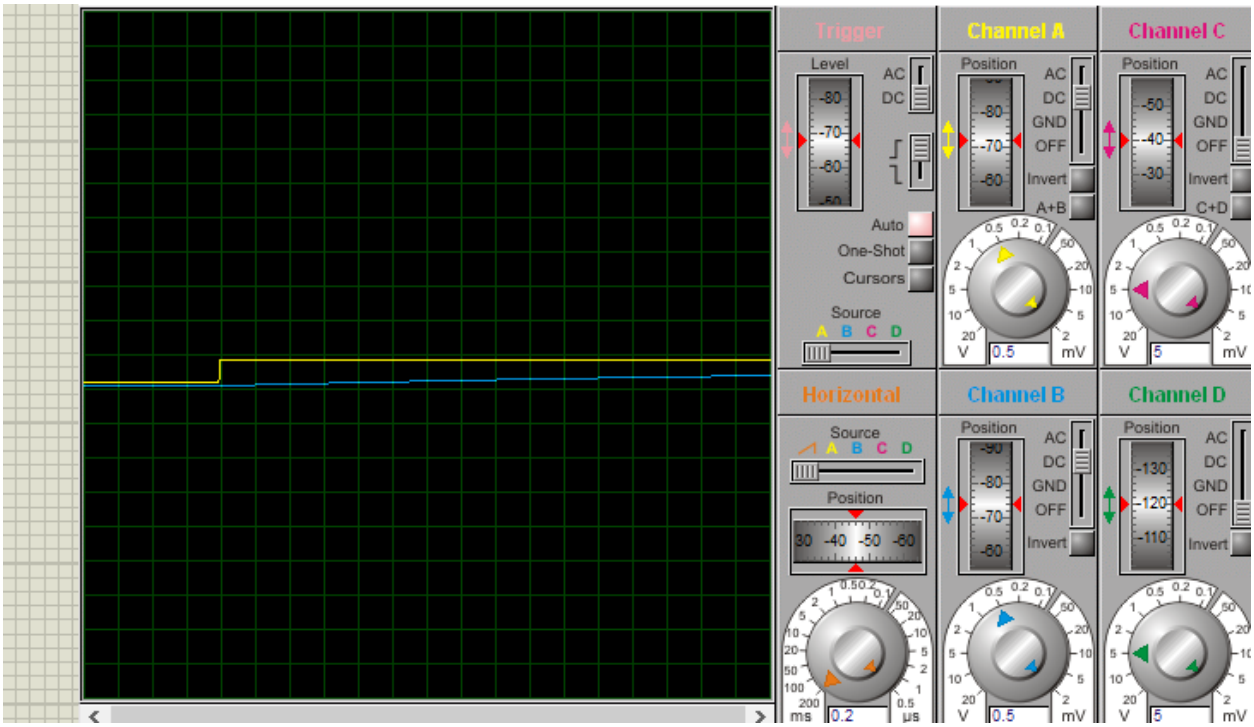
663,659,657,661,664



PCB



OUTPUT


Trigger
Level
AC
DC
Auto
One-Shot
Cursors
Source
A B C D
Channel A
Position
AC
DC
GND
OFF
Invert
A+B
V
0.5
mV
Channel C
Position
AC
DC
GND
OFF
Invert
C+D
V
5
mV
Horizontal
Source
A B C D
Position
ms
0.2
µs
Channel B
Position
AC
DC
GND
OFF
Invert
V
0.5
mV
Channel D
Position
AC
DC
GND
OFF
Invert
V
5
mV

APPLICATIONS

Applications of a PID Controller

A PID controller device is typically used in industries to control or adjust complex physical parameters of the environment such as temperature and pressure. It can also be used to maintain these parameters at a constant value. Some of the most common uses of a PID controller are listed below:

1. A PID controller is an integral part of the temperature control system of an industry. It is typically used to control the temperature of the premises. Here, the input of the PID controller is obtained from a temperature sensor and the output is fed to a fan or a heater. The fan or the heater; therefore, acts as a control element. The speed of the fan or the temperature of the heater gets adjusted according to the feedback signal.

2. Most manufacturing industries make use of huge furnaces to melt and heat different elements. The temperature of such furnaces is required to be monitored periodically. Also, one must be able to control and vary the temperature to maintain the temperature of the furnace at the desired constant value. For this purpose generally, a PID controller is employed.

3. A PID controller is mostly used as a maximum power point tracking charge controller or MPPT charge controller. The V-I characteristics of a photovoltaic cell generally depend on two parameters, namely the irradiance and the range of the temperature. This is the reason why the values of current and the operating voltage is frequently required to be varied as per the weather conditions. The tracking of the highest power point of a photovoltaic cell is a complicated task.

A PID controller is usually employed to perform the task of maintaining the stable value of current and voltage by evaluating the MPPT and giving a constant value of current and voltage for every change in weather.

4. A PID controller is most commonly used in power converters.

5. Various research, development, and testing organizations such as chemical, pharmaceutical, and manufacturing industries make use of the PID controllers to maintain the humidity and temperature of a particular area at a constant level.

6. PID controllers are also used in pH, flow, and speed control devices.