Variable Power Supply Using Microcontroller

Namrata Alve[1], Pratik Ambikar[2], Pranay sawant[3], Pratik Phalke[4]
[1-4]BE Student
Department of Electronics and Tele-communication Engineering
K.C.College Of Engineering and Management Studies And Research,
Kopri, Thane(E), - 400603
[1]namrataalve@gmail.com,[2]pratik.ambikar@gmail.com
,[3]pranay.sawant14@gmail.com,[4]pratikp54@gmail.com

ABSTRACT- A variable power supply is one where you can continuously adjust the output voltage to our requirements. In this project, we designed the circuit to get DC and AC voltage using microcontroller. The value of the required voltage is fed to microcontroller using keypad and is displayed on the LCD screen. Controlling action is done by the servomotor which is controlled by the microcontroller. Relay and DC motors are used for the rotation of the servomotor. Value of the signal at the load is displayed on LCD. Signal obtained at the servomotor is then rectified and DC signal is obtained. The drop in signal because of connecting any load at output is reduced by the servomotor.

I. INTRODUCTION

The conventional method of controlling a variable power supply involves the meticulous task of adjusting a rheostat that is a knob on the instrument. This method has a lot of limitations such as human errors while varying the potentiometer, parallax error while taking readings, it is time consuming, and requires continuous monitoring in case of line voltage fluctuations and it gives only DC signal.

In order to get rid of these limitations, the system that is accurate as well as highly efficient which

eliminates the human errors is planned. A peek is taken into the world of computer-aided process. The present work is an

Implementation of micro-controller interfaced with servo motor mechanism is the heart of the system wherein the use of digital technology has improved the system's efficiency immensely that is quite widely used in industries and is now very important to industries where time is important factor as regards to testing of electrical devices.

II. LITERATURE SURVEY

Different systems are available in market to get variable signal but it gives the only DC. Servo stabilizer[2] gives the AC signal but for the single value for which it is made up of.

Again the system available in the market requires continuous human monitoring and has some limitation.[3]

III. BLOCK DIAGRAM

Basic idea of the system is explained by using block diagram.

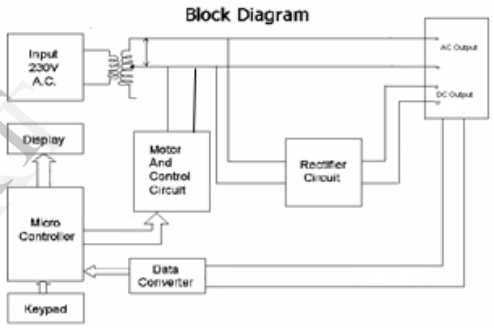

Figure.1

Input signal of 230V is directly given to output section with reference signal from control unit is added or subtracted from it. The signal after addition or subtraction of reference signal is rectified using rectifier circuit to get DC signal. Motor and control unit is the heart of the system which is controlled by microcontroller. Data converter converts the value of the signal at output to digital value for the value to be displayed on display and to generate controlling action from microcontroller. The value of the required signal is fed to microcontroller by keypad.

I. IMPLEMENTATION

The design of the AC/DC Variable power supply can be better understood with the circuit diagram. It can be broadly divided into the following sections:

1. Input Section
2. Micro-controller
3. Data Conversion Section

4. Motor and controlling circuit
5. Rectifier Section
6. Output Section

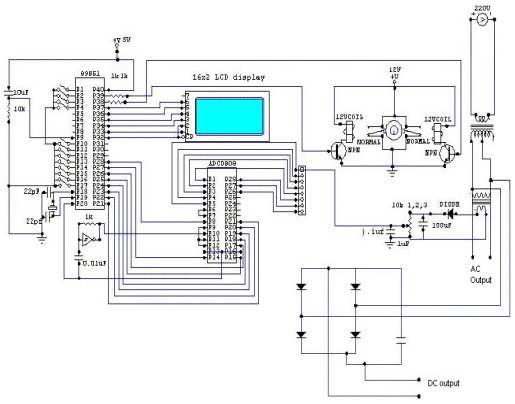

Figure.2

A. Input Section
There are basically 2 inputs. One is 230V power supply and other is keypad to enter the value of required voltage. Keypad consists of total 12 keys, 0-9 numbers, clr(clear) and enter.

B. Micro-controller
The micro-controller used is 89S51 chip. ADC 0808 is also interfaced with the port 2 of the micro-controller. The port 3 and four pins of port 1 of are connected with the Keypad. The pin number P0 and P1 of port 0 are connected with the motor control circuit. The LCD is interfaced with the port 0.
The micro-controller is the heart of this system. It controls the various processes and makes the system efficient as well as hassle free.

C. Data Conversion Section
As the ADC cannot take such large input voltages the input voltage is stepped down to 3V by a step down transformer and an equivalent voltage is given to the ADC. Thus the analog voltage is digitized by the ADC and that value gets stored in the memory of the micro-controller.

D. Motor and controlling circuit
This section is controlled by the microcontroller. It consists of Variac, dc motor(30 Rpm), Driver circuitry.
DC motor is rotated by very minute angle to increase or decrease final voltage if it is less or greater than required voltage.
The precision in the output depends on the number of turns of variac.

E. Rectifier Section
The rectifier circuit is a full wave bridge rectifier. The diodes used in this system are IN Series diodes which can handle voltages up to 250V. A capacitor is connected across the rectifier to filter the pulsating dc voltage obtained at the output.
Also it is used to give 5V to microcontroller, ADC, LCD for their operation.

F. Output Section
AC and DC voltage of the required voltage is obtained at the output section. At the same time its value is displayed on LCD screen.

II. WORKING

The system is entirely micro-controller controlled and starts functioning on being given an input through the keypad. On switching on the power the user has to type in the value of voltage required. This value is stored in the micro-controller in binary format. The typed value can be seen on the LCD. Then when the input is typed in, the ENTER key must be pressed. This begins the operation of the system.
Then the micro-controller gives start signal. The motor starts running and accordingly increases the variac output.
The voltage obtained at the output may not be exactly equal to the desired voltage; hence a feedback path is incorporated to the errors. The feedback path consists of a step down transformer then rectifier circuit and data converter. The step down transformer converts the Voltage at o/p in proportion to 3 volts. The rectifier rectifies it to DC voltage.
If the stored value is found to be less than observed value, then micro-controller sends a reverse signal. The motor begins to run in the opposite direction and the above process is repeated. If stored value is more than received value then motor continues to run in forward direction and the feedback is again provided. This process continues till the observed value is equal to the keyed in value.
Thus with the help of micro-controller an error free output voltage can be obtained effortlessly.

III. APPLICATION

The project was designed basically for testing electrical devices having various ratings.
The system is not dependent on load, so besides the original purpose for designing it can be used for various other applications. In an electrical or electronic industry, this will act as a quick, easy and accurate power supply. With no manual adjustment or monitoring required, this system will be welcomed in any industry requiring a wide range of voltages for different purposes.

IV. FUTURE SCOPE

The motor interfaced with microprocessor can be used for various purposes such as solar tracking system, opening and closing of shutters or curtains, water level control by controlling valves, robotic appliances, etc.The error detecting circuit can be used for detecting sudden fluctuations or dangerous increase in line current. The microprocessor may then provide proper signals for atonement of these fluctuations or for cutting off the supply.
The range of the output voltage can be varied by selecting the servo-motor mechanism with a suitable rating.
Frequency of the o/p AC signal can be varied according to requirement so that this mechanism can be used with any kind of system.

V. RESULT AND CONCLUSION

The design of the system is simple and easy to implement. The voltage obtained at the output is stable and accurate. The

system is encased in a single compact assembly. Thus, the system is portable and occupies less space. The system needs only to be plugged in to a single phase AC supply. The various parts in the system requiring constant voltage are provided through the line voltage itself by means of rectifiers, adapters, transformers, etc. The system is easy to use and extremely user–friendly due to the well programmed keypad and display. As components used are relatively less expensive and weight is placed on comprehensive programming, the system cost as well as complexity is reduced.

Some of the drawbacks of the design are the mechanical portion of the design need not give very accurate results, the DC output is a pulsated one and the cost of the entire project is a bit on the higher side.

REFERENCES

[1]: variac with DC motor:
http://www.radioelectricindia.com/variauto_with_built.html
[2]:http://www.servostabilizer.in/Servo_Stabilizer.html
[3]:http://en.wikipedia.org/wiki/Voltage_regulator