HANDHELD TOUCH SCREEN SUPER SCOPE DEVICE FOR ENGINEERING STUDENTS

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ABSTRACT

Practical Sessions are the backbone of qualification in engineering education. It leads to better understanding and allows mastering scientific concepts and theories. The lack of availability of practical sessions at many universities and institutions owing to the cost and the unavailability of skilled instructors, the most of the time caused decline in experimentation in engineering education over the last decades. Even though the revolution of remote laboratories and touchscreen based smartphone, most of engineering colleges in India continue the tradition of introducing the students to a decade old instruments. The objective is to design and develop a portable device called Super Scope which is ALL-IN-ONE electronics laboratory equipment that has multiple functionalities needed by a modern day engineering students for their practical experiments in electronics laboratory that would replace the existing superfluity of instruments. The device is completely operated from touch screen using touch buttons and menus.

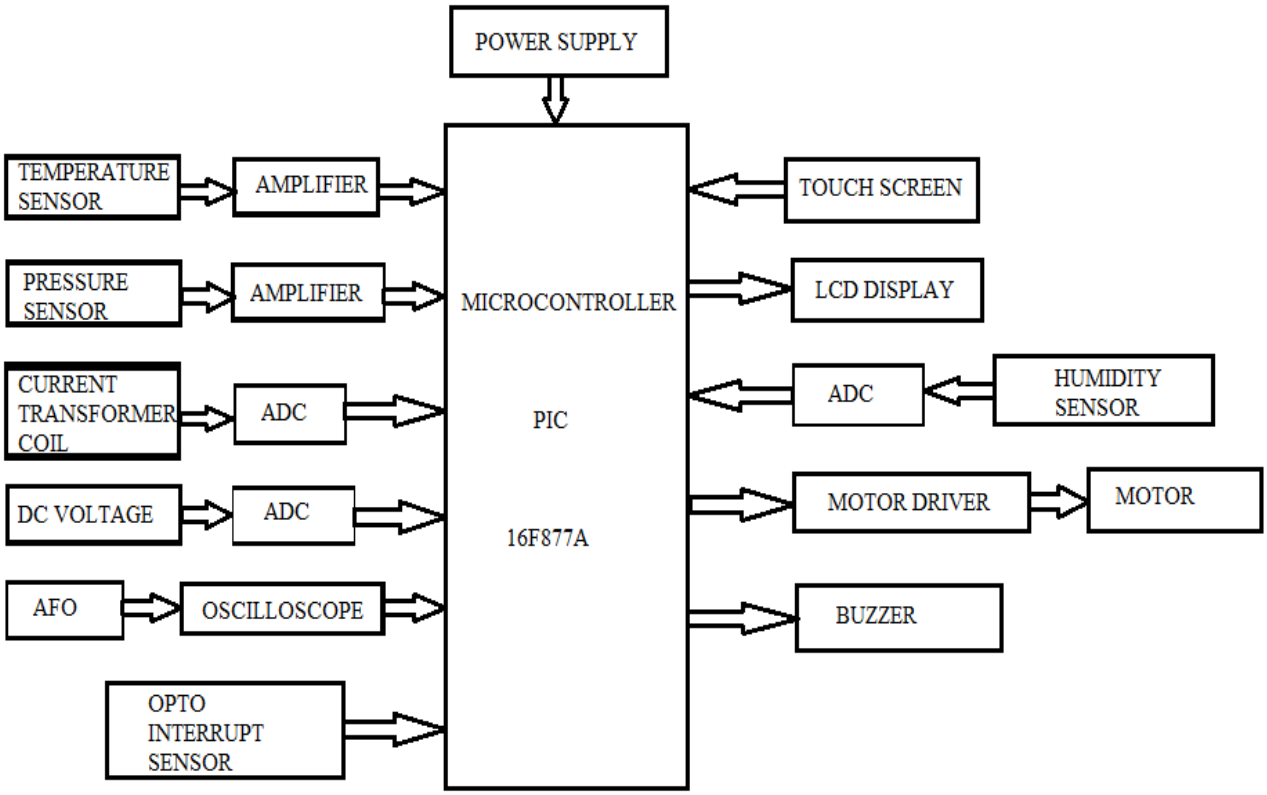
Keywords: Oscilloscopes, Multimeter, PIC16F877A, Touch Screen, 16*24 LCD Display

I.INTRODUCTION

In the world's current scenario, the high cost and administration burdens of physical equipment have caused a significant decline in experimentation within engineering education. This situation has induced the development and adoption ofremote laboratories as a replacement. Currently, remote laboratories based on a large variety of technologies have been developed at multiple universities and adopted in industrial electronics engineering education. The tendency in the development of distance laboratories is to integrate real distance and virtual distance laboratories in a unique remote laboratory and letting the users to develop their own controllers in aremote way. In such laboratories, the complexity in the hardware and software design is drastically increased. The traditional, proximal, model of the laboratory class is coming under increasing pressure because of the changing demands\ of engineering courses. Scheduling increasingly large numbers of small groups of students, each of which requires an hour (or more) of continuous and adequately supervised access to an expensive piece of laboratory equipment, is a difficult and expensive task. An increasingly prevalent olution to this dilemma is the use of alternative access modes – either simulation (or virtual) laboratories or remote access to real laboratory hardware. Web-based remote

labs have been offered by universities in undergraduate engineering courses since 1996, with the number and sophistication of these efforts growing each year. Test and measurement instruments such as oscilloscopes and multimeter are the traditional hardware tools, an electronics engineer would have on this bench. Students in engineering curriculum, when exposed to these instruments, often come across a multitude of equipment's such as voltmeter, ammeter, oscilloscopes and even simple things like calculator. Even after the touch screensmart phone revolution, most of the engineering degrees in India continue the tradition of introducing the students to a decade old instruments. The extensive evolution of the global economy and worldwide competition in the industrial market has demanded a further restructuring and enhancement of engineering education. So, having recognized that the nature of the learning outcomes arising from lab experiences has a complex relationship with the characteristics of the interaction modality, it is worth considering the way in which the technologies that are used effect the nature of the interaction. So, in this paper, Handheld All-in-One Electronics Lab Device has been introduced to overcome from those technologies.

II.BLOCK DIAGRAM



III.BLOCK DIAGRAM DESCRIPTION

1. PIC 16F877A Microcontroller

PIC 16F877A is a modified and advanced version of Microchip. This controller is widely used for vast applications in the field of Electronics, Embedded, Virtual and all integrated type Systems. It is unique because of its ease of availability, embedding mode, precise measurement and so on. The PIC 16F877A have the capability of easy programming than any other Microcontrollers.

2. Power Supply

Available power source is an Ac voltage arrives at 230V.Since our electronic circuits require only very minimal voltage and current we use step down power transformer. Step down transformer is designed in such a way that the input is 230V and output of 12V. Another thing is that electronic circuits operate in DC whereas available output of transformer is AC of 12V. So rectifier circuit is used to convert AC to DC. Rectifier circuit consists of four diodes formed in bridge fashion so as to convert incoming AC to DC.

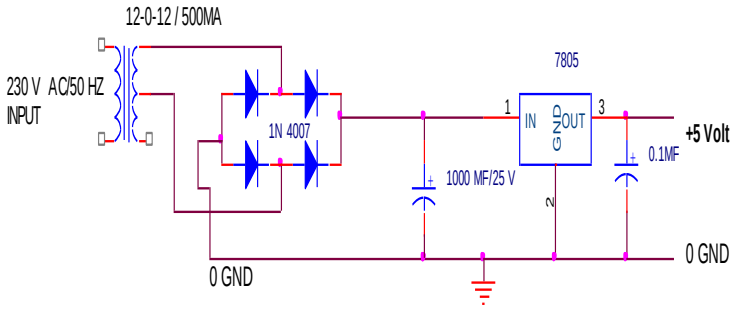


Fig No. 1 Circuit Diagram of Power Supply

3. Pressure Sensor

The SX Series of pressure sensors provides the lowest cost components for measuring pressures up to some good extend. Convenient pressure ranges are available to measure differential, gauge, and absolute pressures from 0 to 1 psi (5X01) up to 0 to 150 psi (5X150). In this, the senor of type 5X150 is used to get a sensing range from 0 to 150 psi. The sensed pressure is amplified using an amplifier which then gives to *pin 6* of microcontroller.

4. Temperature Sensor

The LM 35 is an integrated circuit sensor can be used to measure temperature with an electrical output proportional to the temperature (in °C). The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is exactly proportional to the Celsius (Centigrade) temperature. The LM35 is rated to operate over a −55° to

+150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy).The sensed temperature is amplified using an amplifier which then gives to *pin 2* of microcontroller.

5. Current Transformer Coil

TheCurrent Transformer(C.T.), is a type of "instrument transformer" that is designed to produce an alternating current in its secondary winding which is proportional to the current being measured.Current transformer have the tendency to minimize the high rated incoming currents to some lower value and provide a convenient way of safely monitoring the actual electrical current flowing in an AC transmission line. The interior working of a current transformer is no different from that of an ordinary transformer. The current from the coil is given to the ADC circuit for conversion. The digitized output from ADC is then fed to *Pin 3* of PIC.

6. Analog to Digital Converter

The ADC0809 data acquisition component is a monolithic CMOS device for efficient conversion of incoming analog signals to digital one. The 8-bit A/D converter uses successive approximation as the conversion technique. The basic working mode of this ADC is Successive Approximation type. This can be easily interfaced to all microprocessors.

7. Opto Interrupt Sensor

The MCT2XXX series optoisolators consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 4-pin dual in-line package. The optocoupler circuit is as shown in the figure.The sensed temperature is amplified using an amplifier which then gives to *Pin 7* of microcontroller. The respective output of the sensor will measure the speed of the connected to the *Pin 23* which then senses the speed of the motor and the result will again fed back to the PIC of *Pin 25.*

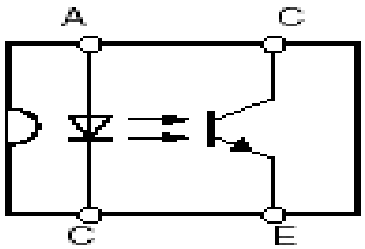


Fig No. 2 Circuit Diagram of Opto Coupler

8. Humidity Sensor

Humidity sensors from Measurement Specialties are designed to improve its working performance, reduce energy consumption, and increase safety. In any condition where temperature affects its performance, compensating for

humidity should also be notified. Some noted applications for analog humidity sensors anddigital humidity sensors include automotive, appliances, HVAC, and medical. The analog output of the device is given to ADC for conversion. The conversion is made to digitized form and then fed to the *Pin 5 of* microcontroller.

9. Digital Oscilloscope

Digital Signal Oscilloscope – used to monitor signals acquisitioned through the inbuilt 10-bit A to D converter. The signals will be shown in color waveforms in a nice 65K Color QVGA Touch screen TFT Graphical LCD Display. The oscilloscope gets input from the Function Generator and that gives the waveform according to the command/input given by the user.

10. LCD Display

LCD stands for Liquid Crystal Dispaly. The choice of LCD as an output device was because of its cost of use and is better with alphabets when compared with a 7-segment LED display. This gets data from the microcontroller and displays the exact thing which it had been received. This makes the whole device user friendly by showing the balance left in the card. The output channels of the Microcontroller are given to the LCD display.

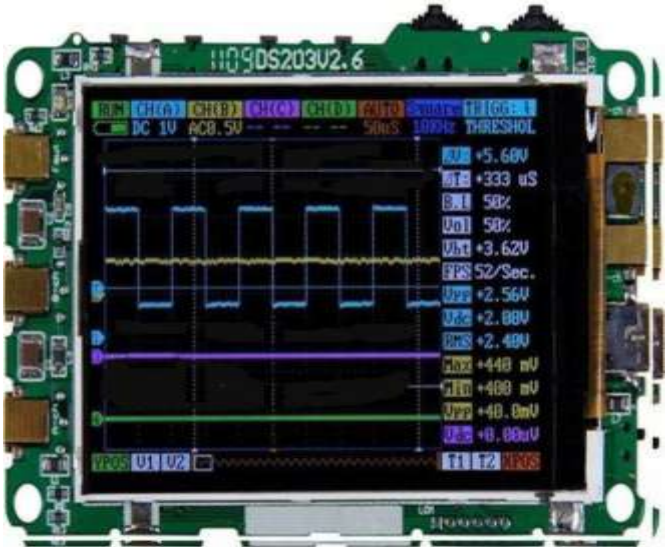


Fig No. 3 Waveform Display

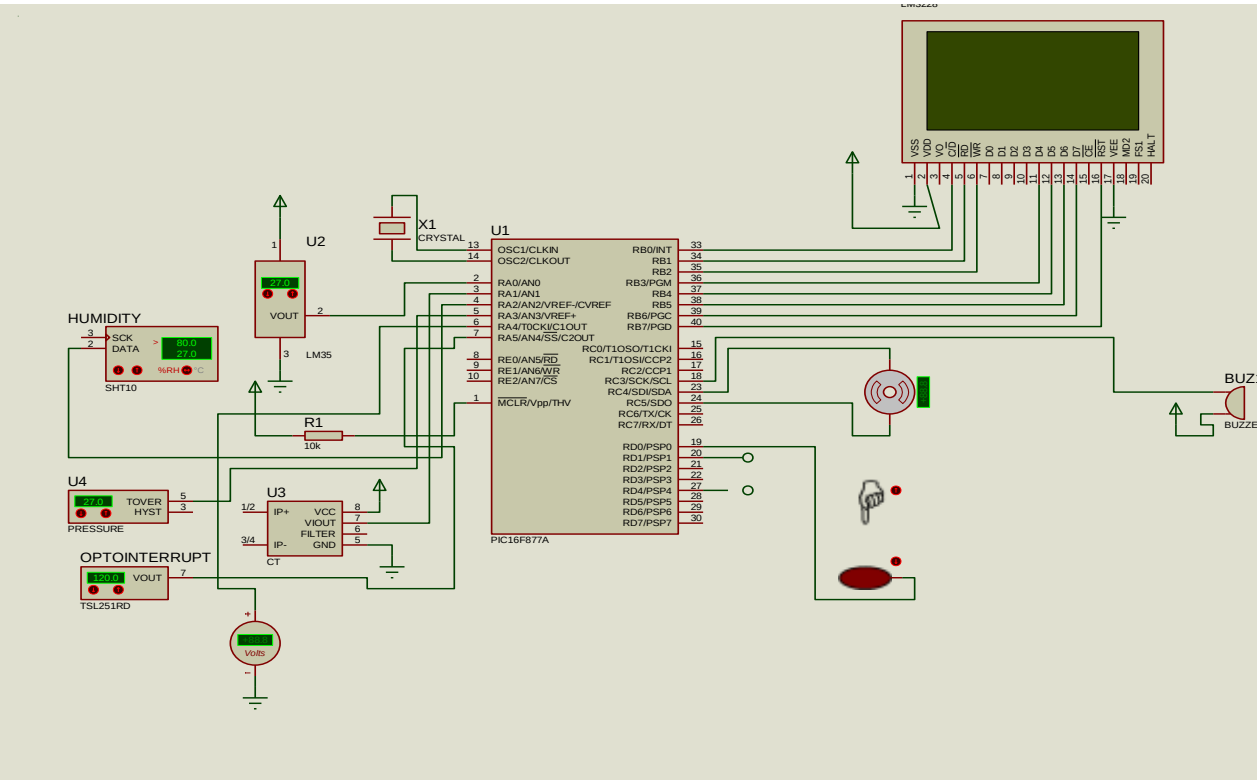
11. Buzzer

An electronic device for signaling with sound is called as a buzzer or beeper. Piezoelectric film buzz is very high-pressure buzzer i.e. it operates efficiently on high pressure. In the recent days, it is more popular to use a ceramic-based piezoelectric sounder like a Sonalert which makes a high-pitched tone. Usually these were hooked up to "driver" circuits which varied the pitch of the sound or pulsed the sound on and off. This will be connected to *Pin 18* of the microcontroller.

IV. SOFTWARE

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. In the past days, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmeticand basic I/O operations.It is small and reasonably simpler to learn, understand, program and debug.In comparison with assembly, C code written is more reliable and easy, more portable between different systems.C compilers are available for almost all embedded devices in use today.C has the advantage of processor-independence i.e. it is independent of the kind of controllers or processors used, and is not specific to any particular microprocessor/microcontroller or any system.

V.CIRCUIT DIAGRAM



VI.CONCLUSION

This paper gives an improved version of the proximal workbench that is used in the present engineering studies. For these benefits to be realized, attention must be given to the complex interplay between desired educational outcomes, pedagogical (theoretical) design, and the nature of the technology supporting the laboratory. In this paper the main aim is to design and develop a portable device called Super-Scope which is ALL-IN-ONE electronics lab equipment with multiple functionalities needed by a modern day engineering student for their practical experiments

in electronics that would replace the decade old instruments. As such, many improvements can be made upon this initial design. That being said, it is felt that this system represents a functioning miniature scale model which could be replicated to a much larger scale.

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