ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 2, February 2017

Oscilloscope on Android Using Raspberry Pi

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ABSTRACT: The oscilloscope on android using raspberry pi, this project is design to develop a handy oscilloscope by using android. The concept is to monitor the signal. and it is implemented by first making signal conditioning on given signal, give it to high sampling rate and high resolution ADC. The ADC sends data to the raspberry pi3 model B, high speed processor. The raspberry pi will read the data on serial port and send the data android phone throw the inbuilt Bluetooth.

KEYWORDS: ADC (MCP3008), Raspberry pi 3 Model B, Android Phone.

I.INTRODUCTION

we can see now a days there are large size oscilloscope are use in which we see different waveforms and measure the frequency, Time etc, in a lab only ,Which Consumes a Lot of time and money.[1] so we can implement this project using Android…! Portable oscilloscopes in the market are very expensive, less power efficient This paper presents the design and implementation of a low cost, portable, light-weight, low power, single-channel oscilloscope, consisting of a hardware device and a software application. The device is equipped with raspberry pi3 model B.[3] which consist a Bluetooth module to provide connectivity to a device with Bluetooth, running the Android operating system (OS), in order to display the waveforms. Android OS is selected because there are a more number of Android device users and most of these devices satisfy the requirements of the oscilloscopes software application. The Software application developed for Android receives the data transmitted from the hardware device and plots the waveform according to the display settings configured by the user. These display configurations are transmitted to the hardware device once they are set by the user, and are used by the hardware device to set the sampling rate and the values of samples.

II.LITERATURE SURVEY

In the modern world, cathode-Ray oscilloscope plays a very important role in electronic measurement field. CRO is mainly used to measure the voltage, frequency across the circuit with change in time. The drawbacks of CRO are to spend huge amount of money to buy it .To overcome this, CRO functions can be brought as an android application. The implementation of an oscilloscope with Bluetooth was previously reported, by Yus in 2010 [2]. It is an open source prototype project called the “Android Bluetooth Oscilloscope”, which consisted of a Bluetooth enabled transmitter circuit to send data to an Android phone which draws the waveforms on its android screen. The transmitter circuit uses Microchip's dsPIC33FJ16GS504 and an LMX9838 Bluetooth 2.0 SPP module.

Android is a Linux operating system design for touch screen mobile device such as a smart phone. Advantage of this android application is environmental sustainable application, high mobility, cost is less than CRO. the oscilloscope is a another kind of electronic test instrument which allow observation of constantly varying signal voltage, usually as a two dimensional graph of one or more electrical potential difference using the vertical or y-axis, plotted as function as a time. This allow the measurement of peak-to-peak voltage of a waveform, the frequency of periodic signal, the time between pulse, the time taken for a signal to rise to full amplitude and relative timing of several related signal.

In the literature survey we found that Oscilloscope is most important testing instrument in Digital storage. Oscilloscopes currently in the market are having following drawbacks:

Cathode ray oscilloscopes are very costly as we can see in the market, it consume large amount of power, it have small as well as low resolve displays. And also the Bulky transmitter circuit uses change of the input signals.

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Fig 1: general cathode ray oscilloscope

III.SYSTEM OVERVIEW

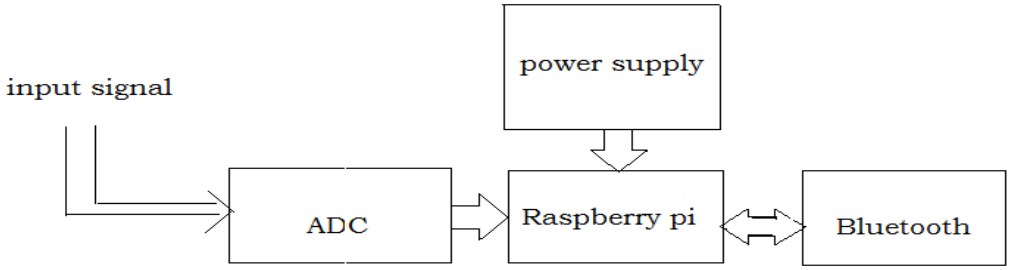

Fig 2: Block Diagram

A. BLOCK DIAGRAM EXPLANATION:

In this block diagram first we give the input signal to the ADC (MCP3008). it may be any kind of signal such as sine wave, triangular wave, square wave etc. MCP3008 ADC receives this input signal it has SPI protocol. Means this SPI protocol have 4 pins. .i.e. MISO, MOSI, CE, CLK. these 4 pins connected to Raspberry pi3 module. It has 40 GPIO pins. Out of these 40 pins, we required only 4pins to read the signal. I.e. pin no.19 for MOSI, pin no. 21for MISO, pin no.23 for CLK and pin no.24 for CE. So these pins are read the signal. And with the inbuilt Bluetooth module, signal transmitted to android application. And the android phone displays the waveform on screen.

B. SPECIFICATIONS:

1. Raspberry pi3 module B:
Processor: Broadcom BCM2387 chipset, 1.2GHz Quad-core ARM cortex-A53.
Memory: 1GB LPDDR2.
Power: Micro USB socket 5v1, 2.5A.

2. ADC (MCP3008):
VDD: 2.7V to 5.5V
VSS: GND

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10bit ADC converter

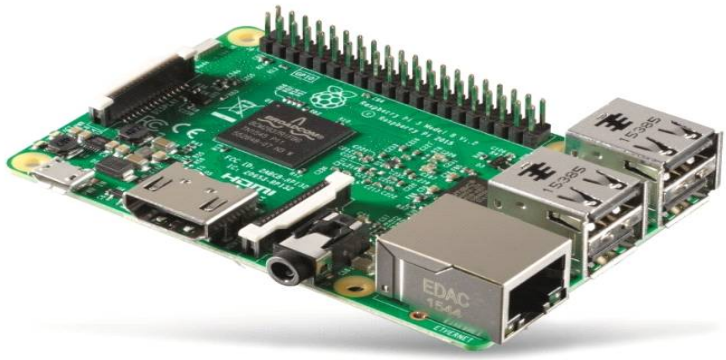
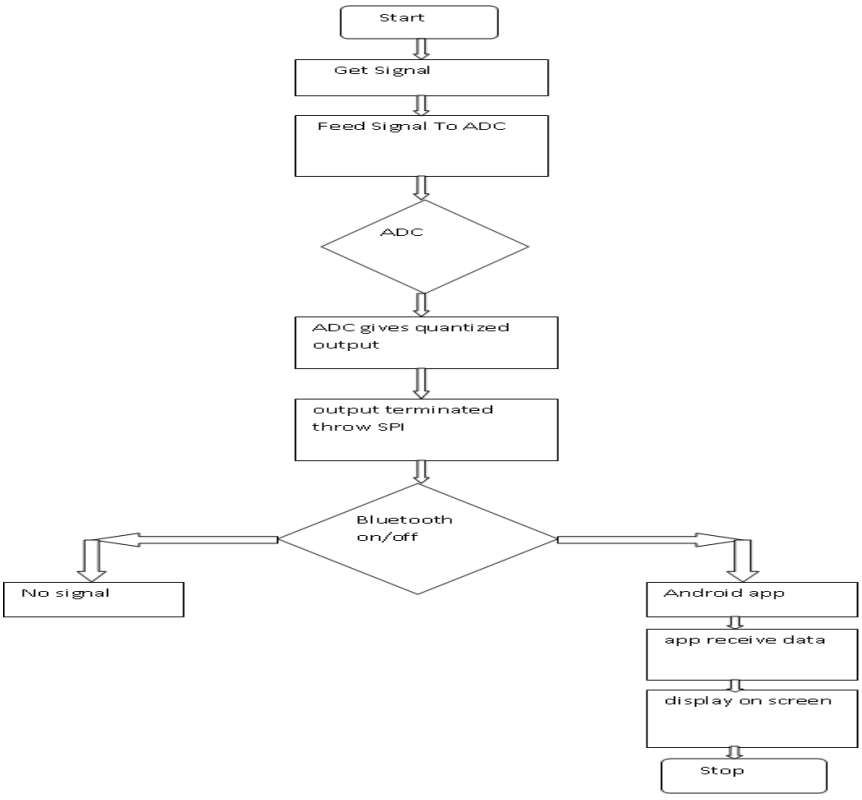


Fig 3: Raspberry Pi3 module B

IV. FLOWCHART



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V.RESULT

In android phone we can create our own application. With the help of this android application we can see the output waveform. Through the wireless Bluetooth we can interface Raspberry pi and android phone. This application also shows the frequency and voltage of the signal.

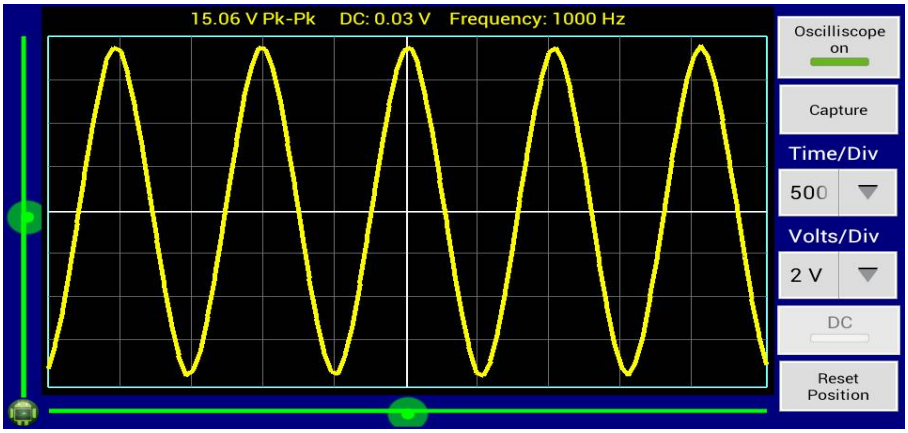

Fig 4: Output waveform

VI. ADVANTAGES OF ANDROID PHONE

1. cost effective
2. open source
3. supported by some hardware manufactures and more to come in future
4. we can modify the android program at any time

VII. CONCLUSION

In this way we implement this system with the help of android application. so that we can design our objective i.e. with the help of these system we can save the output of different kind of waveform like sine wave, triangular wave, square wave etc. we can create our own android app so we can change the program at any time. The hardware device includes circuitry to get the input voltage signals and a raspberry pi module for transmitting the input signal throw wireless Bluetooth to an Android device for displaying the waveform.

VIII. ACKNOWLEDGEMENT

I take this opportunity to express gratitude to my guide. Prof. V.P. Patil Sir, for his constant encouragement, able to guidance and support throughout the course. I take this opportunity to thank Head of Department, Department of electronics and telecommunication Engineering, Mrs. G.M Phade mam and express my gratitude towards my parents, friend to complete my work. I sincerely thanks Dr. S. T. Gandhe sir, principle, sandip institute of technology and research center, Nasik. for his advice during the course of my work.

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