



Wireless Oscilloscope for Android Mobile Phone

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Abstract:

To construct a regulated DC powers supply 12 V / 3A source. The power supply converts the (220-230) V AC into (12 V – 3A) DC output .Establishment of regulated DC power supply being used in the labs .To simulate PV module output (adjustable current & voltage) in the laboratory. Establishment of a possibility Useful for testing of charge regulator being used in PV system. Choosing the circuit diagram. Studying each block of circuit and it is work, input and output start to construct the circuit and make improvements on it.

Keywords: CRT, EDR, PIO, CH1, CH2

I. INDRODUCTION

A power supply is a device that supplies electrical energy to one or more electric loads. The term is most commonly applied to devices that convert one form of electrical energy to another, though it may also refer to devices that convert another form of energy (e.g., mechanical, chemical, solar) to electrical energy. For electronic circuits made up of transistors and/or ICs, this power source must be a DC voltage of a specific value. A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source. Every power supply must obtain the energy it supplies to its load, as well as any energy it consumes while performing that task, from an energy source. Depending on its design, a power supply may obtain energy from Electrical energy transmission systems. Common examples of this include power supplies that convert AC line voltage to DC voltage. Energy storage devices such as batteries and electromechanical systems such as generators and alternators. Solar power. A power supply may be implemented as a discrete, stand-alone device or as an integral device that is hardwired to its load. In the latter case, for example, low voltage DC power supplies are commonly integrated with their loads in devices such as computers and household electronics. Constraints that commonly affect power supplies include: The amount of voltage and current they can supply. How long they can supply energy without needing some kind of refueling or recharging (applies to power supplies that employ portable energy sources). How stable their output voltage or current is under varying load conditions. Whether they provide continuous or pulsed energy Types of Power Supply there are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can be broken down into a series of blocks, each of which performs a particular function. In this project we will build power supply voltage produced by an unregulated power supply will vary depending on the load and on variations in the AC supply voltage. For critical electronics applications a linear regulator may be used to set the voltage to a precise value, stabilized against fluctuations in input voltage and load. The regulator also greatly reduces the ripple

and noise in the output direct current. Linear regulators often provide current limiting, protecting the power supply and attached circuit from over current. Adjustable linear power supplies are common laboratory and service shop test equipment, allowing the output voltage to be adjusted over a range. For example, a bench power supply used by circuit designers may be adjustable up to 30 volts and up to 5 amperes output. Some can be driven by an external signal, for example, for applications requiring a pulsed output. Power supplies made from these blocks are described below with a circuit diagram and a graph of their output margins, and 1.0 for top and bottom margins this will create correct margins and columns throughout the paper.

II. PRESENT SCENARIO:

A mobile based oscilloscope is provide a simple yet very cheap solution rather than going in for the expensive standard oscilloscope .Given that the project is supposed to display waveform. Our project is developing an oscilloscope which measures the electrical signals. We can measure the frequency, amplitude, time, etc parameters. We can also measure small frequency parameter like pressure, vibration in the industry. Our project kit is easily transferred from one place to other. A thorough background research was conducted in all the areas, which is presented in the following pages of this chapter

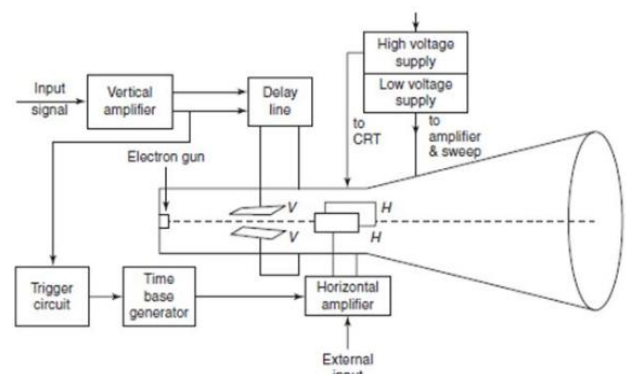


FIGURE1 : WORKING OF CRO

FIGURE1. WORKING OF CRO

III. WORKING:

- The instrument employs a cathode ray tube (CRT), which is the heart of the oscilloscope. It generates the electron beam, accelerates the beam to a high velocity, deflects the beam to create the image, and contains a phosphor screen where the electron beam eventually becomes visible. For accomplishing these tasks various electrical signals and voltages are required, which are provided by the power supply circuit of the oscilloscope. Low voltage supply is required for the heater of the electron gun for generation of electron beam and high voltage, of the order of few thousand volts, is required for cathode ray tube to accelerate the beam. Normal voltage supply, say a few hundred volts, is required for other control circuits of the oscilloscope.
- Horizontal and vertical deflection plates are fitted between electron gun and screen to deflect the beam according to input signal. Electron beam strikes the screen and creates a visible spot. This spot is deflected on the screen in horizontal direction (X-axis) with constant time dependent rate. This is accomplished by a time base circuit provided in the oscilloscope. The signal to be viewed is supplied to the vertical deflection plates through the vertical amplifier, which raises the potential of the input signal to a level that will provide usable deflection of the electron beam. Now electron beam deflects in two directions, horizontal on X-axis and vertical on Y-axis. A triggering circuit is provided for synchronizing two types of deflections so that horizontal deflection starts at the same point of the input vertical signal each time it sweeps.

FEATURES:

- 2 or more input channels
- XY mode
- USB interface
- Digital readout with backlit LCD

Display Platform of CRO:

The bulky nature of CRO is basically due to the heavy display screen. We figured out that to make our device portable we had to choose a handy and portable display platform. We had options of choosing a PC, PDA or Smart Phones based on Apple's IOS, Google's Android OS or Microsoft's Windows Mobile 7 OS. This also set us free from the requirement of a GLCD and the corresponding wiring and space on the PCB.



FIGURE 2 : FRONT VIEW OF CRO
FIGURE.2. FRONT VIEW OF CRO

The front panel is most important thing from where we can give input signal to CRO and see response on display. On

front panel there are different knobs such as ON/OFF switch, Intens, Focus, Position, Volts/div & Time/div.



Figure.3. Back view

This back view of CRO from where power supply is provided. Since we give 230Volts we need transformer for step-down purpose which makes it bulky.



Figure.4. Electron gun

This part of CRO is used for displaying the waveform on florescent screen with help of deflections. Most of the power is consumed in this CRT which results into heating problems. Large CRT results into heavy display.

IV. BLOCK DIAGRAM

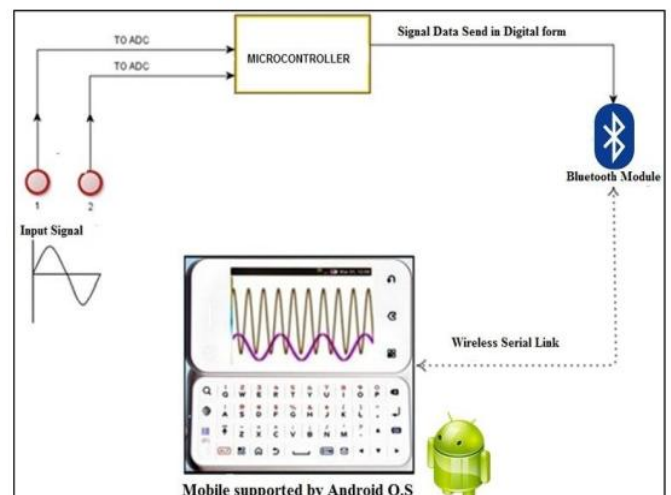


Figure.5. Mobile supported by android O.S

EXPLANATION OF EACH BLOCK:

Input: We will provide for two analog input signals in the range. These inputs will be simultaneously sampled and

displayed on the output. The proposed bandwidth of the system. The input can be given of any type of signal but within limits of specification stated in above table. The response of any circuit can also be given the input will be given by pair of multi thread wires directly to the ADC of Microcontroller.

Microcontroller Unit:

The microcontroller unit performs basically two jobs.

- i. Sampling the Input signal and processing it
- ii. Transmitting the samples via UART to the Bluetooth Module.

Analog to Digital Converter: A Microcontroller will be interfaced for Analog to digital conversion of the data. The speed of the sampling of the MCU will define our frequency range of the Oscilloscope. This is done to quantize the input to digital format for further use by the Android OS. Depending upon the sampling rate and the frequency we will determine the time control division.

UART: This is Universal Asynchronous Receive Transmit Mode. Here we will be just transmitting data from the MCU. We will basically transmitting the data from the A2D to the Wireless module (Bluetooth) to send it over to the Android OS Phone for further Processing.

Bluetooth Module: The Bluetooth Module will make itself ready for transmission of data via SPP. It will await a connection request from the Android Phone. Once connected the Bluetooth Module will send data serially and the Phone will save it for displaying.

- **Android Phone OS:** Here we will develop a user interface which will allow us to connect to the Bluetooth module and accept incoming data from it. We will use this data to plot waveforms. We will also be providing Input option wherein the user can change the positions of the waveforms. We will also try to implement Volts/div tab. We will also implement Run/stop function and if feasible support for screenshot of the waveform.

OVERVIEW OF HARDWARES:

BLUETOOTHMODULE :



Figure.6. Bluetooth module

Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mm x27 mm. Hope it will simplify your overall design/development cycle.

Software features:

- Default Baud rate: 38400, Data bits:8, Stop bit:1,Parity:No parity, Data control: has. Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.
- Given a rising pulse in PIO0, device will be disconnected.
- Status instruction port PIO1: low-disconnected, high-connected;
- PIO10 and PIO11 can be connected to red and blue led separately. When master and slave are paired, red and blue led blinks 1time/2s in interval, while disconnected only blue led blinks 2times/s.
- Auto-connect to the last device on power as default.
- Permit pairing device to connect as default.
- Auto-pairing PINCODE:”0000” as default

ANDROID PHONES:

Android is an operating system based on the Linux kernel, and designed primarily for touch screen mobile devices such as smart phone and tablet computers. Initially developed by Android, Inc., which Google backed financially and later bought in 2005, Android was unveiled in 2007 along with the founding of the Open Handset Alliance a consortium of hardware, software, and telecommunication companies devote do advancing open standards for mobile devices. The first public available smart phone running Android, the HTC Dream, was released on October 22, 2008.The user interface of Android is based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects. Android is hailed as “the first complete, open, and free mobile platform.

Complete: The designers took a comprehensive approach when they developed the Android platform. They began with a secure operating system and built robust software framework on top that allows for rich application development opportunities.

Open: The Android platform is provided through open source licensing. Developers have unprecedented access to handset features when developing applications.

Free: Android applications are free to develop. There are no licensing or royalty fees to develop on the platform. No required membership fees. No required testing fees. No required signing or certification fees. Android applications can be distributed and commercialized in a variety of ways.

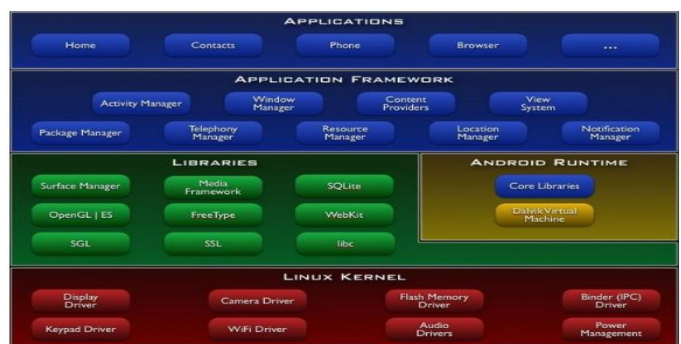


Figure.7. Application

Android Application

The Android application is developed based on the software development kit (SDK) of Android 2.2 Froyo OS, API (Application Program interface) level 8. The Android device used for testing the application is a Sony Xperia M smartphone with Android OS, V4.1 (JellyBean) with Dual core 1GHz krait. This smartphone has a TFT capacitive touch with 480 x 854 LCD screen with Bluetooth v4.0 + HS (High Speed). Fig.5.2. shows the android mobile which is used for experimental purpose. Fig.5.3, shows layout of the application on the phone's screen.



Figure.8. Phone "s screen

• MODES OF OPERATION:

The device provides two modes of operation, as in Figure 9, namely single channel mode where only channel 1 is operational, with the full bandwidth available for channel 1 and, dual channel mode where both channels are operational, with the bandwidth shared between the two channels. The sampling frequency in single channel mode is 20 kHz which is double the sampling frequency per channel of 10 kHz in dual channel mode. The user can select a mode from the application, which in turn sends a message to the dsPIC to notify the selected mode, so it can change the sampling frequency. This helps to make efficient use of the available bandwidth when only one channel is required. By default, the hardware is in dual channel mode, so both input channels are sampled simultaneously. After sampling and conversion, Channel 1 (CH1) and Channel 2 (CH2) samples are converted to a byte.

Android Application User Interface:

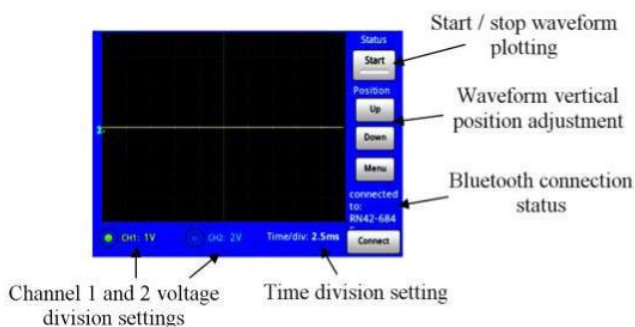


Figure.9. Android application User interface

Figure shows the Menu screen of the application on Menu button press on the main interface. Here, the user can change the settings as desired, such as the voltage and time division

settings, the channel to be displayed on the grid and the operating mode.

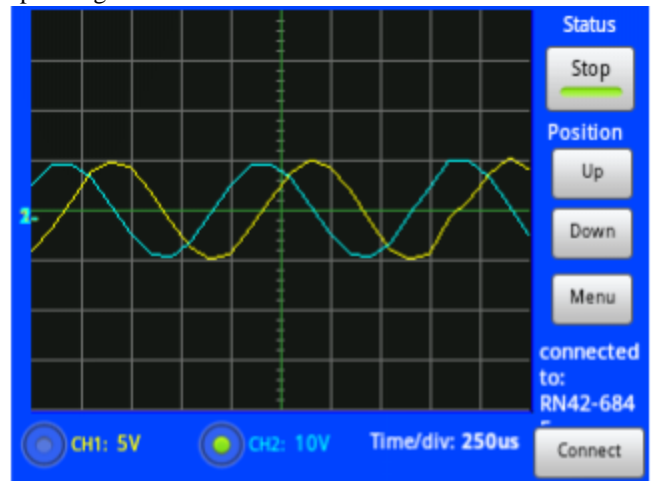


Figure.10. Volts-per-division

When the user does a change in the volts-per-division setting from the android application, it sends a message to the dsPIC notifying the change. The dsPIC then adjusts the values of the samples to be transmitted based on the current setting in order to plot the waveform correctly. The transmission format in Figure also makes the reception of data easier. The application reads the data stream from its Bluetooth data buffer and separates out the channel 1 and channel 2 data into two arrays. Reading this continuous data stream with the un-rooted Android OS and synchronizing with the transmission rate was the major challenge in developing the application. Thereafter, the waveform of the particular channel is plotted on the grid by joining the data points (samples) together with straight lines.

ADVANTAGES:

- Real time operation.
- Longer range communication works about 10-100m.
- Very high speed data transmission of 10-105 mbps.
- Wi-Fi doesn't consume high power compared to normal CRO and nontoxic one.
- Easy to handle & use.
- Which is portable, low-cost, less power consumption?

APPLICATIONS:

- Industrial-To measure remote signals.
- Educational Institute-To measure electrical quantities.
- Medical Faculty-To monitor the ECG signals.
- Wireless oscilloscope use in institutes.

V. CONCLUSION

Thus we are going to develop "A WIRELESS OSCILLOSCOPE". In this way we are going to implement this system with the help of android mobile operating system. So that we can design our objective i.e. Oscilloscope on android phone which becomes the handy oscilloscope. With the help of this system we will save the o/p of different kind of wave shaping Signal in the mobile system. For e.g. Sine wave, square wave.

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