DEPARTMENT OF ELECTRONICS AND COMMUNICATION

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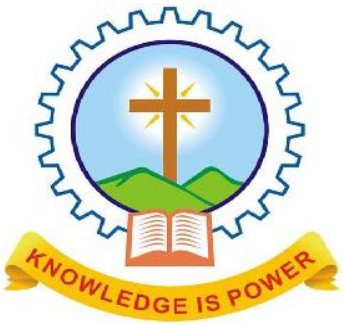

MINI PROJECT REPORT 2014

FREQUENCY ANALYZER

GUIDED BY

Asst Prof. JISS PAUL

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

SUBMITTED BY

SEBIN C JOSEPH

REG NO: 11008899

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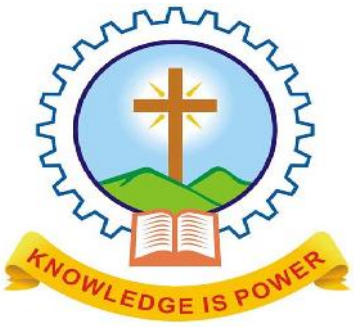

Bonafide record of mini project done by

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ACKNOWLEDGEMENT

First and foremost, we thank almighty who has blessed us profusely throughout this project work .**FREQUENCY ANALYZER** was possible only because of the encouragement that was received from all the quarters,and we take this opportunity to express our sincere thanks and gratitude to **Prof. ANNAMMA SHOBHA JOSEPH,** G.T for their support and cooperation

We are indebted to our project co-ordinator **Asst Prof. JISS PAUL** whose thoughtful comments and constant encouragement improved our project, significantly.

We also express our sincere gratitude to all the staff members and students of the Electronics and Communication Department for their support and guidance.

CONTENTS

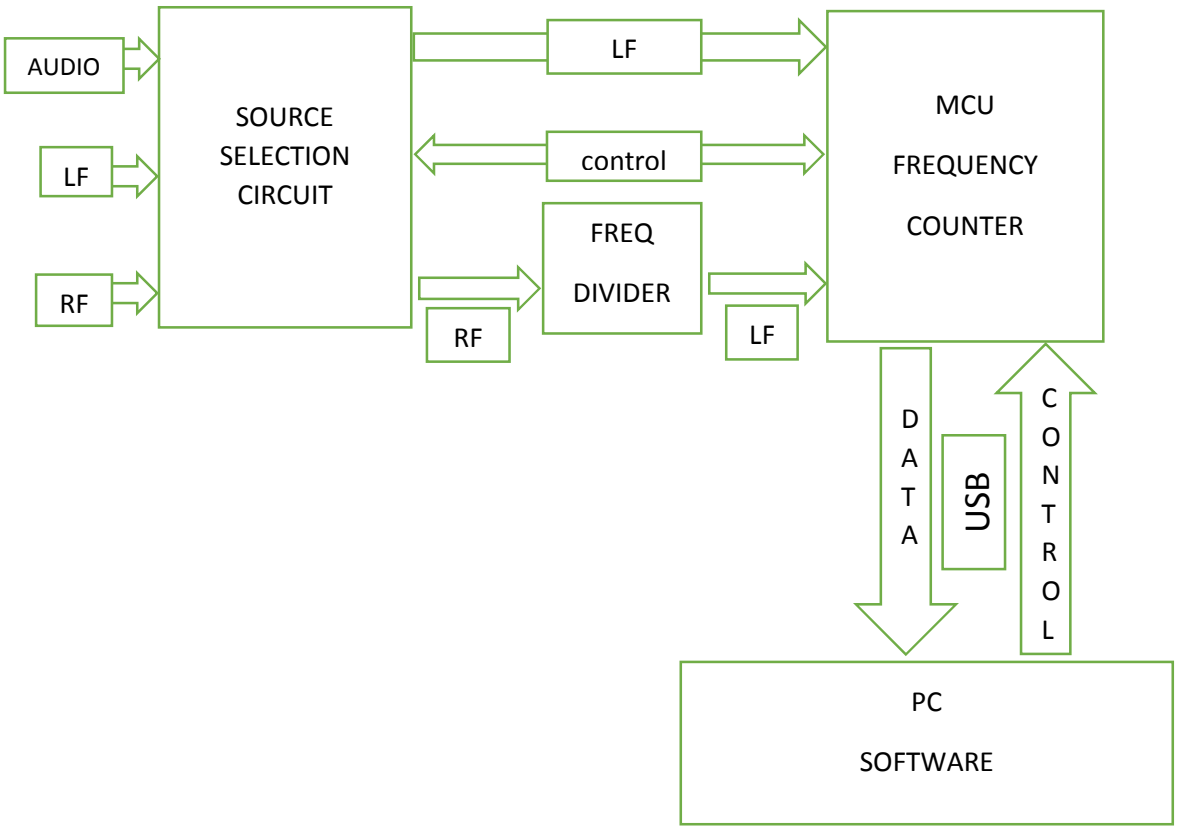
INTRODUCTION

By project entitled FREQUENCY ANALYZER we are trying to develop a simple, low cost frequency meter that is to be interfaced with a computer software. In certain applications, we come across situations where we need to measure frequencies with precision. But at present situation there are not many viable media by which we can measure the same. Normally for the measurement of frequencies, we employ cathode ray oscilloscopes. But when it comes to the case of industrial applications CRO's are used rarely as they do not account for frequency analysing and decision making. This drawback of CRO's and other frequency measuring analyzing devices lead to the thought of computer controlled frequency analyser.

WORKING PRINCIPLE

The idea is very simple and applied more often. We divide the RF signal with a pre-scalar to medium frequency range frequencies by the use of frequency divider circuit. This medium frequency is connected to the PIC microcontroller and we measure the frequency. Then this frequency is multiplied with the pre-scalar value, and transfered to PC via USB. The instantaneous frequency is displayed in PC, and the frequency analysis is made on software basis. (Depending on analysis made, we can control other circuitry if needed).The advantage of USB interfacing is the huge bandwidth capability, and availability of full duplex mode. The audio frequency can also be measured using the setup, from the mic on the board.

BLOCK DIAGRAM



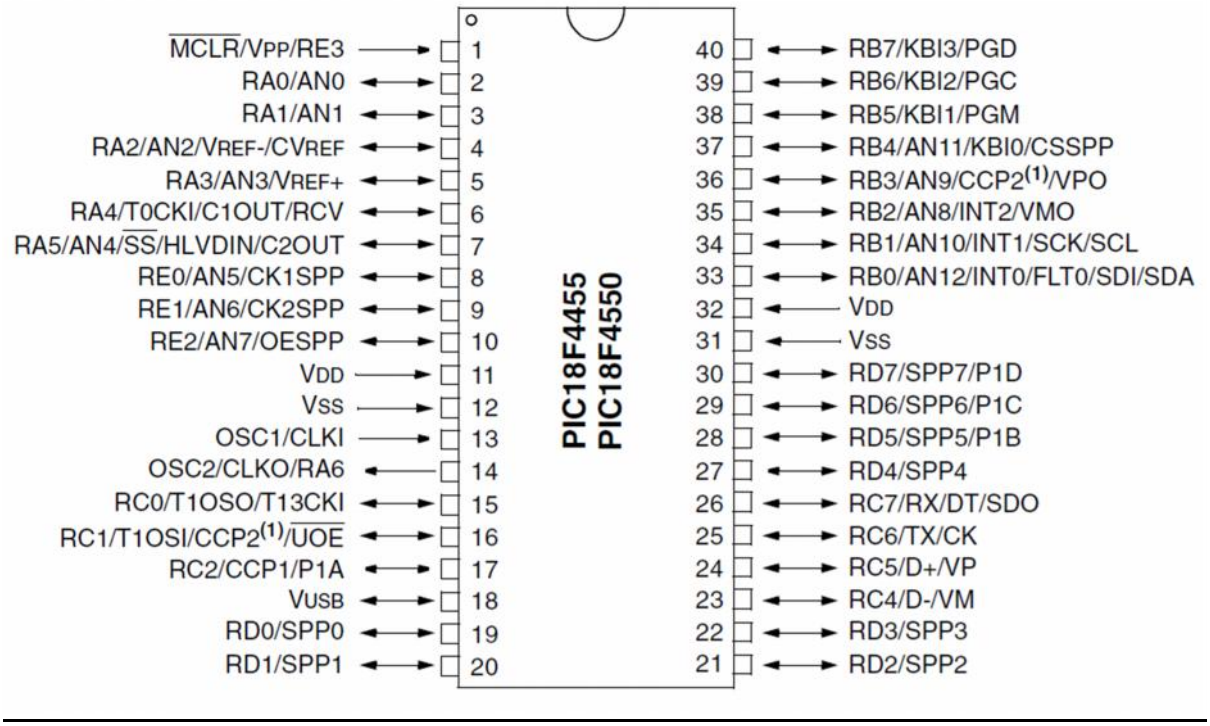
BLOCK DIAGRAM EXPLANATION

Source selection circuit: The source selection circuit is used to select the particular input source (MIC, RF, LF) etc. The source selection is controlled from PC software through micro-controller.

Frequency Divider: A frequency divider, also called a clock divider or prescaler is a circuit that takes an input signal of a frequency, Fin, and generates an output signal of a frequency Fin/n. For power-of-2 integer division, a simple binary counter can be used, clocked by the input signal. The least-significant output bit alternates at 1/2 the rate of the input clock, the next bit at 1/4 the rate, the third bit at 1/8 the rate, etc. An arrangement of flip-flops are a classic method for integer-n division. The easiest configuration is a series where each flip-flop is a divide-by-2. For a series of three of these, such system would be a divide-by-8. By adding additional logic gates to the chain of flip flops, other division ratios can be obtained. Integrated circuit logic families can provide a single chip solution for some common division ratios. Here we use a counter(4020) for the purpose.

Micro Controller: A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals, which is actually the heart of the system. All controls in the board are done by microcontroller, and is controlled directly from the PC software .The PIC18F4550 device contain a full speed and low speed serial engine that allows fast communication between any USB host and the PIC microcontroller. The Serial Engine can interface directly to USB utilizing the internal tranciever. The USB interfacing of PIC is introduced in the **appendix** area. The protocols used in the programming are obtained from the official USB website www,usb.org.

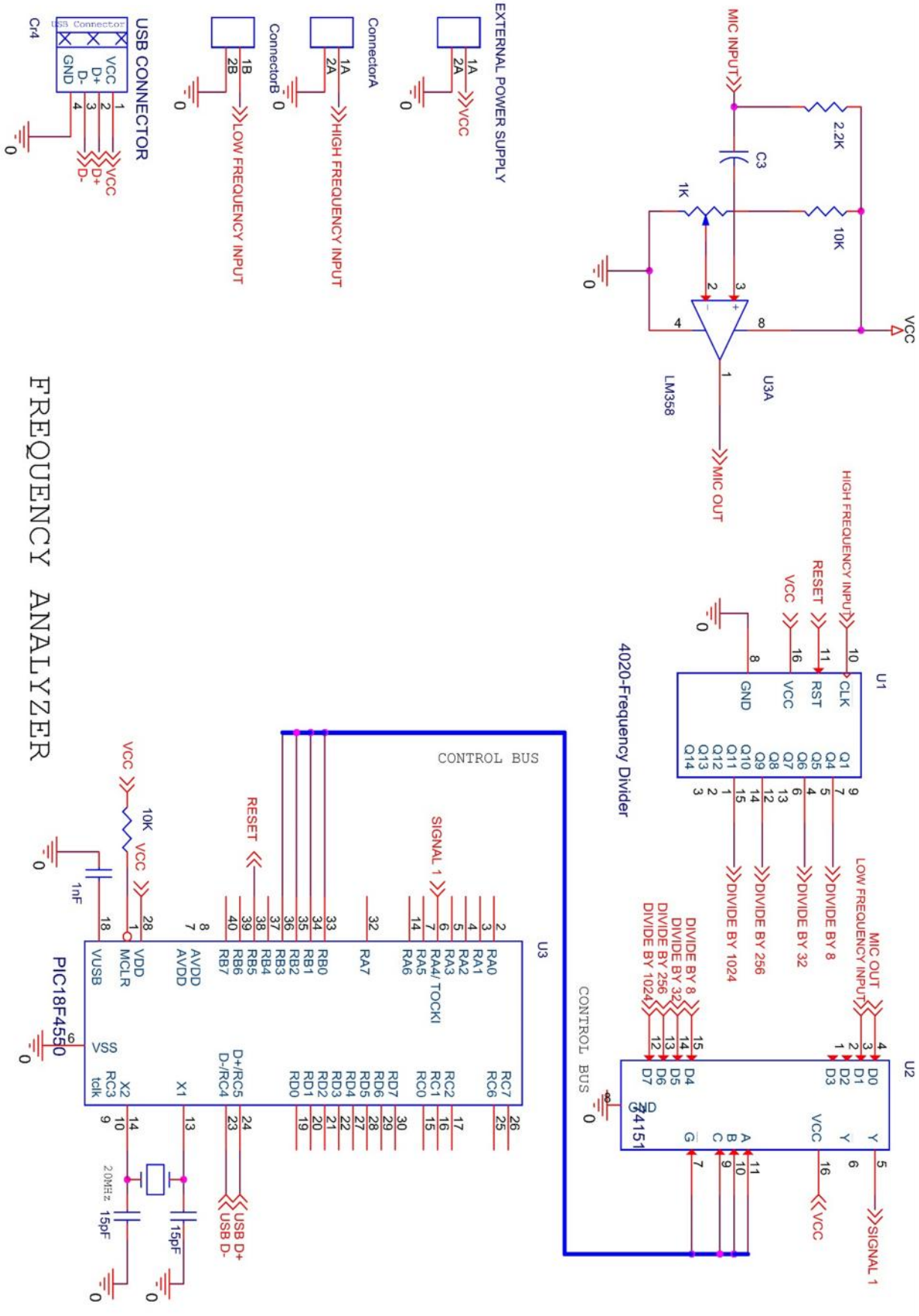
The frequency measurement is done within the microcontroller using the internal TIMER or COUNTER for a period of 40ms interval, and the data is directly send to PC via USB. All the control signals coming through USB is handled by microcontroller, and the response is send back to PC.



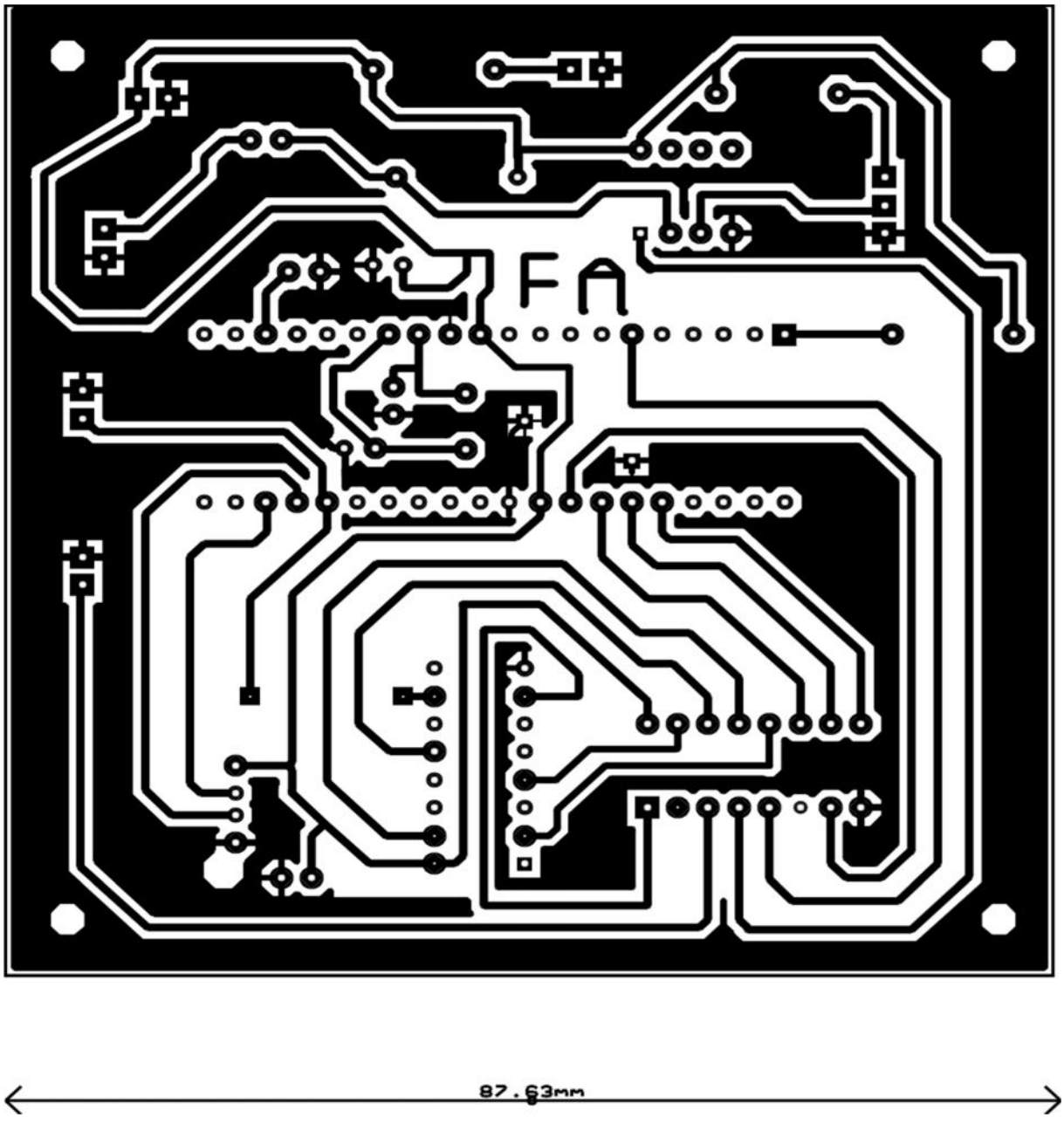
USB INTERFACE: USB emerged as a result of the difficulties associated with the cost, configuration, and attachment of peripheral devices in the personal computer environment. In short, USB creates a method of attaching and accessing peripheral devices that reduces overall cost, simplifies the attachment and configuration from the end-user perspective, and solves several technical issues associated with old style peripherals. USB can detect the attachment of a new peripheral and automatically install the relevant software needed to access the device. This process also eliminates the need to set switches and jumpers when configuring a peripheral device and eliminates the need to restart the system when the device is attached. In short, the peripheral can simply be attached by the user and be ready for immediate use. The high speed and huge bandwidth capability made the USB as right choice over their Complex protocols, which is difficult to implement in the limited resource.

SOFTWARE: It is the brain of the system. Since microcontroller has very limited capability in high accuracy situations like industries, computer interfacing is a suitable method for the problem. All high precision calculations are done using PC software so that hardware cost can be minimise. In our system the frequency valued transmitted by microcontroller is used for displaying and decision making. All controls of the frequency analyzer board is done from the software so no interface with hardware is required once the device is attached. A graph is provided for easier visualization the frequency variation. The advantage of the software interface is it is easy to reprogram, so only software change is require for one application to another of the hardware.

CIRCUIT DIAGRAM



PCB LAYOUT



COMPONENTS USED

1. PIC 18F4550 microcontroller
2. 4020 counter/divider
3. LM 358 Op-Amp
4. 74153 8x1 mux

Application

1. Motor RPM measurement
2. Musical instrument testing
3. Industrial object counter and controlling
4. Communication field
5. in air crafts to receive a specific frequency signal
6. Frequency to voltage convertor calibration
7. Many industrial application

CONCLUSION

The project entitled FREQUENCY ANALYZER has been designed and developed successfully. We were extremely satisfied with the operation of our project. The PCB layout is also created using the same. The project was completed within the stipulated time, tested and verified.

REFERENCES

1. www.usb.org (USB protocol definitions)
2. Google
3. PROTEUS software
4. OR CAD software
5. Microchip PIC datasheet

APPENDIX