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FM BASED WIRELESS LONG RANGE COMMUNICATION SYSTEM AND DEVICE CONTROL

KARAN SINGH VEDI, KAUSHAL BHUTANI, NILESH YADAV, BHOOPENDRA GURJAR
Department of Electronics& Communication Engineering
SRM University, NCR Campus
Ghaziabad

ABSTRACT:
A lot of times we need to keep track of data from a device or a sensor located in a remote location from the point where it is processed. In other situations we desire wireless solutions for ease. Using long cables, infrared (IR) or other means are often tedious and not loss-less. Imagine collecting pH level data from a chemically lethal or toxic treatment plant where human presence is highly health hazardous. Running long cables from the pH sensor to the control or monitor station will surely introduce noisy signals and signal-to-noise ratio will thus drastically decrease. The result is erroneous data acquisition and thereby false decisions may be generated. In the recent years, A simple FM-Transmitter to be used specialized applications such as in radio broadcasting and telecommunications etc .Frequency modulation has several advantages over the system of amplitude modulation (AM) used in the alternate form of radio broadcasting. The most important of these advantages is that an FM system has greater freedom from interference and static. Commercial FM radio stations are assigned frequencies between 88 and 108 MHz and will be the intended frequency range of transmission. As human endeavors dispersed around the globe, mankind worked to maintain contact and pass on information. The history of communication technology is one of the great stories of technological progress ever accomplished. If infrared signals or other optical means including lasers are used, they will need good obstacle-free line of sight or expensive and delicate optical fibers. Thus the solution stays in the radio frequency (RF) domain. This article talks about interfacing low cost FM modules (SI-4432) for transmitting data between two remotely located PIC microcontrollers.

INTRODUCTION:

The project named wireless communication system with device control is used to monitor devices or sensors and send voice over FM modulation. This project is very useful where mobile networks are not available or a disaster like earthquake (when local communication failures) to make own local communication system. It is also very useful for our farmers to control their water pumps which are located their remote field. This device uses a long range about 20dbm 433MHz transmitter and very sensitive receiver having approx -105dbm sensitivity for data transmission and reception while for voice transmission 88MHz to 108MHz FM transmitters are used at both ends. A PIC16F877A microcontroller is used to interface the RF modules, keyboard, relay and LCD. This project aim is to provide long range wireless communication system and device control. With the help of this project we can establish a low cost communication over a certain distance using FM module. This project also enables us to control device and exchange information at a long distance. The project's goal is to create an FM transmitter, which transmits, it redundancy, a signal or sound to an FM receiver, without the need for cables. This signal is received through a microphone built into the circuit this signal can be heard on stations already occupied with a frequency, i..e to listen to our sound emitted at the transmitter, we search the FM band station or frequency that is free or empty.

PROJECT DESCRIPTION:

The objective of the project is to design, circuit to develop a fully FM based wireless communication system and device control. With this objective the project is divided in 3 modules as:

- Concept Designing of power circuit ,text transmission circuit.
- Designing FM voice transmitter circuit.
- Interfacing of microcontroller**.**

CONCEPT SPECIFICATION:

This FM transmitter has 3 RF stages. A variable frequency vhf oscillator, a class CRF driver and a class c , RF driver and a class c RF amplifier with harmonics filter. Block diagram of transmitter is shown in fig.1.

- Default operating range is 200m approx. but it can be expected up to 3 km by adding a telescopic antenna in the given slot.
- RF output power is 150mw.
- Frequency range 88-108MHz
- Adjust frequency by changing capacitor "freq"**.**
- Adjust range by changing capacitor "range".

The FM transmitter is shown in the figure.1 below:

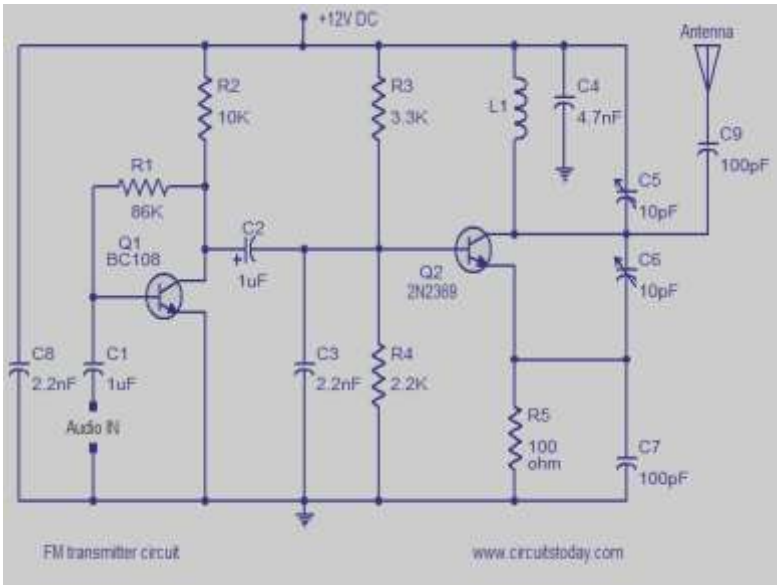

Figure.1

OPERATIONAL PRINCIPLE:

A lot of FM transmitter circuits have been already published here. This is just another one, a simple two transistor FM transmitter. The first stage of the circuit is a preamplifier stage based on transistor Q1. This is a collector to base biased amplifier stage where resistor R2 sets the collector current and R1 provided the necessary collector to base bias. C1 is the input DC decoupling capacitor which couples the input audio signal to the Q1 base. C8 is the power supply by-pass capacitor. Next stage is the oscillator cum modulator stage built around transistor Q2. Electrolytic capacitor C2 couples the output of the first stage to the second stage. R3 and R4 are the biasing resistors of Q2. R5 is the emitter resistor of Q2. Inductor L1 and trimmer capacitor C5 forms the tank circuit which is necessary for creating oscillations. The modulated FM signal is available at the collector of Q2 and it is coupled to the antenna using capacitor C9.

Figure 1, above shows the fm wireless transmitter fig l.

TEXT AND DEVICE CONTROL TRANSMISSION CIRCUIT:

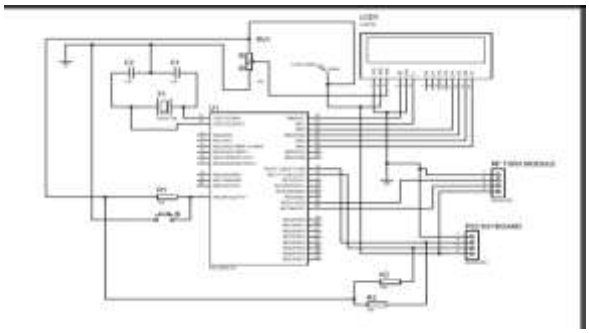

Fig. 2

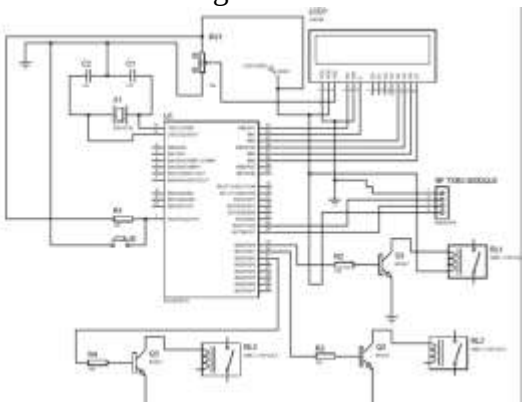

Figure.3

In this demo, we will see how to achieve an easy data transaction between two PIC16F877A microcontrollers using inexpensive RF modules. The theory is pretty simple and straight. It uses FMand SI-4432 modules which is a 433 MHz serial data transmitter/receiver pair. One PIC16F877A is programmed to transmit its ADC data (RA0/AN0 channel) serially using its built-in USART hardware at 1200 baud with no parity and 8-bit data stream. The PIC's USART transmitter (TX) pin feeds the data into the data pin of the FM module which transmits it using 433 MHz ASK RF signal. On the receiving end the FM module receives the data and its output is connected to another PIC's USART input pin. The second PIC is programmed to read its USART receiver (RX) pin. On both ends, two LCD displays are also connected which show the transmitted and received bytes. Since RS232 communications typically allow 8-bit data, the 8-bit A/D conversion is used here for simplicity, instead of the more common 10-bit ADC.

POWER CIRCUIT:

The construction of this power supply circuit is very simple in such a way that the components used are easy to be located while the cost is very cheap. With the biggest provided current at 1 A, the output voltage is adjusted for minimal ripple effect and stabilized in the range of 0 V to 12 V DC. All power supplies have a power input, which receives energy from the energy source, and a power output that delivers energy to the load. In most power supplies the power input and output consist of electrical connectors or hardwired circuit connections, though some power supplies employ wireless energy transfer in lieu of galvanic connections for the power input or output. Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control. Some DC power supplies use AC mains electricity as an energy source. Such power supplies will sometimes employ a transformer to convert the input voltage to a higher or lower AC voltage. A rectifier is used to convert the transformer output voltage to a varying DC voltage,

which in turn is passed through an electronic filter to convert it to an unregulated DC voltage. The filter removes most, but not all of the AC voltage variations; the remaining voltage variations are known as ripple. The electric load's tolerance of ripple dictates the minimum amount of filtering that must be provided by a power supply. In some applications, high ripple is tolerated and therefore no filtering is required. For example, in some battery charging applications it is possible to implement a mains-powered DC power supply with nothing more than a transformer and a single rectifier diode, with a resistor in series with the output to limit charging current.

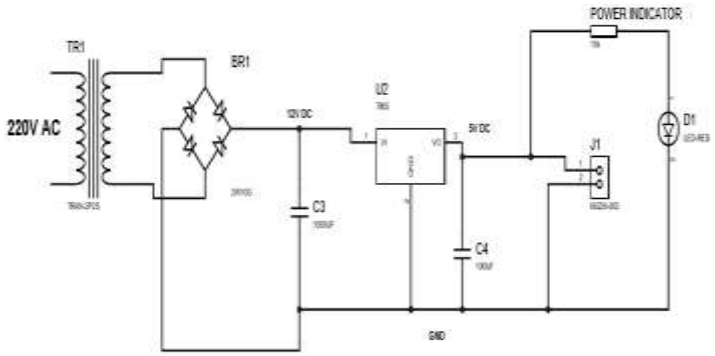

Figure.4

The voltage regulator (7805) is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels**.**

PROJECT APPLICATIONS:

Commonly used in many industries, including the automotive wireless control, agricultural pump control, computer, electronic devices control, chemically lethal or toxic treatment plant where human presence is highly health hazardous wireless communication is highly preferred ,long range device control and monitoring is also done as uninterrupted signal transmission is possible. It can be used to sensor network.

RESULTS ACHIEVED:

The concept of developing an FM based wireless devices has been executed. We have developed an circuit, which would be the precursor for the future developments.

The results of the project are as: -

- Designing of the circuit range is accomplished.
- Interfacing of LCD and key pad display is done.
- Connection meant with microcontroller is interfaced.
- More interfaced communication is possible.

2. DESIGN OF INTERFACING CIRCUIT

To achieve an easy data transaction between two PIC16F877A microcontrollers using in expensive RF Module, connection is designed to produce transmission easily.

3. EXPERIMENTAL TESTING:

Experiments were carried out to get more FM long range communication system interference of noise is seen. Calculation of inductor value • Frequency the specific frequency, f generated is now determined by the capacitance C and inductance L measured in Farads and Henry respectively. Fig 2.3: Calculation of Frequency Value. • Resonant Frequency of a Parallel LC Circuit The variable capacitor and self-made inductor constitute a parallel LC circuit also called a tank circuit which vibrates at a resonant frequency to be picked up by an FM radio. The underlying physics is that a capacitor stores energy in the electric field between its plates, depending on the voltage across it, and an inductor stores energy in its magnetic field, depending on the current through it. The oscillation frequency is determined by the capacitance and inductance values.

APLLICATIONS:

- Hazardous and Chemical Industries where communication is difficult.
- Long Range Wireless Device Control.
- Free of cost and Uninterrupted Communication.
- Remote meter reading
- Home security alarm
- Sensor Networks
- Health monitoring and telemetry.

CONCLUSION:

In this reviewed the generation mobile communication and latest technology of networks communication system and device control. The main aim of this generation to create fastest and reliability mobile network which will access all the users with high speed of device control and communicate over a area.

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