# Chapter-10

## Interfacing RF Module with Microcontroller

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10.1 Introduction of RF module
In many projects we use RF modules for transmitting and receiving data because it has high volume of applications than the IR. RF signals travel in the transmitter and receiver even if there is an obstruction. The RF operates at a specific frequency of about 433MHz. An RF transmitter receives serial data and transmits this to the receiver through an antenna which is connected to the 4th pin of the transmitter. When the logic 0 is applied to the transmitter, then there is no power supply in the transmitter. When the logic 1 is applied to the transmitter, then the transmitter is on; and, there is a high power supply in the range of 4.5mA with 3V voltage.

10.2 Interfacing the RF module to the microcontroller
The RF modules such as RF transmitter and RF receiver are interfaced to the microcontroller with the help of decoder and encoder ICs. The RF modules working with a certain frequency range transfer and receive the data with analog form, but for a microcontroller working with the binary data ‘0’ or ‘1’s’, the RF transmitter is interfaced to such microcontroller with the help of an encoder, and the RF receiver is connected to the microcontroller with help of a decoder.

10.3 Circuit Connections
Transmitter
From the circuit, the power supply +3.3V are connected to the 48th pin and ground is connected to the 8th pin of the microcontroller. Here two switches are connected to the 16th and 17th pins of the microcontroller for controlling the load. A 2*8 LCD display is connected to the microcontroller to display the information. The RF transmitter is connected to the 30th pin of the microcontroller for sending the input signals to the receiver.
Receiver:
Ay receiver end has similar connections for power supply as the microcontroller needs +3.3V, which is same as the transmitter. The RF receiver is connected to the 31st pin of the microcontroller. The LCD display is connected to the portA of the microcontroller for displaying the information. The crystal is connected to the 5th and 6th pins of the microcontroller. The reset button is connected to the 9th pin of the microcontroller.
10.4 RF Transmitter and Receiver's Working Procedure

**RF transmitter:**
Transmitter modules are usually interfaced to the microcontroller, which provides binary data by sending it to the encoder. The encoder converts the digital data into analog data and sends it to the RF transmitter module.

**RF Receiver**
The RF receiver receives the data from the transmitter and sends it to the decoder. The decoder decodes that data in binary format and sends it to the microcontroller. The microcontroller generates output signals based on the decoder values to control the loads.

For example, switching on and off the LED lights through RF technology
A group of LEDs connected to the microcontroller's PORTA terminal.

**Receiver Block Code:**
```
#include<reg51.h>
Sbit D0 = P2^0;
Sbit D1 = P2^1;
Sbit D2 = P2^2;
Sbit D3 = P2^3;
Sbit LIGHT = P1^0;
bit INTO_FLAG=0;
Void Int_ISR()
{
    INTO_FLAG=1;
}
Void main()
{
P2=0XFF; //P2 as input port
While(1)
{
    If(INTO_FLAG)
    {
        If(D0==1 && D1==1 && D2==1 && D3==0)
            LIGHT=1;
        If(D0==1 && D1==1 && D2==0 && D3==1)
            LIGHT=0;
        INTO_FLAG=0;
    }
}
```
Transmitter Block Code:
#include<reg51.h>
Sbit  SW1 = P2^0;
Sbit  SW2 = P2^1;
Sbit  D0 = P1^0;
Sbit  D1 = P1^1;
Sbit  D2 = P1^2;
Sbit  D3 = P1^3;
Void main()
{
    P2=0xFF;     //make as input port
    While(1)
    {
        If(SW1==0)
        {
            D0=1;
            D1=1;
            D2=1;
            D3=0;
        }
        Else if (sw2==0)
        {
            D0=1;
            D1=1;
            D2=0;
            D3=1;
        }
    }
}