

Description of the Transmitter (TX)

1. Digital Board

The transmitter contains two main parts, the RF board and the digital board. The operation of the transmitter can be described as following.

The temperature and humidity information are sensed by their individual sensors, the TH1 (103AT-2B) thermistor for temperature and the HM1 (C5-M3) humidity sensor respectively. These sensors are variable resistors whose values change as the temperature and humidity are changing.

The U1 device, which is a low power CMOS microcontroller driven by a quartz crystal clock of 32.768 KHz and operated by 3V dry battery. It has special input ports to accept these variable resistance values. These values cause change of frequency of certain internal oscillators, which are translated into pulse counts.

This means,

$$\text{Temperature or Humidity} \propto \text{Resistance} \propto \text{Frequency} \propto \text{pulse counts}$$

By counting the pulses, one can determine the temperature or humidity values through a table lookup. The U1 device is able to perform all these functions. It also has Liquid Crystal Display drivers that can send the temperature and humidity data out to the LCD (LCD1) to be displayed.

The temperature and humidity data are first serialised then together with other digital codes, these bits are sent to the RF portion of the product to be transmitted.

The transmitted codes include preamble, synchronization and data. The data packet includes ID code, time code, low battery detect code and temperature and humidity data codes. Through the ID codes, several transmitters can interface with one receiver. The ID of the transmitter is set by the channel select switch SW1.

All these coding are done by the U1 control program, which is resided inside the ROM (read only memory).

The U1 micro-controller is really the master controller to activate all these tasks.

To conserve battery power, the RF circuit is activated only when transmission is intended. This is done by port 1.3 of U1 which goes low when transmission is desired. This causes the base of the transistor Q1 to go low and turns it on. Power is then connected to the RF board of the transmitter. This is designated as TX-PWR. The serial transmission data is sent via the port P1.0 of U1 to the RF board. This is designated as TXD.

The connections of the digital board to the RF board are the TXD and TX-PWR.

2. RF Board

The serial digital data pulses with all the necessary coding is sent to the RF board to be processed and transmitted.

The coded data is first mixed with the high frequency pulses generated by the 433.92 MHz SAW resonator.

Q2 is the transistor that is doing this mixing action and generating the modulated signal. It works as an emitter follower where the modulated data is sent to the second transistor Q3 where the signal is readily amplified before sending to the antenna to be transmitted.
