Circuit Description

RF Receiver Section :

Transistor Q9 functions as an RF pre-amplifier and Q10 forms the major part of the conventional super regenerative detector stage.

The detected output is input to the LM324 operational amplifier with the first stage extracting the data from the very weak signal. Its second stage operational amplifier provides gain to the extracted data. The last stage purely compares the amplified data and makes the weak signal data to be square ware in order to let the MCU recognize the data easily.

1.5V Zener Circuit:

Transistor Q5 and Q7 combine together to form the a DC regulator. Q5 is the pass transistor to delivery enough power to the MCU while Q7 samples the Q5's emitter voltage and stabilizes the Q5's base voltage in order to keep the Q5 emitter output voltage to be fairly constant. Thus the power supply voltage of the MCU becomes 1.5V and suitable for the MCU to function properly.

Low voltage detector:

Transistor Q1, D2,R7,R50 and R6 are combined together to form the low battery detector. Since the minimum operating voltage of the RF receiver is 2.65V, we have to set the low voltage detector to be activated before 2.65V and our design have set this value between 2.85V and 2.65V. In this circuit section, R7 and R50 provide an unconventional (but precise) resistance value and combine with R6 to make a voltage divider to the battery voltage after the voltage drop due to the silicon PN junction threshold voltage of the diode D2. Thus at a voltage slightly lower than 2.85V, Q1 is being cut off and a zero voltage is then input to the low-battery detection input of the MCU in order to switch on the Low-Battery icon on the LCD display.

Temperature Sensor:

This temperature sensor circuit section is achieved by the charging the C5 through R5 as the reference time constant and R1,Th and R3 form the temperature dependent charging path to C5. These two charging paths can then form two different time interval and thus the MCU can calculate the difference to convert it into temperature value. The reason why we need a reference charging path is for eliminating the temperature effect of this circuit components especially the capacitor C5.