

Anzacare Wireless Body Fluid Detecting Alarm

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1 Introduction

Anzacare Wireless Body Fluid Detecting Alarm (AWBFDA) system consists of a radio frequency transmitter (TX) and a receiver (RX) pair. Both TX and RX modules are battery powered. TX module includes a conductivity sensor, which can detect body fluids like urine and blood. The RX module includes a piezo beeper for alarm generation. Both TX and RX modules operate in power down mode under normal condition. TX module comes out of power down mode and transmits an RF signal when its associated body fluid sensor becomes wet. This RF signals causes the RX module to come out of power down mode generating alarm condition. Each TX module transmits its own unique ID under wet condition. The RX module can be configured for a particular TX module.

1.1 Audience

This document is intended for engineering and management staff of Anzacare.

1.2 Status

The status of this document is *draft*.

2 System architecture

Following block diagram indicates the main building blocks of the Anzacare Wireless Body Fluid Detecting Alarm.

- 1 TX module
- 2 RX module

Figure 2-1: Anzacare Wireless Body Fluid Detecting Alarm Block Diagram

2.1 TX Module

TX module uses AT86RF401E microcontroller, which belongs to Atmel's AVR series RISC family. This microcontroller has on chip UHF transmitter. The microcontroller can operate from 2Vdc and consumes less than 0.5uA in power down mode. The microcontroller is in system programmable (ISP). Microcontroller has 6 general purpose input output (I/O) pins. One of the I/O pin of the microcontroller is connected to body fluid sensor via a signal conditioner. Signal conditioner block converts the body fluid sensor's output compatible to microcontroller. The microcontroller and the signal-conditioner operate from a 3V lithium battery. A reed switch controls Battery power to the TX module.

2.2 RX Module

The RX module uses ATTINY13 microcontroller, which belongs to Atmel's AVR series RISC family. The microcontroller can operate from 1.8Vdc and consumes about 0.1uA in power down mode. The microcontroller is in system programmable (ISP). The microcontroller has 6 general purpose input output (I/O) pins. The RX module uses Micrel's MICRF009 chip as UHF receiver. This UHF receiver chip operates in duty cycle mode to conserve power. In the power down mode receiver chip consumes about 0.15uA current. The receiver chip's output is connected to the microcontroller's I/O pin. One of the microcontroller's I/O pin drives the piezo driver to generate the alarm. The RX module can be configured to a particular TX module using the learn button. Voltage booster is required to power the receiver chip and the piezo driver. TX module is powered from a 3 volts lithium battery. The ON-OFF switch is provided to disconnect the battery from the RX module. The magnet in the receiver case is used to operate the reed switch on the TX module.

2.3 Functional Description

The cases for TX & RX modules are designed in such a way that the TX module can sit on RX module when the unit is not in use. In this position the RX module's case-magnet operates the reed switch on TX module, which puts the TX module in off state. The TX module's power is turned on when it is not sitting on the rest provided by RX module. In power on state TX module conserves power by putting the microcontroller in power down mode. Under wet condition body fluid sensor activates microcontroller's I/O pin. This causes the microcontroller to come out of power down mode and send an RF signal. The transmitted RF signal includes a 24 bit unique ID for that particular TX module. After the RF transmission the microcontroller on TX module once again enters power down mode. The RX module receives the transmitter signal. The UHF receiver chip passes the received 24-bit ID to the microcontroller. Receiver microcontroller compares this ID with the stored ID. The RX microcontroller turns on the piezo alarm if IDs match.

3 Operating Instructions

1 TX Module

2



2) RX Module

Figure 3-1: Anzacare Wireless Body Fluid Detecting Alarm

3.1 TX Module

The case magnet of the RX module will operate the reed switch on the TX module when the TX module is kept in the rest position provided on the RX module. Thus when the TX module is placed over the RX module as shown in the picture above the TX module's power will be cut. On the topside of TX module there are two conductive plastic electrodes. Following steps should be followed for testing the TX module.

1. Lift the TX module from the top of RX module. This will turn on the TX module
2. Use a wet tissue paper to short the top conductive plastic electrodes. This will activate the TX module, which does an RF transmission.
3. Any RX module that is configured for this TX module will enter in Alarm generation mode.
4. To repeat the trigger sequence clean the TX electrodes with a dry tissue-paper

3.2 RX Module

The picture above shows an RX module. It has a power on-off switch, a learn push button to configure the RX module and a piezo beeper. Following steps can help testing

the RX module, which is previously configured for a TX module.

1. Switch on the RX module by change the power switch position from “0” to “1”.
2. A short burst of beeps after power on indicates that RX module initialisation is successful.
3. After power on 5 seconds of wait period is necessary for RX module. This allows the UHF receiver chip to stabilise, which operates in duty cycle mode.
4. Now RX module is ready for reception from TX module. Follow steps 1 to 3 of TX module testing.
5. RX module enters in alarm mode for 2 minutes. Alarm can be stopped at any time by operating the power switch on TX module.

3.3 RX module configuration

RX module can store one TX module ID in its non-volatile memory (EEPROM). In the configuration process one can modify the stored ID using the learn button provided on the RX module. Following steps should be followed to change the stored ID.

1. The TX and RX modules should be kept adjacent at about half meter separation.
2. Switch on the RX module by change the power switch position from “0” to “1”.
3. A short burst of beeps after power on indicates that RX module initialisation is successful.
4. Press the learn button provided on RX module until the beeps start. A total 63 beeps can be heard in about 2 minutes. This low frequency beeping indicates that RX module is in learning mode.
5. While the RX module is in learn mode follow TX module testing steps from 1 to 4.
6. Upon successful learn condition the beeper on the RX module will change its beeping frequency.
7. Repeating TX module testing steps 1 to 4 can test the newly configured RX module.

4 Technical Specifications

4.1 RF Specifications

- 1 Transmit Frequency: 433.92MHz
- 2 Modulation Type: ON OFF modulation
- 3 Modulating Frequency: 750Hz
- 4 Data is Manchester coded
- 5 Transmits only when the fluid sensor is wet
- 6 Transmits for 1.4 seconds twice with a small gap
- 7 Power measured at 3 meters is about -57dBm
- 8 Uses a loop antenna for transmission