

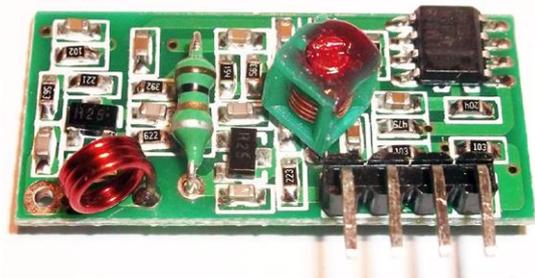
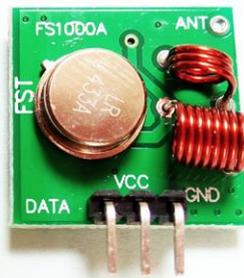
Remote sensor unit (alias GPS beacon)



- is intended for outdoor mounting (indoors at a window is ok too)
- is part of the WSPR-beacon project but can also be used for other purposes (e.g. station clock, ...)
- comprises a NEO-6M GPS unit, a 18B20 temperature sensor, an Arduino NANO and a 433MHz ISM-band transmitter unit.
- can be equipped with other communication modules instead of the radio transmitter (e.g. optical, wired, ...)
- generates a Manchester coded (hence DC-free) output
- consumes about 100mA; power supply can be designed in different ways (the one depicted here employs a 9V switching-type wall power supply as well as a line regulator to get down to 5V); if the concept chosen generates large amount of heat (e.g. a line regulator with input voltage > 15V) you may want to place the temperature sensor at a greater distance to avoid false readings
- cyclically broadcasts position, speed over ground, altitude, temperature, Sun's and Moon's current altitude/azimuth, time of Sunrise & -set as well as Moonrise & -set, the Moon's current phase
- datastream includes CRC8-checking to prevent erroneous transmission.
- transmission consists of 2 datasets, sent at a 19s interval. Status LED will flash 1x during transmission of set 1 and 2x for set 2. High frequency blinking indicates faulty data / GPS not locked (no transmission will take place)



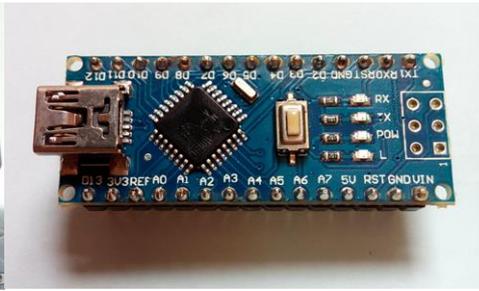
GPS-module



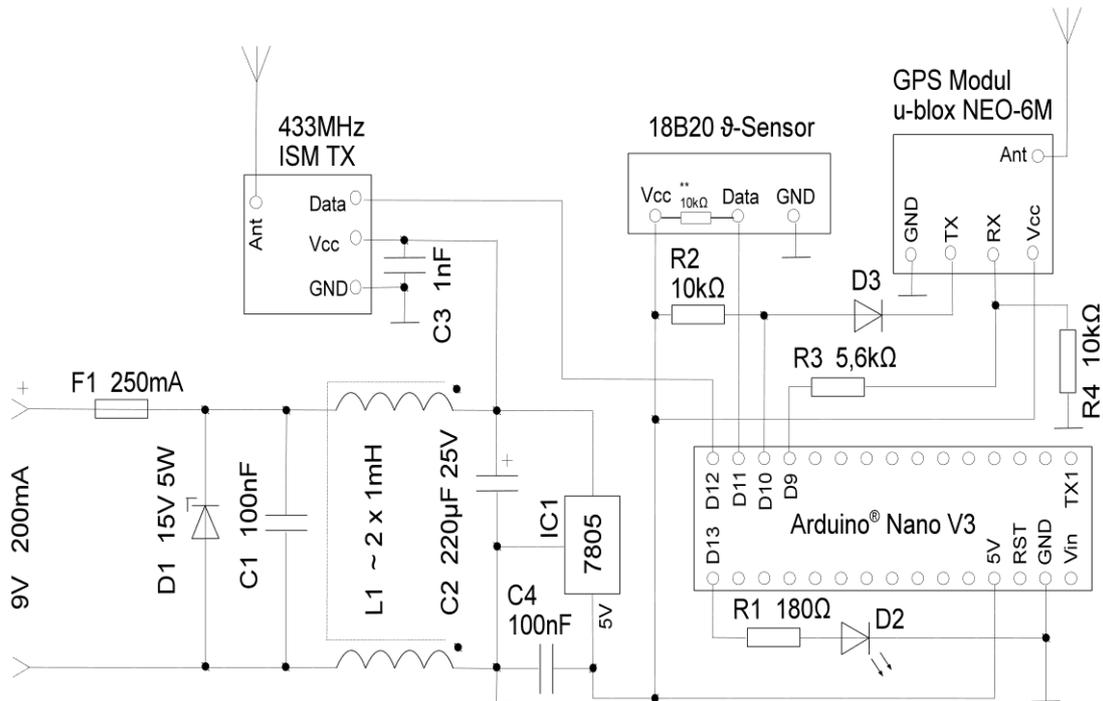
433MHz ISM transmitter (left) and receiver (right)



18B20 temp. Sensor



Arduino Nano clone



schematic of remote sensor unit (D3, R2, R3, R4 are for conversion from 5 to 3.3V; 18B20 requires 4.7...10k from Vcc to data / some modules already have that one onboard, some don't)

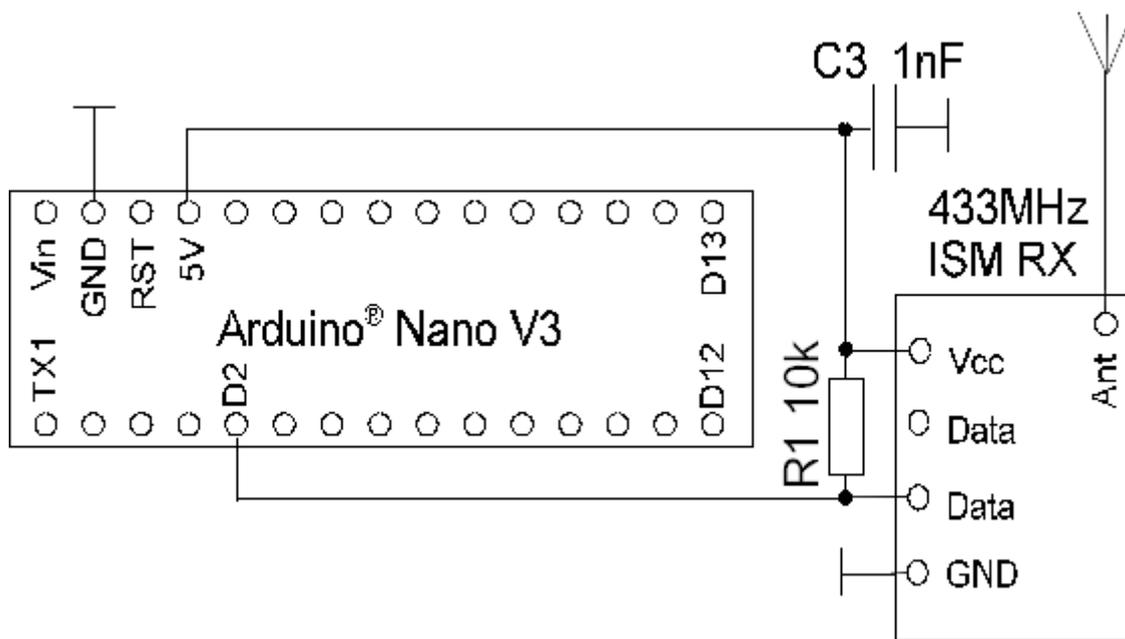
To check if the remote sensor unit is functioning properly,

- hook-up an 433MHz ISM-receiver unit to Pin 2 of an Arduino Uno or Nano (can be the one inside your WSPR-beacon if you've already built one); some units require a pullup resistor of about 10k to Vcc (+5V) → so better add one when in doubt
- load the Arduino with the sketch „GPS_beacon_receiver_demo.ino“
- keep the Arduino connected to the PC and open the terminal program (Tools -> Serial Monitor) at 9600 Baud.
- once the sensor unit has started transmitting, you should see a messages similar to the one below on your PC's screen

Received dataset with ID 0:
Latitude: 51 deg 4 min 12 sec N
Longitude: 13 deg 39 min 46 sec E
Altitude: 150 meter
Speed over ground: 0 km/h
Number of satellites in use: 10
Maidenhead locator: JO61TB
Temperature: 18.7 °C
UTC: 9:24:44
Date: 9/14/2017
Local time: 9:24:44
Date: 9/14/2017

Received dataset with ID 1:
Speed over ground: 0 km/h
Sunrise: 9/14 4:39 UTC
Sunset: 9/14 17:21 UTC
Moonrise: 9/13 21:50 UTC
Moonset: 9/14 13:52 UTC
Sun's position at 9/14 9:25:0 UTC
Azimuth in degree (N=0, E=90, S=180, W=270): 149.0
Altitude in degree: 38.1
Moon's position at 9/14 9:25:0 UTC
Azimuth in degree (N=0, E=90, S=180, W=270): 251.4
Altitude in degree: 38.1
The Moon's phase is 37.2% decreasing.

If you do not have a WSPR-beacon but still want to build and test the GPS-unit, you can make a little test setup like in the picture below and connect it to the PC via USB.



The Nano has plenty of ports and memory yet unutilized. So if you'd like to re-program the unit or add some functions, feel free to do so. All underlying libraries are available at my homepage (follow the „Arduino“ link).

Good luck!

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