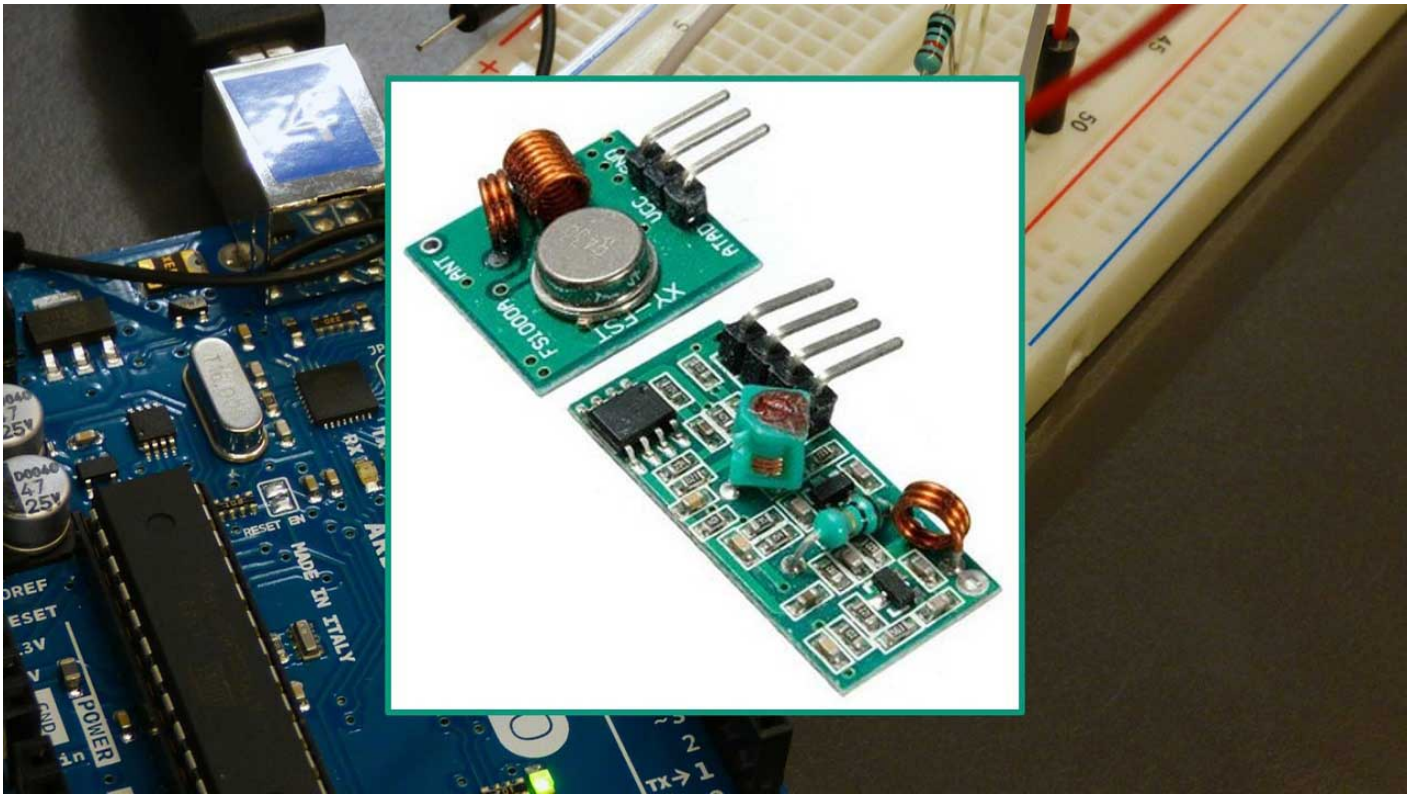
Complete Guide for RF 433MHz Transmitter/Receiver Module With Arduino

This post is a guide for the popular RF 433MHz Transmitter/Receiver modules with Arduino. We'll explain how they work and share an Arduino project example that you can apply to use in your own projects.



We have other tutorials about the 433MHz transmitter/receiver that you may found useful:

- Decode and Send 433 MHz RF Signals with Arduino
- ESP8266 Remote Controlled Sockets

Description

Throughout this tutorial we'll be using the FS1000A transmitter and corresponding receiver, but the instructions provided also work with other 433MHz transmitter/receiver modules that work in a similar fashion. These RF modules are very popular among the Arduino tinkerers and are used on a wide variety of applications that require wireless control.

These modules are very cheap and you can use them with any microcontroller, whether it's an Arduino, ESP8266, or ESP32.

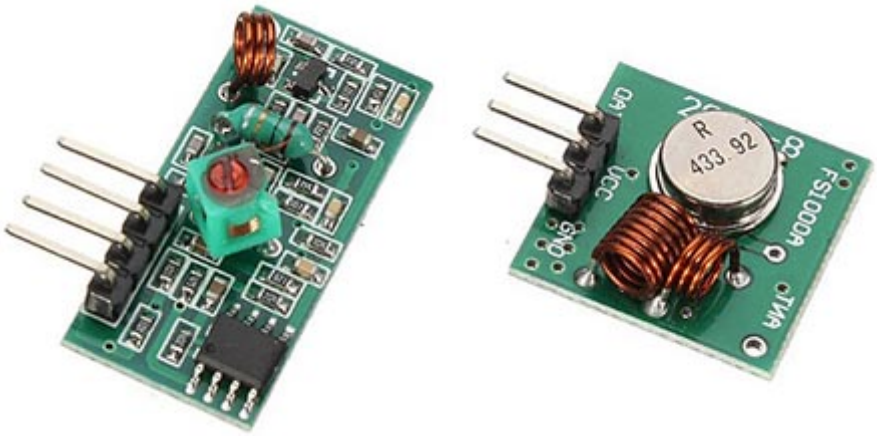
Specifications RF 433MHz Receiver

- Frequency Range: 433.92 MHz
- Modulation: ASK
- Input Voltage: 5V
- Price: $1 to $2

Specifications RF 433MHz Transmitter

- Frequency Range: 433.92MHz
- Input Voltage: 3-12V
- Price: $1 to $2

Where to buy?



You can purchase these modules for just a few dollars. Click here to compare the RF 433MHz transmitter/receiver on several stores and find the best price.

Arduino with RF 433MHz Transmitter/Receiver Modules

In this section, we'll build a simple example that sends a message from an Arduino to another Arduino board using 433 MHz. An Arduino board will be connected to a 433 MHz transmitter and will send the "Hello World!" message. The other Arduino board will be connected to a 433 MHz receiver to receive the messages.

Parts Required

You need the following components for this example:

- 2x Arduino – read Best Arduino Starter Kits
- RF 433MHz Receiver/Transmitter
- Breadboard
- Jumper wires

You can use the preceding links or go directly to MakerAdvisor.com/tools to find all the parts for your projects at the best price!

Installing the RadioHead Library

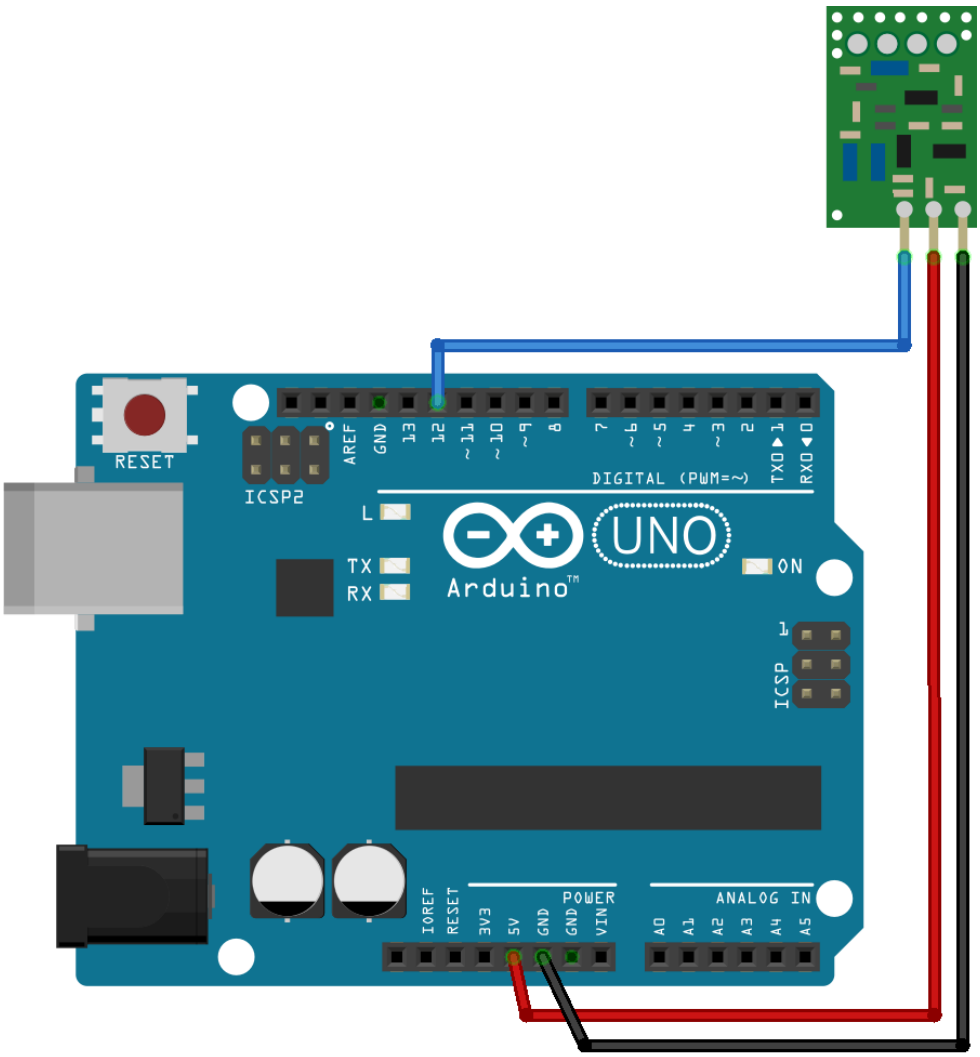
The RadioHead library provides an easy way to work with the 433 MHz transmitter/receiver with the Arduino. Follow the next steps to install that library in the Arduino IDE:

1. Click here to download the RadioHead library. You should have a .zip folder in your **Downloads** folder.
2. Unzip the **RadioHead** library.
3. Move the **RadioHead** library folder to the Arduino IDE installation **libraries** folder.
4. Restart your Arduino IDE

The RadioHead library is great and it works with almost all RF modules in the market. You can read more about the RadioHead library here.

Transmitter Circuit

Wire the transmitter module to the Arduino by following the next schematic diagram.



Important: always check the pinout for the transmitter module you're using. Usually, there are labels next to the pins. Alternatively, you can also take a look at your module's datasheet.

Transmitter Sketch

Upload the following code to the Arduino board that will act as a transmitter. This is based on one of the examples provided by the RadioHead library.

```
#include <RH_ASK.h>
#include <SPI.h> // Not actually used but needed to compile

RH_ASK driver;

void setup()
{
    Serial.begin(9600);    // Debugging only
    if (!driver.init())
```

```
        Serial.println("init failed");
}

void loop()
{
    const char *msg = "Hello World!";
    driver.send((uint8_t *)msg, strlen(msg));
    driver.waitPacketSent();
    delay(1000);
}
```

View raw code

How the transmitter sketch works

First, include the `RadioHead ASK` library.

```
#include <RH_ASK.h>
```

This library needs the SPI library to work. So, you also need to include the SPI library.

```
#include <SPI.h>
```

After that, create a `RH_ASK` object called `driver`.

In the `setup()`, initialize the `RH_ASK` object by using the `init()` method.

```
Serial.begin(9600); // Debugging only
if (!driver.init())
    Serial.println("init failed");
```

In the `loop()`, we write and send our message. The message is saved on the `msg` variable. Please note that **the message needs to be of type char**.

```
const char *msg = "Hello World!";
```

This message contains the “Hello World!” message, but you can send anything you want as long as it is in char format.

Finally, we send our message as follows:

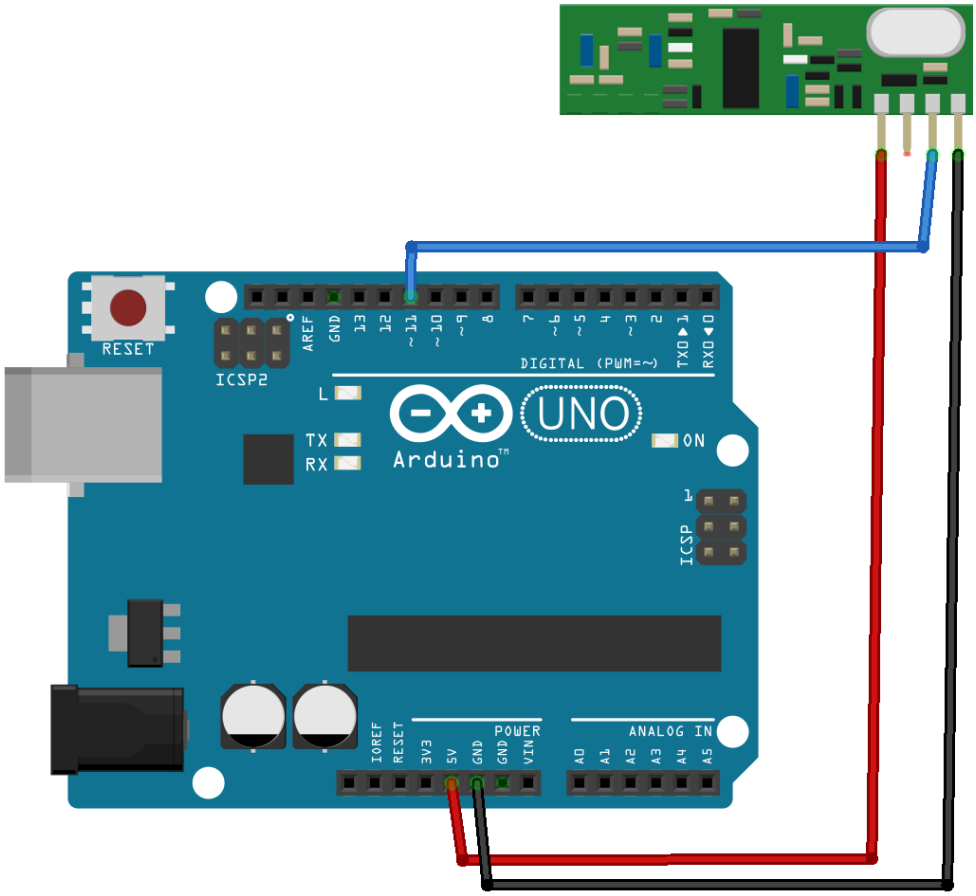
```
driver.send((uint8_t *)msg, strlen(msg));
driver.waitPacketSent();
```

The message is being sent every second, but you can adjust this delay time.

```
delay(1000);
```

Receiver Circuit

Wire the receiver module to another Arduino by following the next schematic diagram.



Important: always check the pinout for the transmitter module you're using. Usually, there are labels next to the pins. Alternatively, you can also take a look at your module's datasheet.

Receiver Sketch

Upload the code below to the Arduino connected to the receiver. This is based on one of the examples provided by the RadioHead library.

```
#include <RH_ASK.h>
#include <SPI.h> // Not actualy used but needed to compile

RH_ASK driver;

void setup()
{
    Serial.begin(9600); // Debugging only
    if (!driver.init())
         Serial.println("init failed");
}

void loop()
{
    uint8_t buf[12];
    uint8_t buflen = sizeof(buf);
    if (driver.recv(buf, &buflen)) // Non-blocking
    {
      int i;
      // Message with a good checksum received, dump it.
      Serial.print("Message: ");
      Serial.println((char*)buf);
    }
}
```

View raw code

How the receiver sketch works

Similarly to the previous sketch, you start by including the necessary libraries:

```
#include <RH_ASK.h>
#include <SPI.h>
```

You create a `RH_ASK` object called `driver`:

```
RH_ASK driver;
```

In the `setup()`, initialize the `RH_ASK` object.

```
void setup(){
    Serial.begin(9600); // Debugging only
    if (!driver.init())
    Serial.println("init failed");
}
```

In the `loop()`, we need to set a buffer that matches the size of the message we'll receive. "Hello World!" has 12 characters. You should adjust the buffer size accordingly to the message you'll receive (spaces and punctuation also count).

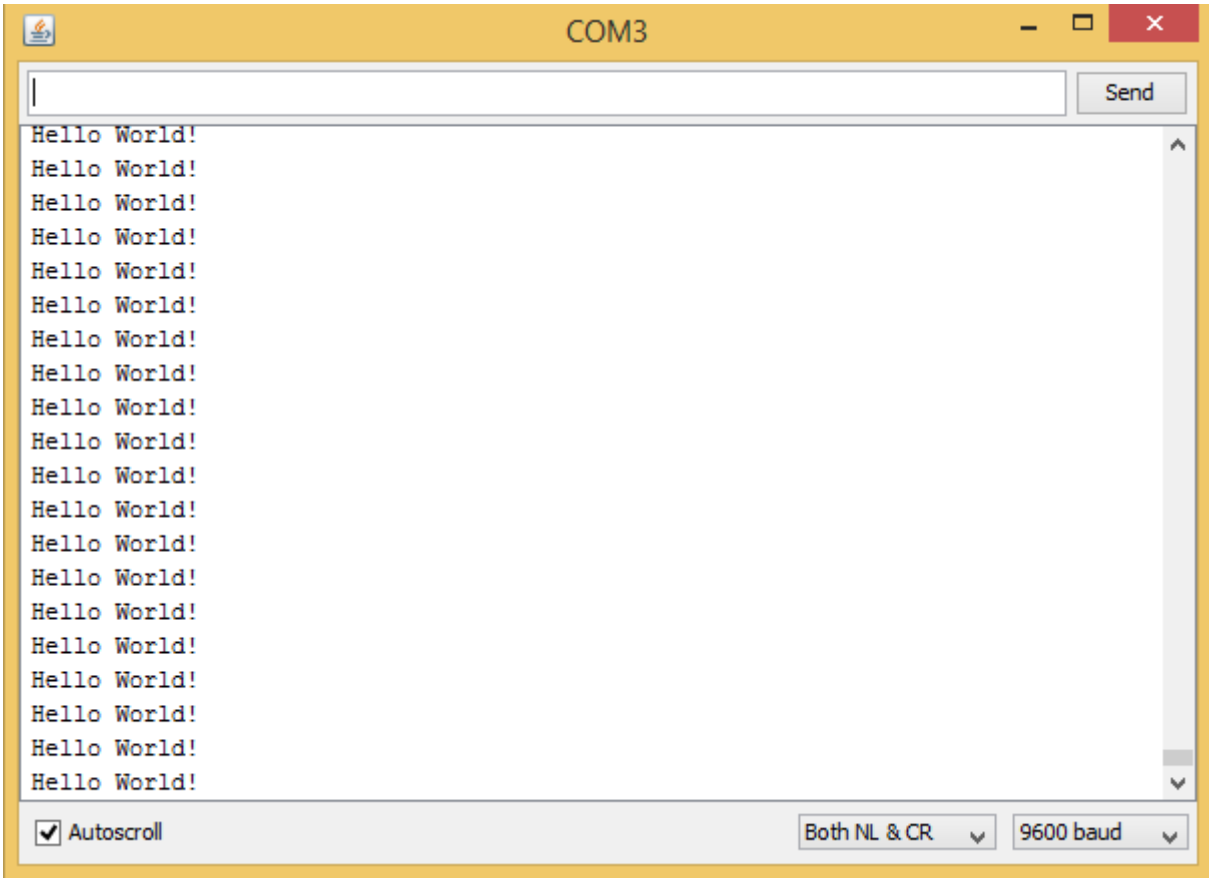
```
uint8_t buf[12];
uint8_t buflen = sizeof(buf);
```

Then, check if you've received a valid message. If you receive a valid message, print it in the serial monitor.

```
if (driver.recv(buf, &buflen)) {
    int i;
    // Message with a good checksum received, dump it.
    Serial.print("Message: ");
    Serial.println((char*)buf);
}
```

Demonstration

In this project the transmitter is sending a message "Hello World!" to the receiver via RF. Those messages are being displayed in receiver's serial monitor. The following figure shows what you should see in your Arduino IDE serial monitor.



Wrapping Up

You need to have some realistic expectations when using this module. They work very well when the receiver and transmitter are close to each other. If you separate them too far apart you'll lose the communication. The communication range will vary. It depends on how much voltage you're supplying to your transmitter module, RF noise in your environment, and if you're using an external antenna.

If you want to use 433 MHz remote controls to communicate with your Arduino, follow this tutorial: Decode and Send 433 MHz RF Signals with Arduino.

If you are an Arduino beginner, we recommend following our **Arduino Mini Course**. It will help you quickly getting started with this amazing board (and it is free!).

You may also like the following resources:

- Arduino Step-by-step Projects course
- Guide to SD card module with Arduino
- Guide to DHT11/DHT22 Humidity and Temperature Sensor with Arduino
- Guide to Ultrasonic Sensor with Arduino

You can find all our Arduino projects and tutorials here.

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