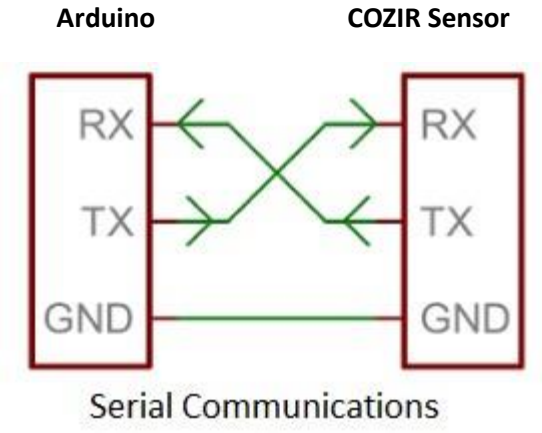
Application Note AN-128:
Arduino UART to Interface to COZIR Sensor

Introduction

The Arduino Uno, Mega 1280 or Mega 2560 are ideal microcontrollers for operating a COZIR sensor using an industry-standard UART TXD-RXD connection.

The example code contained in this app note utilizes Software.Serial, a library built into the Arduino software.

If you are new to Arduino, these low cost development boards are available from many sources. We recommend you start with authentic Arduino products.



Run the Blink Example

The best way to become familiar with the Arduino Graphical User's Interface (GUI) is to verify your Arduino board is operating properly. Create an Arduino project and run the example **Blink**. This simple test program confirms that a number of connection details and that the GUI are working properly.

Caution: Do not connect the Arduino board to the USB port until the Arduino software is installed. Otherwise Windows will install a generic driver and the Arduino will not operate.

Step 1: Install Arduino software on your computer. From this page select the **Windows Installer.** https://www.arduino.cc/en/Main/Software

Step 2: To run the Blink example follow these instructions: https://www.arduino.cc/en/Tutorial/Blink

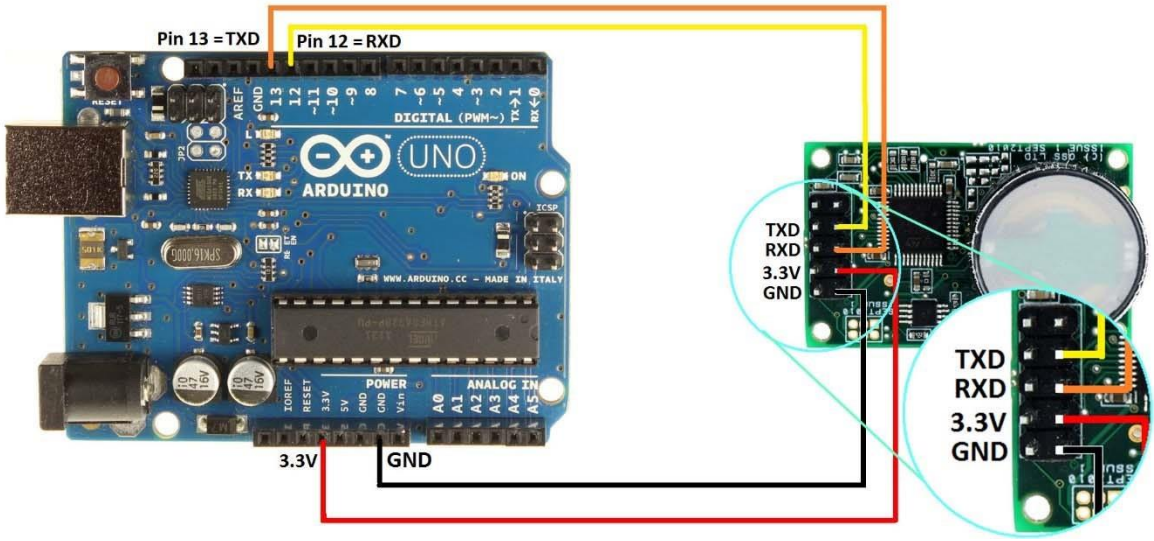
Note that the MEGA Arduinos have a LED on board. The Arduino UNO may require a LED and resistor be added as specified in the tutorial.

Once Blink runs properly, you can connect the COZIR sensor.

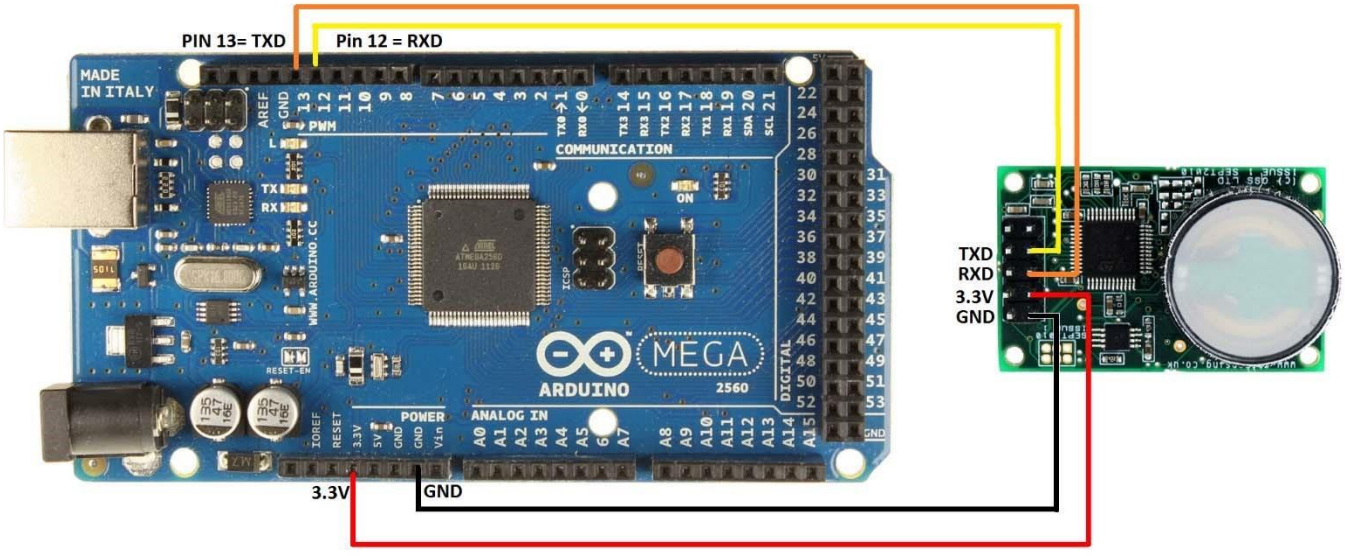
Connecting your Arduino

Refer to the wiring diagram below for the Arduino Uno or Arduino Mega 2560. The connections for Arduino MEGA are identical to the Mega 2560.

Arduino Uno to COZIR via Software.Serial UART



Arduino Mega or MEGA 2560 to COZIR via Software.Serial UART



Creating an Arduino Project

Example

This example uses the Software.Serial driver which is built into the Arduino software. This statement

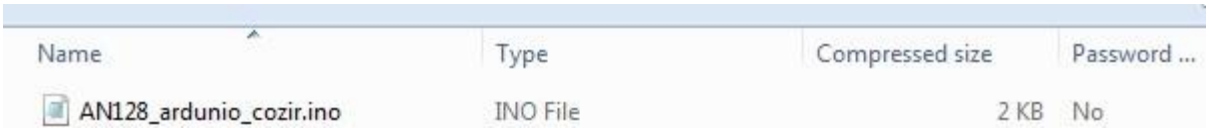
```
SoftwareSerial mySerial(12, 13); // RX, TX pins on Ardunio
```

Sets up a virtual serial port using pin 12 for Rx and pin 13 for Tx, both UNO and MEGA

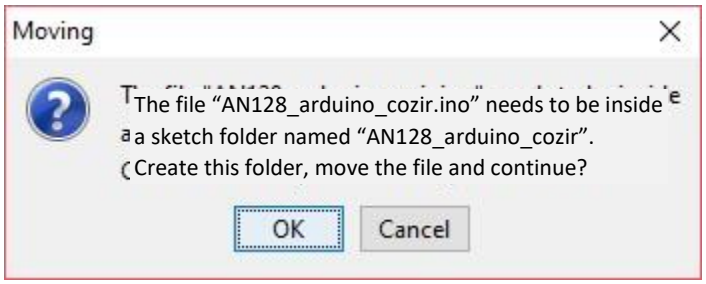
Demo file download instructions

1. Download the example code.

2. Save the example code to your hard drive. Inside the .zip file, navigate to the AN128_aduino_cozir.ino file in the example folder. Extract it from the .zip file.



3. Double-click the .ino file to open it in the Arduino GUI. It will start and ask the following:



4. Click on OK. Observe the Arduino project code is displayed.

5. Click on Sketch >> Verify/Compile. The project should compile without errors.

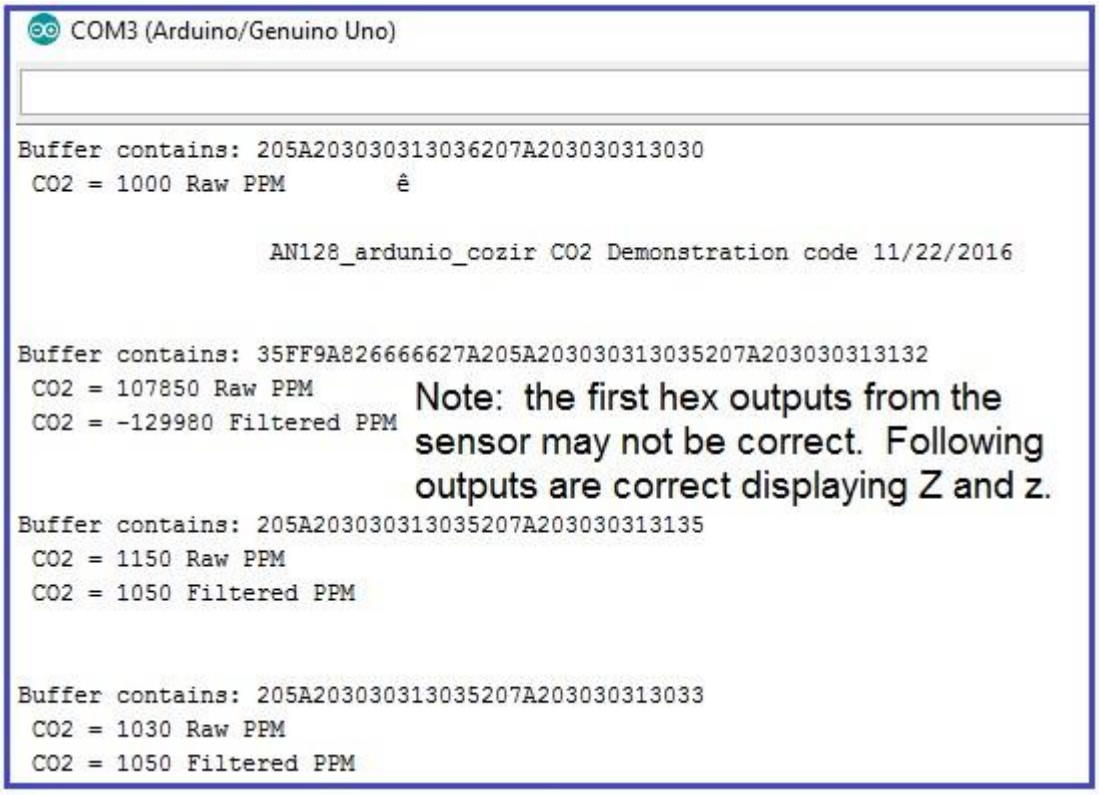
6. Verify that your Arduino board is recognized correctly:
    a. Click on Tools. Set Board to Arduino Uno or MEGA.
    b. Confirm that Processor matches your Arduino: Uno, MEGA or MEGA 2560.

7. Click on Upload. When done uploading, your project is now running in the Arduino board.

8. To view program operation, click on Tools >> Serial Monitor. Note that your COM number may differ from the COM port number shown here.

9. You should see the following:

Serial Monitor output



The easiest way to test the sensor is to blow on it and watch the CO2 level rise.

Appendix A: Sample code

```
/*
AN128_ardunio_cozir CO2 Demonstration code.
  Runs on Ardunio UNO, MEGA or MEGA2560
  Revised 11/29/17, 2/14/18 by John Houck

  This sketch connects a COZIR sensor and reports readings back to the host
computer over USB.
  The value is stored in a global variable 'co2' and can be used for any
number of applications.
      pin
connections:

  Arduino________COZIR Sensor
   GND ------------------ 1 (gnd)
   3.3v------------------- 3 (Vcc)
13 -------------------- 5 (Rx)
```

```
    12 -------------------- 7 (Tx)
*/
#include <SoftwareSerial.h>

SoftwareSerial mySerial(12, 13); // RX, TX pins on Ardunio
 int co2
=0;
double multiplier = 1;// 1 for 2% =20000 PPM, 10 for 20% = 200,000 PPM
uint8_t buffer[25]; uint8_t ind =0; uint8_t index =0;

int fill_buffer();  // function prototypes here int
format_output();

void setup() {
Serial.begin(9600);
  Serial.print("\n\n");
  Serial.println("             Ardunio to COZIR CO2 Sensor - Demonstration
code 2/14/18\n\n");
  mySerial.begin(9600); // Start serial communications with sensor
  //mySerial.println("K 0");  // Set Command mode
  mySerial.println("M 6"); // send Mode for Z and z outputs
  // "Z xxxxx z xxxxx" (CO2 filtered and unfiltered)

  mySerial.println("K 1");  // set streaming mode

}

void loop() {
  fill_buffer();  // function call that reacds CO2 sensor and fills buffer
    Serial.print("Buffer contains: ");
  for(int j=0; j<ind; j++)Serial.print(buffer[j],HEX);
index = 0;  format_output();
  Serial.print(" Raw PPM        ");

  index = 8;  // In ASCII buffer, filtered value is offset from raw by 8
bytes
  format_output();
  Serial.println(" Filtered PPM\n\n");
}
int fill_buffer(void){


// Fill buffer with sensor ascii data ind
= 0;
while(buffer[ind-1] != 0x0A){  // Read sensor and fill buffer up to 0XA = CR
if(mySerial.available()){     buffer[ind] = mySerial.read();     ind++;
```

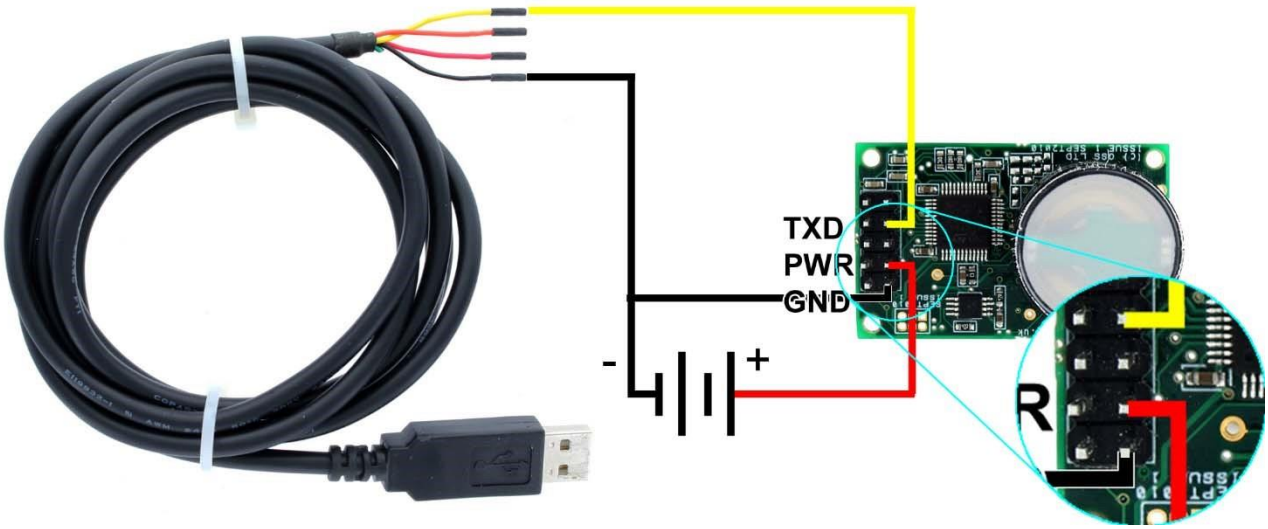
```
    }
  }
  // buffer() now filled with sensor ascii data
  // ind contains the number of characters loaded into buffer up to 0xA =
CR
  ind = ind -2; // decrement buffer to exactly match last numerical
character
  }
 int format_output(void){ // read buffer, extract 6 ASCII chars, convert to
PPM and print
   co2 = buffer[15-index]-0x30;   co2 =
co2+((buffer[14-index]-0x30)*10);   co2
+=(buffer[13-index]-0x30)*100;   co2
+=(buffer[12-index]-0x30)*1000;   co2
+=(buffer[11-index]-0x30)*10000;
  Serial.print("\n CO2 = ");
  Serial.print(co2*multiplier,0);
// Serial.print(" PPM,"); //
Serial.print("\n");
delay(200);
 }
```

Appendix B: Termite Output Monitor

Termite, a Simple RS-232 Terminal emulator, is very useful for observing, sending and receiving RS-232 serial ASCII data. The image below shows the connections which will display actual ASCII data coming from the COZIR. This ASCII data is also parsed by the Ardunio code described in this app note.

Important: The USB cable contains a FTDI interface converting RS-232 to USB. Be sure to use a FTDI compatible cable **Termite** is available from http://termie.sourceforge.net

USB FTDI Cable to COZIR Sensor



Sample Data

Output: