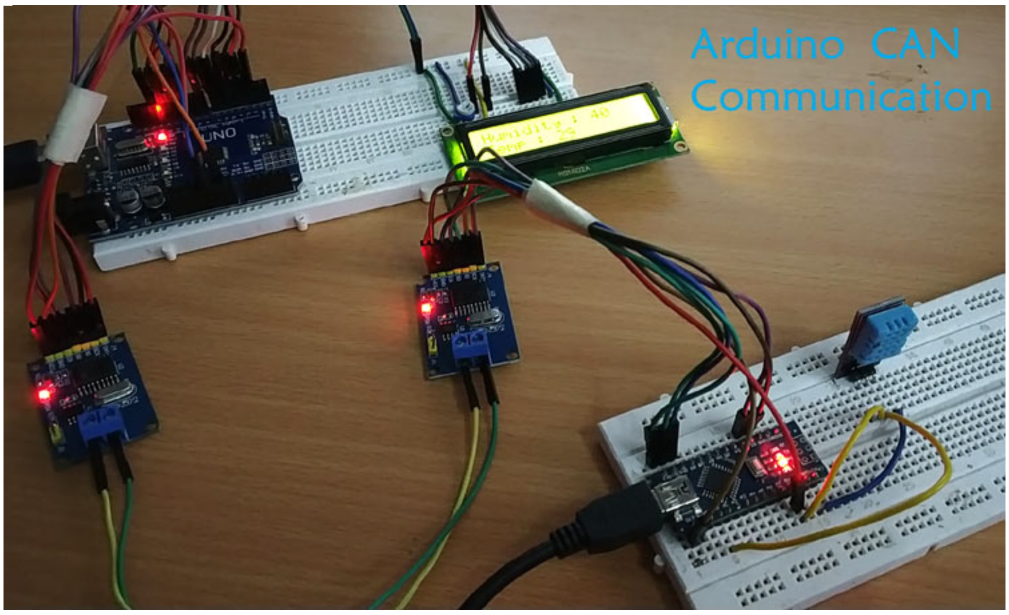
ARDUINO (HTTPS://CIRCUITDIGEST.COM/ARDUINO-PROJECTS)

Arduino CAN Tutorial - Interfacing MCP2515 CAN BUS Module with Arduino (/microcontroller-projects/arduino-can-tutorial-interfacing-mcp2515-can-bus-module-with-arduino)

By (page_author.html)**Pramoth Thangavel (/users/pramoth-thangavel)** Jul 16, 2019

0



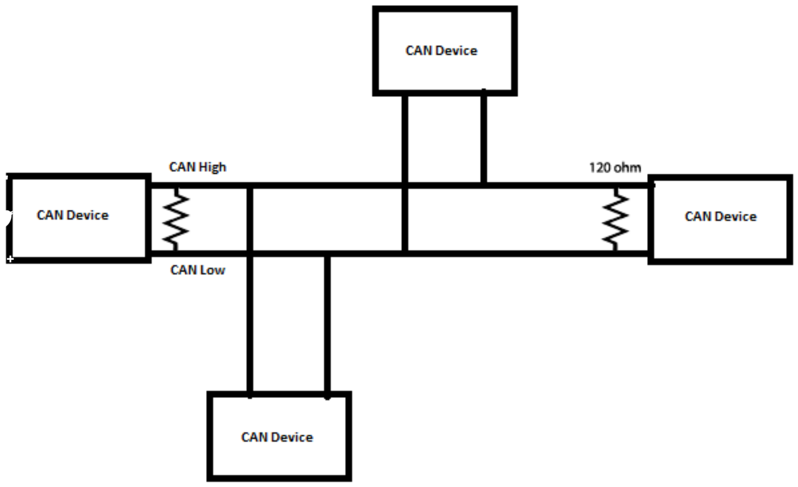
Arduino CAN Tutorial- Interfacing MCP2515 CAN BUS Module with Arduino

Today any average car consists of around 60 to 100 sensor units in it for sensing and exchanging information. With car manufactures constantly making their car more smarter with features like Autonomous driving, Airbag system, Tire Pressure monitoring, Cruise control system etc. this number is only expected to go high. Unlike other sensors, these sensors process critical information and hence the data from these sensors should be communicated using standard **automotive communication protocols**. For example, cruise control system data like speed, throttle position etc are vital values which is sent to **Electronic Control Unit (ECU)** to decide the acceleration level of the car, a miscommunication or loss of data here could lead to critical failures. Hence unlike standard communication protocols like UART, SPI (https://circuitdigest.com/microcontroller-projects/arduino-spi-communication-tutorial) or I2C (https://circuitdigest.com/microcontroller-projects/arduino-i2c-tutorial-communication-between-two-arduino), designers use much reliable automobile communication protocols like LIN, CAN, FlexRay etc.

Out of all the available protocols CAN is more predominantly used and popular. We have already discussed what is CAN and how CAN works (https://circuitdigest.com/forums/embedded/quick-intro-vehicle-control-protocols-can-flexray-lin-most-uds). So, in this article we will look into the basics again and then finally we will also **exchange data between two Arduinos using CAN communication**. Sounds interesting right! So, let's get started.

Introduction to CAN

CAN a.k.a **Controller Area Network** is a serial communication (https://circuitdigest.com/tutorial/serial-communication-protocols) bus designed for industrial and automotive applications. It is a message-based protocol used for communication between multiple devices. When multiple CAN devices are connected together like shown below, the connection forms a network acting like our central nervous system allowing any device to speak with any other device in the node.



A **CAN Network** will consist of only two wires **CAN High and CAN Low** for bi-directional data transmission as shown above. Typically the communication speed for CAN ranges from 50 Kbps to 1Mbps and the distance can range from 40 meters at 1Mbps to 1000 meters at 50kpbs.

ADICIONE A LINKEDIN INSIGHT TAG
ao seu site e descubra o perfil dos seus visitantes
LinkedIn

Format of CAN Message:

In the CAN communication the data is transmitted in the network as a particular message format. This message format contains of many segments but two main segments are the **identifier and data** which helps to send and respond to messages in CAN bus.

Identifier or CAN ID: The identifier is also known as a CAN ID or also known as PGN (Parameter Group Number). It is used to identify the CAN devices present in a CAN network. The length of the identifier is either 11 or 29 bits based on the type of CAN protocol used.

Standard CAN: 0-2047 (11-bit)

Extended CAN: 0-2^{29}-1 (29-bit)

Data: This is the actual sensor/control data that has to be send form one device to another. The size data can be anywhere from 0 to 8 bytes in length.

Data Length Code (DLC): 0 to 8 for the number of data bytes present.

Wires used in CAN:

CAN protocol consist of two wires namely **CAN_H and CAN_L** to send and receive information. Both the wires acts as a **differential line**, meaning t[illegible] CAN signal (0 or 1) is represented by the potential difference between CAN_L and CAN_H. If the difference is positive and larger than a certain minimum voltage then it is 1 and if the difference is negative it is a 0.

Normally a twisted pair cable is used for CAN communication. A single 120-ohm resistor is generally used at the two ends of the CAN network as shown in image, this is because the line needs to be balanced and tied to same potential.

Comparison of CAN over SPI & I2C

Since we have already learnt how to use SPI with Arduino (https://circuitdigest.com/microcontroller-projects/arduino-spi-communication-tutorial) and IIC with Arduino (https://circuitdigest.com/microcontroller-projects/arduino-i2c-tutorial-communication-between-two-arduino), let us compare the features of SPI and I2C with CAN

Parameter	SPI	I2C	CAN
Speed	3Mbps to 10Mbps	Standard: 100Kbps	10KBps to 1MBps Also depends upon length of wire used
		Fast: 400 Kbps	
		Highspeed:3.4Mbps	
Type	Synchronous	Synchronous	Asynchronous
Number of Wires	3+ (MISO, MOSI, SCK, SS1, SS2… SS(n))	2 wires (SDA, SCL)	2 wires (CAN_H, CAN_L)
Duplex	Full Duplex	Half Duplex	Half Duplex

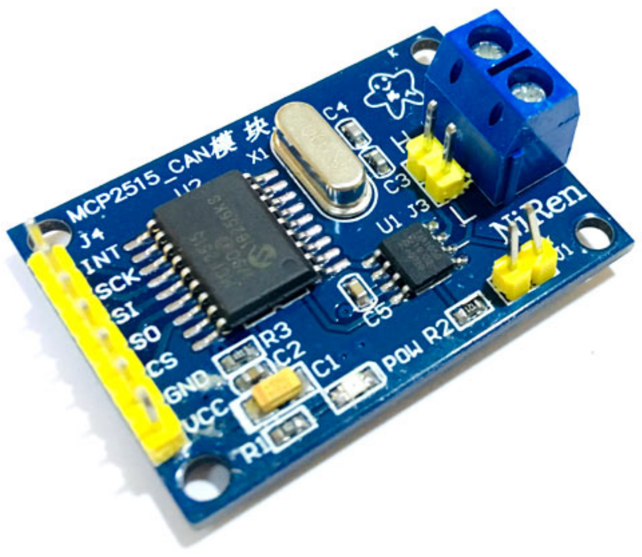
CAN Protocol Applications

1. Because of the robustness and reliability of CAN protocol, they are used in industries like Automotive, Industrial machines, Agriculture, Medical Equipment etc.
2. As wiring complexity is reduced in CAN they are mainly used in automotive applications like car.
3. Low cost to implement and also hardware components price is also less.
4. Easy to add and remove the CAN bus devices.

How to use CAN protocol in Arduino

As Arduino doesn't contain any inbuilt CAN port, a CAN module called **MCP2515** is used. This CAN module is interfaced with Arduino by using the SPI communication. Let's see about more about MCP2515 in detail and how it is interfaced with Arduino.

MCP2515 CAN Module:



MCP2515 Module has a CAN controller MCP2515 which is **high speed CAN transceiver**. The connection between MCP2515 and MCU is through SPI. So, it is easy to interface with any microcontroller having SPI interface.

For beginners who want to learn CAN Bus, this module will act as a good start. This CAN SPI board is ideal for industrial automation, home automation and other automotive embedded projects.

Features and Specification of MCP2515:

- Uses High-speed CAN transceiver TJA1050
- Dimension: 40×28mm
- SPI control for expand Multi CAN bus interface
- 8MHZ crystal oscillator
- 120Ω terminal resistance
- Has independent key, LED indicator, Power indicator
- Supports 1 Mb/s CAN operation
- Low current standby operation
- Up to 112 nodes can be connected

Pinout of MCP2515 CAN Module:

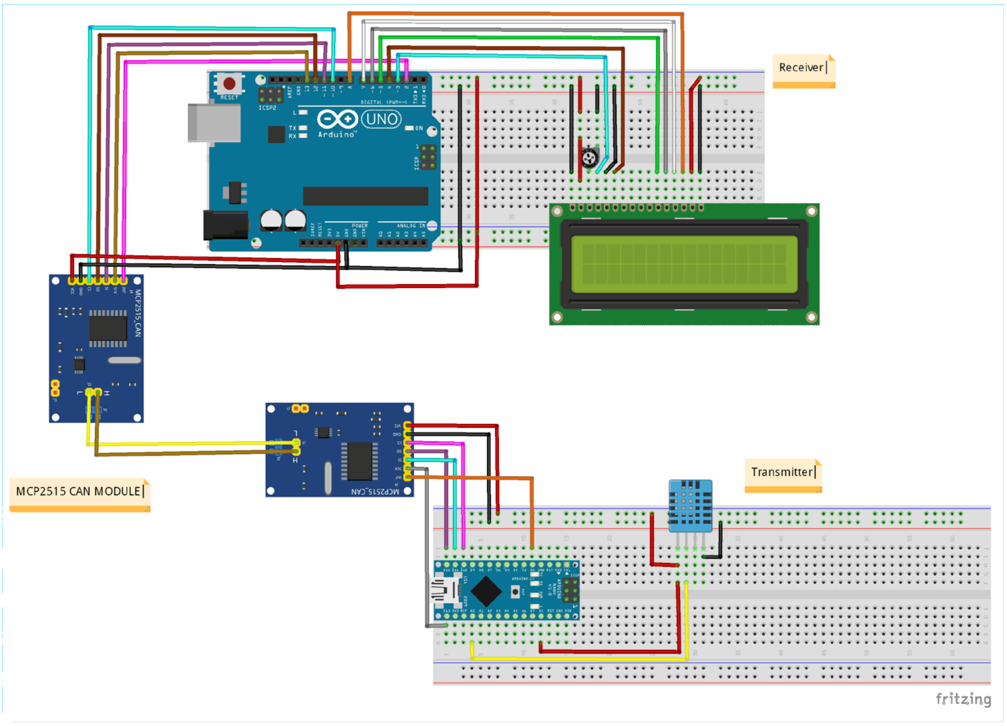
Pin Name	**USE**
VCC	5V Power input pin
GND	Ground pin
CS	SPI SLAVE select pin (Active low)
SO	SPI master input slave output lead
SI	SPI master output slave input lead
SCLK	SPI Clock pin
INT	MCP2515 interrupt pin

In this tutorial let's see how to **send humidity & temperature (DHT11) sensor data from Arduino Nano to Arduino Uno via CAN** bus module MCP2515.

Components Required

- Arduino UNO
- Arduino NANO
- DHT11
- 16x2 LCD Display
- MCP2515 CAN Module – 2
- 10k Potentiometer
- Breadboard
- Connecting Wires

Circuit Diagram



(/fullimage?i=circuitdiagram_mic/Circuit-Diagram-for-Interfacing-MCP2515-CAN-BUS-Module-with-Arduino.png)

Connection on CAN Transmitter side:

Component - Pin	Arduino Nano
MPC2515 - VCC	+5V
MPC2515 - GND	GND
MPC2515 - CS	D10 (SPI_SS)
MPC2515 - SO	D12 (SPI_MISO)
MPC2515 - S I	D11 (SPI_MOSI)
MPC2515 - SCK	D13 (SPI_SCK)
MPC2515 - INT	D2
DHT11 - VCC	+5V
DHT11 - GND	GND
DHT11 - OUT	A0

Circuit Connections at CAN Receiver side:

Component - Pin	Arduino UNO

MPC2515 - VCC	+5V
MPC2515 - GND	GND
MPC2515 - CS	10 (SPI_SS)
MPC2515 - SO	12 (SPI_MISO)
MPC2515 - SI	11 (SPI_MOSI)
MPC2515 - SCK	13 (SPI_SCK)
MPC2515 - INT	2
LCD - VSS	GND
LCD - VDD	+5V
LCD - V0	To 10K Potentiometer Centre PIN
LCD - RS	3
LCD - RW	GND
LCD - E	4
LCD - D4	5
LCD - D5	6
LCD - D6	7
LCD - D7	8
LCD - A	+5V
LCD - K	GND

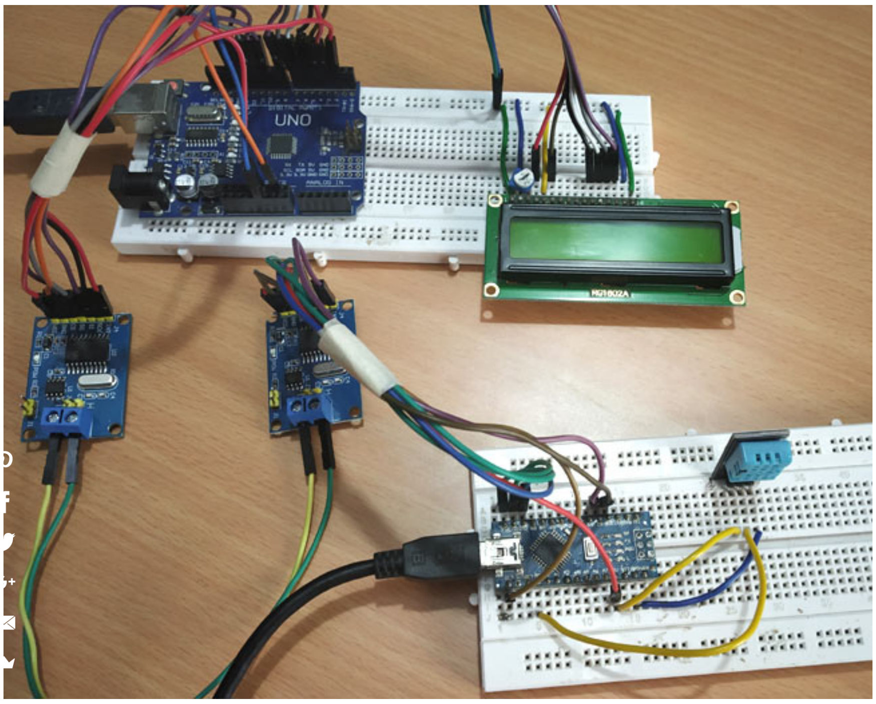
Connection between two MCP2515 CAN modules

H – CAN High

L – CAN Low

MCP2515 (Arduino Nano)	**MCP2515 (Arduino UNO)**
H	**H**
L	**L**

Once all the connections were made, my hardware looked like this below



Programming Arduino for CAN communication

First we have to install a library for CAN in Arduino IDE. Interfacing MCP2515 CAN Module with the Arduino becomes easier by using the following library.

1. Download the ZIP file of Arduino CAN MCP2515 Library (https://github.com/autowp/arduino-mcp2515/archive/master.zip).
2. From the Arduino IDE: Sketch -> Include Library -> Add .ZIP Library

In this tutorial coding is divided into two parts one as **CAN transmitter code** (Arduino Nano) and other as **CAN Receiver code** (Arduino UNO) both of which can be found at the bottom of this page. The explanation for the same is as follows.

Before writing program for sending and receiving data make sure you have installed the library following the above steps and the CAN module MCP2515 is initialized in your program as following.

Initialize MCP2515 CAN Module:

In order to create connection with MCP2515 follow the steps:

1. Set the pin number where SPI CS is connected (10 by default)

```
MCP2515 mcp2515(10);
```

2. Set baud rate and oscillator frequency

```
mcp2515.setBitrate(CAN_125KBPS, MCP_8MHZ);
```

Available Baud Rates:

CAN_5KBPS, CAN_10KBPS, CAN_20KBPS, CAN_31K25BPS, CAN_33KBPS, CAN_40KBPS, CAN_50KBPS, CAN_80KBPS, CAN_83K3BPS, CAN_95KBPS, CAN_100KBPS, CAN_125KBPS, CAN_200KBPS, CAN_250KBPS, CAN_500KBPS, CAN_1000KBPS.

Available Clock Speeds:

MCP_20MHZ, MCP_16MHZ, MCP_8MHZ

3. Set modes.

```
mcp2515.setNormalMode();
mcp2515.setLoopbackMode();
mcp2515.setListenOnlyMode();
```

CAN Transmitter Side Code Explanation (Arduino Nano)

In the transmitter section, Arduino Nano interfaced with the MCP2515 CAN module through SPI pins and **DHT11 sends Temperature and Humidity data** to CAN bus.

First the required libraries are included, SPI Library for using SPI Communication, MCP2515 Library for using CAN Communication and DHT Library for using DHT sensor with Arduino**.** We previously interfaced DHT11 with Arduino (https://circuitdigest.com/microcontroller-projects/arduino-humidity-measurement).

```
#include <SPI.h>
#include <mcp2515.h>
#include <DHT.h>
```

Now the pin name of DHT11 (OUT pin) that is connected with the A0 of Arduino Nano is defined

```
#define DHTPIN A0
```

And also, the *DHTTYPE* is defined as DHT11.

```
#define DHTTYPE DHT11
```

A *canMsg* struct data type for storing CAN message format.

```
struct can_frame canMsg;
```

Set the pin number where SPI CS is connected (10 by default)

```
MCP2515 mcp2515(10);
```

And also, object dht for class DHT with DHT pin with Arduino Nano and DHT type as DHT11 is initialized.

```
DHT dht(DHTPIN, DHTTYPE);
```

Next in void setup():

Begin the SPI communication by using following statement

```
SPI.begin();
```

And then use below statement to begin to receive Temperature and humidity values from DHT11 sensor.

```
dht.begin();
```

Next the MCP2515 is being RESET using the following command

```
mcp2515.reset();
```

Now the MCP2515 is **set speed** of 500KBPS and 8MHZ as clock

```
mcp2515.setBitrate(CAN_500KBPS,MCP_8MHZ);
```

And the MCP2525 is set at normal mode

```
mcp2515.setNormalMode();
```

In the void loop():

The following statement gets the Humidity and Temperature value and stores in an integer variable h and t.

```
 int h = dht.readHumidity();
 int t = dht.readTemperature();
```

Next the CAN ID is given as 0x036 (As per choice) and DLC as 8 and we give the h and t data to the *data[0]* and *data[1]* and rest all data with 0.

```
canMsg.can_id  = 0x036;
canMsg.can_dlc = 8;
canMsg.data[0] = h;       //Update humidity value in [0]
canMsg.data[1] = t;   //Update temperature value in [1]
canMsg.data[2] = 0x00;            //Rest all with 0
canMsg.data[3] = 0x00;
canMsg.data[4] = 0x00;
canMsg.data[5] = 0x00;
canMsg.data[6] = 0x00;
canMsg.data[7] = 0x00;
```

After all, to **send the message to CAN BUS** we use the following statement.

```
  mcp2515.sendMessage(&canMsg);
```

So now the temperature and humidity data are sent as message to CAN bus.

CAN Receiver Side Code Explanation (Arduino UNO)

In the receiver section, Arduino UNO interfaced with the MCP2515 and 16x2 LCD display (https://circuitdigest.com/article/16x2-lcd-display-module-pinout-datasheet). Here the Arduino UNO receives the Temperature and Humidity from CAN bus and display the data received in LCD.

First the required libraries are included, SPI Library for using SPI Communication, MCP2515 Library for using CAN Communication and LiquidCrsytal Library for using 16x2 LCD with Arduino.

```
#include <SPI.h
#include <mcp2515.h>
#include <LiquidCrystal.h>
```

Next the LCD pins that are used in connecting with the Arduino UNO are defined.

```
const int rs = 3, en = 4, d4 = 5, d5 = 6, d6 = 7, d7 = 8;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
```

A *struct* data type is declared for storing **CAN message format**.

```
struct can_frame canMsg;
```

Set the pin number where SPI CS is connected (10 by default)

```
MCP2515 mcp2515(10);
```

In void setup ():

First the LCD is set at 16x2 mode and a welcome message is displayed.

```
  lcd.begin(16,2);
 lcd.setCursor(0,0);
  lcd.print("CIRCUIT DIGEST");
  lcd.setCursor(0,1);
  lcd.print("CAN ARDUINO");
  delay(3000);
  lcd.clear();
```

Begin the SPI communication by using following statement.

```
 SPI.begin();
```

Next the MCP2515 is being RESET using the following command.

```
mcp2515.reset();
```

Now the MCP2515 is set speed of 500KBPS and 8MHZ as clock.

```
mcp2515.setBitrate(CAN_500KBPS,MCP_8MHZ);
```

And the MCP2525 is set at normal mode.

```
mcp2515.setNormalMode();
```

Next in void loop():

The following statement is used to receive the message from the CAN bus. If message is received it gets into the *if* condition.

```
if (mcp2515.readMessage(&canMsg) == MCP2515::ERROR_OK)
```

In the *if* condition the data is received and stored in *canMsg*, the data [0] that has humidity value and data [1] that has temperature value. Both values are stored in an integer x and y.

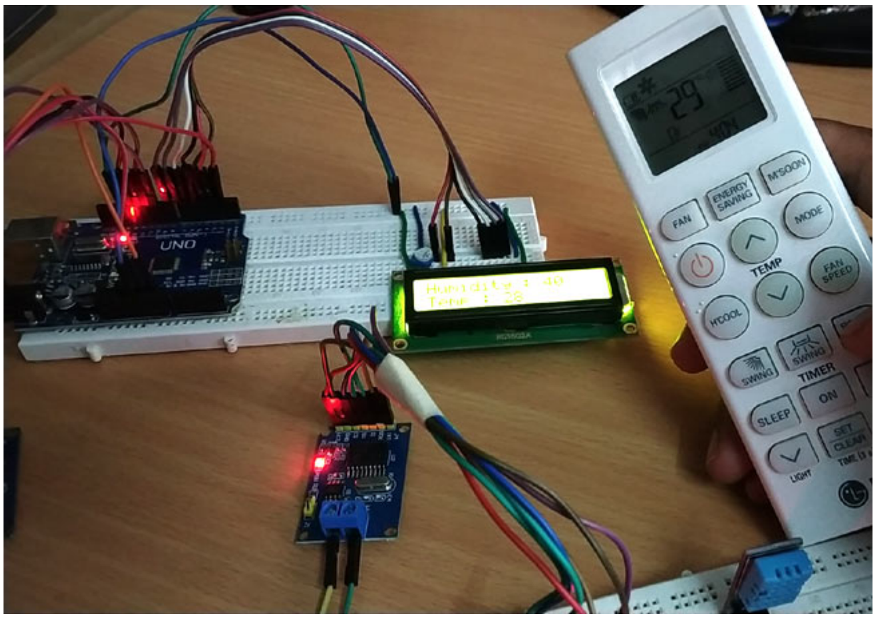
```
     int x = canMsg.data[0];
     int y = canMsg.data[1];
```

After receiving the values, the temperature and humidity values are displayed in 16x2 LCD display using following statement.

```
 lcd.setCursor(0,0);
 lcd.print("Humidity : ");
 lcd.print(x);
 lcd.setCursor(0,1);
      lcd.print("Temp : ");
      lcd.print(y);
      delay(1000);
      lcd.clear();
```

Working of CAN communication in Arduino

Once the hardware is ready upload the program for CAN transmitter and CAN receiver (complete programs are given below) in the respective Arduino boards. When powered you should notice the temperature value read by DHT11 will be sent to another Arduino through CAN communication and displayed on the LCD of the 2nd Arduino as you can see in the below image. I have also used my AC remote to check if the temperature displayed on the LCD is close to actual room temperature.



The complete working can be found at the video linked below. If you have any questions leave them in the comment section or use our forums (https://circuitdigest.com/forums) for other technical questions.

Code

CAN Transmitter Code (Arduino Nano):

```
#include <SPI.h>          //Library for using SPI Communication

#include <mcp2515.h>      //Library for using CAN Communication

#include <DHT.h>          //Library for using DHT sensor
```

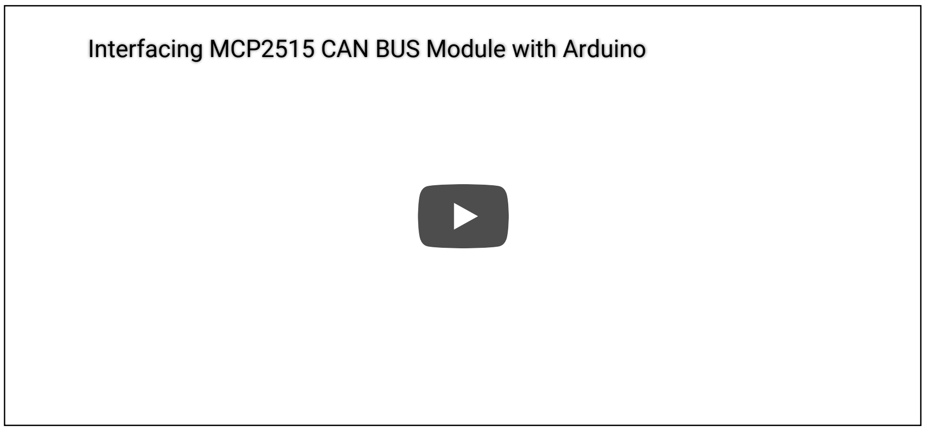
```
#define DHTPIN A0
#define DHTTYPE DHT11

struct can_frame canMsg;
MCP2515 mcp2515(10);

DHT dht(DHTPIN, DHTTYPE);     //initilize object dht for class DHT with DHT pin with STM32 and DHT type as DHT11

void setup()
{
  while (!Serial);
  Serial.begin(9600);


  SPI.begin();              //Begins SPI communication
  dht.begin();              //Begins to read temperature & humidity sesnor value


  mcp2515.reset();
  mcp2515.setBitrate(CAN_500KBPS,MCP_8MHZ); //Sets CAN at speed 500KBPS and Clock 8MHz
  mcp2515.setNormalMode();
}

void loop()
{
  int h = dht.readHumidity();       //Gets Humidity value
  int t = dht.readTemperature();    //Gets Temperature value

  canMsg.can_id  = 0x036;           //CAN id as 0x036
  canMsg.can_dlc = 8;               //CAN data length as 8
  canMsg.data[0] = h;               //Update humidity value in [0]
  canMsg.data[1] = t;               //Update temperature value in [1]
  canMsg.data[2] = 0x00;            //Rest all with 0
  canMsg.data[3] = 0x00;
  canMsg.data[4] = 0x00;
  canMsg.data[5] = 0x00;
  canMsg.data[6] = 0x00;
  canMsg.data[7] = 0x00;
  mcp2515.sendMessage(&canMsg);     //Sends the CAN message
  delay(1000);
}
```

CAN Receiver Code (Arduino UNO):

```
#include <SPI.h>              //Library for using SPI Communication
#include <mcp2515.h>          //Library for using CAN Communication
#include <LiquidCrystal.h>    //Library for using LCD display

const int rs = 3, en = 4, d4 = 5, d5 = 6, d6 = 7, d7 = 8;

LiquidCrystal lcd(rs, en, d4, d5, d6, d7);  //Define LCD display pins RS,E,D4,D5,D6,D7

struct can_frame canMsg;
MCP2515 mcp2515(10);                // SPI CS Pin 10


void setup() {
  lcd.begin(16,2);                  //Sets LCD as 16x2 type
  lcd.setCursor(0,0);               //Display Welcome Message
  lcd.print("CIRCUIT DIGEST");
  lcd.setCursor(0,1);
  lcd.print("CAN ARDUINO");
  delay(3000);
```

```
 lcd.clear();

 SPI.begin();                //Begins SPI communication

 Serial.begin(9600);         //Begins Serial Communication at 9600 baudrate

 mcp2515.reset();
 mcp2515.setBitrate(CAN_500KBPS,MCP_8MHZ); //Sets CAN at speed 500KBPS and Clock 8MHz
 mcp2515.setNormalMode();              //Sets CAN at normal mode
}

void loop()
{
 if (mcp2515.readMessage(&canMsg) == MCP2515::ERROR_OK) // To receive data (Poll Read)
 {
    int x = canMsg.data[0];
    int y = canMsg.data[1];

     lcd.setCursor(0,0);        //Display Temp & Humidity value received at 16x2 LCD
     lcd.print("Humidity : ");
     lcd.print(x);
     lcd.setCursor(0,1);
     lcd.print("Temp : ");
     lcd.print(y);
     delay(1000);
     lcd.clear();
   }
}
```

Video



TAGS ARDUINO (/TAGS/ARDUINO) ARDUINO UNO (/TAGS/ARDUINO-UNO) CAN PROTOCOL (/TAGS/CAN-PROTOCOL) ARDUINO NANO (/TAGS/ARDUINO-NANO) 16X2 LCD (/TAGS/16X2-LCD) DHT11 (/TAGS/DHT11) SERIAL COMMUNICATION (/TAGS/SERIAL-COMMUNICATION)

RECOMMENDED POSTS

(http://bit.ly/2qhkOds)

IoT Device Security Conference 2020 (http://bit.ly/2qhkOds)

(http://bit.ly/2NLAL4l)

Proactive Ecosystem Collaboration for Autonomous Driving Systems (http://bit.ly/2NLAL4l)

(http://bit.ly/37efx6G)

The Current State of Machine Vision Technology (http://bit.ly/37efx6G)

(http://bit.ly/3arbcz6)

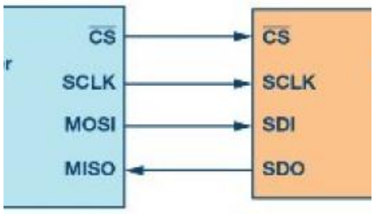
The Buffer/Driver: What Is It, and Do I Need One? (http://bit.ly/3arbcz6)

(http://bit.ly/2THbcFm)

Embedded Insiders: Recapping the 2020 Consumer Electronics Show (http://bit.ly/2THbcFm)

(http://bit.ly/30G58OA)

Dealing with Legacy in Industrial IoT (http://bit.ly/30G58OA)



(http://bit.ly/36iL2vl)

Introduction to the SPI Interface (http://bit.ly/36iL2vl)

(http://bit.ly/3aIFQEt)

Dev Kit Weekly: Renesas EK-RA6M3G Graphics Evaluation Kit (http://bit.ly/3aIFQEt)

Get Our Weekly Newsletter!

Subscribe below to receive most popular news, articles and DIY projects from Circuit Digest

Email Address*

Name

Country

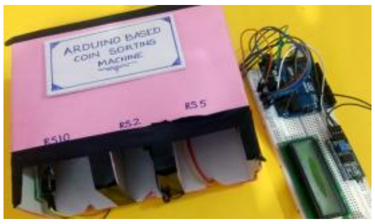
United States of America ▾

Subscribe

RELATED CONTENT

(/microcontroller-projects/digital-keypad-security-door-lock-using-arduino)

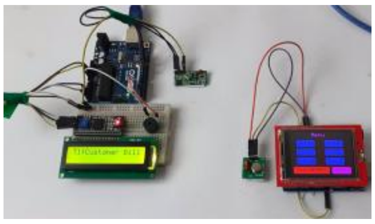
Digital Keypad Security Door Lock using Arduino (/microcontroller-projects/digital-keypad-security-door-lock-using-arduino)

 (/microcontroller-projects/arduino-coin-sorter-and-counter)

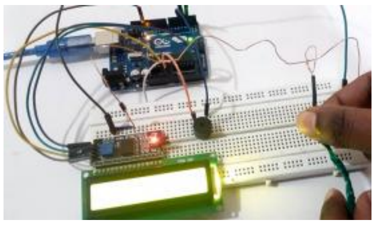
Coin Sorting Machine using Arduino (/microcontroller-projects/arduino-coin-sorter-and-counter)

(/microcontroller-projects/adustable-electronic-dc-load-using-arduino)

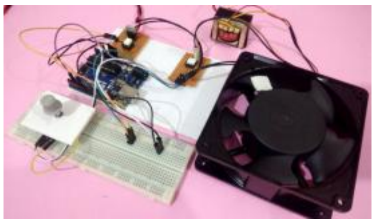
Build your own Adjustable Electronic DC Load using Arduino (/microcontroller-projects/adustable-electronic-dc-load-using-arduino)

 (/microcontroller-projects/arduino-smart-restaurant-menu-ordering-menu-ordering-system)

Smart Restaurant Menu Ordering System using Arduino (/microcontroller-projects/arduino-smart-restaurant-menu-ordering-menu-ordering-system)

 (/microcontroller-proejcts/arduino-buzz-wire-game)

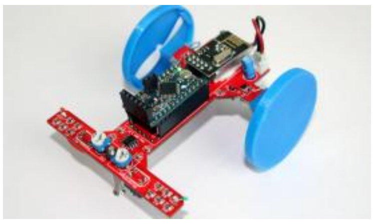
Make a Buzz Wire Game with an Arduino (/microcontroller-proejcts/arduino-buzz-wire-game)

 (/microcontroller-projects/ac-fan-speed-control-using-arduino-and-triac)

AC Fan Speed Control using Arduino and TRIAC (/microcontroller-projects/ac-fan-speed-control-using-arduino-and-triac)

(/microcontroller-projects/arduino-walkie-talkie-using-nrf24l01)

Long Range Arduino Based Walkie Talkie using nRF24L01 (/microcontroller-projects/arduino-walkie-talkie-using-nrf24l01)


(/microcontroller-projects/arduino-rc-car-using-bldc-motors-and-nrf24l01-rf-module)

Fastest Arduino RC Car using Coreless DC Motors and nRF24L01 RF module (/microcontroller-projects/arduino-rc-car-using-bldc-motors-and-nrf24l01-rf-module)

< PREVIOUS POST

IoT based Smart Irrigation System using Soil Moisture Sensor and ESP8266 NodeMCU (https://circuitdigest.com/microcontroller-projects/iot-based-smart-irrigation-system-using-esp8266-and-soil-moisture-sensor)

NEXT POST >

Interfacing HC-05 Bluetooth Module with MSP430 Launchpad to control an LED (https://circuitdigest.com/microcontroller-projects/interfacing-hc-05-bluetooth-module-with-msp430-launchpad-to-control-an-led)

COMMENTS

LOG IN (/USER/LOGIN?DESTINATION=NODE/3881%23COMMENT-FORM) OR REGISTER (/USER/REGISTER?DESTINATION=NODE/3881%23COMMENT-FORM) TO POST COMMENT

MOUSER ELECTRONICS FEATURED PRODUCTS FROM MOUSER

(http://bit.ly/2PuO9KS)

293 High-Precision Current Sense Amplifiers (http://bit.ly/2PuO9KS)

: voltage drops across shunt resistors from -4V to 110V.

(http://bit.ly/3aeOQ2K)

7A24 Low-Dropout Linear Voltage Regulator (http://bit.ly/3aeOQ2K)

s a 2.4V to 18V input voltage range with ultra-low quiescent current (IQ).

(http://bit.ly/2T78x7e)

onic SVPT Conductive Polymer Aluminum Solid Capacitors (http://bit.ly/2T78x7e)

low ESR range from 15–24mΩ and cover a capacitance range of 100µF to 5600µF.

(http://bit.ly/2Tg70dC)

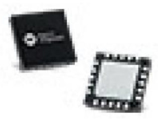
miconductor NxHL080N120SC1 N-Ch SiC MOSFETs (http://bit.ly/2Tg70dC)

30mΩ MOSFETs that provide superior switching performance and high reliability.

(http://bit.ly/3acX9MA)

ıip VC-801 CMOS Crystal Oscillators (XO) (http://bit.ly/3acX9MA)

ːabilized square wave generator with a CMOS output.


(http://bit.ly/2wUVgpE)

634x Synchronous Step-Down DC-DC Converter (http://bit.ly/2wUVgpE)

vith integrated MOSFETs and operates over an input-voltage range of 4.5V to 36V.

(http://bit.ly/32xaTiC)

ʻaft 1812CAN Common Mode Choke Inductors (http://bit.ly/32xaTiC)

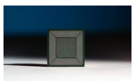
ıed for CAN or CAN FD in automotive or general industrial automation applications.

(http://bit.ly/2PxuOJ5)

ı Devices ADPD188BI Integrated Optical Module (http://bit.ly/2PxuOJ5)

te photometric systems for smoke detection using optical dual-wavelength technology.

NEWS ARTICLES PROJECTS


(/news/neuromorphic-chip-from-intel-can-mimic-components-brain-cells-to-identify-hazardous-chemicals)

Neuromorphic Chip from Intel Can Mimic Components Of Brain Cells to Identify Hazardous Chemicals (/news/neuromorphic-chip-from-intel-can-mimic-components-brain-cells-to-identify-hazardous-chemicals)

(/news/multi-channel-cdp-07m-narrow-band-industrial-transmitter-and-receiver-pair-high-stability-long-range-applications)

Multi-Channel CDP-07M Narrow-Band Industrial Transmitter and Receiver Pair For High Stability Long Range Applications (/news/multi-channel-cdp-07m-narrow-band-industrial-transmitter-and-receiver-pair-high-stability-long-range-applications)

(/news/smart-gateway-platform-for-automotive-gateway-and-domain-controller-ecu-applications)

Smart Gateway Platform for Automotive Gateway and Domain Controller ECU Applications (/news/smart-gateway-platform-for-automotive-gateway-and-domain-controller-ecu-applications)

(/news/metal-composite-power-inductors-for-automotive-applications)

Metal Composite Power Inductors for Automotive Applications (/news/metal-composite-power-inductors-for-automotive-applications)

(/news/inn3x78c-new-family-of-offline-cvcc-flyback-converter-ics)

INN3x78C - New Family of Offline CV/CC Flyback Converter ICs with Efficiency up to 94% (/news/inn3x78c-new-family-of-offline-cvcc-flyback-converter-ics)