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Zoeken

Zoek hier …

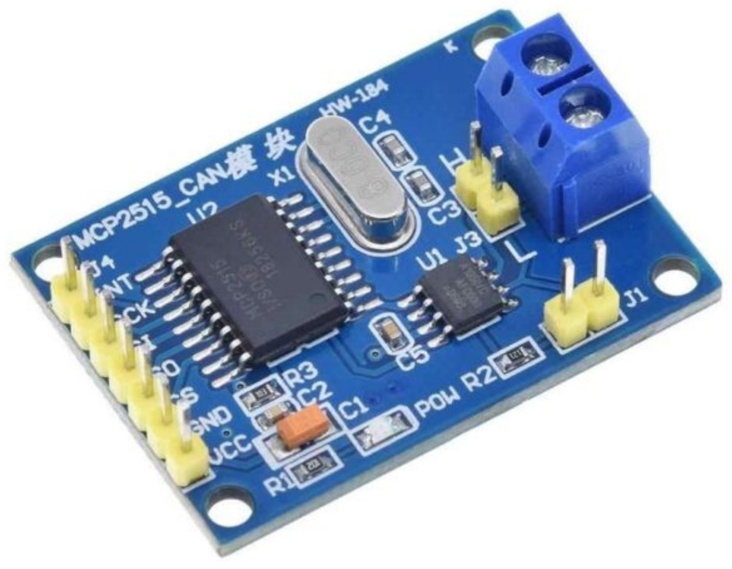
The closer you look, the less you see!

Arduino – CAN Bus communicatie

Het is mogelijk een arduino te gebruiken met een CAN Bus interface, met CAN Bus kan je datalijnen gebruiken tot ca. 500m, en apparaten werken peer-to-peer (ipv master – slave) dat is erg interessant!

Wat je nodig hebt is een CAN Bus module met een controller en transciever om het differentiële signaal van de CAN Bus bus om te zetten naar SPI signalen voor de Arduino (en andersom).

Hardware CAN Bus controller module



BESTELLEN

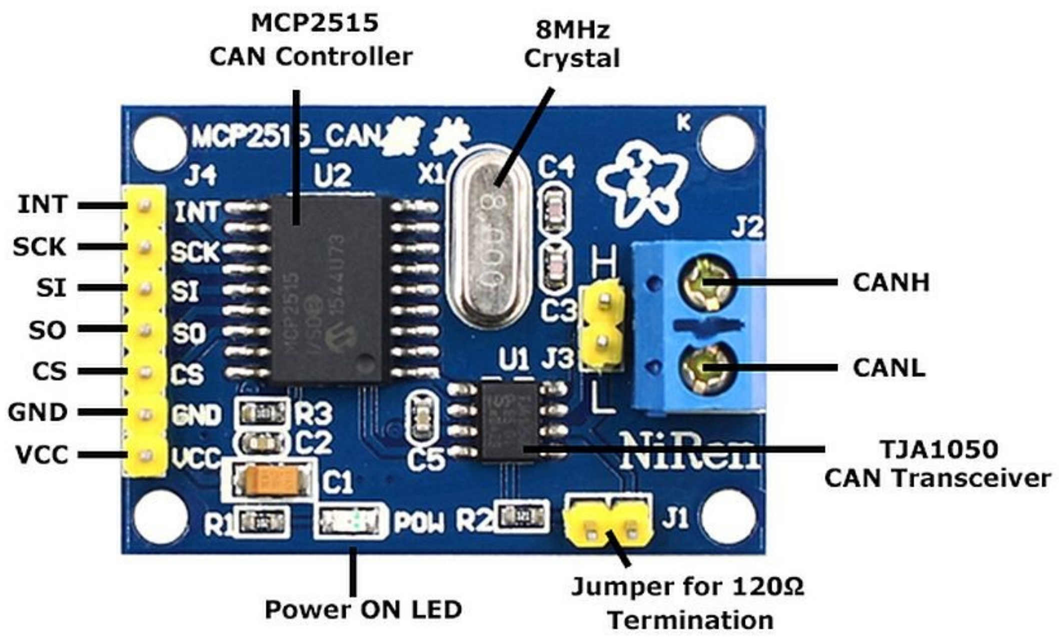
The MCP2515 CAN Bus Controller is a simple Module that supports CAN Protocol version 2.0B and can be used for communication at 1Mbps. In order to setup a complete communication system, you will need two CAN Bus Module.

- Supports CAN V2.0B specification, with communication speed up to 1Mb/s.
- 0 to 8-byte data field with standard frame, extended frame and remote frame.
- 5V DC power supply module, SPI interface protocol control.
- Onboard 120 Ohm termination resistor.
- Working current: 5mA (1 microamp standby current).
- Operating temperature: -40 C – +85 C

This particular module is based on MCP2515 CAN Controller IC and TJA1050 CAN Transceiver IC. The MCP2515 IC is a standalone CAN Controller and has integrated SPI Interface for communication with microcontrollers.

Coming to the TJA1050 IC, it acts as an interface between the MCP2515 CAN Controller IC and the Physical CAN Bus.

The following image shows the components and pins on a typical MCP2515 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
SCK	SPI clock pin
INT	MCP2515 interrupt pin

MCP2515 datasheet (Microchip)

TJA1050 datasheet (NXP)

Module schema

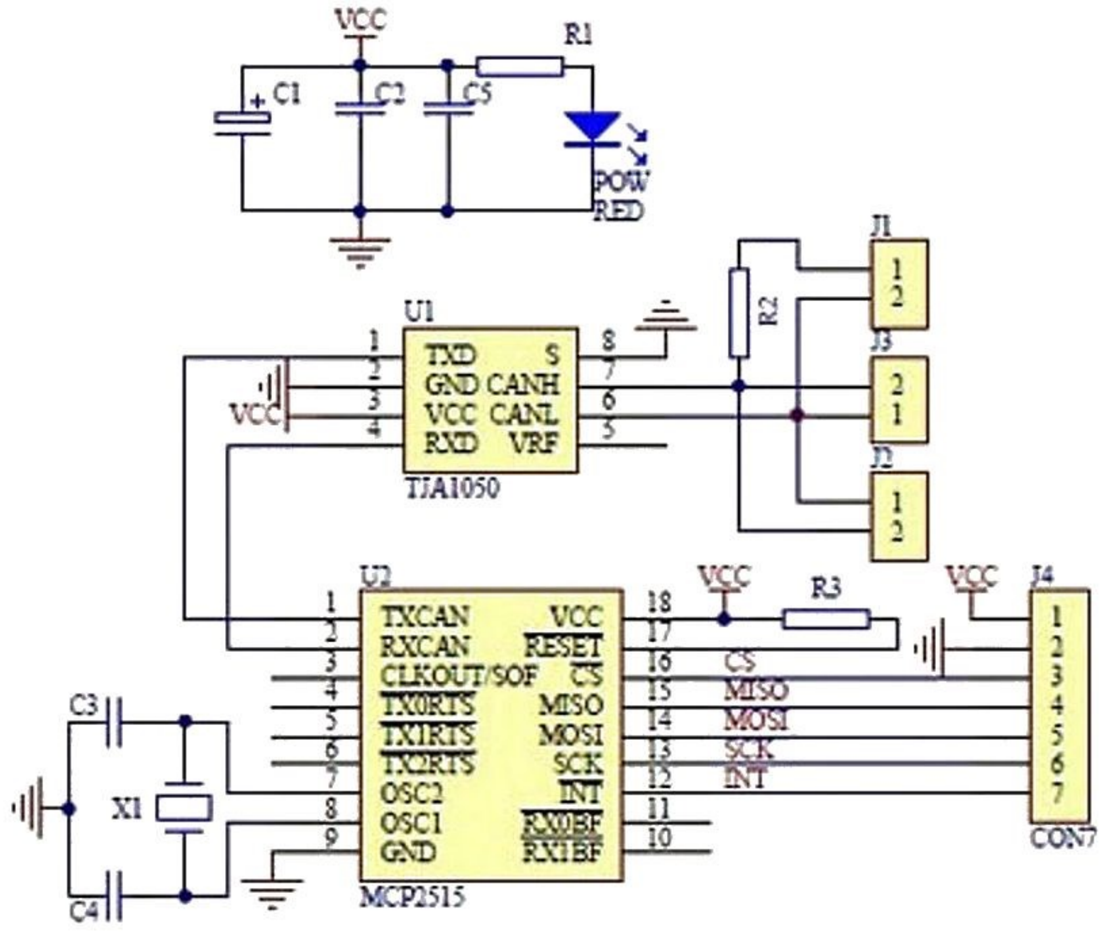
Before seeing the schematic of the module, you need to understand a couple of things about both the ICs i.e. MCP2515 and TJA1050.

MCP2515 IC is the main controller that internally consists of three main subcomponents: The CAN Module, the Control Logic and the SPI Block.

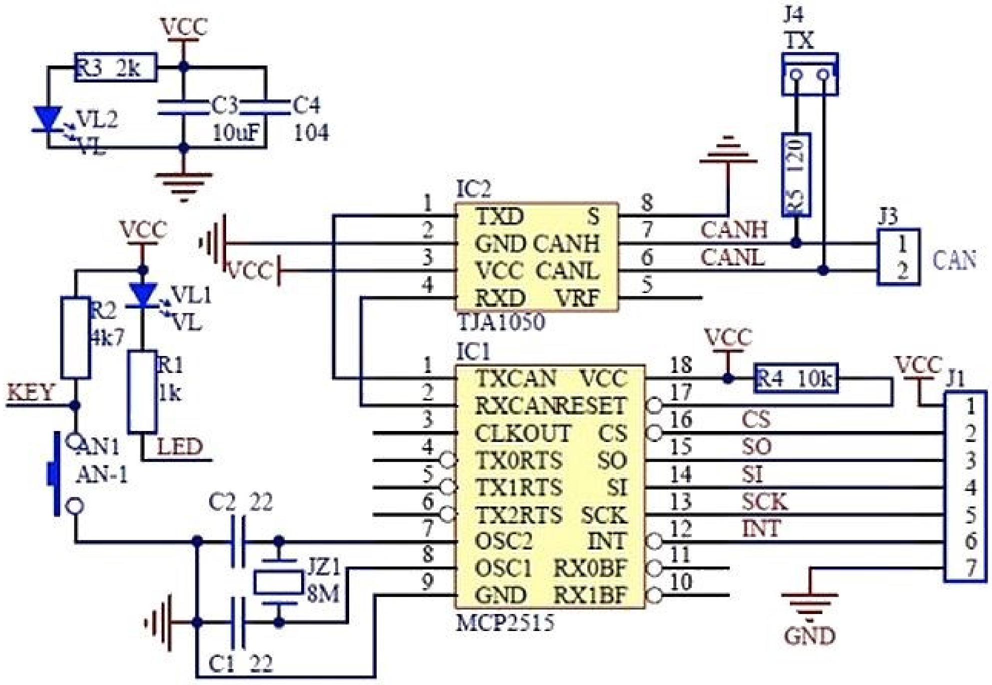
CAN Module is responsible for transmitting and receiving messages on the CAN Bus. Control Logic handles the setup and operation of the MCP2515 by interfacing all the blocks. The SPI Block is responsible for the SPI Communication interface.

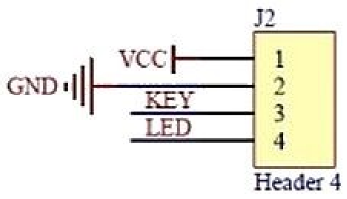
Coming to the TJA1050 IC, since it acts as an interface between MCP2515 CAN Controller and the physical CAN Bus, this IC is responsible for taking the data from the controller and relaying it on to the bus.

The following image shows the schematic of the MCP2515 CAN Module and it shows how MCP2515 IC and TJA1050 IC are connected on the Module.



Schema met component waarden:

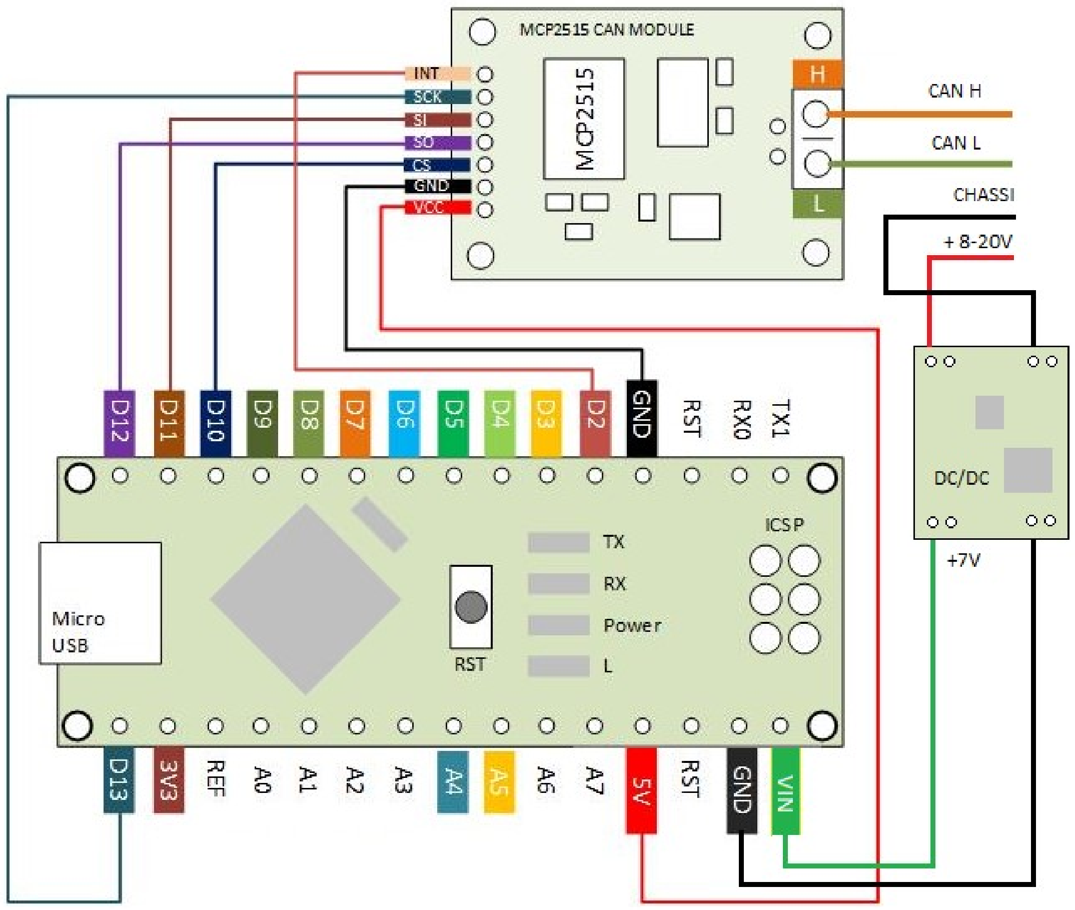




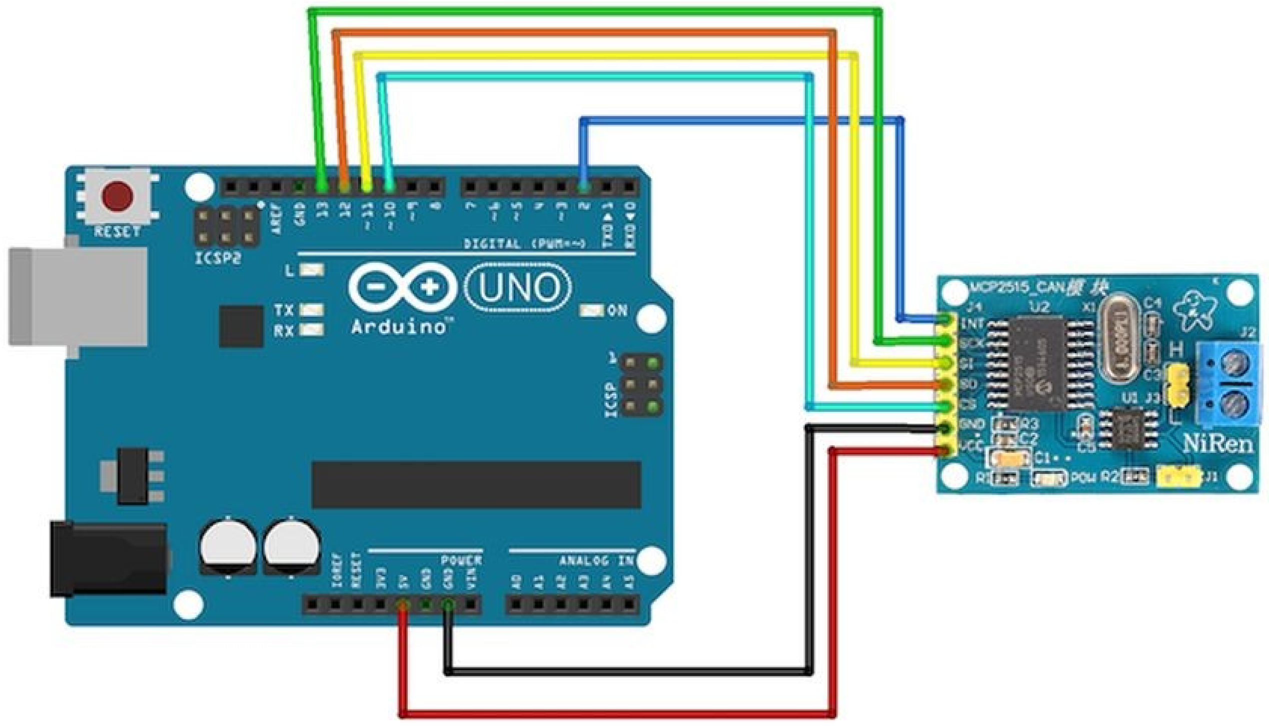
Arduino schema

Sluit de CAN Bus Module aan zoals hieronder aangegeven.

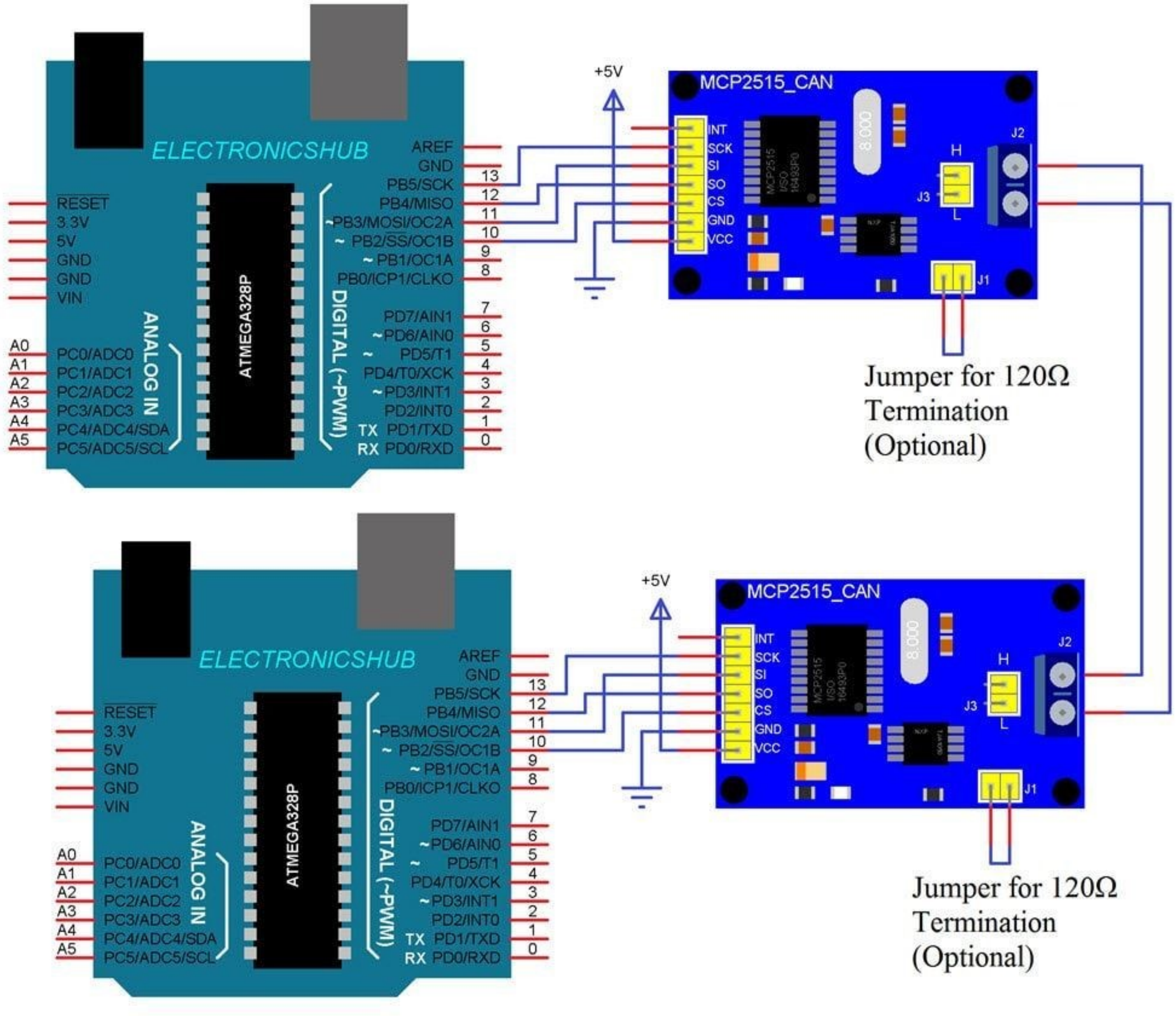
Arduino NANO:


MCP2515 CAN MODULE
MCP2515
INT
SCK
SI
SO
CS
GND
VCC
H
L
CAN H
CAN L
CHASSI
+ 8-20V
DC/DC
+7V
D12
D11
D10
D9
D8
D7
D6
D5
D4
D3
D2
GND
RST
RX0
TX1
Micro USB
TX
RX
Power
L
RST
ICSP
D13
3V3
REF
A0
A1
A2
A3
A4
A5
A6
A7
5V
RST
GND
VIN

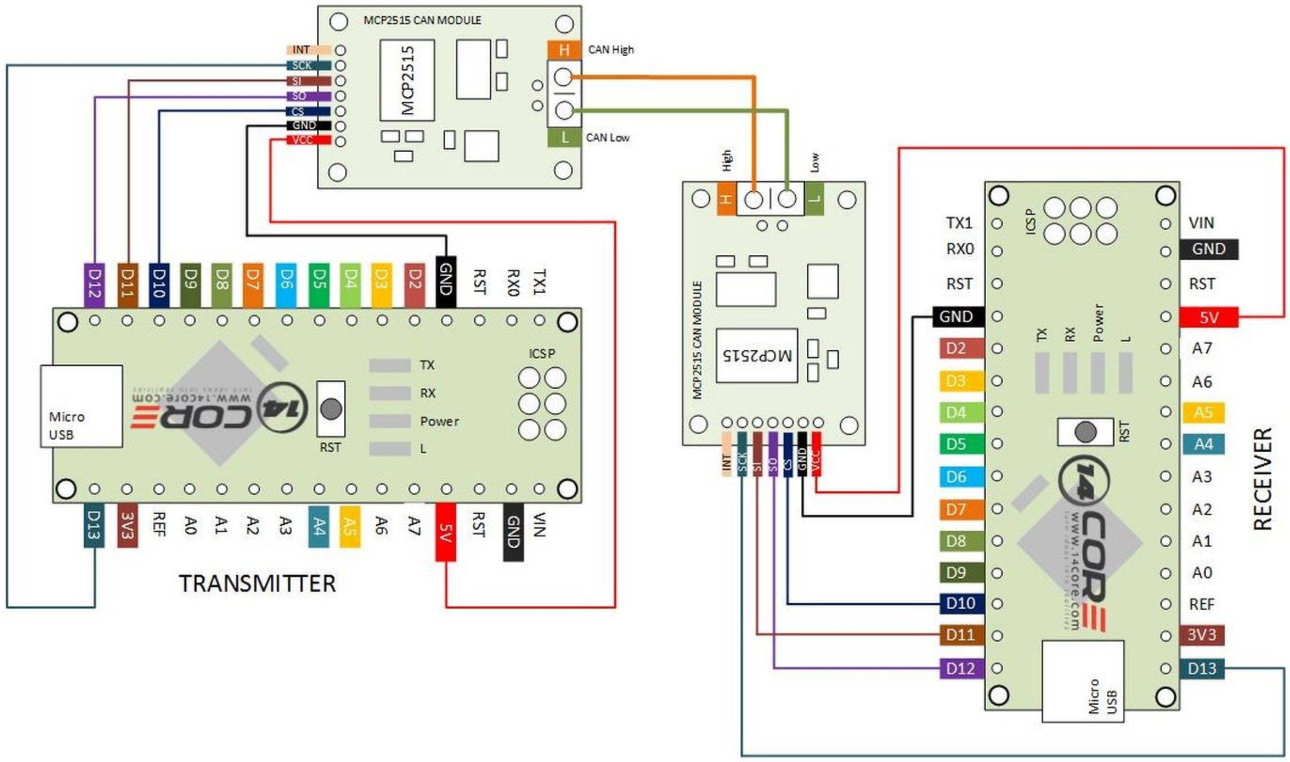
Arduino UNO:



In duale opstelling UNO:



In duale opstelling NANO:


MCP2515 CAN MODULE
INT
SCK
SI
SO
CS
GND
VCC
MCP2515
H
CAN High
L
CAN Low
D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 GND RST RX0 TX1
ICSP
TX
RX
Power
L
RST
Micro USB
D13 3V3 REF A0 A1 A2 A3 A4 A5 A6 A7 5V RST GND VIN
TRANSMITTER
High
Low
MCP2515 CAN MODULE
MCP2515
TX1 RX0 RST GND D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12
VIN GND RST 5V A7 A6 A5 A4 A3 A2 A1 A0 REF 3V3 D13
RECEIVER

For Transmitter (Arduino 1)

MCP2515 Module -> 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

For Receiver (Arduino 2)

MCP2515 Module -> Arduino Uno

VCC -> +5V

GND -> GND

CS -> 10 (SPI_SS)

SO -> 12 (SPI_MISO)

SI -> 11 (SPI_MOSI)

SCK -> 13 (SPI_SCK)

INT -> 2

Between two MCP2515

MCP2515 on Arduino Nano (Arduino 1) -> MCP2515 on Arduino Nano (Arduino 2)

H -> H

L -> L

Scripts

Wat heb je nodig?

1) Arduino CAN Bus bibliotheek (autowp): https://github.com/autowp/arduino-mcp2515

arduino-mcp2515-1.0.0

arduino-mcp2515-1.0.1

arduino-mcp2515-master (DL @ 2020-12-08)

Transmitter script

Arduino code Arduino

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

struct can_frame canMsg;
MCP2515 mcp2515(10);

void setup(){
  SPI.begin(); // Begins SPI communication
  mcp2515.reset();
  mcp2515.setBitrate(CAN_500KBPS, MCP_8MHZ); // Sets CAN at speed 500KBPS and Clock 8MHz
  mcp2515.setNormalMode();
}

void loop(){
  canMsg.can_id = 0x036; // CAN id as 0x036
  canMsg.can_dlc = 8; // CAN data length as 8
  canMsg.data[0] = 125; // value in [0] (max=255)
  canMsg.data[1] = 203; // value in [1] (max=255)
  canMsg.data[2] = 255; // value in [2] (max=255)
  canMsg.data[3] = 0x00;  // Rest all with 0
  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);
}
```

Reciever script

Arduino code Arduino

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

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

void setup() {
  SPI.begin(); // Begins SPI communication
  Serial.begin(9600); // Begins Serial Communication at 9600 baud rate
  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) && (canMsg.can_id == 0x036)){
    Serial.print("Getal 1: "); Serial.print(canMsg.data[0]);
    Serial.print(", Getal 2: "); Serial.print(canMsg.data[1]);
    Serial.print(", Getal 3: "); Serial.println(canMsg.data[2]);
  }
}
```

Console uitput van de ontvanger:

```
Getal 1: 125, Getal 2: 203, Getal 3: 255
Getal 1: 125, Getal 2: 203, Getal 3: 255
Getal 1: 125, Getal 2: 203, Getal 3: 255
Getal 1: 125, Getal 2: 203, Getal 3: 255
```

Met 3 apparaten

Transmitter script 1

Arduino code Arduino

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

struct can_frame canMsg;
MCP2515 mcp2515(10);
```

```

void setup(){
  SPI.begin(); // Begins SPI communication
  mcp2515.reset();
  mcp2515.setBitrate(CAN_500KBPS, MCP_8MHZ); // Sets CAN at speed 500KBPS and Clock 8MHz
  mcp2515.setNormalMode();
}

void loop(){
  canMsg.can_id = 0x036; // CAN id as 0x036
  canMsg.can_dlc = 8; // CAN data length as 8
  canMsg.data[0] = 125; // value in [0] (max=255)
  canMsg.data[1] = 203; // value in [1] (max=255)
  canMsg.data[2] = 255; // value in [2] (max=255)
  canMsg.data[3] = 0x00;  // Rest all with 0
  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);
}
```

Transmitter script 2

Arduino code Arduino

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

struct can_frame canMsg;
MCP2515 mcp2515(10);

void setup(){
  SPI.begin(); // Begins SPI communication
  mcp2515.reset();
  mcp2515.setBitrate(CAN_500KBPS, MCP_8MHZ); // Sets CAN at speed 500KBPS and Clock 8MHz
  mcp2515.setNormalMode();
}

void loop(){
  canMsg.can_id = 0x021; // CAN id as 0x036
  canMsg.can_dlc = 8; // CAN data length as 8
  canMsg.data[0] = 100; // value in [0] (max=255)
  canMsg.data[1] = 111; // value in [1] (max=255)
  canMsg.data[2] = 222; // value in [2] (max=255)
  canMsg.data[3] = 0x00;  // Rest all with 0
  canMsg.data[4] = 0x00;
  canMsg.data[5] = 0x00;
  canMsg.data[6] = 0x00;
  canMsg.data[7] = 0x00;
  mcp2515.sendMessage(&canMsg); //Sends the CAN message
  delay(400);
}
```

Reciever script

Arduino code Arduino

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

struct can_frame canMsg;
```

```
MCP2515 mcp2515(10); // SPI CS Pin 10

void setup() {
  SPI.begin(); // Begins SPI communication
  Serial.begin(9600); // Begins Serial Communication at 9600 baud rate
  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) {
    if (canMsg.can_id == 0x036) {
      Serial.print("0x036 - Getal 1: "); Serial.print(canMsg.data[0]);
      Serial.print(", Getal 2: "); Serial.print(canMsg.data[1]);
      Serial.print(", Getal 3: "); Serial.println(canMsg.data[2]);
    }
    if (canMsg.can_id == 0x021) {
      Serial.print("0x021 - Getal 1: "); Serial.print(canMsg.data[0]);
      Serial.print(", Getal 2: "); Serial.print(canMsg.data[1]);
      Serial.print(", Getal 3: "); Serial.println(canMsg.data[2]);
    }
  }
}
```

Console uitput van de ontvanger:

```
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
0x036 - Getal 1: 125, Getal 2: 203, Getal 3: 255
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
0x036 - Getal 1: 125, Getal 2: 203, Getal 3: 255
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
0x036 - Getal 1: 125, Getal 2: 203, Getal 3: 255
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
0x021 - Getal 1: 100, Getal 2: 111, Getal 3: 222
```

Bronnen:

https://www.electronicshub.org/arduino-mcp2515-can-bus-tutorial/

https://copperhilltech.com/mcp2515-can-bus-breakout-board-with-spi-interface/

https://create.arduino.cc/projecthub/maurizfa-13216008-arthur-jogy-13216037-agha-maretha-1321609
/can-bus-using-arduino-9ce7ba