# CAN-BUS Shield V2.0



**CAN-BUS** is a common industrial bus because of its long travel distance, medium communication speed and high reliability. It is commonly found on modern machine tools, such as an automotive diagnostic bus.

This CAN-BUS Shield adopts **MCP2515** CAN Bus controller with SPI interface and **MCP2551** CAN transceiver to give your Arduino/Seeeduino CAN-BUS capability. With an **OBD-II** converter cable added on and the OBD-II library imported, you are ready to build an onboard diagnostic device or data logger.

Previously we have made two versions of CAN-BUS Shield, the V1.0 and V1.2. They are all awesome shields that widely liked by our users. In order to make it better, several months ago we conducted a survey about CAN-BUS Shield V1.2 and received many valuable advices (Thanks to all the users who replied to us), so we decided to make an update and here it is - CAN-BUS Shield V2.

### What's new in CAN BUS Shield V2.0

### Hardware

- OBD-II or CAN standard pinout can be selected by switching jumpers on DB9 interface, the default pinout is OBD-II.
- Add a TF card slot for data storage and the CS pin can be either set to D4 or D5.
- The INT pin can be set to D2 or D3 by cutting and soldering pad on the back of the shield.
- Moved the P1 pad from front to the back of the shield to make it easier to cut and solder.
- Consider that the D0/D1 pin are usually used for downloading code, we changed the serial Grove connector to pin A0/A1.
- The I2C grove connector is also changed to more reasonable standard SDA/SCL pin instead of previous A4/A5.

• The two grove connectors are both changed to horizontal rather than vertical to the shield so that it would be more convenient when connecting to other grove modules.

# Software

- Add the function and example to access the data of your car.
- Add the function to read the SD card.
- Add the example to store the data of your car into the SD card.
- Fix some bugs and optimize some program.

# D-Sub CANbus PinOut

| 1 | Reserved | Upgrade Path     |
|---|----------|------------------|
| 2 | CAN_L    | Dominant Low     |
| 3 | CAN_GND  | Ground           |
| 4 | Reserved | Upgrade Path     |
| 5 | CAN_SHLD | Shield, Optional |
| 6 | GND      | Ground, Optional |
| 7 | CAN_H    | Dominant High    |
| 8 | Reserved | Upgrade Path     |
| 9 | CAN_V+   | Power, Optional  |
|   |          |                  |



### What if I want to connect this shield to my car

If you want to read data or control your car, there's an OBD>DB9 cable available for you, <u>this cable</u> make easier to connect to OBD-connector and DB9-connector. This cable will also work with anything that has a OBD-connector. Add a power switch makes such a satisfying click.



# **USB-CAN Analyser**

If you want a CAN Bus Analyser to debug your CAN Bus, this <u>USB-CAN Analyser</u> is recommended.



# Features

- Implements CAN V2.0B at up to 1 Mb/s
- Industrial standard 9 pin sub-D connector
- OBD-II and CAN standard pinout selectable.
- Changeable chip select pin
- Changeable CS pin for TF card slot

- Changeable INT pin
- Screw terminal that easily to connect CAN\_H and CAN\_L
- Arduino Uno pin headers
- 2 Grove connectors (I2C and UART)
- SPI Interface up to 10 MHz
- Standard (11 bit) and extended (29 bit) data and remote frames
- Two receive buffers with prioritized message storage

### Note

CAN BUS Shield Work well with Arduino UNO (ATmega328), Arduino Mega (ATmega1280/2560) as well as Arduino Leonardo (ATmega32U4).

# Hardware Overview



- 1. **DB9 Interface** to connect to OBDII Interface via a DBG-OBD Cable.
- 2. **V\_OBD** It gets power from OBDII Interface (from DB9)
- 3. Led Indicator:
  - **PWR**: power

- TX: blink when the data is sending
- RX: blink when there's data receiving
- INT: data interrupt
- 4. Terminal CAN\_H and CAN\_L
- 5. Arduino UNO pin out
- 6. Serial Grove connector
- 7. I2C Grove connector
- 8. ICSP pins
- 9. IC MCP2551, a high-speed CAN transceiver (datasheet)
- 10. IC MCP2515, stand-alone CAN controller with SPI interface (datasheet)
- 11. SD card slot

#### Warning

When you use more than two CAN Bus Shield in one net, you should take the impedance into consideration. You should either cut P1 in the PCB with a knife, or just remove R3 on the PCB.

### Pin map



#### Note

• The FREE pin is available for the other usages.

# DB9&OBDii Interface



# CS\_CAN pin

SPI\_CS pin of V2.0 is connected to **D9** by default. If you want to change to **D10**, please follow below instructions.

• Step1: Take a look at the backside of the PCBA, you will find a pad named CS\_CAN.



• Step2: Cut the wire between pad9 and the middle pad.



• Step3: Weld the middle pad and pad 10.



# Warning

Be careful with the box cutter, it's easy to hurt yourself or the PCBA.

# INT pin

INT pin of V2.0 is connected to **D2** by default. If you want to change to **D3**, please follow below instructions.

• Step1: Take a look at the backside of the PCBA, you will find a pad named INT.



• Step2: Cut the wire between pad 2 and the middle pad.



• Step3: Weld the middle pad and pad 3.



# **SPI pins**

The SPI pins (SCK, MISO, MOSI) are routed to the ICSP pins by default. But for some boards, the SPI pins are located at D11~D13. if this happens, you need make some change to the PCBA. Take a look at the backside of the PCBA, there're three pads, MOSI, MISO and SCK, they are connected to A by default. You can change them to B if needed.

# Note

For Arduino UNO, Arduino Mega, Arduino Leonardo and any others AVR based Arduino boards, it works well by default setting.

### Warning

Be careful when you are going to change SPI pins, it's easy to hurt yourself or the PCBA.

# **ODB** pins



### Warning

Please do not cut the forth left PAD connection. Because there is no signal connected with forth right PAD.

# **Getting Started**

Here's a simple example to show you how CAN-BUS Shield works. In this example we need 2 pieces of CAN-BUS Shields as well as Arduino or Seeeduino.

#### Note

This example is built under <u>Arduino IDE version 1.6.9</u>.

### STEP1: What do we need

| CAN-BUS Shield | CAN Bus communication | 2 | <u>link</u> |
|----------------|-----------------------|---|-------------|
| Seeeduino V4.2 | Controller            | 2 | <u>link</u> |
| Jumper Wire    | connection            | 2 | <u>link</u> |

# **STEP2: Hardware Connection**

Insert each CAN-BUS Shield into Seeeduino V4.2, and connect the 2 CAN-BUS Shield together via 2 jumper wires. Shown as below images.



#### Note

CAN\_H to CAN\_H, CAN\_L to CAN\_L

# **STEP3: Software**

Please follow how to install an Arduino library procedures to install CAN BUS shield library.

Click on below button to download the library.

# Download CAN BUS Shield Library

Install the library to your Arduino IDE when it is downloaded.

One of the node (a node means Seeeduino + CAN\_BUS Shield) acts as master, the other acts as slaver. The master will send data to slaver constantly.

#### Note

Each node can act as master before the code being uploaded.

Open the **send** example (File > Examples > CAN\_BUS\_Shield-master > send) and upload to the master.



Open the **receive\_check** example (**File > Examples > CAN\_BUS\_Shield-master > receive\_check**) and upload to

| le Edit Ske<br>New  | etch Too  | ls Help   |  |   |
|---|---|---|--|---|
| New   | 100000  |   |  |   |
|   | ₩N  |   | 1  | Arduino 1.6.9   |
| Open<br>Open Recent<br>Sketchbook   | ₩O<br>►   | DHT sensor library<br>EEPROM  | *  |   |
| Examples  |   | Esplora   |  |   |
| Close<br>Save   | ₩W<br>₩S  | Ethernet<br>Firmata<br>Robot Control  | *  |   |
| Save As   | 0#S   | Robot Motor   | •  |   |
| Page Setup  | ΩжР   | SD  | •  |   |
| Print   | ЖР  | SoftwareSerial  | •  |   |
| "Halls World  | I" to the   | SPI   | •  |   |
| inis sketch prints Hello World! to the  |   | Temboo  | •  |   |
|   |   | Wire<br>RETIRED   | *  |   |
| gital pin 12<br>o digital pin<br>gital pin 4<br>gital pin 3<br>gital pin 2<br>round<br>round<br>V | 11  | Examples from Custom Libraries<br>Accelerometer_H3LIS331DL-master<br>Arduino Learning Board<br>Arduino Twitter Library<br>Arduino-Websocket-Fast<br>Blynk<br>BTLE   | * * * * *  |   |
|   |   | CAN_BUS_Shield-master   |  | receive_Blink   |
| pin (pin 3)<br>added 18 Apr<br>Jul 2009<br>tp://www.ladyd   | 2008<br>ada.net)  | GNU 11<br>ESP8266 Weather Station<br>ESP8266_Simple-master<br>GSM<br>IRremote<br>Keypad   | * * * *  | receive_check<br>receive_interrupt<br>send<br>send_Blink<br>send_Blink_ROS<br>set_mask_filter_recv  |
|   | Sketchbook<br>Examples<br>Close<br>Save<br>Save As<br>Page Setup<br>Print<br>"Hello World<br>"Hello World<br>"Hello World<br>"Hello World<br>"Hello World<br>"Hello World<br>"<br>gital pin 12<br>o digital pin 12<br>o digital pin 3<br>gital pin 4<br>gital pin 3<br>gital pin 3<br>gital pin 3<br>gital pin 3<br>gital pin 4<br>gital pin 3<br>gital pin 3<br>gital pin 3<br>gital pin 3<br>gital pin 3<br>gital pin 4<br>gital pin 3<br>gital pin 4<br>gital pin 3<br>gital pin 4<br>gital pin 2<br>gital pin 4<br>gital pin 4<br>gital pin 4<br>gital pin 2<br>gital pin 4<br>gital pin 4<br>g | Sketchbook  ►    Examples  ►    Close  % W    Save  % S    Save As  ① % S    Page Setup  ① % P    Print  % P    "Hello World!" to the     gital pin 12  o digital pin 11    gital pin 5  gital pin 3    gital pin 3  gital pin 3    gital pin 4  gital pin 3    gital pin 5     round     ground     y  ground    pin (pin 3)     added 18 Apr 2008    i Jul 2009     tbul 2009 | Sketchbook  ►    Examples  ►    Examples  ►    Close  第KW    Save  第S    Save As  ①第S    Page Setup  ①第F    Print  第P    "Hello World!" to the  SD    SoftwareSerial  SPI    "Hello World!" to the  Temboo    Wire  RETIRED    gital pin 12  Accelerometer_H3LIS331DL-master    o digital pin 11  Accelerometer_H3LIS331DL-master    gital pin 3  Arduino Learning Board    gital pin 4  Arduino-Websocket-Fast    gital pin 3  Arduino-Websocket-Fast    gital pin 4  Blynk    gital pin 3  Arduino-Websocket-Fast    gital pin 4  Blynk    gital pin 3  Arduino-Websocket-Fast    Blynk  BTLE    CAN_BUS_Shield-master  GSM    i Jul 2009  IRremote    ttp://www.ladyada.net  Keypad | Sketchbook  Esplora    Examples  Esplora    Ethernet  Ethernet    Close  #EW    Save  #ES    Save As  IP #ES    Page Setup  IP #EP    "Hello World!" to the  SD    "Hello World!" to the  SD    gital pin 12  o digital pin 11    gital pin 5  Accelerometer_H3LIS331DL-master    gital pin 4  Arduino Learning Board    gital pin 3  Arduino-Websocket-Fast    round  Blynk    Byn  ESP8266 Weather Station    V  ESP8266 Simple-master    GSM  IRremote    Keypad  Keypad |

# **STEP4: View Result**

Open the Serial Monitor of Arduino IDE(**slaver**), you will get the data sent from the master.

|          |                |            |   |   |   |   |   | COM5 (Arduino Uno) – 🗖 🗙         |
|----------|----------------|------------|---|---|---|---|---|----------------------------------|
| 4        |                |            |   |   |   |   |   | Send                             |
| Get      | data from      | ID: 0      |   |   |   |   |   | ^                                |
| 0        | 1              | 2          | 3 | 4 | 5 | 6 | 7 |                                  |
| Get<br>0 | data from<br>1 | 1D: 0<br>2 | 3 | 4 | 5 | 6 | 7 |                                  |
| Get<br>0 | data from<br>1 | 1D: 0<br>2 | 3 | 4 | 5 | 6 | 7 |                                  |
| Get<br>0 | data from<br>1 | 1D: 0<br>2 | 3 | 4 | 5 | 6 | 7 |                                  |
| Get<br>0 | data from<br>1 | 1D: 0<br>2 | 3 | 4 | 5 | 6 | 7 |                                  |
| Get<br>0 | data from<br>1 | 1D: 0<br>2 | 3 | 4 | 5 | 6 | 7 |                                  |
| Get<br>0 | data from<br>1 | 1D: 0<br>2 | 3 |   | 5 | 6 | 7 |                                  |
| Get      | data from<br>1 | 1D: 0<br>2 | 3 | 4 | 5 | 6 | 7 |                                  |
| Get<br>0 | data from<br>1 | 1D: 0<br>2 | 3 | 4 | 5 | 6 | 7 |                                  |
| •        | Autoscrol      | 1          |   |   |   |   |   | ₩ Ho line ending ∨ 115200 baud ∨ |