『MITSUMI Sensor Shield Kit for Arduino』 User's Guide:

Instruction Manual

OUTLINE

This document is the instruction manual of "MITSUMI Sensor Shield Kit for Arduino".

"MITSUMI Sensor Shield Kit for Arduino" is a kit consisting of the Shield for Arduino, which is supposed to be used by connecting to Arduino, and the Sensor board equipped with various sensors. You can easily check the operation of the sensors by using Sample Sketch for each sensor.

For details on each sensor, refer to the applicable data sheet.

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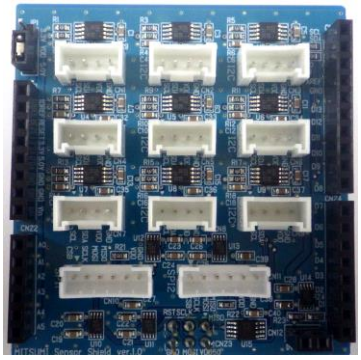
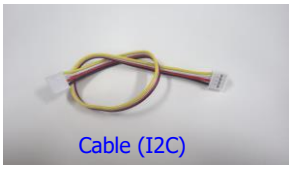
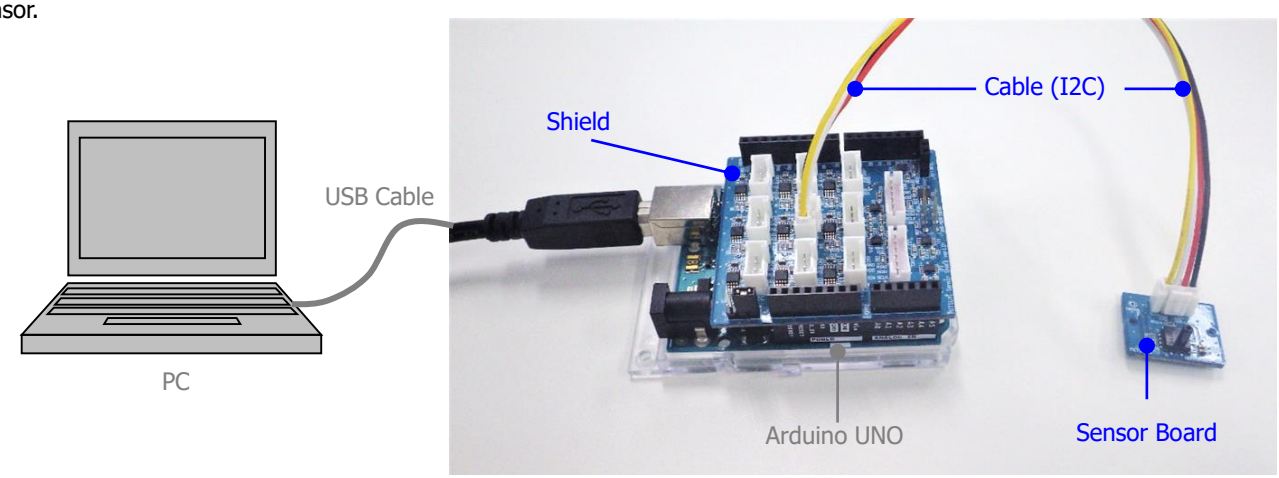
1 Configuration

"MITSUMI Sensor Shield Kit for Arduino" consists of Shield, Sensor boards, Cables (I2C, SPI), and Sample Sketch. Arduino itself is not included in this kit.

Shield	Sensor Board	Cable	Sample Sketch
	 	 Cable (I2C)  Cable (SPI)	

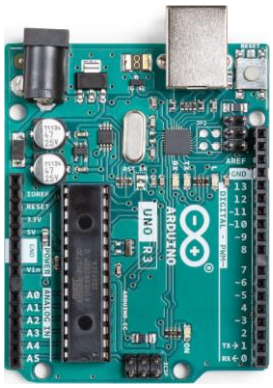
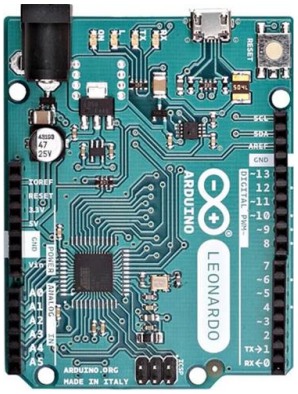
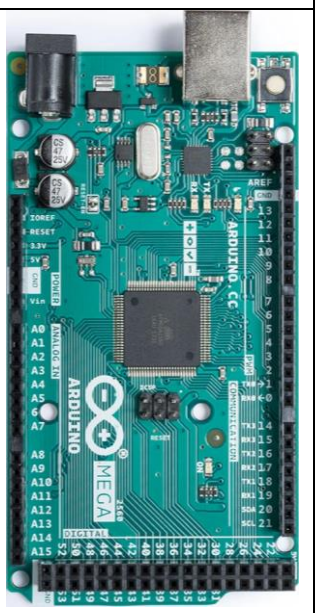
2 Usage form

This kit is used by connecting the Shield to user's Arduino. Using Sample Sketch allows you to check operations of each sensor.

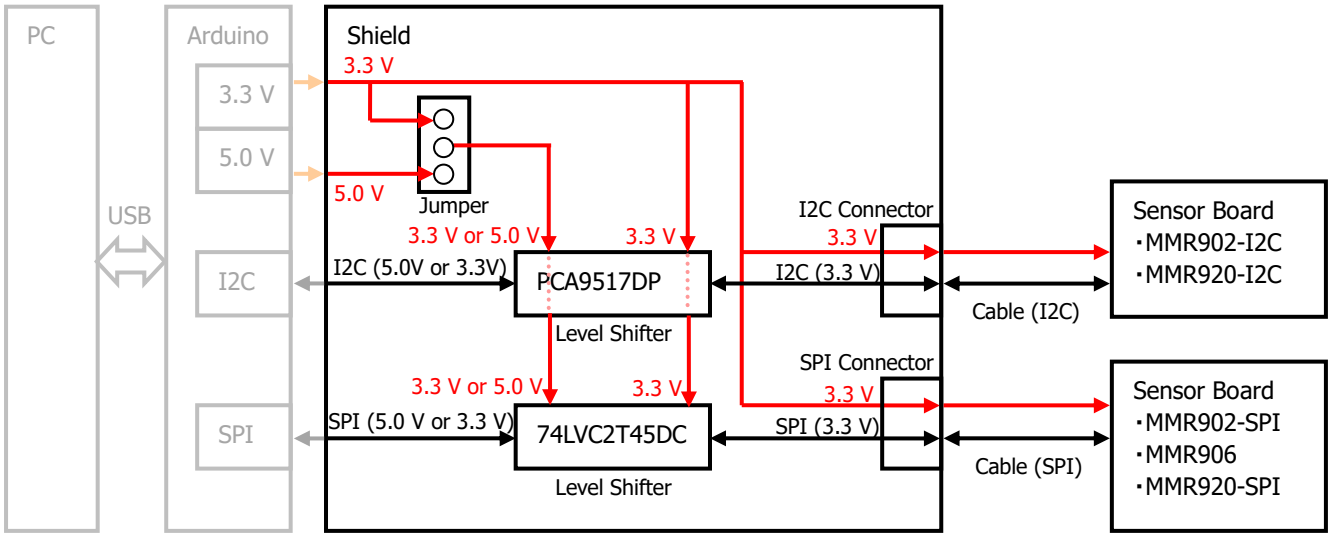


3 Compatible Arduino models

This kit is applicable to UNO, LEONARDO, DUE, and MEGA2560.

Model	UNO	LEONARDO	DUE	MEGA2560
View				
System Power Supply	5.0 V	5.0 V	3.3 V	5.0 V

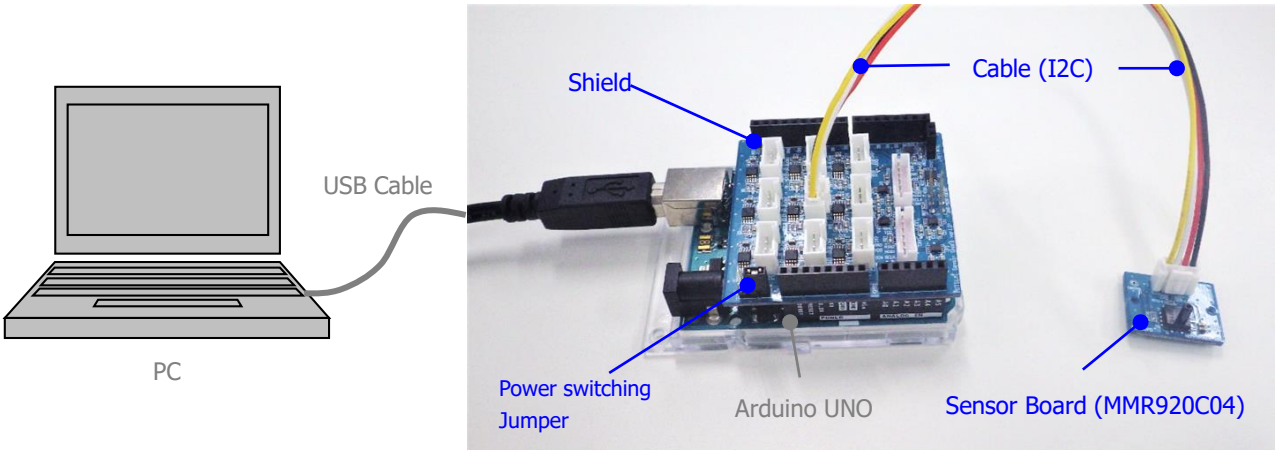
4 Block diagram



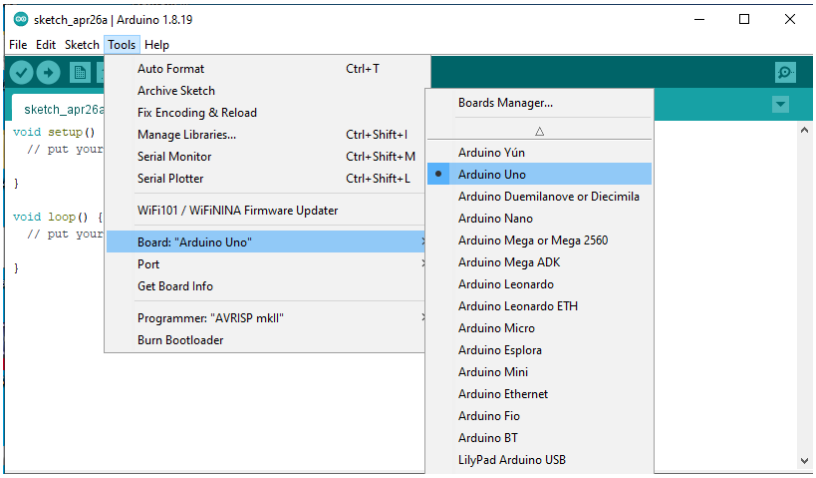
5 How to use the Sensor Shield Kit

An example connection is given below. In this example, the Sensor board of the gauge pressure sensor (MMR920C04) and Arduino Uno are used.

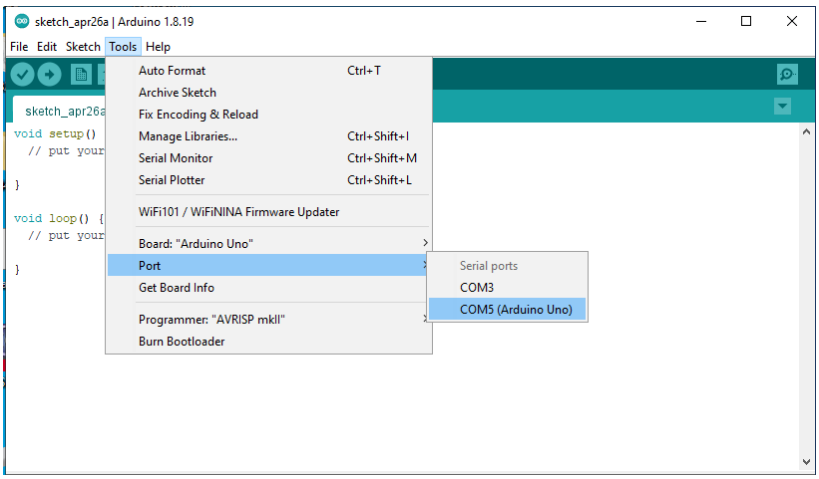
(1) Connect the Arduino UNO and the Shield.
(2) Connect the system power switch jumper to 5 V pin.
(3) Connect I2C connector (CN104) on the Sensor board of MMR920C04 and I2C connector (CN5) on the Shield using an I2C cable.
(4) Connect the Arduino UNO and the PC using an USB cable.



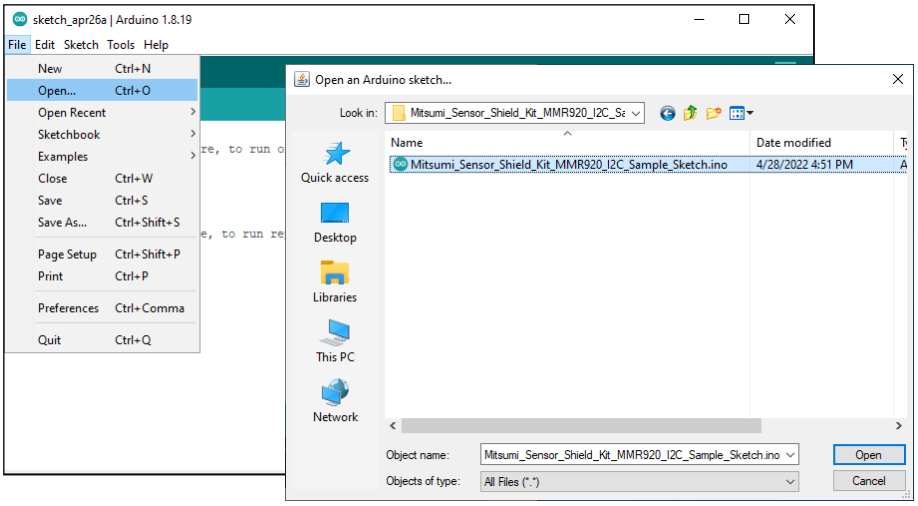
(5) Launch Arduino IDE.
(6) Recognize the Arduino UNO on the Arduino IDE.
Select [Tools] -> [Board: "Arduino Uno"] -> [Arduino Uno].



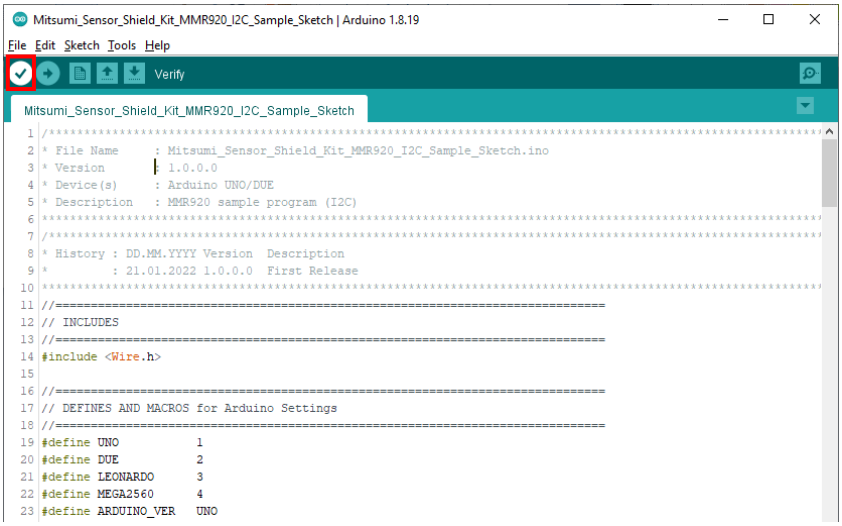
Select [Tools] -> [Port] -> [COMxx (Arduino Uno)].
The port number (COMxx) differs depending on the PC.



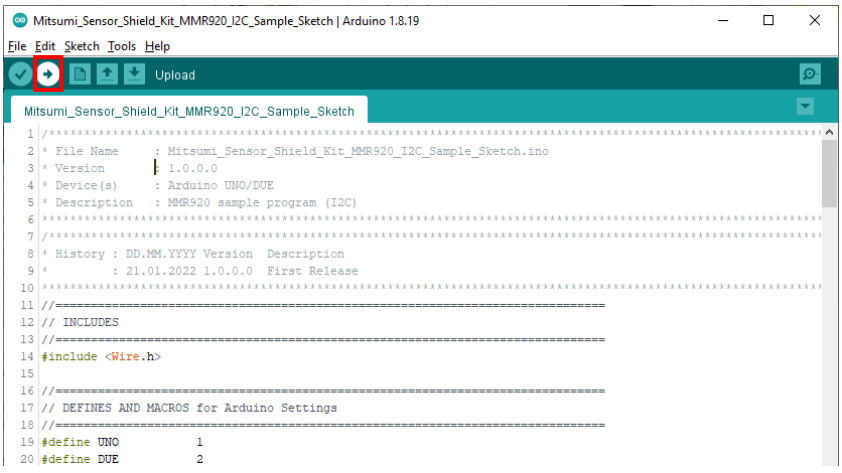
(7) Open the Sample Sketch on the Arduino IDE.
Select [File] -> [Open…] -> [Mitsumi_Sensor_Shield_Kit_MMR920_I2C_Sample_Sketch.ino].



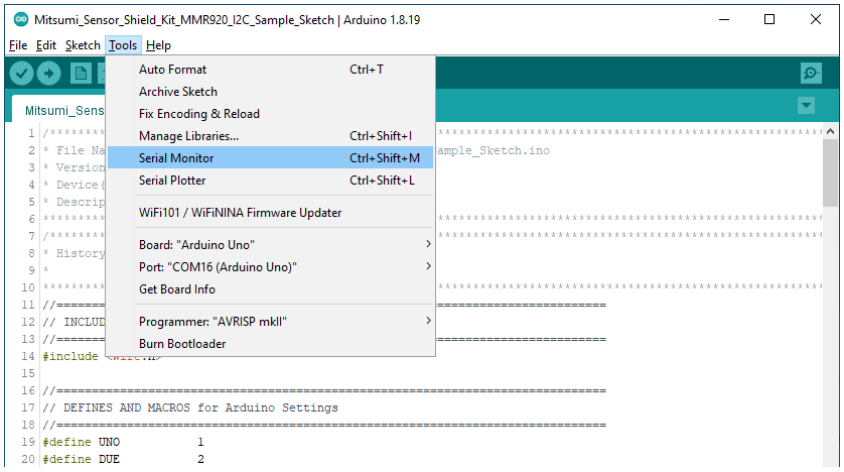
(8) Verify the Sample Sketch on the Arduino IDE.
Click [Verify] button to check whether an error occurs.



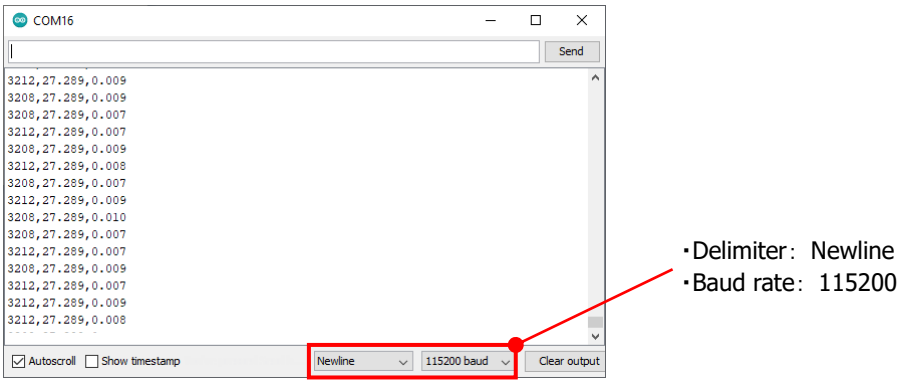
(9) Upload the Sample Sketch to the Arduino UNO on the Arduino IDE.
Click [Upload] button to upload the Sample Sketch.



(10) Check the output data on the serial monitor.
Select [Tools] -> [Serial Monitor].



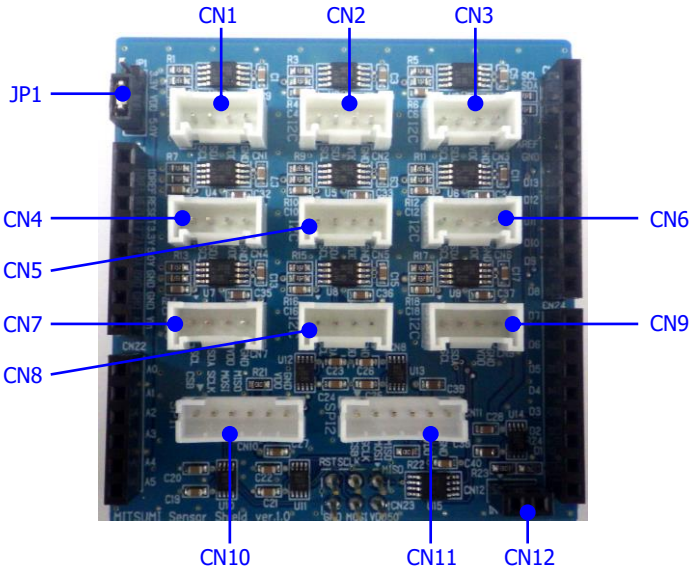
The data is output to the serial monitor. The delimiter and baud rate should be as follows.
The data is displayed in the following order: measurement interval [usec], measurement data (temperature [°C], pressure [cmH20])



6 Shield

6-1 Description

The Shield has connectors to connect to Arduino (CN21 to CN25) in its peripheral area and those to connect to the Sensor board (I2C connectors: CN1 to CN9, SPI connectors: CN10 to CN11, interrupt connector: CN12) in its center.
The size of the Shield is 55.88 x 53.34 mm.



6-2 Connector

JP1: System power switch jumper

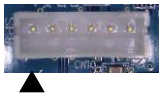
View	Pin	Name	Function	Note
	1	3.3 V	3.3 V supplied from the Arduino.	Sensor power supply
	2	VDD	System power supply	・ During use of UNO, LEONARDO, or MEGA2560 -> Connected to 5.0 V pin. ・ During use of DUE -> Connected to 3.3 V pin.
	3	5.0 V	5.0 V supplied from the Arduino.	

Set the jumper according to the system power supply of the Arduino. For the system power supply, refer to the compatible models. If the jumper setting is wrong, the communication between the Arduino and each sensor may fail.

CN1 - CN9: I2C connector

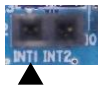
View	Pin	Name	Function	Note
	1	SCL	I2C	Connected to CN25 SCL pin.
	2	SDA		Connected to CN25 SDA pin.
	3	VDD	3.3 V (sensor power supply)	—
	4	GND	Ground	—

CN10, CN11: SPI connector

View	Pin	Name	Function	Note
	1	CSB	SPI	SPI1: Connected to CN24 D7 pin. SPI2: Connected to CN24 D6 pin.
	2	SCLK		Connected to CN23 SCLK pin.
	3	MOSI		Connected to CN23 MOSI pin.
	4	MISO		Connected to CN23 MISO pin.
	5	VDD	3.3 V (sensor power supply)	—
	6	GND	Ground	—

CSB pin of SPI1 connector and that of SPI2 connector are connected to different pins of the Arduino.

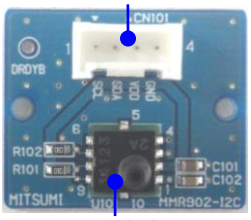
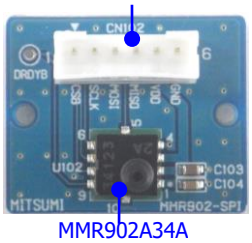
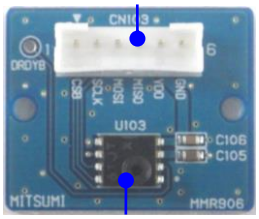
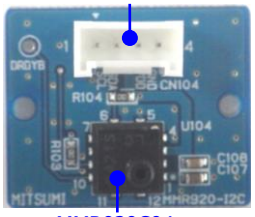
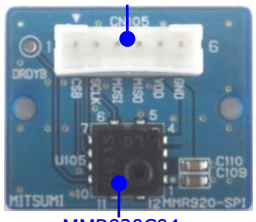
CN12: Interrupt connector

View	Pin	Name	Function	Note
	1	INT1	Interrupt or Digital input	Connected to CN24 D3 pin. Connect TH on the Sensor board to use DRDY / DRDYB signal of the sensor.
	2	INT2	Interrupt or Digital input	Connected to CN24 D2 pin. Connect TH on the Sensor board to use DRDY / DRDYB signal of the sensor.

7 Sensor Board

7-1 Description

For the Sensor board, the IF depends on the mounted sensor. The size of this board is 20 x 24 mm.

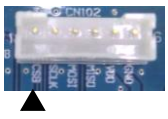
Sensor	I2C	SPI	Note
MMR902A34A	CN101  MMR902A34A	CN102  MMR902A34A	- Digital output gauge pressure sensor - Operating range: 0 to +300 mmHg - Operating range: 0 to +50°C - I2C Address: 0xCA(W)/0xCB(R) - Data Sheet: MMR902A34A_DATASHEET_Rev.0
MMR906XAN	—	CN103  MMR906XAN	- Digital output gauge pressure sensor - Operating range: -40 to +360 mmHg - Operating range: 0 to +60°C - Data Sheet: MMR906XAN_DATASHEET_Rev.0
MMR920C04	CN104  MMR920C04	CN105  MMR920C04	- Digital output micro-pressure sensor - Operating range: -40 to +40 cmH2O - Operating range: 0 to +50°C - I2C Address: 0xCE(W)/0xCF(R) - Data Sheet: MMR920_DATASHEET_Rev.1.1

7-2 Connector

CN101, CN104, CN106: I2C connector

View	Pin	Name	Function	Note
	1	SCL	I2C	Connected to SCL pin of the sensor.
	2	SDA		Connected to SDA pin of the sensor.
	3	VDD	3.3 V (sensor power supply)	—
	4	GND	Ground	—

CN102, CN103, CN105: SPI connector

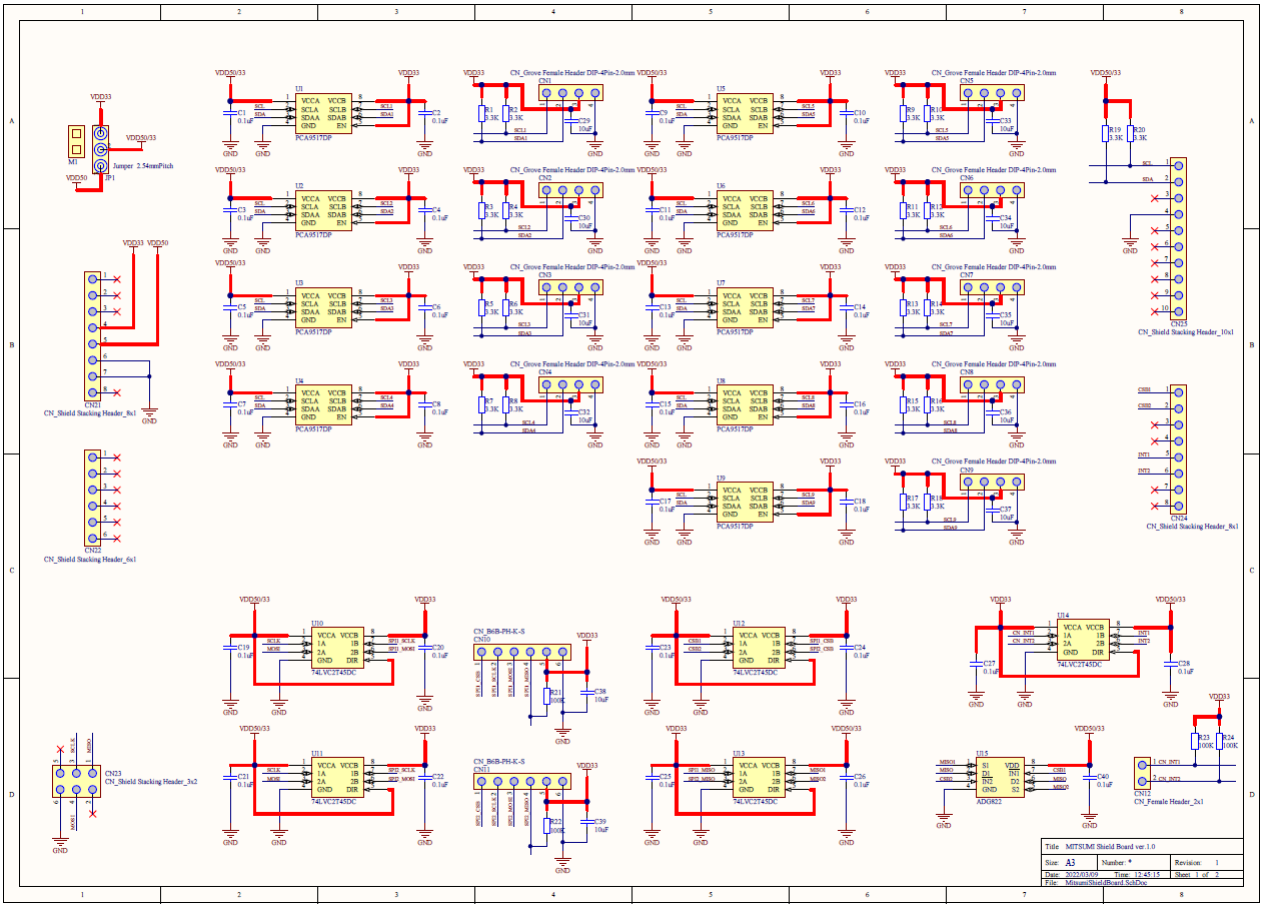
View	Pin	Name	Function	Note
	1	CSB	SPI	Connected to CSB pin of the sensor.
	2	SCLK		Connected to SCLK pin of the sensor.
	3	MOSI		Connected to SDI pin of the sensor.
	4	MISO		Connected to SDO pin of the sensor.
	5	VDD	3.3 V (sensor power supply)	—
	6	GND	Ground	—

TH: Through-hole

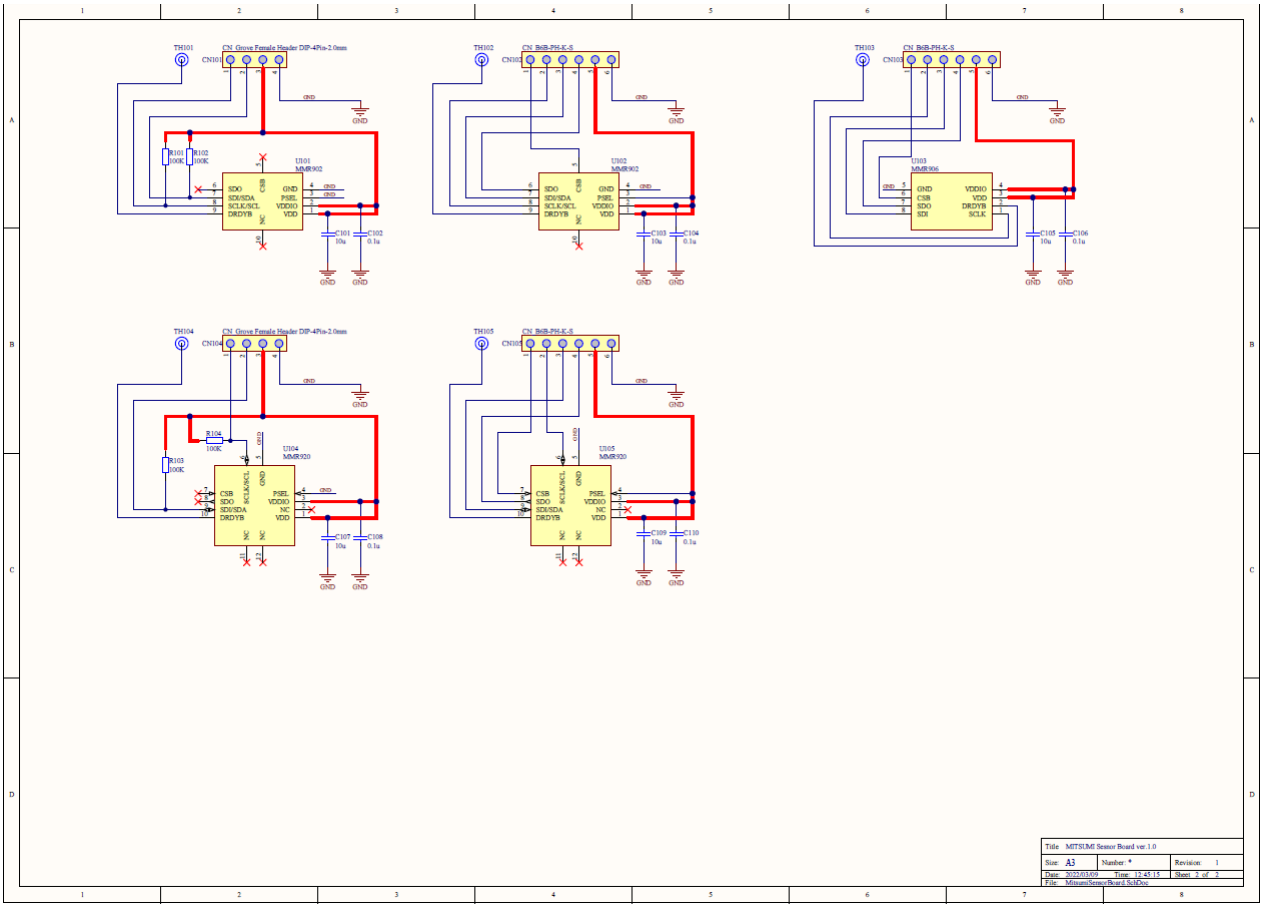
View	Pin	Name	Function	Note
	1	DRDYB (DRDY)	Digital output (Data Ready signal)	Connect to CN12 on the Shield to use DRDYB or DRDY signal of the sensor.

8 Schematic Circuit Diagram

8-1 Shield



8-2 Sensor Board



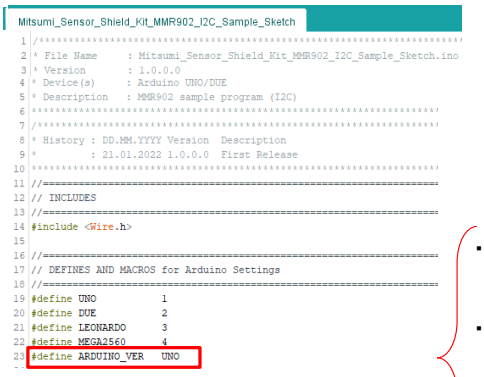
9 Sample Sketch

Sensor board	Interface	File Name
MMR902_I2C	I2C	Mitsumi_Sensor_Shield_Kit_MMR902_I2C_Sample_Sketch.ino
MMR902_SPI	SPI	Mitsumi_Sensor_Shield_Kit_MMR902_SPI_Sample_Sketch.ino
MMR906	SPI	Mitsumi_Sensor_Shield_Kit_MMR906_SPI_Sample_Sketch.ino
MMR920_I2C	I2C	Mitsumi_Sensor_Shield_Kit_MMR920_I2C_Sample_Sketch.ino
MMR920_SPI	SPI	Mitsumi_Sensor_Shield_Kit_MMR920_SPI_Sample_Sketch.ino

* Operation check using Arduino IDE 1.8.19.

9-1 How to change Arduino model

In the Sample Sketch, the code for UNO is initially set.
Change the code given below according to the Arduino model to use.



・For use of Arduino UNO

```
23 #define ARDUINO_VER    UNO
```

・For use of Arduino DUE

```
23 #define ARDUINO_VER    DUE
```

・For use of Arduino LEONARDO

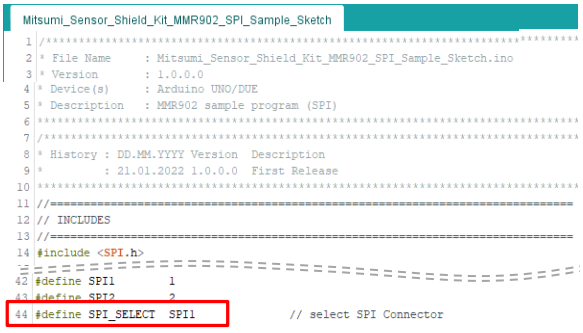
```
23 #define ARDUINO_VER    LEONARDO
```

・For use of Arduino MEGA2560

```
23 #define ARDUINO_VER    MEGA2560
```

9-2 How to change SPI connector

In the Sample Sketch, the code for CN10 SPI1 connector is initially set.
To make the Sample Sketch to be used for CN11 SPI2 connector, change the code given below.



・For use of CN10 SPI1 connector

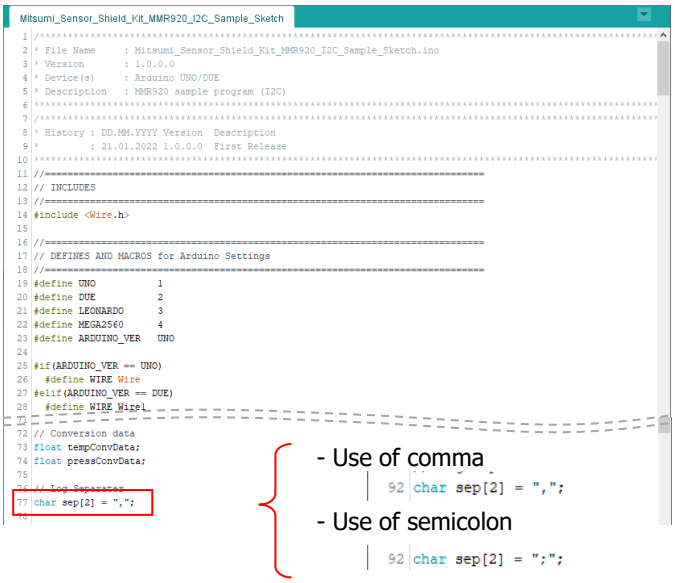
```
44 #define SPI_SELECT   SPI1              // select SPI Connector
```

・For use of CN11 SPI2 connector

```
44 #define SPI_SELECT   SPI2              // select SPI Connector
```

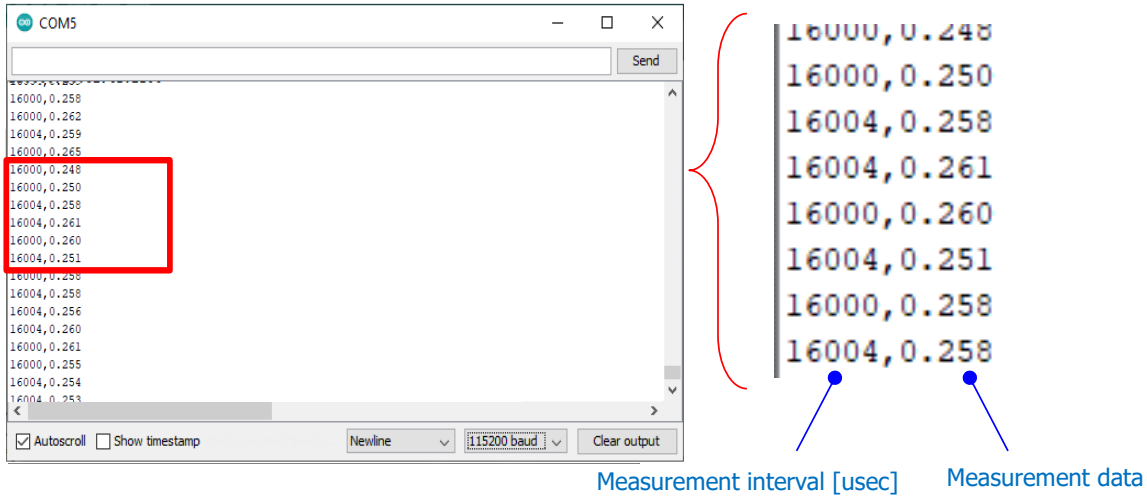
9-3 How to change the delimiter

Data output of the Sample Sketch is initially comma-separated.
To change the delimiter, change the character between double quotations to the desired character as shown below.



9-4 Serial Monitor Settings

The Sample Sketch outputs the measurement data and the measurement intervals by serial communication.
The measurement data can be confirmed on the serial monitor.



Setting of the serial communication is as shown below. The data can be confirmed by multi-purpose terminal software and others.

Serial communication setting

Item	Setting Value
Baud rate	115,200 bps
Data length	8 bits
Parity	None
Stop bit	1 bit
Transfer Direction	LSB First
Delimiter	LF

9-5 Download of Arduino IDE

The Arduino IDE is required to upload the Sample Sketch to the Arduino. Download the Arduino IDE from the URL below.
https://www.arduino.cc/en/software

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[Contact]

Mitsumi Electric Co., Ltd.
Semiconductor Division, Design Engineering Department

1601, Sakai, Atsugi-shi, Kanagawa, 243-8533 JAPAN
TEL：046-230-3367
URL：http://www.mitsumi.co.jp/profile/contact.html