

**『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.


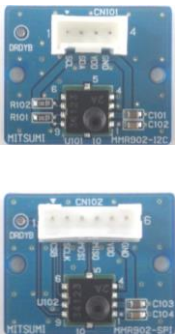
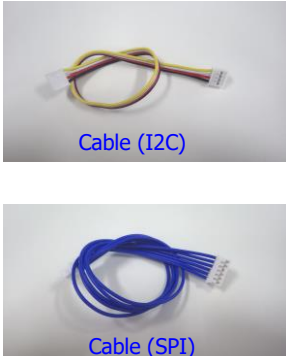

For details on each sensor, refer to the applicable data sheet.

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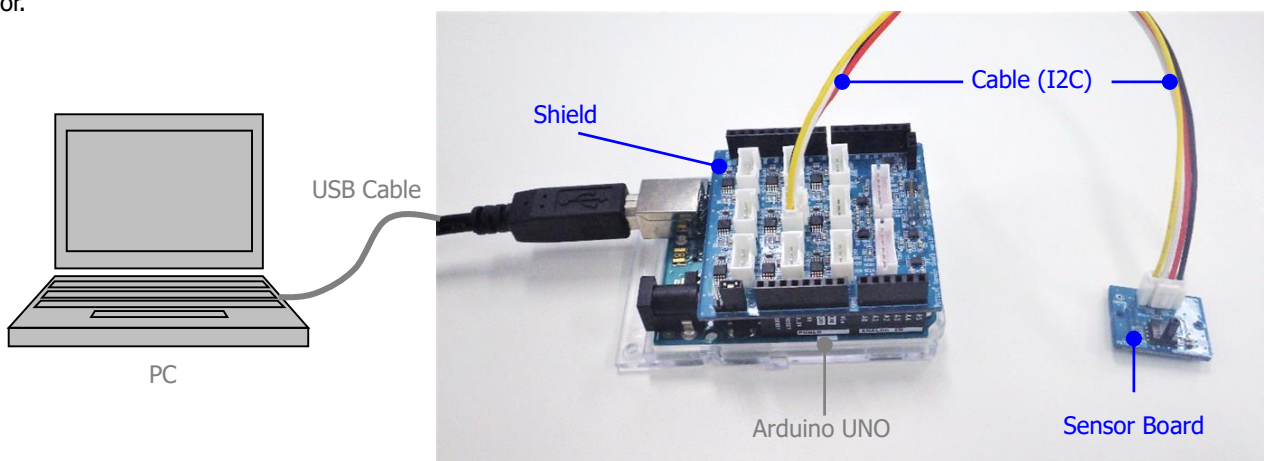
## 1 Configuration

"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
		 <p data-bbox="954 465 1066 495">Cable (I2C)</p> <p data-bbox="963 667 1075 696">Cable (SPI)</p>	


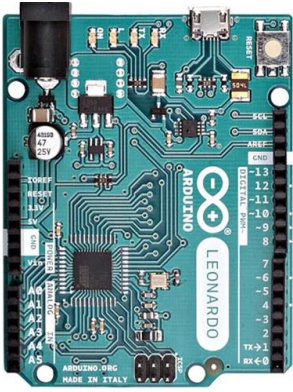


## 2 Usage form

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

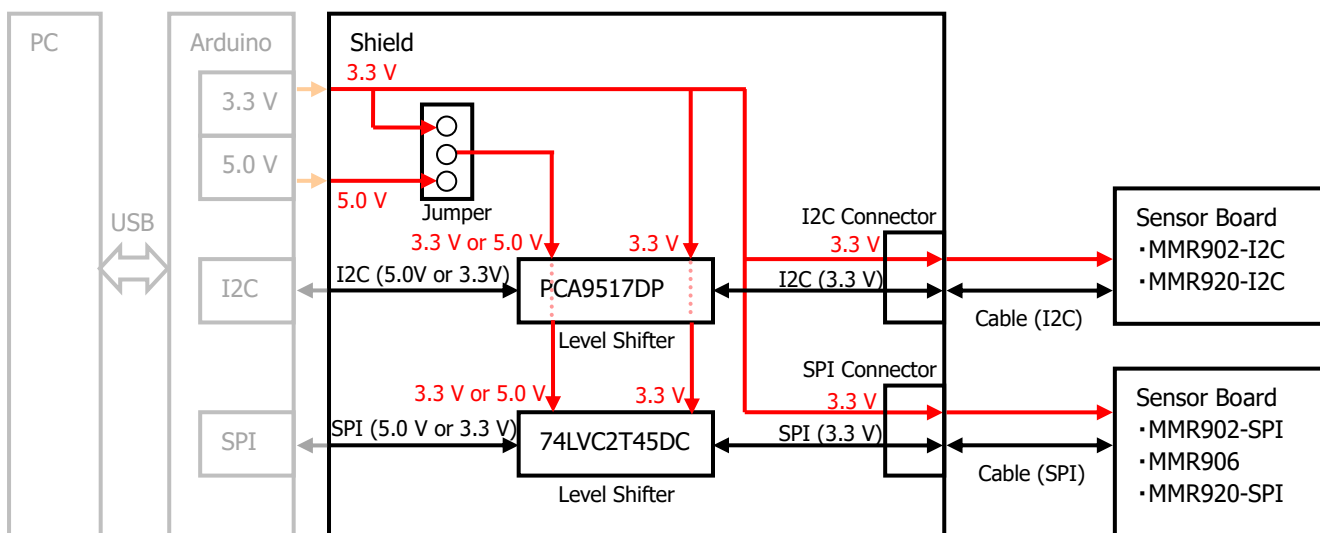


### 3 Compatible Arduino models

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

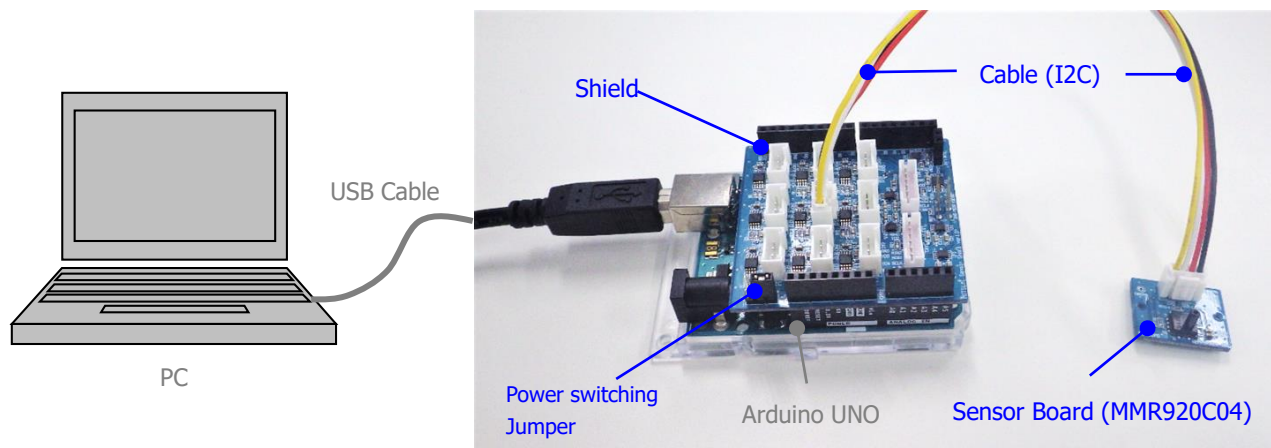
### 4 Block diagram



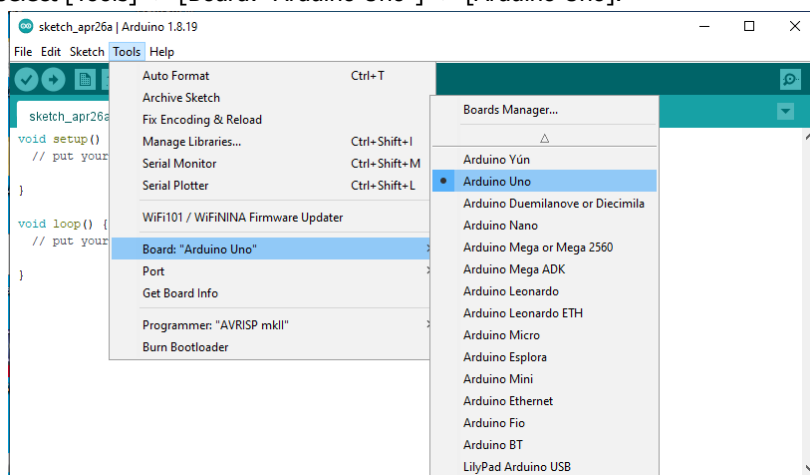
## 5 How to use the Sensor Shield Kit

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

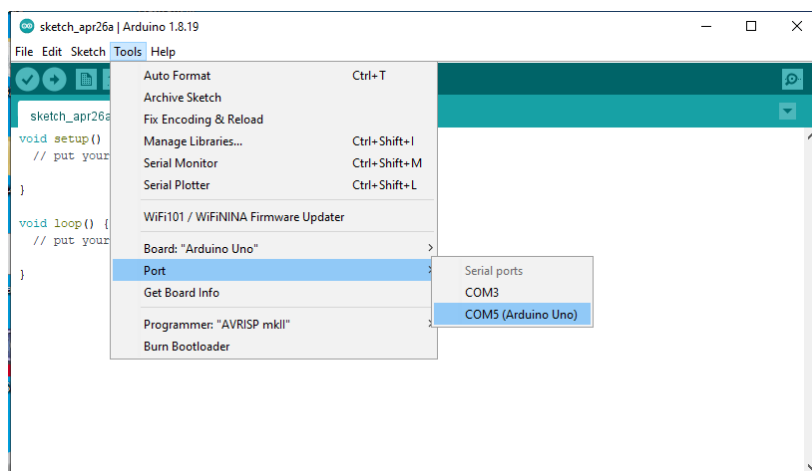
- (1) Connect the Arduino UNO and the Shield.
- (2) Connect the system power switch jumper to 5 V pin.
- (3) Connect I2C connector (CN104) on the Sensor board of MMR920C04 and I2C connector (CN5) on the Shield using an I2C cable.
- (4) Connect the Arduino UNO and the PC using an USB cable.



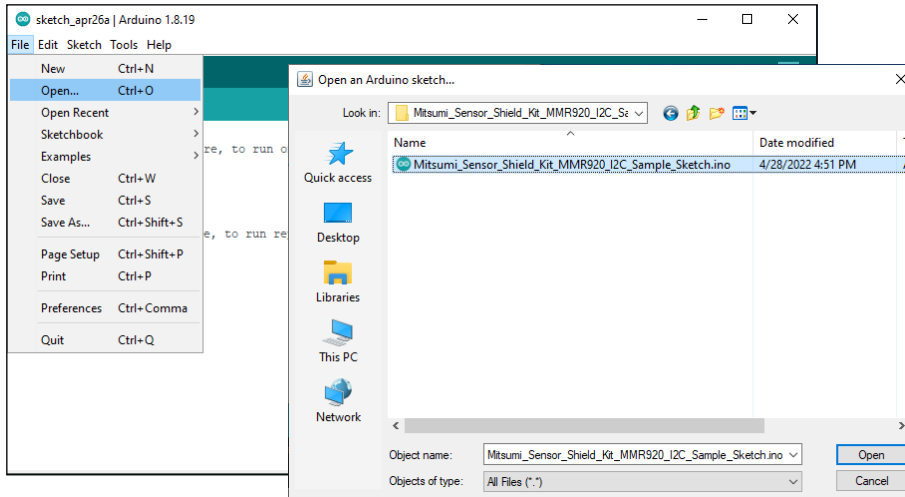
- (5) Launch Arduino IDE.
- (6) Recognize the Arduino UNO on the Arduino IDE.  
Select [Tools] -> [Board: "Arduino Uno"] -> [Arduino Uno].



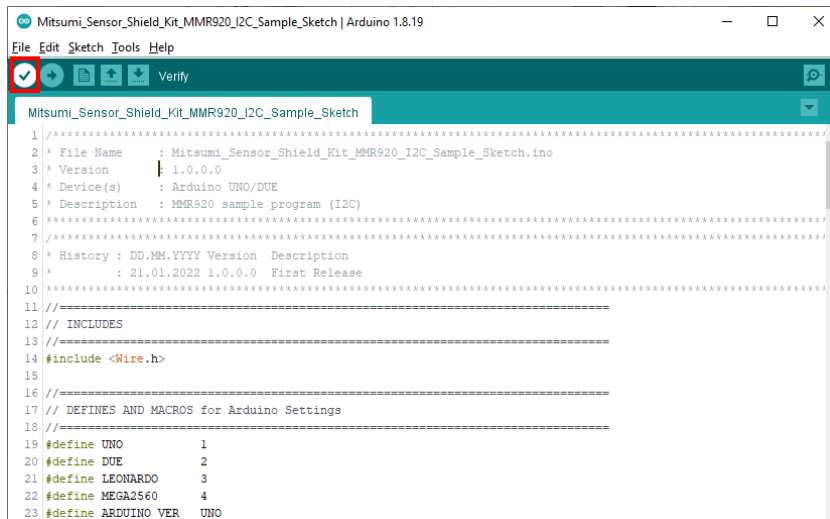
Select [Tools] -> [Port] -> [COMxx (Arduino Uno)].  
The port number (COMxx) differs depending on the PC.



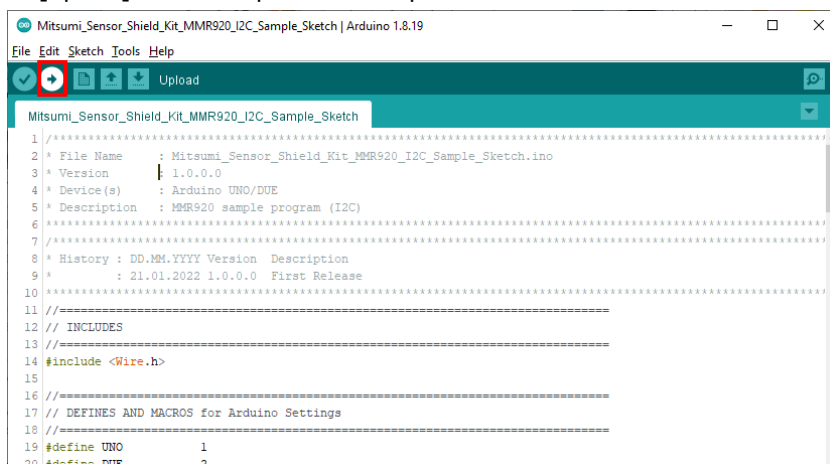
- (7) Open the Sample Sketch on the Arduino IDE.  
 Select [File] -> [Open...] -> [Mitsumi\_Sensor\_Shield\_Kit\_MMR920\_I2C\_Sample\_Sketch.ino].



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

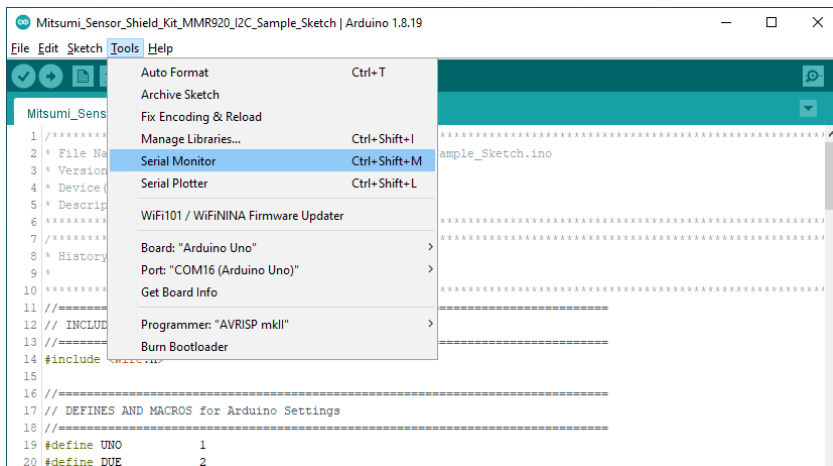


- (9) Upload the Sample Sketch to the Arduino UNO on the Arduino IDE.  
 Click [Upload] button to upload the Sample Sketch.



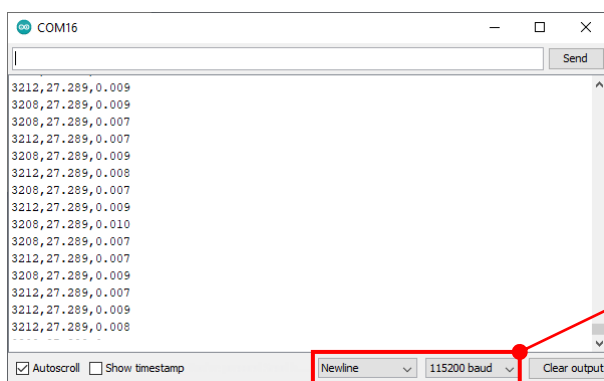


(10) Check the output data on the serial monitor.  
 Select [Tools] -> [Serial Monitor].



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 [cmH2O])



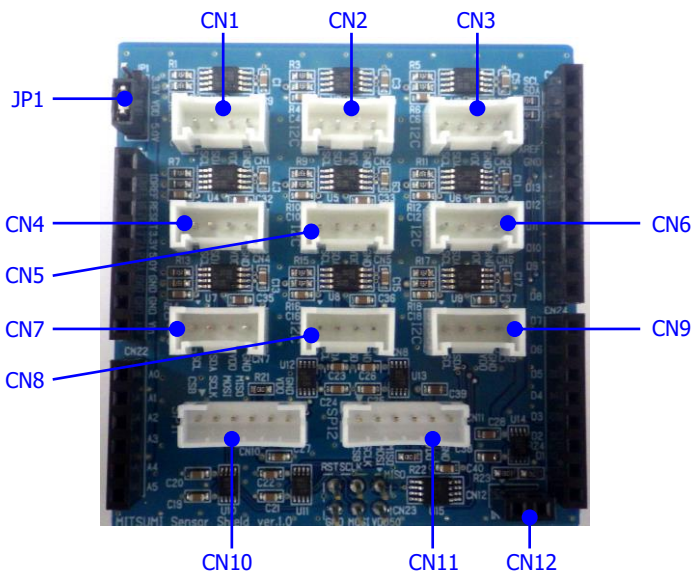
- Delimiter: Newline
- Baud rate: 115200

## 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	<ul style="list-style-type: none"> <li>• During use of UNO, LEONARDO, or MEGA2560 -&gt; Connected to 5.0 V pin.</li> <li>• During use of DUE -&gt; Connected to 3.3 V pin.</li> </ul>
	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

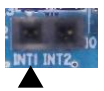
View	Pin	Name	Function	Note
	1	SCL	I2C	Connected to CN25 SCL pin.
	2	SDA		Connected to CN25 SDA pin.
	3	VDD	3.3 V (sensor power supply)	—
	4	GND	Ground	—

CN10, CN11: SPI connector

View	Pin	Name	Function	Note
	1	CSB	SPI	SPI1: Connected to CN24 D7 pin.
	2	SCLK		SPI2: Connected to CN24 D6 pin.
	3	MOSI		Connected to CN23 SCLK pin.
	4	MISO		Connected to CN23 MOSI 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.

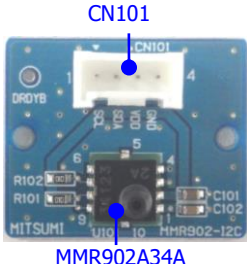
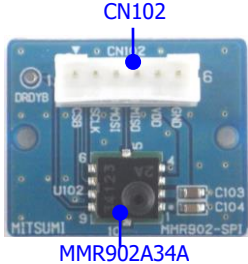
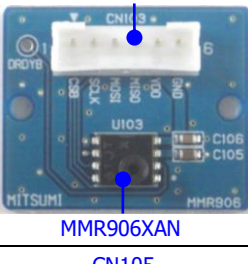
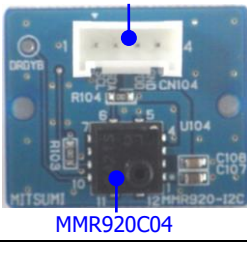
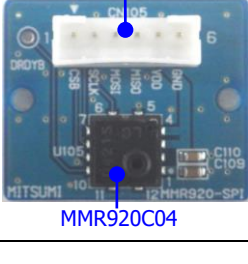
CN12: Interrupt connector

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	 <p>CN101 MMR902A34A</p>	 <p>CN102 MMR902A34A</p>	<ul style="list-style-type: none"> <li>- Digital output gauge pressure sensor</li> <li>- Operating range: 0 to +300 mmHg</li> <li>- Operating range: 0 to +50°C</li> <li>- I2C Address: 0xCA(W)/0xCB(R)</li> <li>- Data Sheet: MMR902A34A_DATASHEET_Rev.0</li> </ul>
MMR906XAN	—	 <p>CN103 MMR906XAN</p>	<ul style="list-style-type: none"> <li>- Digital output gauge pressure sensor</li> <li>- Operating range: -40 to +360 mmHg</li> <li>- Operating range: 0 to +60°C</li> <li>- Data Sheet: MMR906XAN_DATASHEET_Rev.0</li> </ul>
MMR920C04	 <p>CN104 MMR920C04</p>	 <p>CN105 MMR920C04</p>	<ul style="list-style-type: none"> <li>- Digital output micro-pressure sensor</li> <li>- Operating range: -40 to +40 cmH2O</li> <li>- Operating range: 0 to +50°C</li> <li>- I2C Address: 0xCE(W)/0xCF(R)</li> <li>- Data Sheet: MMR920_DATASHEET_Rev.1.1</li> </ul>

### 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	—

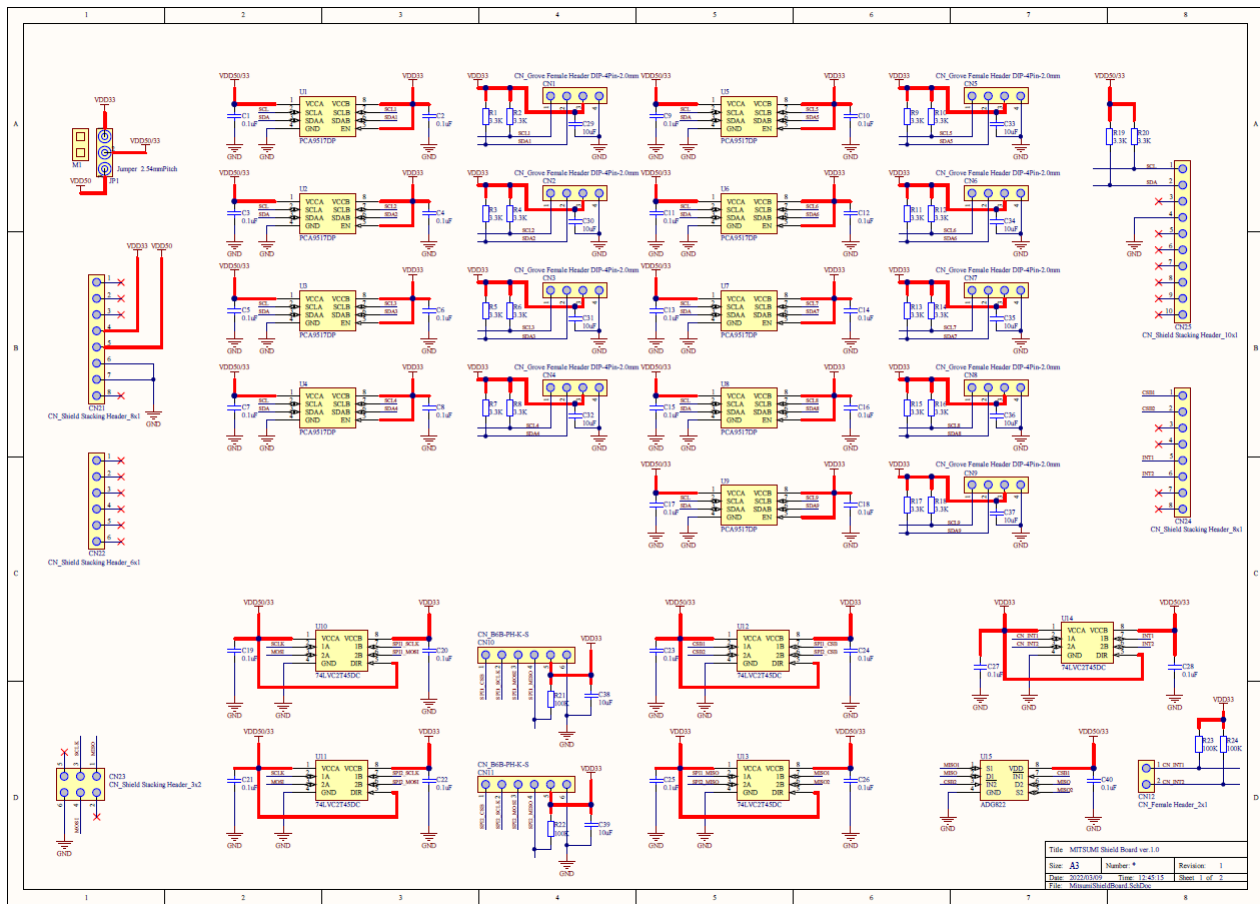
TH: Through-hole

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.

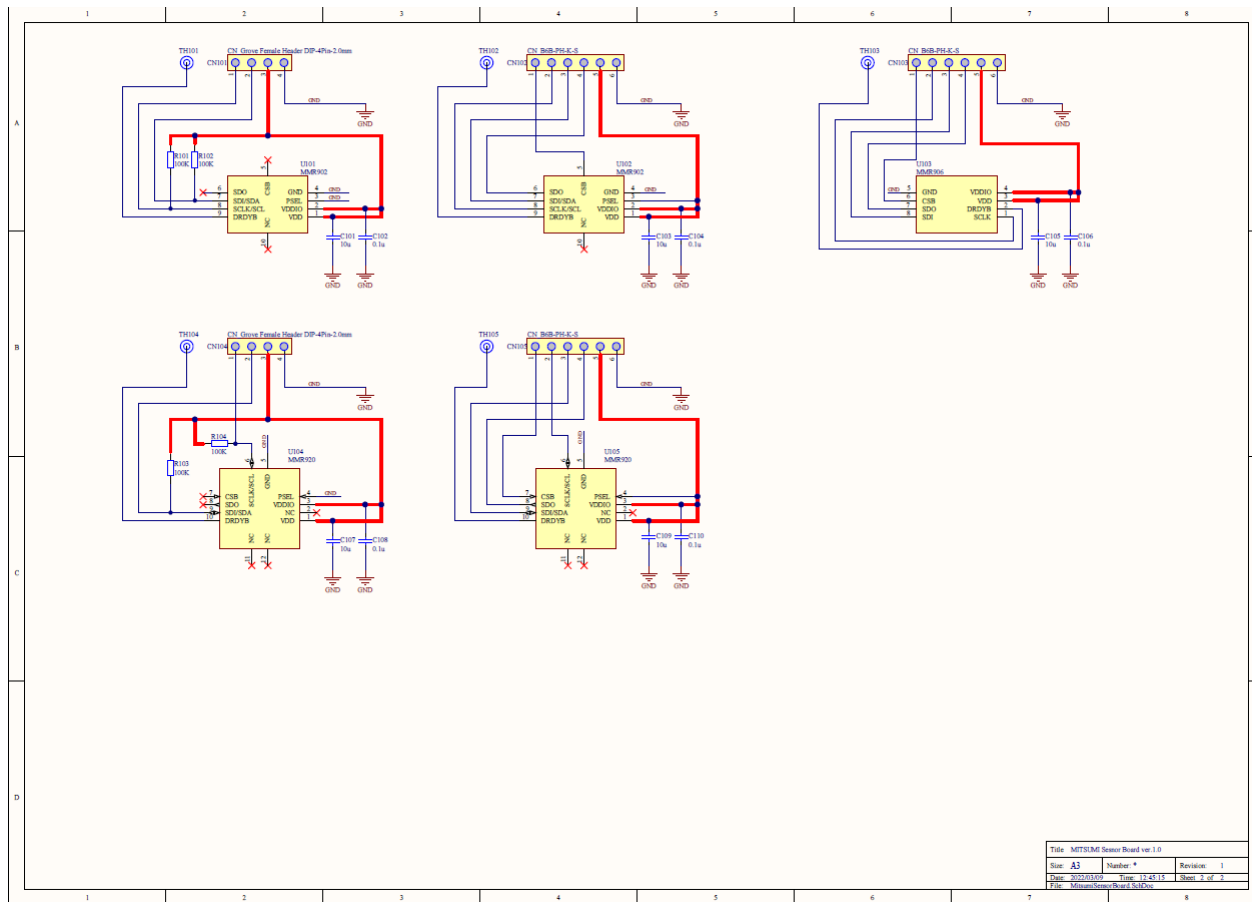


# 8 Schematic Circuit Diagram

## 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.

```

Mitsumi_Sensor_Shield_Kit_MMR902_I2C_Sample_Sketch
1 //*****
2 * File Name      : Mitsumi_Sensor_Shield_Kit_MMR902_I2C_Sample_Sketch.ino
3 * Version       : 1.0.0.0
4 * Device(s)    : Arduino UNO/DUE
5 * Description   : MMR902 sample program (I2C)
6 *****
7 //*****
8 * History      : DD.MM.YYYY Version Description
9 *              : 21.01.2022 1.0.0.0 First Release
10 *****
11 //*****
12 // INCLUDES
13 //*****
14 #include <Wire.h>
15
16 //*****
17 // DEFINES AND MACROS for Arduino Settings
18 //*****
19 #define UNO      1
20 #define DUE     2
21 #define LEONARDO 3
22 #define MEGA2560 4
23 #define ARDUINO_VER UNO

```

- 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.

```

Mitsumi_Sensor_Shield_Kit_MMR902_SPI_Sample_Sketch
1 //*****
2 * File Name      : Mitsumi_Sensor_Shield_Kit_MMR902_SPI_Sample_Sketch.ino
3 * Version       : 1.0.0.0
4 * Device(s)    : Arduino UNO/DUE
5 * Description   : MMR902 sample program (SPI)
6 *****
7 //*****
8 * History      : DD.MM.YYYY Version Description
9 *              : 21.01.2022 1.0.0.0 First Release
10 *****
11 //*****
12 // INCLUDES
13 //*****
14 #include <SPI.h>
15
16 //*****
17 // DEFINES AND MACROS for SPI Connector
18 //*****
19 #define SPI1     1
20 #define SPI2     2
21 #define SPI_SELECT SPI1

```

- For use of CN10 SPI1 connector  
21 | #define SPI\_SELECT SPI1 // select SPI Connector
- For use of CN11 SPI2 connector  
21 | #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.

```

1 //*****
2 * File Name      : Mitsumi_Sensor_Shield_Kit_MMR920_I2C_Sample_Sketch.ino
3 * Version       : 1.0.0.0
4 * Device(s)    : Arduino UNO/DUE
5 * Description   : MMR920 sample program (I2C)
6 *****
7 //*****
8 * History      : DD.MM.YYYY Version  Description
9 *              : 21.01.2022 1.0.0.0  First Release
10 *****
11 //*****
12 // INCLUDES
13 //*****
14 #include <Wire.h>
15
16 //*****
17 // DEFINES AND MACROS for Arduino Settings
18 //*****
19 #define UNO      1
20 #define DUE     2
21 #define LEONARDO 3
22 #define MEGA2560 4
23 #define ARDUINO_VER UNO
24
25 #if(ARDUINO_VER == UNO)
26 #define WIRE Wire
27 #elif(ARDUINO_VER == DUE)
28 #define WIRE_Wire1
29 #endif
30
31 //*****
32 // Conversion data
33 float tempConvData;
34 float pressConvData;
35
36 //*****
37 // Top Separators
38 char sep[2] = ",";
39
40 //*****
41 // Conversion data
42 float tempConvData;
43 float pressConvData;
44
45 //*****
46 // Top Separators
47 char sep[2] = ";";
48
49 //*****
50 // Conversion data
51 float tempConvData;
52 float pressConvData;
53
54 //*****
55 // Top Separators
56 char sep[2] = ";";
57
58 //*****
59 // Conversion data
60 float tempConvData;
61 float pressConvData;
62
63 //*****
64 // Top Separators
65 char sep[2] = ";";
66
67 //*****
68 // Conversion data
69 float tempConvData;
70 float pressConvData;
71
72 //*****
73 // Top Separators
74 char sep[2] = ";";
75
76 //*****
77 // Conversion data
78 float tempConvData;
79 float pressConvData;
80
81 //*****
82 // Top Separators
83 char sep[2] = ";";
84
85 //*****
86 // Conversion data
87 float tempConvData;
88 float pressConvData;
89
90 //*****
91 // Top Separators
92 char sep[2] = ";";
93
94 //*****
95 // Conversion data
96 float tempConvData;
97 float pressConvData;
98
99 //*****
100 // Top Separators
101 char sep[2] = ";";
102
103 //*****
104 // Conversion data
105 float tempConvData;
106 float pressConvData;
107
108 //*****
109 // Top Separators
110 char sep[2] = ";";
111
112 //*****
113 // Conversion data
114 float tempConvData;
115 float pressConvData;
116
117 //*****
118 // Top Separators
119 char sep[2] = ";";
120
121 //*****
122 // Conversion data
123 float tempConvData;
124 float pressConvData;
125
126 //*****
127 // Top Separators
128 char sep[2] = ";";
129
130 //*****
131 // Conversion data
132 float tempConvData;
133 float pressConvData;
134
135 //*****
136 // Top Separators
137 char sep[2] = ";";
138
139 //*****
140 // Conversion data
141 float tempConvData;
142 float pressConvData;
143
144 //*****
145 // Top Separators
146 char sep[2] = ";";
147
148 //*****
149 // Conversion data
150 float tempConvData;
151 float pressConvData;
152
153 //*****
154 // Top Separators
155 char sep[2] = ";";
156
157 //*****
158 // Conversion data
159 float tempConvData;
160 float pressConvData;
161
162 //*****
163 // Top Separators
164 char sep[2] = ";";
165
166 //*****
167 // Conversion data
168 float tempConvData;
169 float pressConvData;
170
171 //*****
172 // Top Separators
173 char sep[2] = ";";
174
175 //*****
176 // Conversion data
177 float tempConvData;
178 float pressConvData;
179
180 //*****
181 // Top Separators
182 char sep[2] = ";";
183
184 //*****
185 // Conversion data
186 float tempConvData;
187 float pressConvData;
188
189 //*****
190 // Top Separators
191 char sep[2] = ";";
192
193 //*****
194 // Conversion data
195 float tempConvData;
196 float pressConvData;
197
198 //*****
199 // Top Separators
200 char sep[2] = ";";
201
202 //*****
203 // Conversion data
204 float tempConvData;
205 float pressConvData;
206
207 //*****
208 // Top Separators
209 char sep[2] = ";";
210
211 //*****
212 // Conversion data
213 float tempConvData;
214 float pressConvData;
215
216 //*****
217 // Top Separators
218 char sep[2] = ";";
219
220 //*****
221 // Conversion data
222 float tempConvData;
223 float pressConvData;
224
225 //*****
226 // Top Separators
227 char sep[2] = ";";
228
229 //*****
230 // Conversion data
231 float tempConvData;
232 float pressConvData;
233
234 //*****
235 // Top Separators
236 char sep[2] = ";";
237
238 //*****
239 // Conversion data
240 float tempConvData;
241 float pressConvData;
242
243 //*****
244 // Top Separators
245 char sep[2] = ";";
246
247 //*****
248 // Conversion data
249 float tempConvData;
250 float pressConvData;
251
252 //*****
253 // Top Separators
254 char sep[2] = ";";
255
256 //*****
257 // Conversion data
258 float tempConvData;
259 float pressConvData;
260
261 //*****
262 // Top Separators
263 char sep[2] = ";";
264
265 //*****
266 // Conversion data
267 float tempConvData;
268 float pressConvData;
269
270 //*****
271 // Top Separators
272 char sep[2] = ";";
273
274 //*****
275 // Conversion data
276 float tempConvData;
277 float pressConvData;
278
279 //*****
280 // Top Separators
281 char sep[2] = ";";
282
283 //*****
284 // Conversion data
285 float tempConvData;
286 float pressConvData;
287
288 //*****
289 // Top Separators
290 char sep[2] = ";";
291
292 //*****
293 // Conversion data
294 float tempConvData;
295 float pressConvData;
296
297 //*****
298 // Top Separators
299 char sep[2] = ";";
300
301 //*****
302 // Conversion data
303 float tempConvData;
304 float pressConvData;
305
306 //*****
307 // Top Separators
308 char sep[2] = ";";
309
310 //*****
311 // Conversion data
312 float tempConvData;
313 float pressConvData;
314
315 //*****
316 // Top Separators
317 char sep[2] = ";";
318
319 //*****
320 // Conversion data
321 float tempConvData;
322 float pressConvData;
323
324 //*****
325 // Top Separators
326 char sep[2] = ";";
327
328 //*****
329 // Conversion data
330 float tempConvData;
331 float pressConvData;
332
333 //*****
334 // Top Separators
335 char sep[2] = ";";
336
337 //*****
338 // Conversion data
339 float tempConvData;
340 float pressConvData;
341
342 //*****
343 // Top Separators
344 char sep[2] = ";";
345
346 //*****
347 // Conversion data
348 float tempConvData;
349 float pressConvData;
350
351 //*****
352 // Top Separators
353 char sep[2] = ";";
354
355 //*****
356 // Conversion data
357 float tempConvData;
358 float pressConvData;
359
360 //*****
361 // Top Separators
362 char sep[2] = ";";
363
364 //*****
365 // Conversion data
366 float tempConvData;
367 float pressConvData;
368
369 //*****
370 // Top Separators
371 char sep[2] = ";";
372
373 //*****
374 // Conversion data
375 float tempConvData;
376 float pressConvData;
377
378 //*****
379 // Top Separators
380 char sep[2] = ";";
381
382 //*****
383 // Conversion data
384 float tempConvData;
385 float pressConvData;
386
387 //*****
388 // Top Separators
389 char sep[2] = ";";
390
391 //*****
392 // Conversion data
393 float tempConvData;
394 float pressConvData;
395
396 //*****
397 // Top Separators
398 char sep[2] = ";";
399
400 //*****
401 // Conversion data
402 float tempConvData;
403 float pressConvData;
404
405 //*****
406 // Top Separators
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1561
1562 //*****
1563 // Conversion data
1563 float tempConvData;
1564 float pressConvData;
1564
1565 //*****
1566 // Top Separators
1567 char sep[2] = ";";
1568
1569 //*****
1570 // Conversion data
157
```

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