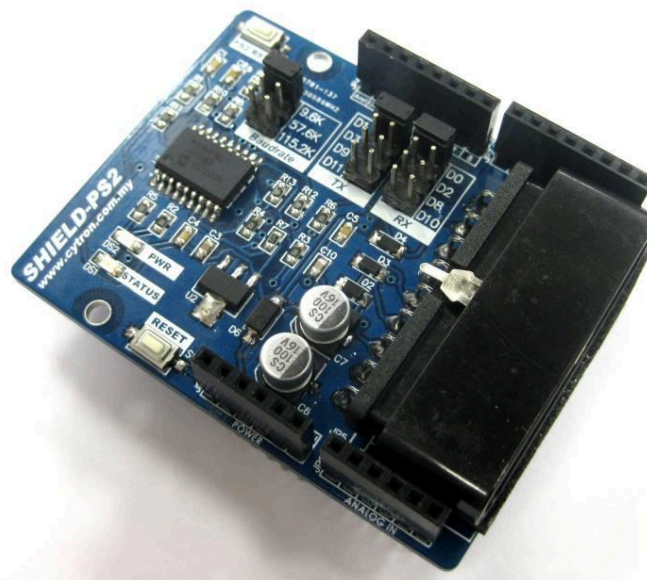




## Shield-PS2

### Cytron PS2 Shield



## User's Manual

### V1.0

### September 2013

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## **1.0 INTRODUCTION AND OVERVIEW**

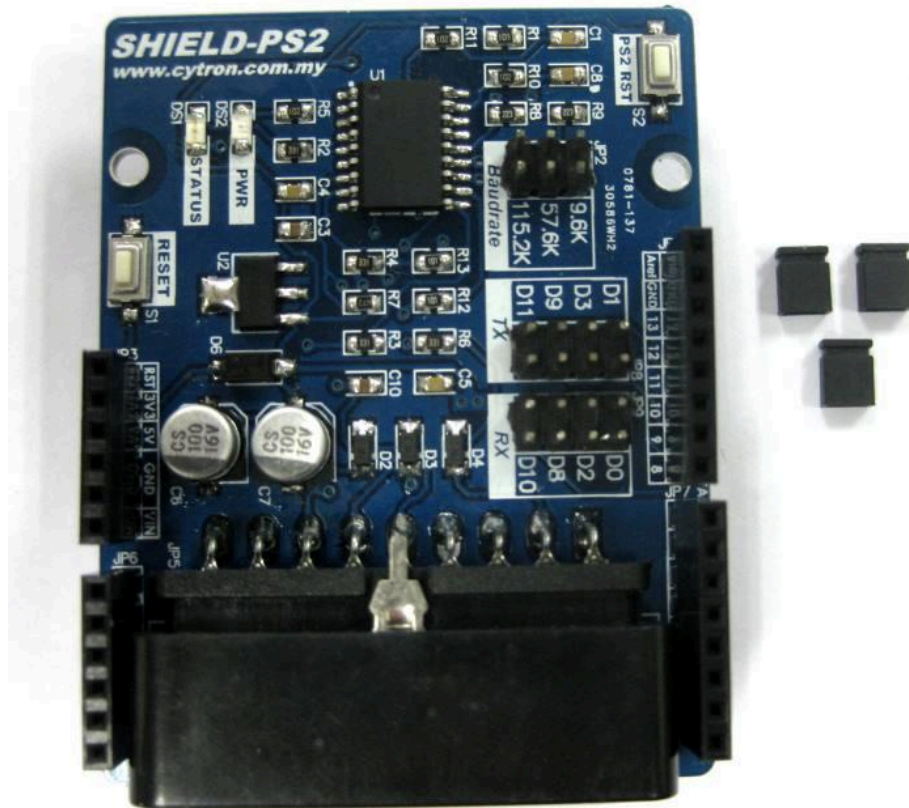
Cytron PS2 Shield ([SHIELD-PS2](#)) is an Arduino compatible shield which is compatible with [Arduino UNO](#), [Arduino Duemilanove](#), [Arduino Mega](#), Arduino [Leonardo](#) and possibly other pin compatible main boards. Cytron PS2 Shield offers a compact yet reliable PS2 Controller Converter for user. Cytron PS2 Shield is powered from Arduino main board. with Cytron PS2 Shield Reading Joy-stick and button's state of PS2 controller will be as easy as reading UART data. It offers a standard connector for SONY PS2 controller to plug-in, either [wired](#) or [wireless](#).

Shield-PS2 has stackable side headers which allows for more Arduino shields to be stacked on top of it. Besides, user has option to use either **hardware or software UART** with Arduino's main board to communication to get the PS2 controller status. Shield-PS2 reset is connected to arduino's analog pin 1 (A1). User can pull down this analog pin to reset the shield.

### Features:

- 5V powered, low current consumption.
- Simple to use UART protocol
- Vibrator motor on PS2 is controllable.
- Wired and Wireless PS2 controller is supported.
- PS2 Controller will automatically operate in analog mode.
- A status LED
- Jumper selector to select different UART Baud Rate (4800, 9600, 57600, 115200).
- Jumper selectors to select different digital pin as UART TX and RX pin.

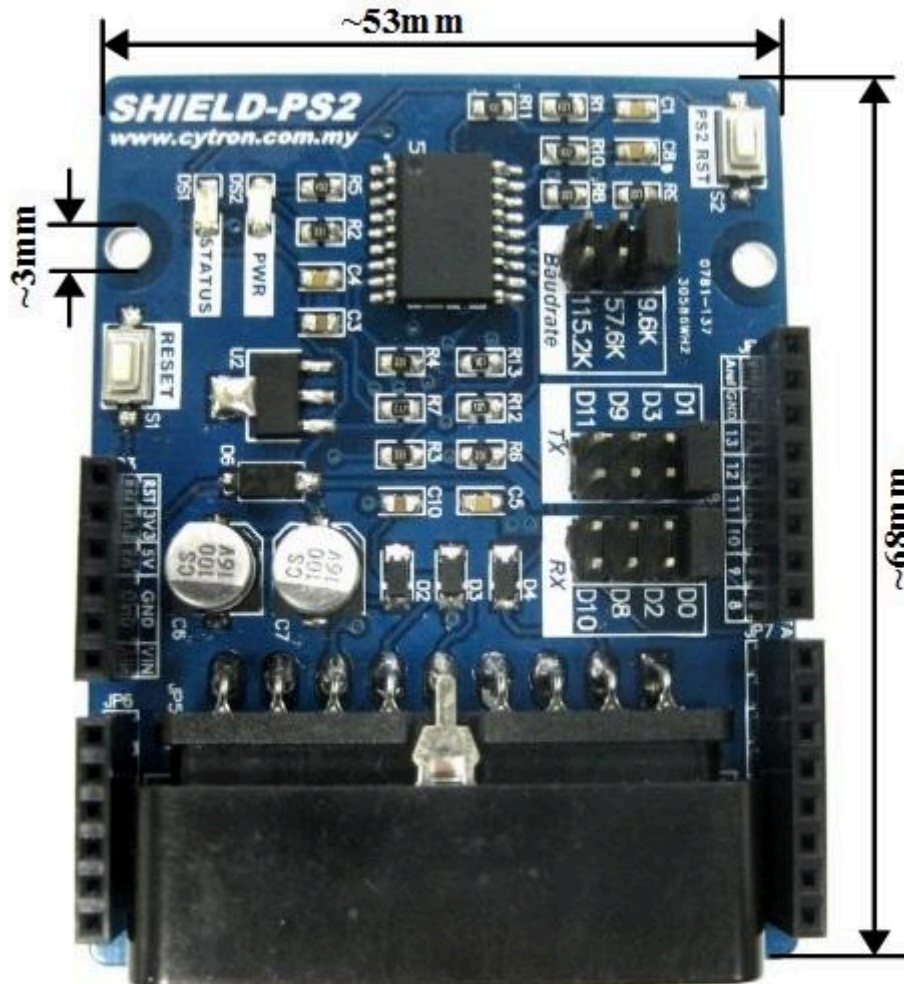
## 2.0 PACKING LIST



1. 1 x [Shield-PS2](#)
2. 3 x [mini jumper](#)
3. User's manual, and sample source code can be downloaded from <http://www.cytron.com.my>.

### 3.0 PRODUCT SPECIFICATION AND LIMITATIONS

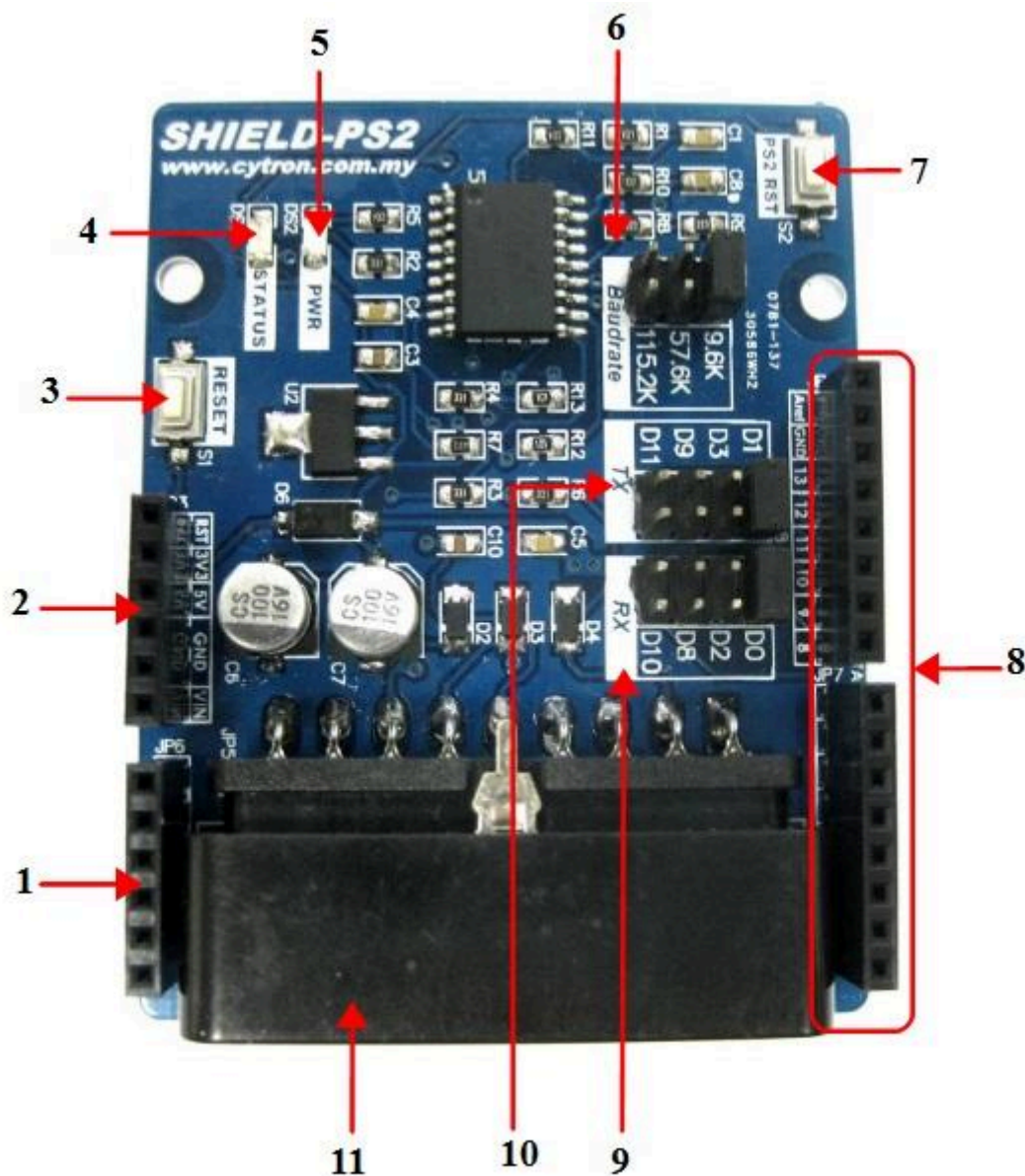
#### Dimensions



No	Parameters	Min	Typical	Max	Unit
1	Input Voltage (Logic Operation Voltage)	4.5	-	5.5	V
2	Current Consumption	100	150	500	mA
3	$V_{IOH}$ (Logic Input – High Level)	3.5	5.0	5.5	V
4	$V_{IOL}$ (Logic Input – Low Level)	0	0	1.0	V



## 4.0 PRODUCT LAYOUT



Components on Shield-PS2 and their functions:

- 1. Stackable Analog Input Header**  
This is the analog port of the Arduino. The stackable header allows other stacked shield to utilize these pins.
- 2. Stackable Power Pins Header**  
This is the power port of the Arduino. The stackable header allows other stacked shield to utilize these pins.
- 3. Main Board reset button**  
Arduino main board will require around 30ms to ready after reset.

**4. Status indicator LED (Orange)**

This LED will blink and illuminate with different brightness depending on the PS2 status.

LED Condition	Description
Blink with different brightness	Once power up, if there is no SONY PS2 controller connected or detected.
Stay illuminated with low brightness	SONY PS2 controller detected and communication is working fine.
Stay illuminated with high brightness	Digital button on SONY PS2 controller is pressed.

**5. Power indicator LED (Green)**

Indicator to shows that power is supplied to Cytron PS2 Shield.

**6. Baud Rate selector**

To select the preferable UART baud rate For Cytron PS2 Shield to obtain latest baudrate from selector, Shield-PS2 need to be reset to update the board's baud rate.

**7. On board Cytron PS2 Shield reset button**

PS2 RST button will only reset the SHIELD-PS2 but not the Arduino Main board.

**8. Stackable Digital I/O Headers**

JP4 and JP7 are Digital I/O pins stacked to the Arduino main board.

**9. RX Pin Selector**

User may select D0, D2, D8 or D10 as the RX pin from Arduino main board with the mini jumper. If Arduino UNO or Mega is used, recommended to move the RX pin selector to D2, D8 or D10 as D0 is used for bootloader (loading program).

**10. TX Pin Selector**

User may select D1, D3, D9 or D11 as the TX pin from Arduino main board with the mini jumper. If Arduino UNO or Mega is used, recommended to move the TX pin selector to D3, D9 or D11 as D1 is used for bootloader (loading program).

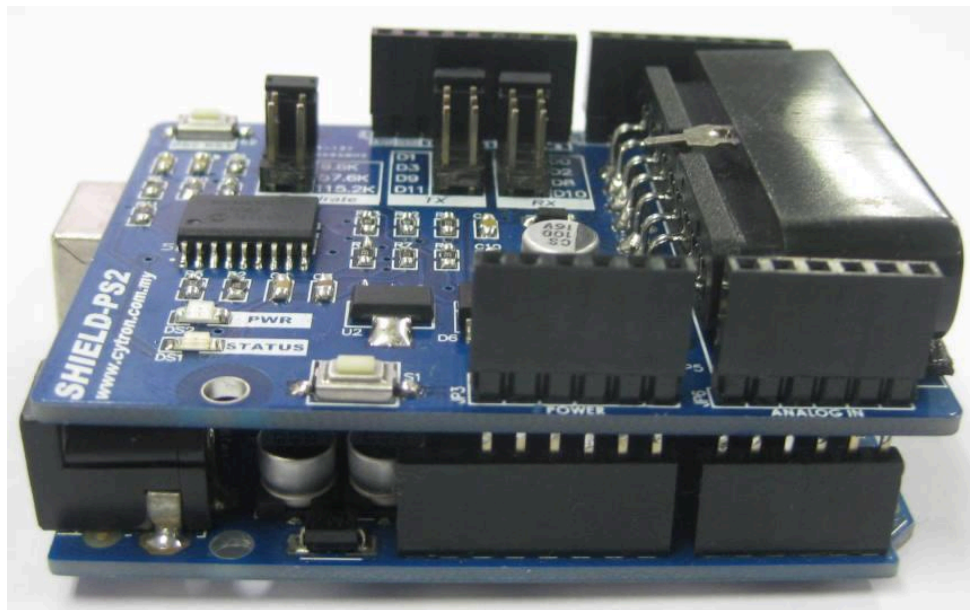
**11. SONY PS2 Connector Socket**

Please connect PS2 Controller plug here, wireless or wired.

## 5.0 HARDWARE INTERFACE

This section shows the example of using SHIELD-PS2 with Arduino UNO as the main controller. However, other Arduino main board such as Arduino Duemilanove and Arduino Mega can also be used.

Figure below shows that the SHIELD-PS2 is stacked on the Arduino UNO. Please ensure that the pins alignment is correct.



Select the pins for UART's TX and RX. Pin D0 and D1 are **hardware serial** of most arduino main board. Other selectable pin for TX and RX on Shield-PS2 are software serial pin. The default TX pin is set to D3 while the RX pin is set to D2. However, other pins may be selected if these pins are already used by other application. If hardware serial pin (D0, D1) is selected, user needs to **unplug** the **PS2 Connector** from the Shield-PS2 before start to program the main board. Programming of main board may fail if the Shield-PS2 is stacked on mainboard and PS2 controller connector is connected. Select desired baudrate for Shield-PS2 using the mini jumper.

Guideline to choose pin for software serial:

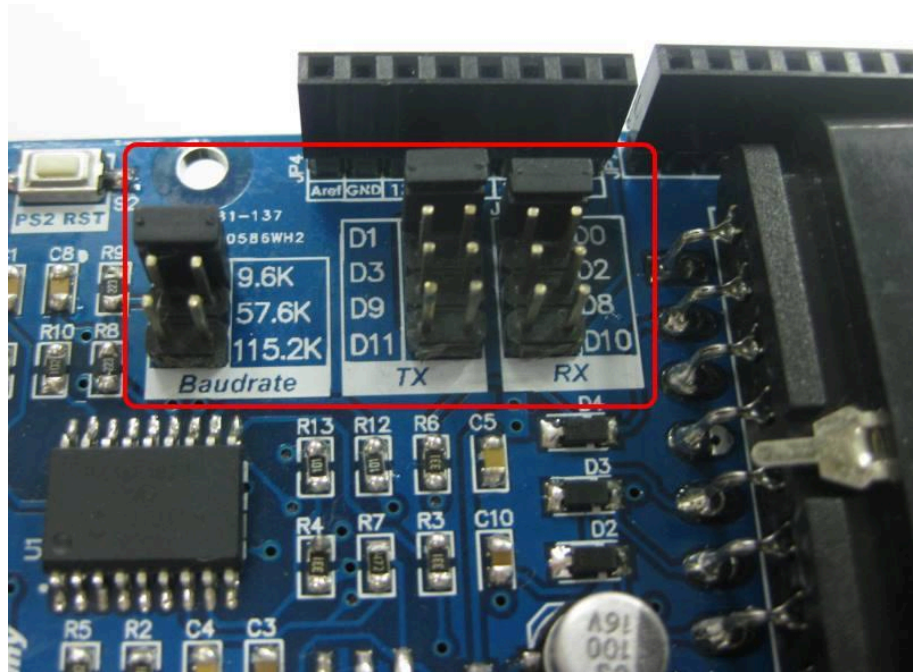
*Not all pins on the Mega and Mega 2560 support change interrupts, so only the following can be used for RX:*

*10, 11, 12, 13, 50, 51, 52, 53, 62, 63, 64, 65, 66, 67, 68, 69*

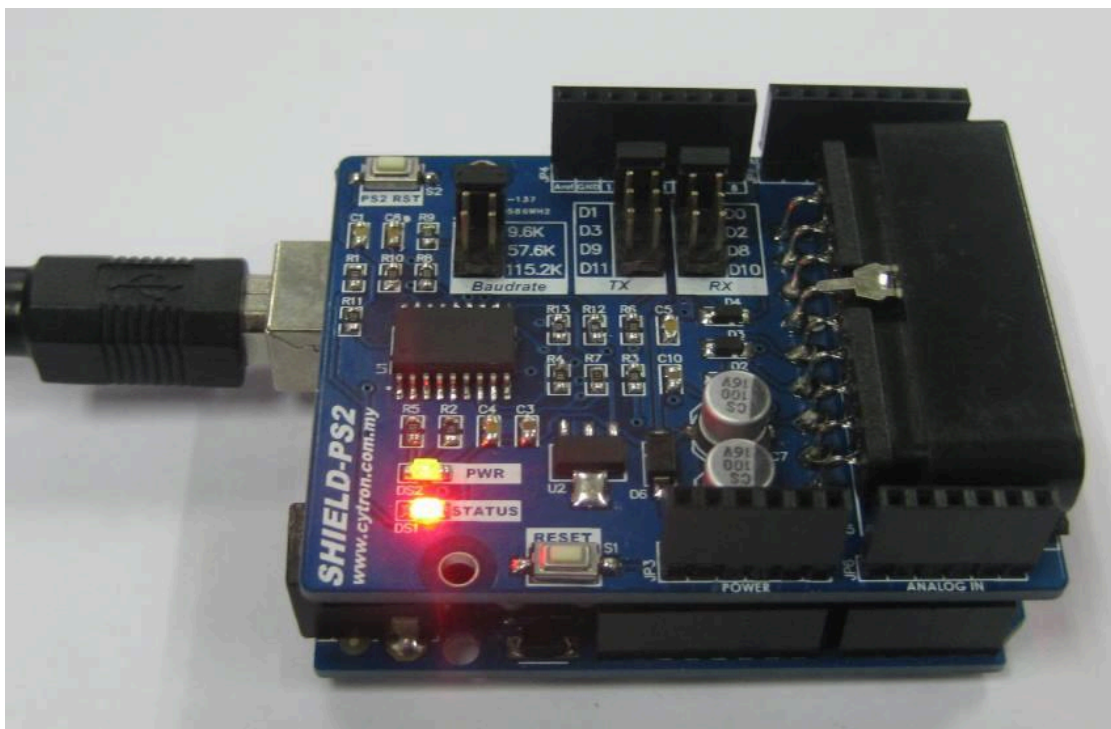
*Not all pins on the Leonardo support change interrupts, so only the following can be used for RX:*

*8, 9, 10, 11, 14 (MISO), 15 (SCK), 16 (MOSI).*

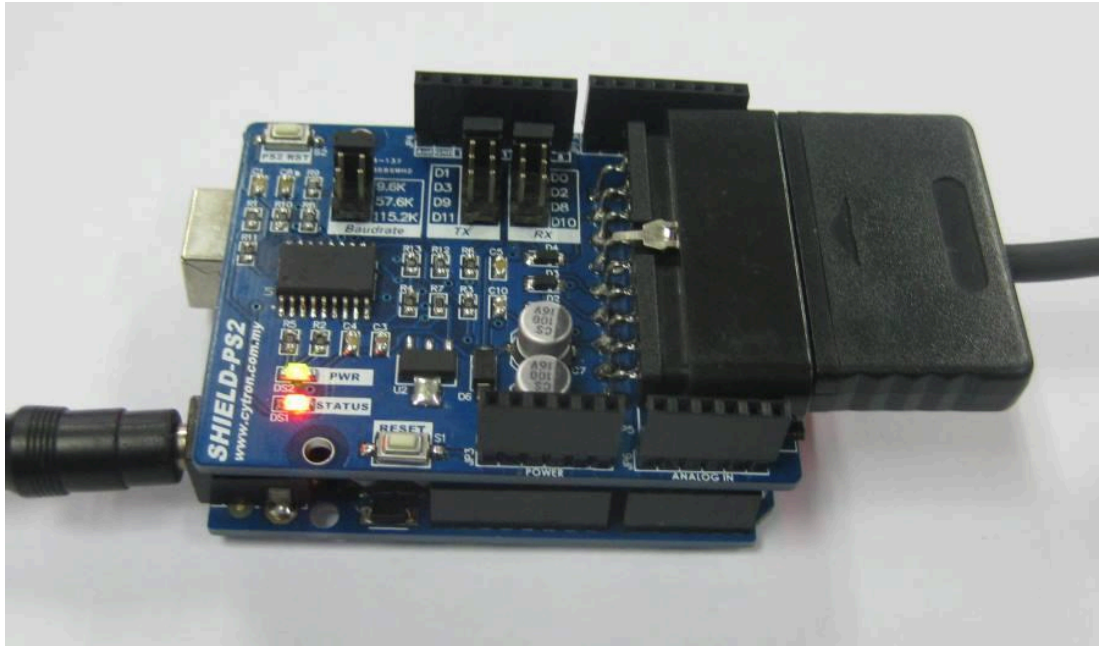




USB cable to Arduino main board and load example code. Sample source code and Arduino's Library can be downloaded from the [SHIELD-PS2 product page](#) at Cytron's website.



Connect the PS2 joystick to the PS2 connector socket on SHIELD-PS2 as shown. Don't forget about the power source for the Arduino main board too. Power source for the Arduino main board is from DC adaptor plug.



### 5.1 Choose SONY PS2 DualShock Controller

There are many types of PS2 controller in the market with different sensitivity. User are free to choose any type of them. However, it is advised to use the PS2 controller from Cytron Technologies. We do not guarantee the compatibility for all PS2 controllers from other sources. You can check the PS2 controller that are available in our store [here](#).

No modification is needed to connect to PS2 shield.



Wired PS2 Controller

### RF Wireless Joypad Controller for PS / PS2



Wireless PS2 Controller



Figure below shows the digital buttons and analog joystick on a typical PS2 controller.



The analog value of Left Joystick and Right Joystick can be read from shield-PS2 too. Each joystick have 2 axes, and there are two formats of output. These formats will be explained later. User may choose format 1 or format 2.

**NOTE:**

SONY PS2 controller does not come with PS2 Shield, please purchase separately from Cytron Technologies website. It is advised to use PS2 controller from Cytron Technologies because all PS2 controller is tested before it is being shipped to customer.

### Analog output format 1:

There are 2 variables for each joystick, axis X and axis Y, this is what we commonly use in graph drawing. On PS2 joystick, as example, when user push the joystick up or down, the Y axis will change. Meanwhile if user push the joystick left or right, the value of X axis will change.

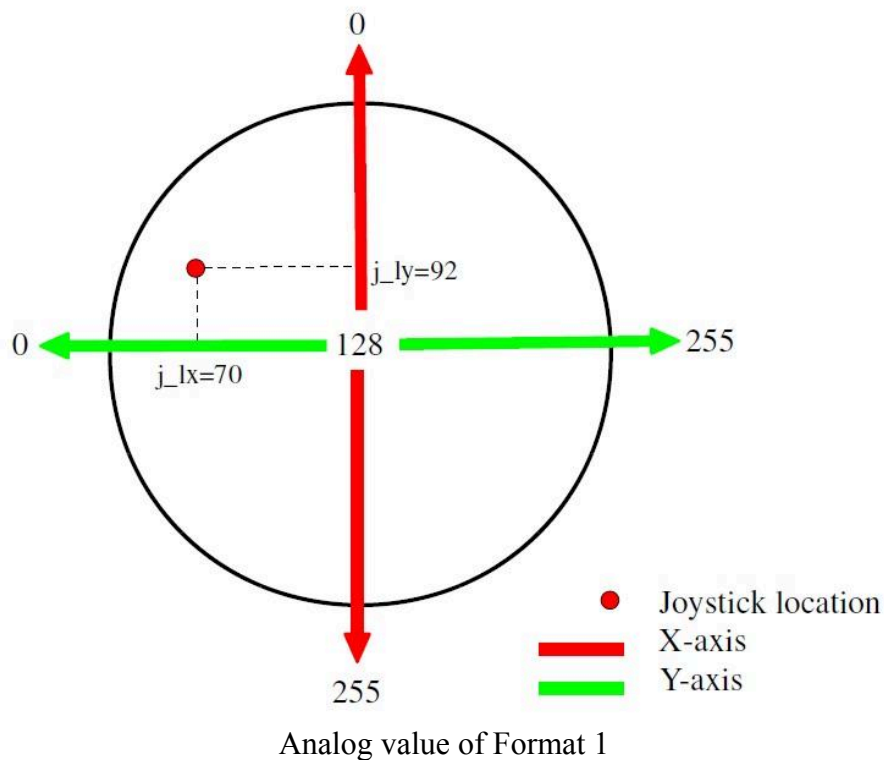
Y Axis:

- Middle (neutral), value is 128
- Push up, value change from 128 to 0
- Push down, value change from 128 to 255.

X Axis:

- Middle(neutral, value is 128
- Push towards left, value change from 128 to 0
- Push towards right, value change from 128 to 255

Left joystick have X axis and Y axis, Right joystick also have its own X and Y axis.



Taking an example, let's say the left joystick is being push to the position shown in the figure. It is being push to left top corner. The value of left joystick will change will should get approximately:

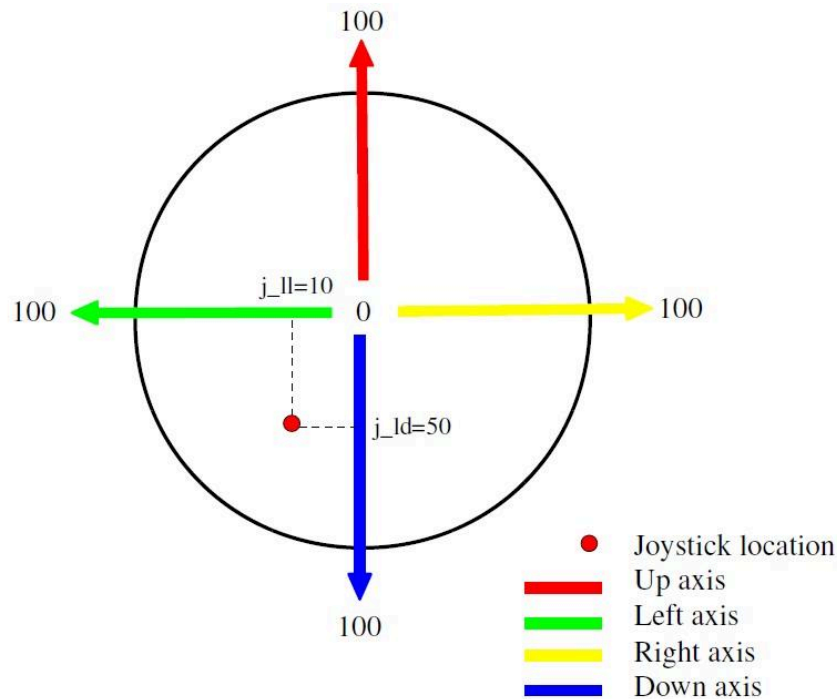
- $j\_lx = 70$
- $j\_ly = 92$

This is just an example, we notice a lot of PS2 joystick do not provide linear analog value across the range. There is a big dead zone near the middle position where analog value does not change. User is required to “play” around with the joystick.



### Analog output format 2:

In format 2, there are four variables for each joystick. The four variables are up, down, left and right. When user move the joystick in any direction, the value of these four variables change from 0 to 100. Left and Right joystick will have 4 independent variables.



Analog value of Format 2

Taking an example, let's say the left joystick is being pushed to the position shown in the figure. It is being push to left down corner. The value of left joystick will change will should get approximately:

- j\_ll = 10
- j\_ld = 50

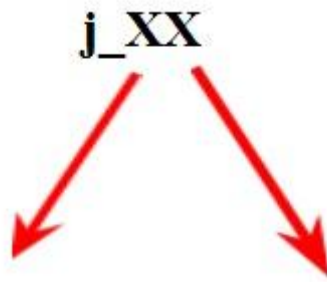
You can choose whichever format to use by sending particular command to PS2 Shield.

Please do take note that the the format 1 variables are:

- j\_lx - Left joystick, X axis
- j\_ly - Left joystick, Y axis
- j\_rx - Right joystick, X axis
- j\_ry - Right joystick, Y axis

Format 2 variables are:

- j\_lu - Left joystick, up axis
- j\_ld - Left joystick, down axis
- j\_ll - Left joystick, left axis
- j\_lr - Left joystick, right axis
- j\_ru - Right joystick, up axis
- j\_rd - Right joystick, down axis
- j\_rl - Right joystick, left axis
- j\_rr - Right joystick, right axis



l - mean Left joystick r - mean Right joystick	x - mean X axis, format 1, range 0 to 255 y - mean Y axis, format 1, range 0 to 255 u - mean Up axis, format 2, range 0 to 100 d - mean Down axis, format 2, range 0 to 100 l - mean Left axis, format 2, range 0 to 100 r - mean Right axis, format 2, range 0 to 100
---	---

## 6. PROTOCOL

By default, Shield-PS2 is in passive condition, where it waits for command from UART. If Arduino main board sends a command, it will response based on the command and the status of PS2 button and joystick. The command is simple, it is in value. Each value will request Shield-PS2 to check the particular button or joystick status on PS2 and response.

### 6.1 PS2 Button and Joystick Status

Send (decimal)	Button on PS2	Description
0	Select button	<p><b>Applied to value 0 to 15 (decimal):</b> Shield-PS2 will return the status of corresponding button when the particular decimal value is received  <b>0</b> if the button is pressed  <b>1</b> if button is not pressed</p> <p><b>Example:</b> If main board sent 10 (decimal), Shield-PS2 will check L1 button status on PS2 Controller.</p> <p>Shield-PS2 will return:  <b>0</b> if L1 button is pressed or  <b>1</b> if L1 is not pressed.</p>
1	left joystick centre button	
2	right joystick centre button	
3	START button	
4	up button	
5	right button	
6	down button	
7	left button	
8	L2 button	
9	R2 button	
10	L1 button	
11	R1 button	
12	triangle button	
13	circle button	
14	cross button	
15	square button	
16	left joystick x-axis	
17	left joystick y-axis	
18	right joystick x-axis	

19	right joystick y-axis	<p><b>Applied to value from 16 to 27 (decimal):</b> Shield-PS2 will return the particular value of corresponding joystick in the selected axis</p> <p><b>Example :</b> If main board sent <b>20</b> (decimal), Shield-PS2 will read and return the value of left joystick up.</p>
20	left joystick up value	
21	left joystick down value	
22	left joystick left value	
23	left joystick right value	
24	right joystick up value	
25	right joystick down value	
26	right joystick left value	
27	right joystick right value	
28	Return the connection status of PS2 controller on Shield-PS2	Shield-PS2 will read PS2 controller status <b>1</b> is returned if controller is detected or connected to the PS2 connector on Shield-PS2

## 6.2 On board Vibrator Motor Control

Following commands require two bytes of data send from main board. 1st byte to indicates which vibrator motor, following byte (2nd byte) to indicator motor status or the speed.

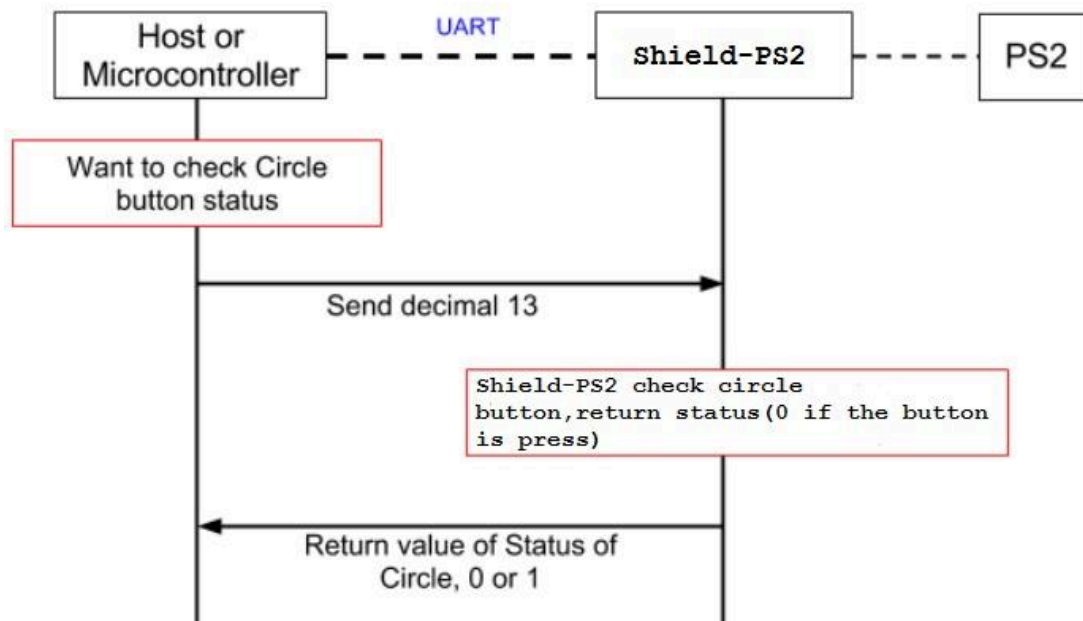
send 1st byte (decimal)	send 2nd byte (decimal)	Controller	Description
29	motor1 value	smaller vibrator on right	motor1 = 1 (motor on) motor1 = 0 (motor off)
30	motor2 value	bigger vibrator on left	motor2 = 0 to 255 (adjustable speed)

### 6.3 All PS2 Button and Joystick Status

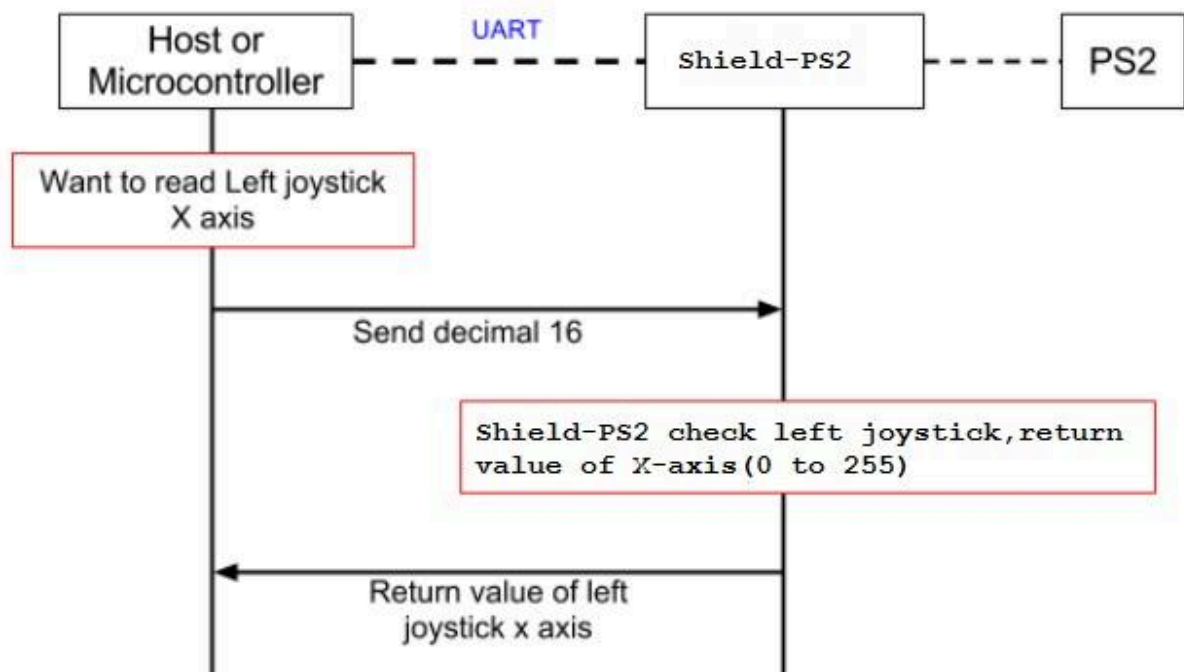
Send (decimal)	Response from PS2	Description
31	<p><b>6 bytes of data:</b>  1st byte: digital button group 1  2nd byte: digital button group 2  3rd byte: Right Joystick X axis  4th byte: Right Joystick Y axis  5th byte: Left Joystick X axis  6th byte: Left Joystick Y axis</p>	<p>Shield-PS2 will return the status of all digital and analog joystick of PS2</p> <p><b>Digital group 1:</b>  bit 7 (MSB): Left button  bit 6: Down button  bit 5: Right button  bit 4: Up button  bit 3: Start button  bit 2: Right Joystick Center button  bit 1: Left Joystick Center button  bit 0 (LSB): Select button</p> <p><b>Digital group 2:</b>  bit 7 (MSB): Square button  bit 6: Cross button  bit 5: Circle button  bit 4: Triangle button  bit 3: R1 button  bit 2: L1 button  bit 1: R2 button  bit 0 (LSB): L2 button</p> <p><b>0</b> if the button is pressed  <b>1</b> if button is not pressed</p> <p><b>Example:</b>  If microcontroller sent <b>31</b> (decimal), Shield-PS2 will check all the button and joystick status and return 6 bytes to microcontroller.</p>



Examples:



Example of UART communication shows main board obtain the Circle button of PS2



Example of UART communication shows mainboard obtain the Left joystick, X axis value of PS2

## 7.0 WARRANTY

- Product warranty is valid for 12 months.
- Warranty only applies to manufacturing defect.
- Damaged caused by misuse is not covered under warranty
- Warranty does not cover freight cost for both ways.

*Prepared by:*

***Cytron Technologies Sdn. Bhd.***

No. 16, Jalan Industri Ringan Permatang Tinggi 2,  
Kawasan Industri Ringan Permatang Tinggi,  
14100 Simpang Ampat,  
Penang, Malaysia.

*Tel:* +604 - 504 1878

*Fax:* +604 - 504 0138

*URL:* [www.cytron.com.my](http://www.cytron.com.my)

*Email:* [support@cytron.com.my](mailto:support@cytron.com.my)  
[sales@cytron.com.my](mailto:sales@cytron.com.my)