Projection Ball IoT
v5.4S
User's Manual

Revision

1st	2017/04/19	First release
2nd	2017/6/10	Add the way of adjustments

CRESCENT

Contents

1. Overview

Thank you for purchasing ProjectionBall this time. Please read this instruction manual carefully and use it correctly.

It is a compact laser projector that anyone can use a laser projector which has been used only in limited fields such as outdoor events by applying robot engineering technology at low cost.

ProjectionBall is a vector type simple laser projector. Drawing information is recorded at the time of shipment, so you can draw immediately, such as stars and arrows.

By connecting the SD card slot, inserting the SD card with the data written in it, you can draw data of your desired drawing shape from the SD card.

With the Wifi module (ESP - WROOM - 02), you can switch drawing from switching from smartphone or PC to ProjectionBall, perform arbitrary character display, time adjustment, Wifi access point setting etc is.

There is a Uart port shared with the Wifi module on the main body of ProjectionBall. You can also operate ProjectionBall by connecting to Arduino, RaspberryPI etc via Uart port.

2. Safety Precautions

2-1. Prohibited items

◆ Prohibition of direct lighting of laser light

Although we are using a relatively safe laser module with class 2 output less than 1 mW, there is a risk of loss of vision or loss of vision in direct viewing.

◆ Prohibition of projection to animals, people, especially head

We use a relatively safe laser module with class 2 output less than 1 mW, but if laser light enters the eye directly, there is a danger of loss of vision or blindness.

◆ Supplied from PC USB power supply

Although USB connector is used as power supply, please never connect to PC. There is a possibility that noise such as a motor etc. will enter the personal computer side and cause personal computer malfunction.

2-2. Precautions

Do not use the USB power supply of output 1A or less

Operating power becomes insufficient, operation becomes unstable, it may cause breakdown at the worst. Please connect to USB charging adapter etc. (voltage 5 V, current 1.2 A or more).

◆ Please disconnect USB power after use

To prevent malfunction, please be sure to unplug the USB power supply or USB connector part after use.

◆Please pay attention to strong magnets

A powerful neodymium magnet is used for the position detection in the mirror module part. There is a possibility that it may cause trouble if it is brought close to a magnetic card or other equipment, so please be careful about handling it.

◆ Place only drawing data on the SD card

When using the SD card please put only the drawing data in the card. In some cases, data in the card may be damaged. Please do not use SD card with important data. Also, please use SD card with no problem even if it is damaged.

3. Features

It is a compact laser projector that anyone can use a laser projector which has been used only in limited fields such as outdoor events by applying robot engineering technology at low cost.

ProjectionBall is a vector type simple laser projector that can draw simple geometric figures and alphanumeric characters. Because it uses a relatively safe laser light source, it is possible to project a projection distance of about 1 m ahead in a bright place and about 5 m in a dark place.

◆ Excellent visibility

Because you are using a laser, you do not need to darken the room like a liquid crystal projector.

It is possible to draw clearly even in bright places.

◆ Design and functionality

Depending on the shape of the ball, it is possible to draw it anywhere you want, such as floor, wall, or ceiling, in any orientation you like.

It operates with USB power supply and it is possible to draw for several hours with a mobile battery for smartphone.

◆ Extensibility

By drawing any shape from the SD card and connecting it with a device such as RaspberryPI, it becomes possible to draw your favorite figure at any time.

◆ Versatility

Not limited to the interior of the room, the application is infinite, such as digital signage such as show window and reception, utilization as IoT display by other equipment cooperation, information display by incorporating in the robot.

4. Specification

※ It may be changed

· Power supply 5 V, maximum 1.2 A microUSB terminal (Please supply from general purpose USB power supply)

- Frame rate 5 to 15 fps (Depending on the number of coordinates, repeat number setting)

· Resolution mirror angle 9 degrees / 400 bit

· 10 types of built-in drawing data

· Alphanumeric display function (Scroll up to 30 characters maximum)

· Analog / digital clock, date display function

· SD card memory drawing (Maximum number of coordinates 200 points, up to 10 data can be supported by switch switching)

· Micro SD card slot

· 3.3 V red 1 mW or less Class 2 laser module

· Blue power LED

· With Uart debug port (9600 bps, 3.3 V)

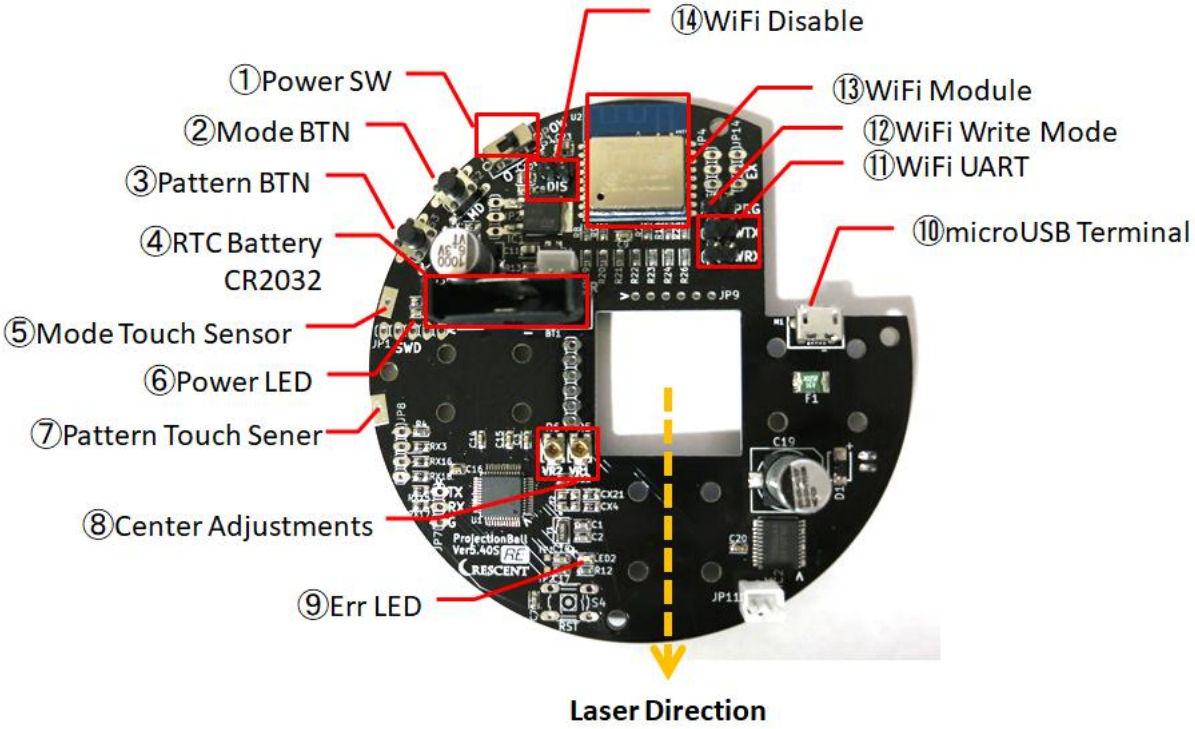
· Setting, time keeping function (backup battery CR 2032)

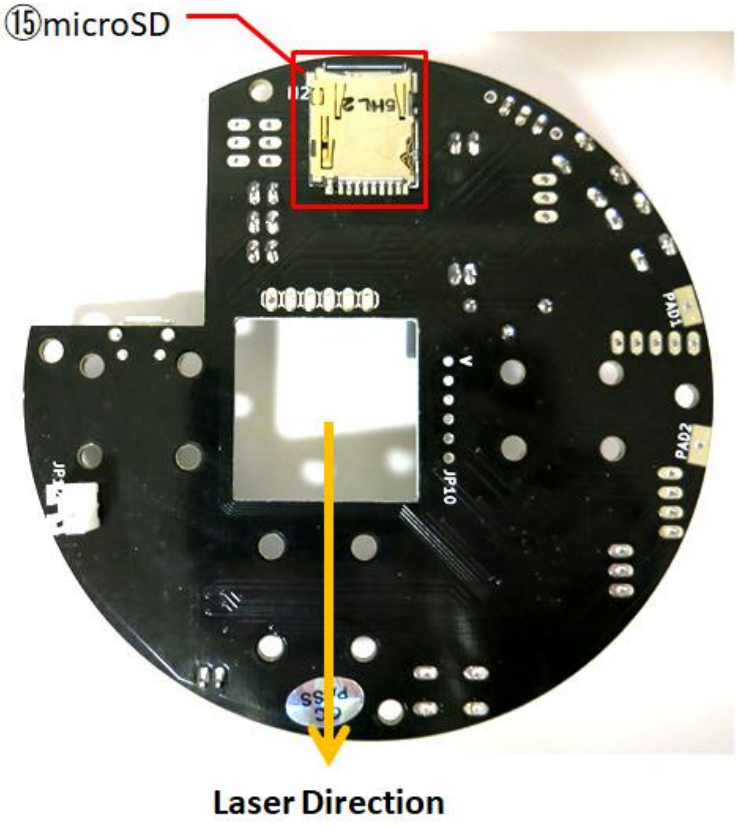
· Wifi module installed

· Capacitive touch sensor mounted

5. Explanation of each part

I will explain the name and function of each part.





①Power switch

[0] turns OFF, [I] turns ON.

② Mode button

Switch on the mode such as constantly lighting, strokes writing, clock etc.

③ Pattern button

Switch drawing patterns such as stars and arrows.

④ Backup battery

Backup battery to store mode, pattern, character string, time information.

⑤ Mode touch sensor

You can switch modes by touching a sphere.

⑥ Power LED

Blue lights up when the power is on.

⑦ Pattern touch sensor

Pattern can be switched by touching a sphere.

⑧ center adjustment trimmer

It is for adjusting the center axis of the mirror. Please do not touch except when trouble such as chipping occurs.

⑨ Error LED

It lights up when it stops automatic when there is a problem with the mirror module or motor part.

⑩ microUSB terminal

It is microUSB terminal for power supply. Please use a power supply capable of supplying voltage 5V and current 1.2A.

⑪ WiFi UART pin

It is a jumper pin connecting the control microcomputer and ESP - WROOM - 02.

⑫ WiFi write mode pin

When shorting the jumper and turning on the power, ESP - WROOM - 02 goes into write mode.

⑬ WiFi module

It is ESP - WROOM - 02 which provides WiFi function.

⑭ WiFi invalidation pin

Shorting off WiFi radio waves. It is used when you want to invalidate WiFi communication in environments where radio wave communication is not permitted.

⑮ micro SD slot

Insert microSD containing data when drawing from data created with drawing software.

6. How to use

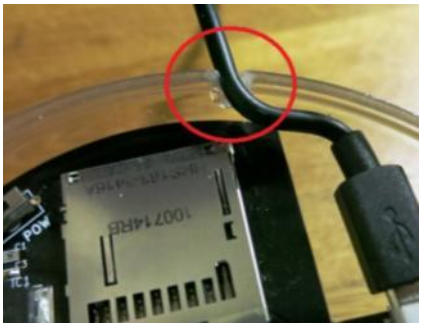
This section explains how to prepare for using ProjectionBall.

① Assemble the stand. The side with the sponge will be on the upper side.

② Install the ProjectionBall main unit on the stand.

Check the laser irradiation destination. It is irradiated from the opposite part to the Wifi module.

If the ProjectionBall board is not set in the sphere, please set through the spherical cable hole with the USB cable connected as shown below.



③Connect the USB power supply. Please use a USB power supply that can output a current of at least 1.2 A with a voltage of 5 V.

④ The blue LED indicating power ON lights up, and drawing starts. If the blue LED does not light up, check that the power switch on the Projection Ball main unit is ON.

⑤ To switch the drawing mode, touch the ProjectionBall main unit, the upper left, the mode touch sensor near the palm. You can also press the mode button.

Lissajous mode → rotation mode → single stroke writing mode → continuous drawing mode → analog watch mode→ digital watch mode → date display mode → character string display mode

Touch in this order to toggle.

⑥ To switch the drawing pattern, touch the ProjectionBall body, bottom left, touch the pattern touch sensor with your palm. It is the same even if you press pattern button.

Star → arrow → e-mail → smile → sun → cloud → umbrella → snow → thunder

Touch in this order to toggle.

* When the microSD card containing the drawing data is inserted, the drawing data changes.

⑦ To temporarily stop drawing, touch the ProjectionBall body, upper left and lower left with the palm at the same time. Touch the upper left and lower left with the palm again at the same time to resume drawing. It is the same also with simultaneous pressing of pattern button and mode button.

⑧Turning the power ON while simultaneously holding the pattern button and pattern button disables the touch function. If you turn on the power again while simultaneously pressing it, the touch function will be activated.

7. Wifi connection method

ESP - WROOM - 02 for WiFi communication to the ProjectionBall main body is carried. It supports two modes, server mode not via access point and client mode connecting via access point.

When it is used for the first time or when the configured access point can not be found, it is automatically connected directly (server mode). If a configured access point is found, it will automatically go through the access point (client mode).

7-1. Server mode connection method

①Turn on the power of the Projection Ball.

When it is used for the first time or when the configured access point can not be found, it will automatically enter the server mode in tens of seconds.

② Connect from the smartphone, PC, etc. to the access point name "prjballXX".

* The XX part is a unique alphanumeric character of a part of the MAC address of ESP - WROOM - 02.

③ Enter "192.168.4.1" to the address screen of the browser etc and press "Enter" key.

④ Connection is completed when "ProjectionBall Remote" screen is displayed.

※ Since the access point "prjballXX" is not connected to the Internet, the first connection on the iPhone or Android smartphone may be disconnected immediately. Please repeat the connection several times.

7-2. Client mode connection method

① Connect in advance in the above server mode and display "ProjectionBall Remote" screen.

② To connect via the access point, set "SSID" and "PASS" on the "Wifi" tab.

③ After completing the access point setting, it will be connected via the access point when the power is turned on again.

* To connect via the access point, turn off the power of the Projection Ball once, then turn it on again.

After several tens of seconds, we will automatically try to connect to the access point we set earlier.

If the connection is successful, you can operate from a browser such as a smartphone or PC connected to the same access point.

④ On the address screen of the browser such as smartphone or PC

Type "prjballxx.local" and press "Enter" key. The XX part of prjballXX is the same as the XX part of prjballXX of the access point name. The XX part is a unique alphanumeric character of a part of the MAC address of ESP - WROOM - 02.

⑤ When "ProjectionBall Remote" screen is displayed, connection is completed.

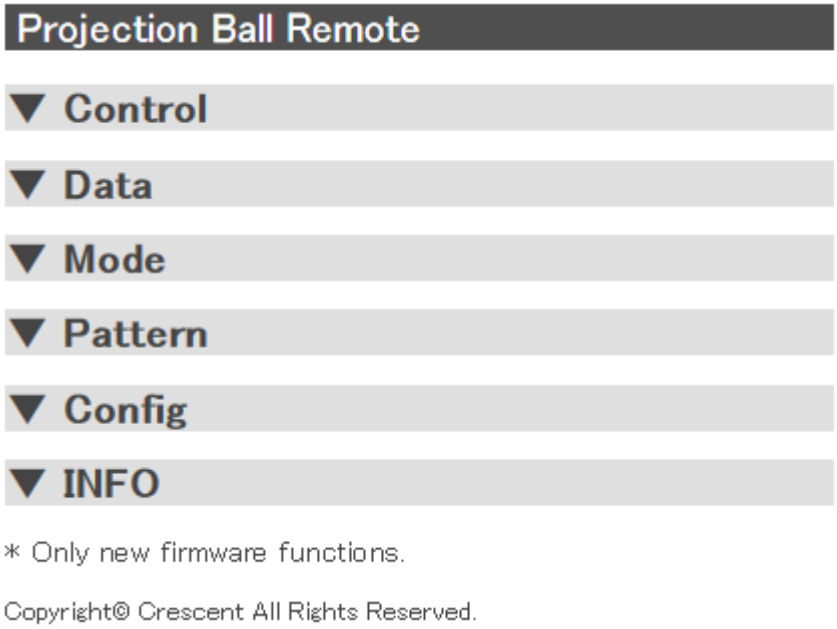
If you want to connect again in the server mode, set appropriate characters with "SSID" and "PASS" on the "Wifi" tab. .

※ Since you can not find an access point by entering appropriate characters, it will be in server

mode

7-3. ProjectionBall Remote How to use

I will explain how to use "ProjectionBall Remote" screen.



Immediately after displaying the "ProjectionBall Remote" screen, it is displayed in six categories: "Control" "Data" "Mode" "Pattern" "Config" "Info".

◆ "Control" category

・"Start / Stop"

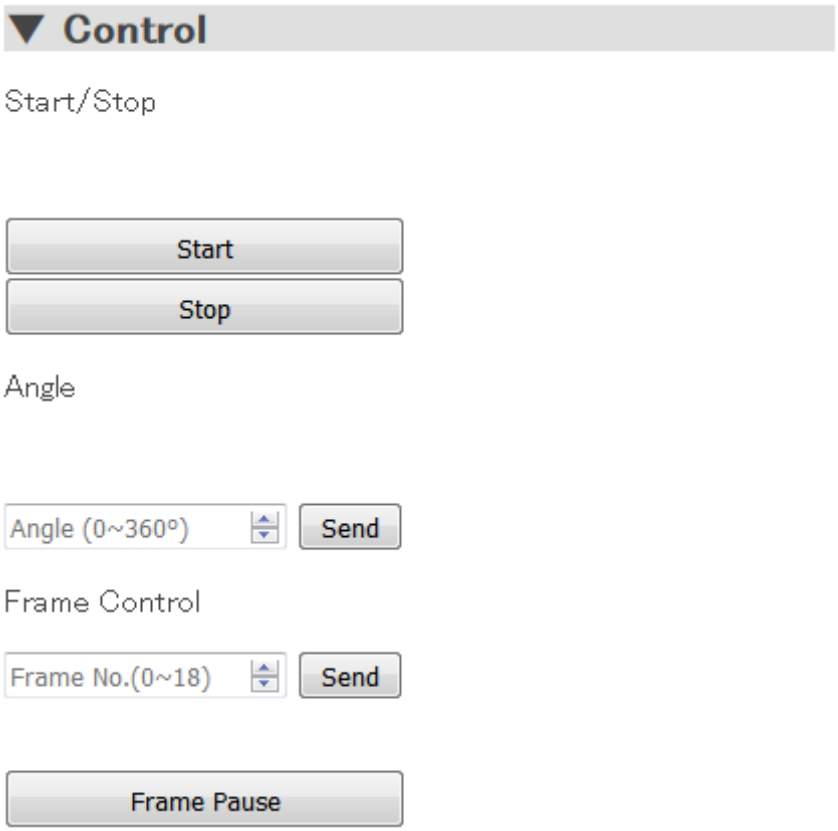
Please press "Stop" to pause drawing and "Start" to resume.

・"Angle"

It is used to change the drawing angle.

Enter the angle in the range of 0 to 359 °.

The angular resolution is 3 °.



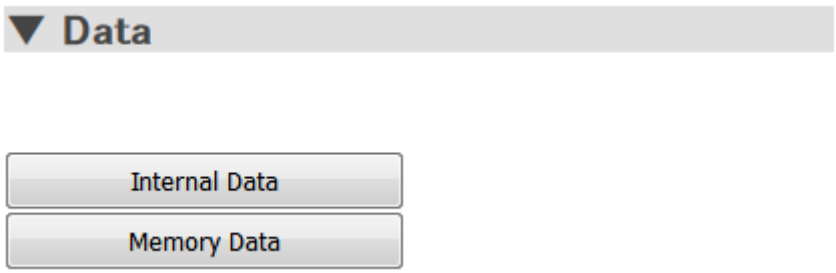
◆"Data" category

·"Internal / Memory Data"

To draw from the built-in drawing pattern, press "Internal Data".

To draw from the microSD containing the drawing data, press "Memory Data".

* If microSD is not inserted or drawing data is not inserted, drawing will stop when "Memory Data" is pressed.



◆"Mode" category

·"Animation"

-MicroSD No card: Lissajous curve drawing

- With microSD card: animation drawing (frames **. Csv files are read in order)

·"Rotation"

It is a mode to draw while rotating.

・"One-stroke"

It is a mode to draw with a single stroke.

・"Always-on"

It is a mode to draw data all the time.

・"Analog Watch"

This mode displays the analog clock.

・"Digital Watch"

This mode displays the digital clock.

・"Date"

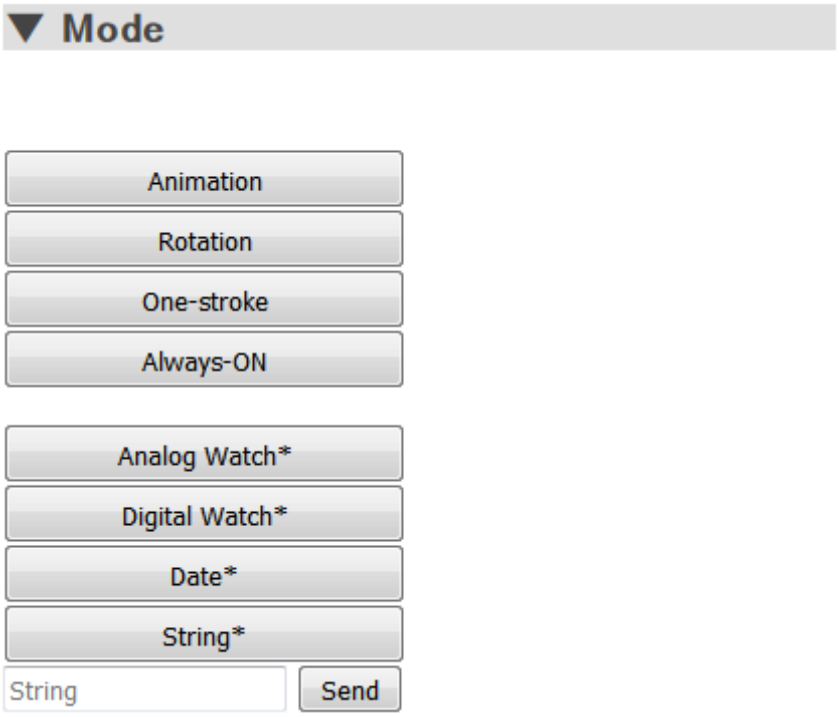
It is a mode to display the date.

・"String"

This mode displays alphanumeric character strings. The initial value is "Hello".

You can draw an arbitrary character string by filling in "String" field and pressing "Send" button.

* If it is more than 6 characters it will be automatically scrolled and rendered.



◆"Pattern" category

Drawing stops if there is no corresponding drawing data even with microSD card.

・"Star / Data 0"

-MicroSD card absent: The star of the built-in data is drawn.

-Micro SD card present: data0.csv file will be drawn.

・"Star / Data 0"

-MicroSD card absent: The star of the built-in data is drawn.

-Micro SD card present: data0.csv file will be drawn.

· "Arrow / Data 1"

-MicroSD card absent: Arrow of internal data will be drawn.

-Micro SD card present: data1.csv file will be drawn.

· "Mail / Data 2"

-MicroSD card absent: Mail of internal data will be drawn.

- With microSD card: data2.csv file will be drawn.

· "Smile / Data 3"

-MicroSD No card: Smile of internal data will be drawn.

-Micro SD card present: data3.csv file will be drawn.

· "Sun / Data 4"

-MicroSD card absent: The sun of the built-in data is drawn.

-Micro SD card present: data4.csv file will be drawn.

· "Cloud / Data 5"

-MicroSD card absent: Cloud of built-in data will be drawn.

-Micro SD card present: data5.csv file will be drawn.

· "Rain / Data 6"

-MicroSD card absent: umbrella of internal data will be drawn.

-Micro SD card present: data6.csv file will be drawn.

· "Snow / Data 7"

-MicroSD card absence: snow of built-in data is drawn.

-Micro SD card present: data7.csv file will be drawn.

· "Thunder / Data 8"

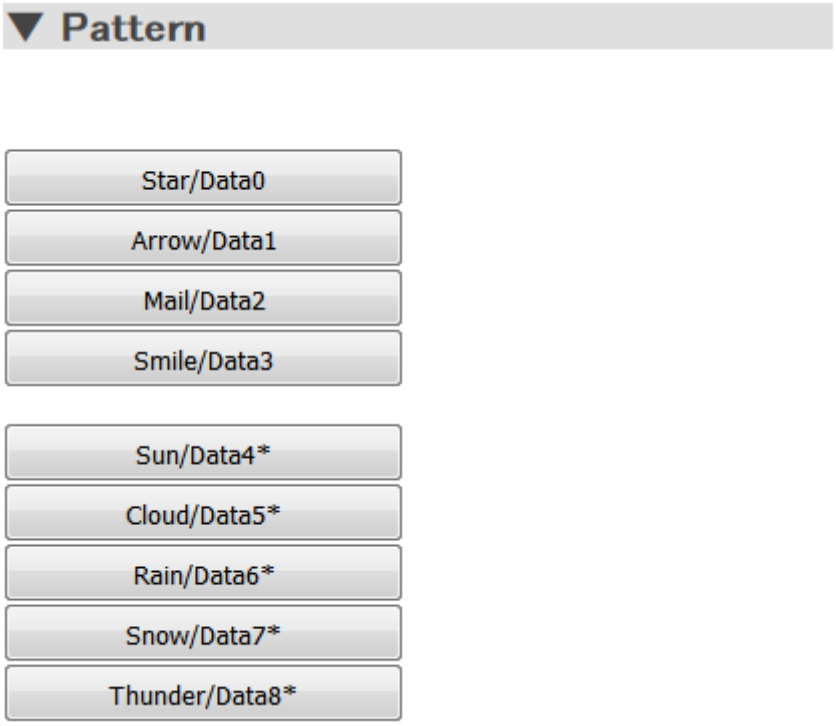
-MicroSD card absence: Lightning of built-in data will be drawn.

-Micro SD card present: data8.csv file will be drawn.

· "Heart / Data 9"

-MicroSD card absent: Heart of built-in data will be drawn.

- With microSD card: data9.csv file will be drawn.



◆"Config" category

Set WiFi module access point settings, date and time.

・"WiFi AP Mode Setting"

Connect using the access point Set the access point name (SSID) and password (PASS) when using client mode. After inputting and pressing "SAVE", the setting is saved.

・"Set Date"

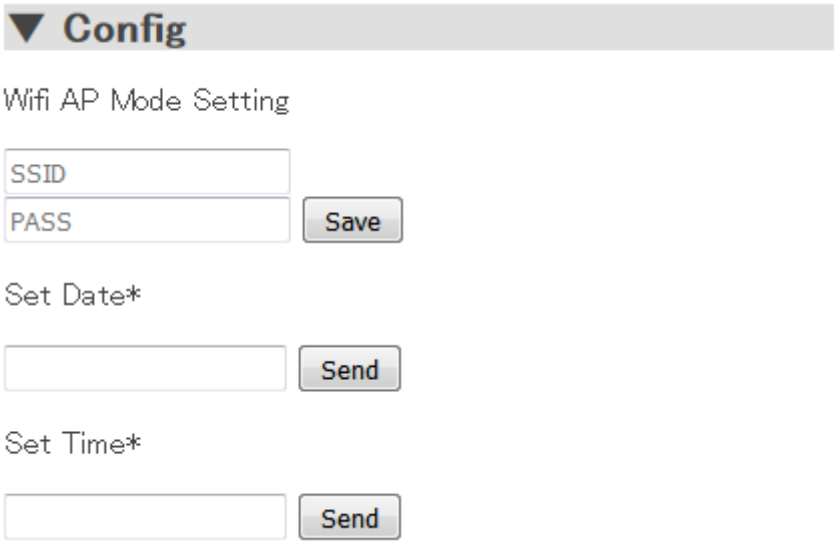
To set the date, press "Send". The dates acquired from browsers such as smartphones and PCs are automatically entered.

* If the date is not displayed properly, check the date of the smartphone or PC you are operating.

・"Set Time"

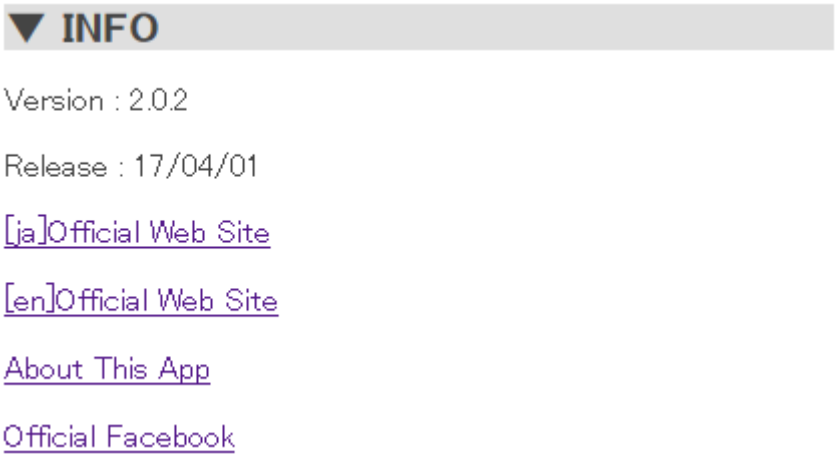
To set the time, press "Send". Time is automatically entered from the browser such as smartphone or PC.

* If the time is not displayed correctly, check the time of the smartphone or PC you are operating.



◆"Info" category

The Wifi module version and Web site link are displayed.



8. Optional data drawing method

You can draw drawing data on the SD card, slot it on the board, and draw arbitrary shapes.

8-1. SD card drawing specification

- When the SD card is not inserted, it will automatically draw from the internal memory data of the main unit.
- If an SD card is inserted and drawing data is not inserted or if the file is corrupted, an error occurs and nothing is drawn.
- Pattern drawing specification
· Up to 10 types of drawing can be made by switching pattern switches.
· It is possible to select from 3 types of constantly lit, rotated, and stroked by mode switch switching.
· The maximum number of coordinates per file is 200.
· File name is half-width alphanumeric data0.csv data1.csv data2.csv data3.csv ... data9.csv.
- Animation drawing specification
· By inserting drawing data slightly different from frame 0 to frame ** (maximum ** up to 17) animation drawing like a flip cartoon becomes possible.
- Insert the file corresponding to the SD card, and place it under the mode switch SW4 or SW5, the animation drawing will start.
· The maximum number of coordinates per file is 200.
· File name must be half-width alphanumeric, frame0.csv frame1.csv · · · frame 18. csv.
· Approximately every 300 msec, the drawing data will be switched automatically from frame 0 to frame 1, frame 2 and according to the number of files in the SD card.
- It returns to frame 0 in the last file and it operates iteratively.

8-2. Drawing data creation method

In this section, we will explain the drawing data creation method using dedicated drawing data creation software.

Please download the drawing software from the following URL.

http://projectionball.jp/share/PBS.zip pass: crescent

· The operating environment is Windows .Net Framework 4.5 or later installed PC
· Launch PBS 2.exe by double-click with no installer required.
· Drawing data creation method using dedicated drawing software

1) Activate the software.

2) Place new coordinates by left clicking and create your favorite shape. Conversely, when deleting, you can delete the coordinates by right clicking.

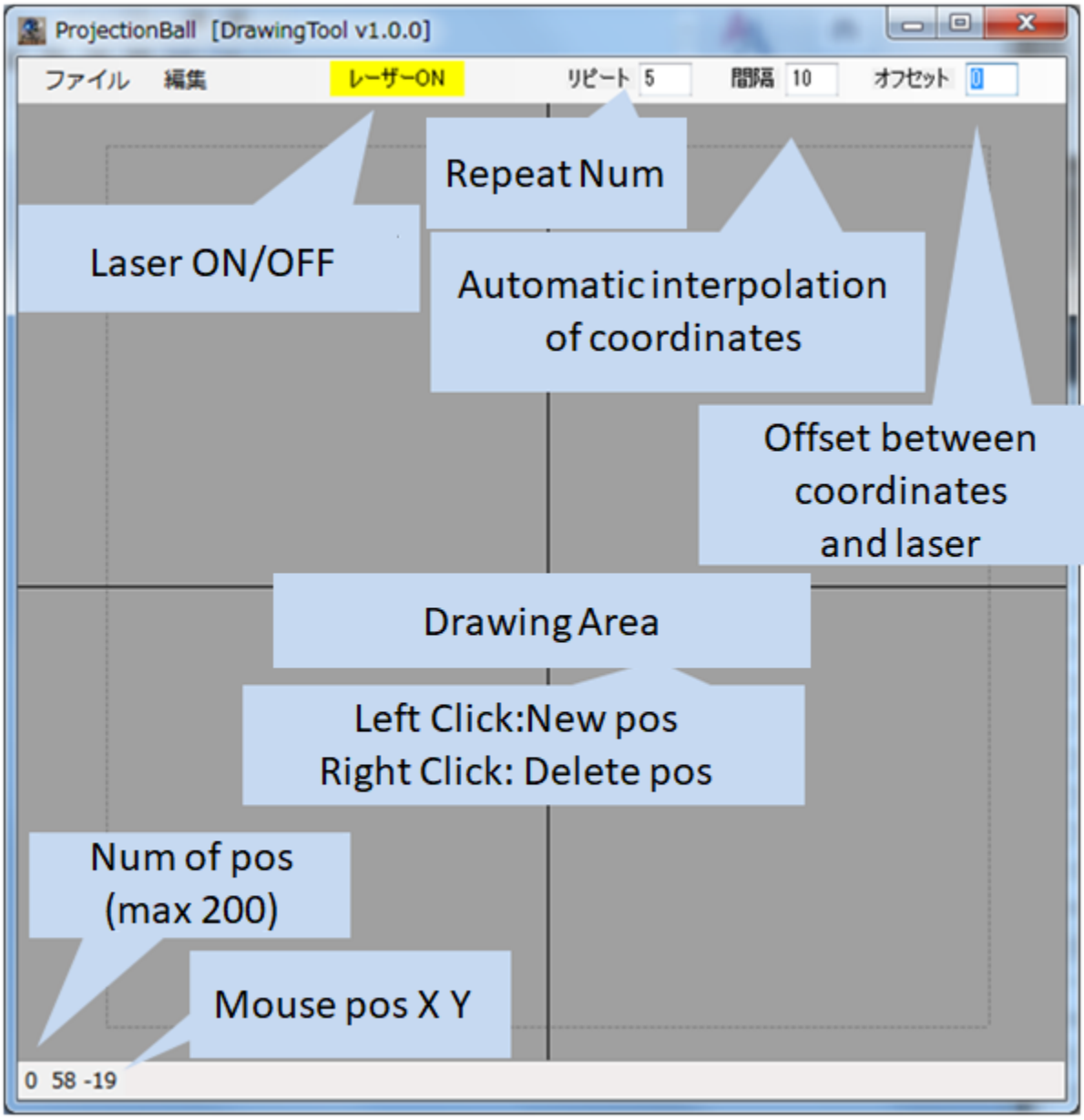
3) Please arrange the coordinates finely for curves and complicated figures. Also, please set so that the starting point and the ending point are close.

4) When finished, save as "File" → "Save As" → "pbs file".

5) Select "File" -> "export csv" -> "data0.csv" and export.

6) Save the "data0.csv" file on the SD card, set it under SW2, SW3 down, SW4 up and SW5, and when you turn on the power, the figure will be drawn.

※ Note Even if pbs file is saved on SD card, it can not be drawn. Please export the csv file and save it on the SD card.



· As the repeat number increases, the accuracy increases but the frame rate becomes rough. Conversely, if the repeat number is small, the accuracy will be worse, but the frame rate will rise. If the repeat number 5 is a standard and complicated figure, set it to 8 to 12. Conversely, in case of simple figure, set repeat number to 3 ~ 5.

· To move the middle coordinates, hold down the "Ctrl" key and drag the coordinates you want to move to move the middle coordinates.

· To place new coordinates, hold down the "Shift" key and left click to place the coordinates in laser

OFF mode.

· If the starting point and the ending point can not be located close to each other, click "Laser ON / OFF", turn OFF the laser lighting, and put the extinct coordinates so that the end point is near the starting point.

· If there is an image file of the figure you want to draw, place the background with "Edit" → "Background reading".

* If the size does not match please edit the image file with "paint" etc and resize it.

· If a message with more than 200 drawing coordinates appears at the time of export, reduce the number of coordinates or set the interval to a larger value such as 10 to 20 of the initial value.

- On the improvement of accuracy of drawing data

· If you want to draw at sharp corners, arrange the corner part coordinates a few times consecutively and place them at the same place and the corners will be drawn cleanly.

· It is also possible to draw beautifully by making the acute angle part circle around and letting the detour part "laser off".

8-3. Drawing data specification

Describe the specification of drawing data. The csv file created with dedicated drawing software meets the following specifications. Please refer if you do not use special drawing software.

· In the first line, enter the numerical value for drawing definition. In the first row and the first column, enter the repeat number.

Please enter 0 for 1st row 2nd row, 3rd row. If 5 is standard and complicated figure, set it to 8 ~ 12. For simple figures, set the repeat number to 3 ~ 5.

· As the repeat number increases, the accuracy increases but the frame rate becomes rough.

Conversely, if the repeat number is small, the accuracy will be worse, but the frame rate will rise.

· From the 2nd line, enter coordinate data with half-width numerals.

· The first row indicates whether or not the laser is lit, 0 is off, and 1 is lit.

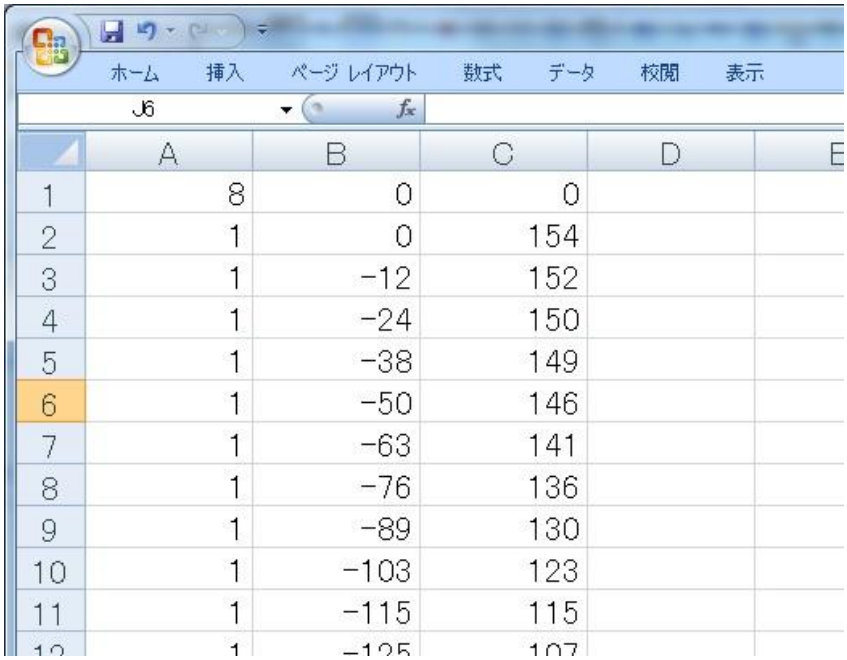
· The second row is the X coordinate and the third row is the Y coordinate.

· Create coordinates with a maximum (± 150, ± 150) around (0,0) as a guide.

· When the drawing starts, the laser light moves from the 2nd line to the 3rd line and the 4th line sequentially.

· If you find a blank space, judge it as the last data, go back to the second line and start drawing again.

* In the case of dedicated drawing software, it automatically becomes data according to the following rule


ホーム
挿入
ページ レイアウト
数式
データ
校閲
表示
J6
A
B
C
D
E
1 8 0 0
2 1 0 154
3 1 −12 152
4 1 −24 150
5 1 −38 149
6 1 −50 146
7 1 −63 141
8 1 −76 136
9 1 −89 130
10 1 −103 123
11 1 −115 115

9. How to rewrite WiFi module

ESP - WROOM - 02 for WiFi communication to the ProjectionBall main body is carried. The factory shipped ESP - WROOM - 02 code is published on the following site. If necessary, you can also update your ESP - WROOM - 02 or add your own code by adding it.

https://github.com/meerstern/prjball-wifimodule 2

Also, IO pins other than the RX and TX ports used in ProjectionBall can be accessed from the external EX port. It is possible to connect LED and serial communication equipment separately as necessary.

9-1. Arduino development environment preparation

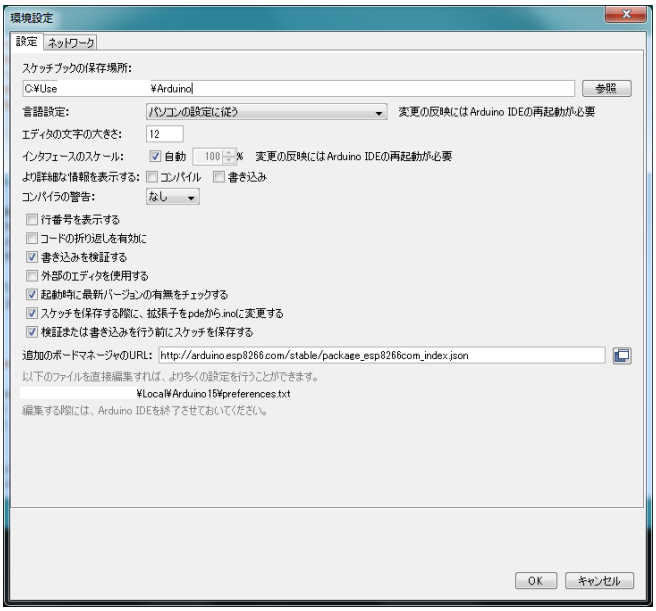
We use the Arduino development environment when updating the firmware of ESP - WROOM - 02 or incorporating your own code.

① Install the Arduino development environment on the PC.

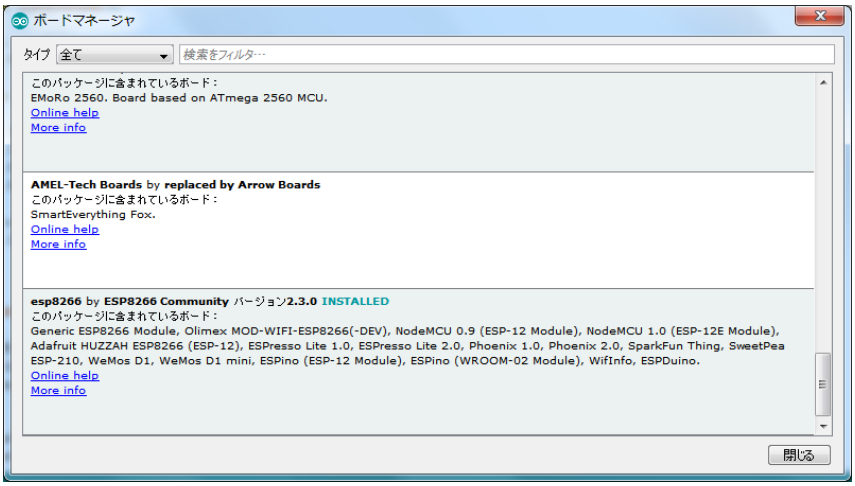
② Activate the Arduino development environment and click "File" → "Development environment".

③ Add the following URL to "Additional Board Manager URL" on the "Settings" tab.

http://arduino.esp8266.com/stable/package_esp8266com_index.json



④Scroll from Tools -> Microcomputer Board -> Board Manager to the bottom, select 'esp 8266 by ESP 8266 Community' and click Install.



⑤Click "Tools" → "Microcomputer board" → "Generic ESP 8266 Module".

⑥ Perform the setting as described below in "Tool" → "Microcomputer board".

The serial port selects the serial port connected to ESP - WROOM - 02 at the time of writing.

9-2. Writing from the Arduino development environment

When writing the firmware from Arduino development environment to ESP - WROOM - 02, a USB serial conversion module etc is required. Please prepare separately.

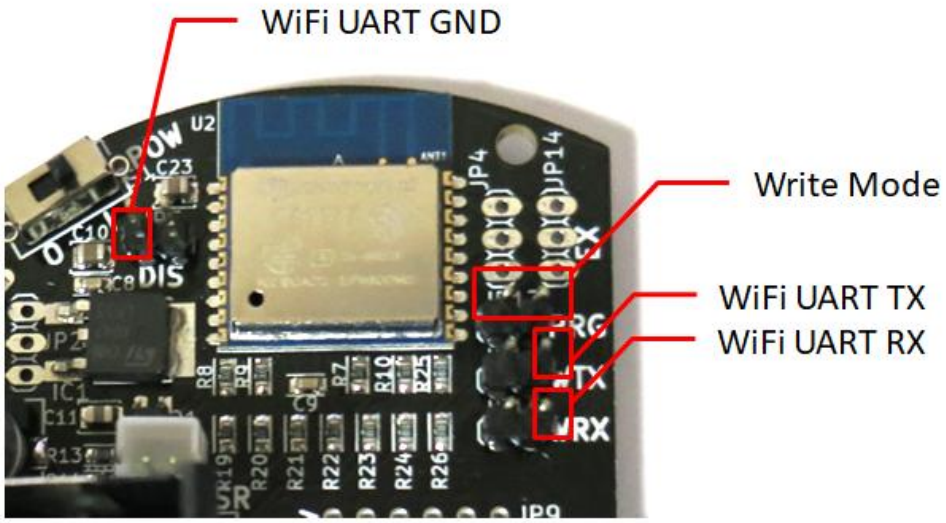
USB serial conversion module (AE-FT 234 X) http://akizukidenshi.com/catalog/g/gM-08461/

① Remove the jumper pin to WiFi UART TX pin and WiFi UART RX pin,

Connect the USB serial conversion module to the ESP - WROOM - 02 of the Projection Ball main unit. In case

Connect the GND of the USB serial conversion module to the WiFi UART GND pin.

Connect the USB serial conversion module TX to the WiFi UART RX pin.
Connect the USB serial conversion module RX to the WiFi UART TX pin.



②Confirm the port number of the USB serial conversion module from the device manager etc.

③ Download the latest WiFi module firmware code from the site below and open the "ESP8266.ino" file.

https://github.com/meerstern/prjball-wifimodule 2

④ Set the port number of the USB serial conversion module.

Select the connection destination port from "Tools" → "Serial port".

⑤ Connect the jumper to the write mode pin and short the write mode pin.

⑥ Power on the Projection Ball body.

⑦ Press the write button to write the farm.

⑧It is update when writing is completed.

In case of first time writing, an error may appear.

If you get an error please try again while confirming the work from ①.

⑨ Set the jumper pin to WiFi UART TX pin (WiFi UART RX pin if necessary).

10. External device linkage method

By sending commands from the UART port of ProjectionBall to the UART port of another device, it is possible to switch the drawing pattern and drawing mode, pause the drawing, and reread the drawing data.

If necessary, connect pinhaders and wiring and connect to other equipment. Connect the TX on the board to the RX terminal of another device, the RX on the board to the TX terminal of another device, and also connect the GND.

When sending a command from a PC etc., use a USB serial conversion module (AE - FT 234 X http://akizukidenshi.com/catalog/g/gM-08461/) etc and send a command using COM software such as Teraterm please.

After sending the command, the command is executed by sending the return key (line feed). The voltage of UART is 3.3V. It is different from RS232C. Also, please set the baud rate to 9600 bps.

* In the case of external device linkage, since the UART ports conflict, the command command from the WiFi module can not be used.

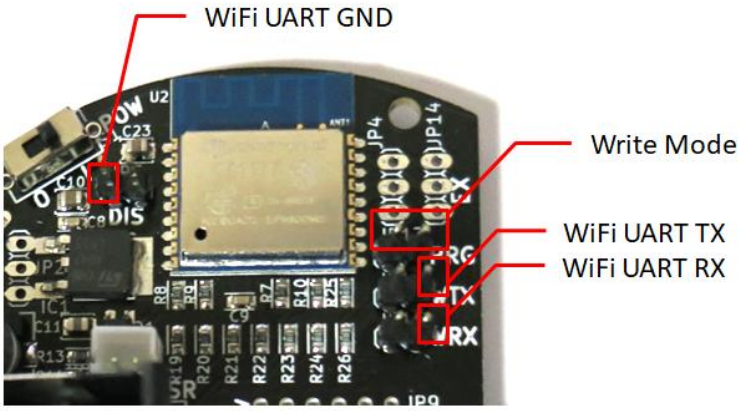


Table 1 UART Command lists

Command Name	Uart command	Description
Start	srt	When drawing is stopped by a command, it is used again when restarting.
Stop	stp	It is used to stop drawing.

Pattern0	sw0	No SD card star pattern, with SD card data0.csv drawing
Pattern1	sw1	No SD card arrow pattern, with SD card data1.csv drawing
Pattern2	sw2	No SD card mail pattern, with SD card data2.csv drawing
Pattern3	sw3	No SD card smile pattern, with SD card data3.csv drawing
Pattern4	sw4	No SD card sun pattern, with SD card data4.csv drawing
Pattern5	sw5	No SD card cloud pattern, with SD card data5.csv drawing
Pattern6	sw6	No SD card rain pattern, with SD card data6.csv drawing
Pattern7	sw7	No SD card snow pattern, with SD card data7.csv drawing
Pattern8	sw8	No SD card thunder pattern, with SD card data8.csv drawing
Pattern9	sw9	No SD card heart pattern, with SD card data9.csv drawing
Analog Clock	awt	Switch to analog clock display mode.
Digital Clock	dwt	Switch to digital clock display mode.
Date Mode	dym	The date display mode is switched.
String Mode	stm	Switch to arbitrary character string display mode.
String Set	stg=X	Arbitrary alphanumeric characters are displayed by placing an alphanumeric character string in X. X can be up to 30 characters.
Time Set	tim=XXYYZZ	Set the time via the UART. Example tim = 213000 21h:30m:00s
Time Get	tim?	Currently, the time held inside ProjectionBall is returned in UART.
Date Set	day=XXYYZZ	Set the date via UART. Example day = 170401 17' April, 1st
Date Get 令	day?	The date currently held in ProjectionBall is returned in UART.
Animation Mode	frm	No SD card :Lissajous curve With SD card : animation (frame **. Csv) will be.loaded.
Rotate Mode	rot	Switch to the rotating animation drawing mode.
Stroke Line Write Mode	str	Switch to the stroke writing animation drawing mode.
Always Lighting Mode	alw	It switches to the drawing mode that always lights up.
Center Position Setting	cen=X,Y	By inserting numbers into X and Y, it is a command to move relative to the current drawing coordinate center. If you set a large value, drawing may not be done correctly. Examples cen = 20, -30
Angle Setting	deg=X	By inserting a value from 0 ° to 360 ° in X, this command rotates the drawing figure at 3 ° intervals. Example deg = 135
Reload	rst	This command executes reading again when the SD card is replaced.
Frame Specification	fno=X	By placing a value between 0 and 18 in X, we draw the frame of the specified animation.
Animation Drawing Frame Pause	fpa	Stops automatic feeding of drawing data when animation is drawn. By running the same command again, automatic feed is restarted.

11. Laser module specification

In terms of safety, we are using a red laser module with 3.3 V drive that is less than 1 mW. When replacing with another laser module, the same 3.3 V laser module can be used. The maximum current that can be supplied is 250 mA as designed. We can not support problems and failures due to the use of laser modules other than standard products.

12. Adjust / Troubleshoot

When trouble etc. occurred, please refer to the following.

◆ The power LED lights, but drawing does not start

- In case of pause mode, release it

Touch the ProjectionBall body, upper left and lower left with the palm at the same time. Touch the upper left and lower left with the palm again at the same time to resume drawing. It is the same also with simultaneous pressing of pattern button and mode button.

- Check that the current of the USB power supply is sufficient enough.

Please connect to USB charging adapter etc. (voltage 5 V, current 1.2 A or more).

◆ Mode, pattern, time etc. are reset

It is possible to hold for more than a few months without USB power supply.

If mode, time etc. are not maintained, please replace the battery.

Replacement battery CR 2032 x 1 * Please be sure to replace plus / minus polarity with care.

◆ WiFi access point is not displayed, can not connect

- Check that there is no jumper pin on the WiFi invalidation pin of the ProjectionBall main unit.

When a jumper pin is inserted in the WiFi invalidation pin, the radio wave stops and can not be connected.

- If there are multiple other WiFi radio waves in the vicinity, it may not be possible to connect due to interference or interference.

Please connect the PC or smartphone closer to the ProjectionBall main unit.

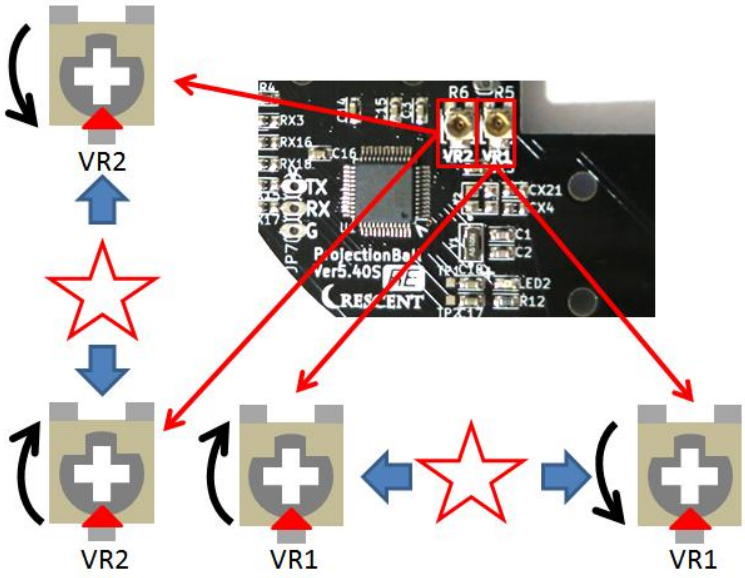
◆ Drawing is lacking

- Make sure that the laser beam strikes the stand, the sphere, etc., and is not blocked.
- The center position of the drawing may be misaligned.

When the drawing center position shifts, the optical axis of the laser interferes with the frame part, and the drawing is lacking. First adjust the position of the motor and laser module so that the optical axis of the laser reflects at the center of the mirror. If it still does not come to the center, adjust the variable resistance.

Adjust the variable resistor VR 1, 2 for drawing center adjustment with the + driver. Adjust the angle, please turn. If the laser beam does not hit the center of the mirror (back side) of the motor 2,

adjust the center of the motor 1 (X axis direction) by adjusting VR1. When the laser light emitted from the motor 2 is caught on the board, adjust the center of the motor 2 (Y axis direction) by adjusting VR2.



◆The shape is randomly drawn or the drawing is not clean

- When the current of the power supply is insufficient or the current is limited by the safety circuit of the USB charging adapter, it may not operate properly. Please try another USB power supply.
- Mirror position Make sure that the center of the magnet matches the center of the encoder IC (black chip of the encoder board). Also check whether the distance between the magnet and the encoder IC is about 5 mm. On the contrary, if it is too close, contact and magnetic force may be too strong to draw beautifully.

◆ Error Yellow Lights up and stops

- Make sure that motor 1 and motor 2 are properly connected to the connector. Make sure that the encoder board is correctly soldered. Also, make sure that the metal of the housing of the laser module contacts the soldering part of the encoder board and is not short-circuited.

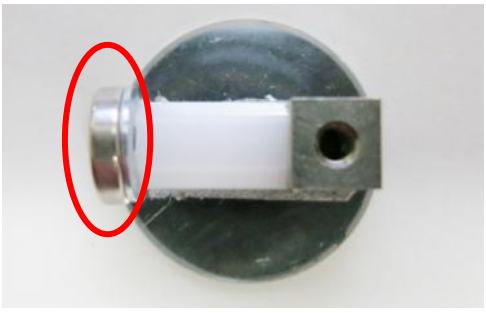
◆ Mirror module magnet position adjustment method

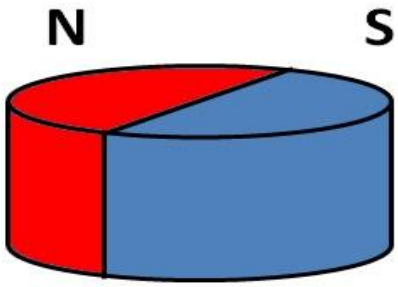
This adjustment has already been done at shipment. Do not remove the magnet from the mirror module.

In the unlikely event that you remove the magnet from the mirror module, follow the procedure below to adjust the magnet position.

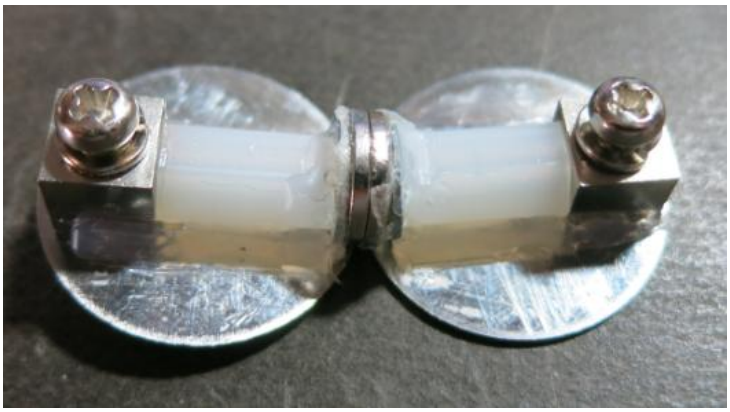
A neodymium magnet for position detection is installed on the side opposite to the motor shaft mounting part of the mirror module (red frame in the figure below). Unlike ordinary magnets, this

neodymium magnet has NS poles separated in the axial direction. The boundary between N pole and S pole is detected with a sensor and the position is read. If the angle of this magnetic pole is deviated from the reflection surface of the mirror, it will not be drawn at the intended location.



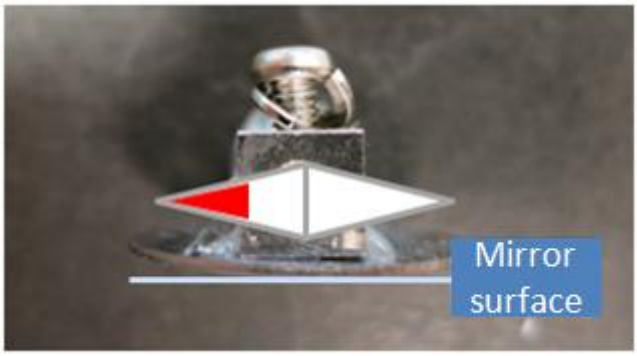


* If one side is mounted correctly, it is possible to fix the magnet so that the two sides of the magnet face each other so that the magnets face each other.



① Place the mirror module at the center of the azimuthal magnet with the magnet part of the mirror module facing downward (be careful as the azimuthal magnet goes bad if placed for a long time).

② As shown in the figure below, rotate the magnet adsorbed by the washer so that the N pole of the azimuthal magnet faces to the left, and make the angle of the azimuthal magnet coincide with the mirror surface. When the adjustment is completed, fix it with tape).


Mirror
surface