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## 1. Overview

Veyron motor drive series are the latest intelligent motor drive devices produced by DFRobot. They cover Brush DC Motor, Brushless DC Motor, Stepper Motor, etc. The Veyron 2x25A/12A is Brush DC motor drive which contains 3 intelligent interface mode: Analog Mode, PPM Mode and UART mode. The perfect protection: under-voltage, over-voltage, under-current, over-current, over-heating, shorted, reverse voltage makes it safely and reliably. And its usability: interface chosen by one button, auto recognized open/closed loop system, self-tuning PID parameter, etc simplifies the user operation.

### 1.1 Electrical Specification

Input voltage range: DC 6~36V, limit voltage is 40V

Single maximum permissible continuous current : 25A (Veyron 2x25A)/12A ( Veyron 2x12A)

Single channel the maximum allowable: 30 A(Veyron 2x25A)/20 A( Veyron 2x12A)

### 1.2 Power Interface

M1A: motor1 wire a

M1B: motor1 wire b

B+: external DC power input +

B-: external DC power input-

M2A: motor2 wire a

M2B: motor2 wire b

### 1.3 Encoder Interface

The same side encoder terminal maps the same side motor encoder interface.

A: encoder A-phase pulse signal input

B: encoder B-phase pulse signal input

GND: Logical ground

VCC: DC-5V power output

### 1.4 Communication Interface

GND: drive's logical ground

5 V: DC-5V/1A power output

S1:

In Analog interface mode, it is the M1 analog voltage input

In PPM interface mode, it is the M1 PWM signal input

In UART interface mode, it is the drive “Rx”

S2:

In Analog interface mode, it is the M2 analog voltage input

In PPM interface mode, it is the M2 input signal pulse width

In UART interface mode, it is the drive “Tx”

## **1.5 Radiator Fan Interface**

Radiator fan has 2 port, they are 5V power output pin and controllable GND.

Cooling fan can be directly connected to 5V (max current 500mA).

## **1.6 Indicator Leds**

Reverse: Reverse power protection indicator led (red)

Set: Set pattern indicator led (green)

Analog: Analog mode indicator led (green)

PPM: PWM mode indicator led (green)

UART: UART mode indicator led (green)

Status1: (yellow)

In PPM and Analog mode, the brightness of the indicator led indicates the speed of M1

In UART mode, when the drive receives data, it will be ON, vice versa.

Status2: (yellow)

In PPM and Analog mode, the brightness of the indicator led indicates the speed of M2

In UART mode, when the drive receives data, it will be ON, vice versa.

Error: Fault indicator led (red)

## **1.7 KEY --Set Working Mode**

You could change its working mode via pressing the key button: “Set, Analog, PPM, UART (four modes). Please check the corresponding indicator LED. It will be reset to default mode, only when current mode doesn’t match with the internal saved mode.

## **1.8 Interface Type**

Analog (two-channel analog voltage signal input): voltage range 0-5V (usually connected with an external potentiometer, if possible , it is recommended that user could add a voltage follower at the analog voltage output ; or use the PWM+ filter circuit for voltage output).

PPM (two-channel PWM signal input): the control signal source can be directly generated by a

microcontroller..

UART: support 10 commonly used baud rate, compatible with both 3.3V and 5V systems.

## 1.9 Control mode

Open-loop speed control mode: this mode applies to the open-loop motor control mode (without encoder), the motor speed is based on the control variable.

Closed-loop speed control mode: this mode applies to the closed-loop motor control (with encoder). You could set the encoder parameter (via the UART interface) to achieve closed-loop speed control.

## 1.10 Protection function

In UART mode, the fault information can be gotten via the "GER" instruction, please refer to the drive **Instruction set**. In PPM and Analog mode, the error can be checked through the combination of Set, Analog, PPM, UART led, as shown in the following table (Note: any kind of failure occurs, the motor will stop working, enter fault mode, in which case, the user will not be able to control the motor. In UART mode, the fault information could be cleared via the "CER" instruction to return to normal mode. In PPM and Analog mode, only it could eliminate the fault information by resetting the drive.):

Set	Analog	PPM	UART	Error	Error Sources
					Lower Voltage
					Over Voltage
					Over Temperature
					M1 Over Current
					M2 Over Current
					Control Signal Lost

Reverse power protection, when power is reversal connected, power supply reverse polarity indicator light up (Reverse), indicating fault.

You can set the threshold of the under-voltage and overvoltage protection. If the input voltage exceeds the set range, the fault led (Error) will be on, and the drive will go into fault mode.

You can set the maximum allowable continuous current protection. Actual when the current is higher than the maximum allowable continuous current, and less than the maximum allowable peak current, it could continue to be 2s, if time exceeds 2s, the fault led (Error) will be on, the drive will go into fault mode.

You can set the maximum allowable peak current protection. Actual when current is higher than the maximum allowable peak current, it could continue to be 400ms, if the time exceeds 400ms, the fault led (Error) is on, the drive goes into fault mode.

You can set the maximum allowable temperature protection. When the internal temperature is higher

than 40°C and less than the limit temperature, the drive automatically open the radiator until the temperature dropped below 35°C. When the internal temperature exceeds the limit temperature, fault led (Error) will be on, and the drive will go into fault mode.

In PPM and UART mode, you could set it to be the discontinuous mode via the “SSM” instruction. If there is no valid control signal input in the limit time, the fault led (Error) will be on, and the drive will go into fault mode.

The driver can run in unidirectional control mode or bidirectional control mode. In the unidirectional control mode, you could start zero detection via “SSD” command. When the driver restarts, if the initialize speed signal is not zero, the drive will be stop unless the control signal drops to zero. This is zero detection protection.

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## 2 Practice guide

So far, maybe you still don't know what to do with this drive, maybe you feel a bit complicated. But it is just “maybe”, then I will introduce this simple dual brush DC motor drive. At the beginning of this section, first, I will show you a brief description of several associated control parameters.

Direction Mode:

This parameter is only valid in Analog mode and PPM mode. It decides its running mode: unidirectional control mode or bidirectional control mode.

Zero Detection:

This parameter is only valid in Analog mode, PPM mode and unidirectional control mode. It decides whether it need to start the detection of the zero start. (It will detect whether there is a speed signal before running. If there is a signal, it won't start until the signal drop to zero.)

Signal Control Mode:

This parameter is only valid in PPM mode and UART, cooperated with “intermittent mode time limit” parameter, and decided whether stopping motor during operation, when it loses control signal.

In addition, there are some brief introductions about factory default values of drive :

### **Common Parameters**

ID : 1

BaudRate : 57600bps

Voltage Range : 6.0-36.0V

Maximum Continuous Current : 25000mA

Maximum Peak Current : 30000mA

Protected Temperature : 100C

Signal Mode : Continuous

PPM Signal Range : 500-2500us

PWM Type : Hpwm-Lpwm(on-off-on)

Direction Type : CW/CCW

Discontinuous Timeout : 1000ms

Start Detection Mode : Non Zero Detection

### Parameters Of Motor1

Reduction Gear Ratio : 1.00

Encoder Resolution : 1

Maximum Velocity : 1000

Velocity Mode : Unloop

Acceleration : 100

Deceleration : 100

PID\_Kp : 0.000

PID\_Ti : 0

PID\_Td : 0

### Parameters Of Motor2

Reduction Gear Ratio : 1.00

Encoder Resolution : 1

Maximum Velocity : 1000

Velocity Mode : Unloop

Acceleration : 100

Deceleration : 100

PID\_Kp : 0.000

PID\_Ti : 0

PID\_Td : 0

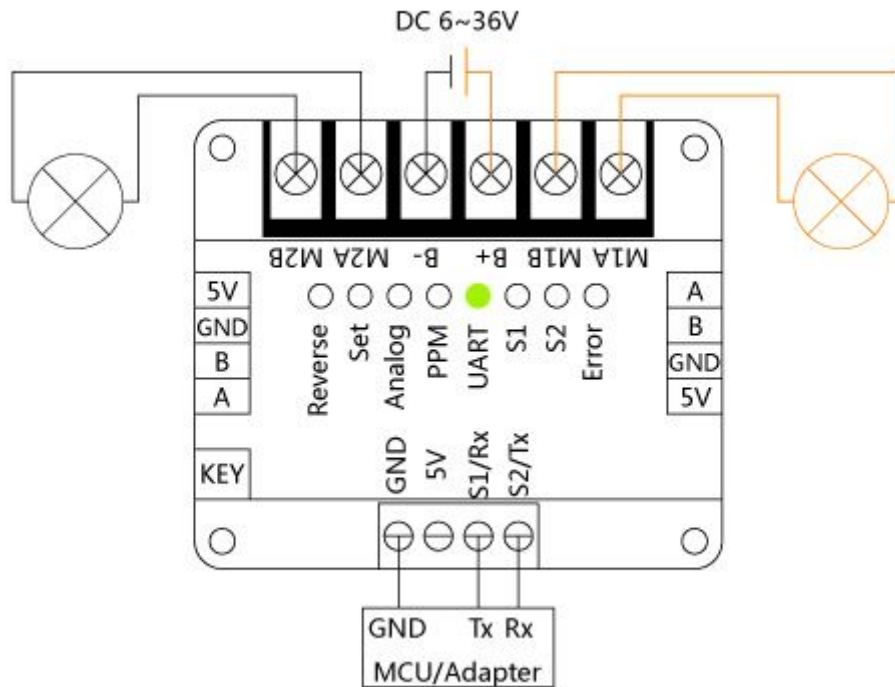
## 2.1 UART interface

You will see the following phenomenon in the first use: the three indicators “Set”, “UART”, “Error,” light up for 2s: then indicator “Error” and “Set” turn off. It shows the current mode is UART mode. When the three lights are on at the same time, it indicates the current baudrate. The relationship between Baud rate and the led State is shown in the following table:

Set	Analog	PPM	UART	Error	BaudRate(bps)
					1200
					2400
					4800
					9600
					14400
					19200
					28800
					38400
					57600
					115200

### Open-loop control mode

Connect the cable, as shown in the figure (of course, connect one circle if you only need one motor):



In UART open loop control mode, the parameters associated with the actual control are as follows: baud rate, drive address, PWM signal generating method, synchronous speed, asynchronously speed, perform asynchronous speed, acceleration, deceleration, control signal mode, break mode time limit, the maximum permissible continuous current, the maximum permissible peak current limit, the maximum allowable temperature and voltage. Please refer to instruction set, set the configuration parameter which you needs, when the configuration is completed, you can send comm to control the motor.

### Close-loop control mode

Connect the cable, as shown in the figure:

In UART close-loop control mode, the parameters associated with the actual control are as follows: baud rate, drive address, Encoder line number, gear ratio, PWM signal generating method, the maximum speed, synchronous speed, asynchronously speed, perform asynchronous speed, acceleration, deceleration, control signal mode, break mode time limit, PID parameters, the maximum permissible continuous current, the maximum permissible peak current limit, the maximum allowable temperature and voltage.

1 Configure Encoder lines, gear ratio and other parameters.

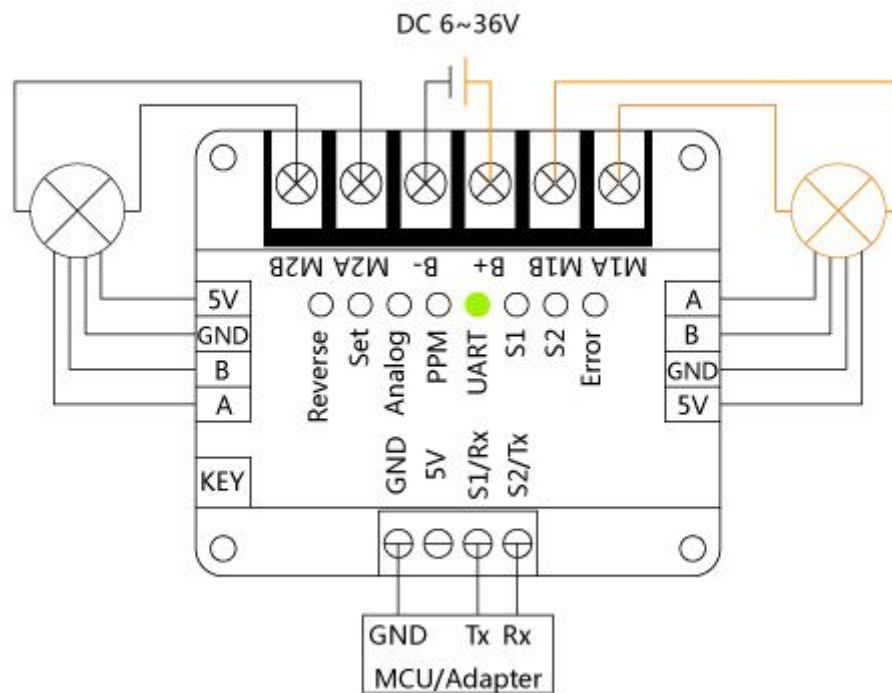
2 Press KEY button on the side for several times, the number depending on the current mode, if the current mode is UART, it just need three times, and the indicator lights on, entering the Setup mode. At this point, the led Status1 flashes (unrelated to the UART mode), and then led Status2 flashes (unrelated to the UART mode).

3 M1 began rotating (Note: For that the instruction of speed control is judged by the plus and minus to distinguish motor rotating direction, we regard this motor rotating direction as the Positive), when



drive detects encoder signal, A/B phase sequence of coding device will adapted automatically, then PID auto-tuning will start on M1, M1 gradually runs stably, then it completes PID parameter auto-tuning of M1. After that, it's the PID parameter auto-tuning of M2.

4 Drive automatically reset, enter the default UART mode.

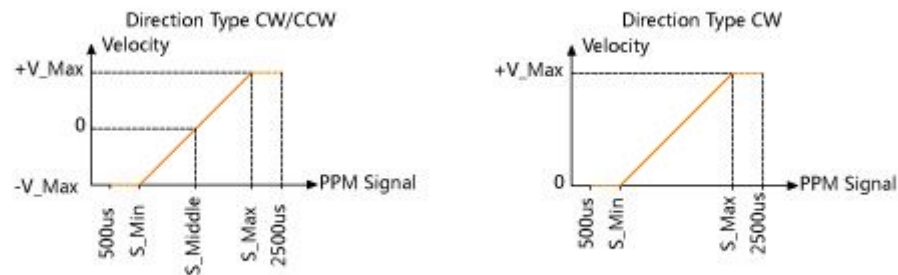


5 You can use (RS232 to UART or USB to UART) Serial Assistant software send "RCONFIG" instruction to read drive configuration parameters, querying all saved internal parameters, at the same time you will notice the parameter of motor with encoder turns from "Velocity Mode" to "Loop Mode", furthermore, it need to be noted that in the actual operation of speed control, the target speed may not be set to be lower than the highest speed, if not, the instructions will not be respond. Please refer to instructions set, set the configuration which you need, when the configuration is completed, you can send directives to control the motor.

## 2.2 PPM interface

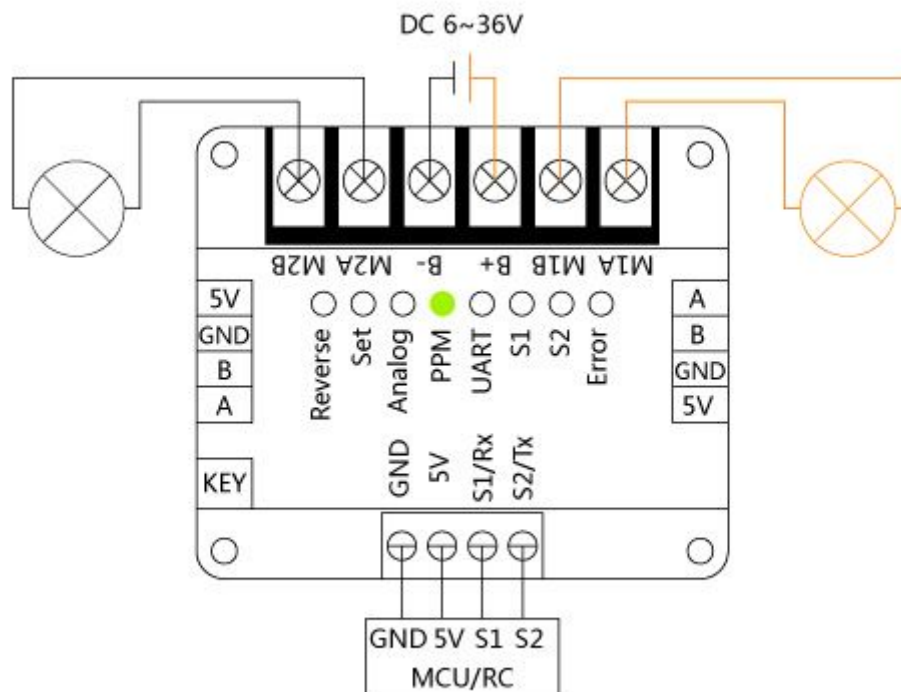
PPM extreme value, a very important parameter, there are two methods to set it. First, send instruction through UART interface; second, in Set mode, while Status1 and Status2 are flashing, the user who is using remote control model could put the corresponding joystick to its extreme location, and holding for about 3 seconds, the drive will automatically recognize threshold value. In this process, if S1 and S2 have already received right PWM input, Drive will calculate reliable limits according to the signals, if there is only one correct PWM input, then the drive will use this signal as an final limit value. Certainly, you can also send PWM signal of the two limit positions through AVR. Regardless of which method you use, PPM limit value shall not exceed the scope 500us-2500us. In

the PPM interface, any other configuration parameters can not be set directly apart from PPM extreme, if you do need to set up the relevant parameters, you must configure them by using UART interface. All the fault messages, it should be checked with above table 1.10 “Protection”. In addition, both in open-loop or closed-loop control mode, the relationship between PPM signal and motor speed are described as the figure below (Note: when the signal is below the minimum limit value or over the maximum limit value, the drive will not respond).



### Open-loop control mode

Connect the cable, as shown in the figure (Connect one circle if you only control one motor):

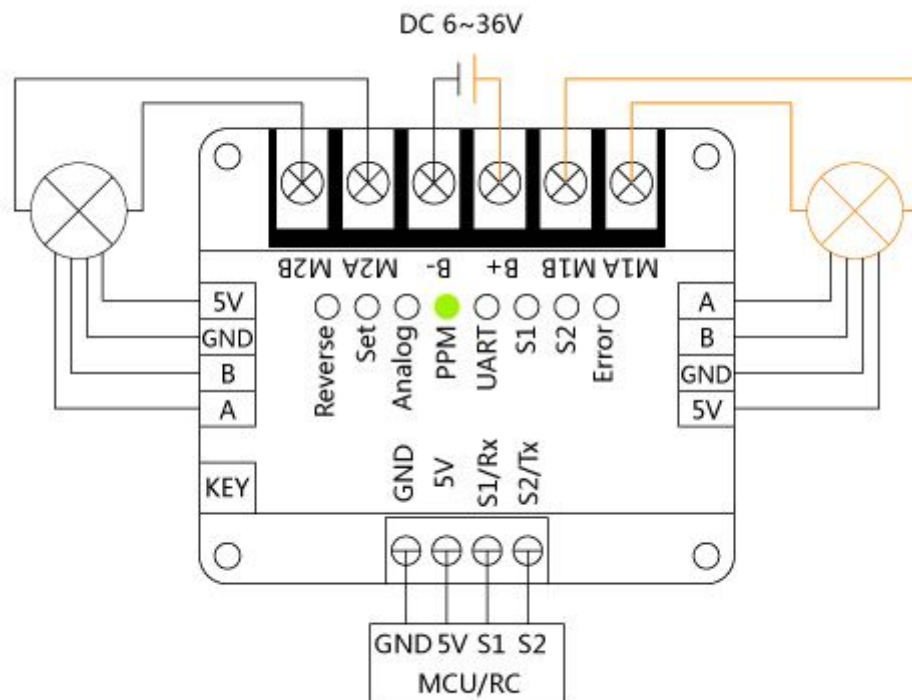


In UART open loop control mode, the parameters associated with the actual control are as follows: direction mode, PWM signal generating method, Starting zero signal detection, PPM extreme value, control signal mode, Discontinuous mode time limit, the maximum permissible continuous current,

the maximum permissible peak current limit, the maximum allowable temperature and voltage. Please refer to instruction set, set those depending on the configuration needs, when the configuration is completed, you can send directives to control the motor.

### Close-loop control mode

Connect the cable, as shown in the figure (Connect one circle if you only control one motor):

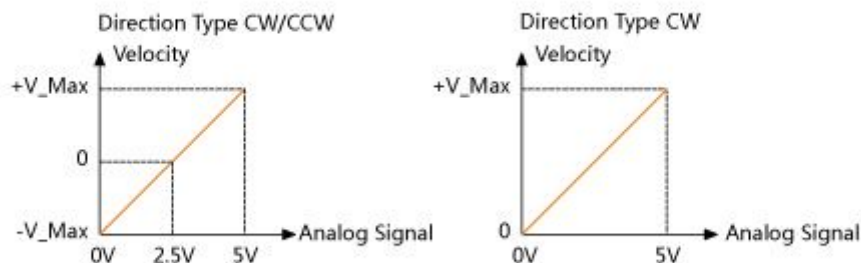


In PPM close loop control mode, the parameters associated with the actual control are as follows: encoder lines, gear ratio, direction mode, PWM signal generating method, Starting zero signal detection, PPM extreme value, control signal mode, Discontinuous mode time limit, PID parameters the maximum permissible continuous current, the maximum permissible peak current limit, the maximum allowable temperature and voltage.

- 1 Configure Encoder lines, gear ratio and other parameters with UART interface.
- 2 Press KEY button on the side to enter the SET mode("SET" indicator led lights up), the led Status1 blinks, then, it's the led Status2. (about how to set PPM limit value, it's already in the start part of the PPM interface).
- 3 M1 began rotating (Note: we regard this motor rotating direction as the Positive, if Direction mode is bi-directional mode, when the PPM signal is in S\_Middle~S\_Max, motor is running positively, when PPM signal is in S\_Min~S\_Middle motor runs in the opposite direction), when drive detect coding device signal, A/B phase sequence of coding device will adapted automatically, then PID auto-tuning will start on M1, M1 gradually runs from oscillation State to steady-state, then it completes PID parameter auto-tuning of M1. After that, it's the PID parameter auto-tuning of M2.
- 4 Drive automatically reset, enter the default UART mode, then turn to PPM mode by KEY button. Finally, confirm all the parameters are set, you can send permitted PWM to control the motor.

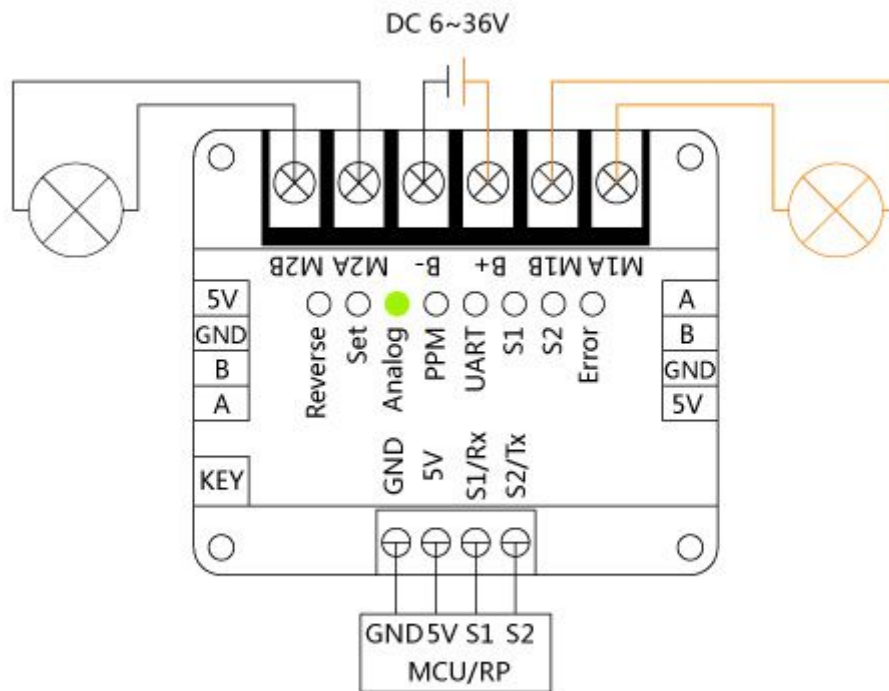
## 2.3 Analog interface

Analog interface mode is the simplest interface, and it is often used to be tested whether drive circuit is good or not. Compared to above two interfaces, there is only one detail need to be noted, if the user is using a potentiometer to regulate motor speed, the direction mode is bidirectional, and require potentiometer mechanical location highly symmetric (that is in the mechanical rotating range potentiometer could reach, a half for positive running, another half opposite-direction running), then at the output terminal of potentiometer, recommends using voltage followed device output, certainly, the user can also use AVR to create PWM + filtering circuit, or use dedicated DAC chip to achieve controllable output voltage signal. In addition, both in open-loop or closed-loop control mode, the relationship between input voltage value and motor speed are described as the figure below.



### Open-loop control mode

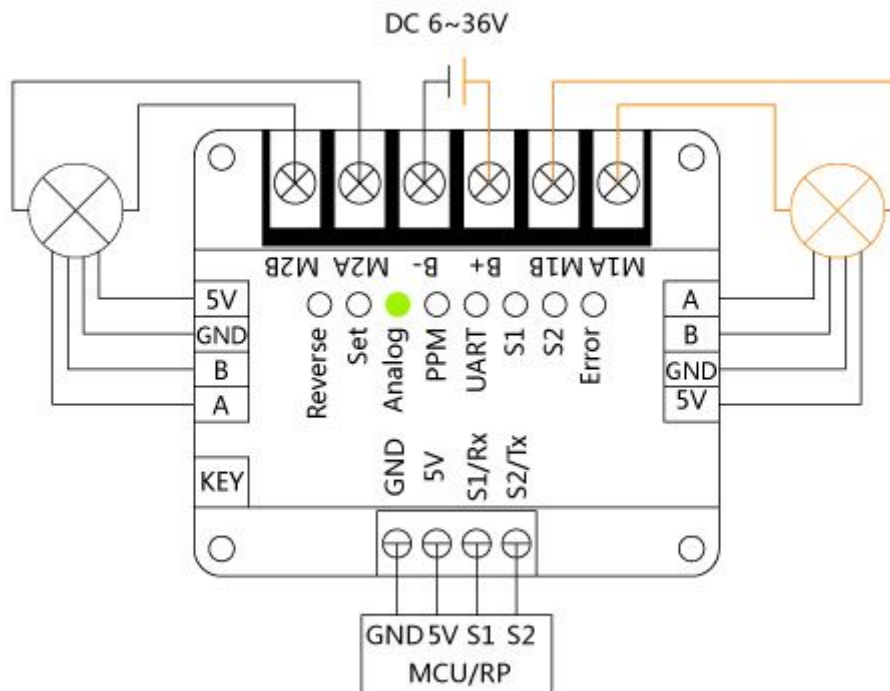
Connect the cable, as shown in the figure (Connect one circle if you only control one motor):



In UART open loop control mode, the parameters associated with the actual control are as follows: direction mode, PWM signal generating method, Starting zero signal detection, control signal mode, discontinuous mode time limit, the maximum permissible continuous current, the maximum permissible peak current limit, the maximum allowable temperature and voltage. Please refer to instruction set, set those depending on the configuration needs, when the configuration is completed, you can control the motor with voltage signal.

### Close-loop control mode

Connect the cable, as shown in the figure (Connect one circle if you only control one motor):



In Analog close loop control mode, the parameters associated with the actual control are as follows: encoder lines, gear ratio, direction mode, PWM signal generating method, Starting zero signal detection, control signal mode, Discontinuous mode time limit, PID parameters the maximum permissible continuous current, the maximum permissible peak current limit, the maximum allowable temperature and voltage.

- 1 Configure Encoder lines, gear ratio and other parameters with UART interface.
- 2 Press KEY button on the side to enter the SET mode("SET" indicator lights up), the led Status1 blinks,then,it's the led Status2. (about how to set PPM limit value,it's already in the start part of the PPM interface).
- 3 M1 began rotating (Note: we regard this motor rotating direction as the Positive direction, if Direction mode is bi-directional mode, when the voltage signal is between 2.5~5V, motor is running in positive direction, when the voltage signal is between 0~2.5V, motor runs in the opposite direction), when drive detect coding device signal, A/B phase sequence of coding device will adapted automatically, then PID auto-tuning will start on M1, M1 gradually runs from oscillation State to steady-state, then it completes PID parameter auto-tuning of M1. After that, it's the PID parameter auto-tuning of M2.
- 4 Drive automatically reset, enter the default UART mode,then turn to Analog mode by KEY button. Finally, after confirming that all the parameters has been set, you can send permitted PWM to control the motor.

### 3 Instruction set V1.0

This version instruction set system contains 44 instructions in all. Letters are not case-sensitive. All instructions, whether were sent or returned, there will be "carriage return + line breaks (\r\n)" as a command ending character. All system parameters can be grouped into the Immediate variable parameter and non-immediate parameters, these parameters will be saved (EEPROM). The rest will be lost (RAM).

Immediate variable parameter is that user setting takes effect immediately (Note: need to perform "EEPSAV" to saves all present configuration parameters in order to ensure those will not lost if power off), including each motor's acceleration/deceleration, PID parameters asynchronously and synchronous speed (Note: asynchronous and synchronous speed are in detail below).

Non-Immediate variable parameter is that parameter which will work in next start. It will be stored in the EEPROM first, after the system was reset, it can take effect.

To allows user to easily analyze the return directive package, Except the directives "read drive configuration parameter", all configuration parameters will be singular form.

### 3.1 Query drive type (ID,PING\r\n)

The type of Veyron motor drive series can be accessed through this command, such as: send the command to brush DC motor drive, it returns "BDC\r\n".

\* Send: 1,PING\r\n

\* Return: BDC\r\n

### 3.2 Read the drive configuration parameters (ID,RCONFIG\r\n)

Through this directive, you could get all the configuration parameters of the drive, after you set the parameters, you can query parameter whether it has been changed according to the requirements with this directive, if it has been changed, and it had to be saved in the EEPROM, it's available to use "save all current configuration parameter" command which will be mentioned bellow, then the parameters can be saved.

\* Send: 1,RCONFIG\r\n

\* Returns: (drive all configuration parameters)

### 3.3 Restore factory settings (ID,FCONFIG\r\n)

All configuration parameters restore to factory settings with this command, drive will automatically reset once receiving the instruction and allow the configure to factory parameters.

\* Send: 1,FCONFIG\r\n

\* Returns: none

### 3.4 Query Help (ID,HELP\r\n)

The instruction help you get the wiki address of DFRobot products, user can search the drive models

on this page, then can get corresponding document.

\* Send: 1,HELP\r\n

\* Returns: (wiki addresses of the DFRobot products)

### 3.5 Save all the configuration parameters (ID,EEPSAV\r\n)

Via this instruction, you could save the current configuration parameters, before saving, it's better to use the "read drive configuration parameter" command to confirm whether the current configuration parameters are your setting values, drive will automatically reset once receiving the instruction and allow the configure to factory parameters.

\* Send: 1,EEPSAV\r\n

\* Returns: none

### 3.6 Set the baud rate (ID,SBR,\*\*\*\*\*\r\n)

This drive supports 10 commonly used baud rate, respectively, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200, the factory default value is 57600.

For example, set the baud rate to 115200

\* Send: 1,SBR,115200\r\n

\* Returns: none

### 3.7 Set the drive addresses (ID,SNA,\*\*\*\r\n)

The drive addresses covers 1~126, the factory default value is 1. When multiple drives running in parallel, two of the same bus address are not allowed. Different address drive, as receiving instructions from host at the same time, response only if the address is identical with itself, or 0 (broadcasts) .

For example, the drive address is set to 8

\* Send: 1,SNA,8\r\n

\* Returns: none

### 3.8 Get the number of cumulative pulse encoder (ID,GEP,\*\r\n)

This command allows to get the encoder pulse numbers accumulated, the range is: -2147483648~2147483647, drive will quadruple the signal of encoder PWM if phase difference of 90 °, if the actual encoder has 200 lines, the drive will turn it into a 200x4=800 line through the internal hardware, so far the drive only supports incremental encoder.

For example, to get the number of cumulative pulse encoder of M1

\* Send: 1,GEP,1\r\n

\* Returns: (actual accumulated pulse number, notice that there are positive and negative, symbols for directions)



### 3.9 Reset encoder cumulative number of pulses (ID, CEP, \*\r\n)

The instruction specifies a way to reset encoder cumulative number of pulses to zero of one motor. For example, to reset encoder cumulative number of pulses to zero of M1

\* Send: 1,CEP,1\r\n

\* Returns: none

### 3.10 Set encoder line (ID, SER, \*\*\*, ####\r\n)

By setting this directive, it can be applied to two motors (M1/M2) encoder line, note: when you set the encoder lines, both must be set, you cannot set a certain route alone. The factory default value is 1.

For example, set M1 encoder line to 100, M2 to 200

\* Send: 1,SER,100,200\r\n

\* Returns: none

### 3.11 Set reduction ratio (ID, SGR, \*\*\*, ####\r\n)

Two motors gearbox reduction ratio can be set with the instruction (M1/M2), actual controlling and output speed is the actual load speed. Users may set this to 1 to get the really true speed of motor. In addition, the drive supports decimal reduction ratio, accurate to 2 decimal digits. The factory default value is 1.

For example, to set the reduction ratio of the M1 to 12.34 and set reduction ratio of M2 to 23.45

\* Send: 1,SGR,12.34,23.45

\* Returns: none

### 3.12 Set direction mode (ID, SDIR, \*\r\n)

In most applications, the motor is sometimes required to run in clockwise, but sometimes anticlockwise, we call it as bidirectional control mode. However, in a number of engineering applications, it only rotates in one direction, we call it one-way control mode. In fact these modes are same in the UART interface, but in PPM and Analog mode is rather different, on the one hand, it is prone to human manipulation errors, on the other hand the precision of the input signal is reduced by half. This drive can be easily set to one type of orientation mode: configuration parameter of 0 indicates a one-way mode, 1 indicates a two-way control mode. The configuration parameters are valid only in Analog mode and PPM, the factory default value is 1.

For example, direction of the drive mode is set to one-way mode

\* Send: 1,SDIR,0\r\n

\* Returns: none

### 3.13 Set the PWM signal generating method (ID, SPWM, \*\r\n)

There are two independent N-MOSFET full bridge drive circuits, MOSFET gate drive signals of most drives cannot be set by user, in order to meet the needs of some users, we set three modes which can be selected, corresponding relationship between PWM generation and configuration parameters are as follows: 0:Hpwm-Lon 1:Hpwm-Lpwm (on-off) 2:Hpwm-Lpwm (on-off-on, the factory default value)

For example, MOSFET drive signal is set to Hpwm-Lpwm (on-off) (Note: the pattern is completely complementary mode)

\* Send: 1,SPWM,1\r\n

\* Returns: none

### 3.14 Set zero signal detection or not when start (ID, SSD, \*\r\n)

Only in the PPM or Analog interface mode, and the direction mode is one-way, the zero signal detection when start is available to set. For most of one-way control mode applications, there are more stringent security requirements, such as in PPM or Analog interface mode, because these modes without acceleration/deceleration feature are servo-controlled, System suddenly reset causes violent impact to load, when the motor holds dangerous loads, it will be a threat to personal safety. In this case, you can start the zero signal detection to enhance security. When system suddenly reset motor at rest, only after the control signals is near to stop before they can engage in normal controls. Configuration parameter of 0 indicates to disable the zero signal detection, of 1 means enable zero-signal detection, the factory default value is 0.

For example, to enable zero-signal detection

\* Send: 1,SSD,1\r\n

\* Returns: none

### 3.15 Gets the current rotation speed (ID, GVC, \*\r\n)

Note: in a closed-loop control mode, return speed value is the current output speed after deceleration, the unit is r/min; in open loop control mode, the return parameter is the quantification speed set last time.

For example, to get the M1 current speed

\* Send: 1,GVC,1\r\n

\* Returns: (current actual output speed)

### 3.16 Get the maximum rotation speed (ID, GVM, \*\r\n)

In closed-loop control mode, the maximum speed of the motor is detected automatically in SET mode after a deceleration maximum speed, the unit is r/min, when the user configuration speed is higher than the value, the directive will not respond; in open loop control mode, the maximum speed

for quantifying is fixed at 1000.

Such as accessing to M1 of maximum speed

\* Send: 1,GVM,1\r\n

\* Returns: (the maximum speed of the motor, the road)

### 3.17 Set synchronous speed (ID, SVS, \*, \*\*\*\*\*\r\n)

Synchronous speed refers to the speed once you have set, the drive will immediately regulate motor speed according to the parameters, aware that synchronous speed should not exceed the maximum speed, otherwise the drive will not respond to this command.

For example, to set the synchronous speed of the M1 to 100r/min

\* Send: 1,SVS,1,100\r\n

\* Returns: none

### 3.18 Set asynchronous speed (ID, SVR, \*, \*\*\*\*\*\r\n)

Synchronous speed refers to the speed once you have set, the drive will Not immediately regulate motor speed according to the parameters, only when it receives command-Perform asynchronous speed before it can take effect. If you need to control two motors simultaneously, by setting motor speed to each motor asynchronously, and then send by radio to perform asynchronous speed command.

For example, to set the asynchronous rotational speed M1 to 100r/min

\* Send: 1,SVR,1,100\r\n

\* Returns: none

### 3.19 Perform asynchronous speed (ID, AVR, \*, #\r\n)

The directive should perform with "set asynchronous speed" instruction to realize strict synchronization of multiple motors. The two parameters which are not corresponding to the mentioned above corresponding to the M1,M2 (1, 2), both values can only be 0 or 1, 0 signifies that the motor is not performing an asynchronous speed, 1 indicates that the road to perform asynchronous speed. \*- the parameter to M1,#- the parameter to M2.

For example, performing asynchronous speed to M1, M2 does not perform asynchronous speed

\* Send: 1,AVR,1,0\r\n

\* Returns: none

### 3.20 Get Acceleration (ID, GACC, \*\r\n)

In a closed-loop control mode, acceleration is r/min/s; in open-loop mode, is a quantitative parameter, no matter the open-loop or closed-loop control, acceleration acts on motor speed. To this drive, when speed's absolute value increased or the speed is in opposite direction, the absolute value of the rate of

velocity changing is the acceleration values, but not like other regular drives which changes the absolute value of the rate of deceleration slowing to 0, then accelerate up to the value of target velocity when the direction changes.

For example, to access to the M1 acceleration

\* Send: 1,GACC,1\r\n

\* Returns: (the motor acceleration)

### 3.21 Get reduced speed (ID, GDEC, \*\r\n)

In closed-loop control mode, the speed reduction unit is r/min/s; in open-loop mode, is a quantitative parameter, no matter the open-loop or closed-loop control, acceleration acts on motor speed. When the direction of the motor is consistent, and absolute value decline, the rate of change of velocity are deceleration values.

For example, to get the deceleration value of M1

\* Send: 1,GDEC,1\r\n

\* Returns: (the road motor deceleration values)

### 3.22 Set increase or decrease speed (ID, SAD, \*, \*\*\*\*\*, #####\r\n)

The directive sets motor acceleration/deceleration values at the same time. In closed-loop control mode, the speed reduction unit is r/min/s; in open-loop mode, is a quantitative parameter.

Such as acceleration of M1 is set to 50, the deceleration is set to 100

\* Send: 1,SAD,1,50,100\r\n

\* Returns: none

### 3.23 Get the PPM Max (ID, GPA\r\n)

PPM Max factory default value is 2500us.

\* Send: 1,GPA\r\n

\* Returns: (PPM maximum)

### 3.24 Get the minimum PPM (ID, GPI\r\n)

PPM minimum factory default value is 500us.

\* Send: 1,GPI\r\n

\* Returns: (PPM minimum)

### 3.25 Set PPM extreme (ID, SPPM, \*\*\*\*, #####\r\n)

Drive PPM maximum can be set in two ways, one is in SET mode, the automatic recognition of PPM

maximum, the specific method will be introduced in PPM interface. Second: user can reset PPM maximum in UART interface. Regardless of which method, all PPM minimum value must be guaranteed not less than 500us, the maximum PPM value is less than 2500us.

For example, to set PPM control signals of the drive the minimum and maximum value respectively for 1000us and 2000us

\* Send: 1,SPPM,1000,2000\r\n

\* Returns: none

### 3.26 Get the control signal mode (ID,GSM\r\n)

Drive control signal patterns into the sustainable mode and discontinuous mode, sustainable mode refers to drive will keep the parameters set before once it received a valid control signal, it will be changed until it receives new parameters. Discontinuous mode is that the drive will stop working once a valid control signal is not received within a stipulated time, and indicates a failure of losing signal (a specific time, please refer to "set a break mode time limit" directive). In addition, the control signal mode is valid only for PPM and UART interfaces. Return parameter of 0 indicates that continuous mode and 1 indicates a break mode, the factory default value is 0.

\* Send: 1,GSM\r\n

\* Returns: (current control signal mode)

### 3.27 Set the control signal mode (ID,SSM,\*\r\n)

For example, the control signal mode is set to continuous mode

\* Send: 1,SSM,1\r\n

\* Returns: none

### 3.28 Set time limit of break mode (ID,SDCT,\*\*\*\r\n)

Discontinuous mode time limit, the maximum can be set to 10s, its timebase is 10ms.

For example, to set the discontinuous mode time to 1s

\* Send: 1,SDCT,100\r\n

\* Returns: none

### 3.29 Get the PID parameter- Kp (ID,GKP,\*\r\n)

For example, to get the parameter of M1 velocity loop PID- Kp

\* Send: 1,GKP,1\r\n

\* Returns: (the current Kp values M1)

### 3.30 Get the PID parameter- Ti (ID,GTI,\*\r\n)

For example, to get the parameter of M1 velocity loop PID- Ti

\* Send: 1,GTI,1\r\n

\* Returns: (current Ti values M1)

### 3.31 Get the PID parameter- Td (ID, GTD, \*\r\n)

For example, to get the parameter of M1 velocity loop PID- Td

\* Send: 1,GTD,1\r\n

\* Returns: (the current Td values M1)

### 3.32 Set the PID parameters (ID, SPID, \*, \*\*\*\*\*, ##, &&\r\n)

M1 and M2 velocity loop PID parameters of the drive is completely independent, including scale parameter, integral, differential parameter. These three parameters can be used in SET mode, the drives will auto-tune based on the load on the motor, draw the ideal parameter values, which greatly facilitates the use. Of course, the drive did not deny user configuring on their own, the three parameters can be set up through the directive, user can observe practical effects of speed servo combined with "real-time output motor speed" instruction and related software.

For example, to set PID parameters of M1, Kp, Ti, Td is respectively to 0.2, 4, 1

\* Send: 1,SPID,1,0.2,4,1\r\n

\* Returns: none

### 3.33 To get the maximum permissible continuous current (ID, GMCC\r\n)

Actual current is greater than the maximum permissible continuous current, and less than the maximum permissible peak current, allowing time for 2s, larger than the 2s, the motor will stop automatically and indicates overcurrent fault, factory default is 25000, unit- mA.

\* Send: 1,GMCC\r\n

\* Returns: (maximum permissible continuous current)

### 3.34 To get the maximum permissible peak current (ID, GMPC\r\n)

Actual current is greater than the maximum permissible peak current, allowing over 400ms, greater than 400ms, the motor will stop automatically, and indicating over current fault, the factory default value is 30000, mA.

\* Send: 1,GMPC\r\n

\* Returns: (maximum permissible peak current)

### 3.35 To get the current current (ID, GCC, \*\r\n)

Such as access to M1 current current

\* Send: 1,GCC,1\r\n

\* Returns: (M1 current, unit is mA)

### 3.36 To set the maximum permissible continuous current and maximum permissible peak current (ID, SMLC, \*\*\*\*, #####\r\n)

The maximum permissible continuous current should not exceed 25000, maximum permissible peak current shall not exceed 30000. Noteworthy is that the two motors share the same parameter.

For example, to set the maximum permissible continuous current and maximum permissible peak current, respectively to 12000mA and 15000mA

\* Send: 1,SMLC,12000,15000\r\n

\* Returns: none

### 3.37 To get the maximum allowed temperature (ID, GMT\r\n)

Drive temperature measuring range: -10~100 °C, resolution of 1 degree Celsius.

\* Send: 1,GMT\r\n

\* Returns: (maximum allowable temperature unit: °C)

### 3.38 To get the current temperature (ID, GCT\r\n)

If the current temperature is greater than 40 °C, fan drive interface will output 5V/500mA power, user can add-in a 5V fan or relay control power fan, to cool the drive off, when the temperature drops below 35 degrees Celsius, power supply will be disconnected. If there is no cooling measures or do not work, when the internal temperature is higher than the maximum allowable temperature, the motor stops, and also indicates over-temperature fault.

\* Send: 1,GCT\r\n

\* Returns: (drive temperature near the current power drive IC, unit: °C)

### 3.39 To set the maximum allowable temperature (ID, SMT, \*\*, \r\n)

Maximum allowable temperature value cannot be greater than 100 °C, if it does, the drive will not respond to the Setup instructions.

For example, to set the maximum allowable temperature at 50 degrees Celsius

\* Send: 1,SMT,50\r\n

\* Returns: none

### 3.40 To get the system voltage (ID, GSV\r\n)

If when the system voltage exceeds the limit voltage range, the motor will stop and then indicates the under-voltage or over-voltage fault.

\* Send: 1,GSV\r\n

\* Returns: (the current \*10 system voltage at a resolution of 0.1V)

### 3.41 To set the limit voltage (ID,SLV,\*\*\*,###\r\n)

The recommended voltage DC drive range 12~36V, limit setting value should not be less than 6V, upper limit value is not greater than 40V, otherwise the drive will not respond.

For example, to set respectively the drive lower and upper voltage threshold to 10V and 24V

\* Send: 1,SLV,100,240\r\n

\* Returns: none

### 3.42 To get the fault information (ID,GER\r\n)

Fault messages should be converted to a hexadecimal number, querying about origin fault in the following table:

Bit	Error Sources
0	Reserved
1	Lower Voltage
2	Over Voltage
3	Over Temperature
4	M1 Over Current
5	M2 Over Current
6	Control Signal Lost
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Control Signal Lost: when the control mode is a break mode, the host controller is required to send control commands within a set time, if there is no control signal for a set time, drive will consider control signals as lost.



\* Send: 1,GER\r\n

\* Returns: (fault information, such as return of 2, then indicates the undervoltage protection)

### 3.43 Clear all fault messages (ID, CER\r\n)

After the failure, the drive goes into protection mode, the motor will not be able to drive. In the UART interface, it can be in normal mode by clearing the fault information; in the PPM and Analog interfaces, resupply power, reset drive, shall enter into the normal mode.

\* Send: 1,CER\r\n

\* Returns: none

### 3.44 Output real-time speed (ID, OUT,\* \r\n)

Real-time speed of motor output is mainly to regulate PID parameters, if needed, to stop exporting, simply enter an empty instruction "\r\n". Worth noting is that in order to monitor the PID parameter tuning results in a better way, the command will call a return of motor speed in real time.

For example, to get the M1 real-time speed

\* Send: 1,OUT,1\r\n

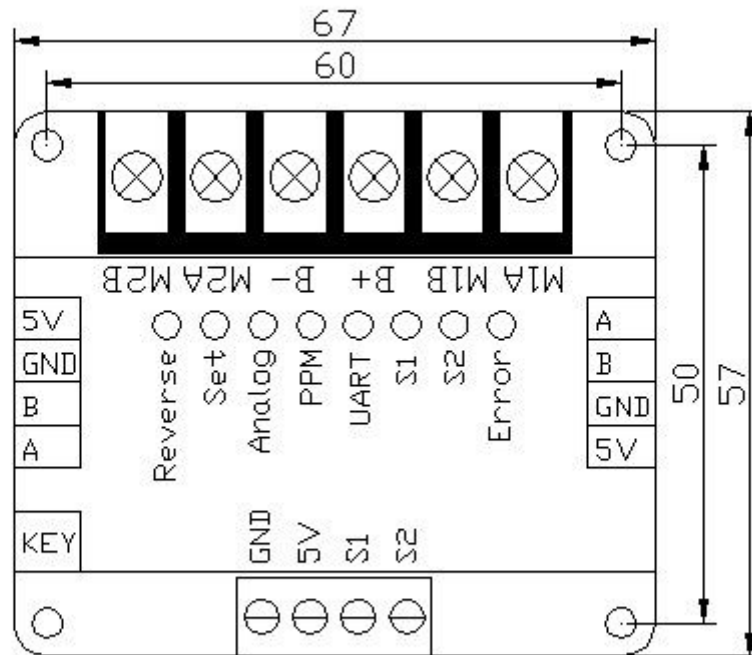
\* Returns: X,Y,Z\r\n (x, y, z are for the abstract representation of the actual data, x means the x time drive speed measurement, value range: 0~4294967295; Y said the actual speed of motor; z is motor target speed.)

## 4 Overall dimensions

Long =67mm

Width =57mm

High =30mm



## Security Statements

This product is designed for the civilian market, for the risks and losses caused by using product in medical, life support, aerospace, military and other industry which is closely linked with the life, DFRobot does not assume any legal liability.

Please read the instructions carefully before use, for the risks and losses caused by the improper use or over the use of limit range, DFRobot does not assume any legal liability.

## Warranty Card

Dear Customers,

Please read the following content carefully in order to protect your rights,

## Return Guidelines

- The product enjoys 15-days (begin from the arrived time) free replacement or repair service, if there is any product quality problem or damaged in shipment.
- The product enjoys 1 year (begin from the arrived time) free repair service, if there is any product quality problem or damaged in shipment. (Note: Man-made damage is not included, please check paid repair).

- All returns should include any accessories, manuals, documentation, etc. that shipped with the product.
- You are responsible for return shipping charges, if it is not a product quality problem.
- After received your product, it may take up to 2 weeks to process, not including transit times.
- After testing, if there is a product quality problem, we will fix it in time, and return your postage back. If there is no problem with product, we will send it back and contact you with the E-mail. And all costs should be assumed by the customer.
- We are not able to process returns for items purchased from a DFRobot distributor. Please contact the store you originally purchased from to arrange a return.

## **Paid repair:**

For the Man-made damage, we will take charge for repair, include:

- The product has phenomenon such as into the water, broken, damaged or corrosion;
- The product has been opened and damaged without permission.
- Exceed the warranty period limit.

We want to ensure that you are fully satisfied with our product. If you have any questions or suggestions please feel free to ask. We will do our best to resolve your matter.