



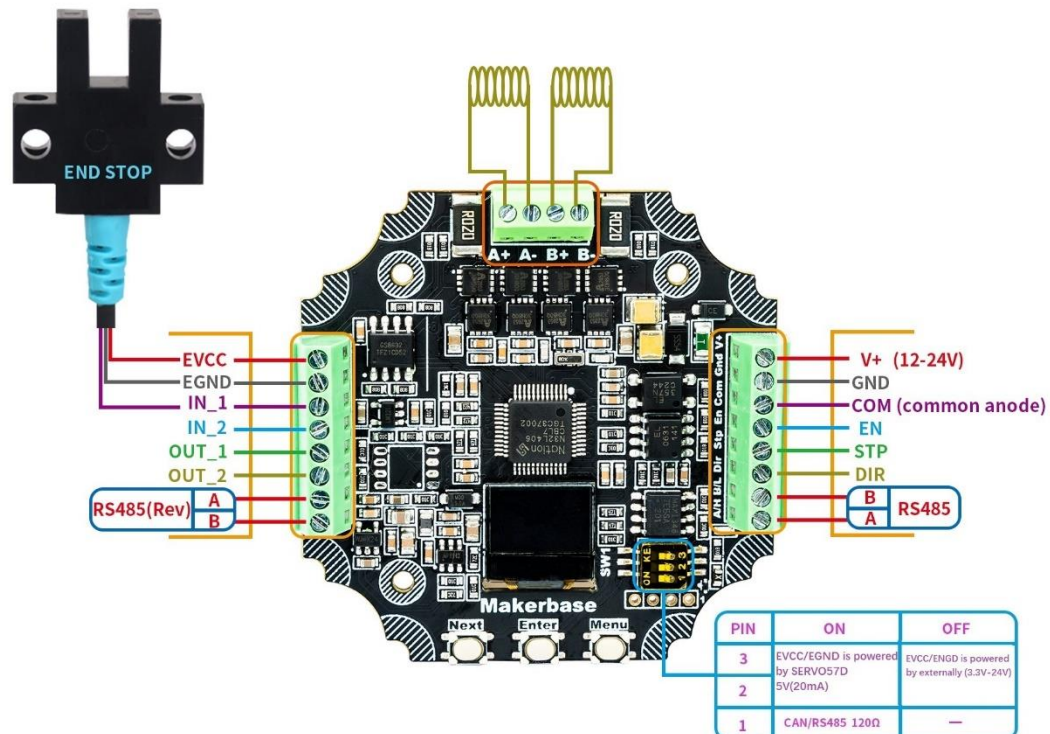
# MKS SERV042D/57D\_RS485 V1.0.1

## USER MANUAL

MKS SERV042D/57D_RS485 Manual Release			
manual	discription	firmware	date
V1.0.0	First release	V1.0.0	Mar-2023
V1.0.1	1.Added SR_OPEN, SR_CLOSE control mode.	V1.0.1	Apr-2023
	2.It can set any working current.		
	3.Redefined speed and acceleration for serial Mode.		
	4. Add the "92" command , It can set the current position to 0 point.		
	5. Add the "8D" command, It can set the group address.		

## Part1. Feature

### 1.1 Interface



## 1.2 Key Operation

Key	Function
Next	move down
Enter	Confirm
Menu	Enter/exit parameter setting menu

### 1. How to View parameter

Press the “Menu” key to Enter the Menu  
press the “Next” key to move to the sub-option  
press the “Enter” key, then it show the value.

### 2. How to setting Parameter:

Press the “Menu” key to Enter the Menu  
press the “Next” key to move to sub-option  
press the “Enter” key, it show the value.  
press the “Next” key to move to the value  
press the “Enter” key to set the value.

## 1.3 Parameter description

- 0.0° - the angle of the motor shaft. (unit degree).  
(Note : It calculated based on the read encoder value, dynamically displayed)
- 0.00err - the err of the motor shaft angle.
- 0clk - the pulses have been received.



## 1.4 Work mode

	Work Mode		MAX RPM	Work Current
OPEN	pulse interface	CR_OPEN	400RPM	Fix, the work current is Ma
	serial interface	SR_OPEN		
CLOSE	pulse interface	CR_CLOSE	1500RPM	Fix, the work current is Ma
	serial interface	SR_CLSOE		
vFOC	pulse interface	CR_vFOC	3000RPM	self-adaption, the Max current is Ma
	serial interface	SR_vFOC		

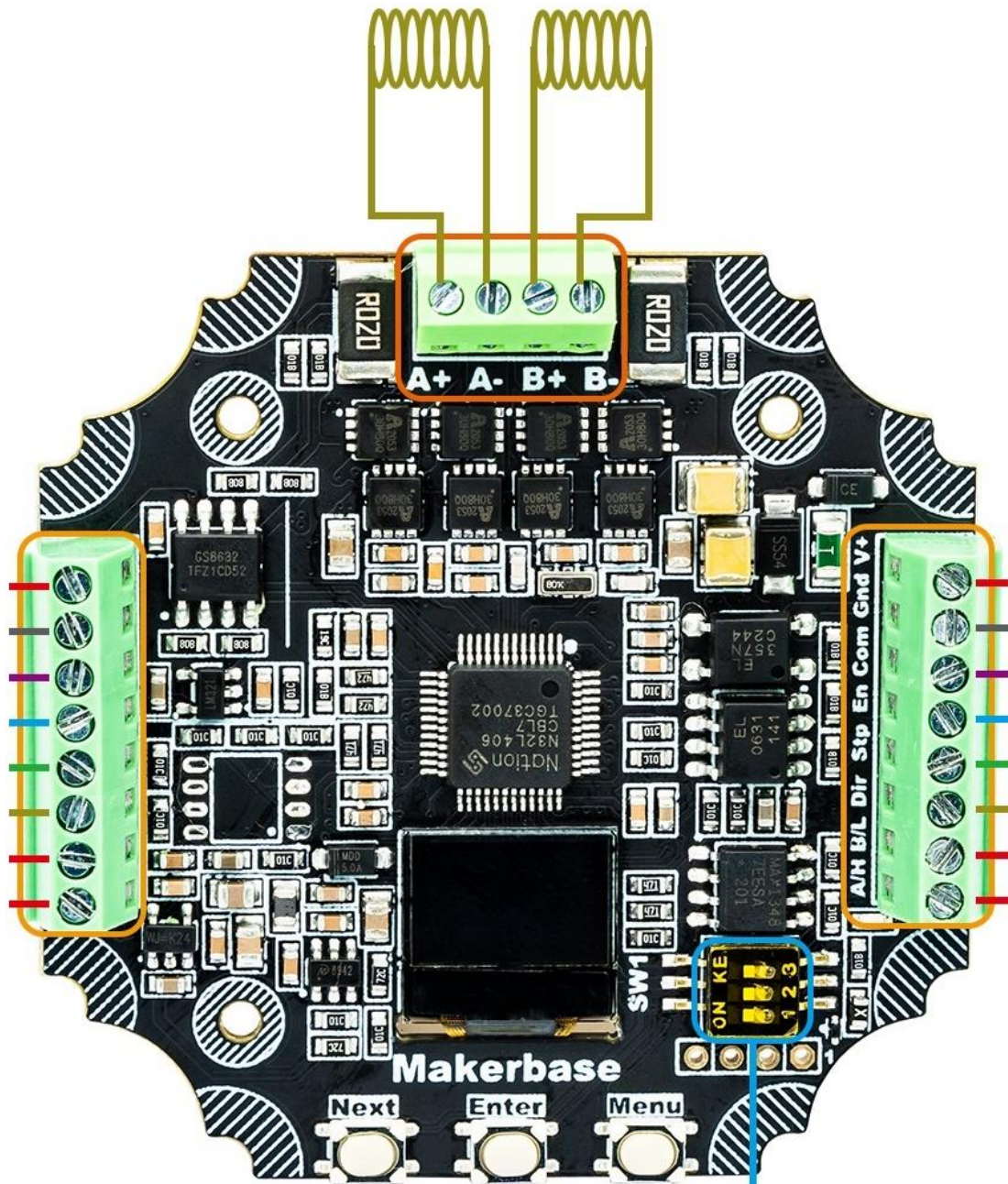
Notel: The default work mode is CR\_vFOC.

Note2: It can work without encoder in “OPEN” work mode.

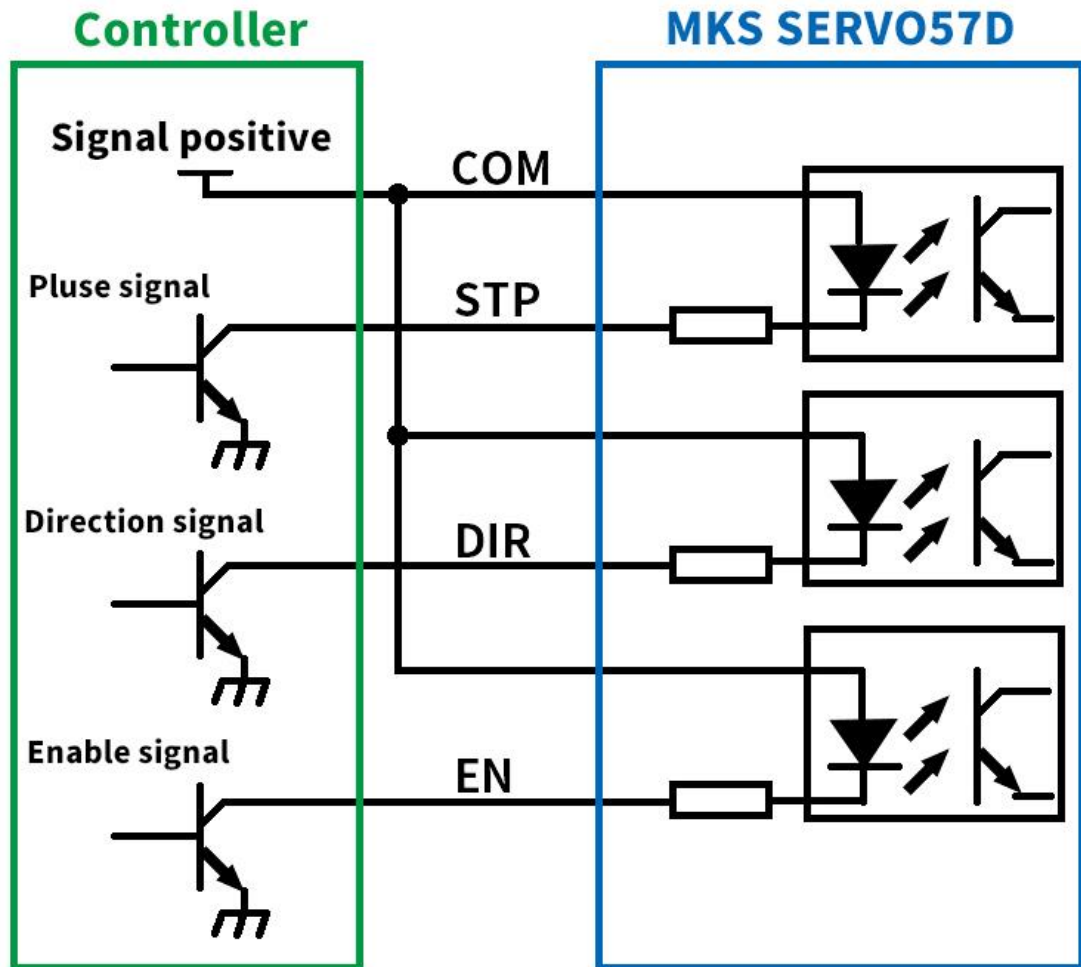
## Part2. Wire

### 2.1 Motor wire

Note: The motor internal resistance should be less than 10 ohms.



## 2.2 Pulse interface wire

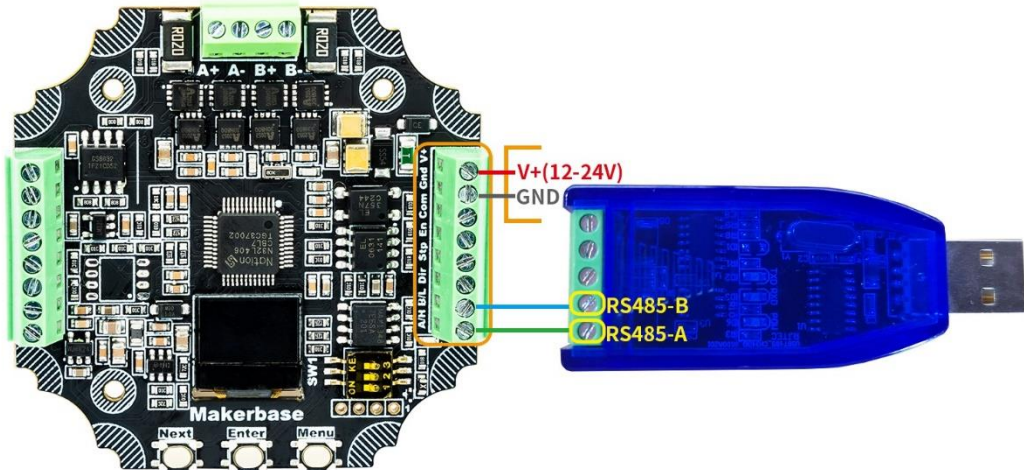


Note: if the (STP/DIR/EN)signal high level is 3.3V, the COM must be 3.3V  
 if the (STP/DIR/EN)signal high level is 5.0V, the COM must be 5.0V  
 ...  
 and so on.

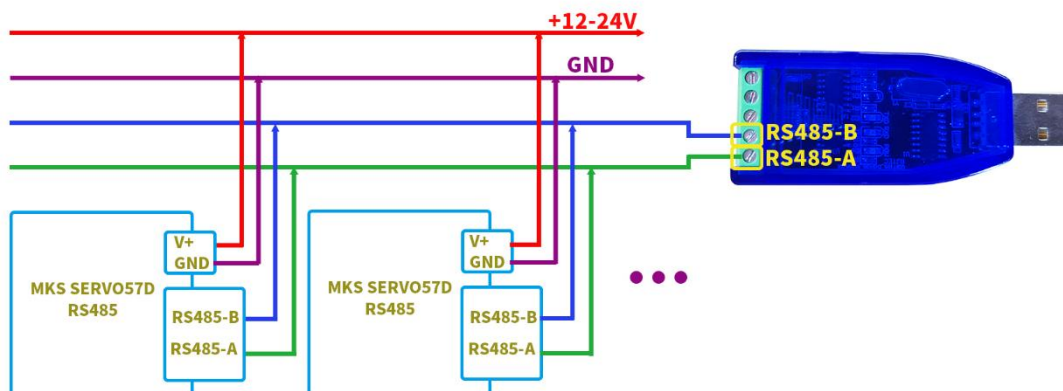


## 2.3 RS485 wire

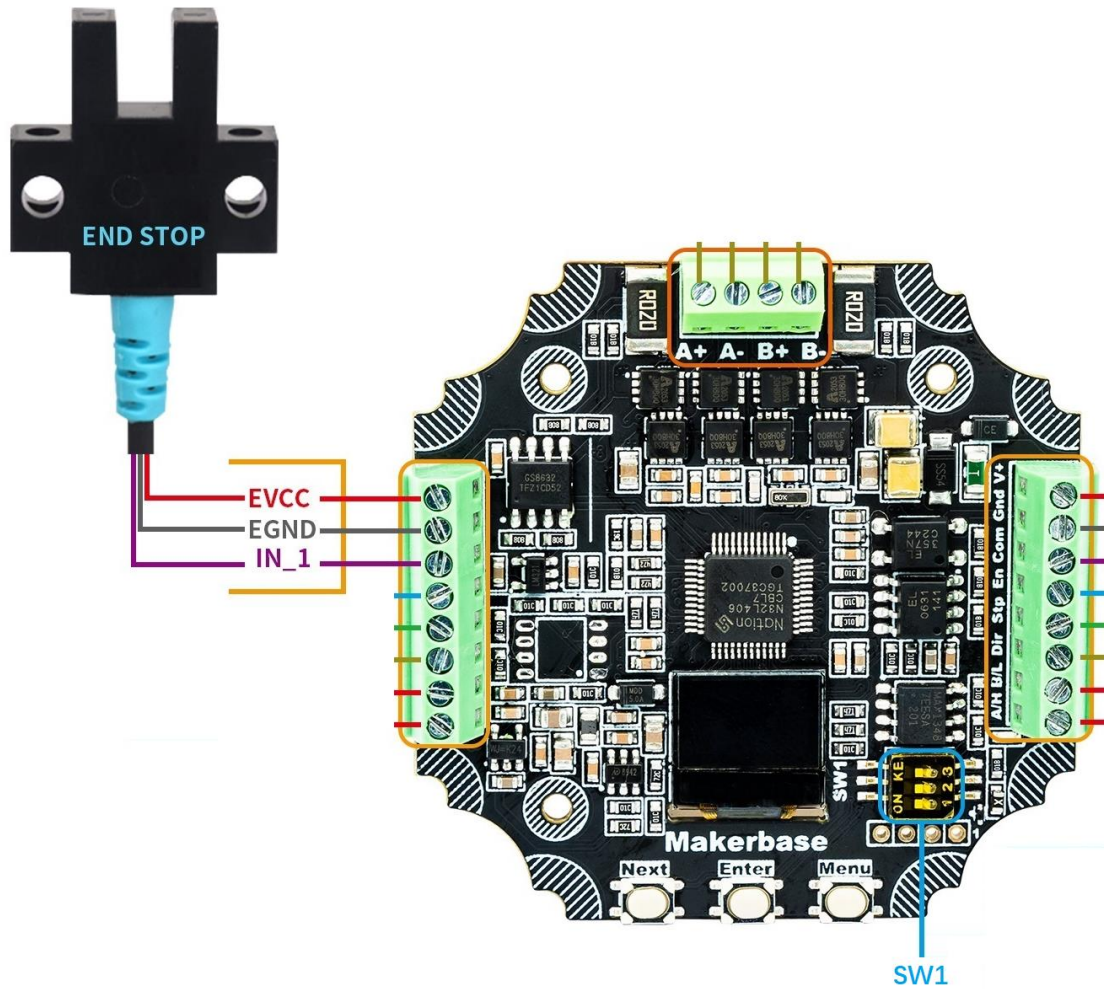
### 1. Single-slave



### 2. Multiple-slave



## 2.4 End stop wire



SW1		
PIN	ON	OFF
3	EVCC/EGND is powered by SERV057D 5V(20mA)	EVCC/EGND is powered by externally power.(3.3V-24V)
2		
1	RS485 120Ω Terminal	NULL

Note: The mechanical switch only needs to be connected the "EGND, IN\_1", and the SW1 pin2 must be in the ON state.



## Part3. Menu description

1. **CAL** : Calibrate the motor.

2. **Mode** : Work mode selection.

CR\_OPEN : pulse interface Open mode, the motor run without encoder

CR\_CLOSE : pulse interface Close mode, the motor run with encoder.

CR\_vFOC : pulse interface FOC mode, the motor run with encoder.

SR\_OPEN : serial interface Open mode, the motor run without encoder

SR\_CLOSE : serial interface Close mode, the motor run with encoder.

SR\_vFOC : serial interface FOC mode, the motor run with encoder.

(Default: CR\_vFOC)

	Mode		MAX RPM	Work Current
OPEN	pulse interface	CR_OPEN	400RPM	Fix, the work current is Ma
	serial interface	SR_OPEN		
CLOSE	pulse interface	CR_CLOSE	1500RPM	Fix, the work current is Ma
	serial interface	SR_CLOSE		
vFOC	pulse interface	CR_vFOC	3000RPM	self-adaption, the Max current is Ma
	serial interface	SR_vFOC		

Note: CR\_CLOSE is better than CR\_vFOC for 3D printing.

3. **Ma** : Set the current.

SERV042D: 0, 200, 400..., 3000(mA) (default 1600mA)

SERV057D: 0, 400, 800..., 5200(mA) (default 3200mA)

Other Current such as 123mA need to be set by serial command .It will be added to the last options.

4. **MStep** : Set subdivisions.

Supports subdivision from 1 to 256.

(Default: 16)

subdivisions 1, 2, 4, 8, 16, 32, 64, 128, and 256 can be set by Menu.

Other subdivisions such as 67 subdivisions need to be set by serial command . It will be added to the last options.

5. **En** : Set the effective level of EN pin.

H : High level is valid.

L : Low level is effective.

Hold : the driver board is always enabled.

(Default: L)

6. **Dir** : Set the positive direction of motor rotation.

CW : Clockwise rotation is positive

CCW : Counterclockwise rotation is positive

(Default: CW)



7. **AutoSDD** : Set auto turn off the OLED screen.  
Disable : disable auto turn off the OLED  
Enable : enable auto turn off the OLED  
(Default: Disable)  
If set to Enable, the screen will automatically turn off after about 15 seconds, and any button can wake up the screen again.
8. **Protect** : Set the motor shaft locked-rotor protection function.  
Disable: disable protection  
Enable: enable protection  
(Default: Disable)  
After this option is enabled, the protection will be triggered when it is detected to be locked-rotor, and the motor will be release.  
Note: you can release the protection status by pressing the Enter button or the serial port command.
9. **MPlyer** : Set internal 256 subdivision.  
(Default: Enable)  
Note: After this option is Enabled, it automatically enable internal 256 subdivision, it can reduce the vibration and noise when the motor at low speed.
10. **UartBaud** : Set the baud rate of serial.  
9600/19200/25000/38400/57600/115200/256000.  
(Default: 38400)
11. **UartAddr** : Set the the slave address of seria.  
01  
...  
09  
10  
(Default: 01)  
Note: The addresses greater than 10 need to be set by serial command. After it is set, it will be added to this option.
12. **UartRSP** : Choose whether the slave respond in speed/positon mode.  
Disable: disable respond  
Enable: enable respond  
(Default: Enable)  
Note: If disable respond, It can query the running status of the motor by command "F1" .





13. **0\_Mode** : The motor will go back to zero when power on.  
Disable : do not go back to zero.  
DirMode : go back to zero with direction of CW or CCW (the direction is set in 0\_Dir menu).  
NearMode : go back to zero with minimum angle.  
(Default: Disable)
14. **Set 0** : Set the zero point for go back when power on.  
(0\_Mode must not be Disable)
15. **0\_Speed** : Set the speed of go back to zero point.  
0 : slowest.  
...  
4 : fastest.
16. **0\_Dir** : Set the direction of go back to zero point.  
CW : Clockwise.  
CCW : Counterclockwise.  
(Default: CW)
17. **HmTrig** : Set the effective level of the end stop.  
Low : Low level is effective  
High : High level is valid  
(Default: Low)
18. **HmDir** : Set the direction of go home.  
CW : Clockwise rotation is positive  
CCW : Counterclockwise rotation is positive  
(Default: CW)
19. **HmSpeed** : Set the speed (RPM) of go home.  
30  
60  
90  
120  
150  
180

Other speed such as 600(RPM) need to be set by serial command .  
It will be added to the last options.



20. **GoHome:** Go home

Notel: It need an “end stop”. The motor will keep running until it hits the limit switch.

Note2: If the limit switch is already closed, the motor will rotate in the opposite direction to homeDir until the limit switch is opened, and then go home.

21. **Restore :** Reload the default parameters.

After restored the default parameters, it needs to Calibrate the motor.

Note: Press the “Next” key first, then power on, it can quickly restore the default parameters.

22. **About :** Show version parameters.

23. **Exit :**Exit the parameter setting menu.

## Part4. Serial data format

Downlink package(PC → SERV042D/57D)					
Head	Slave addr	Function	Data		Check code
FA	addr	code			CRC
Uplink package (PC ← SERV042D/57D)					
Head	Slave addr	Function	Data		Check code
FB	addr	code			CRC

- Downlink package Head is “FA”, uplink package Head is “FB”.
- The slave address(addr) range is 00~255. (default is 01).  
00 is the broadcast address;  
01~10 can be set in the UartAddr option of the display menu;  
greater than 10 need to be set by serial commands.
- The function code (code) executes the corresponding command.  
for example, 0x80 executes the calibration command.
- The Check code is CHECKSUM 8bit  
For example: command “FA 01 80 00 CRC”  
$$\text{CRC} = (0xFA + 0x01 + 0x80 + 0x00) \& 0xFF = 0x17B \& 0xFF = 0x7B$$

## Part5. Serial command description

Note: Please set the serial slave address first.(default:01)

The default address for the following chapters is 01.

### 5.1 Read parameter command

#### 1. command1 : FA 01 30 CRC

read the encoder value(carry).

Uplink package (PC ← SERVO42D/57D)					
Head	Slave addr	Function	Data		CRC
FB	01	30	carry	value	CRC
			int32_t	uint16_t	

carry: the carry vaule of the encoder.

value: the current vaule of the encoder. (range 0~0x3FFF)

When value is greater than 0x3FFF, carry +=1.

When Value is less than 0, carry -=1.

For example:

If the current carry|value is 0x3FF0, After one turn CCW,the carry|value (+0x4000) is 0x13FF0.

If the current carry|value is 0x3FF0, After one turn CW,the carry|value (-0x4000)is 0xFFFFFFFF3FF0.

Note: The encoder value is updated regardless of whether the motor is enabled or not.

#### 2. Command2 : FA 01 31 CRC

read the encoder value(addition).

Uplink package (PC ← SERVO42D/57D)					
Head	Slave addr	Function	value		CRC
FB	01	31	pulses(int48_t)		CRC

After one turn clockwise,the value += 0x4000;

After one turn CCW,the value -= 0x4000;

For example:

If the current value is 0x3FF0, After one turn CCW,the value(+0x4000) is 0x7FF0.

If the current value is 0x3FF0, After one turn CW,the value(-0x4000) is 0xFFFFFFFFFF0.



### 3. Command3 : FA 01 32 CRC

Read the real-time speed of the motor. (RPM)

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	value	CRC
FB	01	31	speed(int16_t)	CRC

Note : if it run CCW, the speed > 0 (RPM)  
if it run CW, the speed < 0 (RPM)

### 4. Command4 : FA 01 33 CRC

Read the number of pulses received.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	33	pulses(int32_t)	CRC

### 5. Command5 : FA 01 39 CRC

read the error of the motor shaft angle.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	39	error(int16_t)	CRC

The error is the difference between the angle you want to control minus the real-time angle of the motor, 0~FFFF corresponds to 0~360° .

for example, when the angle error is 1° , the return error is 65536/360= 182.444, and so on.

### 6. Command6 : FA 01 3A CRC

read the En pins status.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	3A	enable(uint8_t)	CRC

enable =1 Enabled

enable =0 Disabled

### 7. Command7 : FA 01 3B CRC

Read the go back to zero status when power on.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	3B	status(uint8_t)	CRC

status =0 going to zero.

status =1 go back to zero success.

status =2 go back to zero fail.





## 8. Command8 : FA 01 3D CRC

Release the motor shaft locked-rotor protection state.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	3D	status(uint8_t)	CRC

status =1 release success.

status =0 release fail.

## 9. Command9 : FA 01 3E CRC

Read the motor shaft protection state.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	3E	status(uint8_t)	CRC

status =1 protected.

status =0 no protected.

## 5.2 Set parameters command

### 1. Calibrate the encoder

(Same as the "Cal" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	80	00	CRC

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	80	status(uint8_t)	CRC

status =0 Calibrating...

status =1 Calibrated success.

status =2 Calibrating fail.

Note : The motor must be unloaded.



## 2. Set the work mode

(Same as the "Mode" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	82	mode (0~5)	CRC

mode = 0 CR\_OPEN

mode = 1 CR\_CLOSE

mode = 2 CR\_vFOC

mode = 3 SR\_OPEN

mode = 4 SR\_CLOSE

mode = 5 SR\_vFOC

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	82	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

	Mode		MAX RPM	Work Current
OPEN	pulse interface	CR_OPEN	400RPM	Fix, the work current is the <b>Ma</b>
	serial interface	SR_OPEN		
CLOSE	pulse interface	CR_CLOSE	1500RPM	Fix, the work current is the <b>Ma</b>
	serial interface	SR_CLOSE		
vFOC	pulse interface	CR_vFOC	3000RPM	self-adaption, the Max current is the <b>Ma</b>
	serial interface	SR_vFOC		

## 3. Set the current

(Same as the "Ma" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	83	Current(uint16_t)	CRC

Note:the new current will show in the screen of Ma option.

SERV042D: Maximum Current =3000mA

SERV057D: Maximum Current =5200mA

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	83	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.



#### 4. Set subdivision

(Same as the "MStep" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	84	micstep(00~FF)	CRC

Note: the new micstep will show in the screen of MStep option.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	84	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

#### 5. Set the active of the En pin

(Same as the "En" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	85	enable(00~02)	CRC

enable = 00 active low (L)

enable = 01 active high (H)

enable = 02 active always (Hold)

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	85	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

#### 6. Set the direction of motor rotation

(Same as the "Dir" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	86	dir(00~01)	CRC

dir = 00 CW

dir = 01 CCW

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	86	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

## 7. Set auto turn off the screen function

(Same as the "AutoSDD" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	87	enable(00~01)	CRC

enable = 01    enabled

enable = 00    disabled

If set to Enable, the screen will automatically turn off after about 15 seconds, and any button can wake up the screen again.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	87	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

## 8. Set the motor shaft locked-rotor protection function

(Same as the "Protect" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	88	enable(00~01)	CRC

enable = 01    enabled protection

enable = 00    disabled protection

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	88	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

Note: you can release the protection status by pressing the Enter button or the serial command.

## 9. Set the subdivision interpolation function

(Same as the "Mplyer" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	89	enable(00~01)	CRC

enable = 01    enabled interpolation function.

enable = 00    disabled interpolation function.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	89	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

## 10. Set the baud rate

(Same as the "UartBaud" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	8A	baud(01~07)	CRC

baud = 01    9600.

baud = 02    19200.

baud = 03    25000.

baud = 04    38400.

baud = 05    57600.

baud = 06    115200.

baud = 07    256000.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	8A	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.





## 11. Set the slave address

(Same as the "UautAddr" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	8B	addr(00~FF)	CRC

Note1: the new address will show in the screen of UartAddr option.

Note2: 0 is the broadcast address

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	8B	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

## 12. Set the slave respond

(Same as the "UautRSP" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	8C	enable(00~01)	CRC

enable = 01 enabled respond

enable = 00 disabled respond

Note: If disable respond, It can query the running status of the motor by command "F1".

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	8C	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

## 13. Set the group address

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	8D	addr(01~FF)	CRC

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	8D	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

For example, there are 6 motors with the settings address:

	Broadcast addr	Slave addr	Group addr
motor 1	0	1	0x50
motor 2	0	2	0x50
motor 3	0	3	0x50
motor 4	0	4	0x51
motor 5	0	5	0x51
motor 6	0	6	0x51

send FA 01 FD 01 2C 64 00 00 0C 80 15, motor 1 will rotate a turn

send FA 00 FD 01 2C 64 00 00 0C 80 14, motor1-6 will rotate a turn

send FA 50 FD 01 2C 64 00 00 0C 80 64, motor1-3 will rotate a turn

send FA 51 FD 01 2C 64 00 00 0C 80 65, motor4-6 will rotate a turn

## 5.3 Set Home command

### 1. Set the parameter of home

(Same as the “HmTrig、HmDir、HmSpeed” option on screen)

Downlink package (PC → SERV042D/57D)						
byte1	byte2	byte3	byte 4	byte 5	byte 6-7	byte 8
Head	Slave addr	Function	level	dir	speed	Check
FA	01	90	HmTrig	HmDir	HmSpeed	CRC

homeTrig the effective level of the end stop

0: Low

1: High

homeDir the direction of go home

0: CW

1: CCW

homeSpeed the speed of go home

0~3000 (RPM)

Note : The speed description can be found in Chapter 6.1.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	90	status(uint8_t)	CRC

status =1 Set success.

status =0 Set fail.

## 2. Go home

(Same as the “GoHome” option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	91	NULL	CRC

Note: If the limit switch is already closed, the motor will rotate in the opposite direction to homeDir until the limit switch is opened, and then go home.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	91	status(uint8_t)	CRC

status =0 go home fail.

status =1 go home start.

status =2 go home sucess.

## 3. Set Currnet Axis to zero

It can set the current Axis to Zero. Just as “GoHome” without run the motor.

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	92	NULL	CRC

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	92	status(uint8_t)	CRC

status =0 set fail.

status =1 set success.



## 5.4 Restore the default parameter

(Same as the "Restore" option on screen)

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	3F	NULL	CRC

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	3F	status(uint8_t)	CRC

status =1 restore success.

status =0 restore fail.

Note1: After restored the parameters, It will reboot again, and need to calibrate the motor.

Note2: Press the "Next" key, and power on the motor, the default parameter will be restored.

## Part6. Run the motor by serial command

Note: This chapter needs to set the working mode to serial mode.  
(SR\_OPEN/SR\_CLOSE/SR\_VFOC)

### 6.1 Description the parameters of speed and acceleration

#### 1. speed

The speed parameter ranges from 0 to 3000. The larger the value, the faster the motor rotates.

When speed = 0, the motor stops rotating.

The maximum speed of the control mode is as follows:

	Control mode		Max speed
Open mode	Pulse interface	CR_OPEN	400(RPM)
	Serial interface	SR_OPEN	
Close mode	Pulse interface	CR_CLOSE	1500(RPM)
	Serial interface	SR_CLSOE	
FOC mode	Pulse interface	CR_vFOC	3000(RPM)
	Serial interface	SR_vFOC	

If the set speed is greater than the maximum speed of the control mode, the motor runs at the maximum speed of the control mode.

Note: The speed value is calibrated based on 16/32/64 subdivisions, and the speeds of other subdivisions need to be calculated based on 16 subdivisions.

For example, setting speed=1200

At 8 subdivisions, the speed is 2400 (RPM)

At 16/32/64 subdivisions, the speed is 1200 (RPM)

At 128 subdivisions, the speed is 150 (RPM)



## 2. acceleration

The value of the acceleration(acc) ranges from 0 to 255. The larger the value, the faster the motor accelerates/decelerates.

If acc=0, the motor runs without acceleration or deceleration, and runs directly at the set speed.

### ① accelerates

Suppose at time  $t_1$ , the current speed is  $V_{t1}$  ( $V_{t1} < \text{speed}$ )

at time  $t_2$ , the current speed is  $V_{t2}$

$$t_2 - t_1 = (256 - \text{acc}) * 50 \text{ (uS)}$$

The relationship between the current speed  $V_{ti}$ , acc, and speed is as follows:

$$V_{t2} = V_{t1} + 1 \text{ (} V_{t2} \leq \text{speed)}$$

For example: acc = 236, speed = 3000

T(ms)	speed (RPM)	T(ms)	speed (RPM)
0	0	...	...
1	1	...	...
2	2	2998	2998
3	3	2999	2999
...	...	3000	3000

### ② decelerates

Suppose at time  $t_1$ , the current speed is  $V_{t1}$  ( $V_{t1} > \text{speed}$ )

at time  $t_2$ , the current speed is  $V_{t2}$

$$t_2 - t_1 = (256 - \text{acc}) * 50 \text{ (uS)}$$

The relationship between the current speed  $V_{ti}$ , acc, and speed is as follows:

$$V_{t2} = V_{t1} - 1 \text{ (} V_{t2} \geq \text{speed)}$$

## 6.2 Query/Enable the motor command

### 1. Query the motor status

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	F1	—	CRC

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	F1	status(uint8_t)	CRC

status = 0      query fail.  
 status = 1      motor stop  
 status = 2      motor speed up  
 status = 3      motor speed down  
 status = 4      motor full speed  
 status = 5      motor is homing

### 2. Enable the motor

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	F3	en (00~01)	CRC

en = 00      disable.  
 en = 01      enable.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	F3	status(uint8_t)	CRC

status = 1 set success.  
 status = 0 set fail.



## 6.3 Speed mode command

In speed mode, the motor can be run with a fixed acceleration and speed.

### 1. Run the motor in speed mode

Downlink package (PC → SERVO42D/57D)								
BYTE1	BYTE2	BYTE3	BYTE4			BYTE5	BYTE6	BYTE7
Head	Slave addr	Function	dir	Rev	speed		acc	CRC
FA	addr	F6	b7	b6-b4	b3-b0	b7-b0	acc	CRC
			dir	--	speed			

Byte 4: The highest bit indicates the direction, the lower 4 bits and byte 5 together indicate the speed

Byte 5: The lower 4 bits of byte 5 and byte 4 together indicate speed

The parameter description is as follows:

addr: slave address, the value range is 0-255

dir: the value range is 0/1 (CCW/CW)

speed: the speed, the value range is 0-3000

acc: the acceleration, the value range is 0-255

for example:

Send “FA 01 F6 01 40 02 34” ,

the motor rotates forward at acc=2, speed=320RPM

Send “FA 01 F6 81 40 02 B4” ,

the motor reverses at acc=2, speed=320RPM

Uplink package (PC ← SERVO42D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	F6	status(uint8_t)	CRC

status = 1 run success.

status = 0 run fail.

Note: the “Uplink package” can be disable by Menu “UartRSP” or Command “8C” .



## 2. Stop the motor in speed mode

Downlink package (PC → SERVO42D/57D)								
BYTE1	BYTE2	BYTE3	BYTE4		BYTE5		BYTE6	BYTE7
Head	Slave addr	Function	dir	Rev	speed		acc	CRC
FA	addr	F6	b7	b6-b4	b3-b0	b7-b0	acc	CRC
			0	0	0			

The stop command can stop the motor slowly, or stop the motor immediately.

When setting  $acc \neq 0$ , the motor decelerates and stops slowly

When setting  $acc = 0$ , the motor stops immediately

① Deceleration and stop the motor slowly ( $acc \neq 0$ )  
for example:

Send FA 01 F6 00 00 02 F3

Stop the motor with deceleration  $acc=2$

② Immediate stop command ( $acc = 0$ )  
for example:

Send FA 01 F6 00 00 00 F1

Stop the motor immediately

**Note:** If the motor rotating more than 1000RPM, it is not a good idea to stop the motor immediately!

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	F6	status(uint8_t)	CRC

status = 0 stop the motor fail.

status = 1 start to stop the motor.

status = 2 stop the motor success.

Note: the “Uplink package” can be disabled by Menu “UartRSP” or Command “8C”.



### 3. Save/Clear the parameter in speed mode

Downlink package (PC → SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FA	01	FF	state	CRC

state = C8      Save.

state = CA      Clean.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	FF	status(uint8_t)	CRC

status = 1      success.

status = 0      fail.

Note: The motor can rotates clockwise or counterclockwise at a constant speed when powered on.





## 6.4 Position model: relative motion by pulses

In the position control mode, the motor can be run to the specified position with the set acceleration and speed.

### 1. Run the motor in position model

Downlink package (PC → SERVO42D/57D)									
BYTE1	BYTE2	BYTE3	BYTE4		BYTE5		BYTE6	BYTE7-10	BYTE11
Head	Slave addr	Function	dir	Rev	speed		acc	pulses	CRC
FA	addr	FD	b7	b6-b4	b3-b0	b7-b0	acc	pulses	CRC
			dir	--	speed				

Byte 4: The highest bit indicates the direction, the lower 4 bits and byte 5 together indicate the speed

Byte 5: The lower 4 bits of byte 5 and byte 4 together indicate speed

The parameter description is as follows:

addr: slave address, the value range is 0-255

dir: the value range is 0/1 (CCW/CW)

speed: the speed, the value range is 0-3000 (RPM)

acc: the acceleration, the value range is 0-255

pulses: the motor run steps, the value range is 0 - 0xFFFFFFFF

for example:

Send FA 01 FD 01 40 02 00 00 FA 00 35,

the motor rotates 20 times in the forward direction with acc=2, speed=320RPM (16 subdivisions);

Send FA 01 FD 81 40 02 00 00 FA 00 b5,

the motor rotates 20 times in the reverse direction with acc=2, speed=320RPM (16 subdivisions);

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	FD	status(uint8_t)	CRC

status = 0      run fail.

status = 1      run starting...

status = 2      run complete.

Note: the "Uplink package" can be disable by Menu "UartRSP" or Command "8C".



## 2. Stop the motor in position model

Downlink package (PC → SERVO42D/57D)									
BYTE1	BYTE2	BYTE3	BYTE4		BYTE5		BYTE6	BYTE7-10	BYTE11
Head	Slave addr	Function	dir	Rev	speed		acc	pulses	CRC
FA	addr	FD	b7	b6-b4	b3-b0	b7-b0	acc	0	CRC
			0	0	0				

The stop command can stop the motor slowly, or stop the motor immediately.

When setting  $acc \neq 0$ , the motor decelerates and stops slowly

When setting  $acc = 0$ , the motor stops immediately

① Deceleration and stop the motor slowly ( $acc \neq 0$ )

for example:

Send FA 01 FD 00 00 02 00 00 00 00 FA

Stop the motor with deceleration  $acc=2$

② Immediate stop command ( $acc = 0$ )

for example:

Send FA 01 FD 00 00 00 00 00 00 00 F8

Stop the motor immediately

**Note:** If the motor rotating more than 1000RPM, it is not a good idea to stop the motor immediately!

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	FD	status(uint8_t)	CRC

status = 0 stop the motor fail.

status = 1 stop the motor starting....

status = 2 stop the motor complete.

Note1: the “Uplink package” can be disabled by Menu “UartRSP” or Command “8C”.



## 6.5 Position mode2: relative motion by axis

In the position control mode2, the motor can be run to the specified axis with the set acceleration and speed.

Note1: the axis is the encoder value(addition).It can be read by command “31” .

Note2: In this mode ,the axis err about  $\pm 15$ .

Suggest running with 64 subdivisions.

### 1. Run the motor in position mode2

byte1	byte2	byte3	byte 4-5	byte 6	byte 7-10	byte 11
Head	Slave addr	Function	speed	acc	Relative axis	Check
FA	addr	F4	speed	acc	relAxis	CRC

The parameter description is as follows:

speed: the speed, the value range is 0-3000(RPM)

acc: the acceleration, the value range is 0-255

relAxis: the relative axis, int32\_t

For example:

If the current axis is 0x8000. (read by code “31” )

Send FA 01 F4 02 58 02 00 00 40 00 8B

The motor will relative move 0x4000 (speed = 600(RPM), acc =2)

After move the axis is 0xC000. (0x8000+0x4000=0xC000)

If the current axis is 0x8000. (read by code “31” )

Send FA 01 F4 02 58 02 FF FF C0 00 03

The motor will relative move -0x4000 (speed = 600(RPM), acc =2)

After move the axis is 0x4000. (0x8000-0x4000=0x4000)

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	F4	status(uint8_t)	CRC

status = 0      run fail.

status = 1      run starting...

status = 2      run complete.

Note: the “Uplink package” can be disable by Menu “UartRSP” or Command “8C” .

## 2. Stop the motor in position mode2

byte1	byte2	byte3	byte 4-5	byte 6	byte 7-10	byte 11
Head	Slave addr	Function	speed	acc	Relative axis	Check
FA	addr	F4	0	acc	0	CRC

The stop command can stop the motor slowly, or stop the motor immediately.

When setting  $acc \neq 0$ , the motor decelerates and stops slowly

When setting  $acc = 0$ , the motor stops immediately

① Deceleration and stop the motor slowly ( $acc \neq 0$ )

for example:

Send FA 01 F4 00 00 04 00 00 00 00 F3

Stop the motor with deceleration  $acc=4$

② Immediate stop command ( $acc = 0$ )

for example:

Send FA 01 F4 00 00 00 00 00 00 00 EF

Stop the motor immediately

**Note:** If the motor rotating more than 1000RPM, it is not a good idea to stop the motor immediately!

Uplink package (PC ← SERV042D/57D)					
CAN ID		DLC	byte1	byte2	byte3
01	...	3	code	data	Check
			F4	status(uint8_t)	CRC

status = 0 stop the motor fail.

status = 1 stop the motor starting...

status = 2 stop the motor complete.

Note: the "Uplink package" can be disabled by Menu "UartRSP" or Command "8C".



## 6.6 Position mode3: absolute motion by axis

In the position control mode3, the motor can be run to the specified axis with the set acceleration and speed.

Note1: the axis is the encoder value(addition). It can be read by command “31”.

Note2: In this mode ,the axis err about  $\pm 15$ .

Suggest running with 64 subdivisions.

### 1. Run the motor in position mode3

byte1	byte2	byte3	byte 4-5	byte 6	byte 7-10	byte 11
Head	Slave addr	Function	speed	acc	absolute axis	Check
FA	addr	F5	speed	acc	absAxis	CRC

The parameter description is as follows:

speed: the speed, the value range is 0-3000(RPM)

acc: the acceleration, the value range is 0-255

relAxis: the relative axis, int32\_t

For example:

If the current axis is any value

Send FA 01 F5 02 58 02 00 00 40 00 8C

The motor will move to 0x4000 (speed = 600(RPM), acc =2)

After move the axis is 0x4000.

If the current axis is any value

Send FA 01 F5 02 58 02 FF FF C0 00 0A

The motor will move to -0x4000 (speed = 600(RPM), acc =2)

After move the axis is -0x4000.

Uplink package (PC ← SERV042D/57D)				
Head	Slave addr	Function	Data	CRC
FB	01	F5	status(uint8_t)	CRC

status = 0      run fail.

status = 1      run starting...

status = 2      run complete.

Note: the “Uplink package” can be disable by Menu “UartRSP” or Command “8C”.

## 2. Stop the motor in position mode3

byte1	byte2	byte3	byte 4-5	byte 6	byte 7-10	byte 11
Head	Slave addr	Function	speed	acc	absolute axis	Check
FA	addr	F5	0	acc	0	CRC

The stop command can stop the motor slowly, or stop the motor immediately.

When setting  $acc \neq 0$ , the motor decelerates and stops slowly

When setting  $acc = 0$ , the motor stops immediately

① Deceleration and stop the motor slowly ( $acc \neq 0$ )

for example:

Send FA 01 F5 00 00 04 00 00 00 00 F4

Stop the motor with deceleration  $acc=4$

② Immediate stop command ( $acc = 0$ )

for example:

Send FA 01 F5 00 00 00 00 00 00 00 F0

Stop the motor immediately

**Note:** If the motor rotating more than 1000RPM, it is not a good idea to stop the motor immediately!

Uplink frame (PC ← SERV042D/57D)					
CAN ID		DLC	byte1	byte2	byte3
01	...	3	code	data	Check
			F5	status(uint8_t)	CRC

status = 0 stop the motor fail.

status = 1 stop the motor starting...

status = 2 stop the motor complete.

Note: the "Uplink package" can be disabled by Menu "UartRSP" or Command "8C".

## Part7. Serial example

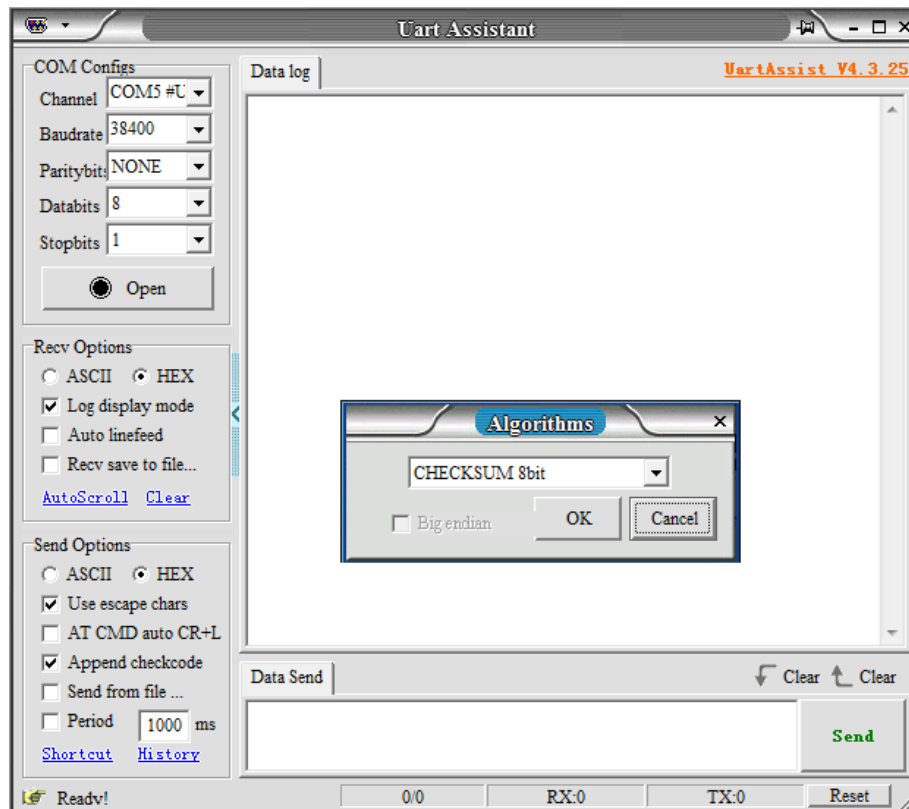
### 7.1 Config the SERV042D/57D

1. Menu → Mode → SR\_vFOC.
2. Menu → UartBaud → 38400.
3. Menu → UartAddr → 01.

### 7.2 Config the Uart Assistant

1. Select the Channel; (such as COM5).
2. Select the Baudrate; (such as 38400, Must be equal to motor baudrate).
3. Recv Options: select “HEX”.
4. Send Options: select “HEX”.
5. Append checkcode: select “CHECKSUM-8”.

Such as below:

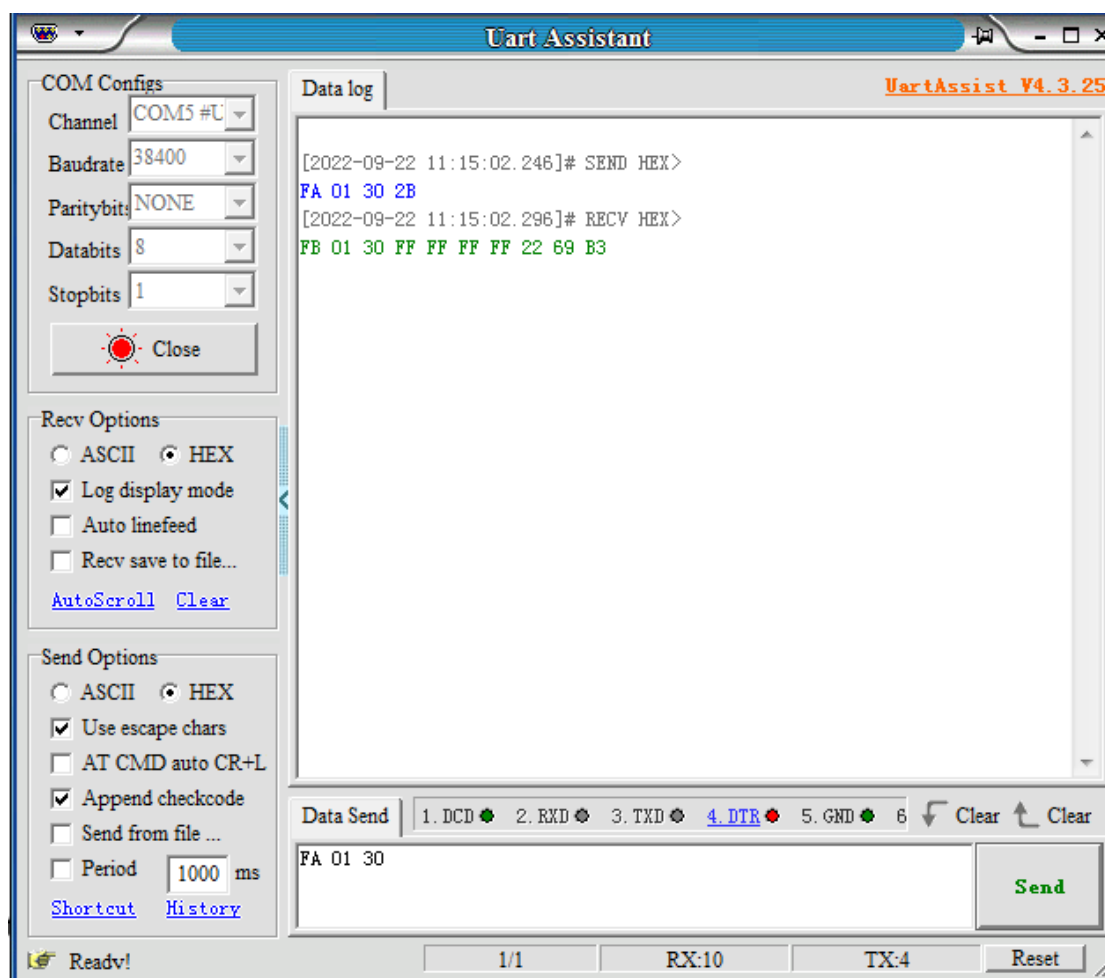




### 7.3 Read the encoder value

send "FA 01 30 2B"

return "FB 01 30 FF FF FF FF 22 69 B3"



## 7.4 Run the motor in speed mode

Note : Please configure the working mode to “SR\_vFOC”.

Menu-> Mode -> SR\_vFOC

1. Send `FA 01 F6 01 40 02` , the motor will rotate at "speed = 320RPM, acc=2";

Return `FB 01 F6 01 F3`, the motor run in speed mode successful;

2. Send `FA 01 FF C8` to save the speed mode parameters;

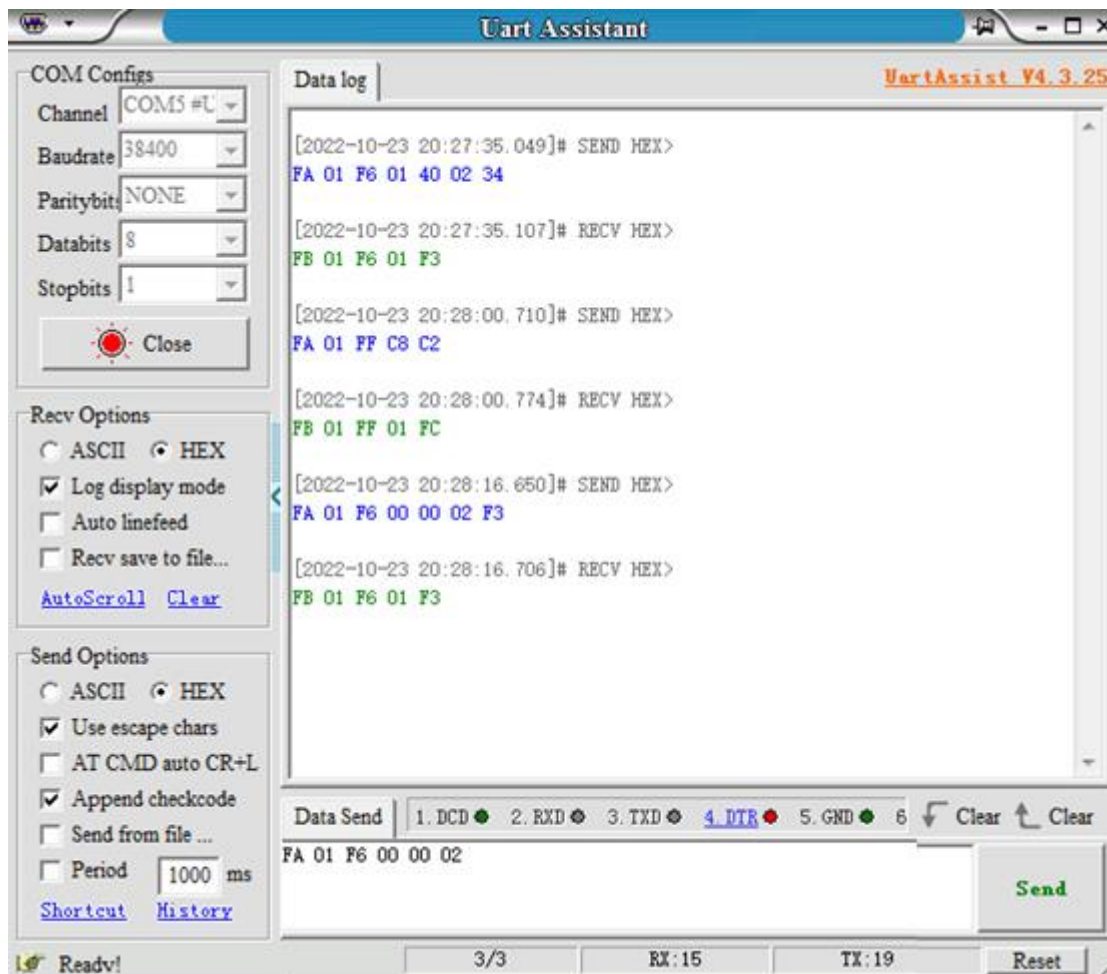
Return `FB 01 FF 01 FC`, save successful;

3. Send `FA 01 F6 00 00 02` to stop the motor;

Return `FB 01 F6 01 F3`, the motor stops successfully;

After power-on again, the motor will run according to the save speed mode parameters.

The example command of speed mode is shown in the following figure:



## 7.5 Run the motor in position model

Note : Please configure the working mode to “SR\_vFOC”.

Menu-> Mode -> SR\_vFOC

1. Send `FA 01 FD 02 80 05 00 09 C4 00`, the motor will rotate forward 200 circles (16 subdivisions) with “speed = 640RPM, acc = 5”;

Return `FB 01 FD 01 FA`, the motor starts to run;

Return `FB 01 FD 02 FB`, the motor is run completed;

2. Send `FA 01 FD 82 80 08 00 30 D4 00`, the motor to reverse 1000 circles with “speed = 640RPM, acc = 8” (16 subdivisions);

Return `FB 01 FD 01 FA`, the motor starts to run;

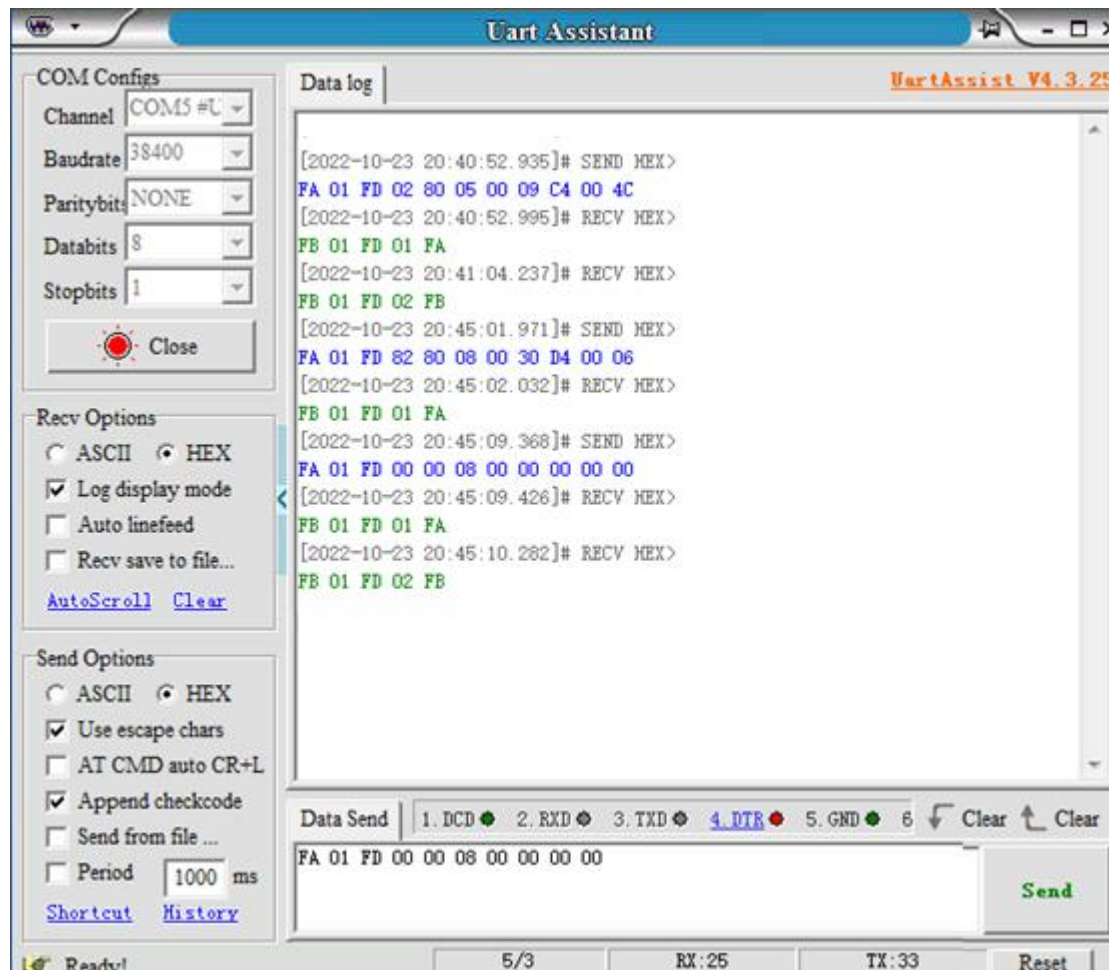
While the motor is running:

Send `FA 01 FD 00 00 08 00 00 00 00`, the motor to stop with acc=8;

Return `FB 01 FD 01 FA`, the motor starting to stop;

Return `FB 01 FD 02 FB`, the motor has stopped;

The example command of position control mode is shown in the following figure:



## Part8. FAQ

### 8.1 NOTE

1. Power input voltage is 12V-24V.
2. Don't hot plug motor cable and data cable.
3. When the motor is calibrating, do not carry a load.
4. After installed the motor, or changed the motor wiring sequence, you need to re-calibrate the motor again.
5. The default work mode is CR\_vFOC(EN/STP/DIR interface).
6. Press the "Next" key first, then power on, it can quickly restore the default parameters.
7. If "Phase Line Error!" is displayed before calibration:
  - a) Check the motor connection line sequence;
  - b) Check the power supply voltage and output power (24V/1A, 12V/2A);;
  - c) If the power supply is connected to the motherboard through the MKS APT module, try to connect the MKS APT module to ports such as X, Y, Z, E, etc., and then restart again.
  - d) Do not use the MKS APT module for power supply before calibration, and the power supply is directly connected to V+ and Gnd.

### 8.2 FAQ

No	Question	Solution
1	Not Cal	Calibrate the motor.
2	Reverse Lookup Error!	Calibrate Fail, Check magnet and motor shaft
3	Magnet Loss!	Not install the magnet.
4	Magnet Strong!	the magnet too near.
5	Magnet Weak!	the magnet too far.
6	Encoder Error!	Check magnet and motor shaft
7	Offset Current Error!	Reference voltage error
8	Phase Line Error!	The motor line sequence is wrong or the power supply is not enough
9	Wrong Protect!	Locked-rotor protection
10	Coming Back to Origin..	Going back to zero.
11	Reboot Again	The motor need to be restart.



## Part9. Schematic

Please download 《MKS SERV042D/57D V1.0 Schematic.pdf》 in  
<https://github.com/makerbase-motor/MKS-SERV042D>  
<https://github.com/makerbase-motor/MKS-SERV057D>

## Part10. contact us

<https://makerbase.aliexpress.com/>  
<https://www.youtube.com/channel/UC2i5I1tc0XRJ2ZJiRxwpCUQ>  
<https://github.com/makerbase-motor>