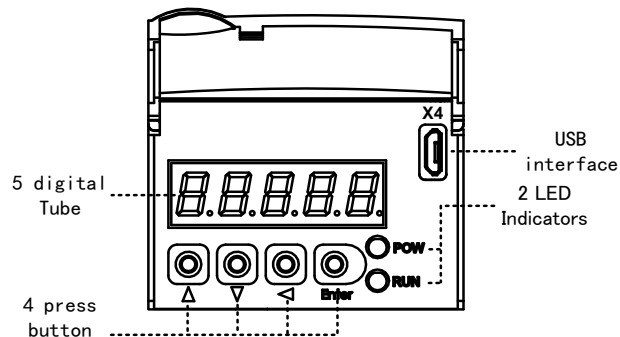# Chapter 3 Front panel operation

3.1 Explanation of the front panel of servo driver

3.1.1 Front panel compositions

The front panel consists of 5-digit LED display and 4 switching buttons (8、2、4、5) and 1 USB interface. It displays monitor status, parameters and changes the parameter setting value and so on. The main menu is in cascade sequence mode and executes in layer.
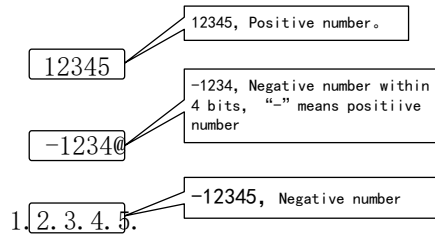

3.1.2 Front panel explanations

Symbol	Name	Functions
POW	Main power lamp	Light: Main power supply already turn on; Go out: Main power supply did not turn on
RUN	Running lamp	Light: the servo motor is power on and running Go out: the servo motor is not power on but running
8	Increasing button	Increase sequence number or value; hold to repeat increasing
2	Decreasing button	Decrease sequence number or value; hold to repeat decreasing
4	Exit button	Menu exit; cancel the operation.

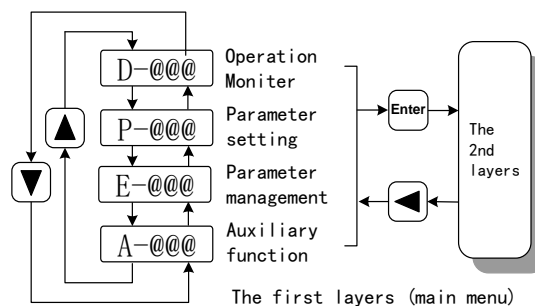|		
5	Confirm button	Menu entered; the operation confirmed.
	USB interface	Connect the device with computer.

3.1.3 Data display

A number is shown by five digital displays; a minus symbol in front of the value represents a negative value; the lit decimal points in all the digits indicate a negative 5-digit value. Some displays have a prefix character. If the value is full-scale, then the prefix character can be omitted.

12345   12345, Positive number。

−1234@   −1234, Negative number within 4 bits, "−" means positiive number

1.2.3.4.5.   −12345, Negative number

3.2 Main menu

The first layer is the main menu and has 4 operating modes. Pressing 8 or 2 button to change the operation mode. Pressing the 5 button then enters the second layer and executes a concrete operation. Pressing 4 button then returns to the main menu from the second layer.


D−@@@   Operation Moniter

P−@@@   Parameter setting

E−@@@   Parameter management

A−@@@   Auxiliary function

Enter

The 2nd layers

The first layers (main menu)

3.3 Status monitor

Choose status monitor "d-''under the main menu. Pressing the 5 button enters the monitor mode. There are many kinds of monitor's project; Use 8 and 2 buttons to select the needing project. Pressing the 5 button again enters the concrete status display.

Code	Description	Display	Value
D-SPd	Motor Speed (r/min)	r1000	1000r/min
D-[P.@	Original position command (input pulse)	Lo@@@	[note1][note2]
D-[Po	Position command(pulse)	Lo@@@	[note1]
D-Pos	Current position(pulse)	Lo@@@	[note1]
D-EPo	Position deviation (pulse)	Lo@@@	[note1]
D-trq	Motor torque(%)	T 50	50%
D-Pt@	Peak torque(%)	T 80	80%[3]
D-i@@	Motor current(A)	i 2.3	2.3A[4]
D-Pi@	Peak current (A)	i 5.6	5.6A[3]
D-Frq	Position command pulse frequency (kHz)	rsd	
D-[S@	Speed command (r/min)	R. -35	-35r/min
D-A1@		rsd	
D-A2@		rsd	
D-[t@	Torque command (%)	T. -20	-20%
D-Di@	Input terminal DI status	&#$	[note5]
D-Do	Output terminal DO status	%*	[note6]
D-APo	Absolute position of rotor	1000	[note7]
D-Cod		rsd	
D-Ld@	Cumulative load rate (%)	Ld 45	45%
D-rG@	Regenerative braking load rate (%)	rG 30	30%
D-[nt	Control mode	rsd	
D-Err	Alarm code	Err--	No alarm [note8]
D-rE@	Display reserved	rE 0	[note9]
D-U@@	Bus voltage	U 300	300V
D-t[	Internal temperature of module	TC 50	50°C
D-HPO	Encoder multi loop position	2000	[note10]
D-ERH	Historical alarm number	E0- 0	[note11]
D-etH	EtherCAT status display	init	[note12]

1. 32 bit binary numerical display [note 1]

The 32 bit binary number ranges from -2147483648 to 2147483647, which is represented by low bit and high position combination. The low bit and high position are selected through the menu, and the complete values are synthesized by the formula in the graph.

32 bit value = Top digital number x 100000+ bottom digital value
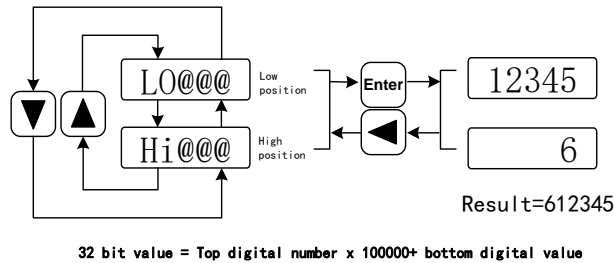
2. Position unit [note 2]

The pulse of the original position instruction refers to the number of input pulses , which is not transformed by electronic gear. Other projects pulse (location instructions, current position, position deviation, absolute position of the rotor) is a unified pulse unit.

unified pulse unit = 65536(pluse/rev)

3. Peak torque and peak current [3]

The maximum torque and the maximum phase current effective value of the motor in the past 10 seconds.

4. Motor current [note 4]

Motor phase current effective value

5. Input   terminal DI[note 5]

A vertical segment of LED shows an input status. The lit top vertical segment shows the DI input to be "ON" and the lit bottom vertical segment to be "OFF".
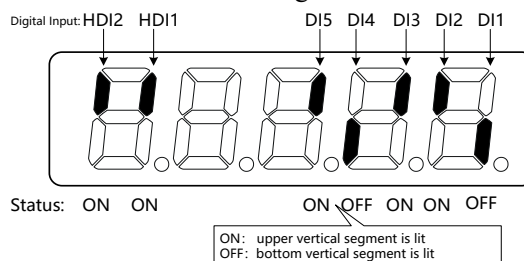
6. Output terminal DO[Note 6]

A vertical segment of LED shows an output status. The lit top vertical segment shows the DO output to be "ON" and the lit bottom vertical segment to be "OFF".
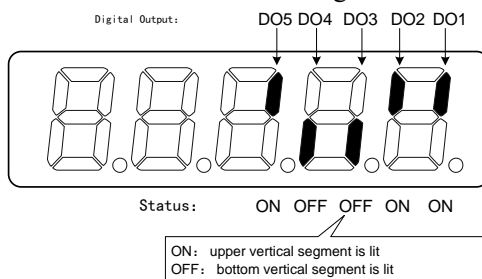

7. The absolute position of the rotor [note 7]

It represents the position of the rotor relative to the stator in one revolution, which takes one turn as a cycle, and unify the pulse unit.It takes the encoder Z pulse as the origin. The range from 0 to 65535, and the Z pulse is 0.

8. Alarm code[note 8]

The " Err " followed by two minus symbols indicates no alarm and by digital number indicates an error code number that is flickering. When alarm appears, the error code number displays automatically on the front panel LED. During the error status, the monitor mode can be changed to other mode by pressing buttons, but the decimal point of the last LED is still flickering and shows existence of an alarm.

$$\boxed{\text{Err}--}\quad \text{No alarm}$$

$$\boxed{\text{Err } 9}\quad \text{flickering} \qquad \text{9 number alarm}$$
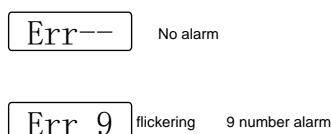
9. RE Reservation display [note 9]

（1） re-0 menu shows the date information of the software:
The 1st digital tube shows the year, example 6 means Year of 2016; 7 means year of 2017 and so on；
The 2nd digital tube shows the month（note：A stands for Octorber, B stands for November, C stands for December
The 3rd-4th digital tube shown the date；
The 5th digital tube stands for the internal contrl version number.
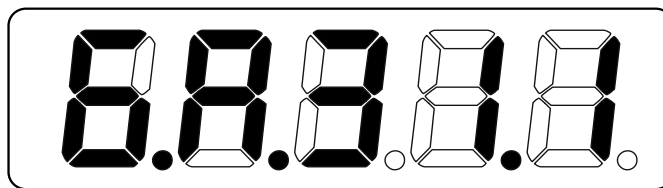
（2） The current site number is displayed under the RE-1 menu.

According to the different master controllers, the site number setting method is different. Please refer to P300 parameter instruction. This value is convenient for field engineers to diagnose whether the station number is set correctly.

（3） The real-time time of the current connection's communication cycle is displayed under the Re-2 menu(the unit is us), showing the 1 bits after the decimal point.

（4） The positive maximum value of the communication cycle time deviation between the driver detection and the set standard is shown under the re-3 menu(the unit is us) and the 2 bit after the decimal point is displayed.

（5） The servo cycle compensation value is displayed under the re-5 menu(the unit is us) and it is exactly 2 bits after the decimal point.

（6） The cumulative number of EtherCAT synchronization interrupt times is displayed under the re-6 menu.

10. Encoder multi circle position [note10]

This status shows that only absolute value drives are valid. The multi circle position of the encoder is recorded. The range is 0~65535. The absolute position of the rotor can be obtained with the APo rotor single circle absolute position.

Absolute position= multi circle position×bits of absolute ecnoder+single circle position
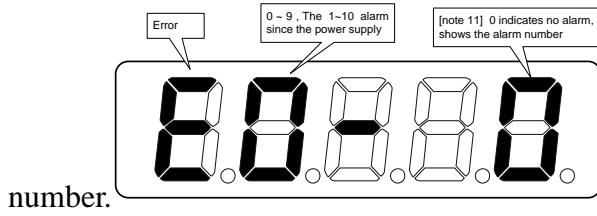
For example: multi circle position display 2000, single circle position display 1000, all 10 binary numbers.

The absolute position of the encoder is （$2000×2^{16}+1000$）（10 decima）=131073000

When absolue encoder is setted as single circle mode（P090=0）, multi cicle postion shows 0,which doesn't change with the position of the rotor.
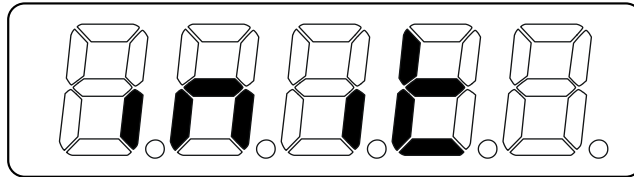
11. Historical alarm number [note 11]

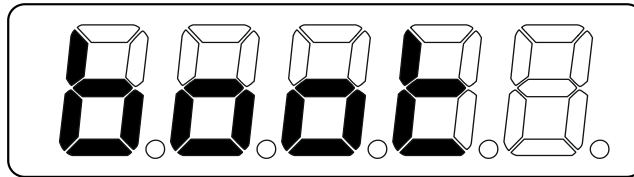Display alarm number, use 8 and 2 keys to check history alarm

number.

Error | 0 ~ 9 , The 1~10 alarm since the power supply | [note 11] 0 indicates no alarm, shows the alarm number
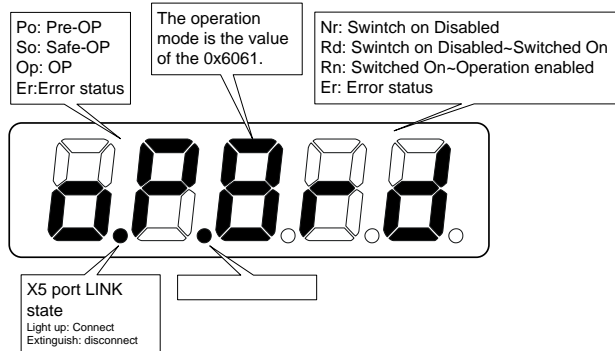
12. EtherCAT status display[note 12]

（1） When the EtherCAT network status is Init, which shows following:

（2） When the EtherCAT network status is boot, which shows following:

（3） For other EtherCAT network status，which shows following:

Po: Pre-OP
So: Safe-OP
Op: OP
Er:Error status

The operation mode is the value of the 0x6061.

Nr: Swintch on Disabled
Rd: Swintch on Disabled~Switched On
Rn: Switched On~Operation enabled
Er: Error status

X5 port LINK state
Light up: Connect
Extinguish: disconnect

3.4 **Parameters setting**

The parameter number expression uses a parameter section name combined with a parameter name. The three figures are the section name and two figures and one figure are the parameter name. Take P102 parameter as an example, '**1**' is the section name and '**02**' the parameter name. "P-102" displays on the front panel LED.

Choose the parameter mode under the main menu " P- ". Pressing the 5 button enters the parameter-setting mode. First use 8 or 2 button to select the parameter section name and then pressing 5 button enters the parameter name selection. Again, use 8 or 2 button to select the parameter name and then pressing '5' button shows the parameter value.

Use 8 or 2 button to alter a parameter value. Pressing 8 or 2 button once to increase (decrease) the parameter value by one. Pressing down and hold the 8 or 2 button, the parameter value can increase (decrease) continuously. When the parameter value is modified, the decimal point on the most right sides LED is lit. Press 5 button to confirm the parameter value to be effective, meanwhile the decimal point turns off. The modified parameter value is immediately active to influence on the control action (but some parameters needs to preserve firstly and then turn off and on the power supply). Hereafter pressing 4 button returns to the parameter number selection and can continue to modify a parameter. If the value is not satisfied, do not press the 5 button and can press 4 button to cancel it for resuming the original parameter value.

The modified parameter did not preserve in EEPROM. For permanent preservation, please refer to the parameter writing operation in the parameter management.The parameter section name and the parameter name are not necessarily continual, but the parameter section name and the parameter name that are not in use will be jumped over and cannot be chosen.
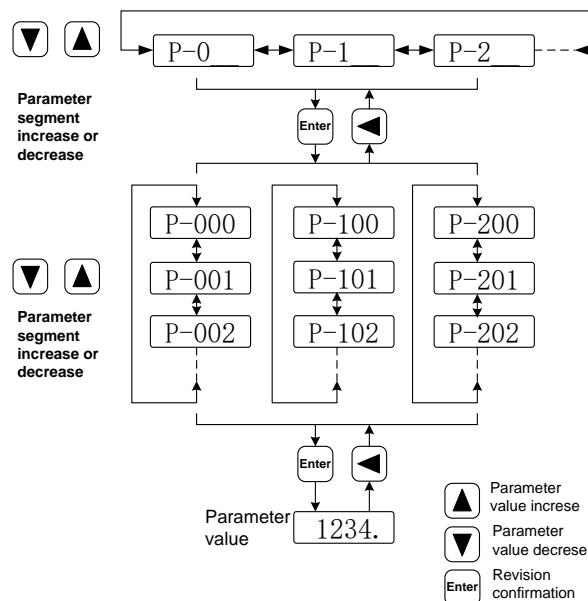
3.5 **Parameter management**

Choose the parameter management mode under the main menu " E- ". Pressing the 5 button enters the parameter management mode. The operation is performed between parameter list and the EEPROM.

There are three operation modes. Use 8 or 2 button to select an operation mode and then pressing down and hold the 5 button at least three seconds to active the operation mode. After finished the operation and then pressing 4 button returns to the operation mode selection.
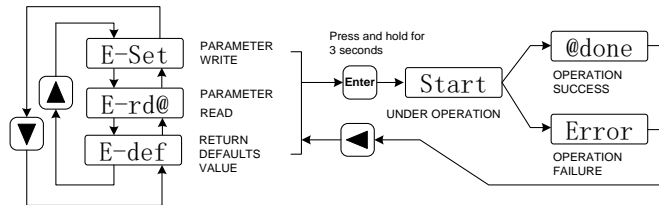
- **Write and save parameters**

    Indicates that the parameters in the parameter table are written to the EEPROM. The user modifies the parameters, only changing the parameter values in the parameter table, and the next time the power will be restored to the original value. If you want to permanently change the parameter value, you need to execute the parameter write operation, write the parameters in the parameter table into the EEPROM, and then use the modified parameters.

- Parameter reading

    It means that the data in the EEPROM is read into the parameter table. This process is automatically executed once the power is on. At the beginning, the parameter values of the parameter table are the same as those in EEPROM. But when the user modifies the parameter, the parameter value of the parameter table will be changed. When the user is not satisfied with the modified parameter or the parameter is disordered, the parameter read operation is executed. The data in the EEPROM can be read to the parameter table again, and the parameters can be restored when power on.

- **Resume default value**

    Indicates that the default value of all parameters (factory value) is read into the parameter table and written to EEPROM. The default parameter will be used next time. When the user scrambling the parameters and unable to work properly, using this operation, all parameters can be restored to factory status. Because the default values of different drive models and motor models are different, the correctness of the motor code (parameter P002) should be ensured when the default parameters are restored.

| E-Set	Parameter write	Parameter table	⇨	EEPROM
E-rd@	Parameter read：	Parameter table	⇦	EEPROM
E-def	Return Defaults Value：	Factory default value	⇨	Parameter table、 EEPROM

3.6 Auxiliary functions

Choose the auxiliary function mode " A- " under the main menu. Pressing the 5 button enters the auxiliary function mode. Use 8 or 2 button to select an operation mode. Then pressing the 5 button again enters the corresponding function. After finished this operation pressing the 4 button and returns to the operation mode selection.
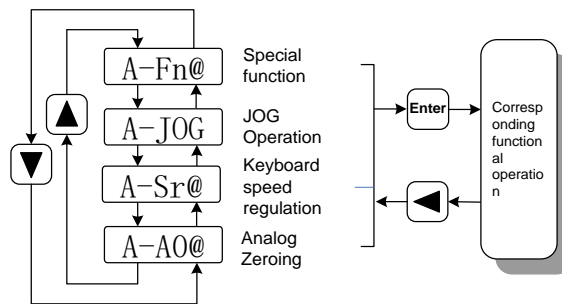
3.6.1 Special functions☆

Choose the special functions, and press the button 5 to enter. Use the button 8 and 2 to set the function code, and then pressing down and hold the 5 button at least three seconds to active the operation mode. After finished the operation and then pressing ◀ button returns to the operation mode selection.
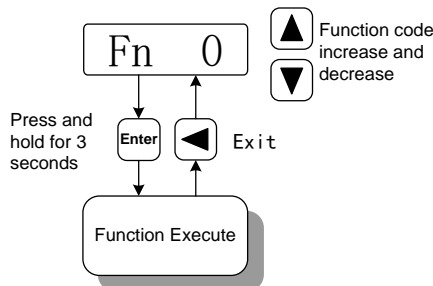
Fn number	functions	explanation
Fn36	reset the encoder （Multi-turn absolute encoder is valid）	The RESET command of encoder is used for encoder initialization, encoder alarm reset and multi-turn information return-to-zero. This function should be executed when the battery is replaced.

|		
Fn37	Encoder alarm clearance	Encoder alarm clearing instructions are used for various alarms cleaning of encoders. Executing this command does not eliminate encoder multi loop information.This function should be executed when the battery is replaced.

3.7 Parameter default recovery

Please use the recovery default parameter (factory parameter) function for following conditions

● The parameters are messed up and the system can't work properly.

● The new motor is different from the original motor.

The steps to restore the default value of all parameters are as follows:

1. Restoring all parameters to the default value, and the user modified parameters are also revert to the factory default value. Restore the default value operation in the execution of parameter management.。
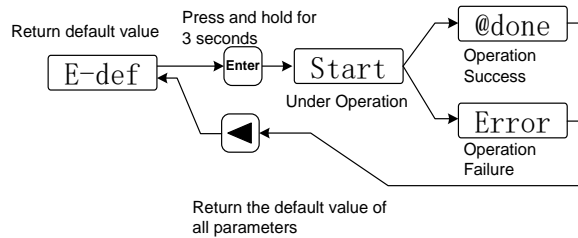
2. Turn off and on the power supply，then the operation can be performed again.

Chapter 4 Running

4.1 Trial running with no load

The goal of trial running is confirming the following items that are correct or not:

- The servo driver power supply wiring;

- The servomotor wiring;

- The encoder wiring;

- The running direction and the servomotor speed

4.1.1 Wiring and inspection

Before turn on the power supply, confirms the servomotor:
- The servomotor has no loading on the shaft; decoupling from the machinery if already coupled.
- Because the servomotor has an impact during acceleration or deceleration, therefore the servomotor must be fixed.

Follow the wiring chart, inspects the following items before turning on the power supply:
- The wirings are correct or not？ In particular, L1、L2、L3、L1C、L2C、24V、0V of the drive wirings and U, V, W wirings corresponding to the servomotor U, V, W are correct or not.
- The input voltage is correct or not？
- The encoder cable connection is correct or not？

4.1.2 Trial running in JOG mode

Keyboard speed test run, you need to set the parameter P304 (EtherCAT mode switch) to 0 before running.

When the parameter P304 is 0, the driver is a common mode and can be used for the function of the keyboard speed control test operation. When the parameter P304 is 1, the driver is EtherCAT mode, and the control mode and instruction are all derived from the EtherCAT bus. After changing the parameter P304, the parameter must be stored in EEPROM, and the driver will be powered off again before the power is switched off.