

# **SDV series**

## Digital AC double servo driver user manual

Please read this manual carefully before  
installing/commissioning/using the product

Thank you for choosing the V series servo driver. Before using it, please read this technical manual first. The main contents of this manual include :

- \* Servo driver inspection, installation and wiring steps.
- \* Operation steps, status display, abnormal alarm and handling of digital panel.
- \* Servo system control mode, trial operation and adjustment steps.
- \* A list of all parameters for the servo driver.
- \* Model and specification of servo driver.

In order to facilitate daily inspection, maintenance and understanding of the cause and treatment of abnormality, please keep this manual properly for reference at any time. Note : Please hand over this manual to the final user to maximize the performance of the servo driver.

- The content of the user manual may be changed due to product improvements without prior notice.

- The Company shall not be liable for any changes made by the User to the product, and the warranty will be void as a result.

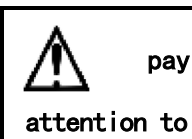
When reading this manual, please pay special attention to the following warning signs



Indicating that an error of operation may lead to disastrous consequences — death or serious injury!



Incorrect operation may cause injury to the operator and may also damage the equipment!



Indicates improper use may damage products and equipment!

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# Chapter 1 Product Model and Installation

## Summarize

SDV series products are our new generation of two-axis integrated servo drives that can drive two motors.

As two independent servo drives, the general-purpose model can reduce electrical wiring, reduce installation space, and can brake energy recovery to improve product energy efficiency.

Synchronous models are suitable for applications requiring strict synchronous operation, such as gantry synchronization.

## 1.1 Product Model and Installation Dimensions

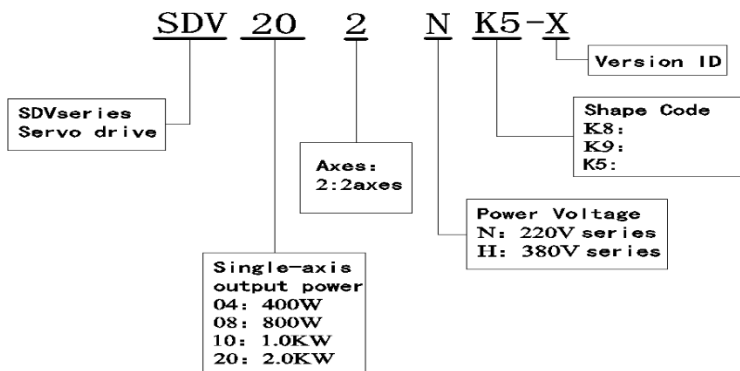
The servo products have been fully tested before shipment. To prevent product irregularities caused by negligence during shipment, please check the following items in detail after unpacking:

1) Check whether the servo driver, motor model and adapted wire are the same as the ordered model.

2) Check the appearance of the servo drive and motor for damage and scratches.

If there is any problem that is not in accordance with the above, please contact your local distributor immediately.

### 1.1.1 Product Model Definition



### 1.1.2 Servo drives come with standard accessories

- ① CN1 plug (6PIN soldered plug) 1 set
- ② CN2 plug (6PIN soldered plug) 1 set
- ③ CN3 plug (DB15 hole) 1 set
- ④ IO1 plug (DB15 pin) 1 set
- ⑤ IO2 plug (DB15 pin) 1 set
- ⑥ RS485 cable (Model CABLE01) 2 pcs.
- ⑦ Debugging cable (Model CABLE02) 1pc (optional)

### 1.1.3 Servo Drive Installation Dimensions

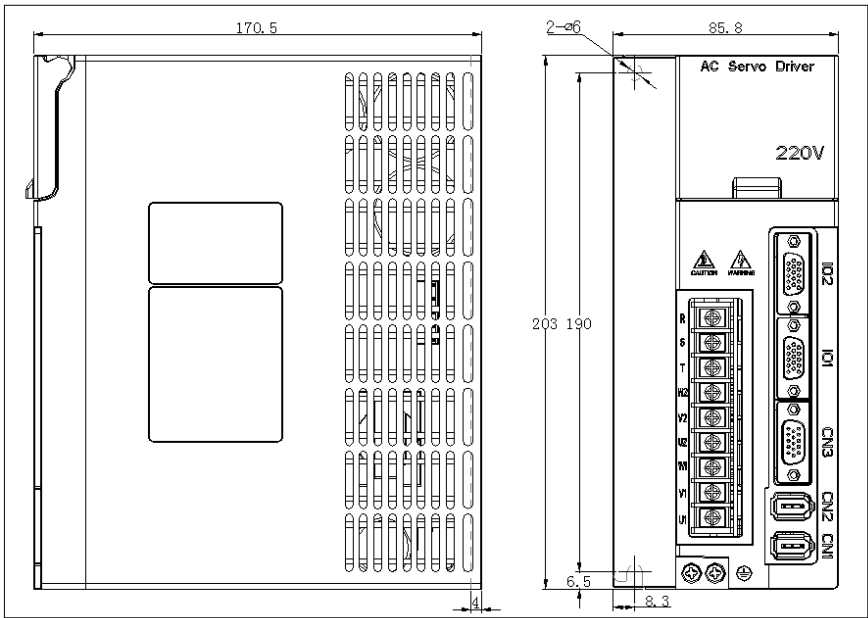


Figure 1-1 SDV202NK5 Servo Drive Installation Dimension Drawing

## 1.2 Servo Drive Specifications

basic speci ficat ions	model	SDV102NK5	SDV202NK5
	maximum current (A)	12.0A	18.0A
	Input power	Single phase AC170~253V	
	Cooling method	Forced air cooling	
	control mode	SVPWM control	

	encoders		17Bit/23 Bit absolute single-turn or multi-turn magnetic or optical encoders
internal function	Display and Operation		2 indicator lamps, 6-digit seven-segment digital tube, 5 function keys
	control mode		Position control, speed control, torque control, jogging, RS485 communication
	brake function		Default built-in (optional external)
	protection function		Undervoltage, overvoltage, overload, overcurrent, encoder abnormality, braking, position overrun, etc.
Position Control Mode	Command control mode		External pulses
	External command pulse input		Command Format: Pulse + Direction, CW/CCW, A/B orthogonality Command frequency: differential 0-500kHz, open collector 0-200KHz
	Electronic Gear Ratios		1~32767 / 1~32767
	Speed control range		speed ratio: 1: 5000
	velocity volatility		Load is 0~100%: $\leq \pm 0.05$
	Command Smoothing Method		linear time constant 1 ms~1000ms (0r/min $\leftrightarrow$ 1000r/min)
	output frequency		0~300Hz
Input/ Output	Position signal output	typology	ABZ-phase line-drive outputs/ Z-phase open collector outputs
		crossover ratio	1~65535 pulses
	input signal		4-point opto-isolated inputs/per

		axis: the input points can be defined as one of any 21 functions, see parameterization PN111 for details.
	output signal	3-point open collector output/per axis: the output point can be defined as one of any 4 functions, see parameter setting PN70 for details.
operating temperature		Operating Temperature: 0°C~55°C Storage Temperature: -20°C~80°C

## 1.3 Servo Drive Installation

### 1.3.1 Installation environment conditions

The installation environment of the servo drive has a direct impact on the normal function of the servo system and service life, so the installation environment of the drive must meet the following conditions:

ITEM	environmental conditions
Operating temperature/humidity	0°C~55°C (no frost); below 90%RH (no condensation).
Storage and transportation temperature/humidity	-20°C~80°C; 90%RH (no condensation)
atmosphere	Installed in the control cabinet, free of corrosive and flammable gases, oil mist, dust, etc.
vibratory	Less than 0.5G (4.9m/s <sup>2</sup> ) 10 Hz ~60Hz (non-continuous operation)
Protection level	IP21

When multiple drives are installed in the control cabinet, the

installation requirements shown in Figure 1-3 must be met in order to obtain sufficient heat dissipation; the control cabinet must be equipped with a cooling fan so that the temperature inside the control cabinet is not higher than 55 °C.

When installing the drive, please install it vertically with the front side facing forward and the top side facing up.

When assembling, care should be taken to avoid drilling chips and other foreign objects falling into the drive.

Fix the drive with two M5 screws.

If it is not possible to avoid vibration in the vicinity, use a vibration absorber or install anti-vibration rubber gaskets.

If there are large magnetic switches, fusion splicers and other noise interference sources near the driver, it is easy to cause the driver to suffer from external interference and cause incorrect operation, in this case, it is necessary to install noise filters; however, noise filters will increase the leakage current, therefore, it is necessary to install insulating transformers on the input side of the driver.

### 1.3.2 Installation Direction and Spacing

Figure 1-2 and Figure 1-3 identify single and multiple drive unit installation intervals, the actual installation should be left as large as possible interval to ensure good heat dissipation conditions.

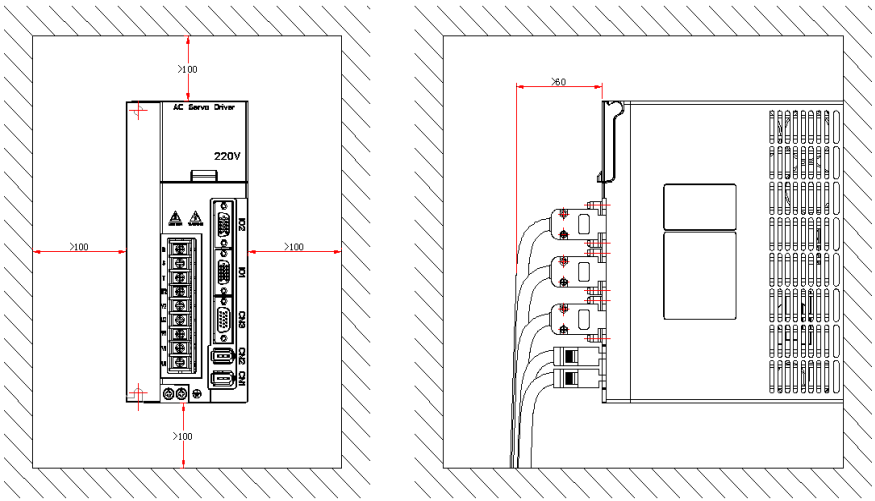


Figure 1-2 Dimensional drawing of single servo drive installation

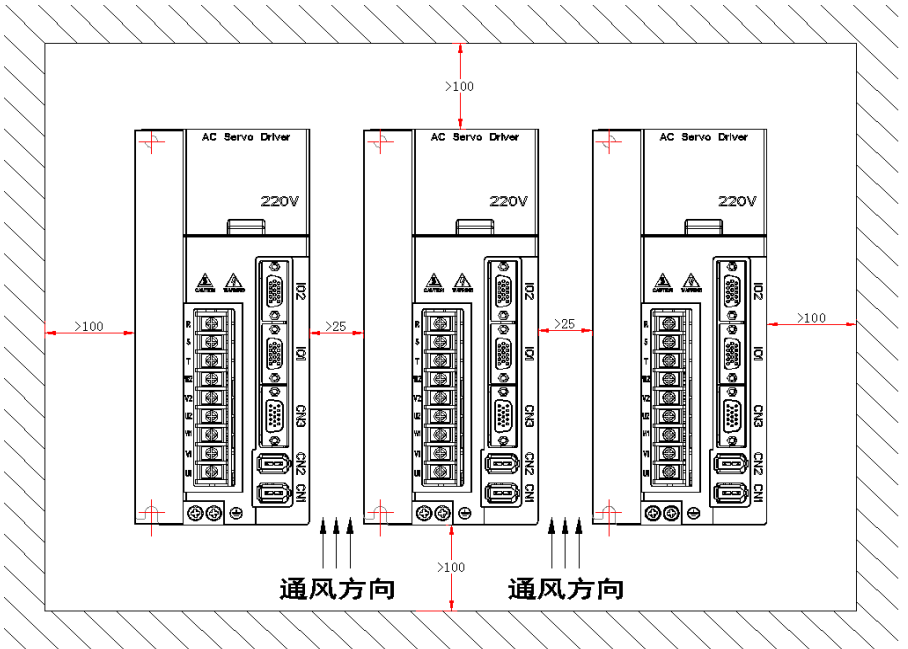


Figure 1-3 Multiple Servo Drive Installation Dimension Drawing

## Chapter 2 Servo Drive and Motor Wiring

### 2.1 Power supply and peripheral device wiring

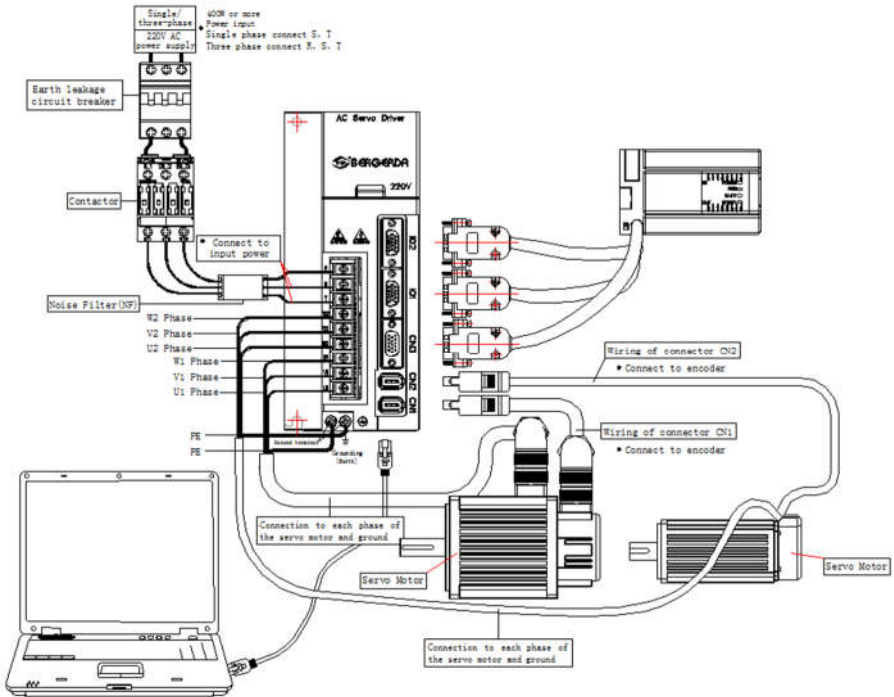


Figure 2-1 SDV102NK5/SDV202NK5 Servo Drive Peripheral Device Wiring

## 2.2 Universal Mode Position Control Method Wiring Diagram Example

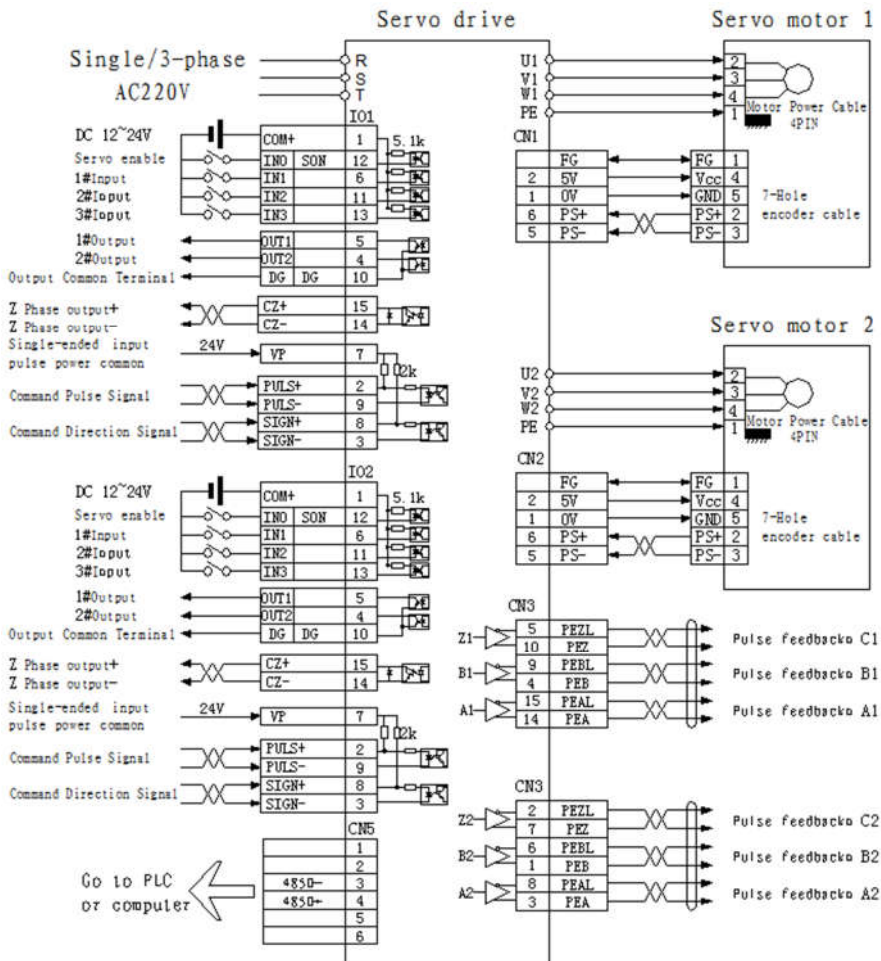


Figure 2-2 SDV102NK5-XY/SDV202NK5-XY servo drive position control wiring diagram

Note: When the two axes are independent, the two axes use their own pulse inputs. !!!

### 2.3 Example of wiring diagram for position control method in synchronous mode

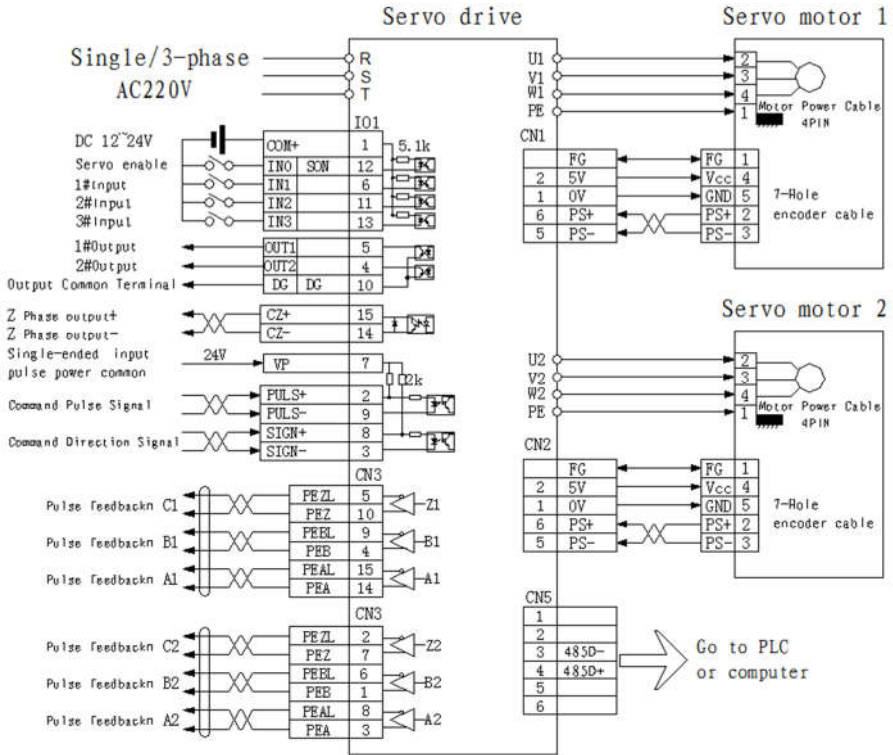


Figure 2-3 Synchronous Position Control Wiring Diagram for SDV102NK5/SDV202NK5

Note: The pulse input port of the first axis (I01) is used for synchronization, and I02 is not wired. !!!

### 2.4 Parameter setting for two-axis synchronization

Pn No.	Parameter name	Definition	set values
Pn4	control mode	Two-axis synchronized position control	Simultaneous setting of both axes1
Pn32	Synchronization Gain	Synchronized control gain on both axes	0~200

Pn56	Synchronized overshoot alarm determination range	Alarm AL-49 if exceeded	0~10000
Pn67	Starting deviation of synchronization adjustment	The deviation of the two axes is greater than this value to start the synchronization adjustment.	0~4096
Pn95	Servo Enable	Force Enable	Simultaneous setting of both axes1
Pn115	I/O parameters defined by bit	Bit0: Z signal redefinition: 0 is normal Z signal; 1 is the port is used as the third output port, the function is set by parameter No. 72; Bit1: 0 is free stop; 1 is position control power-down deceleration stop, acceleration and deceleration time is set by parameter No. 29; Bit2: Synchronized mode input port selection. 0 is independent input port for 2 axes; 1 is shared first axis input port	0~15

		for 2 axes; Bit3: Synchronization mode output port selection. 0 is independent output port for 2 axes; 1 is the first axis output port shared by 2 axes.	
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**Note:** For a more detailed description of the setup, see 5.3 Synchronized Position Control Operation and 5.4 Synchronized Control Description in Chapter 5, Operation and debugging!

## 2.5 Example of wiring diagram of motor with brake

Non-power-down state, the driver optocoupler output conductive, so that the external relay suction, motor holding brake port energized so that the holding brake open, the motor can run normally.

In the moment of power-down, the photocoupler output of the driver is disconnected, the motor holding gate port is de-energized, and the motor is held.

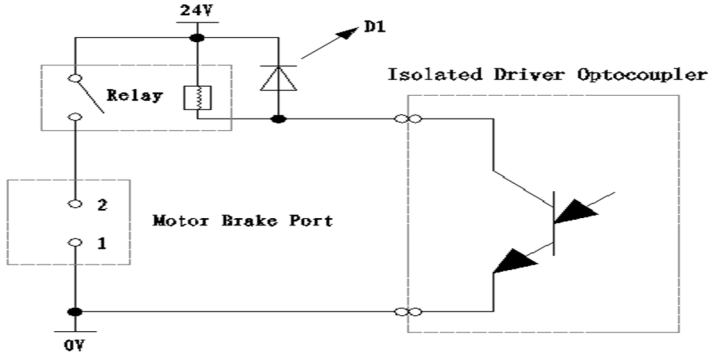



Figure 2-4 wiring diagram of motor with brake

## 2.6 Electrical connection of terminals

### 2.6.1 Power Terminal Definition and Wiring

terminal	Define	Functions
R	Main circuit power supply single-phase or three-phase	Main circuit power input terminal AC220V/ 50Hz
S		Three-phase connected to R, S, T; single-phase connected to any two of the end
T		Wiring cross-sectional area $\geq 1.5\text{mm}^2$ (AWG14-16)
PE	grounding	Grounding terminal resistance to ground $<100\Omega$ ; servo motor output and power input are grounded at one point.
U1	1# servo motor	Servo motor output terminals must be connected to the motor U1, V1, W1 terminals correspondingly, wiring cross-sectional area $\geq 1.5\text{mm}^2$ (AWG14-16)
V1		
W1		
U2	2# servo motor	Servo motor output terminals must be connected to the motor U2, V2, W2 terminals correspondingly, wiring cross-sectional area $\geq 1.5\text{mm}^2$ (AWG14-16)
V2		
W2		

**Wiring requirements:**

The grounding wire should be as thick as possible, and the driver and servo motor should be grounded at the place , and the grounding resistance should be less than 100Ω;

It is recommended to supply power by three-phase isolation transformer to reduce the possibility of electric shock injury;

It is recommended that the power supply be provided by noise filter to improve the anti-interference capability;

Please install a non-fuse type (NFB) circuit breaker, so that the drive can cut off the external power supply in time when it fails.

### 2.6.2 Signal Terminal Definition

The SDV Servo Drive Unit interface terminal configuration is shown in the table below.

I01 and I02 are the signal control terminals of 2 axes respectively, using DB15 connector and female socket;

CN3 is a dual-axis motor encoder feedback terminal with DB15 connector and male socket;

CN1, CN2 are the motor encoder signal terminals for 2 axes respectively, using 6PIN connectors, sockets are 6PIN USB, plugs are 6PIN soldered plugs.

#### 1) Axis 1 control terminal I01

Terminal No.	Signal Name	Mark	I/O	Functions
I01-1	External Input Power Positive	COM+	power supply	Positive of external input power supply, optoelectronic device port power supply; power supply specifications DC12 to 24V/100mA.
I01-10	External Input Power Supply Negative	DG	power supply	External input power supply common negative terminal.
I01-12	input 0	INO(SON)	input	The default is servo enable input SON. 1-enable drive, 0-disable drive

I01-6	input 1	IN1	input	Default is servo alarm clear
I01-11	input 2	IN2	input	The default is positive drive disable
I01-13	input 3	IN3	input	The default is reverse drive disable
I01-5	output 1	OUT1	output	Default is brake output (see section 2.5)
I01-4	output 2	OUT2	output	Default is alarm output
I01-15	Encoder Z1 phase output positive	CZ+	output	Default encoder Z phase signal output; Can be changed to normal outputs by the Pn115 parameter.
I01-14	Encoder Z1 phase output negative	CZ-	output	
I01-2	Command	PULS+	input	External command pulse input terminal: Note: The pulse input method is set by parameter Pn8; 0. Command pulse + symbol method; 1. CCW/CW command pulse method. 2. A/B orthogonal command pulse method
I01-9	Pulse Signal	PULS	input	
I01-8	Command	SIGN+	input	
I01-3	Direction Signal	SIGN-	input	

## 2) Axis 2 control terminal I02

Terminal No.	Signal Name	Mark	I/O	Functions
I02-1	External Input Power Positive	COM+	power supply	Positive of external input power supply, optoelectronic device port power supply; power supply specifications DC12 to 24V/100mA.
I02-10	External Input Power Supply Negative	DG	power supply	External input power supply common negative terminal.
I02-12	input 0	IN0 (SON)	input	The default is servo enable input SON. ON-enable drive, OFF-disable drive
I02-6	input 1	IN1	input	Default is servo alarm clear
I02-11	input 2	IN2	input	The default is positive drive disable
I02-13	input 3	IN3	input	The default is reverse drive disable
I02-5	output 1	OUT1	output	Default is brake output (see section 2.5)

I02-4	output 2	OUT2	output	Default is alarm output
I02-15	Encoder Z1 phase output positive	CZ+	output	Default encoder Z phase signal output; Can be changed to normal outputs by the Pn115 parameter.
I02-14	Encoder Z1 phase output negative	CZ-	output	
I02-2	Command	PULS+	input	External command pulse input terminal; Note: The pulse input method is set by parameter Pn8; 0. Command pulse + symbol method; 1. CCW/CW command pulse method. 2. A/B orthogonal command pulse method
I02-9	Pulse Signal	PULS	input	
I02-8	Command	SIGN+	input	
I02-3	Direction Signal	SIGN-	input	

### 3) Encoder Feedback TerminalCN3

Terminal No.	Signal Name	Mark	I/O	System Default Functions
CN3-12	Power Positive -5V	VCC	电源	Internal power supply -5V/100mA
CN3-11	Power Negative -0V	GND	电源	
CN3-14	Output encoder signalA-	1PEAL	output	Axis 1 encoder feedback output, default 2500 pulses per revolution, can be set by parameter PN41.
CN3-15	Output encoder signalA+	1PEA	output	
CN3-4	Output encoder signalB-	1PEBL	output	
CN3-9	Output encoder signalB+	1PEB	output	
CN3-10	Output encoder signalZ-	1PEZL	output	
CN3-5	Output encoder signalZ+	1PEZ	output	
CN3-3	Output encoder signalA-	2PEAL	output	Axis 2 encoder feedback output, default 2500 pulses per revolution, can be set by parameter PN41.
CN3-8	Output encoder signalA+	2PEA	output	
CN3-1	Output encoder signalB-	2PEBL	output	
CN3-6	Output encoder signalB+	2PEB	output	
CN3-7	Output encoder signalZ-	2PEZL	output	
CN3-2	Output encoder signalZ+	2PEZ	output	

### 4) Axis 1 encoder signal terminal CN1

Terminal No.	Signal Name	Mark	I/O	Functions
CN1-6	Serial encoder signals	PS+	bi-directionality	Encoder Serial Data
CN1-5	Serial encoder signals	PS-	bi-directionality	Encoder Serial Data
CN1-2	+5Vpower supply	VCC		power supply
CN1-1	power ground	GND		digital ground
CN1-shell	shielded ground	FG		shell ground

### 5) Axis 2 encoder signal terminal CN2

Terminal No.	Signal Name	Mark	I/O	Functions
CN2-6	Serial encoder signals	PS+	bi-directionality	Encoder Serial Data
CN2-5	Serial encoder signals	PS-	bi-directionality	Encoder Serial Data
CN2-2	+5Vpower supply	VCC		power supply
CN2-1	power ground	GND		digital ground
CN2-shell	shielded ground	FG		shell ground

### 6) Serial communication terminalCN5

Terminal No.	Signal Name	Mark	Functions
3	RS485 communication signal	485D-	RS485 communication signal
4	RS485 communication signal	485D+	RS485 communication signal

**1 2 3 4 5 6**

Terminal interface

as shown 2-5:



Figure 2-5 CN5 Terminal Block

### 2.6.3 2.6.3 Wiring of the signaling terminals

- wire selection: shielded cable (preferably stranded shielded cable), core cross-sectional area  $\geq 0.12\text{mm}^2$  (AWG24-26), the shield must be connected to the FG terminal;
- Cable length: cable length as short as possible, control IO1, IO2 cable no more than 3 meters, feedback signal CN1, CN2 cable length no more than 20 meters;
- Wiring: Wiring away from power lines to prevent interference cascading in. Please install surge absorbing elements for the inductive components (coils) in the relevant lines; reverse shunt the DC coil with a renewable diode, and shunt the AC coil with a resistive-capacitive absorber circuit.

## 2.7 Signal Interface Schematic

### 2.7.1 Digital Input Interface Circuit

The digital input interface circuit can be controlled by a relay or open collector transistor circuit. A power supply of DC12 to 24V with a current  $\geq 100\text{mA}$  is provided by the user, and the polarity of the power supply is noted. If the current polarity is reversed, the servo driver cannot work. Input signals IN0-IN3 refer to Figure 2-6 connection method.

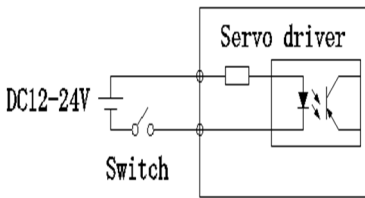


Figure 2-6 Optocoupler Input Wiring Schematic

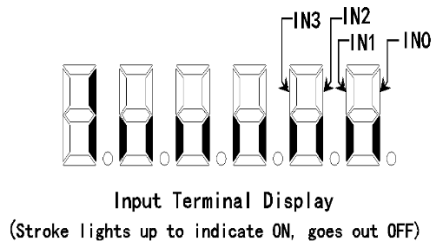


Figure 2-7 Digital Pipe Segment Position Schematic

When the input signal is connected to 0V, the signal input is valid (ON), which can be judged by checking the display menu UN-17, and when the input point is ON, the upper half of the corresponding digital tube firm bar will be lit; when the signal input is invalid (OFF), the upper half of the corresponding digital tube firm bar will be off.

Reasonable application of the contents of this display facilitates the debugging and overhauling of servo input signals.

### 2.7.2 Servo motor optical encoder input interface

The differential output method uses an AM26LS32, MC3487 or similar RS422 line driver as the receiver, as shown in Figure 2-8

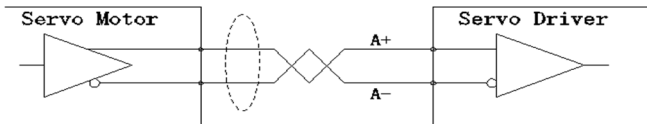


Figure 2-8 Differential Signal Wiring Schematic

### 2.7.3 Pulse signal input interface circuit

In order to transmit the pulse volume data correctly, the differential drive method is recommended. The differential drive method uses the AM26LS31, MC3487, or a similar RS422 line driver, as shown in Figure 2-9:

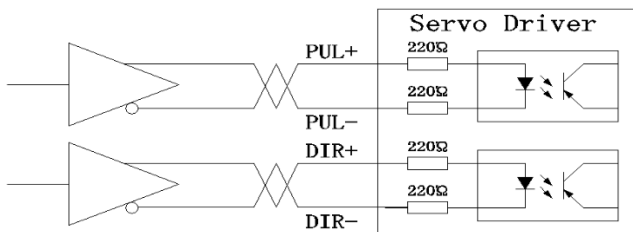


Figure 2-9 Input Pulse Signal Wiring Diagram

If single-ended drive method is used, high frequency signal input is required.

Mode 1: Determine the value of the resistor R according to the conditions of pulse input circuit, drive current 10 to 25mA, and limiting the maximum voltage of the external power supply to 24V. Empirical data:  $VCC = 24V$ ,  $R = 1.3 \sim 2k$ ;  $VCC = 12V$ ,  $R = 510 \sim 820 \Omega$ . External power supply is provided by the user, but it must be noted that if the polarity of the power supply is reversed, the servo drive unit will be damaged.

## Typical applications: PLC, Microcontrol

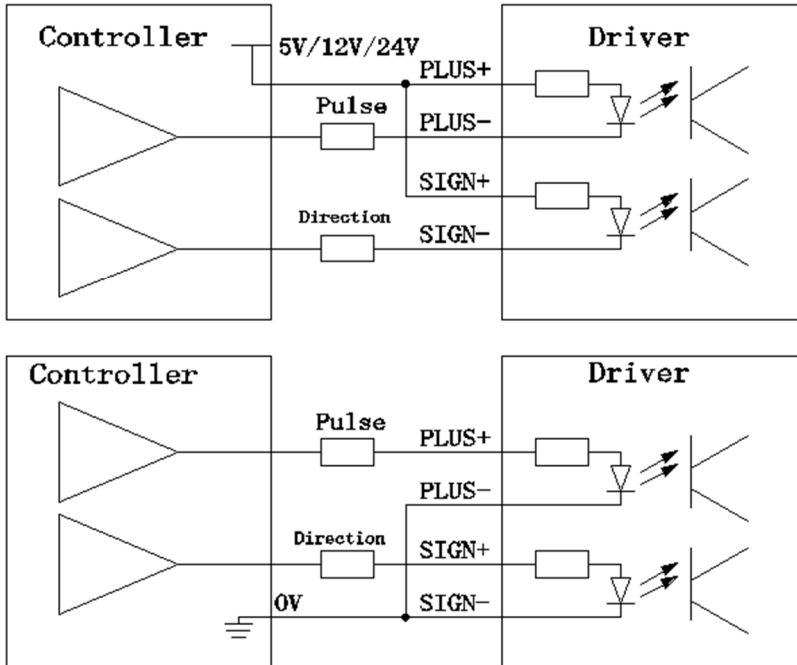


Figure 2-10 Input Pulse/Direction Signal Wiring Schematic (External Power Supply)

Mode 2: No need to connect the resistor in series, use the internal resistor function of the driver to realize. The wiring method is as follows:

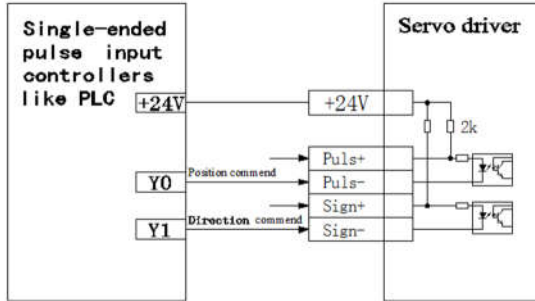


Figure 2-11 Input Pulse/Direction Signal Wiring Schematic (Internal Power Supply)

#### 2.7.4 Motor speed feedback output interface

Motor speed feedback output signals A+, A-, B+, B-, Z+, Z- are shown in Figure 2-12.

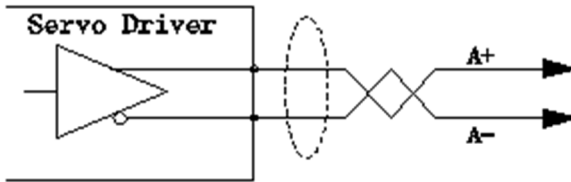


Figure 2-12 Driver motor position output signal wiring diagram

#### 2.7.5 Digital Output Interface Circuit

The digital output is open collector mode, the power supply is provided from outside, the power supply voltage is not more than 24V, the current is less than 50mA, and pay attention to the power supply polarity, the wiring mode refers to Figure 2-13. when using inductive loads such as relays, it is necessary to connect the diode

of renewable current in parallel. The status of the output signal can be observed through UN-18.

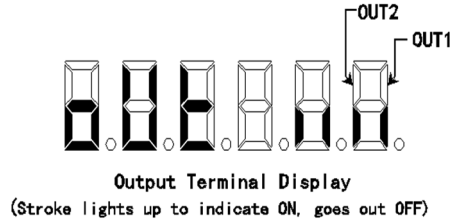



Figure 2-13 Output Port Wiring Diagram    Figure 2-14 Schematic of UN-18 Display


Status


## Chapter 3 Operation and Display


### 3.1 Keyboard Operation


The servo driver panel consists of 6 LED digital tubes, 2 indicator lamps and 5 keys, which are used to display various statuses, setup parameters and so on. The functions of the keys are as follows:



: “Select Axis” key, 1 light is on for axis 1, 2 light is on for axis 2;

: “Plus” key for serial number, numeric value increase, or option to go forward;

: “Minus” key for serial number, numeric value reduction, or option back off;

: “Back” key to return to the previous level of the operation menu, or operation cancellation;

: “Confirm” key to go to the next level of the operating menu, or enter the confirmation.




NOTE: 、 hold down, the operation is repeated, and the longer the hold time, the faster the repeat rate.

6-digit LED digital tube display system status and data, all digital tubes or the rightmost digital tube of the decimal point display blinking, indicating that the failure of the alarm.

The operation is executed according to the multi-layer operation menu, the first layer is the main menu, including eight operation modes, as shown in the table below; the second layer is the function menu under each operation mode. The following table shows the main menu functions.

Display Status	Display Meaning
Un	Status monitoring
Pn	Parameter
Sn	Parameter operation
F1	Internal speed run
F2	Jog run
F3	Load Inertia Ratio & Stiffness Level Setting
F4	Encoder Adjustment
F5	Open-loop run

### 3.2 monitoring method

Select “Un-” in the main menu and press the  key to enter the monitoring mode; there are 37 display states, users use the  and  keys to select the desired display mode.


















Display Status	Display Code	Display Meaning	Examples
Un- 01	r 500	Motor speed	current speed: 500
Un- 02	P 1230	Current position lower 5 bits	Current position: 5001230
Un- 03	P 50	Current position higher 5 bits	
Un- 04	C 1232	Command pulse lower 5 bits	Command pulse: 2001232

Un- 05	C 20	Command pulse higher 5 bits	
Un- 06	E 2	Position deviation lower 5 digits	Current position deviation: 2
Un- 07	E 0	Position deviation higher 5 digits	
Un- 08	t 30	Motor torque	Motor torque 3.0N.M
Un- 09	I 2.0	Current current rms value	Current current 2.0A
Un- 10	-	reservation	
Un- 11	Cnt 1	control mode	control mode 1
Un- 12	F 100	Input pulse frequency	Current pulse frequency 100kHz
Un- 13	r 600	speed command	given 600RPM
Un- 14	t 30	Torque command	Output torque 3.0N.M
Un- 15	A 5600	Rotor Absolute Lower 5 bits	Current rotor position: 5005600
Un- 16	A 50	Rotor Absolute higher 5 bits	
Un- 17	In 1111	Input Signal Status	INO ~ IN3 have input
Un- 18	oUt 111	Output signal status	OUT0 ~ OUT2 have output
Un- 19	o 44	synchronization deviation	Synchronization deviation of the two axes 44
Un- 20	rn on	running state	running
Un- 21	AL 49	Alarm Code	No.49 Alarm

Un- 22	A 50	Number of rotor revolutions	Rotor 50-turn position
Un- 23	reservation	-	
Un- 24	reservation	-	
Un- 25	FU2505	Show FPGA Version	FPGA Version: 2505
Un- 26	FU 10	Display the number of encoder errors	10 communication errors
Un- 27	B12420	User coordinate absolute position low bits	User coordinate values: 2012420
Un- 28	b. 20	User coordinates absolute position high bits	
Un- 29	CL 2.8	Maximum current per unit time	Maximum instantaneous current 2.8A
Un- 30	UA5000	User-defined number of pulses per revolution	5000/ revolution
Un- 31	C23542	User Resolution Command Low Bit	user Command: 3923542
Un- 32	C. 39	User Resolution Command high Bit	
Un- 33	E 1002	User resolution following error low bits	following error: 1002
Un- 34	E. 0	User resolution following error high bits	
Un- 35	P85642	User resolution current position low bits	User's current position: 8285642
Un- 36	P. 82	User resolution current	

		position high bits	
Un- 37	Cod 0	Encoder Software Version	17-bit encoder without version number

### 3.3 Parameter setting

Press  to select the corresponding axis (1 light is on for axis 1, 2 light is on for axis 2), Choose "PN-" in the first layer, and press key  to enter parameter setting mode. Use ,  to choose parameter, press key , display the value of the parameter, use ,  to modify parameter values. press  or  once, parameter increase or decrease one, press and keep  or , the parameter can be increase or decrease continuously. When the parameter value is modified, the rightmost LED digital tube lit up, press  to make sure the modified value effective, the LED digital tube decimal point of the right side go out, the modified value will be reflected in the control immediately, then press  or  keep on modify parameter, after modified press  back to the parameter selection status. If you are not satisfied with the value you are modifying, do not press , can press  to cancel, restore original parameter value, and back to the parameter selection status.

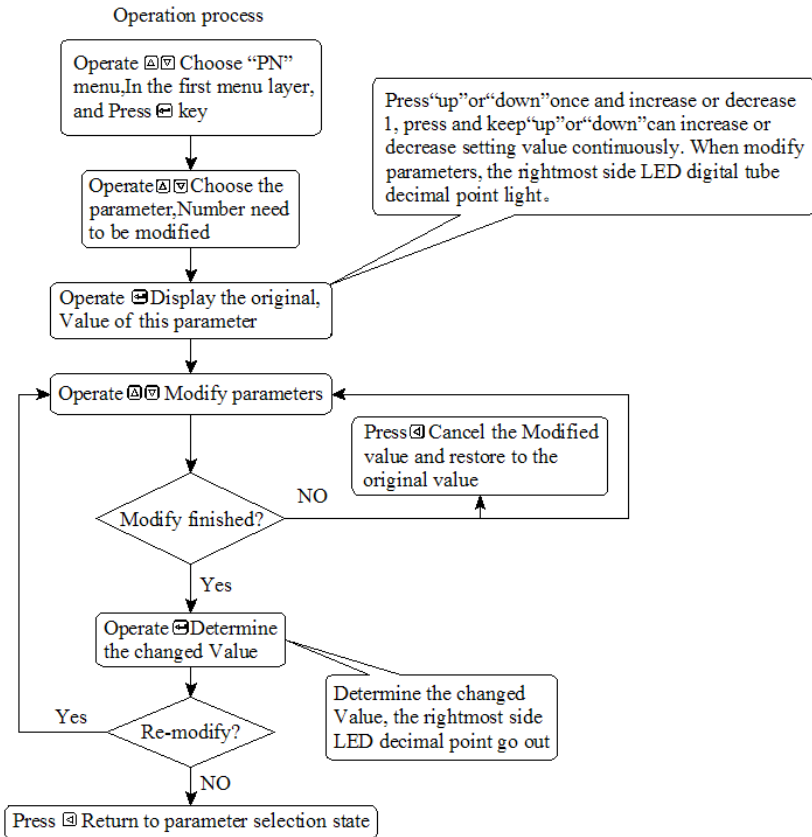








Figure 3-1 Parameter Setting Operation Flowchart

Shift quickly set the data method: to the parameter value interface, press and hold the Enter key, and then press the Return key, the lower right corner of the digital tube is lit up, and keep pressing until you want to modify the thousands or hundreds of decimals lit up, that is, the bit has been selected. Then press the up and down keys to modify the value. Press the Enter key to confirm

the change.

### 3.4 Parameter management

Parameter management mainly deals with the operation between memory and EEPROM, Press  to select the corresponding axis (1 light is on for axis 1, 2 light is on for axis 2).choose “Sn-” in the first layer, and press  entering parameter management mode. First, choose the operation mode, there are 5 modes, use 、 to choose. Take “parameter write in” for example, choose “Sn-Set”, press  and keep more than 2 seconds, if the write success, display “DONE”, if fail, display “ERR”. Press  again back to the operation mode selection status

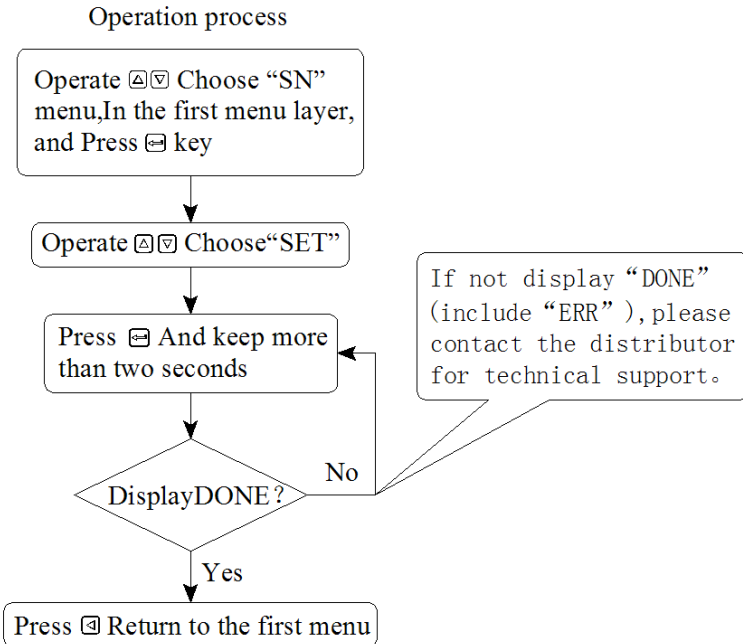


Figure 3-2 Parameter Management Operation Flowchart1

**Sn—SET** parameter write in, it means to write the memory parameter to

the parameter area of EEPROM. When the users changed the parameters, only the memory parameter values changed, next power supply will be restored to the original value. If you want to change the parameter values permanently, need to perform write in operation, write the memory parameter into parameter area of EEPROM, next power supply will use the modified parameters.

- **Sn—rd** parameter read, it means read EEPROM data in parameter area into the memory. The process will perform automatically when power on, at the beginning, the memory parameter and the EEPROM parameter is the same. But when the user modified the parameter, the memory parameter value changed too. When the user is not satisfied with the modified parameter or the parameter is messy, perform the parameter read operation, the data in the ENPROM parameter area will read into the memory again and restore to the original parameters when power on at the first time.
- **Sn—SS backup parameters**
- **Sn—rS Restore backup area parameters to current memory**
- **Sn—dEF** restore default value, it means to read all the parameter default value(factory defaults) into the memory, and write in the EEPROM parameter area, next power on will use the default parameter. When the user messed the parameter and can not work properly, use this operation can restore all parameters to factory default. As different drive mode with different parameter default values, when using restore default parameters, firstly have to ensure the motor ID (parameter PN1) is correct.

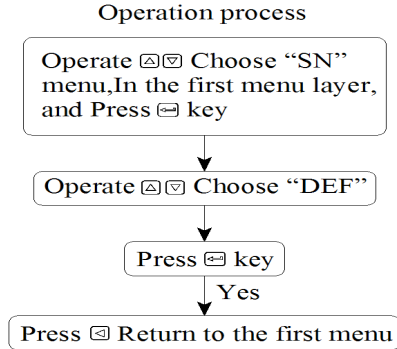








Figure 3-3 Parameter Management Operation Flowchart 2

### 3.5 F1 operation mode (panel test-run function)

Press  to select the corresponding axis (1 light is on for axis 1, 2 light is on for axis 2), Choose "F1-" in the first layer, press  entering speed trial operation mode. Speed trial prompt is "S", value unit is r/min. Speed command provided by keys, use  、  can change speed command. The motor operated at the given speed.  Control the speed positive increasing,  control the speed reducing (reverse increasing). When the speed value is positive, the motor rotated in the forward direction; when the speed value is negative, the motor rotated in the reverse direction.

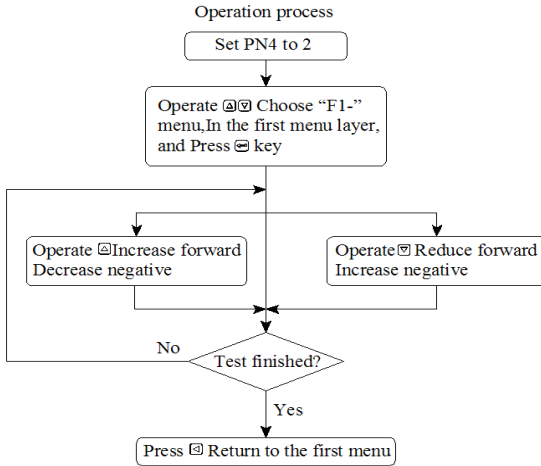


Figure 3-4 F1 Running Mode Operation Flowchart

**Note: the speed mode is a continuous motion, please ensure the motion axes with enough run distance to avoid impact and limit. if without outside enable signal, please set PN95 parameter as 1. Or the motor won't work.**

### 3.6 F2 run mode(JOG run test function)

Press to select the corresponding axis (1 light is on for axis 1, 2 light is on for axis 2), Choose "F2-" in the first layer, press entering jog operation mode. JOG run prompt is "J", value unit is r/min, speed command provided by keys. Enter F2 operation, press key and keep, motor run at jog speed, release the button, motor stop running, retain zero speed; press and keep, the motor inverted running at jog speed, release the key, the motor stop running, retain zero speed, jog speed set by parameter PN22.

If without outside enable signal, please set PN95 parameter as 1.

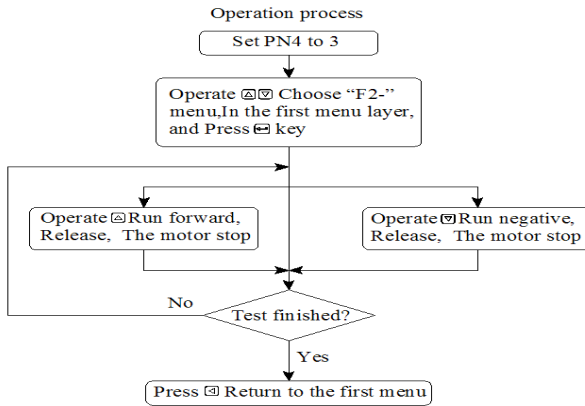


Figure 3-5 F2 Operation Mode Operation Flowchart

### 3.7 F3 Servo Inertia Adaptation and Rigidity Level Setting

In order to simplify the servo parameter debugging work, use this function to set the inertia adaptation and rigidity level, in order to adapt to different occasions of load and transmission form, immediately after the adjustment takes effect, the power failure is automatically saved.

There are 20 levels of inertia, the default is level 10.

0-9 for large inertia load class, such as synchronous wheel and turntable type load, the larger the inertia of the load corresponding to the number of smaller.

11-19 for high rigidity loads, such as screw type drive loads, the smaller the inertia of the load the larger the corresponding number.

### 3.8 Other

F4 for photoelectric encoder zero function, manufacturers use, the user should not be used.

Steps: PN4=4, PN95=1, PNO=12; long press after F4 to confirm (the sequences cannot be wrong)。

F5 for photoelectric encoder zero function, manufacturers use, the user should not be used.

Steps: PN4=5, PN95=1, PNO=12; long press after F5 to confirm (the sequences cannot be wrong).

## Chapter IV. Parameters

SDV series servo drives have a total of 147 parameters that can be adjusted to meet user needs.

Do not arbitrarily change the parameters of the motor package, otherwise unpredictable results occur.

Pn5-Pn16 are position control parameters, Pn17-42 are speed control parameters, Pn43-Pn50 are current control parameters, Pn51-Pn59 are I/O control parameters, Pn60-Pn96 are motor supporting parameters, Pn97-Pn127 are internal position control parameters and communication control parameters, Pn135 are special parameters. Pn142-Pn147 are synchronization-specific parameters, of which Pn142-Pn147 require shutdown operation.

Take the default parameters of 80F-0230GCL motor for example.

### 4.1 Full Parameter List

No.	Name	default	No.	Name	default
0	parameter password	168	16	Driver disable input is invalid	1
1	Motor ID	82	17	Speed proportional gain	200
2	software version	2020	18	Velocity integral time constant	1000
3	Initial Display Status	0	19	Velocity detection low-pass filter	580
4	control mode	0	20	User speed limit	4000
5	Position proportional gain	50	21	arrival speed	500
6	position feedforward	0	22	Jog speed	450
7	Positional low-pass filter cutoff frequency	300	23	Enable OFF delay	0
8	Position Command Pulse Input Format	0	24	Number of absolute positioning pulses during	100

				orientation	
9	Position Command Pulse Gear Ratio numerator	1	25	Absolute positioning turns during orientation	0
10	Position Command Pulse Gear Ratio denominator	1	26	Orientation speed	-100
11	Direction of motor rotation	0	27	Orientation completion recognition scope	30
12	Positioning of the scope of completion	200	28	Feedback output pulse A/B/Z phase sequence	0
13	Position overshoot detection range	4000	29	Speed mode plus or minus time constant	300
14	Position overrun error invalid	0	30	Position mode plus or minus time constant	0
15	Position command smoothing filter	15	31	Position command second gear ratio numerator	1
32	Synchronization Gain	120	63	Max. motor speed	4000
33	Speed 1	-300	64	Motor rated current	51
34	Speed 2	-200	65	Overload times	300
35	Speed 3	-100	66	Current Integral Separation Point	800
36	Speed 4	0	67	Starting deviation of synchronization adjustment	4
37	Speed 5	100	68	Current Command Low Pass Filter	340
38	Speed 6	200	69	velocity integral separation point	200
39	Speed 7	300	70	Output 1 function selection	0
40	Speed 8	400	71	Output 2 function selection	1
41	User encoder feedback resolution	10000	72	Output 3 function selection	2
42	User-defined number of one-turn position commands	10000	73	Orientation method	2
43	Current loop proportional gain	60	74	Orientation completion recognition scope	150

44	Current loop integration time constant	100	75	Overload torque detection point	130
45	Internal torque 1	50	76	Torque at overload characteristic point	200
46	Internal torque 2	-50	77	Maximum overload time at overload point	1000
47	Internal torque 3	100	78	Encoder angle compensation	0
48	Internal torque 4	-100	79	Speed amplifier saturation detection time	1500
49	Trial run jog torque limit	300	80	Motor blocking recognized speed	0
50	Torque command filters	100	81	Motor blocking recognized time	170
51	Input port low four bits forced valid	0	82	Pulse command filter frequency	600
52	reservation	0	83	Maximum permissible braking time	20
53	Input port low four bits inverted	0	84	Current Detection Coefficient	800
54	reservation	0	85	Speed command filter	234
55	Output port inverse	7	86	Encoder bits	17
56	Synchronized overshoot alarm determination range	3000	87	Encoder battery detection	0
57	Second position proportional gain	225	88	Current during encoder zeroing	60
58	Historical Alarm Records	7	89	Motor thermal overload	105
59	Z-signal aspect ratio	1	90	Motor thermal overload torque	130
60	Motor Inertia	220	91	Motor thermal overload time	900
61	Rated motor torque	24	92	Number of motor pole pairs	5
62	Rated motor speed	3000	93	Position gain attenuation factor	2
94	Torque arrival signal		121	User Single Circle 0	0

	effective torque			Point Low bits	
95	Force Enable		122	User Single Circle 0 Point high bits	0
96	Maximum current limit	150	123	Position command conversion filter coefficients	350
97	Internal position 0 turns	0	124	Follower error compensation coefficient	0
98	Internal position 0 pulse	169	125	Torque mode speed limit	20
99	Speed at internal position 0 positioning	0	126	PWM frequency	100
100	Internal position 1 turns	0	127	Encoder error tolerance range	3
101	Internal position 1 pulse	1000	128	reservation	0
102	Speed at internal position 1 positioning	0	129	reservation	0
103	Internal position 2 turns	0	130	reservation	0
104	Internal position 2 pulse	1000	131	reservation	0
105	Speed at internal position 2 positioning	0	132	reservation	0
106	Internal position 3 turns	0	133	reservation	0
107	Internal position 3 pulse	1000	134	reservation	0
108	Speed at internal position 3 positioning	0	135	17/23 bit encoder setting	0
109	Ac/deceleration at internal position	0	136	reservation	3
110	Input port 0 definition	1000	137	reservation	1
111	Input port 1 definition	1	138	reservation	800

112	Input port 2 definition	1	139	reservation	100
113	Input port 3 definition	2	140	reservation	300
114	ADC Sampling Level	14	141	reservation	0
115	Control Bit Parameter	15	142	Zero Return Mode	1
116	Reservation	0	143	Back to zero high speed	800
117	RS485 address	0	144	Back to zero low speed	100
118	RS485 communication rate	0	145	Ac/deceleration constant	300
119	RS485 communication protocol	0	146	Zero return bias low 16 bits	65535
120	Position/speed integral saturation detection	0	147	Zero return bias high 16 bits	0

## 4.2 Parameter Function Details

No.	Name	Functions	Parameter range
0	parameter password	Different passwords correspond to different parameter setting functions: 168 -User parameter 788-Clear encoder error 12 -Encoder regulation 0 789 -Encoder circle number clear 0 0 -Modify motor ID 790 -Clear encoder current position 0	0~30000
1	Motor ID	Unique ID number of the matching motor model	0~199
2	software version	Software version number (4-digit representation, single digit for generic models)	unchangeable
3	Initial Display Status	Selects the display state of the monitor after the drive is powered on: 0: Display motor speed; 1: display current position low 5 bits; 2: display current position high 5 bits; 3: pulse command low 5 bits; 4: pulse command high 5 bits; 5: position deviation low 5 bits;	0~36

		6: position deviation high 5 bits; 7: current motor torque; 8: current current RMS value; 9: reservation; 10: current control mode 11: input command pulse frequency; 12: given speed command; 13: given torque command; 14: rotor absolute position low 5 bits; 15: rotor absolute position high 5 bits 16: input port status display; 17: output port status display; 18: Synchronization deviation value of 2 axes; 19: current running status; 20: current alarm code; 21: current rotor multi-turn status; 22: U-phase current instantaneous raw value; 23: W-phase current instantaneous raw value; 24: FPGA version number; 25: encoder communication error count; 26: user coordinate absolute position low 5 bits; 27: user coordinate absolute position high 5 bits; 28: current moment peak current; 29: user-defined number of single-turn pulses; 30: user command low bit; 31: user command high bit; 32: user following error low bit; 33: user following error high bit; 34: user current position low bit; 35: user current position high bit; 36: encoder software version.	
4	Control mode	This parameter is used to set the control mode of the drive: 0: two-axis independent position control mode; 1: two-axis synchronized position control, the related parameters of two axes are required to be the same; 2: internal speed trial run control mode; 3: jogging control mode; 4: zero adjustment mode; 5: open-loop operation mode; 6: aging operation mode;	0~14

		7: internal position control mode; 8: internal speed control mode; 9: Reserved; 10: Reserved; 11: pulse speed control mode; 12: internal torque control mode; 13: Reserved; 14: Automatic setting of current position as orientation point.	
5	Position proportional gain	The higher the proportional gain of the position loop, the higher the stiffness, and the smaller the position hysteresis under the same frequency command pulse condition. However, too large a value may cause oscillation or overshoot.	1~10000
6	Position feedforward gain	Increasing the feed-forward gain of the position loop improves the high-speed response characteristics of the control system, but makes the system's position loop unstable and prone to oscillation. Unless very high response characteristics are required, the feed-forward gain of the position loop is usually zero.	0~10000
7	Position feed-forward low-pass filter cutoff frequency	Sets the low-pass filter cutoff frequency for the position loop feedforward. The higher the cutoff frequency, the better the position tracking, but it tends to oscillate.	1~1200
8	Position Command Pulse Input Format	Sets the input form of the position command pulse: 0: Symbol + pulse; 1: CCW pulse/CW pulse; 2: A/B orthogonal pulse.	0~2
9	Position Command Pulse Gear Ratio numerator	Electronic gear ratio numerator: The actual drive performs pulses of PN42 / ( PN9/PN10)	1~65535
10	Position Command Pulse Gear	Electronic Gear Score Mater. denominator	1~65535

	Ratio denominator		
11	Motor rotation direction	0: forward 1: reverse	0~1
12	Positioning of the scope of completion	Sets the positioning completion pulse range in position control mode: The basis for the Position Mode Driver Unit to judge whether or not positioning is completed.	0~30000
13	Position overshoot detection range	Set the position overrun alarm detection range: When the count value of the position deviation counter exceeds the value of this parameter, the servo drive unit gives a position overdifference alarm. For example, for a 17-bit encoder, the number of out-of-position pulses is $PN13*1310.72$ .	0~30000
14	Position overshoot error invalid	0: Position overrun alarm detection is valid; 1: Position overrun alarm detection is invalid and no position overrun error is detected.	0~1
15	Position command smoothing filter	Smooths and filters command pulses with an exponential form of acceleration and deceleration, with the value indicating the time constant; The filter does not lose the input pulse, but there is a command delay; when set to 0, the filter does not work.	0~20000
16	Driver disable input is invalid	0: CCW, CW input prohibition is valid; 1: CCW, CW input prohibition is canceled.	0~1
17	Speed proportional gain	Sets the proportional gain of the speed loop regulator: 1. The larger the setting value, the higher the gain and the greater the stiffness; 2. The larger the load inertia, the larger the setting value.	5~2000
18	Speed Integration Time Constant	Sets the integration time constant for the speed loop regulator: 1. The smaller the setting value, the faster the integration speed and the greater the stiffness; 2. the larger the load inertia, the larger the setting value.. Start and stop frequently small power occasions set relatively small to prevent overshooting.	1~1000

19	Speed Detection Low Pass Filter	Set the speed to detect the low-pass filter characteristics: 1. The smaller the value, the lower the cutoff frequency and the less noise generated by the motor. If the load inertia is large, the set value can be reduced appropriately. Too small a value results in a slower response and may cause oscillation; 2. The larger the value, the higher the cutoff frequency and the faster the speed feedback response. If a higher speed response is required, the setting value can be increased appropriately.	1~580
20	User speed limit	Limits the maximum speed of the motor (in RPM).	0~ 6000
21	arrival speed	The speed value (in RPM) at which the output signal is valid when it is reached.	0~6000
22	jog speed	Sets the operating speed of the jog motion (in RPM).	-6000~ 6000
23	Enable OFF delay	Enable OFF acts after a delay of this parameter to prevent the brake motor from falling when it is powered down.	0-30000
24	Number of absolute positioning pulses during orientation	Precise position for externally triggered directional control. The actual operating position is the set value *4.	-32768~ 32767
25	Absolute positioning turns during orientation	Number of turns for external trigger directional control in case of multi-turn encoder.	-32768~ 32767
26	Orientation speed	Externally triggers the speed during orientation control, sets positive and negative speeds to determine the direction of rotation during orientation, or selects a close return to zero via PN73.	-6000~ 6000
27	Orientation completion recognition scope	External triggering of the orientation/return-to-zero completion determination range facilitates the output of the orientation/return-to-zero completion signal.	0~32767
28	Feedback output	Motor feedback output pulse A/B/Z phase sequence at initial power-on:	0~7

	pulse A/B/Z phase sequence	0: normal; 1: A phase inversion; 2: B phase inversion; 3: A/B inverse at the same time; 4: Z phase inversion; 5: A/Z inverse at the same time; 6: B/Z inverse at the same time; 7: A/B/Z inverse at the same time.	
29	Speed mode plus or minus time constant	Acceleration and deceleration time of the motor from 0RPM to 1000RPM. The acceleration/deceleration characteristic is linear and is used only in speed mode; Acceleration and deceleration do not work when set to 0.	0~32767
30	Position mode plus or minus time constant	Acceleration and deceleration time of the motor from 0 RPM to 1000 RPM. The acceleration/deceleration characteristic is linear and is used only in position mode; When set to 0, acceleration and deceleration do not work. When set to other values, it can effectively reduce the shock during commutation and acceleration/deceleration of the position loop, and run more smoothly.	0~32767
31	Position command second gear ratio numerator	Position control second gear ratio numerator, you can switch two sets of gear ratios through the input point, realize quite pulse command, different motor output speed. That is, switching between PN9 and PN31.	1~65536
32	Synchronization Gain	This parameter is adjusted when the synchronization deviation of the two axes running is large. The larger the synchronization, the better, but will cause vibration.	0~32767
33	Speed 1	Internal speed control mode (unit: RPM) The speed is controlled by the state of the external I/O points. For example: IN3 IN2 IN1: Speed 1: OFF OFF OFF Speed 2: OFF OFF ON	-6000~ 6000
34	Speed 2		
35	Speed 3		
36	Speed 4		
37	Speed 5		

38	Speed 6	Speed 3: OFF ON ON		
39	Speed 7	Speed 4: OFF ON ON		
40	Speed 8	Speed 5: ON OFF OFF		
		Speed 6: ON OFF ON Speed 7: ON ON OFF Speed 8: ON ON ON		
41	Encoder feedback resolution	The number of output pulses per 1 revolution of the motor is set.	1~65536	
42	User-defined number of one-turn position commands	The number of unit command pulses required to run the motor one revolution is set . Used in conjunction with electronic gear PN9/PN10. For example, PN42=10000, PN9/PN10=1, the drive command receives 10000 for one revolution.	1~65536	
43	Current loop proportional gain	The higher the current loop proportional gain, the lower the current tracking error, and too much gain will produce oscillation or noise; The current loop proportional gain is servo drive and motor related, not load related.	1~500	
44	Current loop integration time constant	The smaller the current loop integration time constant, the faster the integration speed and the smaller the current tracking error, and too small an integration time constant will produce oscillation or noise; The integration time constant is related to the servo drive and motor, not to the load.	1~10000	
45	Internal torque 1	Torque control by status of external I/O points (%)	0~300	
46	Internal torque 2		-300~0	
47	Internal torque 3		PN45 PN46 PN47 PN48 IN1 OFF ON OFF ON	0~300
48	Internal torque 4		IN2 OFF OFF ON ON	-300~0
49	Trial run jog torque limit	Jog torque limitation (%) 。	0~300	
50	Torque command filter	1. Setting the torque command filter characteristics. Resonance generated by torque (sharp vibration noise from the motor) can be suppressed; 2. The smaller the value, the lower the cutoff frequency, and the less noise generated by the motor. If the load inertia is large, the setting value can be reduced appropriately. Too small a value results in a slower response and may cause instability.	1~500	

51	Input port low four bits forced valid	The lower four bits of the input signal are forced ON. Inverted by binary to set the value to decimal: Example: 1 (0001) the lowest bit is forced valid 2 (0010) the second bit is forced valid 4 (0100) the third bit is forced valid 8 (1000) the fourth bit is forced to be valid	0~15
52	reservation		0~7
53	Input port low four bits inverted	Inverting the lower four bits of the input signal is used to match the logic level of the input signal	0~15
54	reservation		0~7
55	Output port inverse	Output signal inversion is used to match the logic level of the output signal.	0~15
56	Synchronized overshoot alarm determination range	When the synchronization error of two axes exceeds the set parameters, it will synchronize the overshoot alarm.	0~10000
57	Second position proportional gain	The role is the same as PN5, the actual use of that parameter in the system as a position proportional gain is determined by the external I/O, the default state to PN5 to the internal position proportional gain of the system.	1~1000
58	Alarm Records	Historical Alarm Records	0~100
59	Z-signal aspect ratio	This parameter can be used to widen the output of the Z signal if it is difficult to receive the Z signal when applying a PLC or other host computer.	0~31
60	Motor Inertia	Set the motor inertia.	1~32767
61	Rated motor torque	Set the rated motor torque (0.1N.M).	1~1000
62	Rated motor speed	Set the rated motor speed (in RPM).	0~6000
63	Max. motor speed	Set the maximum motor speed (in RPM).	0~8000
64	Motor rated current	Setting the rated motor current (0.1A) The setting value is an effective value.	1~500
65	Overload times	Sets the maximum overload multiplier (%) allowed for the system.	0~300

66	Current Integral Separation Point	When the current error exceeds this setting, the current loop changes from PI to P. The value is a percentage of the rated current.	0~30000
67	Starting deviation of synchronization adjustment	Starting deviation of synchronization adjustment (unit: encoder resolution): Enables synchronization adjustment when the synchronization deviation of both axes exceeds this setting Purpose: To prevent unsynchronization caused by jitter in one axis from affecting the other axis. Setting this parameter too small will cause one axis to jitter, causing the other axis to follow and also jitter.	0~32767
68	Current Command Low Pass Filter	Sets the current command low-pass filter cutoff frequency (Hz): Used to limit the current command band to avoid current shocks and oscillations and to smooth the current response.	1~1500
69	velocity integral separation point	The speed PI becomes P when the speed deviation exceeds this setting.	0~3000
70	Output 1 function selection	Sets the function of output port 1 (default 0): 0: brake output function; 1: servo alarm output; 2: position arrival signal output; 3: speed arrival signal output; 4: servo ready; 5: Orientation (return to zero) completion signal output; 6: Torque arrival signal output; 7: Motor blocking signal output.	0~9
71	Output 2 function selection	To set the function of output port 2 (default 1): refer to Pn70.	0~9
72	Output 3 function selection	To set the function of output port 3 (multiplexed CZ): refer to Pn70.	0~9
73	Orientation method	0: Multi-circle orientation; 1: Single-circle orientation;	0~3

		2: proximity orientation within a single circle.	
74	Orientation completion recognition scope	Prevents directional completion signal jitter.	0~32767
75	Overload torque detection point	Set the starting torque value (rated percentage) for overload protection. When the current torque of the motor is higher than this value, the internal overload counter of the system will work, and the system will output an overload alarm when the count value exceeds it.	0~300
76	Torque at overload characteristic point	Torque at overload point, this parameter and Pn75 together form the overload characteristic of the motor, its value is set according to the overload characteristic of the motor, and Pn76 > Pn75.	0~300
77	Maximum overload time at overload point	Refer to Pn76.	0~30000
78	Encoder angle compensation	Encoder electro-angular compensation coefficient, which can be set appropriately to increase the maximum speed	-32767~32767
79	Speed amplifier saturation detection time	A speed saturation alarm is generated when the internal speed regulator of the system is continuously saturated for longer than this value. This is used to prevent mechanical jamming or other causes of high continuous current.	0~30000
80	Motor blocking recognized speed	For position or speed control, below the set value, it can be considered that the motor is blocked, used in conjunction with parameter PN81.	0~6000
81	Motor blocking recognized time	A blocking signal is output when the timing from the time when blocking is recognized reaches the set value. When the blocking signal is enabled, the output port function setting of 7 is effective.	0~32767

82	Pulse command filter frequency	Sets the input pulse pass-through frequency (kHz). A setting of 500 indicates that the maximum system pass-through frequency is 500 kHz.	1~10000
83	Maximum permissible braking time	Braking over the setting will brake alarm	2~200
84	Current Detection Coefficient	Current detection factor.	1~32767
85	Speed command filter	Pulse frequency control.	0~580
86	Encoder bits	17 or 23 bits.	2~24
87	Encoder battery detection	0: Encoder battery is not detected; 1: Encoder battery is detected and alarm is active.	0~1
88	Current during encoder zeroing	Set the amount of current (percentage of rated motor current) when zeroing the encoder, not too large to prevent the motor from overheating.	0~100
89	Motor thermal overload	Thermal overload is calculated using the I <sup>2</sup> *T method (%).	10~300
90	Motor thermal overload torque	This parameter is set greater than Pn89.	10~300
91	Motor thermal overload time	Sets the maximum time for thermal overload.	0~10000
92	Number of motor pole pairs	Set the number of pole pairs of the servo motor according to the motor parameters.	1~36
93	Position gain attenuation factor	Reduces jitter or noise when the motor is stationary at high position gain, the larger the parameter the more pronounced the effect.	0~100

94	Torque arrival signal effective torque	The analog control torque arrives at this set value, the torque arrival output signal is valid, and the value is a percentage of the rated torque.	0~3000
95	Force Enable	0: Servo enable is controlled by external I/O; 1: Servo enable is automatic after forced power-on, no external signal is required.	0~1
96	Maximum current limit	Maximum Current	0~1000
97	Internal position 0 turns	Set internal position 0 exact position: When the internal position is controlled: the position of the target is determined by Pn97 and Pn98. Position 0 = Pn97 * 131072 + Pn98 * 4. For example, Pn97 = 2 and Pn98 = 1000 means the internal position is: 266144 units = 2 * 131072 + 4000.	-32768~ 32767
98	Internal position 0 pulse	Ref. Pn97	-32768~ 32767
99	Speed at internal position 0 positioning	The speed of movement when localized to internal position 0.	0~6000
100	Internal position 1 turns	Set the internal position 1 exact position, refer to Pn97, Pn98.	-32768~ 32767
101	Internal position 1 pulse		-32768~ 32767
102	Speed at internal position 1 positioning	The speed of movement when positioning to internal position 1.	0~6000
103	Internal position 2 turns	Set the internal position 2 exact position, refer to Pn97 , Pn98.	-32768~ 32767
104	Internal position 2 pulse		-32768~ 32767

105	Speed at internal position 2 positioning	Movement speed (in RPM) when positioning to internal position 2.	0~6000
106	Internal position 3 turns	Set the exact position of internal position 3, refer to Pn97 , Pn98.	-32768~32767
107	Internal position 3 pulse		-32768~32767
108	Speed at internal position 3 positioning	Movement speed (in RPM) when positioning to internal position 3.	0~6000
109	Ac/deceleration at internal position	Acceleration and deceleration time during internal positioning (unit:) The larger the setting value the faster the acceleration.	1~32767
110	Input port 0 definition	Default is servo-enable (1)。	1~31
111	Input port 1 definition	Defines the function of the input port: 0: no function; 1: servo enable; 2: alarm clear; 3: input pulse prohibit; 4: position deviation counter clear; 5: speed command input 0; 6: speed command input 1; 7: Speed command input 2; 8: motor running direction (1 - forward rotation, 0 - reverse rotation) 9: position gain switching 10: position gear ratio numerator switching; 12: Torque command input 0; 13: torque command input 1; 14: Forward drive prohibition; 15: reverse drive prohibition; 16: internal position instruction 0; 17: internal position instruction 1; 18: internal position running start; 19: Internal control mode selection 0 (mode	0~31

		switching function input); 20: Internal control mode selection 1; 21: Orientation (return to zero) control input signal; Note: internal/analog speed and pulse position switching; internal/analog torque and pulse position switching; after setting up PN4 and PN32, you only need to set the switching input point function to 19.	
112	Input port 2 definition	Refer to Pn111.	0~31
113	Input port 3 definition	Refer to Pn111.	0~31
114	ADC Sampling Level	0 - fast response at high frequency; 1 - default frequency; 2 - smoother at low frequency	0~2
115	Control Bit Parameter	bit0: 0 is normal Z signal; 1 is Z signal port used as the third output port, the function is set by parameter No. 72. bit1: 0 is free stop; 1 is open position control power-down deceleration stop, acceleration and deceleration are set by parameter No. 29. bit2: 0 is to use independent input port when synchronization; 1 is to share the first axis input port between two axes during synchronization; bit3: 0 is to use independent output port during synchronization. 1 is to share the first axis output port for both axes during synchronization. Setting method: $1111$ (binary) = $8+4+2+1=15$ (decimal) Example 1: When the first axis input port is shared by both axes when synchronization is required, PN115 is set to 4 (decimal) = 0100 (0+4+0+0); Example 2: When two axes share the first axis input and output ports when synchronization is required, PN115 is set to 12 = 1100 (8+4+0+0).	0~15

116	reservation		0~19
117	RS485 address	Station number for multiple drive communication (default 1 for axis 1, default 2 for axis 2).	0~127
118	RS485 communication rate	Communication rate (in bps): 0: 4800      1: 9600      2: 19200 3: 38400    4: 57600    5: 115200	0~5
119	RS485 communication protocol	Transmission protocol, using RTU mode: 0: 8 0 1 (MODBUS, RTU) ; 1: 8 E 1 (MODBUS, RTU) ; 2: 8 N 2 (No Parity, 2 Stop Bits); 3: 8 N 1 (No Parity, 1 Stop Bits); Note: 8 means 8-bit data; E means even parity; 0-odd parity; N-no parity; 1 means 1 stop bit.	0~3
120	Position/speed integral saturation detection	0: detected 1: not detected	0~1
121	User Single Circle 0 Point Low bits	Record the low 16 bits of the customer-set single-turn 0 point.	0~65535
122	User Single Circle 0 Point high bits	Record the high 16 bits of the customer-set single-turn 0 point.	0~65535
123	Position command conversion filter coefficients	Filter coefficients for converting position commands to speed.	1~580
124	Follower error compensation coefficient	0: normal following error, 100: no following error; The larger the value the smaller the following error can be.	0~100

125	Torque mode speed limit	Speed limitation in torque control mode.	1~5000
126	PWM frequency	Manufacturers use (unit: 0.1kHz).	40~120
127	Encoder error tolerance range	Encoder error tolerance range	0~32767
128	reservation		0~2
129	reservation		0~32767
130	reservation		0~65535
131	reservation		0~65535
132	reservation		0~2
133	reservation		1~580
134	reservation		0~100
135	Encoder Setting	0: 23-bit encoder 1: 17-bit encoder	0~1
136	reservation		0~35
137	reservation		0~35
138	reservation		0~3000
139	reservation		1~3000
140	reservation		0~32767
141	reservation		0~65535
142	Zero Return Mode	Reference to CIA42 standard	0~35
143	Back to zero high speed	Back to zero high speed setting	1~3000
144	Back to zero low speed	Back to zero low speed setting	1~3000
145	Ac/deceleration constant	Acceleration and deceleration constants for return to zero	0~32767
146	Zero return bias low 16 bits	The unit is the user set encoder resolution, if the user encoder resolution is 0 (not set), then the week is calculated by 65536	0~65535
147	Zero return		

	bias high 16 bits	
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### 4.3 Parametric debugging block diagram model

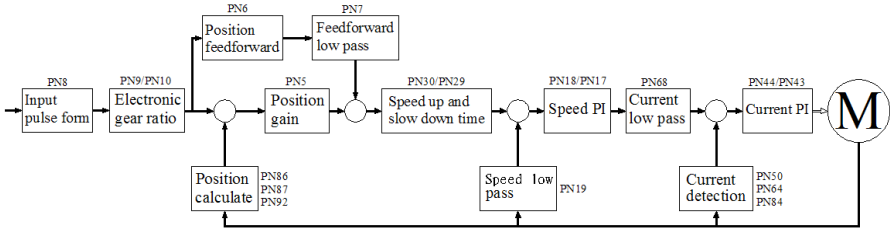


Figure 4-1 Parameter Debugging Operation Flowchart

### 4.4 Description of key servo parameters

Since the default motor package parameters have been optimized, they can be used directly in most applications without adjusting the parameters (except for electronic gear ratios). However, the actual machinery is complex and diverse, if there is an abnormality in the commissioning or the need for ultra-high response, it is necessary to adjust the parameters to meet the demand.

The principle of commissioning is to start with the current loop, then the speed loop, and finally the position loop.

The current loop is generally not adjusted, except on individual occasions. The speed response is too fast, resulting in current inrush causing AL-11 alarm. PN64 can be adjusted to solve the problem.

The speed ring is used in applications where a high speed response is required. It can be obtained by increasing PN17 or decreasing PN18, but PN17 set too large is prone to vibration. In the load inertia is too large occasions, if the load motor movement deceleration stops unsteadily, left and right shaking, then you need to increase PN18 to solve the problem.

The position loop is used in applications that require a high position response. PN5 can be increased to obtain, some occasions

also need to increase PN6 to meet. But PN5, PN6 set too large easy to vibrate, set the premise of priority debugging PN5, only in the short distance, high response to use PN6!。

#### **Electronic Gear Ratio Adjustment:**

(1) If the calculation from the speed can be based on the following formula

$$(PN9/PN10) = PN42 / f$$

Where f represents the pulse from the host computer, the unit is the number of pulses / per revolution

For example: PN42 = 10,000, the host computer issued 10,000 pulses, so that the motor to turn a circle, then the above formula can be calculated (PN9/PN10) should be 1....

2) Directly based on positional accuracy

$$(\text{lead} / \text{pulse equivalent}) \times (PN9 / PN10) = PN42$$

If the lead of the screw is 5mm, the motor is directly connected to the screw, and the load moves 5mm when the motor turns a circle, and if the required accuracy is 0.001mm, the motor needs 5000 pulses to turn a circle, set PN42=10000, PN9=2, PN10=1.

Pulse input form supports pulse plus direction, CW/CCW and A/B orthogonal pulse, set by PN8.

### **4.5 Parameter debugging steps in practical applications**

In the process of debugging or application, if vibration or noise is found or the control accuracy is not reached, the parameters of the system can be adjusted as follows to meet the control requirements:

When the motor is in the state of static locking, if there is vibration or sharp noise, please adjust the parameter value of Pn43 smaller. the larger the Pn43, the better the current tracking effect, the faster the motor response, too large is prone to vibration or noise.

#### 4.5.1 Speed control mode parameter adjustment

(1) The setting value of [Speed Proportional Gain] (parameter Pn17) is set as large as possible under the condition that no oscillation occurs. In general, the larger the load inertia, the larger the setting value should be;

2) The setting value of [Speed Integration Time Constant] (Parameter Pn18) is set as small as possible under the given conditions. If the setting is too small, the response speed will be increased, but oscillation is easily generated. Therefore, keep the setting as small as possible under the condition that no oscillation occurs. If the setting is too large, the speed will vary greatly when the load changes.

#### 4.5.2 Position control mode parameter adjustment

1) First, set the appropriate [Velocity Proportional Gain] and [Velocity Integration Time Constant] as above;

2) Set [Position feedforward gain] (parameter Pn6) to 0%;

3) The setting value of [Position Proportional Gain] (parameter Pn5) is set as large as possible within the stabilization range. When set too large, the position command has good tracking characteristics and a small hysteresis error, but is prone to oscillation when stopping for positioning. If the setting is small, the system is in a stable state, but the position tracking characteristics deteriorate and the hysteresis error is large;

4) If the position tracking characteristic is particularly high, the setting value of Pn6 can be increased; however, if it is too large, it will cause overshooting.

## Chapter 5 Operation and debugging

### 5.1 Special Precautions for Debugging:

- 1) The servo drive connects AC single-phase/three-phase 220V power to the power input terminal. Three-phase connect to R, S, T, single-phase connect to any two ends of R, S, T;
- (2) The motor power line is connected to U1, V1, W1 and U2, V2, W2, PE respectively, and the sequences must not be connected wrongly;
- (3) If the above connection of the driver is connected incorrectly, it may lead to damage to the driver, the motor does not rotate, alarm and other phenomena, so please check carefully before powering on.
- (4) 1S after the power supply is turned on servo alarm signal output, 1.5S after the ready signal output, 1.51S after the response to the enable signal, 1.51S or less motor incentive locking, waiting for operation.

### 5.2 Independent position control for both axes

- 1) Turn on the power, the display of the driver unit lights up (if there is an alarm, please check the wires).
- 2) Set the relevant parameters as follows:

No.	Name	definition	Value
Pn4	control mode	0: Position Mode	0
Pn8	Position command pulse input mode	0: Single pulse; 1: CW/CCW pulse; 2: A/B orthogonal pulse.	0
Pn5	Position proportional gain	Enlargement reduces positional deviation and improves system rigidity.	300
Pn9	Gear ratio numerator 1		1
Pn10	Gear ratio denominator		1
Pn30	Position ac/deceleration	Position mode acceleration and deceleration reduces vibration during commutation.	0

Pn 41	Encoder output signal frequency	Used to feedback the encoder position to the host computer.	10000
Pn 42	User Pulse Command Equivalent	Set how many pulses to one revolution, you can set this parameter directly, do not need to set the gear ratio.	10000
Pn59	Z-Signal Spread Ratio	Widen the Z signal for easy reception by the host computer	1
Pn95	Servo Enable	0: external enable; 1: forced enable.	1

3) After confirming that there is no alarm or any abnormal condition, make the servo enable (SON) ON, at this time the motor is excited and in zero speed state. If the enable signal cannot be wired, you can set Pn95 to 1 to automatically enable the motor;

4) Adjust the pulse frequency of the input signal so that the motor runs as commanded.

### 5.3 Synchronized position control for both axes

1) Turn on the power, the display of the driver unit lights up (if there is an alarm, please check the wires).

2) Set the relevant parameters as follows:

No.	Name	definition	Value
Pn4	control mode	1: Two axes synchronized position control	1
Pn8	Position command pulse input mode	0: Single pulse; 1: CW/CCW pulse; 2: A/B orthogonal pulse.	0
Pn5	Position proportional gain	Enlargement reduces positional deviation and improves system rigidity.	300
Pn9	Gear ratio numerator 1		1
Pn10	Gear ratio denominator		1

Pn29	Speed mode ac/deceleration	speed or acceleration/deceleration time in power-down synchronization mode.	100
Pn30	Position mode ac/deceleration	Position mode acceleration and deceleration reduces vibration during commutation.	0
Pn32	Synchronizat ion Gain	Synchronized gain control for both axes.	0~200
Pn 41	Encoder output signal frequency	Used to feedback the encoder position to the host computer.	10000
Pn 42	User-defined number of one-turn position commands	Set how many pulses to one revolution, you can set this parameter directly without setting the gear ratio.	10000
Pn56	Synchronized overshoot alarm determination range	Alarm AL-49 when value exceeded	0~10000
Pn59	Z-Signal Spread Ratio	Widen the Z signal for easy reception by the host computer	0
Pn67	Starting deviation of synchronizatio n adjustment	The deviation of the two axes is greater than this value to start the synchronization adjustment.	0~4096
Pn70—Pn72	Output port function setting	Set the output port function.	0-6
Pn95	Servo Enable	0: external enable; 1: forced enable.	1
Pn110—Pn113	Input port function setting	Input port function setting.	0-24
Pn115	Control Bit Parameters	Functional configuration of various input and output signals.	0-15

3) After confirming that there is no alarm or any abnormal condition, enable the servo enable (SON), then the motor is excited and in zero speed state. If the enable

signal is not wired, you can set Pn95 to 1 to automatically enable the motor;

4) Adjust the pulse frequency of the input signal to make the motor run according to the instruction.。

## 5.4 Description of two-axis synchronized control

(1) The parameter Pn4 of both axes is set to 1 at the same time to enter the synchronized control mode (it is not allowed that one is set to 1 and the other is not), at this time, the dual axes share the pulse command of the first axis, and the pulse command of the second axis is invalid;

2) When bit2 of Pn115 is set to 1, both axes share the input port of the first axis (reduce wiring);

(3) When bit2 of Pn115 is set to 0, the two axes use independent input ports (convenient for debugging).

**The specific features of the two-axis mechanical debugging are described as follows:**

A) When the enable of one axis is turned off, it will quit synchronization automatically, at this time, you can manually adjust the axis which is turned off, after adjusting the position, both axes will be given the enable to start synchronization automatically;

B) When the pulse command of one axis is prohibited and automatically exits synchronization, the pulse command can be used to control the axis which is not prohibited by pulse command to make mechanical adjustments, and after adjusting, the synchronization will be started automatically by removing the enable prohibition;

(C) Synchronization control, two axes can be oriented individually, when any one axis is oriented, it will exit synchronization automatically;

(D) When entering synchronization control, the two axes share the gear ratio, pulse command form, command feed forward, command smooth filtering, position acceleration and deceleration of the first axis and other position command parameters, while the relevant parameters of the second axis are invalid;

(E) The position command gain of the two axes should be set equal,

and the position command is valid for each of them if it is reversed;

(F) If the two axes are synchronized in the opposite direction (gantry synchronization), only the pulse command direction of the second axis and the first axis can be set in the opposite direction.

(4) When bit3 of Pn115 is set to 1, dual axes can share the output port, at this time the second axis output port is invalid. For example, if either axis has an alarm, the first axis has an alarm output and the second axis has no alarm output;

5) When bit3 of Pn115 is set to 0, dual axes use independent output ports;

6) Power-down synchronization function: when power-down occurs during operation and Pn115 parameter bit1 is 1, the synchronized deceleration stops; when Pn115 parameter bit1 is 0, the motor runs normally until it stops freely after under-voltage;

7) When Pn115 parameter bit0 is set to 1, the CZ signal is used as the common output port OUT3, and set to 0, the CZ signal is output;

8) When the synchronization deviation is less than the setting of Pn67, no synchronization adjustment is made;

9) Pn32 is the synchronization gain, users who require higher synchronization performance can increase the value of Pn32 and decrease the value of Pn67, but too large a value of Pn32 or too small a value of Pn67 may cause vibration;

(10) When the synchronization error exceeds the value of Pn56, it will synchronize the over-difference alarm;

(11) UN19 displays the maximum position deviation (relative value) in operation, the real maximum deviation should be the display value + 2\* encoder maximum measurement deviation.



## 5.5 Description of the speed trial mode

1) Turn on the power, the display of the drive unit lights up (if there is an alarm, please check the wiring).

2) Set the following parameters:

No.	Name	definition	Value
Pn4	control mode	1: Synchronized position mode; 2: Trial run.	2
Pn95	Servo Enable	0: external enable; 1: forced enable.	1

3) After confirming that there is no alarm or any abnormal situation, make the servo enable (SON) ON, at this time the motor excitation, in the state of zero speed (if the enable signal is not wired, you can set Pn95 to 1 to enable the servo)


4) By pressing the key, enter the F1 speed trial operation mode, the speed trial prompt is “S”, the numerical unit is r/min, the system is in the speed trial operation mode, the speed command is provided by the key, change the speed command with the   key, and the motor should be operated according to the given speed.

## 5.6 Explanation of jog operation mode

- 1) Turn on the power and the display of the drive unit lights up (if an alarm appears, check the wiring)
- 2) Set the following parameters:

No.	Name	definition	Value
Pn4	control mode	0: Independent position mode; 1: synchronized position mode; 2: trial run; 3: jog run.	3
Pn95	Servo Enable	0: external enable; 1: forced enable.	1

3) After confirming that there is no alarm or any abnormal situation, make the servo enable (SON) ON, at this time the motor excitation, in the state of zero speed (if the enable signal is not wired, you can set Pn95 to 1 to enable the servo);

4) Through key operation, enter F2 pointing operation state, JOG operation prompt is “J”, the numerical unit is r/min, the system is in the speed control mode, the speed is determined by the parameter Pn22, press the key , the motor is running at the speed

determined by the parameter Pn22, press the key , the motor is running at the speed determined by the parameter Pn22. The motor runs in the opposite direction.

## 5.7 Servo Featured Functions Application

### 5.7.1 Servo Start Orientation Function:

When the input port is set to the servo-activated orientation (return to zero) function, the orientation (return to zero) function is automatically activated by turning the input signal ON (except in the torque control mode). The direction of rotation during orientation is determined by Pn26. The exact position of single-turn orientation is determined by Pn24. When the output port function is set to 5, a zero return completion signal is output from the corresponding pin after orientation.

When the input signal is OFF, the orientation function is turned off.

### 5.7.2 Position gear ratio switching function

When the input port is set to the position gear ratio switching function, when the input signal is set to ON, the system adopts the value of Pn31 parameter as the current input pulse electronic gear; when the input signal is set to OFF, the system adopts the value of Pn9 parameter as the current input pulse electronic gear.

This function is mainly used in the occasions where dynamic electronic gear ratio is required.

### 5.7.3 Position gain switching function

When the input port is set to position gain switching function, when the input signal is set to ON, the system adopts the value in the Pn57 parameter to do the current position loop control gain; when the input signal is set to OFF, the system adopts the value in the Pn55 parameter to do the current position loop control gain.

This function is mainly applied to the occasions where dynamic position gain is required.

#### 5.7.4 Input Pulse Command Filter

In the actual industrial application site, there are more interferences, and the input pulse command may be caused by external interferences resulting in servo counting errors, thus affecting the servo repetitive positioning accuracy. By setting this filter, it can effectively prevent the interference string into the servo system and improve the anti-interference ability of the system.

The relationship between the setting value and the passable frequency is as follows:

Value set by Pn82	500	250	100
Maximum pulse frequency the system can pass	500KHZ	250KHZ	100KHZ

## Chapter 6 RS485 Communication

### 6.1 RS485 communication hardware interface

This servo drive is equipped with RS485 communication function, which can control the servo system operation, change parameters, monitor the servo system status and other functions to adapt to the specific application requirements.

The following figure shows the wiring diagram of RS485 communication.

Connect the drive with the communication cable, by default axis 1 selects station 1, axis 2 selects station 2.

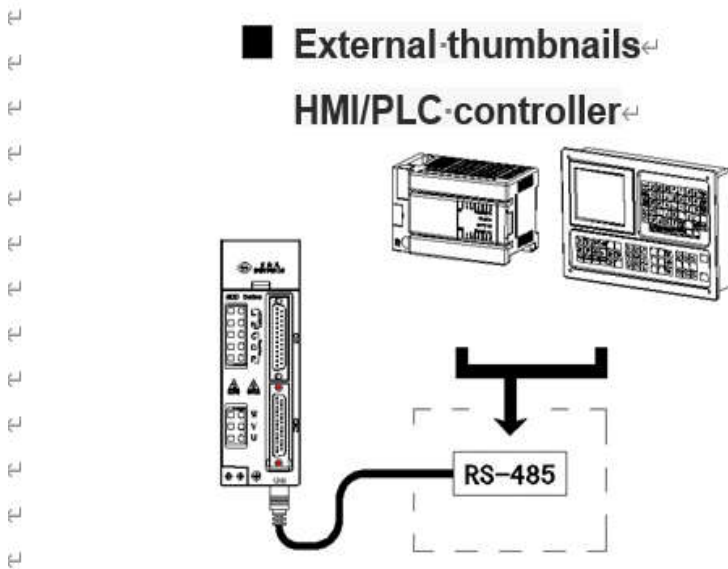


Figure 6-1 RS485 Communication Wiring Diagram

### 6.2 communication protocol

This servo system adopts the standard asynchronous serial master-slave MODBUS communication protocol, only one device host in the network can establish the protocol, other devices slave can only respond to the host's commands by providing data or according

to the host's commands to do the corresponding action.

The host is a personal computer, industrial control device or PLC, etc., and the slave is this servo system.

Communication commands can only be sent from the sending device (host) to the receiving device (slave), all receiving devices (slave) to receive commands and CRC check is correct, it is compared with the local address; in line with the local address code of the slave to read the complete information and perform the corresponding tasks, the results of the implementation (data) back to the host; the return information includes the address code, the function code, the implementation of the data and the CRC check code.

The communication frame structure adopts RTU mode.

### 6.2.1 Command Code and Data Description

function code	definition	Operation (Binary)
03	Read register data	Read data from one or more registers
06	Write single register	Write a set of binary data to a single register
10	Write multiplexed registers	Write multiple sets of binary data to multiple registers

### 6.2.2 Read Register Data - 03 Function Code

Example 1: The master wants to read the data of 2 slave registers with slave address 01 and start address 0134H.

The address and data of the slave (PDM) data register are:

Register Addresses	Register data (hexadecimal)	Corresponding Data Definition
0134H	0020H	Motor torque T
0135H	0034H	Motor Current I

The format of the message sent by the host:

Host sends	bytes	Message sent	Notes
slave address	1	01	Select the slave with address 01

function code	1	03	Read register data
starting address	2	0134	Starting address 0134H
data length	2	0002	Read 2 register data (4 bytes total)
CRC code	2	8439	CRC code 8439H is calculated by the host computer

Format of the message returned by the slave (PDM) response:

slave response	bytes	Message sent	Notes
slave address	1	01	Slave 01
function code	1	03	Read register data
Number of bytes to read	1	04	2 registers totaling 4 bytes
register data 1	2	0020	Contents of register at address 0134H
register data 2	2	0034	Contents of register at address 0135H
CRC code	2	FA2E	The CRC code is calculated by the slave

### 6.2.3 Write Single Register – 06 Function Code

Example 1: The host wants to save data 07D0H into register 002CH of the slave (slave address is 01), and after the communication data saving is finished, the PDM table storage information at address 002CH is:

address	Original stored data (hexadecimal)
002CH	04B0H

The format of the message sent by the host:

Host sends	bytes	Message sent	Notes
slave address	1	01	Send to slave at address 01
function	1	06	Write single register

code			
starting address	2	002C	Register address to be written
write data	2	07D0	Corresponding new data
CRC code	2	4BAF	CRC code calculated by the host

The format of the message returned by the slave (PDM) is identical to the format and data content of the message sent by the master.

#### 6.2.4 Write Multiplexed Registers – 10 Function Codes

This function code is used to save multiple data into the data memory of the PDM table.

Registers in the Modbus communication statute refer to 16 bits (i.e., 2 bytes) and are preceded by the high bit so that the PDM's memories are all two bytes. Since the Modbus communication protocol allows up to 60 registers to be saved at a time, the PDM is also allowed to save up to 60 data registers at a time.

Example 1: The host has to save the data of two words 0064H, 0010H to the register address 002CH, 002DH of the slave (slave address 01), after the communication data saving is finished, the information stored in the PDM table with the address of 002CH, 002DH is as follows:

address	Original stored data (hexadecimal)
002CH	04B0H
002DH	1388H

The format of the message sent by the host:

Host sends	bytes	Message sent	Notes
slave address	1	01	Send to slave 01
function code	1	10	Write multiplexed registers
Write Start Address	2	002C	Starting address of the register to be written to
Number of write	2	0002	Word length of saved data (2

registers (words)			words total)
Write data bit length (bytes)	1	04	Byte length of saved data (4 bytes total)
Save data 1	2	04B0	data address 002CH
Save data 2	2	1388	data address 002DH
CRC code	2	FC63	CRC code calculated by the host

Format of the message returned by the slave (PDM) response:

slave response	bytes	Message sent	Notes
slave address	1	01	From Slave 01
function code	1	10	Write multiplexed registers
starting address	2	002C	Starting address 002C
Save data word length	2	0002	Holds 2 word lengths of data
CRC code	2	8001	CRC code calculated by the slave

### 6.2.5 Error check code (CRC checksum):

A host or a slave can use a checksum code to determine whether the received information is correct or not. The error check code (CRC) allows the host or slave to check whether the information in the communication data transmission process is incorrect or not, and incorrect data can be discarded (either sent or received), which increases the safety and efficiency of the system.

The CRC (Cyclic Redundancy Code) of the MODBUS communication protocol consists of 2 bytes, i. e. a 16-bit binary number. the CRC code is calculated by the transmitting device (host) and placed at the end of the frame in which the information is sent. The device receiving the message (slave) then recalculates the CRC of the received message, compares whether the calculated CRC matches the received one, and if it does not, an error has occurred.

Only 8 data bits are used in the CRC calculation, and the start

and stop bits, including parity bits if any, are not involved in the CRC calculation.

● The CRC code is calculated as:

1. Preset a 16-bit register to hexadecimal FFFF (i. e., all 1s); call this register the CRC register;

2. Isolate the first 8-bit binary data (i. e., the first byte of the communication information frame) with the lower 8 bits of the 16-bit CRC register, and place the result in the CRC register;

3. Shift the contents of the CRC register one bit to the right (toward the lower bit) to fill the highest bit with a 0, and check the shifted out bit after the right shift;

4. If the shifted out bit is 0: Repeat step 3 (shift right one bit again);

If the shifted out bit is 1: the CRC register is iso-or with the polynomial A001 (1010 0000 0000 0001);

5. Repeat steps 3 and 4 until it is shifted right 8 times, so that the entire 8-bit data is processed in its entirety;

6. repeating steps 2 through 5 for the next byte of the communication information frame;

7. After all bytes of the communication information frame are calculated according to the above steps, the high and low bytes of the 16-bit CRC register are exchanged;

8. The content of the CRC register obtained at the end is the CRC code.

### 6.3 Handling of communication error messages and data:

When the PDM table detects an error other than a CRC code error, it must send a message back to the host with the highest position of the function code being 1. This means that the function code returned to the host by the slave is the function code sent by the host plus 128 . These codes below indicate that an unexpected error has occurred.

Messages received by the PDM from the host with CRC errors are

ignored by the PDM table.

The format of the error codes returned by the PDM is as follows (except for CRC codes):

Address code: 1 byte

Function code: 1 byte (highest bit is 1)

Error code: 1 byte

CRC code: 2 bytes.

PDM responds by sending back the following error codes:

81. Illegal function code.

The received function code is not supported by the PDM table.

82. illegal data location.

The specified data location is out of the range of the PDM table.

83. illegal data value.

The received data value sent by the host is outside the data range of the corresponding address of the PDM.

#### 6.4 SDV series driver debugging software description and use

This servo drive debugging software is green and does not require installation. After obtaining the software from the manufacturer and storing it on the computer, it can be run directly.

To connect the computer with the servo drive, you must use the manufacturer's special debugging cable (model CABLE02). The use of other communication cable will result in damage to the drive or can not communicate!

The debugging steps are as follows:

1. Double-click BGD Servo to enter the first interface, as shown in Figure 6-2 to Figure 6-5.
2. Click the serial port setting software will automatically recognize the COM port, the baud rate should be selected according to the driver settings, such as mismatch will occur

communication errors. The default baud rate of the software and driver is 115200, the station number is set according to the driver, the driver model is selected SDV, other parameters are defaulted and saved. Then click the “Connect” button, at this time the software and the drive can communicate normally, offline mode is used to not connect the drive, view other information about the software.

3. click parameter setting, this interface is mainly to view and modify the drive parameters, can be modified individually or batch modification, greatly improving the efficiency of drive commissioning.

4. the running test interface can be four-way acquisition of motor speed, position, command position, torque and current, please refer to the instructions in the debugging software for specific use instructions.

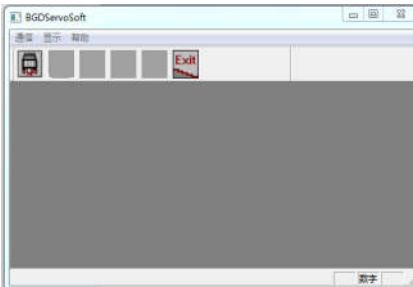


Figure 6-2 BGD Servo main interface

Figure 6-3 Serial port setting interface

数据参数	编号	参数名称	参数值	范围	默认值	单位	备注
<input type="checkbox"/>	Pn0	伺服使用密码	168	0 ~ 300	168	—	只
<input type="checkbox"/>	Pn1	电机ID号	1	0 ~ 100	1	—	断
<input type="checkbox"/>	Pn2	软件版本	147	0 ~ 32737	138	—	口
<input type="checkbox"/>	Pn3	初始显示状态	0	0 ~ 20	0	—	无
<input type="checkbox"/>	Pn4	控制模式	0	0 ~ 5	0	—	无
<input type="checkbox"/>	Pn5	位置比例增益	200	1 ~ 65535	200	—	无
<input type="checkbox"/>	Pn6	位置前馈	0	0 ~ 100	0	—	无
<input type="checkbox"/>	Pn7	位置前馈低通滤波器截止频率	300	0 ~ 1200	300	—	无
<input type="checkbox"/>	Pn8	位置指令脉冲输入形式	0	0 ~ 2	0	—	无
<input type="checkbox"/>	Pn9	位置指令脉冲分辨率	8192	1 ~ 32767	8192	—	无
<input type="checkbox"/>	Pn10	位置指令脉冲分辨率分母	625	1 ~ 32767	625	—	无
<input type="checkbox"/>	Pn11	位置控制电机旋转方向	0	0 ~ 1	0	—	无
<input type="checkbox"/>	Pn12	定位完成范围	20	0 ~ 30000	20	—	无
<input type="checkbox"/>	Pn13	位置超差检测范围	800	0 ~ 30000	800	—	无
<input type="checkbox"/>	Pn14	位置超差错误无效	0	0 ~ 1	0	—	无
<input type="checkbox"/>	Pn15	位置指令平滑滤波器	0	0 ~ 200	0	0.1	无
<input type="checkbox"/>	Pn16	转矩禁止输入无效	1	0 ~ 1	1	—	无
<input type="checkbox"/>	Pn17	速度比例增益	90	5 ~ 2000	220	—	无
<input type="checkbox"/>	Pn18	速度积分时间常数	65	1 ~ 1000	20	—	无

Figure 6-4 Parameter Setting Interface

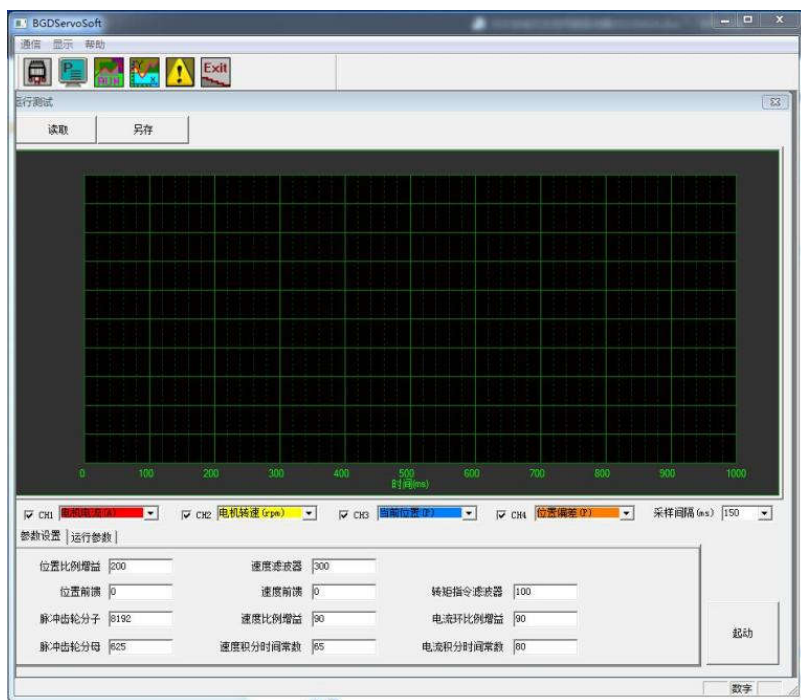


Figure 6-5 Run Test Interface

**Functional Description:**

Read: Read the external parameter table file into the current computer software.

Save: Store the parameter table in the current computer software to another file for downloading.

Upload: Upload the parameter inside the servo drive to the computer software.

Download: download the parameters from the computer software to the servo drive. Parameter Batch Processing

Send down one by one: Download the parameters from the PC software to the Servo Drive. Individual parameter processing

Save: Save the parameters modified in the current computer software directly to the EEPROM of the drive.

## 6.5 Examples of communication commands

RTU Commands: 03 Read Single or Multiple Registers

06 Write single register

10 Write multiple registers

### 6.5.1 Application Examples

Example 1: Reading a multiplexed register (e.g. reading PN9 PN10 electronic gear ratio)

01 03 00 09 00 02 14 09

Station No. Read command Address 9 2 data Checksums

Return: 01 03 04 0001 0001 6A33

Return result: 4 bytes, two parameters according to respectively 01, 01. i.e. PN9, PN10 = 1

Example 2: Write multiplexed registers (e.g. write PN9 PN10 electronic gear ratio)

01 10 00 09 00 02 04 0005 0004 2207

Station No. Write command Address 9 2 data 4 bytes Data 5 and 4 Check digit

Return: 01 10 0009 0002 91 CA

Return result: two byte parameters 91 and CA have been written, view driver PN9=5, PN10=4

Example 3: Read a single register (e.g. read the current level of servo output, i.e. UN-9 address 0135H)

01 03 01 35 00 01 95 f8

Return: 01 03 02 00 03 F8 45 indicates that the read data is 03 indicates 0.3A

Example 4: Reading current motor position UN-2 UN-3 01 03 01 2E 00 02 A5 FE

Return: 01 03 01 F5B1 0003 D9D9

F5B1=62897 0003=03 so the current position is 0362897

Example 5: Modify PN95=1 with communication to control motor enable

01 06 00 5F 00 01 78 18

Return: 01 06 00 5F 00 01 78 18 (return message is identical)

### 6.5.2 SDV List of servo system communication addresses

Communications project	Communication address	Read/Write Status
Servo Parameter	0-0093H	readable
Input Port Status	0122H-0128H	read-only
Output port status	0129H-012BH	read-only
Monitor menu contents	012DH-0151H	read-only
Motor position information	0191H-0198H	read-only

### 6.5.3 SDV servo drive common communication address

Motor speed (16bit)	012DH
Current motor position (32bit)	012EH
Motor torque (16bit)	0134H
Motor Current (16bit)	0135H
frequency pulse (16bit)	0138H
speed command (16bit)	0139H
Torque command (16bit)	013AH
Motor encoder physical absolute position (32bit)	0191H
User encoder absolute position (32bit)	0193H
Motor encoder physical absolute position (32bit)	0195H
User encoder absolute position multi-turn (16bit)	0197H
User Encoder Absolute Position Singleturn Absolute Position (16bit)	0198H

#### Attention:

- (1) The address of the monitoring menu is mainly read by the host computer through 485 communication to monitor the servo status.
- (2) Monitor menu address: 012DH to 0151H, corresponding to UN-01 to UN-37.
- 3) Read address 0122H to 0125H is used to read the status of input ports I00 to I03 through communication; read address 0129H to 012BH is used to read the status of output ports OUT1 to OUT3 through communication.
- 4) Communication software can be used to communicate with the serial port debugging assistant.

## Chapter VII Alarm and Handling

If the servo malfunctions while in use, the display will show: AL XX, and if there are multiple alarms at the same time, the alarm code will be displayed in a loop.

Please follow the instructions in this section to eliminate the corresponding faults before putting it back into use.

### 7.1 Alarm List

Code	Alarm Name	Reasons for alarm
AL 0	normal	no alarm
AL 1	overspeed	Servo motor speed exceeds the set value
AL 2	Main circuit overvoltage	Main circuit voltage too high
AL 3	Main circuit undervoltage	Main circuit voltage too low
AL 4	positional deviation	Motor deviation exceeding the set value of parameter Pn13
AL 6	Velocity amplifier saturation	Speed regulator saturated for a long time
AL 7	Servo drive prohibited limit	Pressing on the limit switch
AL 8	Position deviation counter overflow	Input command frequency is too high
AL 9	Encoder Abnormal	The encoder has a broken wire or short circuit
AL 11	overcurrent 1	Excessive output current for short time
AL 12	overcurrent 2	Current Sampling Saturation
AL 13	overload	Mechanical jamming or load exceeding 130% or more of rated value
AL 14	abnormal braking	Brake resistor power too low or brake failure

AL 16	Motor thermal overload	Motor overloaded under 100%~120% working condition for a long period of time
AL 20	EPROM error	Servo internal EEPROM read/write abnormality
AL 21	Encoder version read error	In case of 17-bit encoder, set PN135=1
AL 24	FPGA communication anomaly	FPGA communication anomaly
AL 25	Encoder CRC checksum error	Drive and encoder mismatch or interference
AL 36	Abnormal servo power-down signal	Abnormal servo power-down signal
AL 45	ADC error	ADC error
AL 46	Low encoder battery	Encoder battery voltage below 3.1V
AL 47	No voltage from encoder battery	Add Battery
AL 48	Encoder revolution error during operation	Bad encoder or low encoder battery voltage
AL 49	Synchronized overshoot alarm	Position deviation of both axes exceeds PN56 set value

## 7.2 Alarm processing method

alarm code	alarm name	reason	disposal method
AL-1	overspeed	input command pulse frequency is too high	Set input command pulse correct
		input electronic gear ratio is too large	set Pn9 Pn10 parameter correct
		encoder zero point error	ask the factory to reset the encoder zero
		motor U、V、W lead connect wrong	confirm the wiring sequence
AL-2	main circuit overvoltage	input L1 L2 L3 power voltage higher than AC260V	reduce power voltage
		brake circuit capacity is not enough (Usually occur in the occasion that frequently and rapidly start and stop and the load inertia is large)	1.prolong control system acceleration and deceleration time 2.contact manufacturer to increase braking resistance capacity
AL-3	main circuit undervoltage	input L1 L2 L3 power voltage less than AC170V	find out the external reason of low voltage
		Immediate alarm when re-powered.	replace a new servo drive
AL-4	position error	operation, the motor does not turn any angle, immediately alarm	1.confirm UVW wire phase sequence correct or not 2.confirm if the input pulse frequency is too high 3.pulse electronics gear setting it too large, set parameter Pn9 Pn10 correctly
		alarm when rotating ( <b>input pulse abnormal</b> )	confirm input pulse frequency and width
		alarm when rotating ( <b>error detection range is too small</b> )	set parameter Pn13 larger

		alarm when rotating ( <b>position proportion gain is too small</b> )	increase position gain Pn5 set value
		alarm when rotating ( <b>lack of torque</b> )	higher power servo motor
AL-6	speed amplifier saturation	motor mechanically locked	check the load mechanical part
		the load is too large	1.decrease load, 2.change a higher power drive and motor
AL-9	encoder failure	encoder wiring wrong or line break	check or change encoder wire
		caused by interference	Rewiring of electrical wiring
		the encoder cable is too long, lead to the encoder power voltage a little low	Shorten cables or add cable cores
AL-11	Overcurrent at power-on	bad grounding	Proper Grounding;
		Damaged motor insulation or short-circuited motor	Replace motor after measuring insulation with megohmmeter;
		Damaged or short-circuited power cable	Replacement of motor power cable;
		Still alarming after unplugging the power cable and re-powering it on	Replacing the drive;
	Overcurrent during operation	Mismatch of servo matching motor parameters	Recheck the set motor ID number;
		Acceleration and deceleration time too short	Increase the acceleration and deceleration time of the upper computer or increase the value of Pn29 Pn30 to reduce the current shock;
current shock		Reduced parameters Pn43 Pn5;	
AL-12	Over-current 2	motor insulation damaged	replace a new motor
		grounding defective	grounding correctly
		Still alarm after unplugging the power cable and re-powering it on	Replace a new servo drive
AL-13	excess load	Mechanical jamming or load exceeding limits	1.mechanically locked or resistance is large, 2. motor type is not good, change to higher power drive and motor

AL-14	abnormal braking	The alarm is immediate upon re-powering.	Adding an external brake unit;
		Insufficient brake circuit capacity	1, Increase the acceleration/deceleration time constant; 2, replace the servo and motor with higher power;
		Main circuit power supply too high	Check AC input power;
AL-16	Motor thermal overload	Motor overloaded at 100%-120% operating conditions for a long period of time	1, exclude the cause of high mechanical resistance; 2, replace the high-power servo drive;
AL-20	EPROM error	Servo internal EPROM read/write abnormality	Replacement of servo drive;
AL-21	Encoder Error	Encoder version read error	In case of 17-bit encoder, set PN135=1
AL-24	FPGA Error	FPGA communication anomaly	Replacement of servo drive;
AL-25	Encoder CRC checksum error	CRC check error	1, check or replace the encoder connection cable; 2, replace the motor; 3, exclude external interference, optimize the layout of the electrical cabinet, away from the source of interference, encoder wire properly grounded; 4, replace the drive; 5, encoder shell and motor shell and drive metal shell are all connected to the FG end of the machine.
AL-36	power-down abnormality	Abnormal power-down detection	Replacement of servo drive;
AL-45	ADC error	Current detection error	Replacement of servo drive;
AL-46	Low encoder	Encoder battery voltage below 3.1V	Appears when powering on: set Pn87=0 to clear;

	battery	Remind the user to change the battery	Appears during operation: alarm only without shutting down the enable, the alarm clears by itself after replacing the battery and re-powering on.
AL-47	No voltage from encoder battery	Indicates that the battery is dead, at this point the lap data is incorrect when power-on	Run the encoder alarm clearing program; Pn87=1 does not check this alarm.
AL-48	Incorrect number of encoder turns	Bad encoder or low encoder battery voltage	Requires running the encoder alarm clearing program to clear or replace the encoder;
AL-49	Synchronized overshoot alarm	Position deviation of both axes exceeds PN56 set value	1. Check whether the synchronization parameters of the two axes are the same; 2. Increase PN56 or decrease PN67; 3. Increase the value of PN30 appropriately (around 200); 4. Mechanical jamming or too heavy a load.

Note:

AL-47 AL-48 these two alarms with multi-turn absolute encoder may appear, for safety reasons, the above two alarms re-power, can not directly eliminate the alarm. It is necessary to do the following operations:

Clear AL47 method: Pn4=4 Pn95=1 Pn0=789 In F4 interface, press and hold the enter key for 5 seconds, then re-power on. If it is invalid, please replace the motor encoder.

Clear AL48: Pn4=4 Pn95=1 Pn0=788 In F4 screen, press and hold the enter key for 5 seconds, then re-power on. If it is invalid, please replace the motor encoder.

**Special Instructions:**

If the servo drive displays an alarm, but the alarm disappears after re-powering up. It is generally believed that the servo drive outside the components caused by problems or improper parameter adjustment caused, please check the servo peripheral components. Please check the servo peripheral components, such as: power supply voltage, controller, mechanical loads, motors and so on. Detection of peripheral components is not a problem, please consult the manufacturer to adjust the parameters.

If the re-power alarm can not be eliminated, please replace the servo drive and then observe!

**7.3 Frequently Asked Questions or Abnormalities in Use****7.3.1 Strong vibration or screaming of the motor in no-load operation, noisy or misaligned loads**

Processing method: Confirm whether the parameter of servo drive PN1 matches with the connected motor, set the correct parameter according to the table in Appendix B, and then perform the operation of restoring the factory value.

For example: the current motor is 80F-B0130GCL

- (1) By checking the table Appendix A, get the motor ID=82;
- 2) Operate the driver and set PNO to 0 first;
- 3) Set PN1 to the motor ID number, i. e. PN1=82;
- 4) Operate the drive to enter the SN-DEF interface, press and hold the ENTER key on the display panel for two seconds, when the display shows DONE, indicating success;
- 5) Shut down and re-power on the machine.

### 7.3.2 The motor running positioning accuracy deviates greatly from the required accuracy with regularity

Treatment: Set the position pulse electronic gear ratio correctly.

The default of this servo system is 10,000 pulses for one motor revolution. If the upper computer control requirement is 3000 pulses for one motor revolution, then you need to set the gear ratio to meet the requirement. It can be calculated by the following formula:

$$3000 * (PN9 / PN10) = 10000$$

It can be concluded that  $PN9 = 10 PN10 = 3$

### 7.3.3 Driver input and output signal levels are reversed

Set parameters PN53, PN55 to set the input/output to the appropriate high or low effective level to adapt to the input/output level requirements of different controllers.

### 7.3.4 Upper computer sends pulse motor does not run

Please make sure  $PN4=0$ , check the UN-12 monitoring value, if there is a digital display indicates that the drive has received a pulse, it can indicate that there is no problem with the control signal connection line. Please refer to method 1 for troubleshooting. If F 0.0 is displayed, the drive is not receiving pulses.

Please refer to method 2 for troubleshooting. the unit of UN-12 display is KHZ, for example, if F 150 is displayed, it means that the current pulse frequency received by the drive is 150KHZ.。

#### Method 1:

Set the following two parameters:  $PN95=1$ ,  $PN4=3$  to execute the

jog function in the mode of F2. If the motor can rotate, it means that the motor and wires are connected correctly.

Mainly check whether CN1 signal has INH signal or CLE signal has ON. It can be found by observing UN-17.

If the motor cannot rotate do the following checks:

(1) Detect whether the driver has an enabling motor, you can turn the motor shaft by hand, if it does not turn indicates that the motor has an enabling lock. If you can rotate the motor to indicate that there is no enable, please check the I01/I02 input enable signal is not connected correctly. If the enable signal does not need to be controlled by the host computer and I01/I02 input enable signal is not connected, you can set PN95 = 1, drive power on the motor is automatically enabled to lock.

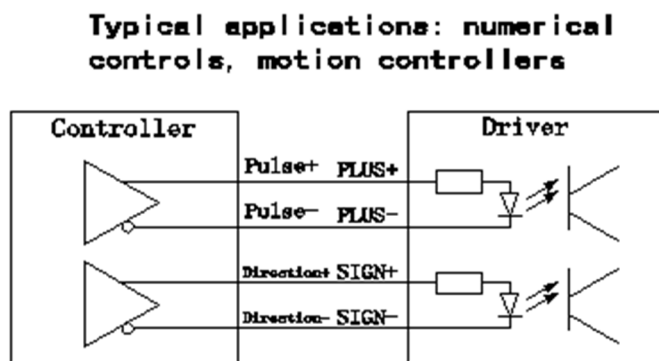
(2) Check whether the power cable between the drive and the motor is connected, and whether the socket plug is loose. The outputs of the drive U1, V1, W1, U2, V2, W2, PE and the U, V, W, PE of motor 1 and motor 2 must correspond exactly and the order must not be changed;

3) Please contact the manufacturer's technician.

## Method 2:

1) Check the pulse amplitude of the input driver, the default is  $5V \pm 0.5V$ , if the pulse amplitude of 12V need to be connected in series with a 1K resistor, if the pulse amplitude of 24V need to be connected in series with a 2K resistor, otherwise it will damage the driver.

2) Confirm that the pulse wiring is correct. Refer to Figure 7-1 for differential wiring and single-ended wiring.



## Typical applications: PLC, Microcontrol

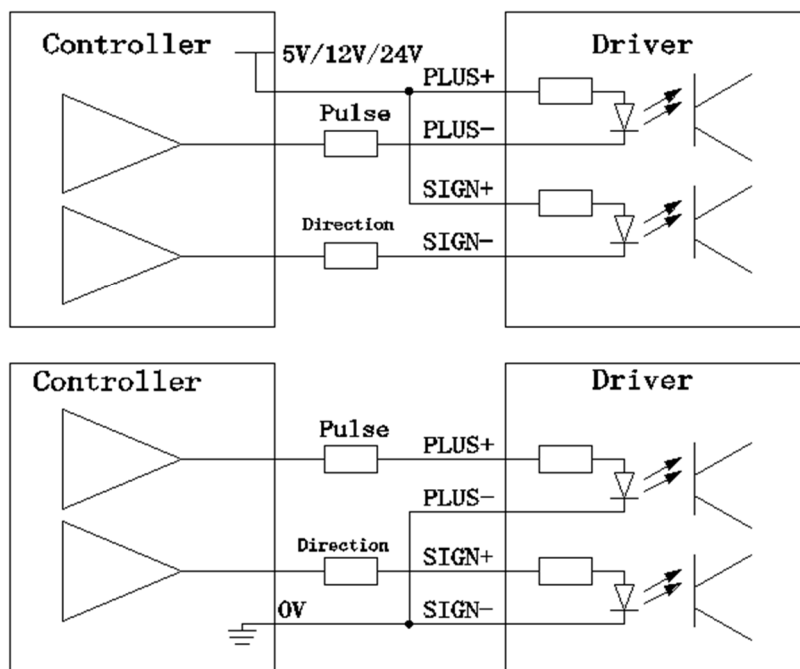


Figure 7-1 Pulse Input Wiring Diagram

### 7.3.5 Motor does not change direction

1) Confirm that the pulse type of the input driver is correct, and set the correct working mode by PN8: PN8=0 for pulse + direction, PN8=1 for CW/CCW, PN8=1 for A/B orthogonal pulse;

2) Observe the display status of UN-12, it should show F xx when the upper computer sends forward signal, and F -xx when it sends reverse signal, if it is F xx or F -xx both times when the upper computer sends forward or reverse signal, please check the direction signal SIGN from the upper computer to the drive;

3) Please contact the manufacturer's technician.

### 7.3.6 When stopping at high speed or moving from top to bottom to do negative work, the drive displays AL-3

1) Modify the upper unit deceleration time;

2) Reduce the motor operating speed;

3) Please contact the manufacturer's technician.

### 7.3.7 No display when power is turned on

1) Confirm the power connection cable and input power;

2) Please contact the manufacturer's technician.

### 7.3.8 Powering on the drive displays "... " or "888888. "

Please contact the manufacturer's technician.

### 7.3.9 Inaccurate motor positioning

1) Without regularity, check the mechanical part of the motor connection;

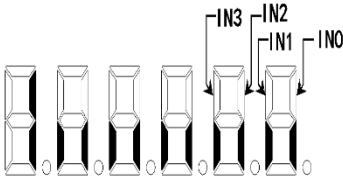
(2) Regular, monitoring UN-02, UN-03, UN-04, UN-05 analysis can be derived;

(3) troubleshooting site interference, take the signal line with shielded wire and grounding, add a magnetic ring. Motor cable to use shielded wire, etc.. Electrical control system rewiring, strong and weak power separate routing. Installation of filters, etc.

### Appendix A: Role of the Servo Monitor Menu in Analysis and Debugging

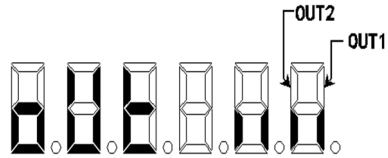
monitoring code	Code Meaning	function
UN-01	Motor speed	Actual motor running speed
UN-02 UN-03	Current motor position	The current position of the motor is expressed in the form of number of pulses. For example, if the control walks a fixed trajectory, the value displayed should be the same every time it repeats the run and walks to the same position, indicating accurate positioning every time.
UN-04 UN-05	Pulse command counting	It is used to monitor whether the pulse from the upper computer is accurate or not. For example, if the control walks a fixed trajectory, the displayed value should be the same when it walks to the same position every time it repeats the operation, indicating that the pulse sent from the upper computer is accurate.
UN-08	Current motor torque	Percentage of the actual running torque of the motor. If this value exceeds 90 for a long period of

		time, it means that the motor selection is small.
UN-12	Input pulse frequency	Used to observe the pulse frequency and stability from the host computer.
UN-17	Input Signal Status	To determine whether the input signal is normal, see Figure 7-2 (IN4-7 is not available)
UN-18	Output signal status	Judge whether the output signal is normal, see Figure 7-3



**Input Terminal Display**

(Stroke lights up to indicate ON, goes out OFF)



**Output Terminal Display**

(Stroke lights up to indicate ON, goes out OFF)

Figure 7-2 Input Port Status Display Schematic

Figure 7-3 Output Port Status Display Schematic

## Appendix B: SDV Series Servo Drive Adaptable Motor Parameter Table

Motor Model	Torque N.M	Speed RPM	Current A	Power KW	Motor ID	Cable
40F-B00330GCL(A)	0.32	3000		0.1	80	
60F-B00630GCL(A)	0.64	3000		0.2	81	
60F-B0130GCL(A)	1.27	3000		0.4	82	
80F-B0230GCL(A)	2.39	3000		0.75	83	
80F-B0330GCL(A)	3.18	3000		1.0	84	
40F-B00330WML	0.32	3000		0.1	180	
60F-B00630WML	0.64	3000		0.2	181	
60F-B0130WML	1.27	3000		0.4	182	
80F-B0230WML	2.39	3000		0.75	183	
80F-B0330WML	3.18	3000		1.0	184	
110F-D0630WCL(A)	5.40	3000		1.8	14	
130F-D0520WCL(A)	4.78	2000		1.0	16	
130F-D0820WCL(A)	7.16	2000		1.5	18	
130F-D1020WCL(A)	9.55	2000		2.0	21	
130F-D0515WCL(A)	5.39	1500		0.85	25	
130F-D0815WCL(A)	8.34	1500		1.3	26	
130F-D1115WCL(A)	11.5	1500		1.8	27	
110F-D0630WML	5.40	3000		1.8	114	
130F-D0520WML	4.78	2000		1.0	116	
130F-D0820WML	7.16	2000		1.5	118	
130F-D1020WML	9.55	2000		2.0	121	
130F-D0515WML	5.39	1500		0.85	125	
130F-D0815WML	8.34	1500		1.3	126	
130F-D1115WML	11.5	1500		1.8	127	

Motor Model	Torque N.M	Speed RPM	Current A	Power KW	Motor ID	Cable
60SM-M00630NEL	0.64	3000		0.2	41	
60SM-M0130NEL	1.27	3000		0.4	42	
60SM-M0230NEL	1.91	3000		0.6	43	
80SM-M0230NEL	2.39	3000		0.75	44	
80SM-M0425NEL	2.39	3000		0.75	45	
110SM-M0430NEL	4.0	3000		1.2	46	
110SM-M0530NEL	5.0	3000		1.5	50	
110SM-M0630NEL	6.0	3000		1.8	51	
130SM-M0425NEL	4.0	2500		1.0	53	
130SM-M0525NEL	5.0	2500		1.3	54	
130SM-M0625NEL	6.0	2500		1.5	55	
130SM-M0825NEL	7.7	2500		2.0	56	

**Description:**

- 1. The motor ID is determined by the number of pole pairs, torque and speed of the motor, and the suffix of the motor model (e.g. GCL, GBL, GDL, GEL and WCL, WBL, WDL, WEL) does not change the motor ID;**
- 2. Servo drive selection rules: the total power of two axes is less than 2KW use SDV102NK5, the total power of two axes is 2KW-4KW use SDV202NK5, the total power of two axes is not allowed to exceed 4KW;**
- 3. It is allowed to use different types of motors for the two axes, and it is necessary to set the corresponding motor ID separately, otherwise vibration, screaming, and inaccurate positioning may occur.**
- 4. Refer to section 7.3.1 for the motor ID setting method.**

---

## **Appendix C: Product after-sales service description**

This product will have a long service life if used in the correct way. If the product is used improperly or in an environment that is more hostile than permitted. The product will malfunction. The standard warranty period for this product is 18 months. Repair will be charged due to improper use or malfunction beyond 18 months. Please note the following about the repair service:

- (1) The product label is an important proof for maintenance, please do not tear or damage it at will. Otherwise, the warranty will not be honored;
- (2) The warranty period of 12 months from the date of purchase, can not provide proof of purchase, according to the product label on the date of shipment of the factory within 12 months;
- (3) The need for maintenance services can be offices or dealers to contact;
- (4) product repair and transportation process, please packaged to prevent secondary damage.

### **The following cases are not covered by the warranty:**

- \*Damage caused by wrong use, such as connecting to the wrong power supply, disassembling and remodeling by yourself, water and oil ingress, and other human factors;
- \*Damage caused by natural disasters, such as lightning, earthquakes and so on.

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