NT102 Independent capacitance height controller user manual

Contents

Chapter I Product Introduction

1.1 Synopsis

The NT102 independent capacitance height controller (hereinafter referred to as NT102) adopts a closed-loop control method for controlling the capacitance laser cutting head, which is a high-performance capacitance height control device. Except for controllers similar to other products, in addition to formula, NT102 also provides a unique Ethernet communication (TCP/IP protocol) interface, which can easily realize height automatic tracking, segmentation perforation, gradual perforation, edge cutting, frog jump lifting, cutting head height arbitrary setting through the network. Its response speed is also greatly improved.In terms of servo control, because NT102 adopts the speed position double closed-loop algorithm, the operation speed and accuracy are significantly better than similar products at home and abroad.

1.2 Performance specification

The sampling rate was 1,000 times per second.

Static measurement accuracy was 0.001 mm.

Dynamic response accuracy was 0.05 mm.

Height-dependent control range of 0-25 mm.

The following speed limit depends on the servo motor speed limit and the lead screw guide.10 mm lead screw and 6000

turn / m servo up to follow speed of 1000 mm / s.

When the signal transmission cable reaches 100 m, the signal is not attenuated and has strong interference resistance.

It supports network communication and online network upgrades.

It can fit with any cutting head and nozzle with capacitance parameters.

It supports the touch plate alarm, follow beyond the edge alarm.

It supports for edge detection and automatic edge-seeking.

One-button calibration process, fast, simple and convenient operation.

It supports frog jump type lift, section perforation, lift height arbitrary setting.

It supports the oscilloscope function to detect the capacitance and height change in real time.

It supports the jitter suppression function, which can effectively inhibit the jitter caused by blowing and scum.

The performance parameter tables are as follows：

Performance parameter	NT102

Max speed	999mm/s
Max acceleration	2G
Capacitor mutation inhibition	10%
Minimum mechanical rigidity requirements	2Hz
DA resolution ratio	16 位
DA null shift	3mV
DA response time	0.01ms
Positioning accuracy	0.001mm

Chapter II Operation Instructions

2.1 Level diagram of the system functions
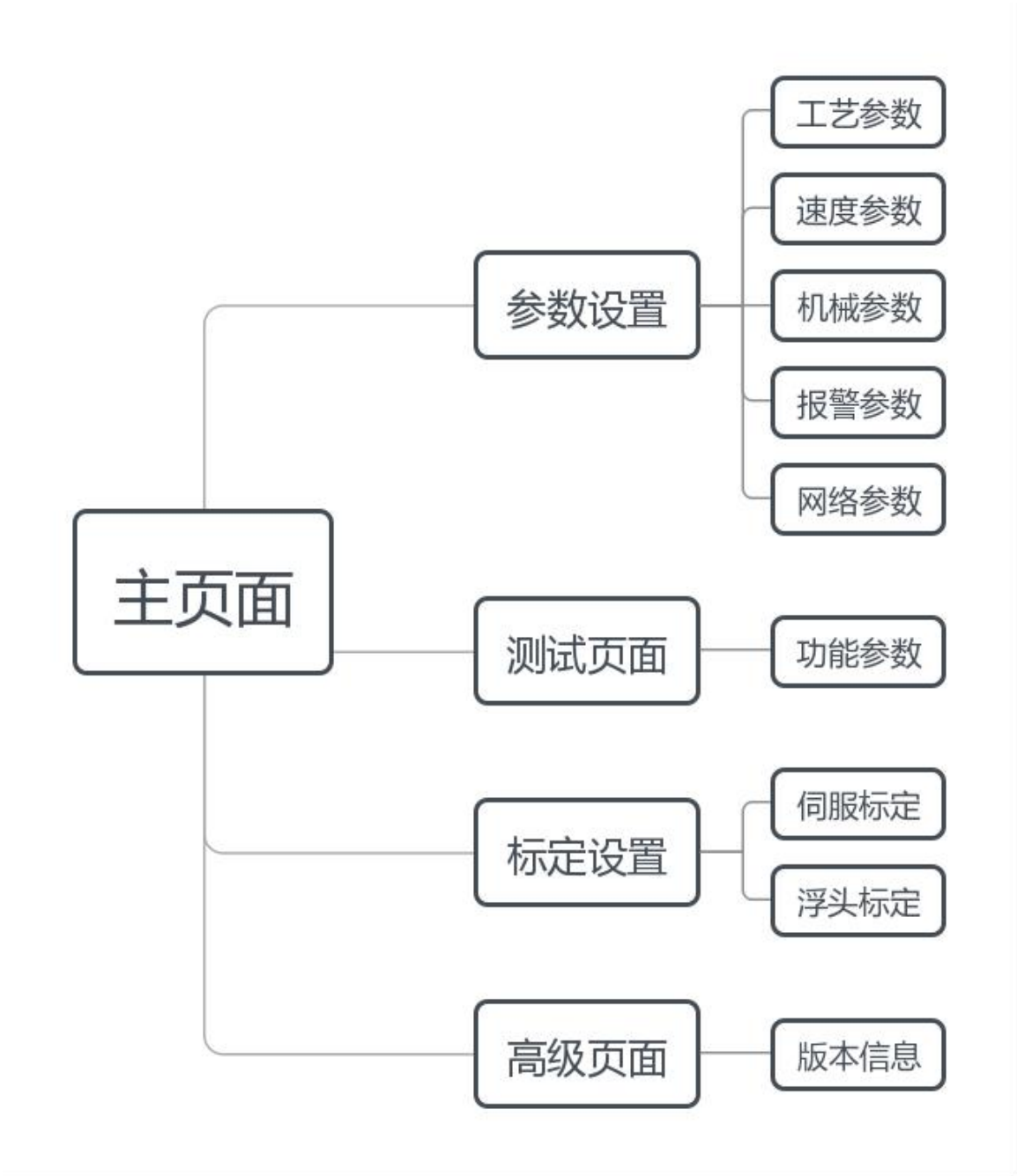
2.2 Lock screen page

After the electrical initialization on the system, enter the lock screen page automatically. As shown in Fig：

Long press the fingerprint icon to unlock and enter the main page. The child lock screen time is 3 seconds, the settings can be changed on the alarm parameter page

2.3 Home page

Features on the home page include：

2.3.1 Displays function

Current status: Displays the motion state of the current attendant system. The

following movement states are available:

A.Stop: The Z-axis is stationary.

B.In the slow stop: After receiving a stop command in the motion state, there is a short stop transition state. The state becomes "stops" after stopping completely.

C.Empty movement: upper lifting in processing is the empty movement movement of Z-axis.

D.Follow: During perforation and cutting, the floating head is in the state of following the cut plate.

E.In the reset: back to the Z-axis mechanical origin.

F.In the dot motion: the Z-axis dot motion manually.

G.Stop back: Close following and lift up to the stop position.

Response level: The follow-up gain level ranges from 1 to 30, and the default level

is 17. The higher level, the smaller the average follow-up error, the faster the follow-up action, and the stronger the climbing ability when encountering slopes. But if the gain level is too high, the system will have self-oscillation. Press "Follow Fast" and "Follow Slow" on the main page, and adjust with level 1 step.

Follow-up height: Press "Follow Fast" and "Follow Slow" on the main page, and

adjust with level 1 step.

Actual following height. Press "Follow on" and "Follow off" to control whether to follow or not. After following close, the axis will automatically lift to the docking coordinates (enter the process parameter interface, you can also modify the docking coordinates)

In addition, in the Ethernet control mode, the following height can be set through commands.

Current height: In the capacitance measurement range (calibration range), the

distance between the floating head and the plate. When the measurement range is exceeded, the maximum calibration height is displayed.

Z-axis position: After returning to the origin, the Z-axis establishes a mechanical

coordinate system.Down motion coordinates increase.

Capacity value: The principle of system sampling is to obtain the distance by

measuring the capacitance between the floating head and the polar plates.

The closer the floating head is to the plate, the greater the capacitance value.When the floating head touches the plate, the capacitance changes to 0.

One-key calibration: Directly enter the floating head calibration function.

2.3.2 Key instructions

Follow-on: Manually start follow-up, the follow-up height is the set follow-up display height, after pressing the button, it will change to "follow-up off" .

Follow-off： Manually close follow. When closing follow, the cutting head will automatically rise to the docking height. After pressing, the button will change to "follow on".

Low speed: Switch jog speed to set low jog speed.

High speed: Switch jog speed to set high jog speed.

Follow fast: Used to increase the real-time adjustment of the following motion setting grade.

Follow slow: Used to reduce the real-time adjustment of the following motion setting grade.

Follow high: Used to adjust the follow height in real time, adding 0.1mm steps each time.

Follow low: Used to adjust the follow height in real time, reducing 0.1mm steps each time.

Back to origin: Immediately move back to the origin and correct the mechanical coordinates.

Stop：Stop all motion immediately.

↑：Jog upward

↓：Jog downward

2.4 Calibration Interface

Press the calibration settings on the main page and enter the calibration interface.

2.4.1 Servo Calibration

The servo calibration aims to eliminate the zero drift of the servo motor.Since the motor will oscillate back and forth in a small amplitude during servo calibration, **it is necessary to jog to the middle of the stroke to prevent it from exceeding the stroke range when oscillating.** Then press Start Calibration. As shown in Fig:

After the calibration is completed, the zero-drift voltage value will pop up. If the servo zero-drift value is wrong, you can press Cancel to return to the upper page.

User can also press the OK key to set the zero drift value, and a confirmation interface for clearing zero drift will pop up.

2.4.2 Floating head calibration

The purpose of floating head calibration is to measure the correspondence between the capacitance and position of the floating head and the plate. Before the floating

head is calibrated, press "back to origin" to correct the mechanical coordinates. Press Float Calibration to enter the Float Calibration interface. As shown in Fig:

First select the calibration range and press to start calibration. The system starts to calibrate, as shown in the figure: (Please ground the plate. Failure to ground may cause the cutting head to press the plate and cause the calibration to fail) .

After calibration completion, the calibration completion interface will popup:

If the calibration fails, the calibration failure interface will popup:

After the floating head calibration fails, please confirm whether the workpiece is grounded, touch the nozzle to check whether the capacitance value is normal before the calibration again.

2.5 Parameter interface

Press the parameter setting on the main page, and enter the password: 666666, and then enter the parameter setting page.

2.5.1 Process parameters

This page is mainly for setting the three-level perforation parameters. The parameters will take effect after selecting "three-level perforation" in the "follow mode". Note: The parameters here are effective with the selected follow mode. When the follow mode is "Direct", the perforation height and perforation delay parameters are invalid. The perforation height parameter setting must comply with: Level 1<Level 2<Level 3, otherwise it cannot be saved and prompted, as shown in fig:

parameter	meaning
Perforation height	Set the separation distance between the floating head and the plate during the piercing movement
Z-axis stroke	Set the stroke of the Z axis. When the software limit is turned on, if the stroke is exceeded during operation, it will stop immediately, and an alarm "Z-axis stroke exceeded" will be generated.
Perforation delay	Time of delay during perforation
Progressive speed	Set the speed of perforation height gradually follow the cutting height
Automatically lift	Automatically lift up after canceling follow, it is enabled by default
Limit waiting	During the following process, it won't lift up after hitting the limit
Follow mode	Direct: follow directly to the following distance, three-level perforation: perforation height-delay-follow to follow distance, asymptotic: perforate to follow distance

2.5.2 Speed parameter

Press Speed parameters to enter this page:

Parameter	meaning
Moving speed	The speed at which the floating head moves downward and upward. It is recommended to set the servo motor to run near the rated speed to achieve the purpose of improving efficiency and ensure the smooth operation of the system.
Moving acceleration	Set the acceleration of the floating head following and moving movement.

Follow limit	The maximum following speed of floating head. The value is influenced by the empty shift acceleration and the type of nozzle, and increases with the void shift acceleration. The higher the capacitance sensitivity of the nozzle, the greater the speed it follows. It is also related to the rigidity of the Z-axis.
Docking coordinate	Set the target position for the floating head lift after the complete procedure.
Low jog speed	Set the speed of the slow jog motion.
High jog speed	Set the speed of the fast jog motion.
Reset speed	Set the speed of motion back to the origin.
Return distance	Set the distance returned after touching the origin switch.
Back coordinate	Go back to the target position after restoration
Reset docking	After setting reset (return to origin), whether to return to the set docking position
Soft limit protection	Protect the limit on the software
Power-on reset	Set whether to automatically reset (back to origin) after power-on, this function should be set to open after parameter debugging is completed

2.5.3 Mechanical parameters

Press Mechanical parameters to enter this page:

Parameter	meaning
Screw pitch	Set the stroke per revolution of the used transmission mechanism, such as a screw rod, it is the screw pitch (lead). Theoretically, the larger the lead of the screw used, the faster the running speed of the Z axis. It is recommended to use a ball screw with a lead of 5~10 mm.
Upper speed limit	Set the upper limit of the allowable speed of the servo motor, according to the characteristics of the motor and load. Generally no more than 4500 rpm.
Speed gain	Set the actual speed corresponding to each volt. Need to be consistent with the parameters set in the driver, the recommended value is 500 revolutions per minute per volt.
Pulse per revolution	Set the number of pulses feedback from the encoder per revolution of the servo motor. Need to be consistent with the parameters in the drive.
Servo direction	Set the rotation direction of the servo, the default is off.
Encoder direction	Set the direction of encoder pulse feedback, the default is closed.
Limit logic	After setting reset, whether to return to the set parking position. Set the logic of the limit input port (IN5~6) (open: normally open/close: normally closed).
Input logic	Set the logic of general input ports (IN1~4) (open: normally open/close: normally closed).
IO mode	Using network mode, please turn off IO control mode.

2.5.4 Alarm parameters

Press Alarm parameters to enter this page:

Parameter	meaning
Vibration suppression time	This parameter is the strength of the vibration suppression function. The larger the value, the more obvious the effect of the vibration suppression function, but it will reduce the response of the height controller. The default value is 20ms, and the recommended range is 5~50ms.
Touching delay time	In the cutting process, if the duration of touching the plate (capacitance is 0) reaches this time, the floating head will automatically lift up for protection and output an alarm signal. When this value is set to 0, the plate-touching alarm will no longer be triggered during the cutting process.
Idle-moving touch plate delay time	In the system stop state, if the duration of touching the plate reaches this time, the floating head will automatically lift up for protection and output an alarm signal. When this value is set to 0, the touch plate alarm will no longer be triggered in the stopped state.
Following error alarm	Maximum following error allowed by NT102. After the cutting head is in place, if the following error exceeds the set alarm value due to movement beyond the boundary of the sheet or violent vibration of the sheet, the controller will generate an excessive following error alarm.
Following error delay	Set the filter time of the following error alarm. The larger the value, the longer the tracking error is allowed to occur, and the stronger the ability to filter out interference.
Body capacitance decrease	Set the capacitance reduction threshold that generates the "Body Capacitance Decrease Alarm". When real-time calibration is turned on, the threshold value will be added to the subsequent capacitance compensation value, which can reduce the trigger

	frequency of the alarm.
Limit alarm enable	When it is set to on, the upper and lower limit alarm function is turned on. When the upper/lower limit is encountered during following, it will automatically lift up and give an alarm number. When set to off, the function is off.
Lock time	Set the lock screen time, turn off the lock screen function when it is 0.

2.5.5 Network parameters

Press Network parameters to enter this page: (This page only displays the IP address, and the IP cannot be set temporarily).

When connecting to the network, it is recommended to connect the PC and NT102 through a crossover cable. The IP address of the PC must be set in the same network segment as NT102 (192.168.1.xxx, cannot be repeated with NT102). The gateway also needs to be set in this network segment, and the last number is 1, such as 192.168.1.1.

2.6 Test page

Press Test Page on the main page to enter, and to return, press the return button in the upper left corner to return to the main page.

In this interface, user can test whether the keys are in the correct state of the input and output ports. Installed for the first time, confirm that the input signals are all off. As shown in the figure above, if they are not off, enter "mechanical parameters" and perform "normally open/normally closed" operations on "limit logic" and "input logic".

2.7 Advanced page

On the main page, press Advanced page to enter. The left side of the page displays the current system version number, HMI screen version number and restart function, and the right side is the factory reset function. This function should be used with caution and requires a password.

Chapter 3 Wiring Instructions

3.1 Installation size

3.1.1 Preamplifier

The appearance and size of the preamplifier:

放大器外观图
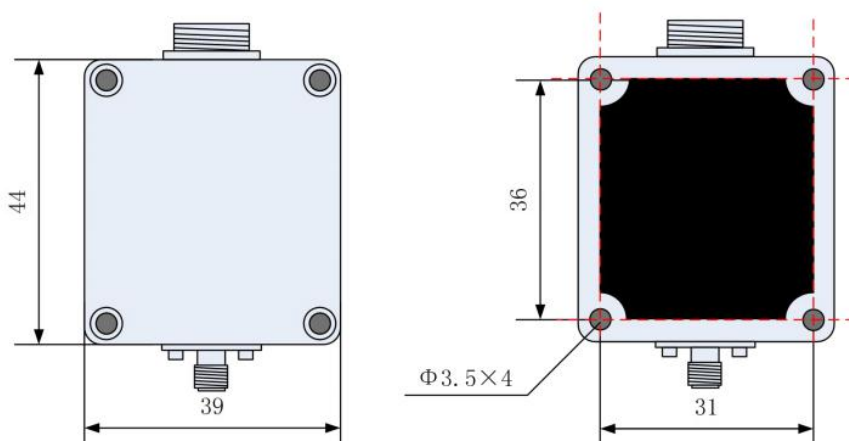
放大器安装图

3.1.2 Main controller
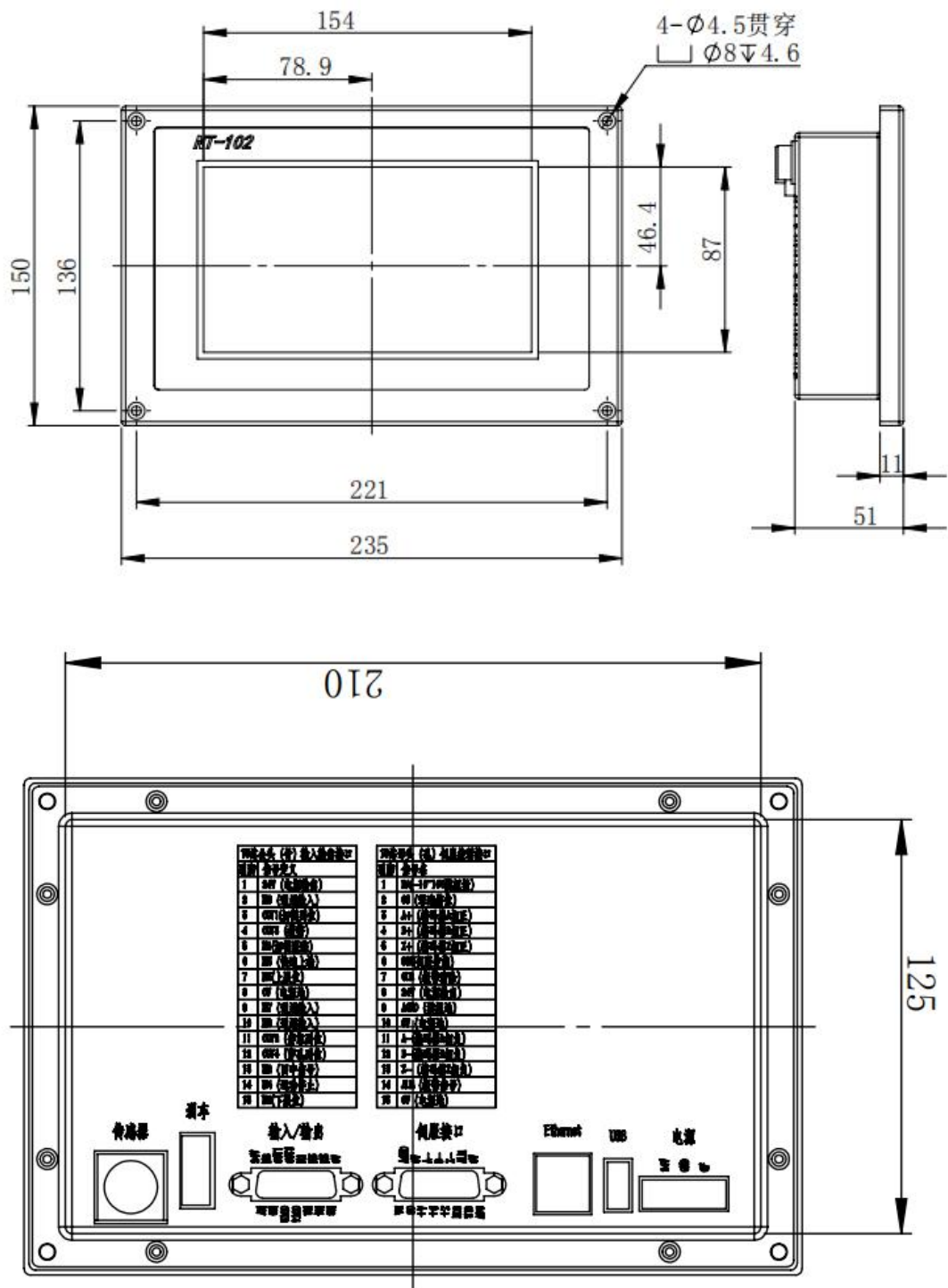
3.2 Interface instruction

3.2.1 Power interface description
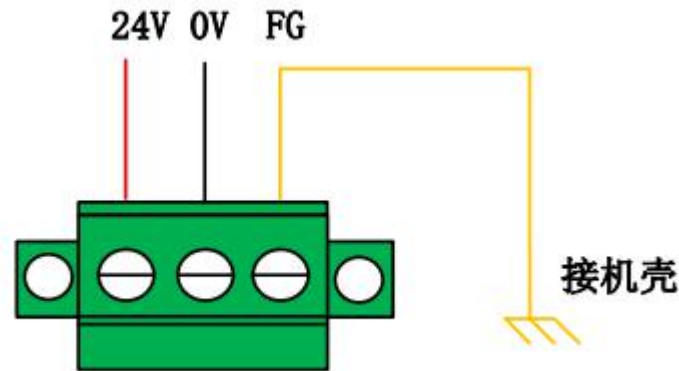
The casing of the machine is the negative electrode of the measured capacitance. In order to ensure the stable operation of the measuring circuit, the "FG pin" of the power interface must be reliably connected to the casing of the machine (that is, the casing of the machine is well connected), and the casing of the preamplifier must also be connected to the casing of the machine in good conduction. The specific index is that the DC impedance is always less than 10 ohms, otherwise the actual following effect may be poor.

3.2.2 Servo drive interface description and parameter setting
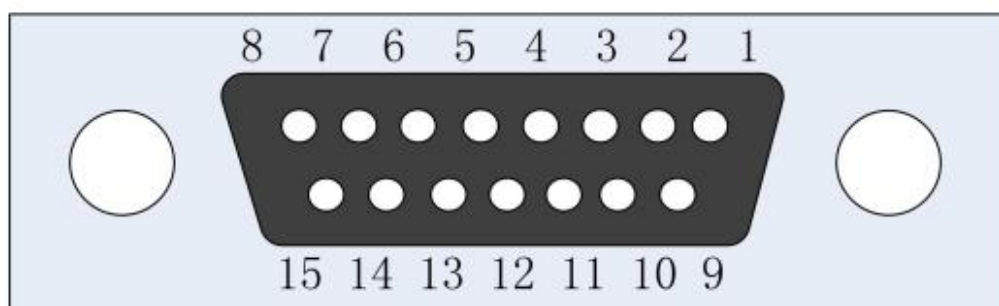
15 core female (hole) servo control interface			
Pin	**Signal**	**Pin**	**Signal**
1	DA（-10~10V analog）	9	AGND（analog ground）
2	0S（Zero speed clamp）	10	0V（power ground）
3	A+（encoder A phase+）	11	A-（encoder A phase-）
4	B+（encoder B phase+）	12	B-（encoder B phase-）
5	Z+（encoder Z phase+）	13	Z-（encoder Z phase-）
6	SON（servo enable）	14	ALM（alarm signal）
7	CLR（alarm clear）	15	0V（power ground）
8	24V（power output）		

+24V、0V：Provide the 24VDC power supply for the servo drive.

DA、AGND：Analog signal, to provide speed signal for the drive.

0S：Zero-speed clamp, used to suppress the zero-drift of the servo

SON：Output the servo-drive enabling signal.

ALM：Receive the servo drive alarm signal.

A+、A-、B+、B-、Z+、Z-：Encoder three-phase, input signal.

Note the following matters when connecting to the drive

（1）Please make sure that the servo drive supports speed mode. For example, for Panasonic A5 series servo must choose full-function type, pulse type cannot be used.

（2）The input and output ports of NT102 are low-level effective, and the selected servo should also be low-level effective.

（3）Confirm whether the servo motor used is equipped with a brake. If it is equipped with a brake, please wire it strictly in accordance with the wiring method in the servo manual and set the parameters related to the brake.

（4）Connect the shielding layer of the control signal line to the servo drive housing, and ensure that the servo drive is well grounded.

Panasonic servo wiring diagram

NT102 servo interface

Panasonic Servo MINAS-A Driver 50P interface

信号名	引脚		引脚	信号名
DA	1	屏蔽线	14	SPR/TRQR
AGND	9		15	GND
A+	3		21	OA+
A-	11		22	OA-
B+	4		48	OB+
B-	12		49	OB-
Z+	5		23	OZ+
Z-	13		24	OZ-
24V	8		7	COM+
0S	2		26	ZEROSPD
SON	6		29	SRV-ON
CLR	7		31	A-CLR
0V	10		36	ALM-
ALM	14		37	ALM+
0V	15		41	COM-
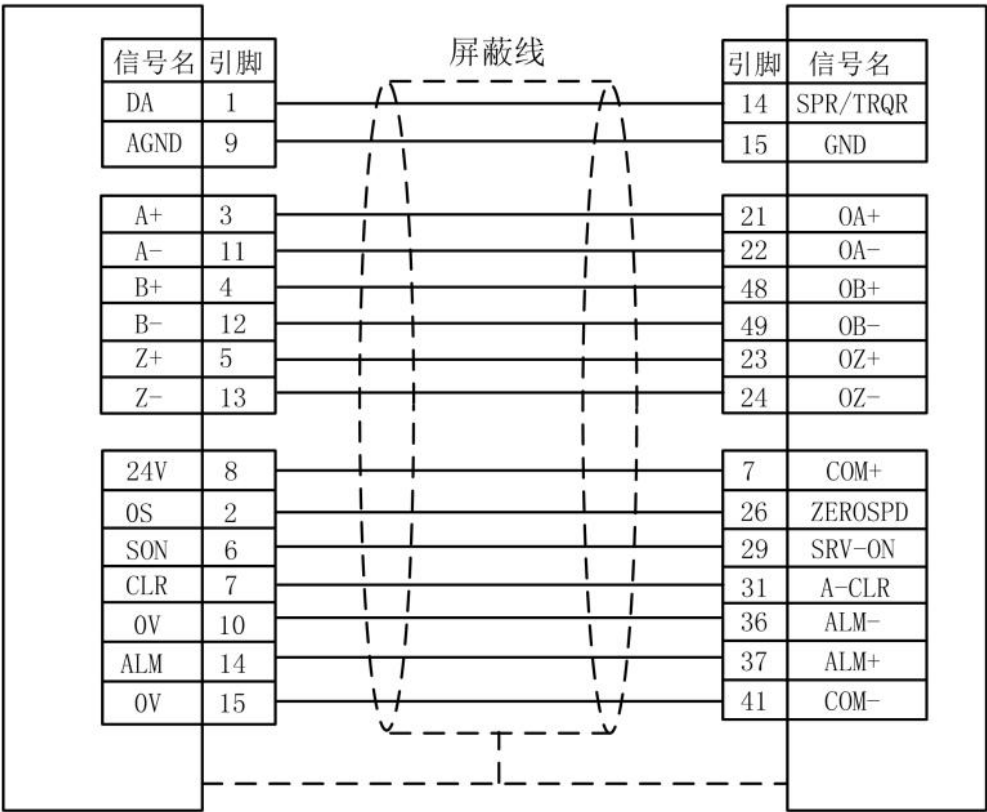
Panasonic A5 series servo parameter setting

parameter	value	meaning
Pr001	1	Control mode, it must be set speed mode
Pr002	3	Real-time automatic adjustment, the recommended setting is vertical axis mode
Pr003	17	Servo rigidity, recommended range is 14~20 grade
Pr302	500	Input speed command gain
Pr315	1	Open zero clamp function
Pr504	1	Set the servo to prohibit input (POT, NOT) action

Panasonic A4 series servo parameter setting

parameter	value	meaning
Pr02	1	Control mode, it must be set speed mode
Pr21	4	Real-time automatic adjustment, the recommended setting is vertical axis mode
Pr22	7	Servo rigidity, recommended range is 5~10 grade
Pr50	500	Input speed command gain

Pr06	1	Open zero clamp function
Pr04	1	Set stroke limit prohibition input is invalid

YASKAWA servo wiring diagram

NT102 servo interface

YASKAWA Σ series
servo 50P interface

信号名	引脚		引脚	信号名
DA	1	屏蔽线	5	V-REF
AGND	9		6	SG
A+	3		33	PAO
A-	11		34	/PAO
B+	4		35	PBO
B-	12		36	/PBO
Z+	5		19	PCO
Z-	13		20	/PCO
24V	8		47	+24 VIN
0S	2		41	/P-CON
SON	6		40	/S-ON
CLR	7		44	/ALM-RST
0V	10		32	ALM-
ALM	14		31	ALM+
0V	15		1	SG
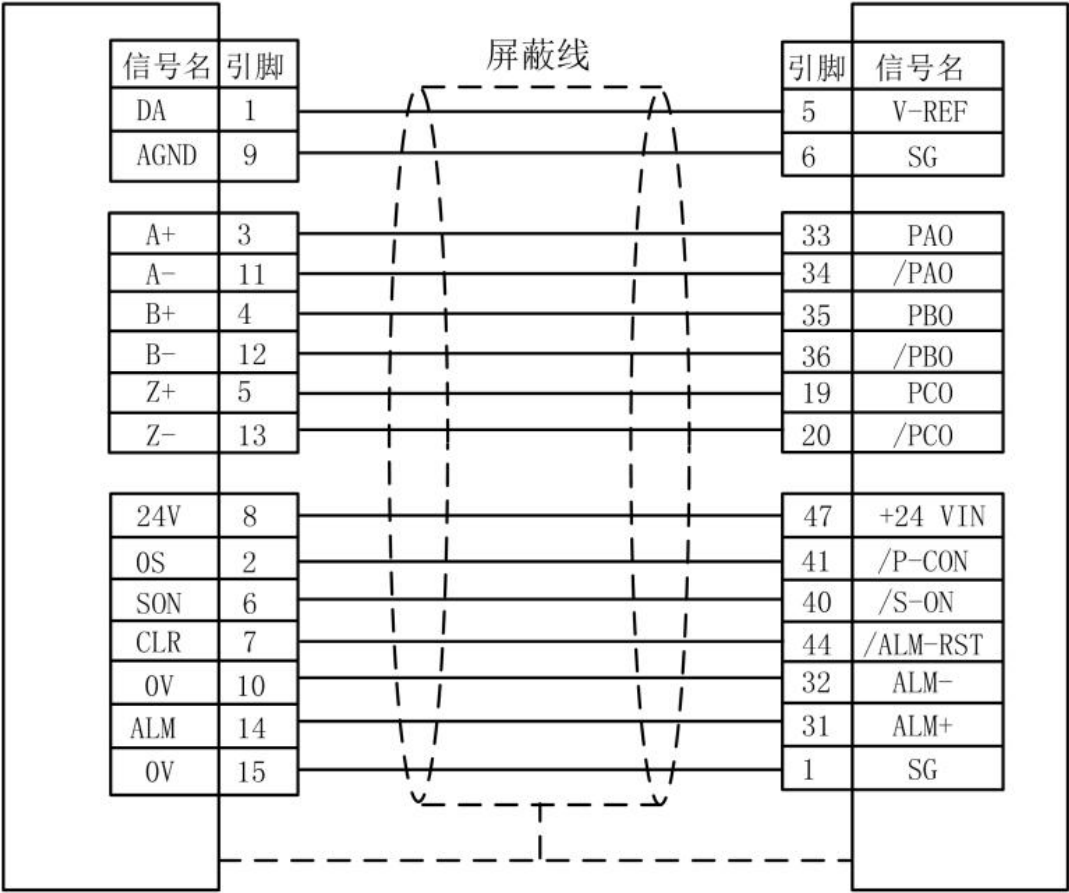
Yaskawa Σ-V series servo parameter setting

Parameter No.	Recommended value	Description
Pn000	00A0	Speed control with zero-position fixation function.
Pn00B	-	Set to 0100 when using single-phase power.
Pn212	2500	Number of pulses output by the encoder per revolution. The pulse parameter of corresponding CHC-1000 per revolution is 10,000.
Pn300	6.00	The speed gain of corresponding height controller is 500 r/v/min.
Pn501	10000	Zero fixed value.
Pn50A	8100	Forward rotation is enabled.
Pn50B	6548	Reverse rotation is enabled.

Delta servo wiring diagram

NT102 servo interface

Delta ASD-A servo
50P interface

信号名	引脚		引脚	信号名
DA	1	屏蔽线	42	V-REF
AGND	9		44	GND
A+	3		21	OA
A-	11		22	/OA
B+	4		25	OB
B-	12		23	/OB
Z+	5		50	OZ
Z-	13		24	/OZ
24V	8		11	COM+
OS	2		10	DI2
SON	6		9	DI1 SON
CLR	7		33	DI5 ARST
0V	10		45	COM-
ALM	14		28	DO5+ ALRM
0V	15		27	DO5-
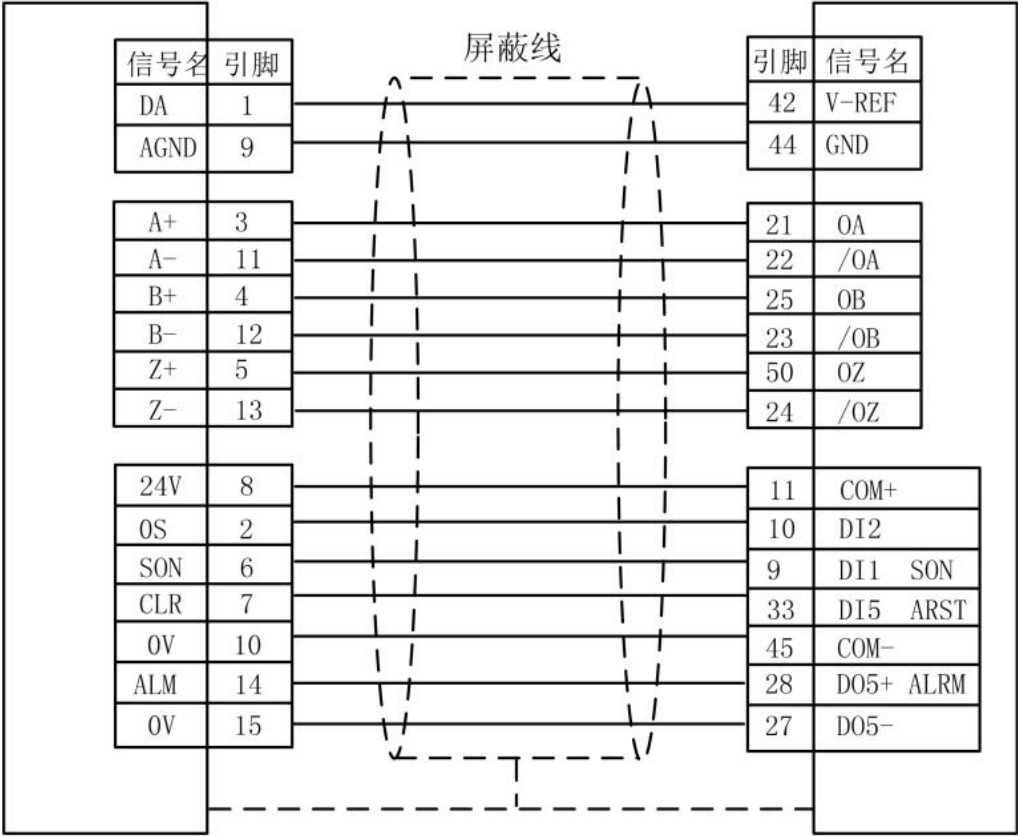
Delta ASD-A series:

Parameter No.	Recommended value	Description
P1-01	0002	Control mode: It must be set to speed control mode.
P1-38	2000	Set zero speed clamp value to the maximum.
P1-40	5000	The speed gain of corresponding height controller is 500 r/v/min.
P2-10	101	Set DI1 to SON, normally opened.
P2-11	105	Set DI2 to CLAMP, normally opened.
P2-12	114	Set speed command to external analog control.
P2-13	115	Set speed command to external analog control.
P2-14	102	Set DI5 to ARST, normally opened.
P2-22	007	Set DO5 to ALRM, normal close.

NT102 独立式电容调高器用户手册

TECO servo wiring diagram

NT102 servo interface

TECO JSDEP servo control signal port

信号名	引脚			引脚	信号名
			屏蔽线		
DA	1			12	SIC
AGND	9			13	AG
A+	3			21	PA
A−	11			9	/PA
B+	4			22	PB
B−	12			10	/PB
Z+	5			23	PZ
Z−	13			13	/PZ
24V	8			17	DICOM
0S	2			15	DI−4
SON	6			9	DI−1
CLR	7				
0V	10			24	IG
ALM	14			19	DO−2
0V	15				
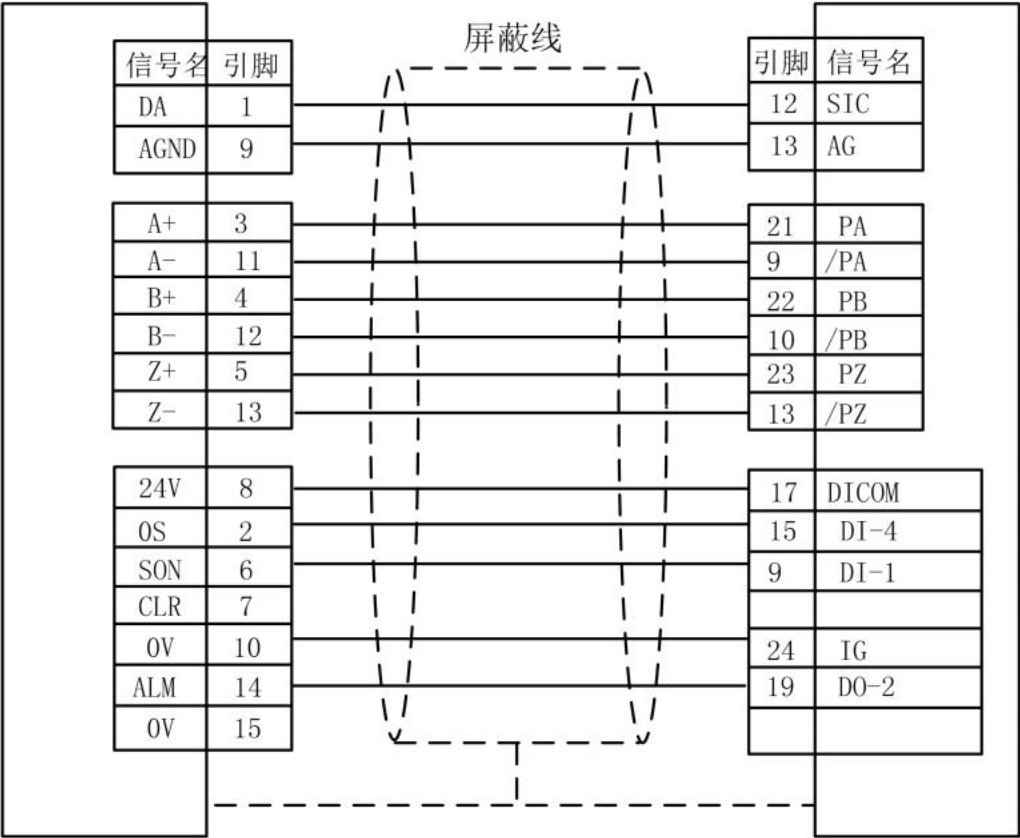
Teco JSDEP servo parameter setting

Parameter No.	Recommended value	Description
Cn001	1	Control mode: It must be set to speed control mode.
Cn002.2	1	Automatic gain. (Note: It is the parameter of the second figure of Cn002)
Cn005	2500	Number of pulses output by the encoder per revolution. The number of pulses of corresponding CHC-1000 per revolution is 10,000
Cn026	4	Rigidity. Level 4 is the default.
Sn216	4000	Speed gain. The speed gain of corresponding CHC-1000 is 400.

Mitsubishi Servo MR-J30A wiring diagram

NT102 servo interface

Mitsubishi J3 servo interface
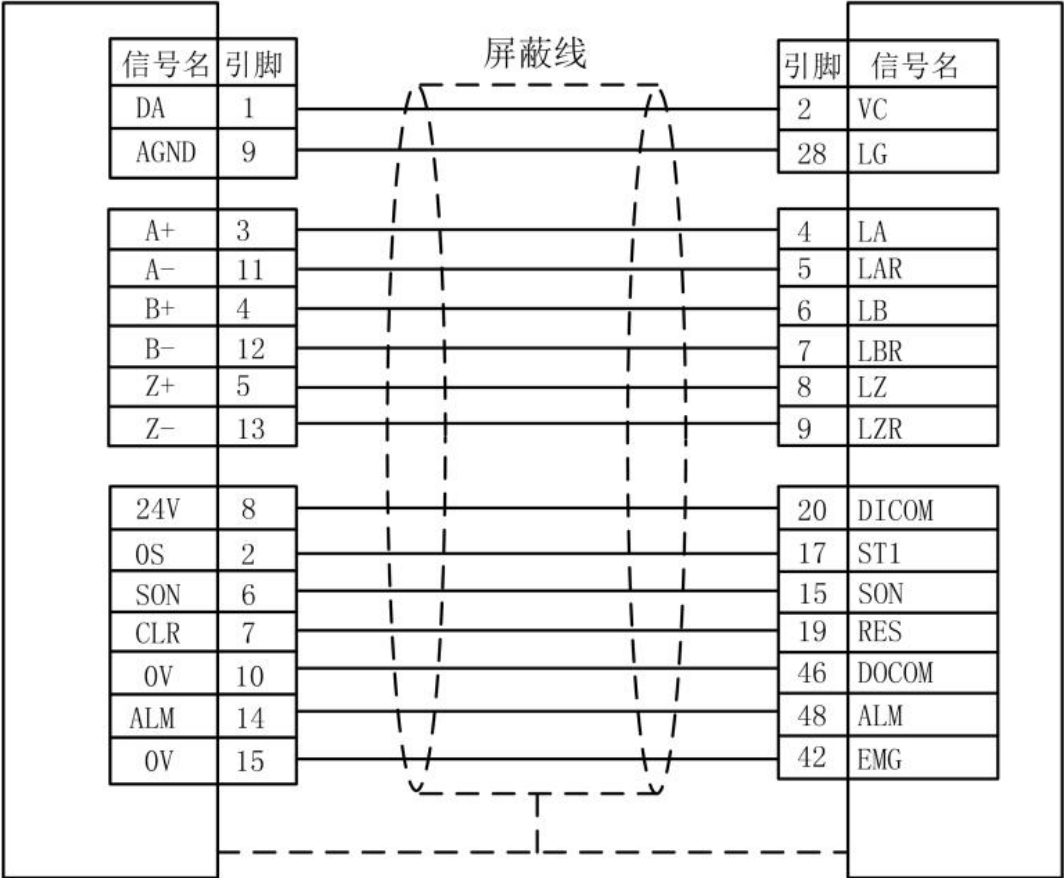
MR-J30A other pin

pin	connection
ST2	None
SP1	None
SP2	None
SP3	None
EMG	DOCOM

Parameter

Parameter	value	Description
PA01	2	Control mode: Must be speed control mode
PA15	10000	Number of pulse output by the encoder per resolution.The number of pulses of corresponding NT101 per resolution is 10,000.
PC12	5000	Speed gain. The speed gain of corresponding NT101 is 500 r/v/min.
PC17	0	Not using 0 speed function (0 zero speed clamp function through ST1 port)

Schneider Servo Lexium 23D wiring diagram

NT102 servo interface

Schneider Servo drive interface

信号名	引脚	屏蔽线	引脚	信号名
DA	1		42	V-REF
AGND	9		44	GND
A+	3		21	OA
A−	11		22	/OA
B+	4		25	OB
B−	12		23	/OB
Z+	5		50	OC
Z−	13		24	/OC
24V	8		11	COM+
0S	2		34	DI3
SON	6		9	SON
CLR	7		33	ARST
0V	10		45	COM−
ALM	14		28	DO5+
0V	15		27	DO5−
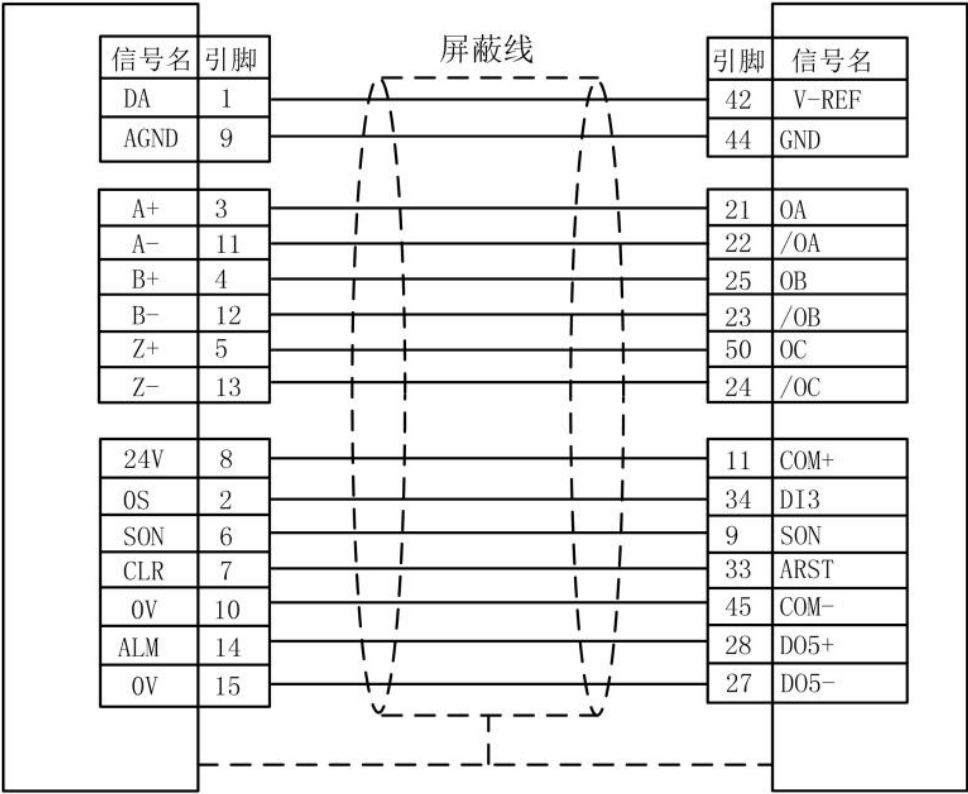
Schneider Lexium 23D servo setting

Parameter	value	Description
P2-10	101	Servo IN1 function: SON
P2-11	0	Servo IN2 function: Not used
P2-12	5	Servo IN2 function: 0 speed 0S signal
P2-13 to P2-17	0	Not use IN4 to IN8
P1-38	2000	It's 200.0RPM, the zero compare value
P1-01	2	Must be speed control mode
P1-40	5000	Speed gain. The speed gain correspond NT102 is 500 r/v/min
P1-46	2500	Number of pulse output by the encoder per resolution. The number of pulse of corresponding NT102 per resolution is 10,000.
P2-68	1	SON is valid, that is, the motor is enabled, and there is no need to resend the SON signal

Fuji Servo ALPHA 5 series wiring diagram

NT102 servo interface

Fuji Servo A5 Series drive 26P interface
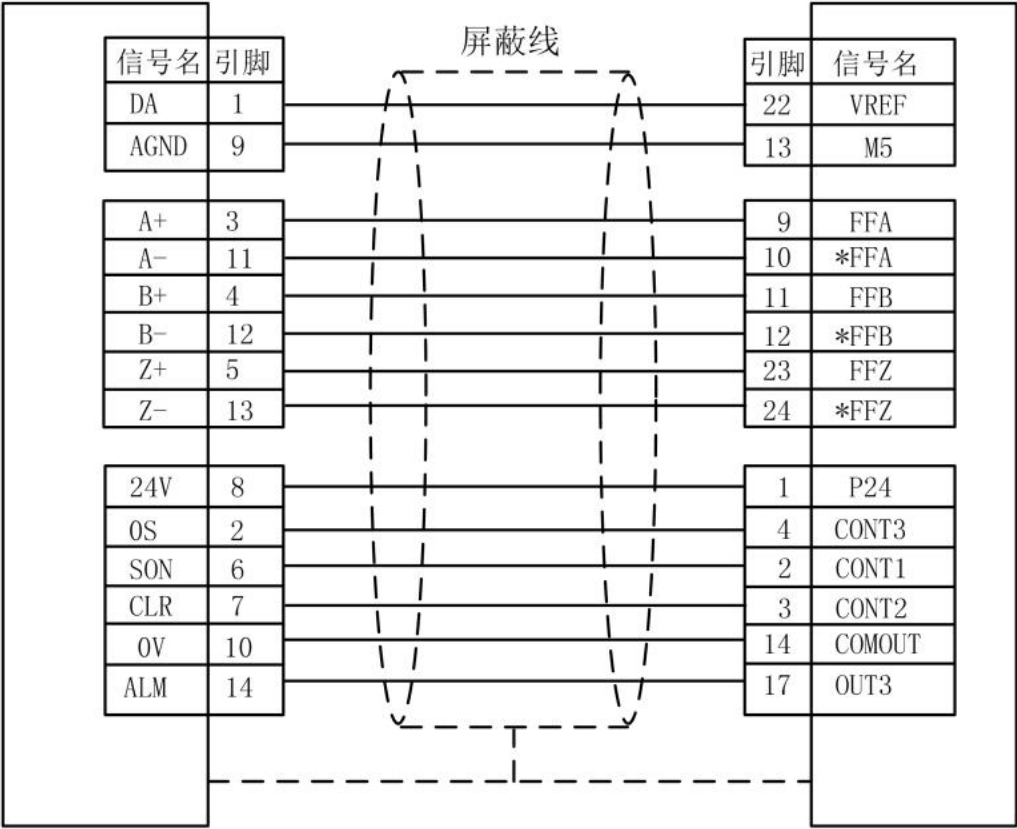
Fuji ALPH A5 servo setting as follow,

Parameter No.	Recommended value	Description
PA-101	01	Control mode: Must be speed control mode
PA-108	2500	Encoder feedback pulse
PA-115	17	Servo rigidity level
PA-303	02	Forward rotation command
PA-331	6.0	Speed gain. The speed gain of corresponding NT102 is 500 r/v/min.

Sanyo R-series servo wiring diagram

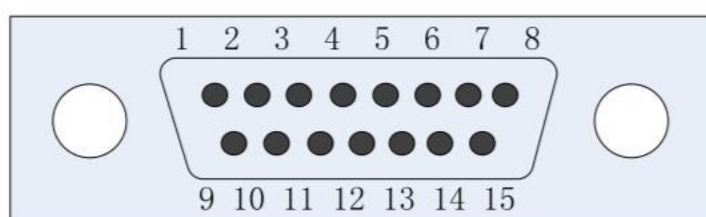NT102 servo interface　　　　　　　　Sanyo R-Series 50P interface
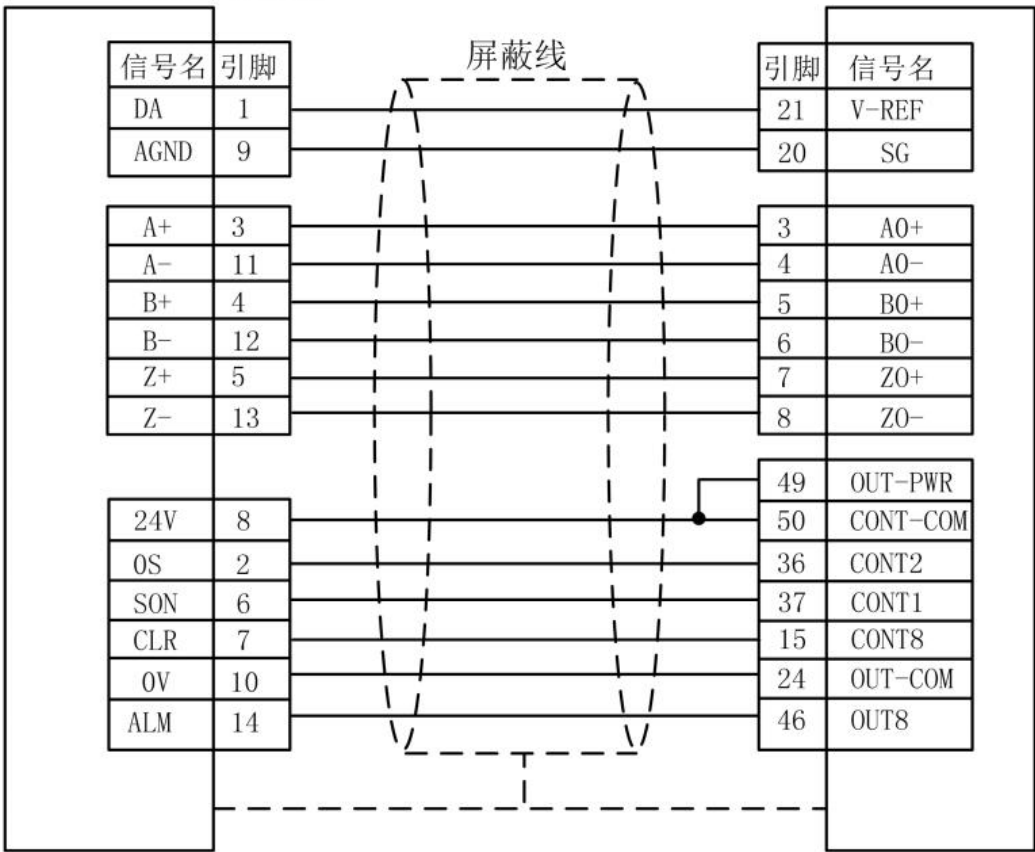
SANYO R series Servo setting

Parameter	value	Description
SY08	01	Control mode: Must be speed control mode
Gr0.00	00	Auto tune
Gr8.25	5000	The maximum speed of the motor corresponding to the system output 10V
Gr9.00	00	Motor rotate CW enable
Gr9.01	00	Motor rotate CCW enable
Gr9.26	00	Shut down servo gain switch
GrB.13	0	Set the brake delay time for switching from servo ON to servo OFF state
GrB.14	0	Set the brake release delay for switching from servo ON to servo OFF state
GrC.05	2500/32768	Number of pulse output by the encoder per resolution. The number of pulses of corresponding NT102 per resolution is 10,000.

3.2.3 Servo brake wiring description

The NT102 height controller has provided an independent Z axis brake signal interface. Connect the two brake signal wires of the servo motor to the brake interface on the back panel of the height controller (upper positive and lower negative) to realize the control of Z axis (It is not recommended to pull out the enable signal of the height controller connected to the servo separately for emergency stop. This operation will cause the brake function of the height controller to be abnormal). The brake signal is only a relay switch.

### 3.2.4 Input/output interface description

15-pin male (hole) servo control interface		
Pin	Signal	Description
1	24V（power output）	Power 24V output
2	IN8(common input)	Reserved signal
3	OUT1(cutting in place)	Cutting in place: Following the signal in place, low level is valid; it means following in place and cutting can be started.
4	OUT3(alarm)	Alarm output: Height controller alarm output signal, low level is valid; when valid, it means height controller alarm.
5	IN1(cutting following)	Cutting following: the signal is valid, the height controller controls the Z-axis to move to the set following height, and outputs the cutting in-position signal (OUT1 is valid, and the output is low level); after the signal is invalid (auto lift is on), the Z-axis is controlled to return to the setting Stop at the current following height position, and output the stop-in-position signal (OUT2 is valid, output low level); after the signal is invalid (auto lift is off), stop at the current following height position.
6	IN3(fast lift)	Fast lift: The signal is valid, and the Z-axis is controlled to move to the docking coordinate (the current coordinate of the Z-axis is greater than the docking coordinate), and the docking signal is output after completion (OUT2 is valid, and the output is low level).

7	IN5(upper limit)	Upper limit: Upper limit signal of Z axis.
8	0V(power ground)	Power 0V output
9	IN7(common input)	Reserved signal
10	IN9(common input)	Reserved signal
11	OUT2(docking in position)	Docking in position: Docking in position signal, valid in low level, it means docking in position.
12	OUT4(perforation in position)	Perforation in position: Perforation in position signal,valid in low level, it means perforation in position, user can start perforation.
13	IN2(center-back signal)	Center-back signal: the signal is valid, control the Z-axis to move to the center-back coordinate (the current coordinate of the Z-axis is greater than the center-back coordinate), and output the docking signal after completion (OUT2 is valid, and output low level).
14	IN4(motion stop)	Motion stop: emergency stop signal, input effective stop all motion state, state switch to stop.
15	IN6(lower limit)	Lower limit: lower limit signal of Z axis.

Instruction:

1、The output ports (OUT1~OUT4) are all open-drain outputs, which are connected to the power ground during output.

2、The input ports (IN1~IN9) are all low-level valid, and the input is valid when the input port is connected to the power ground.

3、When piercing is in place, OUT4 outputs an valid signal with a width of 200ms. When the cutting is in place, OUT1 outputs a continuous valid signal of in-position.

3.2.5 Sensor interface instruction
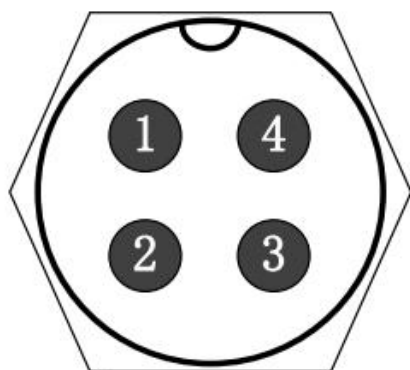
The sensor 4-core signal transmission cable can be made with a 3-core shielded cable and two 4-core aviation plugs. During production, the 1, 2, and 3 cores are connected, and the 4th core must be connected with the shielding layer.

3.3 Debugging steps

After installation, the controller shall be debugged for first use:

1、Set the servo parameters.See the servo parameter settings chapters.

2、Wait for the initialization, enter the parameter setting, set the "mechanical parameters" main setting: screw pitch, pulse, servo type.

3、Enter the test page and check if the travel switch is valid, when invalid, the interface shows the light out state.User can also block the upper limit, when the interface shows "upper limit valid"; block the lower limit, and the interface shows "lower limit valid".

4、Check the alarm information at the "Main interface" and process according to the corresponding alarm prompt.

5、Manual jog up and down at the "main interface", observe the movement direction of the cutting head, whether it moves in the normal direction, and watch whether the Z axis position value is smaller. If the actual movement direction of the cutting head is opposite to the jog direction, the servo direction is wrong, please change the "servo direction" switch to the mechanical parameters. If the down Z coordinate value becomes smaller or the upward point Z coordinate value becomes larger, the direction of the encoder is wrong, and modify the "encoder direction" in the mechanical parameters.

6、Manual return to origin once, before returning to origin, open reset stop on the speed parameter page.

7、Touch the nozzle to observe whether the capacitance will change and confirm that the sensor connection is normal.

8、Enter the [calibration interface] and finish Servo calibration to eliminate the zero drift of the servo.

9、Press "one-key calibration" for "floating head calibration", user can also enter the "calibration interface", for "floating head calibration".

10、User can modify other parameters as necessary after finishing above steps.

Chapter IV Alarm and Abnormal Analysis

4.1 System alarm and reason

Most alarm information will be explained under the main interface.

4.1.1 Upper/lower limit valid

This alarm is generated when the system detects that the upper limit or lower limit photoelectric switch or contact sensor of the Z axis is valid. In this case, pay attention to following situations:

➢ Is the wiring correct.

➢ Whether the Limit Input Logic parameter is set correctly, the limit signal can be set to normal open / normal closed states.

➢ Whether the upper/lower limit really senses the object, which causes the effective level signal to be output.

➢ Whether the sensor is damaged, or there is oil or dust.

4.1.2 Exceed the Z axis stroke

When the Z-axis coordinate of the system is greater than or less than the set positive stroke of the Z-axis, this alarm will be generated. The maximum value is set in the stroke parameter, and the system defaults the minimum value to 0. Confirm that the parameters are correct, first try to return to the origin to reset the coordinate system and check whether the encoder feedback is normal.

4.1.3 Servo alarm

When the ALM signal of No. 14 interface of the system's servo interface detects a servo alarm signal input, the system will generate a servo alarm. Because different servos have different high/low alarm logics, the "Servo Type" parameter must be set correctly. The following reasons may cause the servo alarm on the height controller:

➢ The "Servo Type" parameter setting is incorrect.

➢ Incorrect wiring.

➢ The servo itself has alarm.

➢ Incorrect servo parameter setting.

➢ Interference. (The probability is small, and the system itself has input port filtering.) .

4.1.4 The encoder is abnormal

When the system is in a static state, it detects that the feedback value of the encoder has changed, and the alarm will be generated. The reasons for this alarm include:

➢ The axis shakes due to external force.

➢ Poor wiring, zero-speed clamp signal is invalid.

➢ The servo rigidity is too weak.

➢ If the encoder cable is interfered, it is necessary to confirm whether the

shielding layer is correctly connected to ground, and it is better to add a magnetic ring.

4.1.5   The encoder has no response

When the system sends an analog signal and detects that there is no change in the encoder signal, the alarm will be generated. The reasons for this alarm include:

➢   The wiring is poor, the analog signal is not sent to the servo, or the zero-speed clamp signal is always valid, or the feedback signal of the encoder is not correctly connected to the height controller.

➢   The servo type is incorrect. The pulse type servo cannot be selected, but the servo with speed mode should be selected.

➢   The servo parameter setting is incorrect. It does not switch to speed mode.

4.1.6 The capacitance value is 0

When the system cannot measure the capacitance correctly, the capacitance value will become 0. The following reasons may cause the capacitance to become 0:

➢   The floating head touches the plate surface.

➢   Water enters the cutting head.

➢   The body capacitance of the cutting head is too large, which exceeds the detection range.

➢   The amplifier is damaged.

➢   The connection between the amplifier and the cutting head is poor or the wire is damaged.

➢   Inside the cutting head, the positive electrode (nozzle) and negative electrode (chassis) of the induction capacitor are short-circuited.

4.1.7   Jog to the plate

When the user continues to jog to the vicinity of the plate, the system detects that the distance to the plate is too close, and this alarm will be generated to avoid hitting the plate.

4.2　Analysis of common problems

4.2.1　Obvious jitter when following movement

➢ Poor calibration of the floating head

In this case, it is necessary to check whether the workpiece is grounded or not and re-calibrate the float.

➢ Poor contact between amplifier housing or controller FG pin and machine housing.

The machine case is the negative electrode of the capacitor under test. When the amplifier case and the machine case have poor conductivity, the AC impedance between the positive and negative electrodes of the capacitor is relatively large. In this way, the load of the measurement circuit will change, which will result in a larger measurement error. If user can't make a good mechanical connection, user can add a thick wire (preferably copper wire) between the amplifier and the machine's metal casing to reduce the AC impedance. However, this single-point connection has a better AC impedance than a mechanical connection. The ones are bigger. The specific index should achieve AC impedance less than 10 ohms.

➢ The servo rigidity is set too large

The servo rigidity is set too large. It will cause mechanical shock and obvious jitter during movement. Take the Panasonic MINAS A5 series servo for example, it is recommended that the rigidity setting does not exceed 19 levels.

➢ The speed of following movement is set too large.

If the speed of the following movement is set too large, it will cause jitter during the movement. It is recommended to use the grade 10~16.

4.2.2 Often collision with the plate in following movement

➢ The calibration range setting is too small or the Z axis speed setting is too large

If the calibration range is set too small, it means that the deceleration distance of the following motion is smaller. At this time, if the Z-axis speed is set too large and the Z-axis speed is still not reduced to 0 when the following is in place, overshoot will occur at this time. The greater the Z-axis speed when following in-position, the greater the overshoot. When the Z axis speed is greater than 100mm/s, the calibration range is recommended to be 15mm. When the Z axis speed is greater than 250mm/s, the calibration range is recommended to be set to 20~25mm.

➢ The servo rigidity setting is too small

If the servo rigidity is set too small, the response of the servo will lag behind the control signal of the controller, resulting in collision with the plate. Take the Panasonic MINAS A5 series servo for example, it is recommended that the rigidity

setting is not lower than 13 levels.

> ➢ Capacitive value problem

When the capacitance stored in the NT102 has a large deviation from the actual measured capacitance, it may cause collision with plate surface in following movement. For example, the temperature of the nozzle is abnormally increased, the nozzle is loose, there is foreign matter dirty, or the ceramic body lock nut is not tightened. Find the cause of the problem first, and re-calibrate the capacitor after solving the problem.

4.2.3 The floating head calibration fails or it continues to press down after touching the plate

Please confirm whether the workpiece is well grounded and whether the nozzle is loose or dirty. After troubleshooting, re-calibrate the floating head.

Chapter V Version upgrade and parameter backup

NT102 supports network port upgrade and parameter backup and import after version 1.7.5. All the above functions need to be realized through NT102 network upgrade tool.

5.1 Network connection

Connect NT102 to the computer with a network cable, take the win10 system as an example:

Click the "System Tray" network icon, as shown below:

Click Network and Internet Settings again to enter the figure below:

查找设置

网络和 Internet

状态

以太网

拨号

VPN

代理

Click Ethernet to enter the figure below:

← 设置

⌂ **以太网**

网络 3
已连接

相关设置

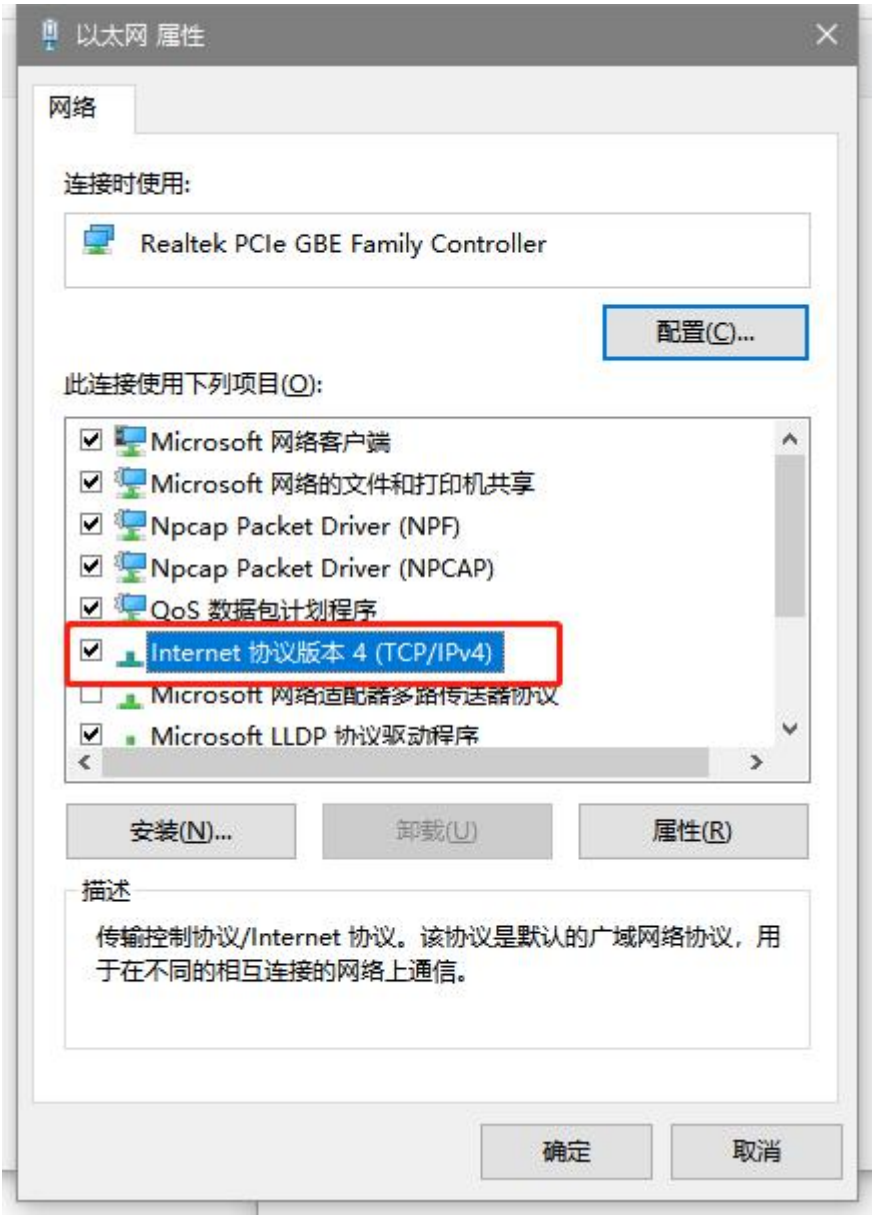更改适配器选项

更改高级共享设置

网络和共享中心

Windows 防火墙

Select Change Adapter Options, and enter the interface to select this

icon , Right-Select properties and go to Fig:
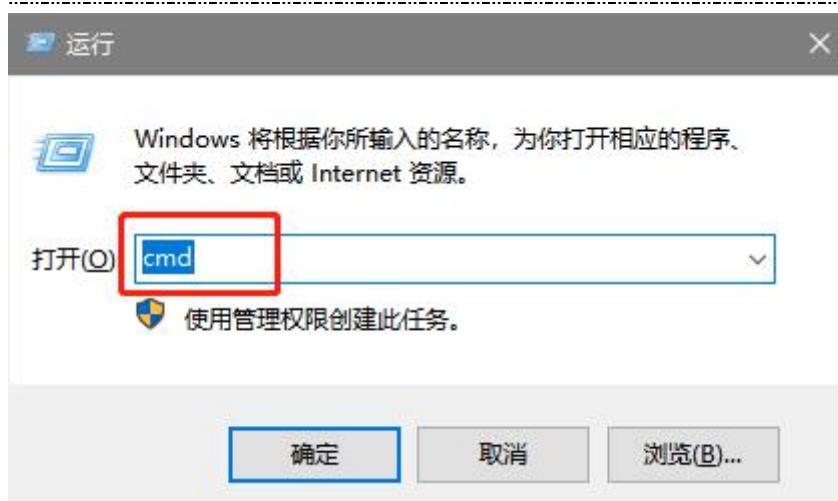

Double-click , Go to the figure interface below:

Note: The IP address should be set in the same network segment as the NT102 (192.168.1.xxx, it cannot be repeated with 192.168.1.10)

After setting the IP address, press win + R (win is), enter "cmd", as shown in Fig:

Click "OK" to enter the next interface, enter "ping 192.168.1.10 -t" in this interface, press "Enter" and the following picture will appear, indicating that the connection is successful:
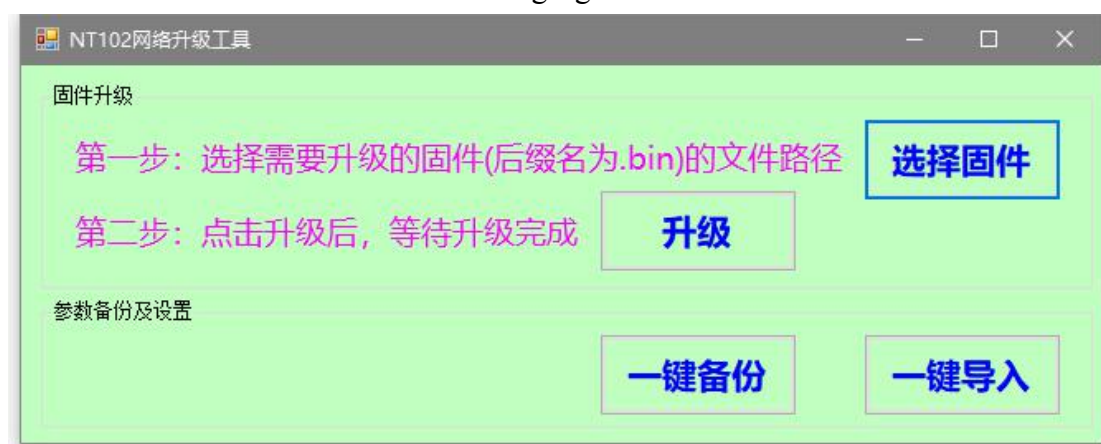

Note: There are spaces behind ping and in front of-t.

5.2 NT102 Network upgrade tool

After ensuring that the network is connected properly, open

folder NT102网络升级工具 , double click NetUpdateTool It can be opened,

without installation as shown in following figure:

> Step 1: Click "**选择固件**" to select the file path of the firmware (suffix: bin). It should be noted that Chinese characters and special characters cannot exist in the path.

> Step 2: Click **升级**, wait for the update to complete.

> One-key backup: It can back up all the parameters of the current NT102 interface.

> One-key import: import the file parameters backed up in "one-key backup".