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1. INTRODUCTION

CNC-210A is a series of COIL WINDING MACHINE CONTROLLER developed by TAILY AUTOMATION. It not only retains all the features of previous designs, it also has a low noise level and is less sensitive to external power fluctuation. Furthermore, it also includes a RS-485 network interface, making coil-winding operation easier to manage.

CNC-210A also features an integrated design: putting stepper motor driver, DC motor speed controller, brake and power supplier control circuits into one control box, simultaneously achieving size reduction, high performance and low cost.

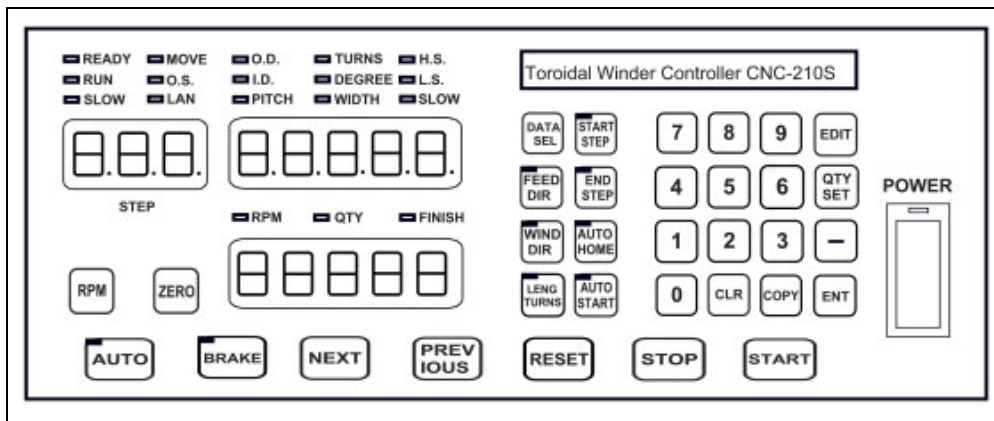
CNC-210A Series offers CNC-210AS "Standard Model" and CNC-210AE "External Connection Model", depending on whether a close-loop driver is provided for various applications.

MODEL	Winding Spindle	Guiding Traverse
CNC-210AS	Drive 0.5hp DC motor in directly.	Drive two phases 2A STEP motor in directly.
CNC-210AE	External connect winding spindles motor driver.	Drive two phases 2A stepper motor in directly, Or external connect guiding traverse STEP motor driver.

2. MAIN FEATURES

- ◆ Single chip Microprocessor design, has further higher performance and higher functions; it also has less sensitive to external power fluctuation or to external electromagnetic interference.
- ◆ Memory use FLASH ROM, capacity capable storing up to 1000 steps winding data, 9 winding parameters, and 5 options can be independently assigned for each step. Off-power memory retention without battery.
- ◆ Winding speed can be specified using the front panel keypad, resulting in easy programming of multi-step, multi-speed settings.
- ◆ Guiding traverse shaft stepper motor with a constant-current driver offering fast wire guiding speeds.
- ◆ Guiding traverse shaft offering 10 steps moving speed selection.
- ◆ Offering RS-485 interface for PC linking and data transfer.
- ◆ Software can be update through the personal computer.
- ◆ Power input AC100V~120V、220V~240V 600VA(max).

3. FRONT PANEL DESCRIPTION



3.1. Power switch

Power supplier equipped, controls the AC power to the controller.

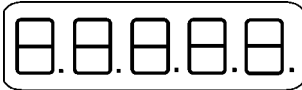
3.2. Key pads

- [0] ~ [9]** : 10 key, for entering numerical values.
- [EDIT]** : Enter into EDIT mode.
- [QTY SET]** : Specify target production quantity.
- [START STEP]** : Specify starting step in memory.
- [END STEP]** : Specify ending step in memory.
- [DATA SEL]** : Select parameter to be programmed.
- [FEED DIR]** : Select guiding direction for each step.
- [WIND DIR]** : Select winding direction for each step.
- [LENG TURNS]** : To specify whether to store or to spread wire for each step.
- [AUTO HOME]** : Select whether to have auto-positioning function for each step.
- [AUTO START]** : Select whether to have auto-starting function for each step.
- [-]** : Reduce step number by one, or reduce PIECE COUNTER by one.
- [CLR]** : During programming, clear current data to zero.
- [COPY]** : Copy the data of previous step into current step.
- [ENT]** : Write data into memory.
- [RPM]** : Switch display to shows PIECE COUNT or RPM.
- [ZERO]** : Hold down this key for two seconds to reset PIECE COUNTER to zero.
- [AUTO]** : No function.
- [BRAKE]** : Switch whether brake will be applied to the win spindle during stopping.
- [NEXT]** : Skip current step and go to the next step.
- [PREVIOUS]** : Discard current step and go to the previous step
- [RESET]** : At any time, discontinues current operation and return to ready mode.
- [STOP]** : Pause during winding.
- [START]** : Restart during pause, or pause during winding.

3.3. Digital display



STEP DISPLAY : Show the current step number being wound or being programmed.



DATA DISPLAY : During programming, in combination with LED, shows the parameter being programmed. During winding or ready mode, show the current number of turns.



PIECE COUNT DISPLAY : Shows PIECE COUNT or RPM.

3.4. Status indicators

- ☐ READY : Lit means in READY mode, flash means PAUSE mode ,not lit means winding or programming in progress.
- ☐ RUN : Lit means winding in progress; not lit means not in progress.
- ☐ SLOW : During winding, lit means low speed winding; not lit means high speed winding.
- ☐ MOVE : Lit means guiding roller is moving to the starting position.
- ☐ O.S : Lit means winding operation is over speeding, guiding roller and winding spindle are out of synchronization.
- ☐ LAN : Lit means currently communicating with network.
- ☐ FINISH : Lit, when reaching the preset piece count.
- ☐ RPM : Lit means the PIECE COUNT DISPLAY shows RPM.
- ☐ QTY : Lit means the PIECE COUNT DISPLAY shows the piece count.

3.5. Winding parameters definitions

- O.D. : Cores outer diameter.[Setting range 0.00~999.99mm].
- I.D. : Cores inner diameter.[Setting range 0.00~999.99mm].
- PITCH : Diameter of the copper wire.[Setting range 0.000 9.999mm].
- URNS : Total length to be store/Total number of turns to be wound.
[Setting range 0 99999].
- DEGREE : Start winding position of the core.[Setting range 0~360].
- WIDTH : Spreading width.[Setting range 0~360].
- H.S. : High winding speed. [Setting range 0~99].
- L.S. : Low winding speed.[Setting range 0~25].
- SLOW : Number of turns to be done at low speed prior to stop
[Setting range 0 999].

4. PROGRAMMING WINDING PARAMETER

4.1. MEMORY REGION SELECTION

CNC-210A contains 1000 memory step, by defining the region, users can effectively manage the memory. Various winding parameter can be stored in different regions and can be retrieved instantaneously. After specifying the regions, programming and winding can be done in those regions; all un-selected regions will retain their original contents and unmodified. When setting the STEP number, the Ending step number must be larger than the Starting step number, or the winding operation will not start



◆ Specifying starting step


In ready mode, press    to selected. [Setting range 0 ~ 999].

◆ Specifying ending step

In ready mode, press    o selected. [Setting range 0 ~ 999].


4.2. Programming winding parameter


In READY mode, press  invokes the programming mode. The STEP DISPLAY shows START STEP number, the parameter indicator 『O.D.』lit, the DATA DISPLAY shows 『O.D.』setting value. The value can be change by pressing numerical keys followed by  key.



After that the STEP number will automatically increase by one, to continue set the 『O.D.』 for next step. When the STEP number larger then the END STEP number, the STEP number will restore to the START STEP number and the indicator light will change from 『O.D.』 to 『I.D.』 for user to specifying the 『I.D.』 for each STEP. Repeat the same procedure using numerical keys and the  key, all winding parameters for each STEP can thus programmed.

The following functions are also available:

 : To select guiding direction, forward or reverse.

 : To select winding direction, clockwise or counter-clockwise.

 : To specify whether to store or to spread wire for each step.


 : To select whether the guiding roller move to the starting position automatically or upon a manual pressing of the  key.


 : Select whether to have auto-start function for each step.

 : Clear the current value to zero.

 : Copy the content of the previous step to the current step.

 : Go back to the previous programming step.

 : To scroll through different parameters.

Each time when change the PARAMETER or OPTIONS,  key must pressed to effect the change.

4.3. Running mode





◆Continual mode

Before it begins winding, if 『DEGREE』 of the step set as 999, then the 『DEGREE』 [WIDTH], [FEED DIR] won't be re-read. The values are not changed, that is the wire guide motor will continue guiding wires from the current position. The width and left-right margins are the same as the ones of the previous section. Both the wire-guiding and winding directions are not changed either. This mode especially suits to winding which have the multiple drawing tops in the same sets of coils.

◆Without WIDTH mode




Before it begins winding, if 『WIDTH』 of the step set as 000 or 999, means without WIDTH mode. When start winding the guide motor will guiding wires on the one direction till finish winding total turns.

4.4. Clear all winding parameter





In the READY mode, press     will clear all the winding parameter in the memory. Be cautious in using this function or all the data will be lost.

5. WINDING EXECUTION



5.1. To start winding

After set up all data items, press  key, the winding process begins in accordance with the set-up content. Press  key to pause winding. During winding, press the  key, the winding speed can be switch between high speed and low speed.

The following key functions are available during PAUSE mode:

-  : Give up the numbers of the winding turns and regress one step.
-  : Finish current step and proceed to next step.
-  : Continue winding.
-  : Give up winding and go back to the READY mode.

5.2. Winding speed (RPM) display

Pressing  key will cause the PIECE COUNT DISPLAY to display the spindle shaft RPM without interrupting the counting. Pressing  again will change the PIECE COUNT DISPLAY back to displaying the piece count.

5.3. Piece counter management

Each time the CONTROLLER goes from the START STEP to the END STEP, the piece counter will automatically increase by one.

◆Preset piece counter :

In READY mode, press **QTY SET** key once and key in desired values **0~99999** followed by the **ENT** key. When the PIECE COUNTER reaches the preset value, the FINISH led will lit. [Setting range 0~99999].

◆Decrease piece counter :

During READY or PAUSE mode, press the **-** key and hold down for two seconds the piece counter will decrease by one.

◆Reset piece counter :

Holding down **ZERO** key for two seconds, it will set the piece counter to zero.

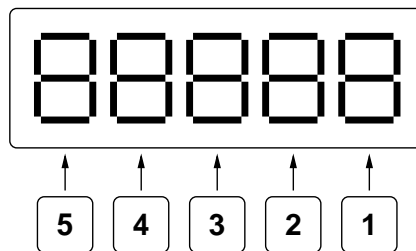
6. CONFIGURATION SETTING

In the READY mode, press the following keys combination as section [6.1. ~6.4], the DATA DISPLAY will show corresponding setting value. If no change is necessary, press the **ENT** key get back to READY mode. Or press numerical key followed by the **ENT** key to changed parameter.

6.1. Winding mode selection **EDIT** **0**

In this function the STEP display and the DATA display will shows eight digits, representing eight winding mode selections respectively.

Press numerical keys as below to set each digit.



1 Moving speed :

Select the moving speed when guiding roller move to the start position.

0 represents high speed; 1 represents low speed. Press **1** to select.

2 jogging speed :

Select the jogging speed of guiding roller when press LEFT and RIGHT button.

0 represents high speed; 1 represents low speed. Press **2** to select.

3 Operation mode :

Select operation mode for the START switch.

0 represents Single click mode; 1 represents Double click mode.

The **START** key on the front panel always as the Double click mode.

4 **5** No function at H6381.

6.2. Station number EDIT 1

Set the station number of the winding machine controller. This number is used to identify the station when using RS-485 communication function. Up to 32 stations can be operated on the same network. [Setting range 01~99]

6.3. Guiding roller moving increment EDIT 2

The moving increment setting value must be according to the guiding roller diameter(mm)、 the gear ratio between step motor and guiding roller. (Please reference the following formula).

Setting value = [(roller diameter × 3.1416) ÷ (gear ratio × 400)] × 100000.

For example :

The gear ratio between step motor and guiding roller = 1 : 3.

The guiding roller diameter = 25.0mm.

Setting value = [(25 × 3.1416) ÷ (3 × 400)] × 100000. = 6545.

Reference table

Gear ratio = 1 : 3		
Guiding roller diameter (mm)	Setting value	
10	2618	
15	3927	
20	5236	
25	6545	
30	7854	
50	13090	
70	18326	

6.4. Acceleration times EDIT 9

To Set the accelerate rate for the winding spindle [Setting range 00~99].

In the READY mode, press EDIT 9 the data display shows accelerate rate setting value, If no change is necessary, press the ENT key get back to READY mode. Or press — key to get into change mode, then the value can be changed by pressing the numerical key followed by the ENT key.

00 means shortest acceleration times ; 99 means longest acceleration times.

6.5. Reset all configuration data EDIT CLR 0 ENT

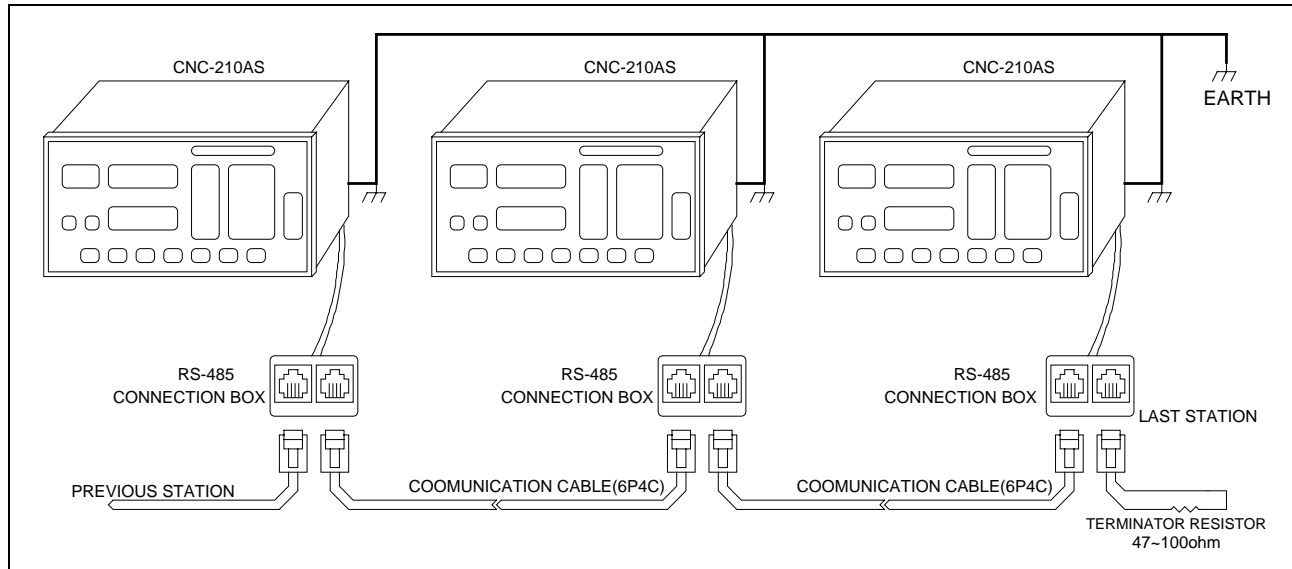
In READY mode press EDIT CLR 0 ENT keys, it will reset all the configuration data and replace by initial data. Be cautious in use this function.

6.6. Data transmit

The CNC-210AS has a RS-485 serial communication interface, can be used to send the winding data to the others station. Up to 32 stations can be operated on the same network.

In this function, set station numbers to the controllers to recognize the controller to which the current data is being send. (Refer to the section 7.2. station numbers.)

The communication bus wiring diagram as below :



In READY mode press following keys combination, its will sent each setting data to target station.

EDIT COPY 0 00~99 ENT : Sends configuration setting data to the specify station.

EDIT COPY 1 00~99 ENT : Sends winding parameters to the specify station.

EDIT COPY 2 00~99 ENT : Sends password to specify station.

It will sends from START STEP to END STEP, during sent the winding parameters,

00~99 Represents target station number. If the target station number specify as "00", all the stations on the same network will receive the data is being sent.

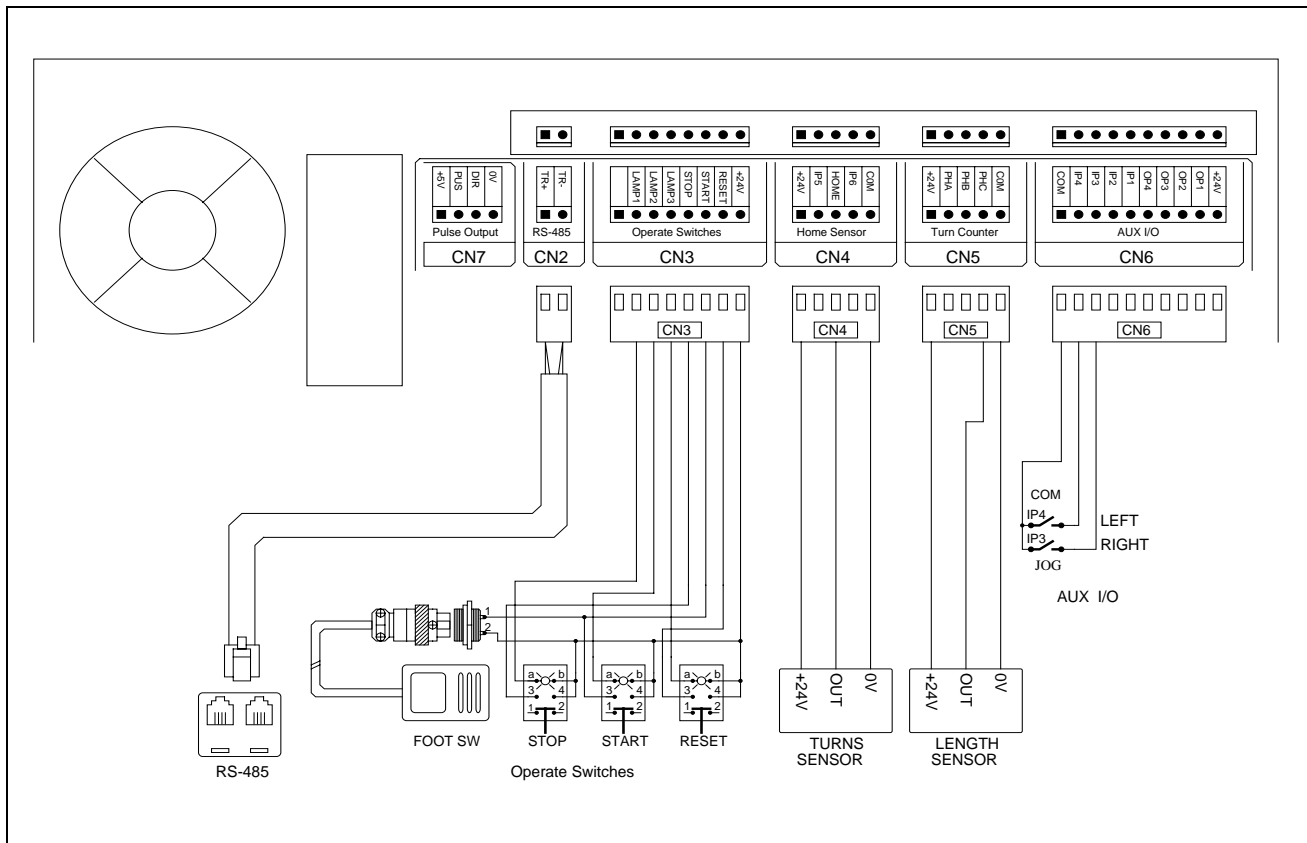
7. INSTALLATION AND WIRING

- ◆ The controllers should be operated in an environment that is protected from moisture, corrosive gases, or liquid, and free from airborne dust, metallic particles, and magnetic noise.
- ◆ Do not block the intake/exhaust ports of the controller. Otherwise, a fault may occur.
- ◆ Make sure that the power source supplies the correct voltage and is capable of supplying the required current to the controllers.
- ◆ Do not connect or disconnect wires and connectors while power is applied to the controller.
- ◆ Make sure the machine and controllers are properly grounded.
- ◆ Make sure that the leads and connectors are connected correctly.
- ◆ Normally operate under 10 ~ 40 environment; over 40 should perform under good ventilation, avoid heating.

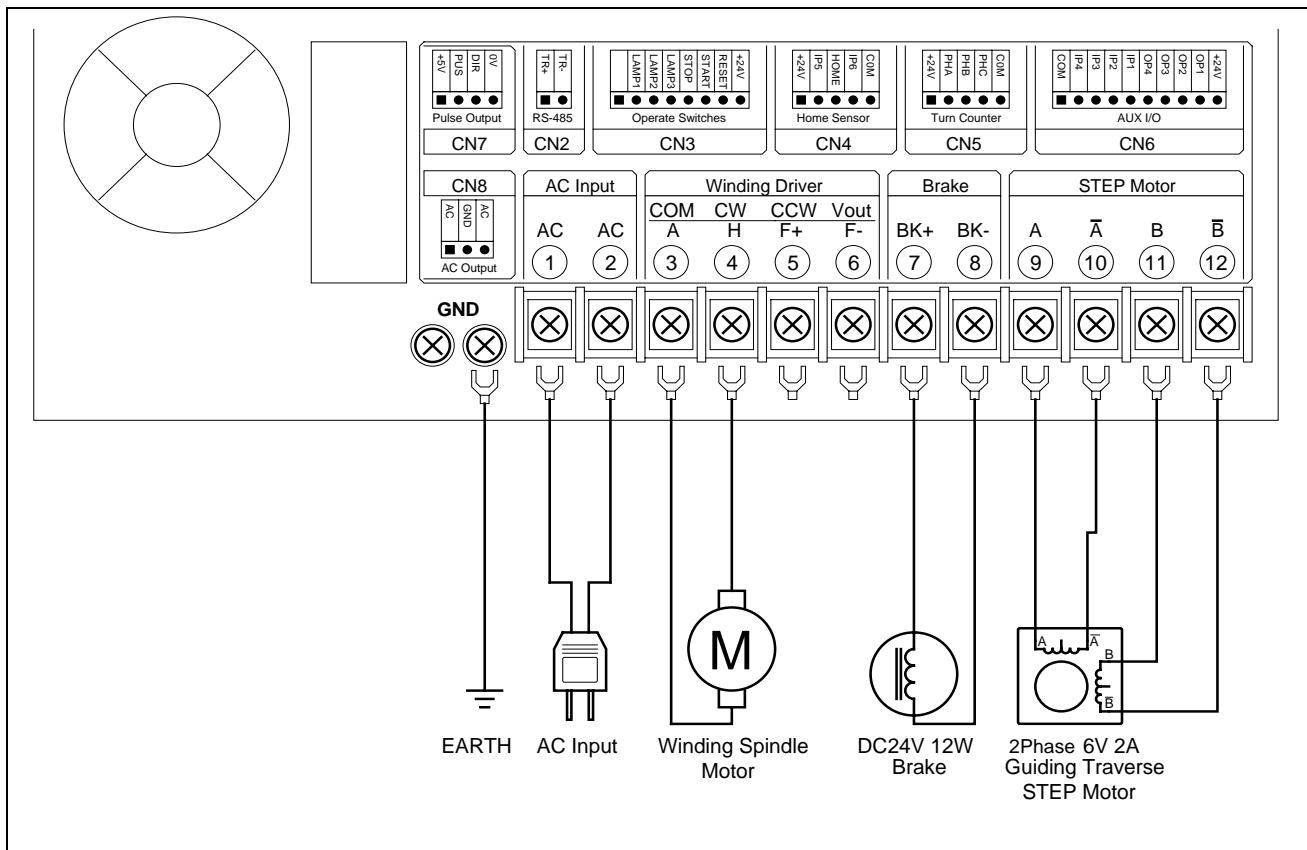
7.1. Accessories

NAME		CNC-210AS	CNC-210AE
210A-CN2	RS-485 Connection box		
210A-CN3	Operate switches connection cable		
210A-CN4	Home sensor connection cable		
210A-CN5	Counting sensor connection cable		
210A-CN6	I/O signal connection cable		
210A-CN7	Pulse output connection cable	x	
210A-CN8	AC output connection cable	x	
HOME-SR	Home sensor		
CNTB-03B/C	Counting sensor		
DISC	Counting disc		
START	Push button switch		
STOP	Push button switch		
RESET	Push button switch		
Foot switch	RUN/STOP Foot switch		
Power cord	AC Power cord		
x = not use in this model			

7.2. Wiring diagram for CN2~CN6

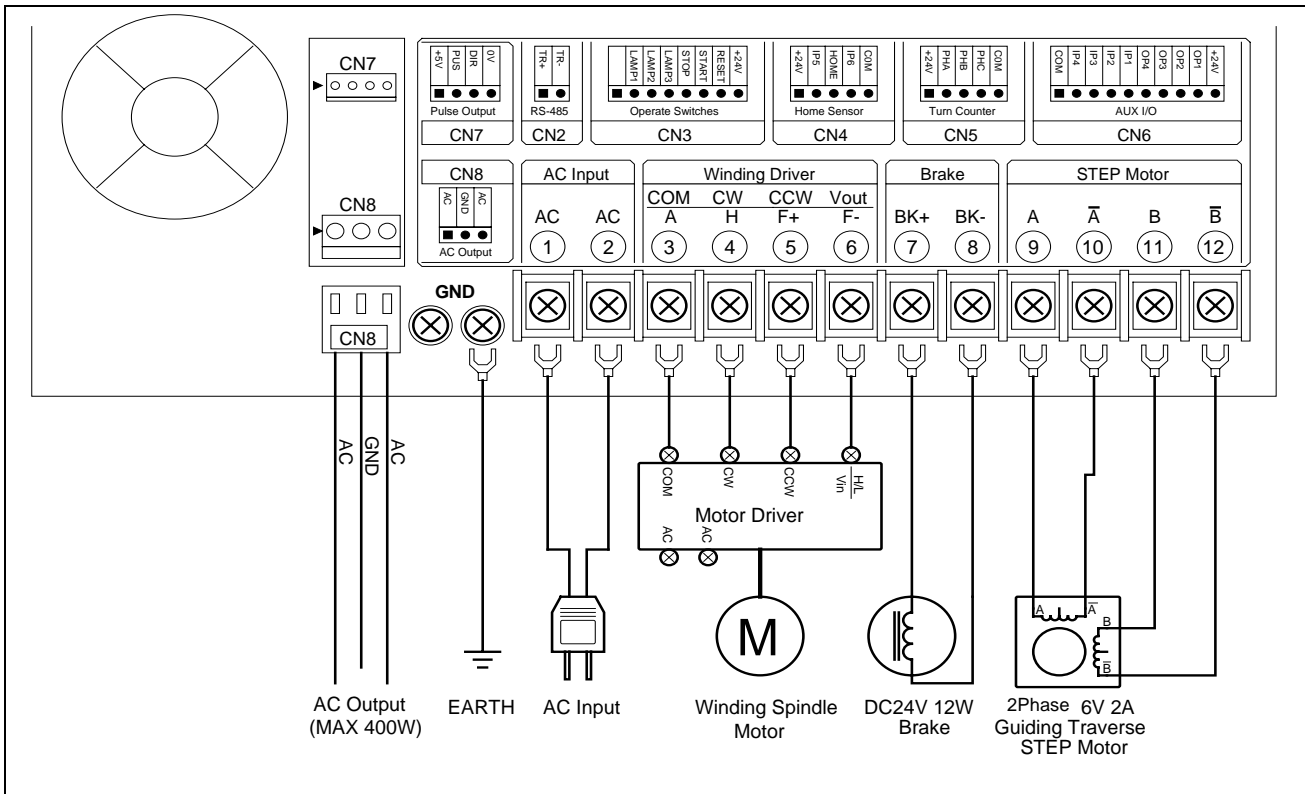


7.3. Wiring diagram for CNC-210AS

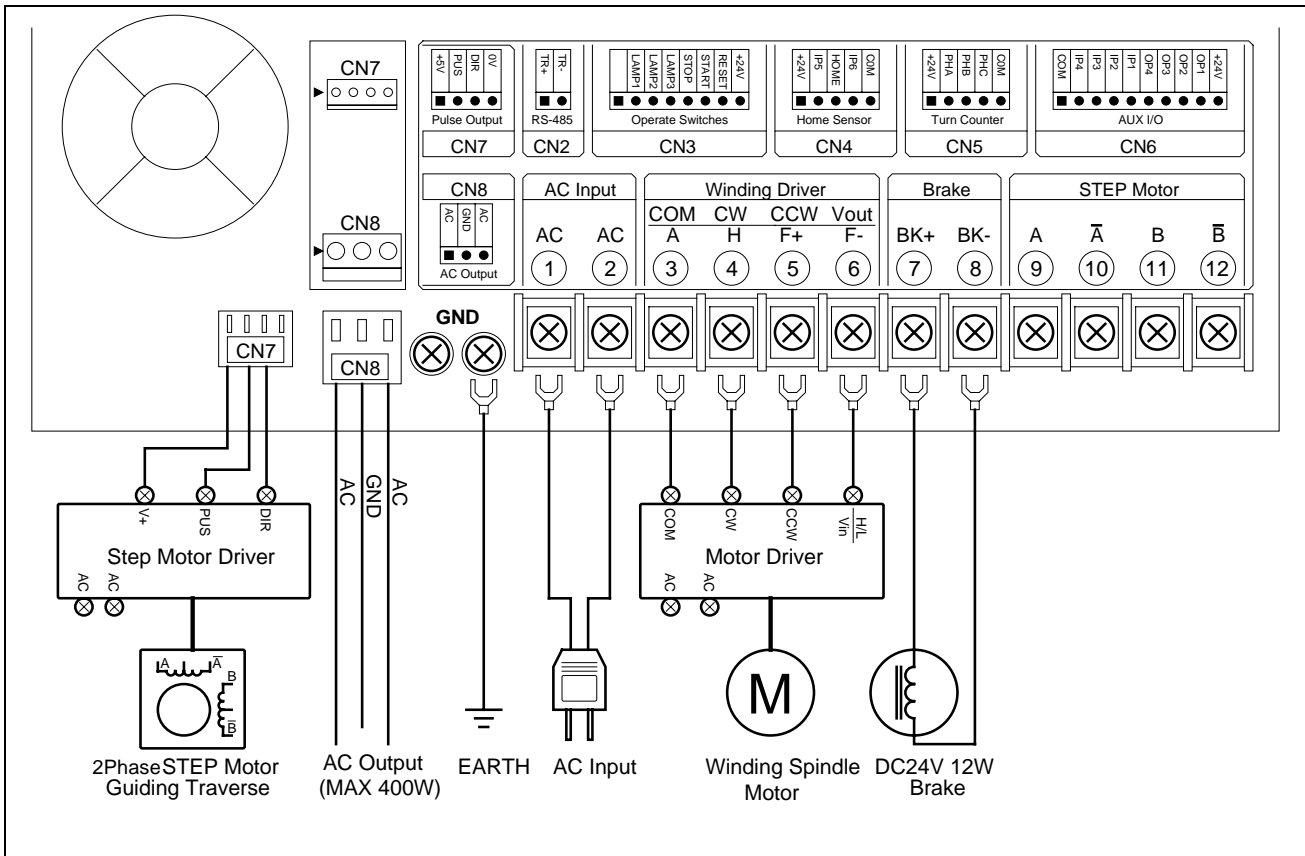


7.4. Wiring diagram for CNC-210AE

◆ Drive STEP Motor in directly



◆ External connect STEP Motor driver



8. ADJUSTMENT

8.1. Adjustments for CNC-210AS

◆ CL : Output current limit.

1. Connect a DC Amperes meter between terminal and DC motor as below.
2. In ready mode press **EDIT** **RPM** **START** to make the DC motor starting rotate and then press **BRAKE** to holding the winding spindle.
3. Rotate CL to set limited current, show on Amperes meter.
(2A for 180v DC motor、 4A for 90v DC motor).

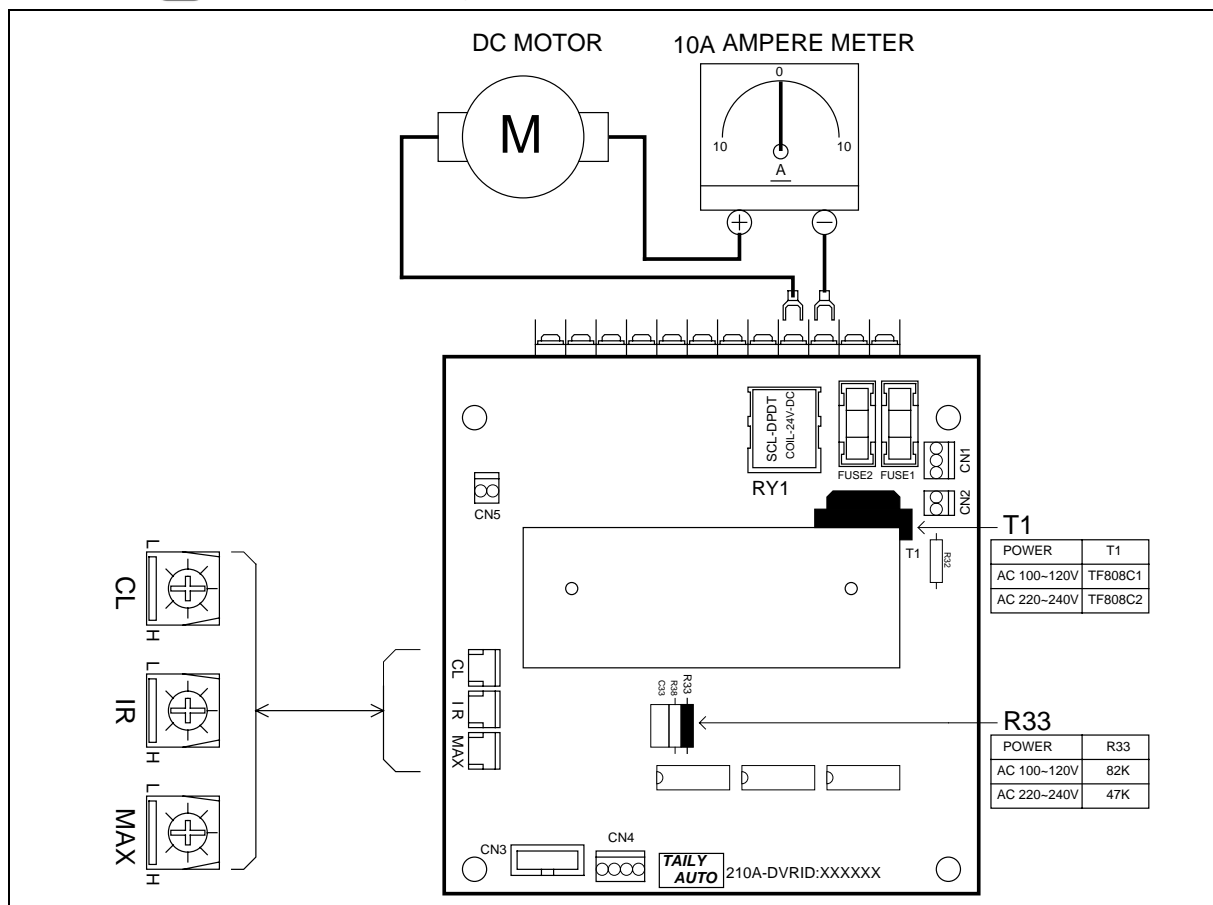
(The CL have been set by factory before delivery. Only adjust it when change DC motor and replace 210A-DVR driver board.)

◆ IR : Torque compensation.

1. Set the winding parameter H.S., L.S. in 20, then press **RPM** to change the DISPLAY shows RPM. Then press **START** key to start winding.
2. Rotate IR potentiometer to make it in same speed during the winding spindle shaft in full-load and unload. Then press **STOP** key to stop winding.

◆ MAX : Maximum winding speed.

1. Set the winding parameter H.S., L.S. in 99, and press **RPM** key to change the DISPLAY shows RPM. Then press **START** key to start winding.
2. Rotate MAX potentiometer to make the winding speed (RPM) as you want.
Then press **STOP** key to stop winding.



8.2. Adjustments for CNC-210AE




◆ Speed Mode selection

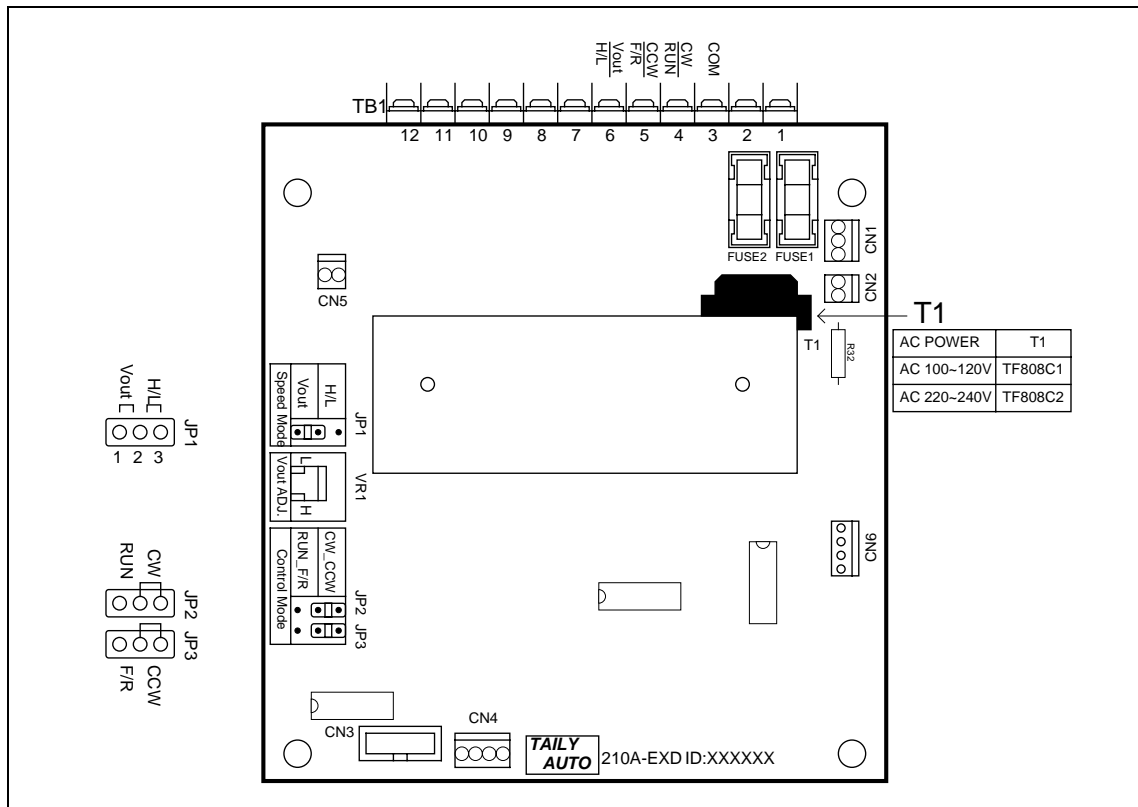
To select the speed signal output mode for winding driver.

Selected by JP1.

1. **V-out mode** : Represents the speed signal with DC 0~10v output.
2. **H/L mode** : Represents the speed signal with HI/LOW lever output.
Hi speed with HI lever, low speed with LOW lever.

◆ V-out adjust

1. Set the winding parameter H.S., L.S. in 99, and press  key to change the DISPLAY shows RPM. Then press  key to start winding.
2. Rotate **Vout** potentiometer to make the winding speed (RPM) as you want.
Then press  key to stop winding.
3. This function only worked in Vout mode.



9. MAINTAIN AND TROUBLESHOOTING

9.1. Error message

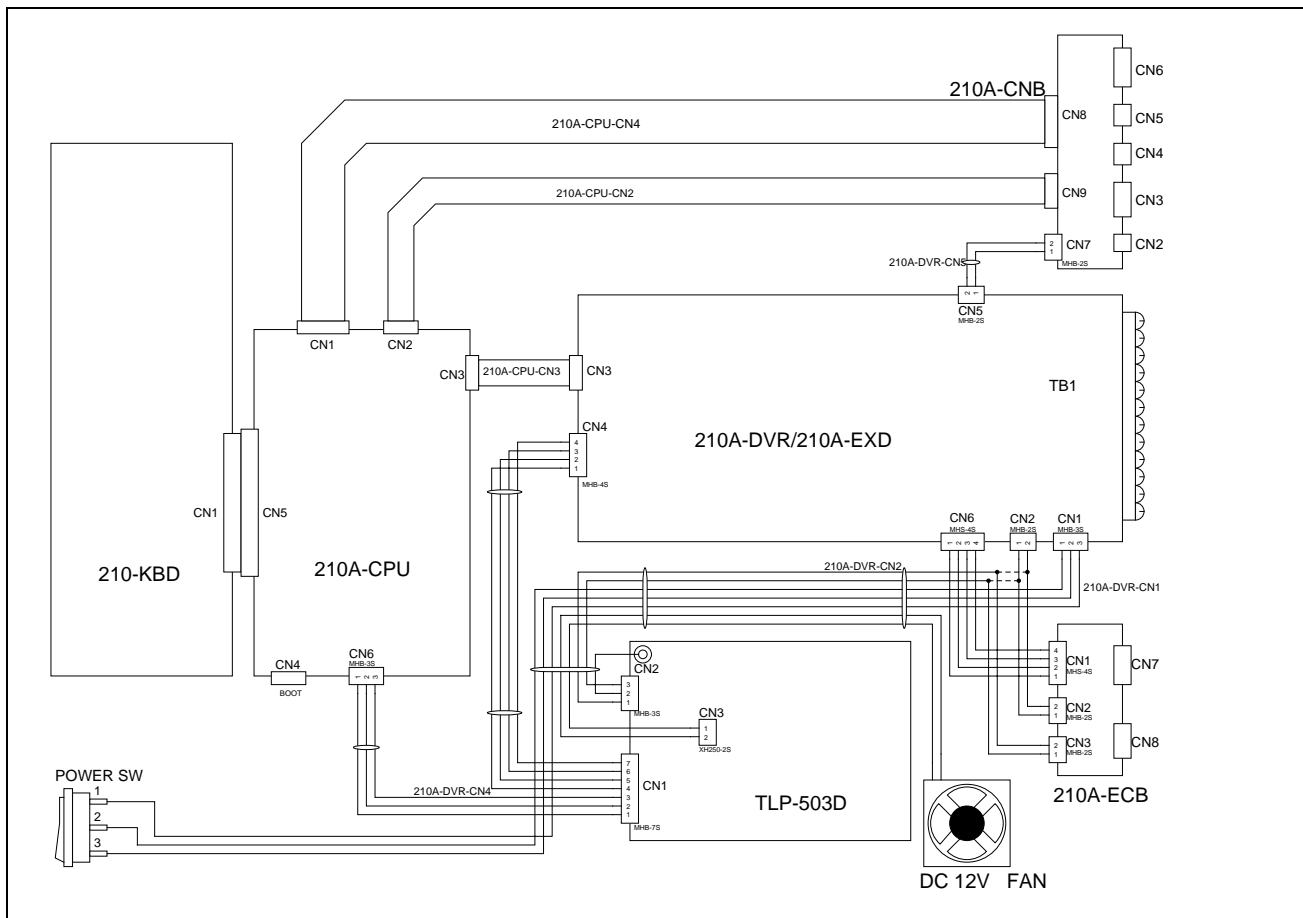
When a fault occurs during operation, the DATA DISPLAY shows error message, stop winding and then RESET go back to the READY mode.

Err-0 : The parameters or data in memory are fault.

Err-5 : RS-485 communication error.

Err-p : Password error, key in 4 numbers password before edit.

9.2. Internal wiring diagram



9.3. Periodically maintain

- ◆ Please periodically clean up the controller inner accumulate dust and dopants.
- ◆ Please periodically check the wire connection between controller and machine if have loose or bad contact.
- ◆ The following parts must be maintained or changed periodically as list below. If any part is found faulty, it must be changed immediately even when it has not yet reached the end of its life, which depends on the operating method and environmental condition.
- ◆ For parts replacement, please contact your sales representative.

NO	Parts name	Life guideline
1	COOLING FAN (DC 12V 6cm)	10,000 hours
2	RELAY (on the 210A-DVR driver board, it used to switching the winding direction)	100,000 times
3	Carbon BRUSH of the DC motor	1 year
4		
5		