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CRP-R Series Robot

Electrical Manual(G4)

This system supports a variety of robot types. This manual only takes the six-joint robot as an example to make a partial introduction. For other types of robots, please refer to this manual and the debugging manual.

《CRP user manual for touch-screen version》

《CRP programming instruction manual(beta)》

《CRP-Welding Process Instructions》

《CRP-CD□0-CRX8 Instructions》

《CRP-CD□0-CRX8 Debugging manual》

《CRP-CD□0-CRX8 PLC manual》

Please ensure that the relevant

instructions reach the end user of the product.

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CRP-SMS2019032501

Revision notes：

2019-3-25 first edition

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Safety Attentions

Before using this system, be sure to familiarize yourself with the knowledge of this operating mannual and all other ancillary data. Be familiar with all the equipment knowledge, safety knowladge and precautions.

Safety attentions in this instruction are graded into four categories- DANGER, CAUTION, MUST, and FORBID.









DANGER indicates that death or severe injury will result if wrong operation is taken.

CAUTION indicates that medium or slight injury or equipment breakdown will result if wrong operation is taken.

MUST indicates that instructions that must be obey.

FORBID indicates that operations that mustn't be taken.

It should be noticed that things labled with CAUTION may also result into severe consequnces in different situation. So it's very important to pay attention to every CAUTION instructions, and stay strictly with them.

Some instructions even may not be labled with DANGER or CAUTION, but users should also obey them.

Danger

★Before operating the robot, press the ‘emergency stop’ button on the teach box and make sure main power supply of servo is off and motor is in ‘off-power and brake’ status.After cutting off the servo power, servo power button on the teach box is red.

Under an emergency, personal injury or equipment damage may result if robot cannot be stopped in time.

emergency stop button



★When emergency is removed and servo power need connecting, please remove and deal properly with the incidence which causes the emergency, and then connect the servo power.

Personal injury may result due to the unwanted robot movement from wrong operation.

rotate the button according the white arrow to remove the emergency stop



★when teaching within the robot movement region, please obey the following principle:

keep observe the robot from the front

follow the operation manual strictly

cosider the backup plan if robot move suddenly toward yourself

set up the shelter just in case

★When following processes are operated, make sure nobody is in the robot movement region and operator is in the safe position:

powering the robot control electric tank;

controlling the robot using teaching programmer;

test run of robot

reoccurrence automatically

Personal injury may result when entering the robot movement region or contacting the robot.

Press the emergency stop button immediately when exception occurs.



CAUTION

★Following items need confirming before operating robot:

Operator is well-trained with robot-operation;

Operator has adequate knowledge of the movement feature of robot;

Operator is fully aware of the danger of robot;

Operator hasn't drink alcohol;

Operator hasn't take drugs that affect the nerve system and make reaction slow.

★Following items need checking before robot teaching process. If any abnormal is found, fix it or take other necessary measurement immediately.

Movement of robot is normal or not;

Zero point adjustment is correct or not;

Auxiliary equipment connected to robot is normal or not.

★Please put the teach equipment to original position after usage, and place it firmly.

Please don't put the teach programmer on robots, claps or ground. Otherwise, personal injury or equipment damage may result when teach programmer has collision with robot or claps.

Please be cautious with the incidental falling of teach programmer, which may leads to wrong movement of robot, personal injury and equipment damage.

★This manual will be updated after the product upgrade and specification change. For details, please contact our related service personnel.

If you need to re-order the operation manual due to damage or loss, please contact our service personnel.

★Do not carry out any dangerous work in the installation area of the robot.

★Please take strict safety precautions, In the relevant areas of the plant should be placed, such as "Flammable", "high", "stop" or "authorized personnel only" and other relevant warning signs.

★When performing the following operations, make sure that no one is within the operating range of the robot and that the operator is in a safe position:

1. When the robot cabinet is powered on.
2. When operating the robot with the hand-held teaching pendant.



Safe operation protocols

★All the operators of robot systems should participate in system training, study safety protection measurements and understand robot functionality.

★Make sure no abnormal or dangerous situation of robot and auxiliary equipment occurs, before starting operating robot.

★ Unplug the power or press emergency stop button before entering the operation region, even robots aren't running.

★ When programming within the movement region of robot, corresponding guard should be set to make sure that robot can be stopped under emergency circumstances. Please don't wear gloves when teach and inch the robot. Please take the slow mode when inching the robot, in case emergency occurs and robot can be stopped efficiently.

★Operators must be familiar with the emergency stop buttons on the robot controller and periphery controller, to the degree that these buttons can be pressed exactly under emergency.

★Never think that static status of robot means the finish of program. Static robot is likely to receive the input signal to get moving.

★The teaching and maintenance of the robot must comply with the following regulations:

1. Laws relating to industrial safety and health.
2. Mandatory orders relating to industrial safety and health laws.
3. Relevant regulations on industrial safety and health laws.
4. Code of practice for the safe operation of industrial robots (ISO 10218).

1、CRP-RH series robot introduction



CRP-RH series robot is a hollow series robot developed by CRP Robotics. It can be used in welding, handling, cutting, spraying, polishing and other related fields. And it's adapted with CRP-E60-G4,the integrated electrical control cabinet.

main features：

Equipped with safety emergency stop board independent of the control system, it adopts imported forced disconnection relay to provide double circuit emergency stop to ensure the reliability of emergency stop.

Automatic external power on function: ensure the operator's line of sight away from the robot, so as to ensure the operator's personal safety.

Energy saving mode: effectively reduce standby energy consumption. At the same time to avoid standby state, personnel into the robot area to bring harm .

Three- phase transformer installed, 380V and 200V isolation, more stable power supply. A three-phase filter is installed to effectively isolate external interference and prevent internal interference output.

Double switch power supply design: avoid internal power supply interference.

The body cable adopts special cable for high flexible robot. Avoid failure caused by internal line damage.

The body provides double loop air pipes tomeet the connection requirements of welding and transportation.

The hollow and large inner diameter of the 6-axis can meet the installation re-quirements of water-cooled gun and bellows gun. At the same time avoid handling jig pipe and cable winding.

The welding cable can be built in to facilitate the use of welding robot.

2、G4 control cabinet(electrical cabinet) introduction

2.1 Brief introduction



Features as follow：

Adopt split design; Divided into power room and control room. The power supply room mainly focuses on heating devices, and adopts multi- group fan + duct design to ensure good heat dissipation of heating devices. The control room is separated from the power supply room to avoid dust and oil entering the control room and ensure the cleaning of the control room to avoid abnormal work caused by dust and oil.

Multiple anti-interference components: power filter, isolation transformer, double switch power supply. Ensure the stable and reliable operation of the control cabinet.

The built-in safety emergency stop plate adopts double safety relays. When any emergency stop is pressed down, the strong power circuit and the servo unit shall deal with the emergency at the same time and stop the robot action by force. In order to achieve safety emergency stop.

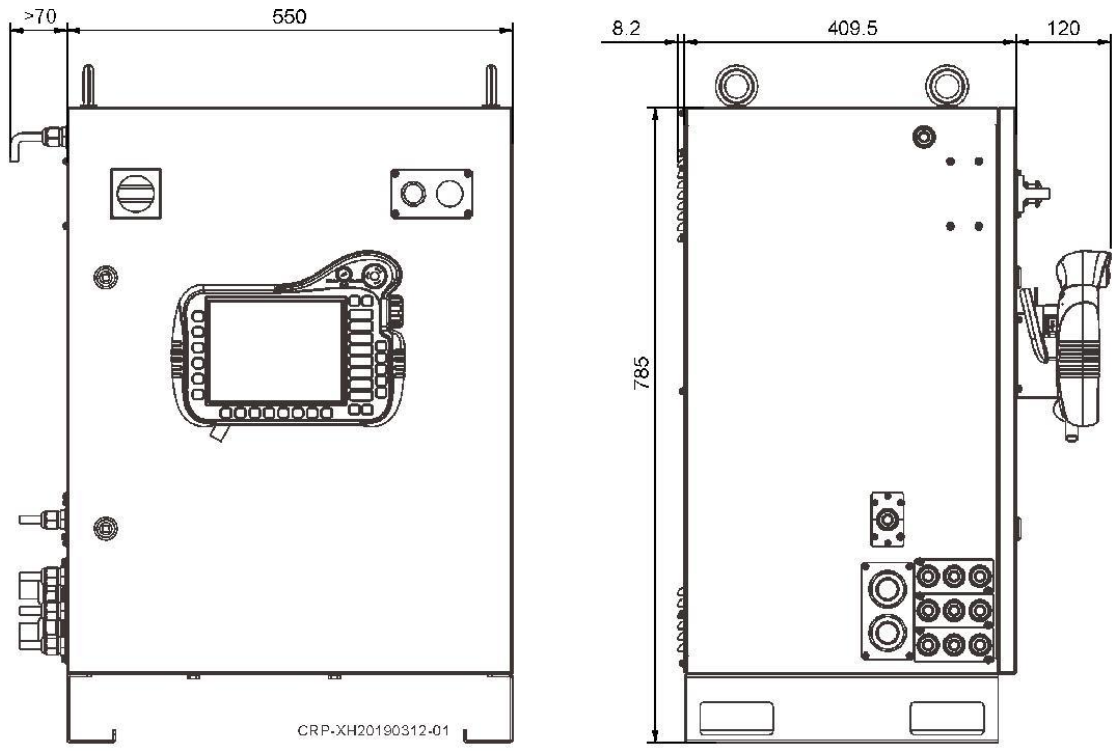
Softy Collision: when the anti-collision signal is effective, the system and drive respond at the same time to quickly soften the attitude axis and avoid damage to the body and welding gun.

2.2 Technical specifications

Teaching pendant	8-inch TFT-LCD, button + touch screen, mode selection switch, safety switch, emergency stop button
User memory	200M
Axis quantity that can be controlled	6 + 2 axes, 6 robot body axes + 2 external axes）

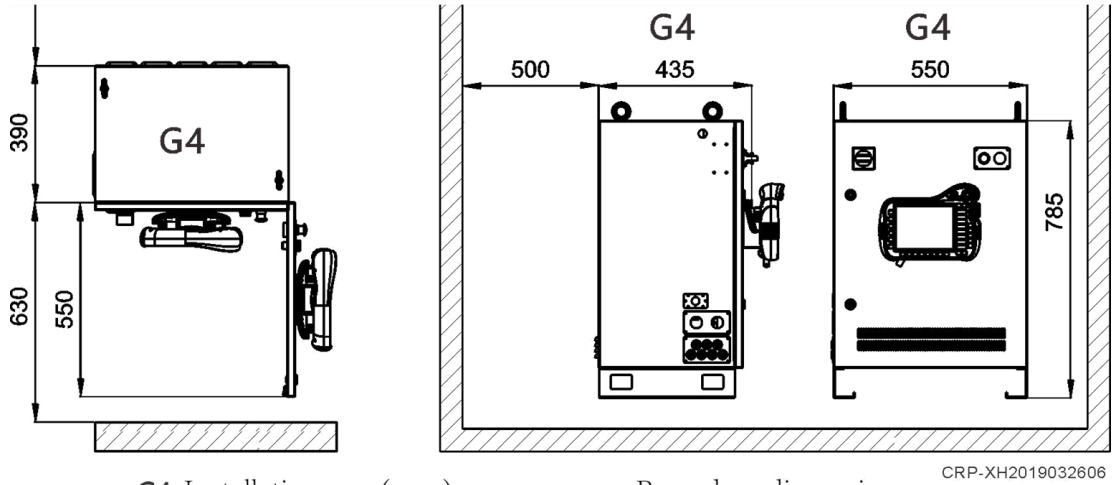
Interface	Digital I/O interface, EtherCAT, 22 input / output(expandable COM)
	4-way 0~10V analog output, 12-bit accuracy(expandable COM) Two-way encoder signal interface(position tracking)
	Two-way encoder signal interface(position tracking)
	Ethernet communication interface
	Double USB interface
Operation mode	Teaching, reproduction, remote
Moving function	Point-to-point, straight line, circle
Command system	Motion, logic, process, operation
Coordinate system	Joint coordinates, rectangular coordinates, user coordinates, tool coordinates, and base coordinates
Abnormal detection function	Abnormal stop, abnormal servo, abnormal user coordinates, abnormal tool coordinates, safety maintenance, abnormal arc, etc.
Robot safety	External emergency stop, anti-collision and safety bolt interface; MC safety circuit, servo soften, etc.
Reserved specific interface	arc welding interface, workstation interface
Software package	With options of welding, handling, palletizing, painting, and spraying applications
Others	Built-in PLC, regenerative braking, encoder interface(supporting synchronous belt), arc tracking and accessories(optional), vision software(optional), laser tracking software(optional), etc.
Connecting cable	3m
Power supply	Three phase 380V AC 50-60HZ
Dimension（MM）	550 x 785 x 410
Weight（KG）	65KG

2.3 Installation dimension



3、G4 Electrical cabinet layout and interface specification(IO）

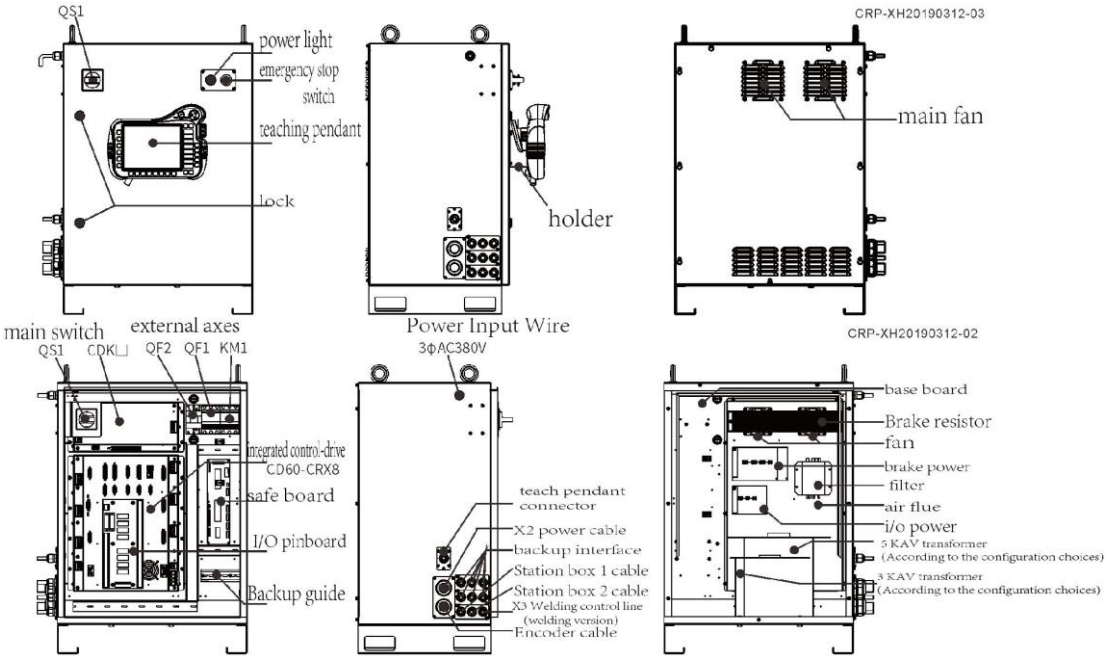
3.1 Installation requirements



G4 Installation area(mm) Boundary dimension

Please install G4 control cabinet according to the size shown above.Ensure adequate space for robot, G4 and peripheral maintenance.Otherwise in the maintenance work, may occur unexpected personnel injury accident.

3.1.1 Layout



3. 2 Main components

3.2.1 Power Supply

The cabinet power supply, please be sure to access 3 φAC380V, 10%, 50HZ power supply.Power supply capacity is selected according to transformer capacity.

When standard transformer (3KVA) is used.External power supply capacity: >3KVA. Wire diameter > 2.5MM²。

When using a band extension configuration transformer (5KVA).External power sup - ply capacity: >5KVA.Wire diameter≥4MM²

When using external transformers, the power supply capacity and line diameter are selected according to the external transformer capacity.

CAUTION !
The power supply of the electric cabinet must be reliably grounded, or it will cause equipment failure or accident.

3.2.2 Main Switch（QS1）



It is used for turning on or off the main power supply of the electric cabinet. When this switch is in the open state, the strong power in the control cabinet is switched on and the power indicator lights up.

Model：KCF1PZC+V0C（25A）

CAUTION！

Non-professionals are strictly prohibited to open the control cabinet door.When really need to open the control cabinet door, be sure to cut off the power switch or careful operation, can open the control cabinet door.Otherwise, it may cause personal injury or equipment damage

3.2.3 Fuse Wire（QF2）



The main functions of the fuse are as follows: protect integrated drive-control unit control circuit power supply, electric cabinet main fan, lock power supply and IO power supply partial circuit.When the indicator light is on, it means the fuse is blown.At this time need to check the relevant line;Reload the fuse after making sure the circuit is normal.

Model：RT28N-32X/3P+RT18-32（6A）

3.2.4 Air Switch（QF1）



This device is mainly used for: protect integrated drive-control unit (cd60-crx8) power supply circuit.

Model：iC65N-3P-D25A

3.2.5 contactor (switch)（KM1）



The main function of this device is used for: connecting or disconnecting the integrated drive-control unit (cd60-crx8) power circuit with the safety emergency stop board.

Model：LC1D25M7C

3.2.6 integrated drive-control unit（CD60-CRX8）



This integrated drive-control unit (cd60-crx8) is the core component of this control cabinet, and this unit (also known as "movement") contains robot control unit and robot drive unit.It is used for all functions and motion control of the robot, so please take good care of it.

Please refer to the "crp-cd-0-crx8 user manual" for detailed instructions and interface instructions of the drive control unit.

3.2.7 external axes（CDK□）

This external axis module is used when the robot needs to extend the external seventh axis or seven or eight axes.Please refer to "crp-cd 0-crx8 user manual" and "4.4 extension axis (CDK) instructions"

3.2.8 Safe Board



This safety emergency stop board adopts double emergency stop circuit access, built - in two safety certified safety relays, and all emergency stop signal correlation box processing.When any emergency stop is pressed, both the strong electric circuit and the servo unit shall deal with the emergency at the same time and force the robot to stop, which has a high safety level and can effectively protect the personnel and equipment from being hurt.

3.2.9 I/O adapter board（for users）



The I/O adapter board is mainly used for external IO signals to access X00-X22 and Y00-Y22 to interact with the control unit. Among them, Y00-Y07 has relay transfer output, and the relay contact capacity is up to 2A. The optional area is the analog isolation part. When using the analog connection welding machine, you can use this part of the circuit to isolate the two analog quantities and then use them.

CAUTION !
1、The TX terminal connection of the board must use H-type terminals and be crimped by special pliers, which can prevent the wiring from being insecure. 2、The +24V and GND signals on the TX1 and TX2 terminals are connected to the +24V and GND signals of TX3 for external switches and electrical appliances.

3.2.9.1 J24 IO-IN Pins Definition

Use: J24 is connected to the host Input interface through the matching 'I/O signal input cable'.			
Pins	Name	Definition	Valid State
1	X00	General purpose input	Low level（0V）valid
2	X02	General purpose input	Low level（0V）valid
3	X04	General purpose input	Low level（0V）valid
4	X06	General purpose input	Low level（0V）valid
5	X08	General purpose input	Low level（0V）valid
6	X10	General purpose input	Low level（0V）valid
7	X12	General purpose input	Low level（0V）valid
8	X14	General purpose input	Low level（0V）valid
9	X16	General purpose input	Low level（0V）valid
10	X18	General purpose input	Low level（0V）valid
11	X20	General purpose input	Low level（0V）valid
12	X22	General purpose input	Low level（0V）valid
13	GND	Earth wire 0V	Supply power to the system
14	X01	General purpose input	Low level（0V）valid

15	X03	General purpose input	Low level（0V）valid
16	X05	General purpose input	Low level（0V）valid
17	X07	General purpose input	Low level（0V）valid
18	X09	General purpose input	Low level（0V）valid
19	X11	General purpose input	Low level（0V）valid
20	X13	General purpose input	Low level（0V）valid
21	X15	General purpose input	Low level（0V）valid
22	X17	General purpose input	Low level（0V）valid
23	X19	General purpose input	Low level（0V）valid
24	X21	General purpose input	Low level（0V）valid
25	GND	Earth wire 0V	Supply power to the system

3.2.9.2 J23 IO-OUT Pins Definition

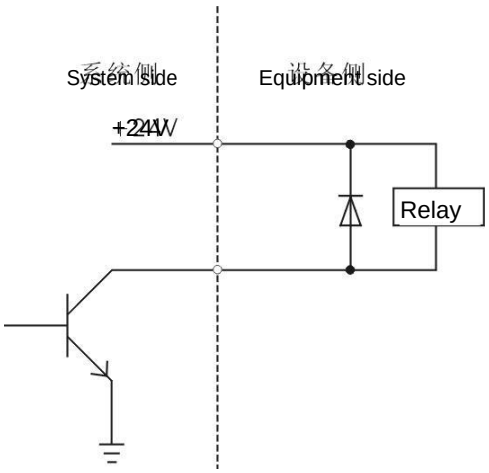
Use: J23 is connected to the host Output interface through the matching 'I/O signal output cable'.			
Pins	Name	Definition	Valid State
1	Y01	General purpose output	Low level（0V）valid
2	Y02	General purpose output	Low level（0V）valid
3	Y04	General purpose output	Low level（0V）valid
4	Y06	General purpose output	Low level（0V）valid
5	Y08	General purpose output	Low level（0V）valid
6	Y10	General purpose output	Low level（0V）valid
7	Y12	General purpose output	Low level（0V）valid
8	Y14	General purpose output	Low level（0V）valid
9	Y16	General purpose output	Low level（0V）valid
10	Y18	General purpose output	Low level（0V）valid
11	Y20	General purpose output	Low level（0V）valid
12	Y22	General purpose output	Low level（0V）valid
13	+24V	24V power supply	Supply power to the system
14	Y01	General purpose output	Low level（0V）valid
15	Y03	General purpose output	Low level（0V）valid
16	Y05	General purpose output	Low level（0V）valid
17	Y07	General purpose output	Low level（0V）valid
18	Y09	General purpose output	Low level（0V）valid
19	Y11	General purpose output	Low level（0V）valid
20	Y13	General purpose output	Low level（0V）valid
21	Y15	General purpose output	Low level（0V）valid
22	Y17	General purpose output	Low level（0V）valid
23	Y19	General purpose output	Low level（0V）valid
24	Y21	General purpose output	Low level（0V）valid
25	+24V	24V power supply	Supply power to the system

3.2.9.3 TX1 IO-OUT Terminal Definition

TX1 Output Signals			
TerminalPins	Name	Definition	Valid State
1	Y08	General purpose output	Low level(0V)valid, maximum output current 200mA
2	Y09	General purpose output	Low level(0V)valid, maximum output current 200mA

3	Y10	General purpose output	Low level(0V)valid, maximum output current 200mA
4	Y11	General purpose output	Low level(0V)valid, maximum output current 200mA
5	Y12	General purpose output	Low level(0V)valid, maximum output current 200mA
6	Y13	General purpose output	Low level(0V)valid, maximum output current 200mA
7	Y14	General purpose output	Low level(0V)valid, maximum output current 200mA
8	Y15	General purpose output	Low level(0V)valid, maximum output current 200mA
9	Y16	General purpose output	Low level(0V)valid, maximum output current 200mA
10	Y17	General purpose output	Low level(0V)valid, maximum output current 200mA
11	Y18	General purpose output	Low level(0V)valid, maximum output current 200mA
12	Y19	General purpose output	Low level(0V)valid, maximum output current 200mA
13	Y20	General purpose output	Low level(0V)valid, maximum output current 200mA
14	Y21	General purpose output	Low level(0V)valid, maximum output current 200mA
15	Y22	General purpose output	Low level(0V)valid, maximum output current 200mA
16			
17	GND	Earth wire 0V	
18	GND	Earth wire 0V	
19	+24V	Output +24V	
20	+24V	Output +24V	

Output Interface Y00-Y22 Diagram:



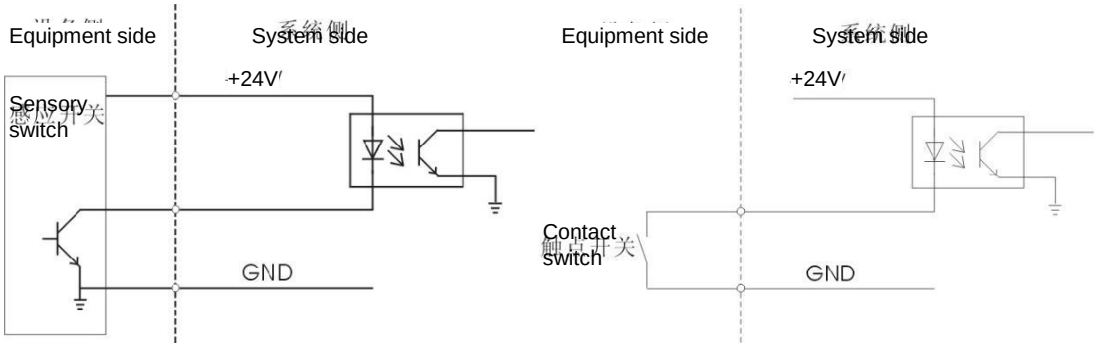
NOTES !
1. Inside the system is an open collector output of the transistor. 2. Maximum load current 100mA。 3. Must connect freewheeling diode when control relays are inductive load. 4. The operation box 2 occupies the Y21 and Y22 interfaces. When these two interfaces need to be used for other purposes, the corresponding PLC loop can be adjusted to shield the operation box 2 to release the two interfaces.

3.2.9.4 TX2 IO-IN Terminal Definition

TX2 Input Terminal			
Terminal Pins	Name	Definition	Valid State
1	X00	General purpose input	Low level (0V) valid
2	X01	General purpose input	Low level (0V) valid
3	X02	General purpose input	Low level (0V) valid

4	X03	General purpose input	Low level (0V) valid
5	X04	General purpose input	Low level (0V) valid
6	X05	General purpose input	Low level (0V) valid
7	X06	General purpose input	Low level (0V) valid
8	X07	General purpose input	Low level (0V) valid
9	X08	General purpose input	Low level (0V) valid
10	X09	General purpose input	Low level (0V) valid
11	X10	General purpose input	Low level (0V) valid
12	X11	General purpose input	Low level (0V) valid
13	X12	General purpose input	Low level (0V) valid
14	X13	General purpose input	Low level (0V) valid
15	X14	General purpose input	Low level (0V) valid
16	X15	General purpose input	Low level (0V) valid
17	X16	General purpose input	Low level (0V) valid
18	X17	General purpose input	Low level (0V) valid
19	X18	General purpose input	Low level (0V) valid
20	X19	General purpose input	Low level (0V) valid
21	X20	General purpose input	Low level (0V) valid
22	X21	General purpose input	Low level (0V) valid
23	X22	General purpose input	Low level (0V) valid
24			
25	GND	Earth wire 0V	
26	GND	Earth wire 0V	
27	+24V	Output +24V	
28	+24V	Output +24V	

X00-X22 Input Interface Diagram



Sensory switch example　　Contact switch example

NOTES！
1. The contacts of the switch are normally open and normally closed, depending on the interface definition. 2. The capacity of the switch is not less than 16mA. 3. When choosing an inductive switch, you need to select the NPN type. 4、The operation box 2 occupies the Y21 and Y22 interfaces. When these two interfaces need to be used for other purposes, the corresponding PLC loop can be adjusted to shield the operation box 2 to release the two interfaces. Refer to "4.3.3 release operation box 2".

3.2.9.5 TX3 Power input terminal definition

TX3 I/O Power			
Terminal Pins	Name	Definition	Valid State
1	+24V	IO interface power supply positive terminal	\
2	GND	IO interface power supply negative terminal	\
3	PE	Grounding	\

Note: 1. I/O interface power supply is + 24V, which is input power for IO board. Use external power supply module to supply power.

3.2.9.6 TX4 Y00 Terminal Definition

TX4 Y00			
Terminal Pins	Name	Definition	Valid State
1	Y00O	Y00 relay output normally open	\
2	Y00G	Y00 relay output common terminal	\
3	Y00C	Y00 relay output normally closed	\

3.2.9.7 TX5 Y01 Terminal Definition

TX5 Y01			
Terminal Pins	Name	Definition	Valid State
1	Y01O	Y01 relay output normally open	\
2	Y01G	Y01 relay output common terminal	\
3	Y01C	Y01 relay output normally closed	\

3.2.9.8 TX6 Y02 Terminal Definition

TX6 Y02			
Terminal Pins	Name	Definition	Valid State
1	Y02O	Y02 relay output normally open	\
2	Y02G	Y02 relay output common terminal	\
3	Y02C	Y02 relay output normally closed	\

3.2.9.9 TX7 Y03 Terminal Definition

TX7 Y03			
Terminal Pins	Name	Definition	Valid State
1	Y03O	Y03 relay output normally open	\
2	Y03G	Y03 relay output common terminal	\

3	Y03C	Y03 relay output normally closed	\

3.2.9.10 TX8 Y04 Terminal Definition

TX8 Y04			
Terminal Pins	Name	Definition	Valid State
1	Y04O	Y04 relay output normally open	\
2	Y04G	Y04 relay output common terminal	\
3	Y04C	Y04 relay output normally closed	\

3.2.9.11 TX9 Y05 Terminal Definition

TX9 Y05			
Terminal Pins	Name	Definition	Valid State
1	Y05O	Y05 relay output common terminal	\
2	Y05G	Y05 relay output common terminal	\
3	Y05C	Y05 relay output normally closed	\

3.2.9.12 TX10 Y06 Terminal Definition

TX10 Y06			
Terminal Pins	Name	Definition	Valid State
1	Y06O	Y06 relay output normally open	\
2	Y06G	Y06 relay output common terminal	\
3	Y06C	Y06 relay output normally closed	\

3.2.9.13 TX11 Y07 Terminal Definition

TX11 Y07			
Terminal Pins	Name	Definition	Valid State
1	Y07O	Y07 relay output normally open	\
2	Y07G	Y07 relay output common terminal	\
3	Y07C	Y07 relay output normally closed	\

3.2.9.14 Analog Isolation Board

CAUTION !

1. Analog isolation board is standard for the welding robot. The handling robot version is null.

2. The analog isolation board is an optional accessory for isolating system analog and welding machine input analog to prevent interference!

3. When the analog isolation board is not selected, the customer can also directly connect the system AVO to the welder input for testing. When used officially, it is highly recommended to use an analog isolation board.

3.2.9.15 TX12

TX12 analog input, interface with host AVO			
Terminal Pins	Name	Definition	Valid State
1	24V	+24V input	\
2	GND	0V input	\
3	DA1	DA1 analog input	\
4	DA2	DA2 analog input	

3.2.9.16 TX13

TX13 connect welding current control terminal			
Terminal Pins	Name	Definition	Valid State
1	DA1+	welding current output positive terminal	\
2	DA1-	welding current output negative terminal	\

CAUTION !
Connecting the welding current control terminal to provide current control for the welding machine. It is the output of the isolation board.

3.2.9.17 TX14

TX14 connect welding voltage control terminal			
Terminal Pins	Name	Definition	Valid State
1	DA2+	welding voltage output positive terminal	\
2	DA2-	welding voltage output negative terminal	\

CAUTION !
Connecting the welding voltage control terminal to provide voltage control for the welding machine. It is the output of the isolation board.

3.2.3 Reserved Rail

The reserved rail is used for installing reserved positions when users need to add relays or other components.

3.2.4 Braking Resistor（R1）

Also called: regenerative resistor. Used when the servo motor in the generator mode generates more energy than the capacitor charging energy, and consumes excess energy.

Generator mode includes the following situations:

During deceleration stop period of accelerating or decelerating.

The servo motor formed by the load side continuously running (negative load).

Specification model: 800W 20RJ

CAUTION !
1. Since the braking resistor is mainly used for energy consumption, a large amount of heat is generated according to the movement of the robot, so it is strictly forbidden to touch when the power is on. 2. Due to the heat, it is necessary to ensure good heat dissipation conditions. 3.After the main switch is turned off, wait for 5 minutes to touch the surface of the brak-ing resistor.

3.2.5 Duct/Air Duct Fan

The power device generates a large amount of heat during the working process of the integrated drive-controller unit, and the heat is mainly transmitted to the heat sink of the integrated drive-controller unit. If the heat cannot be effectively dissipated, the integrated drive-controller unit will over-temperature alarm. The ducts and air duct fans are dedicated to dissipating this part of the heat.

At the same time, the air duct fan also has the purpose of dissipating the heat of the braking resistor.

Specification model: air duct fan: ME80252V1-000C-A99

CAUTION !
Air ducts and fans need regular inspection and maintenance. Prevent clogging, malfunction, and affect heat dissipation.

3.2.6 Filter（RC1）

The function of the power line filter is to prevent electromagnetic interference generated by the device itself from entering the power line, and to prevent interference on the power line from entering the device. This prevents the robot from receiving external disturbances and causing malfunctions.

Specification model: SH360-30

3.2.7 Brake Power Supply（UK2）/IO Power Supply（UK1）

The brake power supply UK2 is mainly used to supply power to the robot body and the external shaft servo motor brake. The IO power supply UK1 is mainly used to power the I/O adapter board. The dual-switch power supply design is used to avoid interference with the IO signal and the control system when the brake is actuated.

Specification model：UK1：LRS-50-24 UK2：LRS-100-24

3.2.8 Transformer（TC1）

It is mainly used to power the integrated drive-controller unit. The control cabinet adopts a three-phase isolating transformer to avoid the risk of electric shock caused by any contact between the output and the person at the output end, ensuring safe use of electricity. At the same time, the input end and the output end are completely isolated, and the input power source is well filtered to prevent interference.

The choice of transformer capacity is directly related to the load.

This control cabinet is currently configured with the following specifications:

SG3000VA：For RH14-10 without external axes.

SG5000VA：For RH14-10 with external axes.

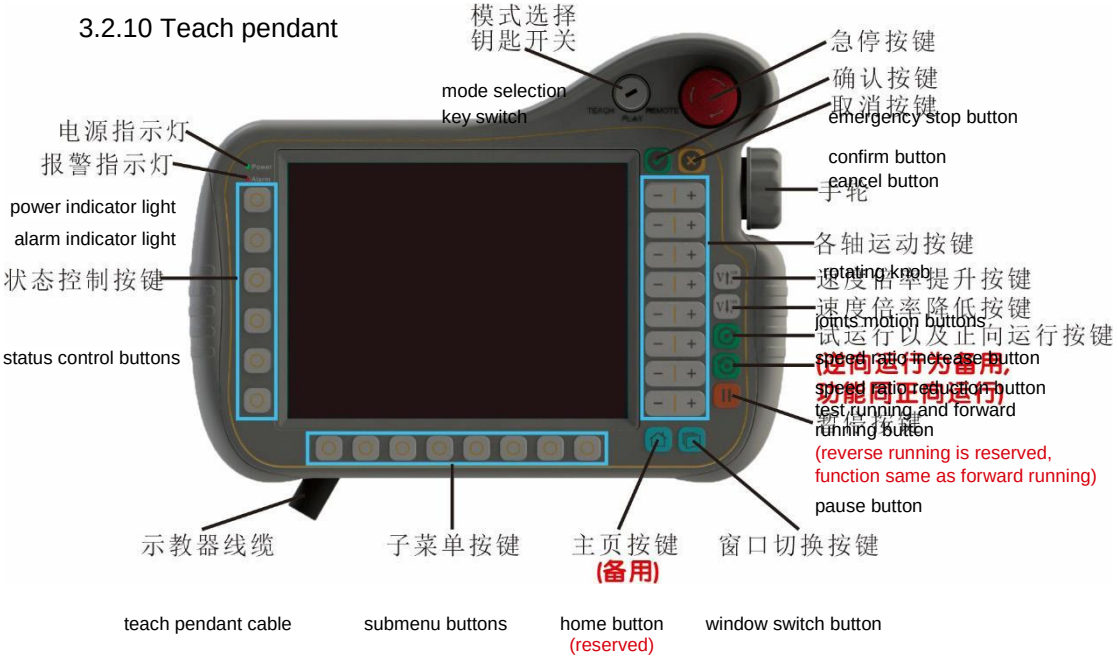
CAUTION！
1. When the transformer is working, the input terminal still has strong power, so it is strictly prohibited to touch the power to prevent electric shock. 2. Heat is generated during the working process of the transformer, so it is strictly for-bidden to touch the power to prevent burns. It is necessary to ensure good ventilation.

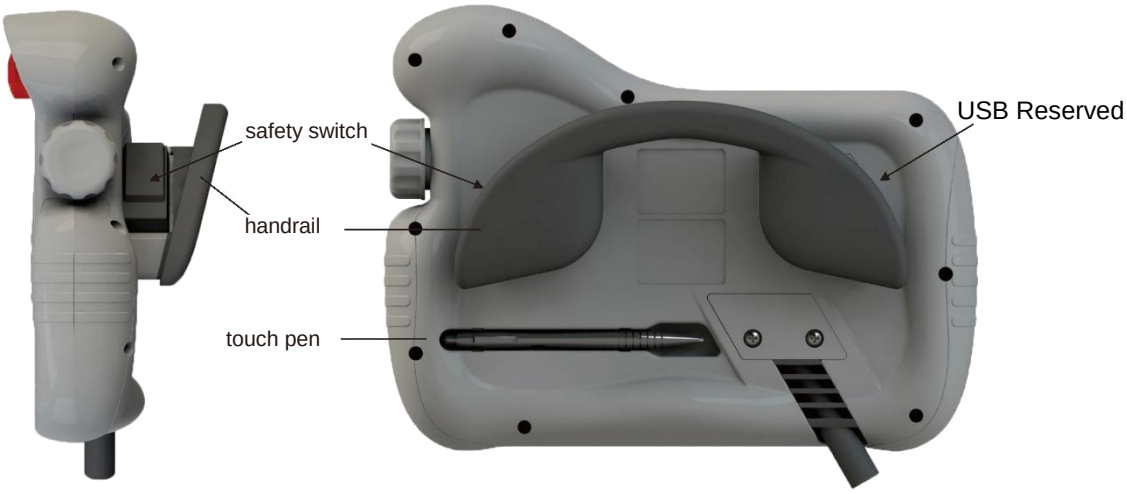
3.2.9 Main Fan of Electrical Cabinet

In the power room area, there are transformers, integrated drive-controller unit radiator, braking resistors, and other heating devices. If there's good heat dissipation, it will lead to a series of abnormalities such as the abnormal operation of the robot and alarm. The main fan of the electrical cabinet is used for ventilation and heat dissipation in the power supply room, in order to ensure good heat dissipation. It is necessary to regularly check the operation of the fan and the blockage of the tuyere.

Specification model：DP200A 2123XBL

3.2.10 Teach pendant





Touchscreen Teach Pendant Back（V2）

The teach pendant is a robot control operator, which is mainly used for teaching programming, status monitoring, operation preparation, etc. Built-in LCD display and touch screen, these parts are fragile parts, please take it lightly and use it with care.

For details on the teach pendant and how to use it, please refer to the "CRP (Touch Screen Edition) Instruction Manual".

3.2.11 Operation Box

The operation box is mainly used for reproduction, remote or scheduled servo enabling and program start-stop.

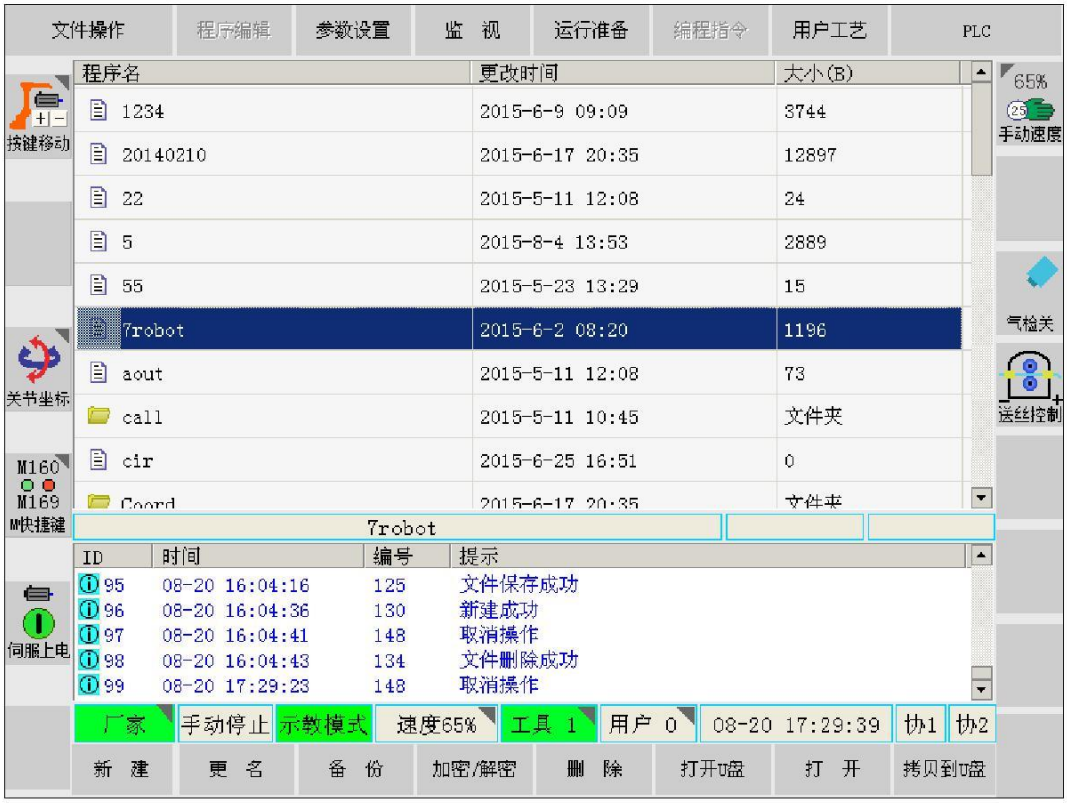
For details, refer to "4.3 Operation Box Detailed Description".

4、G4 Electrical Cabinet Instructions

4.1 Electrical Cabinet Power-on Steps

Please follow the steps below to power-on G4 electrical cabinet:

1. User distribute power.
2. Turn the G4 main switch（QS1）to ON.
3. Wait for about 70 seconds, the system is booted up, and the program list interface will display.



4. Press 

button, then system read absolute position. Then it will show 

。

5. At this point, the system is powered on and can perform subsequent work.

4.2 PLAY or REMOTE Mode Servo Power-on

When the key switch turn to（PLAY）or（REMOTE）mode, the system automatically switches the servo power-on state to servo power-off. The servo power cannot be turned on through the on-screen buttons or the corresponding physical buttons. At this time, the servo must be powered up only by pressing the servo power of the operation box 1 (orange button). When the servo is powered on, the servo orange button of the operation box 1 is lighted up.

For details on the operation box, please refer to "4.3 Position Box Details".

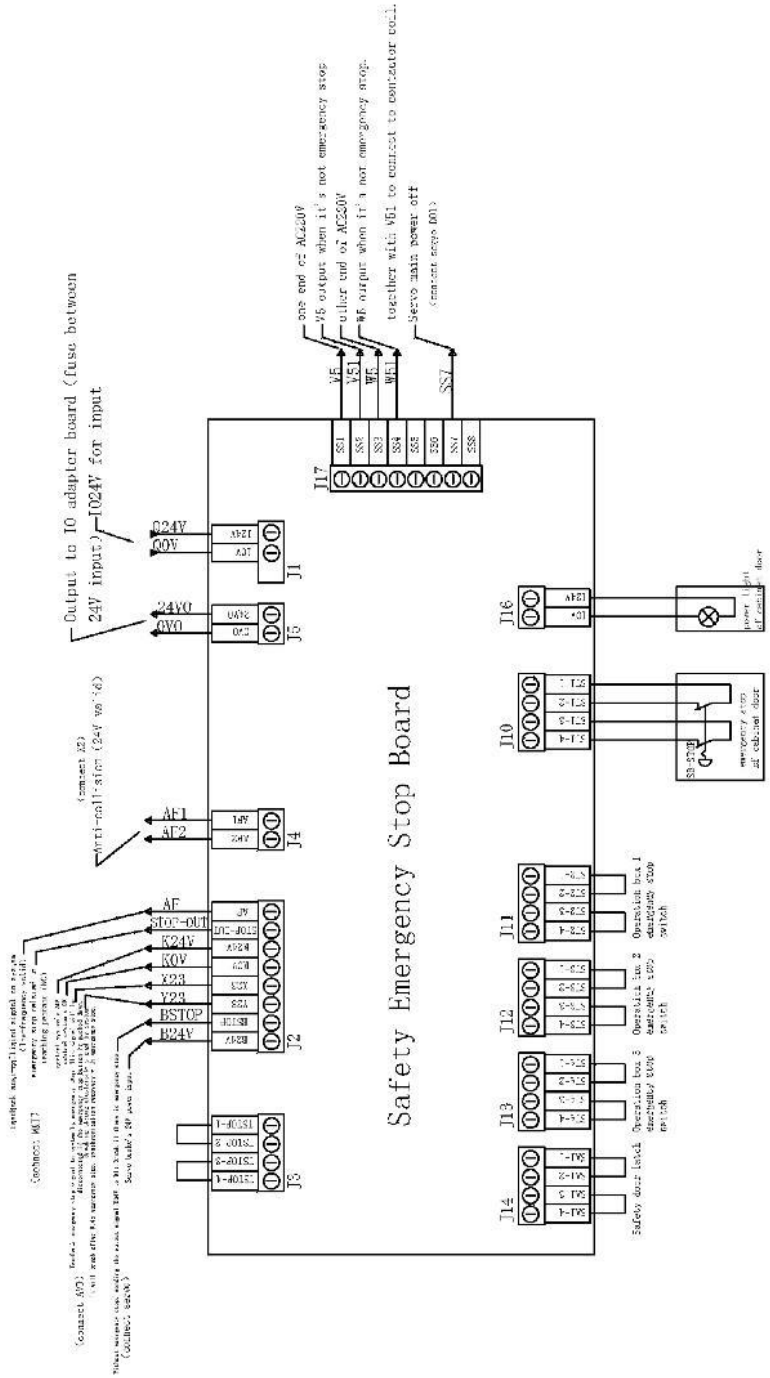
CAUTION !
1. This function is a system mandatory function, please do not try to close it. 2. The main purpose of this function is to confirm the second time, avoiding the opera-tor only paying attention to the teaching box start-up procedure, and ignoring the position and state of the robot, thus causing personal injury. At the same time, it complies with the relevant national safety standards.

5、G4 cabinet Function Blocks Description

5.1 MC Circuit Description

The company's MC circuit mainly refers to the on/off of the main contactor. Mainly used to cut off and turn on the power supply of the main contactor control servo. This circuit is mainly implemented by the Safe Board. When the emergency stop button is pressed, or the drive has a serious alarm, the MC circuit is disconnected, the motor brake is locked, the drive power is cut off, and the robot enters a safe state.

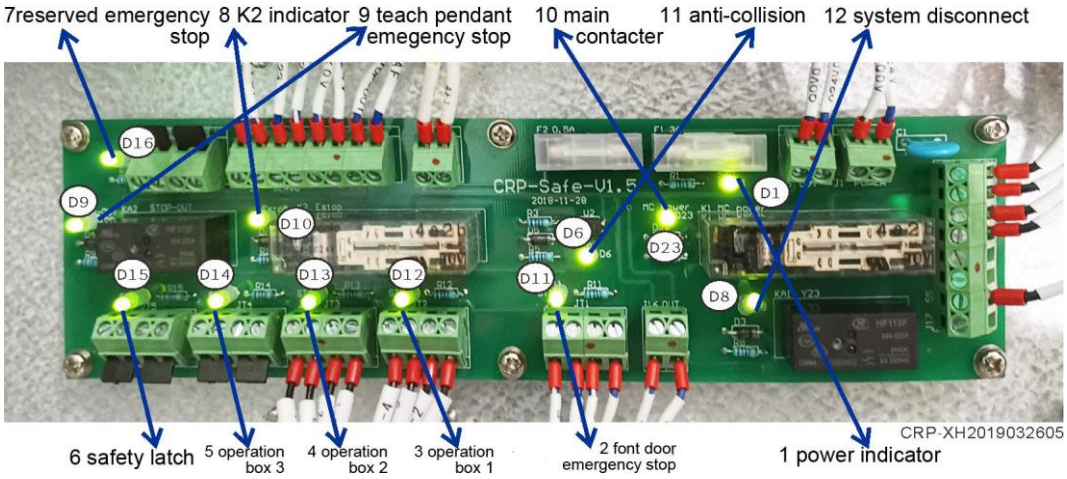
5.1.1 Safety Board Interfaces definition



J11 (operation box 1 emergency stop interface), J12 (operation box 2 emergency stop interface), J13 (operation box 3 emergency stop interface), J14 (operation box 4 emergency stop interface), J13 (backup emergency stop interface). Each group of four terminals, 1/2 of which is a group, 3/4 is a group, note that it can not be cross-connected, nor grounded, otherwise the emergency stop of the road will not work.

The anti-collision signals AF1 and AF2 in the figure are high level inputs. If the line is not connected to the anti-collision (not short-circuited), the system will report an anti-collision error and the welding version has been connected to the anti-collision signal. In addition, if the anti-collision line is short-circuited to the ground or because the wire is broken and the skin is short-circuited to the ground, the fuse will be blown and the anti-collision alarm will be issued.

5.1.2 Safety Emergency Stop Board Troubleshooting



All emergency stop buttons (teaching box emergency stop, operation box 1 emergency stop, operation box 2 emergency stop, electric cabinet door emergency stop, etc.) are pressed, the robot stops quickly, and the teach pendant reports "hardware emergency stop" After resetting the emergency stop switch, press the reset button "R" or the servo power button of the operation box 1 to reset the alarm.

If the teach pendant keeps reporting "Hardware emergency stop", you can check the indicator of the emergency stop board in the electric cabinet to check whether the corresponding circuit is abnormal.

According to the order of the lights in the above figure, the unlit lights are processed in order from ① (the lights are on when the circuit is normal).

5.2 Energy-Saving Mode

5.2.1 Energy-Saving Mode Introduction

The energy-saving mode means that when the robot is in the enabled state, the system is not in the waiting state (Wait), and the system does not send a pulse to control the motor operation. After more than 1 minute, the system will automatically disenable, and the motor brakes are locked.

Main purpose:

1. Safety. When the condition of energy-saving mode is satisfied, the robot appears to be stationary, and the operator thinks that the robot has stopped and entered the working area; but at this time, the robot is still in the enabling position. Once the motion is triggered, the ro-bot will immediately start to operate, which will cause injury to personnel or equipment. This risk can be well avoided by automatically disenabling overtime.

2.Energy saving, when the servo is enabled, the motor and the brake need energy to drive. After disenabling, the brake is locked (return to the original position, the robot joint is locked). The motor is in a free state and no longer consumes energy.

5.2.2 Energy-Saving Mode Adjustment

When users use external devices (such as PLC) to control the start and stop of robots on site, there may be too short overtime or conflict with energy-saving mode. At this time, please contact our technical staff.

WARNING !
Based on the safe use of energy-saving mode, do not adjust the energy-saving mode if it is not absolutely necessary.

5.3 Detailed instruction of the operation box

5.3.1 Operation Box Description





Operation Box 1 (Station 1) has four operation switches, which are mainly used for reappearance or remote mode servo power-on; program start and stop in reappearance mode; program start and stop in remote mode; station 1 start and stop in reservation mode.

Operation box 2 (Station 2; Welding version configuration, no handling version) has three operating switches, which are mainly used for the station 2 start and stop in reservation mode.

Each operation switches' function:

Servo power-on (orange button): User reappearance mode or remote mode servo power-on. When the teaching box is switched to the reappearance or teaching mode, the robot

system automatically servos the power off. At this time, the button must be pressed to power on the servo. When the servo is powered on, the orange indicator of this button lights up.

WARNING !
1. This function is a system mandatory function, please do not try to close it. 2. The main purpose of this function is to confirm the second time, avoiding the opera-tor only paying attention to the teaching box start-up procedure, and ignoring the position and state of the robot, thus causing personal injury. At the same time, it complies with the relevant national safety standards.

Start button (green button): The program for the corresponding mode and station starts, when the program starts running. The green indicator of this button lights up.

Stop button (red button): Program for stopping the operation. When the program stops, the red indicator of this button lights up.

Emergency stop button (mushroom head button): Used to stop the robot when an abnormality occurs.

5.3.2 Operation Box Function and Interface Definition

Operation box 1（Station 1）Servo power-on button and indicator light

In the teach mode, when enabled, the light is on, (Y61)

In the reappearance, remote mode, press this button to clear the alarm and enable (X86)

Operation box 1 start button and indicator light

In the reappearance mode, after enabling, press this button (X84) to start the current program and the light is on (Y60)

In the remote mode, after enabling, press this button to start the specified 1 program, and the light is on (Y60). If it is in the reservation mode, the light will flash.

Operation box 1 stop button and indicator light

In the reappearance and remote mode, during the operation, press this button (X85) to decelerate to stop the current program and the light is on (Y62). If the robot is in the stop state, the light is on.

Operation box 2（Station 2）start button and indicator light

In the remote mode, after enabling, press this button (X21) to start the specified 2 program, and the light is on (Y21). If it is in the reservation mode, the light will flash.

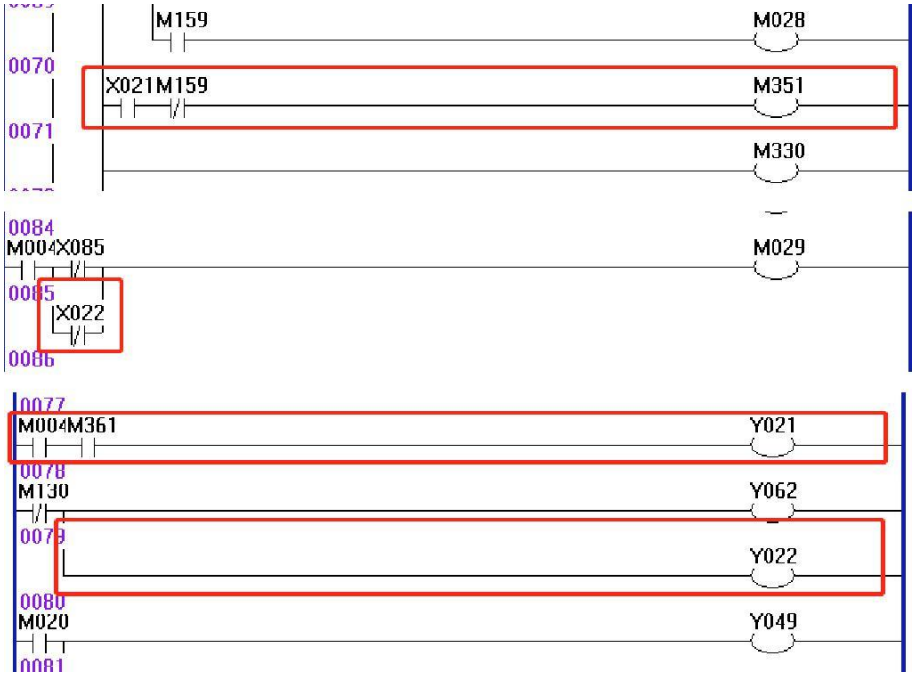
Operation box 2 stop button and indicator light

In the reappearance and remote mode, during the operation, press this button (X22) to decelerate to stop the current program, and the light is on (Y22). If the robot is in the stop state, the light is on.

5.3.3 Release of Operation Box 2

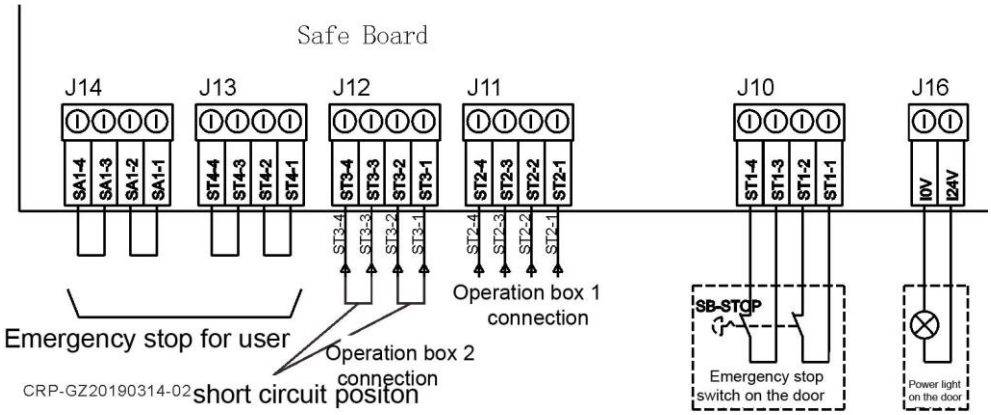
The content of this section only refers to the situation that the workstation box 2 does not need to be used, and the input and output ports are only two less, using the content of this section to release the operation box 2 occupies X21, X22, Y21, Y22 interfaces. This section is not applicable to other occasions. As this section covers the system PLC, please handle it carefully. Avoid by all means.

1. To modify system PLC, delete the following red box inner loop.



2. Cut off X 21, X 22, Y 21, Y22 physical connection. Our suggestion is not to remove the emergency stop curcuit on the operation box 2, so it can be used for a emergency stop box.

3. If it's necessary to remove the emergency stop curcuit, then short connect it as following figure.



5.3.4 Adding operation box

In this section shows the occasion when two operation box is not enough and you need to add extra opration box, system support ten operation box the most.

Example：adding three more operation box.

Because system have two operation box, so we add operation box 3, operation box 4, operation box 5.

Need more operation box you can do it in the same way.

PLC details see 《CRP-CD□0-CRX8 PLC instruction book》

Definition of auxiliary relay:

auxiliary relay	definition	type	illustration

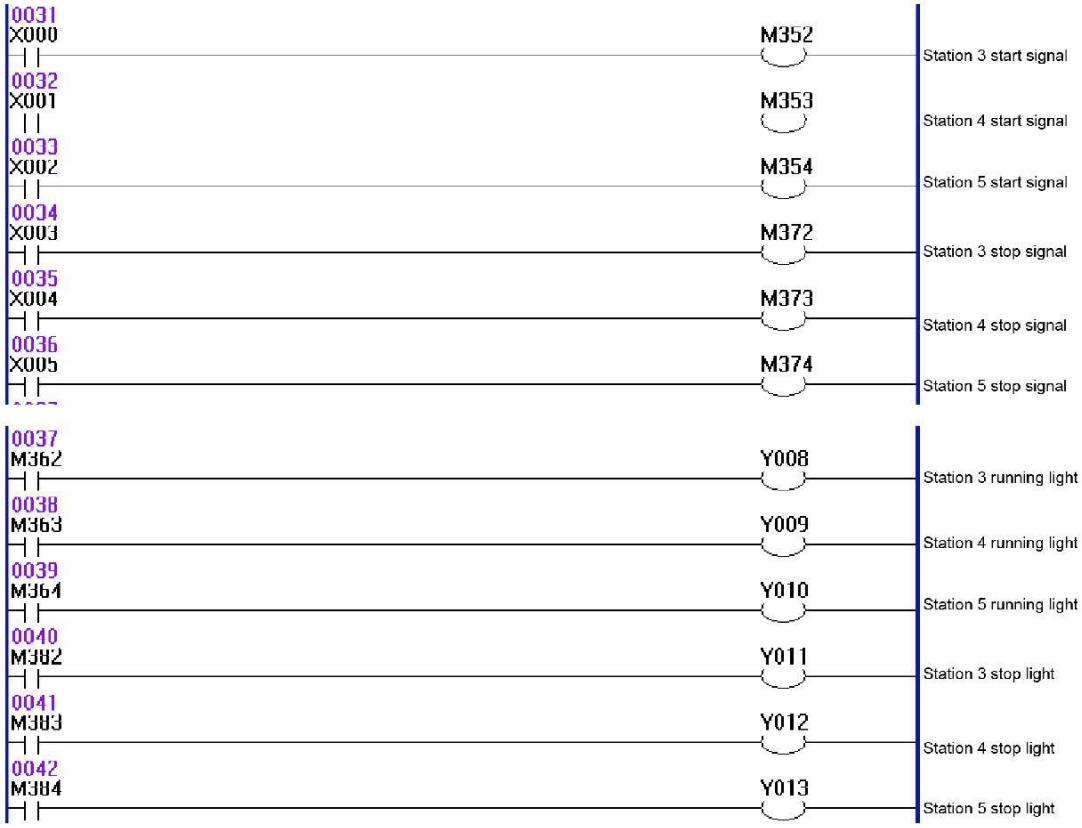
M330	station 1 reserve run permission signal	input	test before reserve program start to run, the rest time no test 1-allow 0-not allow
M331	station 2 reserve run permission signal	input	
M332	station 3 reserve run permission signal	input	
M333	station 4 reserve run permission signal	input	
M334	station 5 reserve run permission signal	input	
M335	station 6 reserve run permission signal	input	
M336	station 7 reserve run permission signal	input	
M337	station 8 reserve run permission signal	input	
M338	station 9 reserve run permission signal	input	
M339	station 10 reserve run permission signal	input	
M340	reserve station 0 failure	input	make sure the signal is on, or:can't reserve, alarm&stop while reserving,cancel the reservation while waiting 1--normal 0--failure
M341	reserve station 1 failure	input	
M342	reserve station 2 failure	input	
M343	reserve station 3 failure	input	
M344	reserve station 4 failure	input	
M345	reserve station 5 failure	input	
M346	reserve station 6 failure	input	
M347	reserve station 7 failure	input	
M348	reserve station 8 failure	input	
M349	reserve station 9 failure	input	

M350	reserve 1 running button, input	input	M35X condition of validity: valid, keep setted valid time signal valid,(operating parameter-20#),invalid,add reservation when no station reservation,continuing when station paused,cancel reservation when station reservation pending.
M351	reserve 2 running button, input	input	
M352	reserve 3 running button, input	input	
M353	reserve 4 running button, input	input	
M354	reserve 5 running button, input	input	
M355	reserve 6 running button, input	input	
M356	reserve 7 running button, input	input	
M357	reserve 8 running button, input	input	
M358	reserve 9 running button, input	input	
M359	reserve 10 running button, input	input	
M360	reserve 1 running light, output	output	operating parameter-30#, set M36X output ways: 0-runing light on, stop runing light off, 1-program complete output 2 seconds, 2-reserve light on complete light off No reservation: 0-off 1-off 2-off waiting for reservation: 0-twink 1-off 2-off reserving: 0-on 1-off 2-on, reservation stopping: 0-off 1-on when completed, off in 2 seconds, 2-on
M361	reserve 2 running light, output	output	
M362	reserve 3 running light, output	output	
M363	reserve 4 running light, output	output	
M364	reserve 5 running light, output	output	
M365	reserve 6 running light, output	output	
M366	reserve 7 running light, output	output	
M367	reserve 8 running light, output	output	
M368	reserve 9 running light, output	output	
M369	reserve 10 running light, output	output	

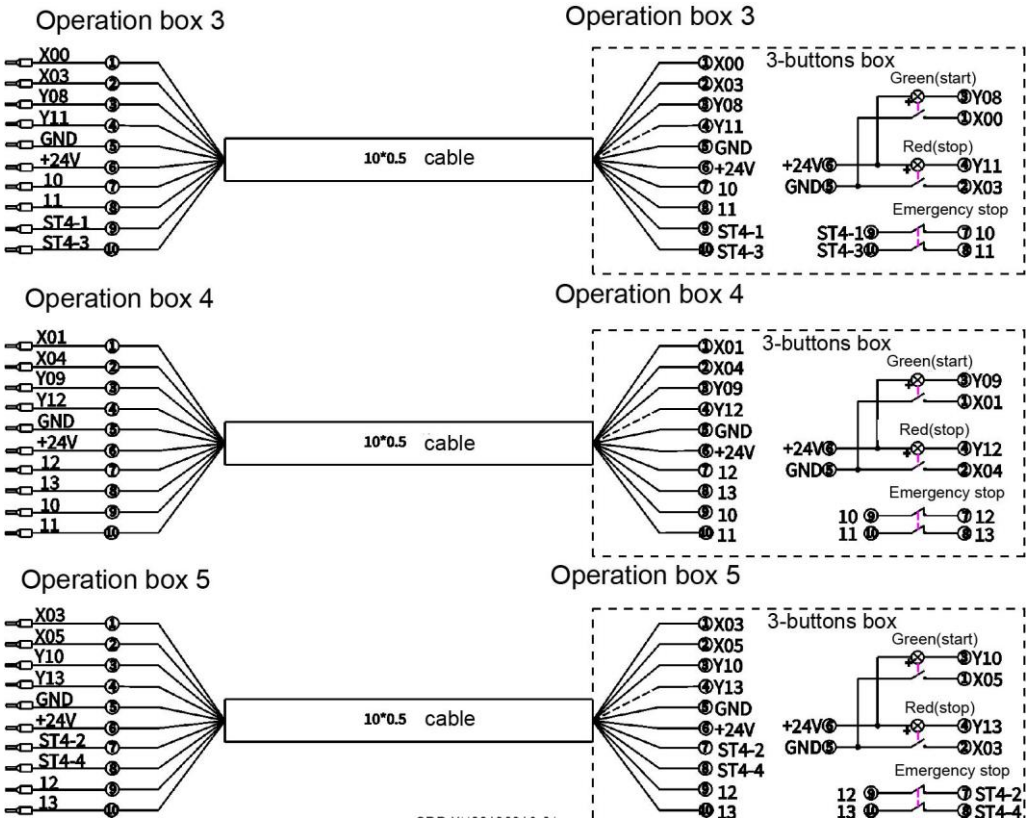
M370	reserve 1 stop button, input	input	When the corresponding station is running, stop running. Other states have no action
M371	reserve 2 stop button, input	input	
M372	reserve 3 stop button, input	input	
M373	reserve 4 stop button, input	input	
M374	reserve 5 stop button, input	input	
M375	reserve 6 stop button, input	input	
M376	reserve 7 stop button, input	input	
M377	reserve 8 stop button, input	input	
M378	reserve 9 stop button, input	input	
M379	reserve 10 stop button, input	input	
M380	reservc 1 stop light, output	output	reserve stopping, stop light on
M381	reservc 2 stop light, output	output	
M382	reservc 3 stop light, output	output	
M383	reservc 4 stop light, output	output	
M384	reservc 5 stop light, output	output	
M385	reservc 6 stop light, output	output	
M386	reservc 7 stop light, output	output	
M387	reservc 8 stop light, output	output	
M388	reservc 9 stop light, output	output	
M389	reservc 10 stop light, output	output	

User PLC adjustment, need add M 332-M334（station permission, necessary）, M342-M344（station failure, necessary）, M352-M354（station start, necessary）, M372-M374（station stop, necessary）, M362-M364（running light, accordingly）, M382-M384（stop light, accordingly).





Connection figure, connect X00-X05, Y08-Y13 to 3.2.9 I/O board（customer use）, TX1 and TX 2 terminal , define 10, 11, 12, 13 cascade. Connect ST 4-1, ST4-2, ST4-3, ST4-4 to 4.1.1 Safe Board J13 terminal.



5.4 External axis (CDK□) description

5.4.1 External axis (CDK□) description

Currently G4 controller cabinet support adding one external axis (CDK1) or two axis (CDK2).Max rated current for external axis is 1 5A, The rated load cannot be reached when the motor exceeds 15A.

It also need to adjust when adding external axis:

1.Brake power supply(UK2), adjust from 100W to 150W, otherwise, the brake will not open effectively. For those which has added external axis before leaving the fac - tory the brake power supply has already adjust to 150W.

2.Transformer(TC1) adjust from 3000VA to 5000VA。For those which has added ex-ternal axis before leaving the factory the transformer has already adjust to 5000VA.

Illustration !
To adding more than two axis, the control cabinet needs to be replaced.

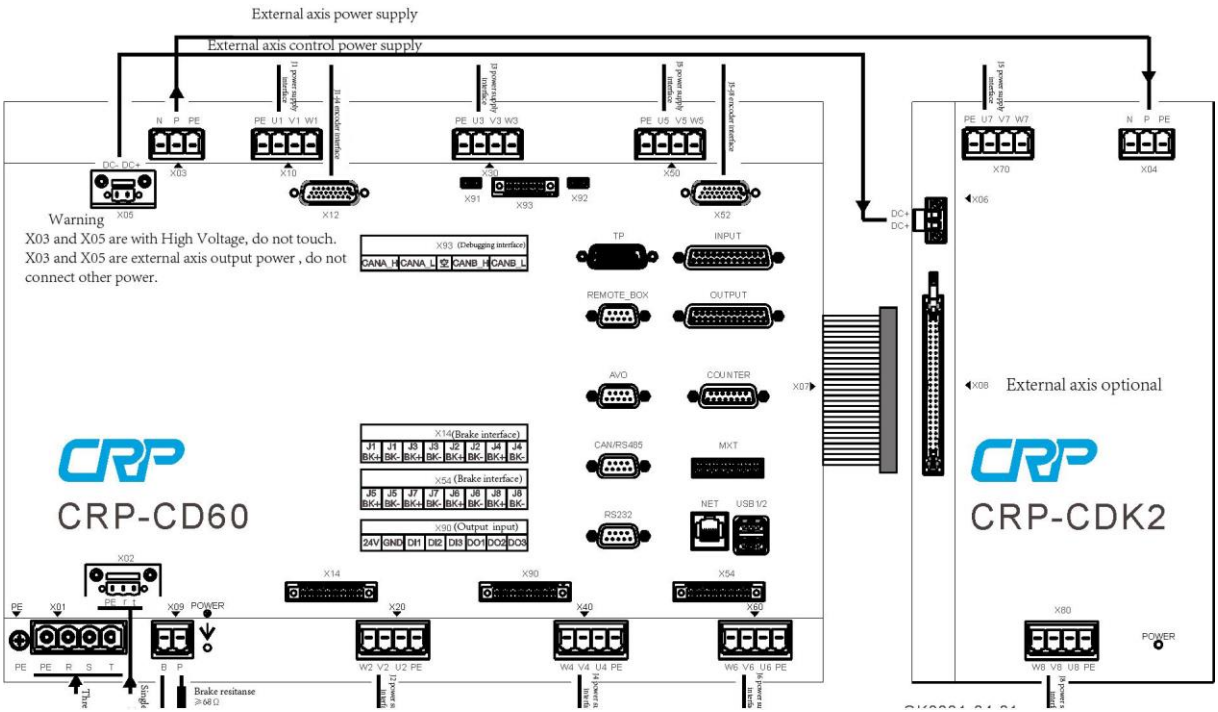
5.4.2 External axis installation and connection

1.Shut off the main power supply of the control cabinet (SQ1). Close the front power switch input to the control cabinet at the same time.

2.Replace the power supply of the brake(UK2).

3.Replace the transformer(TC1)。

4.Mounting external axis (CDK1 or CDK2) to reserved position of the cabinet, and connect (X03-X04, X05-X06, X07-X08)of CD60, as figure bellow.



5.Coonecting motor of the external axis. Motor encoder line connected to X52 terminal of the CD60. Connect the motor power line to X70(7 axis) and X80(8 axis) terminal of the CDK□.

More details on《CRP-CD□0-CRX8 operating manual》《CRP-CD□0-CRX8 debugging

manual》

5.4.3 External axis debugging

External axis（CDK1 和 CDK2）only matchs：Hechuan motor or Tamagawa encoded motor, can not matched other motor.

External axis adjustments:

System-parameter setting-drive parameter-motor matching(motor model,current, torque, inductance, rotate speed, etc)；

System-parameter setting-drive parameter-motor matching(parameter recognition: electrical angle)；

System-parameter setting-general parameter(Inertia, gain, integral, power selection, brake selection, encoder selection, etc)；

System-parameter setting-mechanism parameter (adjustment reduction ratio)；

System-parameter setting-servo parameter(set pulse, feedback, speed, three directions)；

System-parameter setting-speed parameter(joint speed, acceleration)；

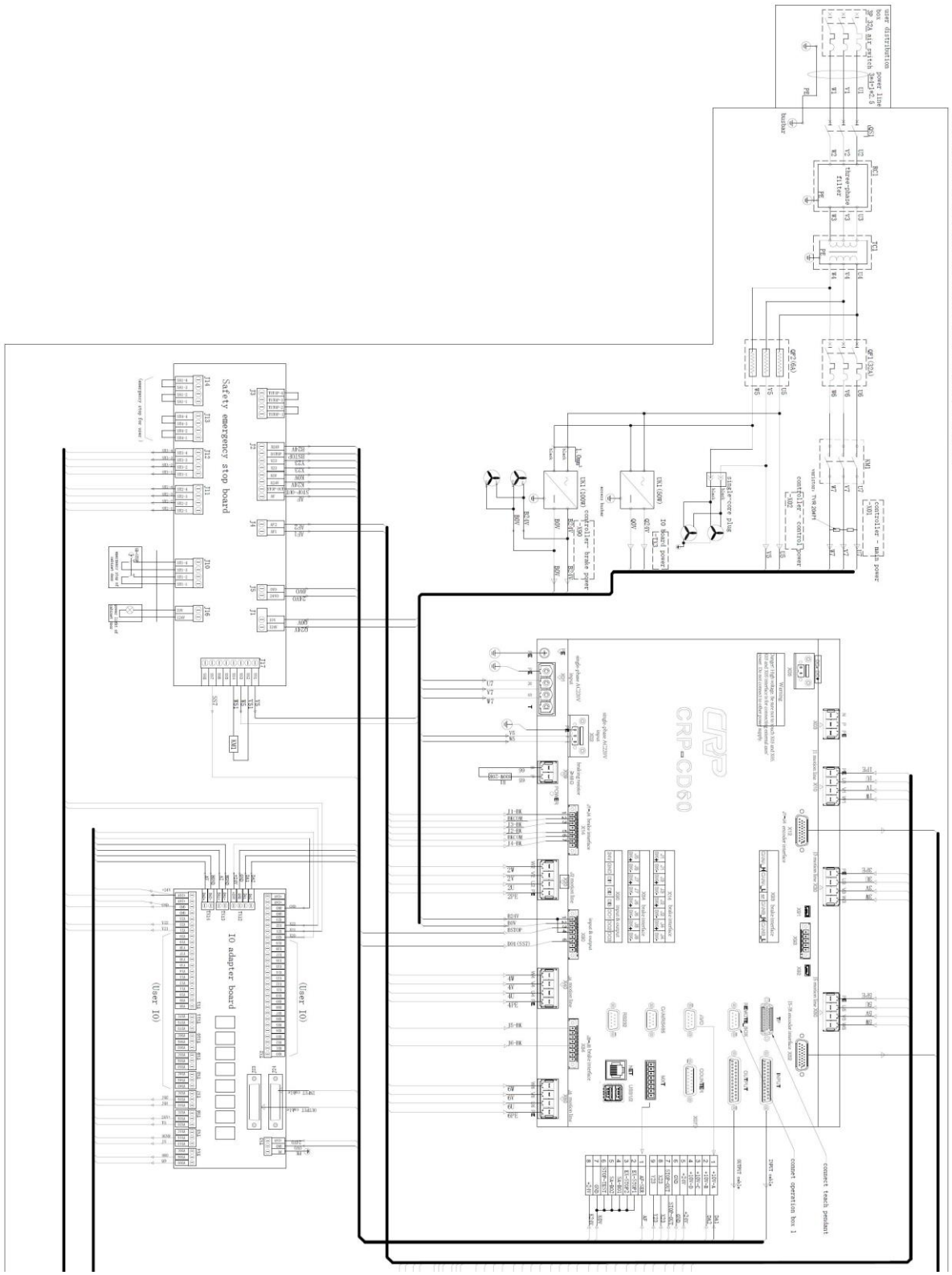
System-running preparation-zero point setting(external axis zero point）；

System-parameter setting-soft limit(external axis limitation range)；

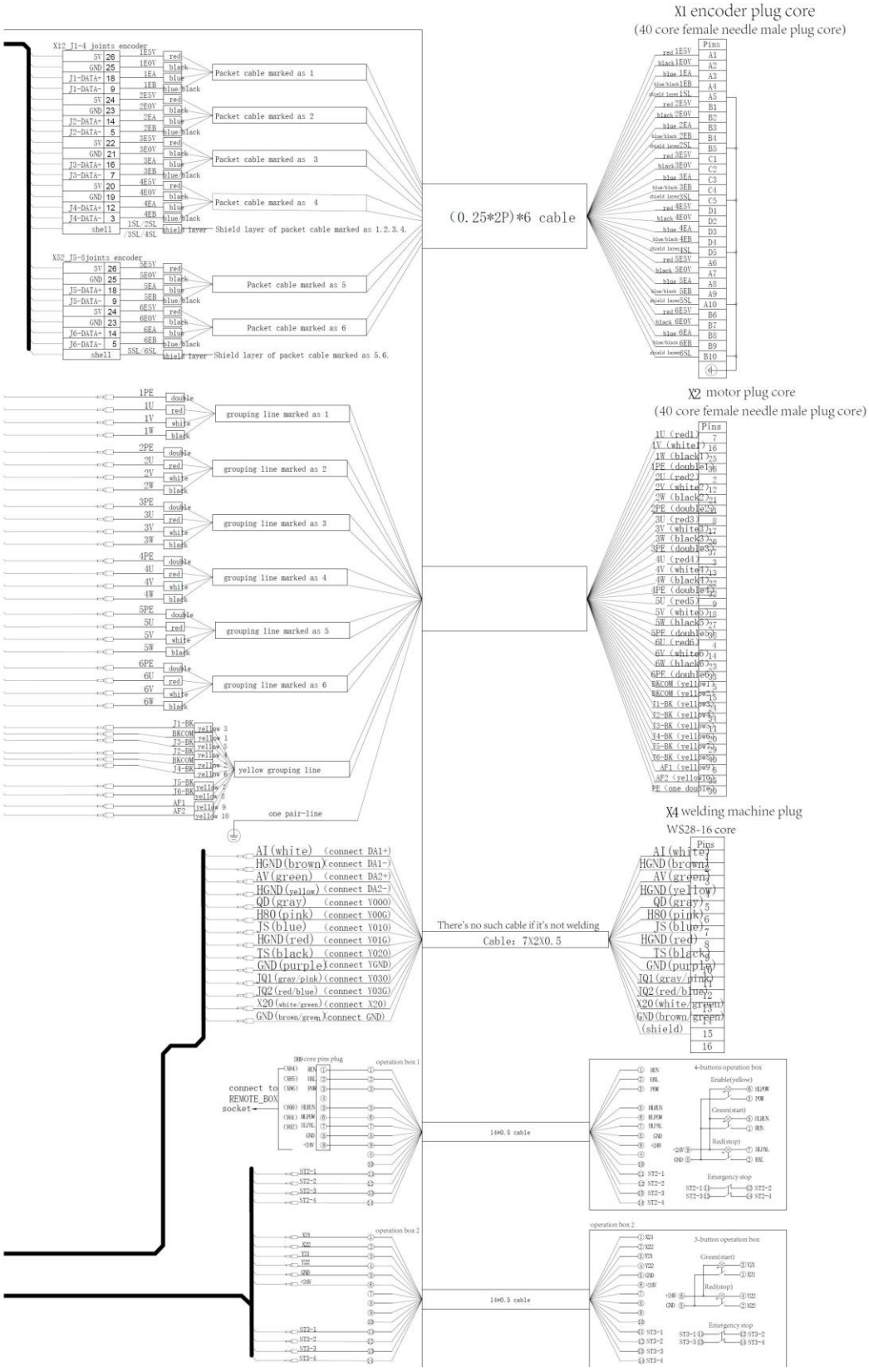
More detail on《CRP-CD□0-CRX8 operation manual》《CRP-CD□0-CRX8 debugging man-ual》.

6、G4 electrical cabinet electric appliance and cable diagram

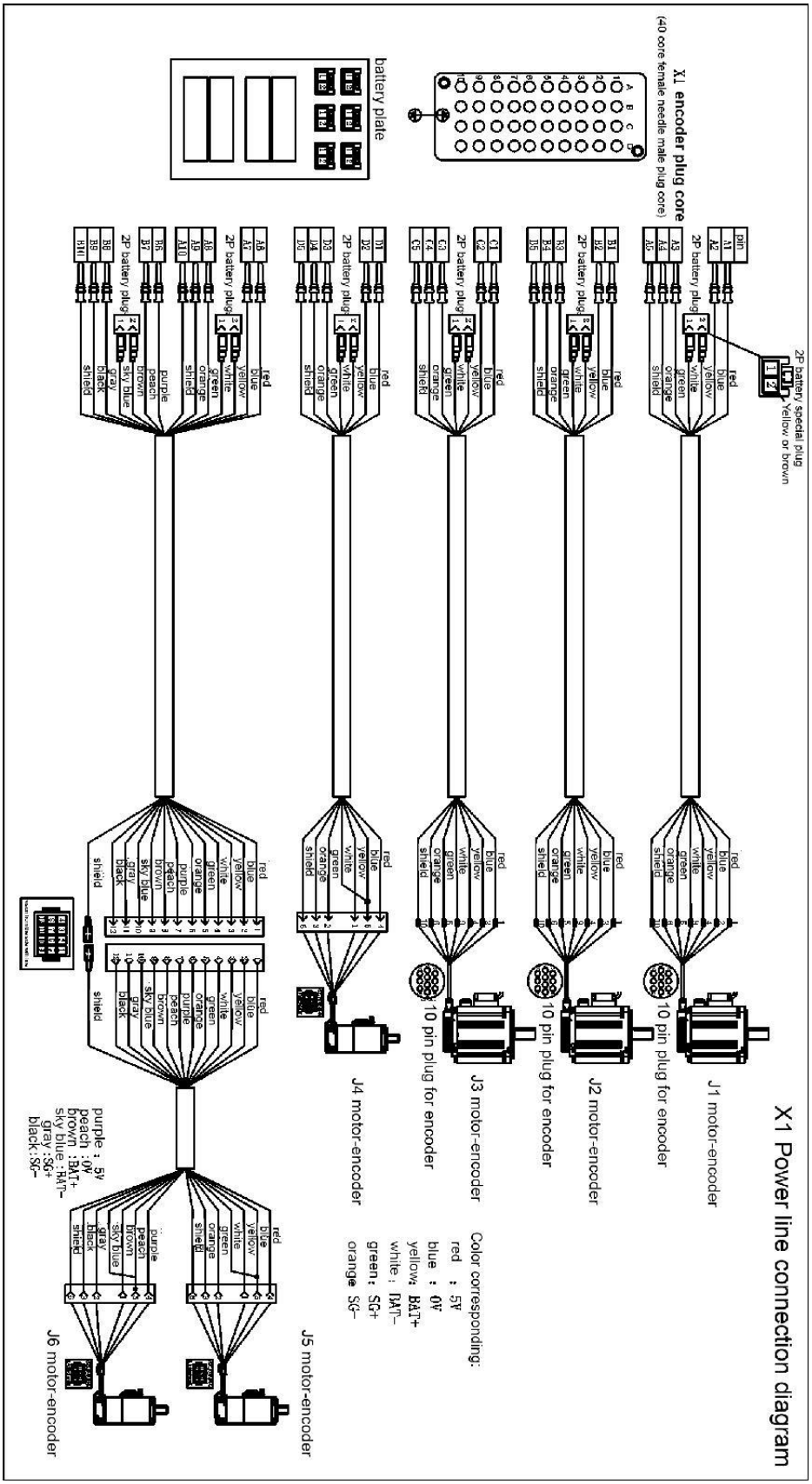
6.1 Electrical principle diagram



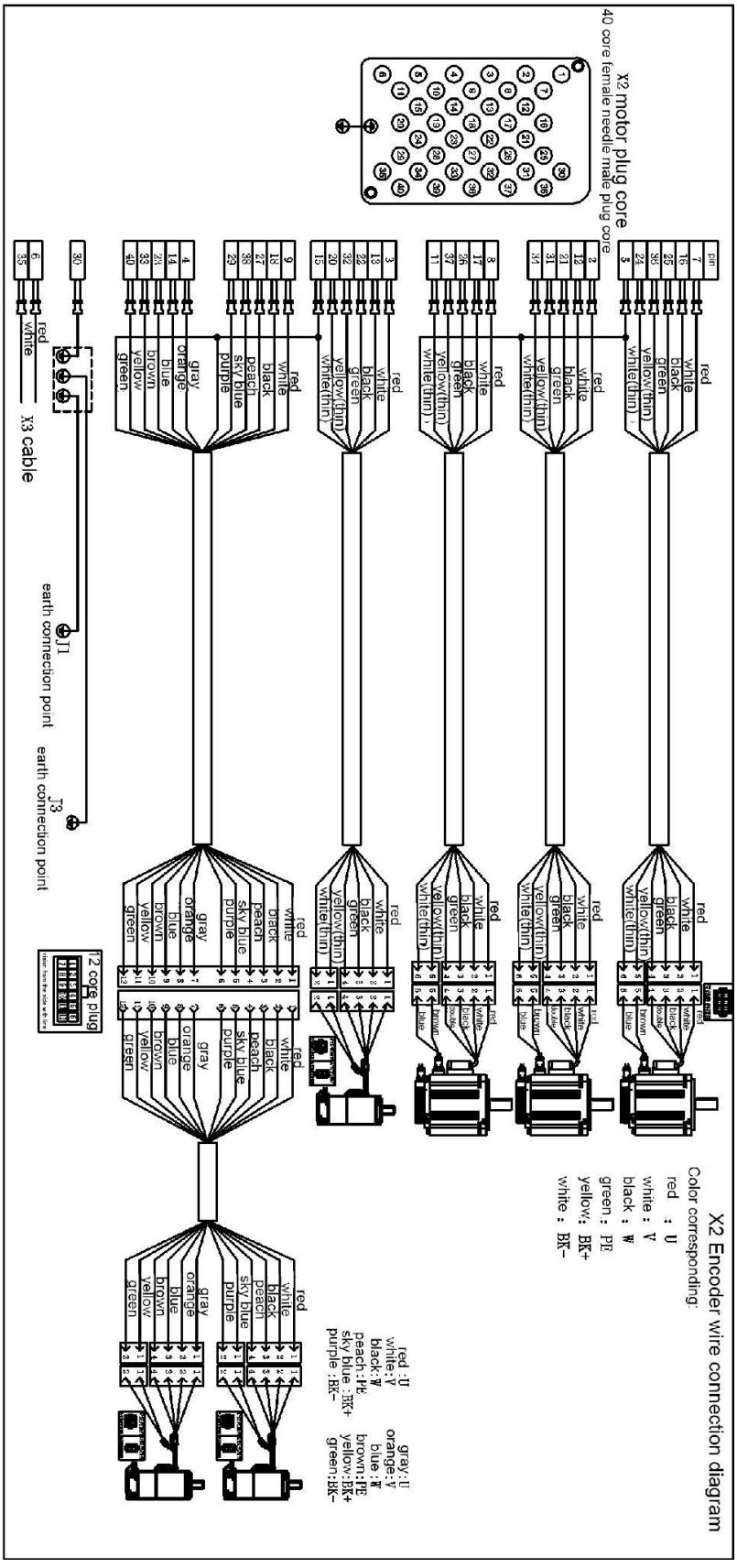
C4 electrical cabinet internal and external connection diagram


X1 encoder plug core
(40 core female needle male plug core)
X2 motor plug core
(40 core female needle male plug core)
X4 welding machine plug
WS28-16 core
(0.25*2P)*6 cable
Packet cable marked as 1
Packet cable marked as 2
Packet cable marked as 3
Packet cable marked as 4
Packet cable marked as 5
Packet cable marked as 6
Shield layer of packet cable marked as 1.2.3.4.
Shield layer of packet cable marked as 5.6.
grouping line marked as 1
grouping line marked as 2
grouping line marked as 3
grouping line marked as 4
grouping line marked as 5
grouping line marked as 6
yellow grouping line
one pair-line
There's no such cable if it's not welding
Cable: 7X2X0.5
14*0.5 cable
14*0.5 cable
connect to REMOTE_BOX socket
operation box 1
operation box 2
4-buttons operation box
3-button operation box
Enable(yellow)
Green(start)
Red(stop)
Emergency stop

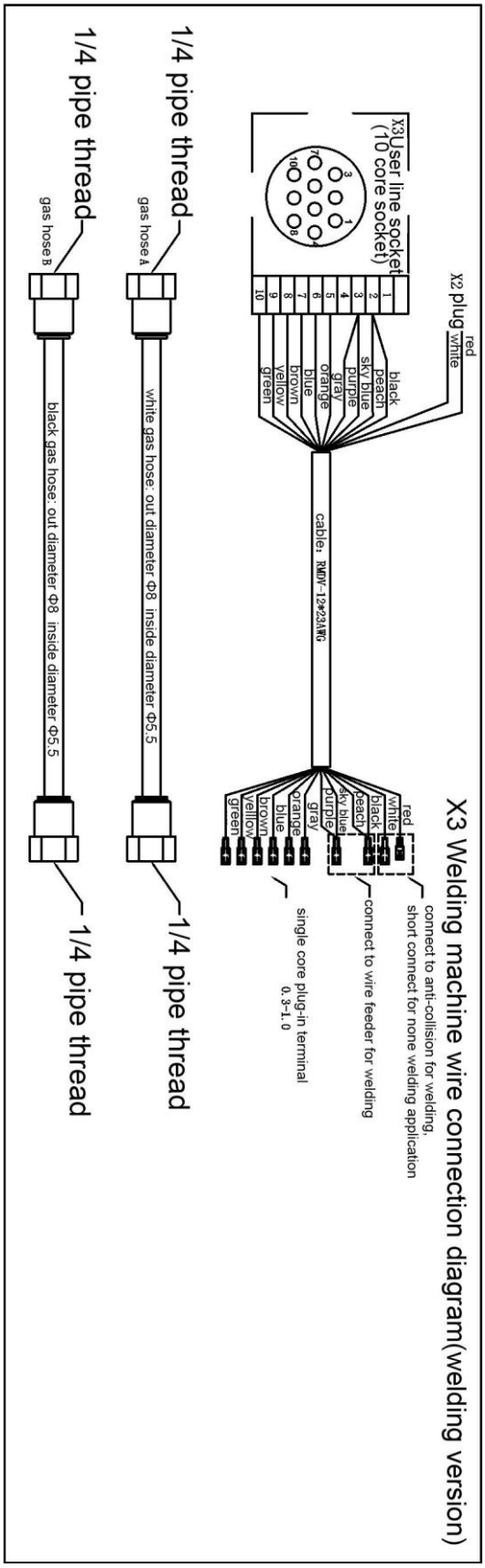
6.2 X1 Power line connection diagram



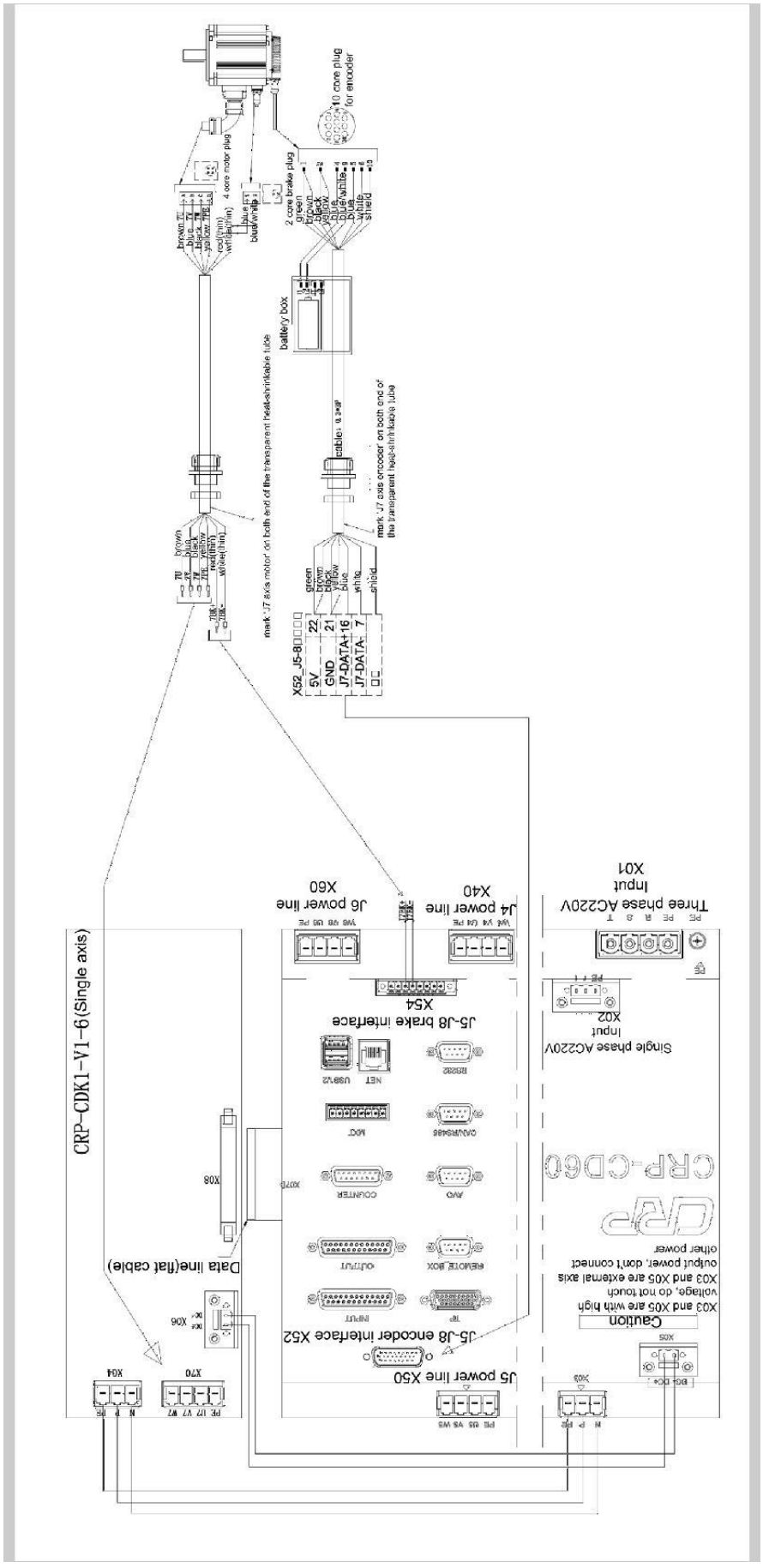
6.3 X2 Encoder wire connection diagram



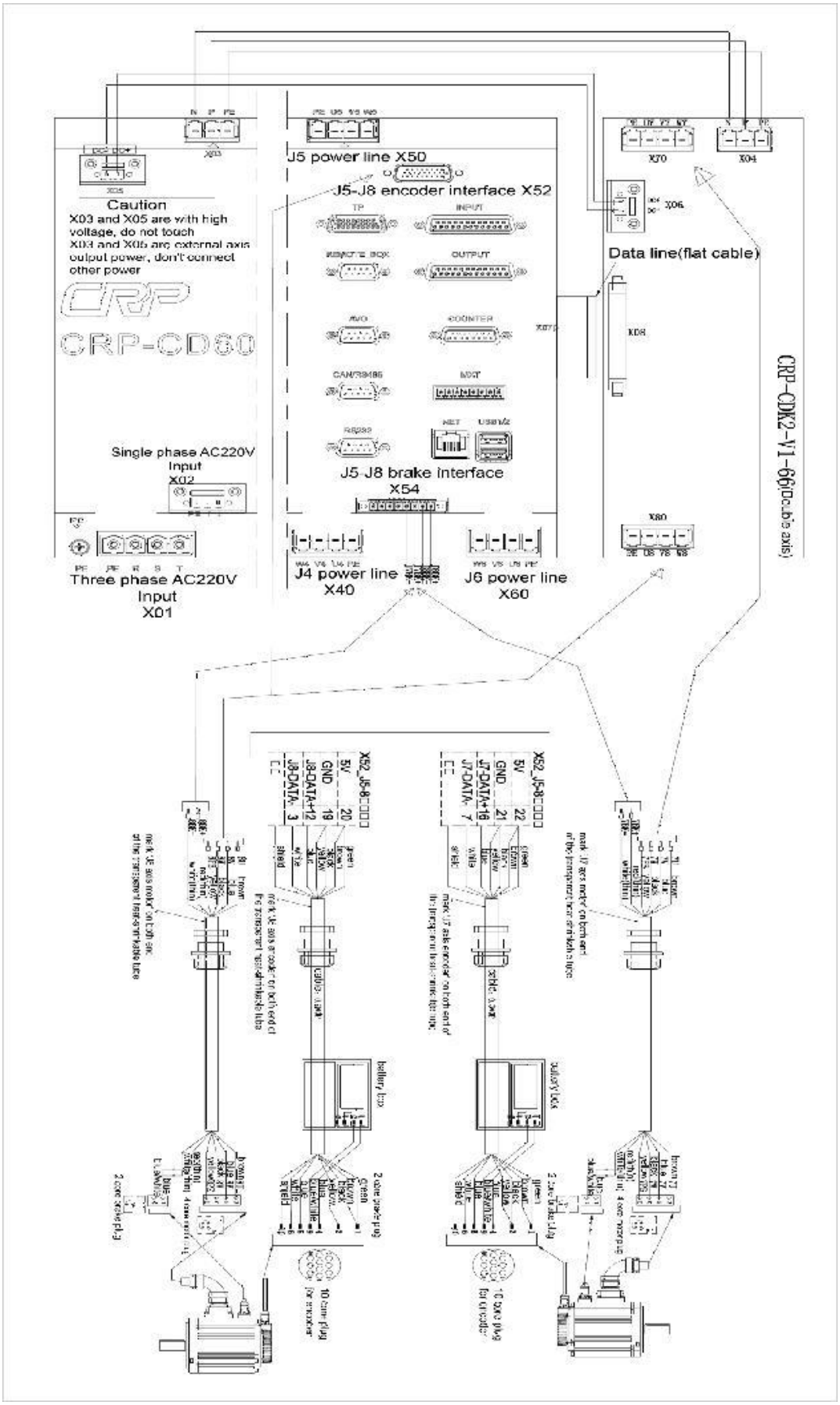
6.4 X3 Welding machine wire connection diagram(welding version)



6.5 External single axis connection diagram



6.5 External double axis connection diagram



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