Scara Robot User And Maintenance Manual Book

DONG GUAN WELDO

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CONTENT

Chapter 1 Scara Robot Introduction 1
1.1 Brief Introduction 1
1.2 Basic Technical Parameter 1
Chapter 2 Software Operation interface ..... 错误! 未定义书签.
2.1 menu bar 2
2.1.1 open file 2
2.1.2 file save and creat new 3
2.1.3 lock status 3
2.1.4 System parameter setting 4
2.1.5 Procedure setting 4
2.1.6 Language Option 4
2.1.7 Read machine ID ,register or update register code 4
2.2 Display window 4
2.2.1 view option 5
2.2.2 track 5
2.2.3 robot hand position parameter 5
2.3 movement controlling interface 6
2.3.1 manual movement controlling 6
2.3.2 position monitor ,big arm and small arm single controlling 6
2.3.3 motor enable and output end debug 7
2.3.4 project's setting key point download and position debug 8
2.3.5 working, download file and clear alarm 9
Chapter 3 Robot operation procedures 10
3.1 Turn on 10
3.1.1 set IP address 10
3.1.2 open software 11
3.1.3 adjust air pressure 11
3.2 adjust 11
3.2.1 robot status debug 11
3.2.2 output ending satus debug 12
3.2.3 position point debug 12
3.2.4 working speed and torque limitation debug 13
3.3 robot start and stop 13
3.3.1 robot start 13
3.3.2 robot stop and alarm clear 13
Chapter 4 normal fault analysis and solution 14
4.1servo motor alarm 14

DONG GUAN WELDO

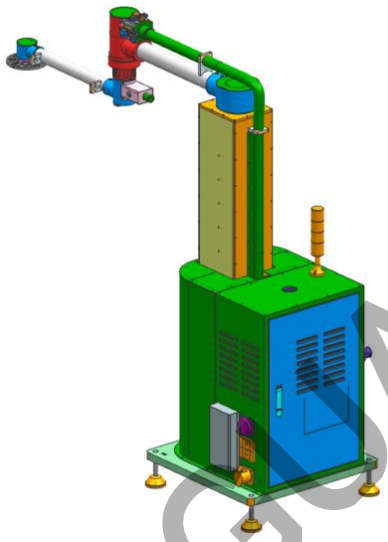
4.1.1 servo motor normal alarm code and analysis 14
4.1.2 encoder lose power and solution 15
4.1.3 origin and key point setting 15
4.2 Other alarm 16
Chapter 5 maintenance 17
5.1 Daily maintenance 17
5.1.1 electricity maintenace 17
5.1.2 penumatic system maintenance 17
5.1.3 mechanical maintenace 17
5.2 reducer maintenace 18
5.2.1 lubricating grease 18
5.2.2 lubricating grease 18

DONG GUAN WELDO

Chapter 1 Scara Robot Introduction

1.1 Brief introduction

Scara robot consists of robot body (mechanical construction) , controller , servo driven system , inspection sensor device and pneumatic system , it is a humanoid robot, and a automatic control system to achieve automatic control , repeat program , 4 axis transmission to complete tasks in 3 three-dimensional space. It is suitable for flexible production of multiple varieties and variable batches, and plays an important role in stabilizing, improving production efficiency, and improving working conditions.



1.2 Basic Technical Parameter

1、Robot Dimension：1000*650*1200mm；

2、Robot Net Weight：345KG。

3、Working Temperature：-5～65 ℃。

4、Power source：AC220V，50HZ；

5、weak power output：DC24V。

6、max working power：2KW。

7、pressed air：5.0～7.0 kg/cm2 。

8、control system：motion controller , AC controller , pneumatic control unit.

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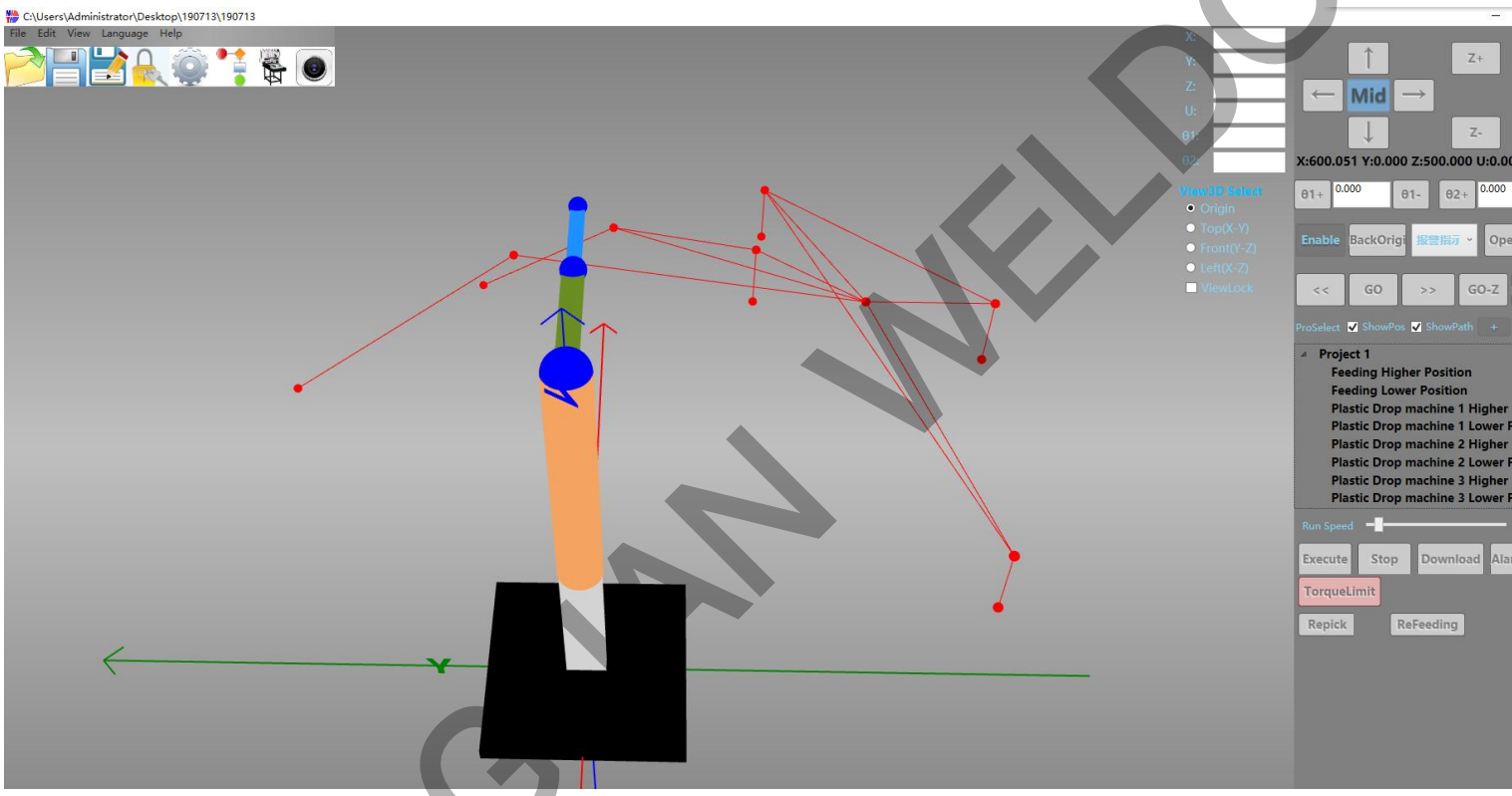
Chapter 2 Software Operation Interface

Software operation is robot main operation interface for user , includes edit program, motion control , system debug , status monitor ect. User start computer , click ico 

to ope weldo robot software to home page



2.1 menu bar

2.1.1 open file

click  to open saved processing project file.

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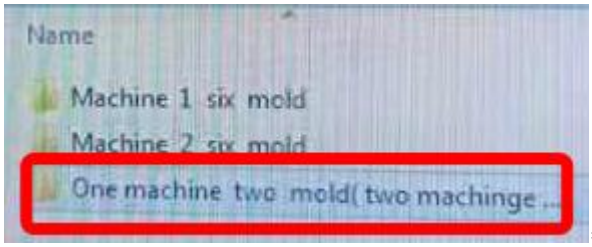
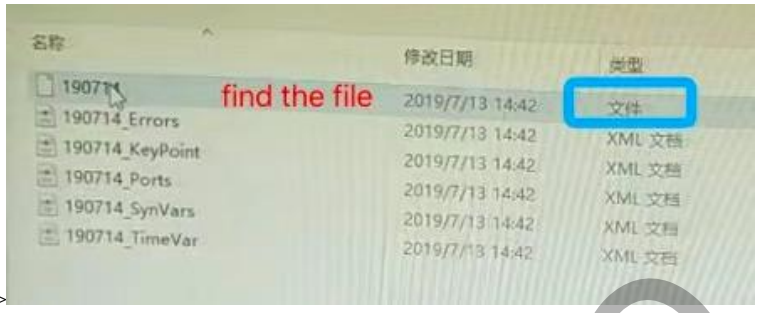


=> 

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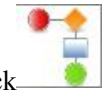
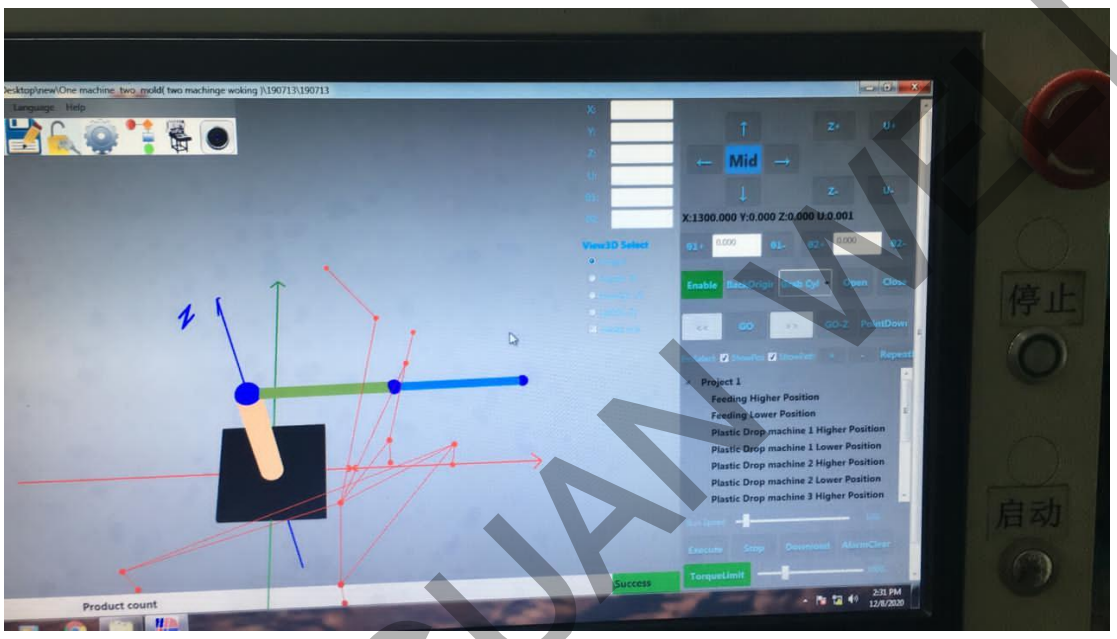
click  => click download to controller , robot will move as current project.



2.1.2 file save and create new

click  to save current project, if the user changes current project parameter or reset, please click  to save .

Click  and save file to computer disk folder. If user needs to create a new file , please first complete current project and save to a position,please give new name to avoid covered by other file.

2.1.3 Lock status

Click  to lock interface to avoid wrong operation and accident when robot running.

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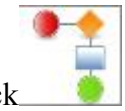
2.1.4 system parameter setting

click  to system parameter setting , includes machine body parameter , software parameter , technical parameter,IO parameter ,and update firm and other setting operation . User should be trained to set robot motion speed , processing model , I/O output , safety set and other set

2.1.5 procedure set

click  and enter procedure set， according to different project to set different procedure. Procedure set generally set and debug by Weldo engineer , user no need to set . except special conditions . to ensure safely production , please consult Weldo engineer to do set.

2.1.6 Language Option

Click ‘Language’ to shift language , there are two option ‘ CHINESE ‘ and ‘ English .

2.1.7 Read Machine ID and register / update register code

Click’help’ to process position debug , read machine ID, register/update register code .

1、read machine ID： it is machine code to produce a register code , user must register the machine to use the robot. Under online situation , click ‘ help-> read machine ID‘ to get robot ID 。 ID displayed at the left corner .

2、register /update register code : register code is the key to software , each code has is expired date. Once register code expired , robot is lock , clients needs to update the register code . before update , please read machine ID to get robot ID and send to Weldo to produce new code . the user get new code and click ‘ help-> register/ update register code ‘ and input new code , click ‘update’ to register.

2.2 Display Window

Display window——it is to display robot running position , track and situation.

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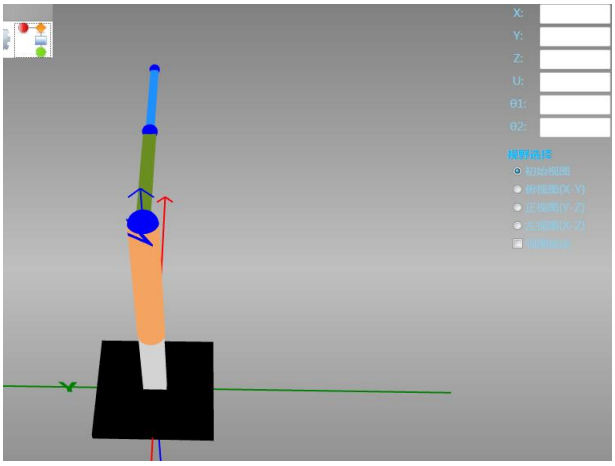


2.2.1 View option

Through the initial view, top view, front view, and left view, the operating state of the manipulator can be observed from different angles.

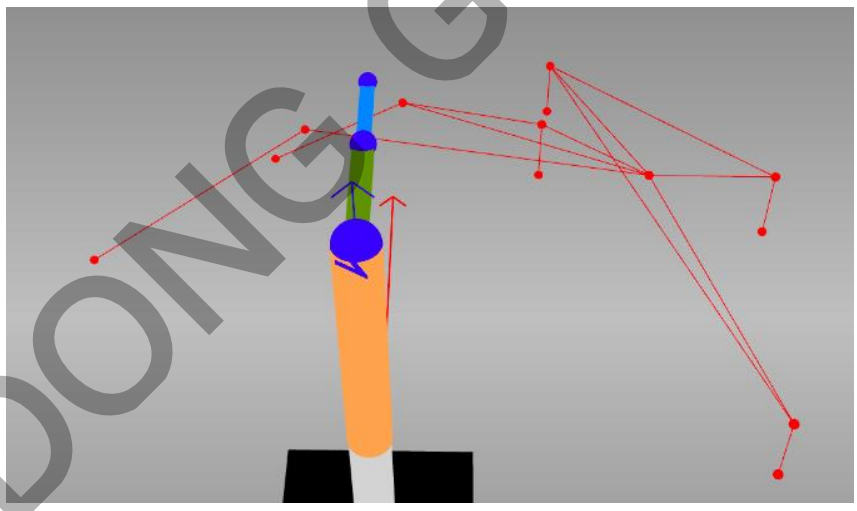
After the view is locked and selected, the manipulator graph in the current view cannot be enlarged or shifted by the mouse.

2.2.2 Track

In display window clearly displays robot running position and track(‘ display position ‘ and ‘ display track’ after selected)

1.point’s position is robot program set running order point .

2. Line’ track is robot run from one order point to another order point.



(the red line is the robot run track , the red point is the position of each point .)

2.2.3 Robot Position Point Parameter

In procedure selection window choose a position point , in display window displays the setting parameter

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1、coordinate (X axis,Yaxis): after set Origin coordinate, robot end point is relative to X axis and Y axis Origin.

2、Z axis：Z axis is robot arm up and down height parameter.

3、U axis：U axis is the angle of sucker plate rotation.

4、θ1：big arm is relative to the Origin rotation angle。

5、θ2：small arm is relative to the Origin rotation angle.

2.3 Movement Controlling interface

Operation movement controlling interface must be under unlock status, and robot not automatically running status

2.3.1 Manual movement controlling

When require to set robot position and program position debug , please stop robot working ,and click lock button to lock the robot , under this situation , please manual move robot to set project each position.

1、click “←、→”:in coordinate, “←,→” means control robot ending point moving to Y+ , Y- direction.

2、click“↑、↓”：in coordinate, ”↑,↓” means control robot ending point moving to X+,X- direction.

3、click“Z+、Z-”：means control robot arm Z axis moving in linear way UP and down

4、click“U+、U-”：in polar coordinate, means control robot arm U axis move in clock-wise and anti-clockwise rotation.

5、speed control：manual control speed through mouse click shift 3 speed model ‘ slow, middle, fast’

2.3.2 position monitor ,big arm and small arm single controlling

Position monitor can monitor robot running parameter to each position in real time.

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1、X、Y value：display robot ending position in coordinate (X,Y) .

2、Z value：display Z axis height position relative to origin.

3、U value：display U axis angle rotation degree relative to zero angle.

4、（θ1+、θ1-）：in polar coordinate, during robot running , display big arm (X axis) rotation degree. Under enable condition, click θ1+, big arm moves to anti-clockwise,click θ1-, big arm moves to clock wise.

5、（θ2+、θ2-）：in polar coordinate, during robot running , display small arm (Yaxis) rotation degree. Under enable condition , click θ2+, small arm moves to anti-clock wise , click θ2- , small arm moves to clock wise.

2.3.3 motor enable and output end debug

1、Enable：it is motor enable, control motor open and close.

1） click ’enable’ to open (becomes green light) , motor locked and under controller situation , after enable , control robot single step run or automatically run.

2） click ‘enable’ again to close enable (button becomes red light), except Z axis, each axis motor unlocked under off controller controlling situation.close ‘enable’ , operator can manual move X,Y,U axis (big arm , small arm and rotary axis), Z axis through controller and front up and down button to control .

（ red button : up and down button)

2、Back safety point: robot back to the position without barrier .

Based on actual situation, under enable locked condition , move robot arm to safety point, in menu bar’s parameter column click ‘ download’ (

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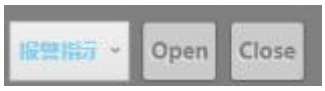
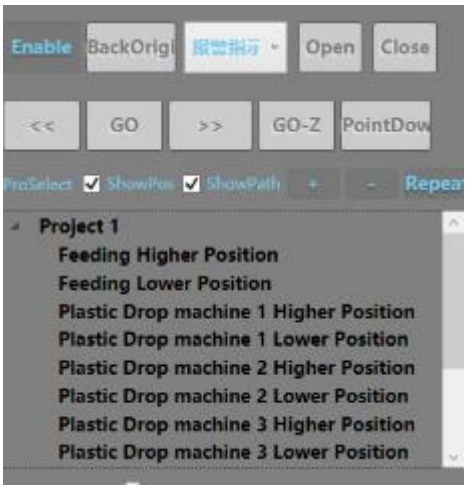
3、output port interface debug： 

， debugging output port can be selected at project interface , click pull menu , click needed debugging output , click’ open’,’ close’ to do debug.

2.3.4 Project's setting key point download and position debug



After edited project that need to set and debug key point .

1） close motor enable : before download , please close motor enable.

2） Move to the first key point : first choose the first point, for example , feeding high point, manual move robot arm to the first processing point , adjust position , click’point download 

’ and click ‘ download ’ to save the first point position parameter .

3） move to the second key point : after download the first point , and select the second key point , manual move robot arm to the second processing point, adjust position , click click’point download 

’ and click ‘ download ’ to save the second point position parameter. Same procedure to select the 3rd, 4th keypoint until all points well set .

4） Repeat point： if there is any position is repeated , repeated point can be set

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Clik' +' to create a repeat group, example as group 1: select repeat point at left window, 点击"+"新建一个重复的组，如组 1；左边窗口选择需要重复的点，如拆垛高位和返回拆垛高位，点击">>"，添加到重复点。在重复点窗口中选择需要移出的重复点，点击"<<"即可。点击"-"可以删除选定的重复组。

5）Go to point ：

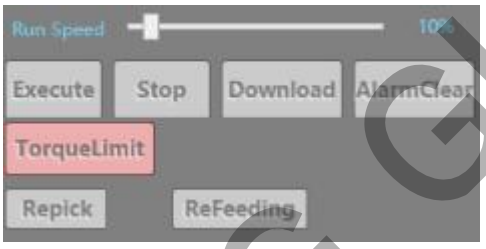
First open 'Enable', shift interface to controlling model. 。

Choose one point to go , click'GO' , robot arm move to the pointed position .(please consider safety when robot arm goes to any position .

Select one position point , click 'GO-Z', robot Z axis move to pointed height position,other axis will do not move.

6)display position and track: display position and track, display window will display robot project processing procedure and robot arm movement position point and linear track, continue click '>>', robot will process the project from up do down, move to corresponding position point , continue click'<<', robot arm will process the project from down to up , move to corresponding position point.

2.3.5 working, download file and clear alarm



1) Run speed: through mouse to slide left and right to adjust the working speed.

2) Download : before start, click ' download' , robot will carry bout current processing file .

3)Execute: before start , please click' download' file , after debugging no problem , click ' start' , robot will automatically complete the whole project procedures.

4)Stop: click' stop' , robot stop working.

5) AlarmClear： during robot working , if any error and alarm happened, status bar will display alarm error,click right mouse to find handling errors method. Based on reminder, clear alarm, click' clear alarm', and robot can continue working. Besides, when motor alarm, please stop robot power first and clear alarm。

6） Torque limit: Under robot debugging and different production model, require to set torque limitation

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size. Before production , first debug , click ‘torque limitation’ button (become to green button) , adjust motor torque to low position , please confirm to safety production , and adjust torque to high position and start production.

Chapter 3 Robot operation procedures

3.1 open

After confirmed electricity cable all safety, turn on red power , please ensure emergency button opened , and start computer .

3.1.1 set IP address

Robot running needed to set fixed model IP address

IP addresss :192.168.0.xxx。

Below address can not be set:

192.168.0.1。

192.168.0.11。

192.168.0.255。

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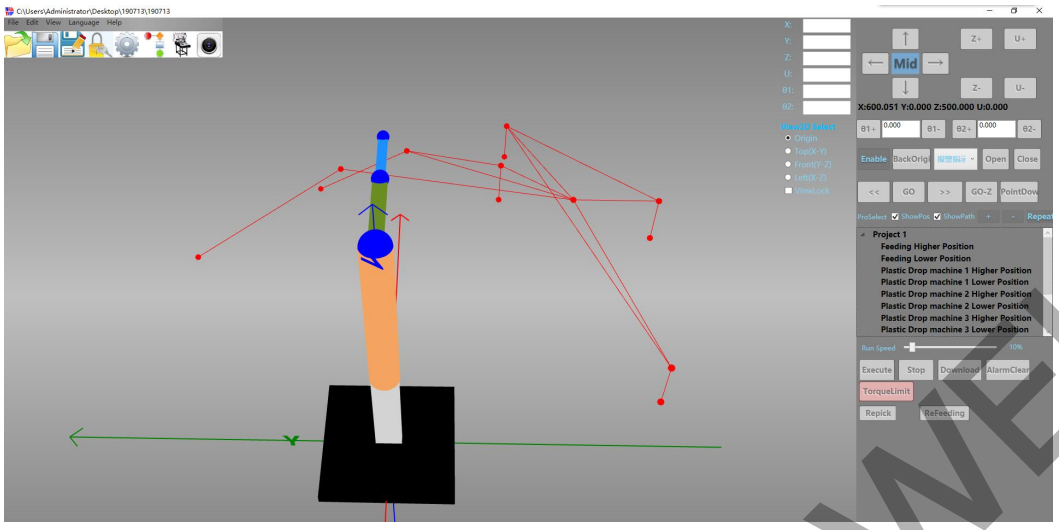
3.1.2 Open software

Computer opened , click ico 

to robot operation interface, please hold on few seconds to check if robot software can contact robot successfully or not .



In display window please check if current opened project is required processing program or not ,if not , please change to processing program, click menu bar folder  , save current project , please open the working file. If the file is opened , no need to open again.

3.1.3 Adjust air pressure

Check whether robot is well contacted pressed air or not , if no air leakage , please adjust air pressure to 0.5Mpa to 0.7Mpa .

3.2 Adjust

Before robot working ,please must well check robot working conditions safety , please ensure motor enable opened , and open Lock to make robot under manual controlling situation.

3.2.1 Robot status debug

Robot status debug is each axis of robot can work normal or not .

Movement control section :

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1、Click "←、→、↓、↓"to control robot big arm and small arm , and check small arm ending point can move up and down , left and right or not in coordinate , check movement status normal or not .

2、Click"Z+、Z-、U+、U-" to control robot Z axis's up and down movement , and U axis anti-clock wise, clock wise movement , and and check if normal move or not .

3、Click" (θ1+、θ1-) 、 (θ2+、θ2-) "separately control robot big arm (X axis) and small arm (Y axis) in anti-clock wise and clock wise movement , click and check move normal or not .

If robot each axis can work normal, next step is to check robot ending port output.

3.2.2 output ending port status debug

Whether the port output status of the robot is normal related to whether the output signal of the robot can normally control external components 。Example image as below : click▼ to choose output port one by one , click ' open' and 'close' two buttons to check whether output signal can normal send or close or not .

If we choose ' grab control' , please first ensure air source normal ,please click ' open ' button to check vacuum valve open or not , if not normal , please check pressed air pipes are dropped , vacuum solenoid valve damaged or not . Same way ,please test each output port status in turn.

3.2.3 Position point debug

Position point debug is to check the key point runs to correct position or not.

First, please open the key point project procedures, example image as below .

From up to down to choose the key point in turn , choose each key point , please click 'GO' , or choose the

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first key point , and click “>>” in turn to see if robot hand can correctly runs to corresponding position . if there is some difference to key point , please choose the difference key point in software to move robot to correct position , and click ‘ download’, and debug other keypoint position until all key points runs to correct position that all position point debug completed.

3.2.4 working speed and torque limitation debug

Before start robot , please ensure safety, please first adjust working speed and torque limitation to a low range. Through click left mouse to slide working speed and torque limitation block to left position. Please pay attention torque limitation can not be slide to the lowest to avoid motor torque power not enough and cause alarm .When start robot , if runs normal , please slide working speed and torque limitation to a higher range .

3.3 Robot start and stop

After above debug to ensure robot normal working , besides ensure other relative equipment working normal , please start and stop robot working

Example image ：

3.3.1 Robot Start

1、before working speed and torque limitation working in low number , click’ download’

2、after downloaded , click’ start’, or press ‘ start’ button on table. Robot will run slowly first as project procedures , once runs normal , increase torque limitation and gradually increase working speed .

3.3.2 robot stop and alarm clear

1、when you need to stop robot , click ‘ stop’ in software , or press ‘ stop’ button on table.

Attention: click’ stop’ in software , robot will stop moving immediately , if press’ stop’ button on table, robot will stop until finish current running procedure and stop .

2、when robot breakup during running , please check the breakup content in software , right click mouse to check the breakup dealing method.

After break up cleared , click ‘ alarm clear’ in software , and click ‘start ‘ to running .

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Click ‘alarm clear’ , please press’ emergency ‘ button , and give power to clear break up . after cleared , please click’ Execute to run.

Example image as below :

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Chapter 4 normal fault analysis and solution

4.1servo motor alarm

4.1.1 servo motor normal alarm code and analysis

1、Erro0： system alarm , electricity is unusual, please power off and power on to clear the fault.

2、Error1：EEP data unusual, parameter input unusual, please contact weldo engineer to adjust parameter , power off and power on to clear the fault

3. Error2： robot code unusual, check encoder cable connection status, if cable is broken , please replace new cable , power off and power on to clear the fault.

4. Error5： speed difference unusual, please contact Weldo engineer to adjust parameter, please power off and power on to clear the fault.

5、Error6： position difference, torque limitation is small , please increase torque , power off and power on to clear the fault.

6、Error7： If the overload is abnormal, power off and power on to clear the fault.

7、Error12： over temperature abnormal , decrease room temperature , please power off and power on to clear fault.

8、Error14： If the over-voltage is abnormal, confirm the installation status of the regenerative resistor,

power off and power on again to clear the fault.

9、Error15：power source abnormal, please confirm the installation status of the regenerative resistor, power off and power on again to clear the fault.

10、Error17： encoder communication abnormal, check encoder cable connection status, contact encoder and the regenerative resistor , power off and power to clear the fault.

11、Error18： encoder abnormal, replace replace encoder battery . after change encoder , please manual clear servo fault , power off and power to clear fault , and reset robot Origin and key position point. (please refer to chapter 4.1.2 and 4.1.3)

12、Error21： encoder fault under low voltage, check encoder voltage lower or not , please replace battery,clear fault and setting , clear fault method same as Error 18.

4.1.2 Encoder lose power and solution

Encoder lose power and how to clear the fault , it needs manual operation to clear the fault . after replace new battery , please process the clear fault at corresponding servo motor panel.

1. Continue press ‘m’button until display ‘SubFnc’Mode
2. Press one time ‘S’button , display ‘F_DOC’
3. Press one time ‘∨’ button,display’F_ECLA’
4. Press one time’s’, display’ECLA’
5. Final press and hold on ‘<’button , display ‘FINISH’, it means debug successful.If not ,debug again .
6. Turn off , and turn on , complete above step until finish .

4.1.3 Origin and key point position setting.

Please attention , after replace new encoder battery , please reset origin and reset key point position . other conditions can not reset origin and key point position .

1、first please cloes’enable’ in software , please use robot straight front as benchmark , make robot big arm and small arm in a straight line , low z axis to the lowest position , but higher Z axis low limitation.

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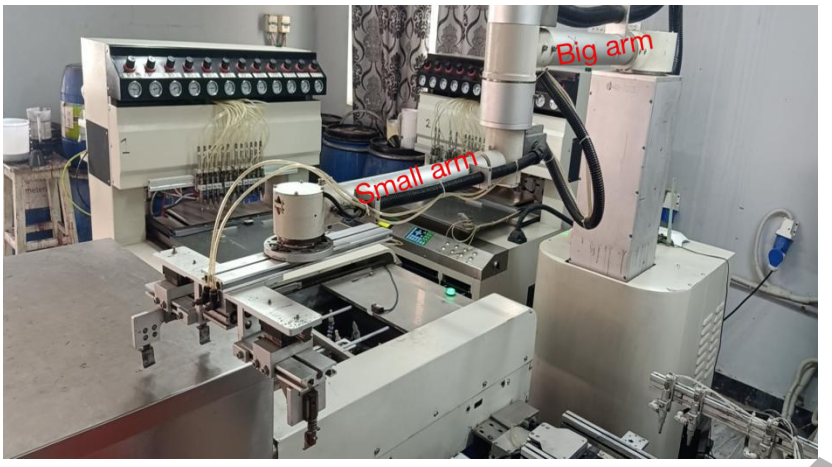

2、click parameter setting in software , input user: Weldo, passwords : 123 to parameter setting page , click ‘ 下位机参数’， click’ origin setting 原点设置’， click ‘origin setting’ to save origin setting.

和密码 123 后进入系统参数设置面板，点击“下位机参数”，在有界面上，找到“原点设置”，点击“原点设置”，确认完成原点设置过程。

3、After origin set , processing project file key point position should be reset. Key point setting please refer to 2.3.4 procedure key point download.

4.2 other alarm

1 、 485 communication fault : please check 485 communication connection status , please confirm connection successful, click ‘clear alarm’ fault in software.

2 、 grab sensor fault: check grab and confirm senor sign normal or not , after confirmed normal , click ‘ clear alarm’ .

3 、 do not grab mold : please check robot hand clamp and sucker , confirm grab normal , click ‘ clear alarm’.

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Chapter 5 maintenance

To keep robot using long life time , and avoid robot fault and accident happened , please must weekly maintained the robot. In this chapter will introduce daily maintenance and reducer maintenance .

5.1 Daily maintenance

Please ensure the robot working environment clean to Avoid contact with strong acids, strong alkalis and corrosive substances. Please stop machine power before keep maintenance to avoid any accident .

5.1.1 Electricity maintenace

1、please check if any cable damaged , any loose or dropped or not .

2、please check and ensure power switch or emergency switch working normal.

3、please check and confirm sensor or solenoid valve damaged or not .

5.1.2 pneumatic system maintenance

1、check air pipes 、cylinder air leakage or not .

2、check filter air pressure meter any air leakage or water inside or not , if any ,please replace oil and water filter .

3、please check robot hand clamp can grab molds or not and clean the clamp regularly . please do not use strong acids, strong alkalis and corrosive substances to clean.

5.1.3 mechanical maintenace

1、clean robot dust and foreign messy.

2、please check each part screw ,nut loose or not , if any please tighten .

3、please check if robot has any un-normal sound ,if any please do not close to robot ,and have engineer to fix it .

4、please check and confirm no barriers within robot working range , if any ,please remove the barriers.

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5.2 Reducer maintenance

Reducer maintenance must be under Weldo engineer instruction . Reducer should be maintenance after long time running . the main maintenance way is to add lubricant.

5.2.1 Lubricant

Below type lubricant can be used for robot : model 14 and 17 should use Harmonic lubricant SK—2。Model 20.25 and 32 should use Harmonic lubricant SK—1A。

Lubricant adding method:

A.Wave generator

Bearing： roll bearing to full bearing ball space.

Bearing outside： apply a thin layer。

B.flexible gear

Gear face： apply all gears .

Inside face： please full of inside face.

Outside face： apply a thin layer to avoid rust.

C. Hard gear

Apply for all gears.

5.2.2 lubricant

A.type

Model “JISgear oil 2tyes number 2”。

B. Oil quantity should be in fixed position .Too much oil will increase the power consumed by mixing oil or cause oil leakage; too little oil will cause heat generation and rapid wear due to insufficient lubrication, causing product failure

C.replace lubricant oil weekly

First time ： running 100 hours.

Second time： running 1000hours or 6 months.

If do not long time using , lubricant will contact air and becomes old and can not play on lubricant function. In this situation , if robot do not run , before using ,please replace new lubricant .

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