

SCARA Robot Software-RS403, RS406

Jser	Manual	

HIWIN. Wel.62 Ready Jaint 11 0.0 13 0.0 - 69 + Lines Front 2018 12-11 13:31 J1- J1+ J1 0.0 J3 0.0 68 + 2918 12-11 13:31 Joint J2- J2+ J1- J1+ 130.00 J3- J3+ J2-J2+ 4 12 158.00 -158.00 8.89 ... 9.8 J4- 🗍 J4+ 13 o 🗿 J3 0.00 6.00 8.88 J3+ J3-<u>а</u> а н м 9.00 8.68 J4- J4+ 9.000 Func. State Punc. State le: 0.01m 0.1m 1m Proc

Original Instructions

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- TMRW Series

TMRI Series

















- VDI Systems





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Revision History

Version	Date	Remark
V1.0	2015/05/12	First issuance
V2.0	2016/01/01	Adjusted the function page according to the interface
V2.1	2016/06/01	 Added communication setting Added the description of R Bit
V2.2	2016/07/12	 Added he screen lock Modified the example of G code Added trigger by R value
V2.3	2016/09/26	 Added the Inertia Page Added the Function Status Page Modified the Resource Planning Table Added the Recon Teaching Modified the Communication Setting
V2.4	2017/02/03	 Modified G Code Modified the Inertia Page
V2.5	2017/05/16	 Changed the IO number of 4 Bit CASE
V2.6	2017/06/14	1. Modified the example of API
V2.7	2017/12/26	 Added the software number of Interference Area Added the software number of grating deceleration Added the command for PC Communication Function Added the C2 Path Reset Added the R Value
V2.8	2018/12/18	 Modified cover page and content Modified part of the title Correct the page number



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1. Layout Description of Operating Page

HI ¥04.62	Read	Jo: ly	int J1 J2	0.0 J 0.0 J	3 4 Т	Title	Bar	+	Alarm Warning	@ Reset	2018 12-05 08:44
				AX	Sta	atus	Cali F	os	Joint Po	s	J1- J1+
				J1	Fin	ish23	0.	.000	0.0	00	
1	Execute	Set Pos	ition	J2	Fin	ish23	0.	.000	0.0	00	Teach
				J3	Fin	ish23	0.	.000	0.0	00	J: Column
				J	Page I	iab22 Display	0.	.000	0.0	00	
	Goto Ca	li Posi	tion								Functi on Status Func. State
⊘ World	⊘ Work	⊘ Tool	⊘ Joint		4	0	l ⊘ hm	🥝 Auto	Teach	10	
				Fu	nction	Men	u			11/2	
Layer	Pos Info	Coor	Ke- cord	Ma tr1x	Pos	t1a	c L1st	Proc Teach	NC View	NC Edit	

The operating page of system is layout as follows:



1.1. Title Bar



Display the current system status and the system version. Click the system status to open the system lock.

Not ready:

When any coordinates are not confirmed, the motor will stay in this status. The auto mode in this status can't be used. The teaching mode can operate the joint coordinates only.

Ready:

When the coordinates for each motor have been confirmed, it will show this status to enter the auto mode. After the coordinates are correct, the algorithm path will be meaningful.

Running:

Auto run

Pause, section stop:

In the pause status when the system runs.

Teaching:

Manually operating



This area will show the coordinates according to the selected coordinate system (world, work, tool, and joint).

HIV	Laint	J1	0.0	J3	0.0			20		Alarm O	2018 12-05	
¥04.62	Ready	JOINT	J2	0.0	J4	0.0	Π	-	20	+	Warning Keset	08:44

The speed percentage when the system automatically runs.

HIWIN _®	Loint	J1	0.0	J3	0.0		20		Alarm Ponot	2018 12-05	
V04.62 Ready		J2	0.0	J4	0.0	-	20	+	Warning Reset	08:44	

Hint the system shows the alarm or the warning. You click the alarm or the warning to show the current contents.



Reset the system (clear the current alarm or warning status, and stop any action).





Display the current time, and click it to enter the setting page (date, screen lock, and emergency stop output).

Setting Page



1. Date: Set the system time.

2. Screen lock: Change the password of the screen lock.

After the auto lock indicator lights up, the screen lock will be automatically started when booting.

3. Emergency stop output: Auto close output when setting the emergency stop.

After the output pin indicator lights up, the pin status will be switched to OFF when triggered in the emergency stop.





Screen Lock Screen

Click the status (in the red frame) to show the screen lock frame. The default password is 123456.



1.2. Function Menu

World	Work	Tool	O Joint	Inc	⊘ 0.01mm	🤗 0.1mm		🤗 Auto	Teach	10
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit

Select the coordinate system.

⊘ World	⊘ Work	⊘ Tool	⊘ Joint	Inc	⊘ 0.01mm	0.1mm	anm	🤗 Auto	Teach	10
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit

It may select the continuous or increment movements (distance and speed) under the teaching mode.

⊘ World	⊘ Work	⊘ Tool	⊘ Joint	Inc	⊘ 0.01mm	🤗 0.1mm		Auto	e Teach	10
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit

Select the modes.

	⊘ Work	⊘ Tool	⊘ Joint	Inc	⊘ 0.01mm	🤗 0.1mm		🤗 Auto	Teach	10
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit

Display the current IO status.

1.3. Teaching Column



Manually move under the teaching mode (present the different figure according to the selected coordinate system, where the world/work/tool and the joint show in gray and black.).



1.4. Function Status

Func. State

Display the function status currently started or set.

					Lurr		ິJ1- ິJ2-	ິJ1+ ງ J2+					
		Inerti	a		0							С С	<u>р</u>
		Work Co	or		0							J3-	J3+
		Limit		joint	🥝 v	orld 🧉						ິ J 4-	ິ J4 +
		Tool		default	() 1 (3 2 (3 🥥						
		CrossSp	ace	0	@ 1	2 2	3 🥥	4 🕜					
	EM	0 output	off	1	2	3 (4 🕜	5 🕜 6	7) * ()			
				13	3 🕜 14 (0 15 (
												Func.	State
⊘ Vo	rld	⊘ Work	🥝 Tool	⊘ Joint	Ілс	⊘ 0.01mm	0 .1mm	✓ 1mm	🤗 Auto	Teach	10		
La	yer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Inertia: Display current inertia. If current inertia isn't set as 0, the indicator will light up.

Work Coordinate System: Display the coordinate origin in the Work Coordinate System. If the origin of work coordinate isn't set as 0, the indicator will light up.

Limit: Display the current limit of joint/world. If the value isn't set as 0, the indicator will light up.

Tool: Display the tool number of Tool Coordinate System.

Interference Area: Display the number of the activated Interference Area.

Emergency Stop Output: Display the number of emergency stop output currently set.



2. Teaching Operation

The Teaching Column on the right corner of the screen can be used to operate the each kind of operation for the robot. Before you operate it, you need to switch to the "Teaching" mode and start the procedure. Note that the system status must be ready, and the safety button on the side of the Teaching Pendant is needed to hold under the teaching.

											0	0
				AX	Sta	atus	Cali	Pos	Joint Po	S	J1-	J1+
				J1	Fin	ish23	0	.000	0.0	90	J2-	J2+
	Execute	Set Pos	ition	J2	Fin	ish23	0	.000	0.0	00		
				J3	Fina	ish23	0	.000	0.0	90	J3-	J3+
				J4	Fina	ish23	0	.000	0.0	00	2	
1											J4-	J4+
	Goto Ca	ali Posi	tion									
											Func.	State
🥑 Morld	e Vorb		0 Loint	Inc	()	a Imm	• 1mm	O	() Touch	10		
w0110	work	1001	JOINT	THC	0.01111	9.100		AULO	Teacit	10		
Layer	Pos	Coor	Re-	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC	NC Edit		



2.1. Continue/Increment



Cont x1	▲ x10	
---------	----------	--

Press the Continue/Increment button to switch the moving approach.

Under "Continue", press the movement button, and the motion will continue to move in accordance with the selected function until the button is up. The moving speed can be determined by selecting from three (3) different speeds of underneath. Under "Increment", press the movement button, and it will move the robot for a fixed distance, and the length of distance will be determined by three (3) different selection of distance of underneath.

The common use is: When the distance is far enough to the target point, use "Continue" mode in order to approach the target point more rapidly. When approaching to the target position, change to use "Increment" mode in order to adjust for reaching the target point precisly.



2.2. Coordinate System of Movement Basis



According to the different coordinate system selected, the moving direction will be transformed from that coordinate system.

World Coordinate System:

The origin of the coordinate system is based on the mechanical home and the direction, and the XYZ directions in the vertical coordinate as the coordinate expression. The meaning of the world coordinate is the end point of the tool relative to the distance (X, Y, Z) and direction (C) of the mechanical home.

Work Coordinate System:

All actions are decided according to the position where a workpiece is put. When many robots in the production line are required to perform the same work, the same procedures should be performed by each robot. However, because the relative position between the machine and the workpiece is difficultly consistent during the installation, the coordinate system is required to define and used to describe the position to place the workpiece and the rotation angle.

Tool Coordinate System:

In the course of the procedures, the movement is sometimes done according to the direction of the fixture at the end of the robot. For example, the actions to load and change the material in the mill require the direction of the fixture at the end of the robot, which will straightly stretch to take and load the workpiece. When the current posture is used for the reference, the tool coordinate system can be set.

Joint Coordinate System:

The joint coordinate is based on the joint angle as the basis of the movement, independent of the mechanical dimensions. Because the joint movement will not suffer from the singular point when calculating, it is often used when going across the simulation point. The special attention should be paid to the collision when it is used.



2.3. Movement Button

According to the moving mode (continue/increment), speed (1%, 10%, 100%) or distance (0.01mm, 0.1mm, 1mm) and the coordinate system (world/work/tool/joint), the behavior will also be different when you press the movement button.

Buttom	Description
V. V. 11. 11	Wolrd, work, and tool coordinate systems:
X+ X- 1T+ 1T-	The end point moves toward to the X-axis direction of the
	selected coordinate system.
	Joint coordinate system: The first joint rotates clockwise/counterclockwise.
	Wolrd, work, and tool coordinate systems:
Y+ Y- J2+ J2-	The end point moves toward to the Y-axis direction of the
	selected coordinate system.
	Joint coordinate system: The second joint rotates
	clockwise/counterclockwise.
	Wolrd, work, and tool coordinate systems:
Z+ Z- <u>J3+</u> J3-	The end point moves toward to the Z-axis direction of the
	selected coordinate system.
	Joint coordinate system: The third joint rotates
	clockwise/counterclockwise.
	Wolrd, work, and tool coordinate systems:
C+ C- J4+ J4-	The end point rotates toward to the C-axis direction of the
	selected coordinate system.
	Joint coordinate system: The fourth joint moves
	positiviely/negatively.



3. Permissions Page

3.1. Permissions

	Now	Level		0 [Operato	r]		CrossSpa	ce	Power01	1	J1-	J1+
		User		Desci	iption			Limit	F	FileTransfer		J2-	J2+
		0		Operator				Tool		TouchCali		J 3-	J3+
		1		Manager				Calibrat	ibrate Language		e	J 4-	J 4+
		2		D				Driver		Tuning			
		2		1/62	Ignei			GearRati	.0	IO			
				Macł	ninery			Mechanic	al	Networl	c .	Func.	State
⊘ Vor]	ld 🤇	e Work) Tool	<mark>0</mark> Joint	Inc	🥝 0.01mm	🥥 0.1mm	@ 1mm	🤗 Auto	G Teach	10		
Lay	er	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

There are four permissions in this system:

- 0 Operator: The operator takes responsibility to operate the machine, but can't program the procedures.
- 1 Manager: The manager takes responsibility to edit and program the procedures. The default password is 2222.
- 2 Developer: The developer takes responsibility to program the machine flow. The default password is 1111.
- 3 Machinery: The supplier who manufactures the robot takes responsibility to set and adapt the machine.

There are four permissions currently opened for the use of customers including the operators and managers. As the name implied, the Operator can only perform the running of procedures; in addition to running the procedures, the Manager can also modify programs. The Developer can use the additional functions.



Login permission: When you click one of the Administrator or the Developer, the screen to enter password will show up. You must enter correct password.

						_					9	.
N	ow Le v el		2 [Designe	r]	C	rossSpa	ce	PowerOr	ı	J1-	J1+
	Pagg	word			.		Limit	F	ileTrans	fer	J2-	J2+
	New Pass	word			ogout		Tool		TouchCal	li	J 3-	J 3+
	Con	firm			Change		Calibrat	te	Languag	e	° J4-	J 4+
	5	StartTim	e(ms)	0			Driver		Tuning			
		ContTim	e(ms)	0			GearRati	io	10			
						þ	lechan i c	al	Networl	k	Func.	State
) World	0 Work	O Tool	0 Joint	Inc	⊘ 0.01mm	🥝 0.1mm	a 1mm	@ Auto	O Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Login: Login the current permission, and change as the Operator.

Change: Change password to login the permission.

StartTime(ms)	0
ContTime(ms)	0

Time for start:

When you want to start program, you must hold the Setting Start button to avoid improper start.

Time for continue:

When you want to continue the paused programs, you must hold the Continue Setting button to avoid the improper start.



3.2. Interference Area

This function is used to define the area where overlaps with the actions from external equipment. The system will automatically detect the end position of the robot. When the robot enters the defined rectangular space, the output signals will be activated to notify external equipment. When external equipment is in the action or non-action state, the input signals will be provided to the robot as well. If the output signals from the robot are simultaneously activated with the input signals from external equipment, the system will alarm to stop the robot and avoid damage.



The diagonal point 1 and 2 define the overlapping area. After the robot can be manually moved to the diagonal point, press the "Take Diagonal Point 1" and "Take Diagonal Angle 2". The system uses the rectangular space formed by two diagonal points in the world coordinate system as the interference area.

The system can set up to five sets of interference area. If you select to activate **sets**, the system will output the signals and logic by alarm.

The output signals from five sets of interference area correspond to O60~O64. Five input signals from external equipment correspond to I60~I64. When O60 and I60 are activated, the system will alarm.



3.3. PowerOn

	Execute Set Position		AX J1 J2 J3 J4	St: Fin Fin Fin Fin	ish23 ish23 ish23 ish23 ish23	Cali 0 0 0	Pos	Joint Po 0.0 0.0 0.0	98 99 99 99 99	ິ J1- ິ J2- ິ J3- ງ) J1+ J2+ J3+	
	Goto	Cali Posi	ition								J4-	J4+
											Func.	State
) Vor	ld Vorl	e Tool	⊘ Joint	Inc	 ⊘ 0.01mm 	0 .1mm	a 1mm	🤗 Auto	🍳 Teach	10		
Lay	ver Pos Info	Соог	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	⊮roc Heach	NC View	NC Edit		

The coordinate status and values at all axes can be viewed in this page.

Execute Auto Set Coordinates:

In the Auto mode, you can press this button to automatically execute the coordinate setting. All axes will read the coordinate values again.

Goto Calibration Point:

In the Auto mode, you can hold this button so that the coordinates the machine moves to the calibration point can gradually move. The action will stop when the coordinates are reached or the button is released.

The coordinate status at all axes is described as follows:

- -10: Encoder communication error
- 0: None (wait to search for Z or read the encoder value)
- 10: Wait to enter the calculation coordinates
- 20: Wait to enter the setting coordinates
- 23: Complete the coordinate setting



3.4. Limit

The large rotation range could not be accommodated because of the mechanical interference or internal wire scrolled or snapped.

Serv	70	Break		- Joint	Limit +	Join	tPos		- Wo	rld Lii	nit +	X -	X+
🥥 J1	9	9 J1	-	-130.00	130.0	0	0.00	X	0	.00	0.00		.
🥥 J2	9	J 2		-150.00	150.0	0	0.00	Y	0	.00	0.00	1-	ĬŦ
J3	•	J 3		0.00	0.0	0	0.00	Z	0	.00	0.00	Z-	Z+
🥥 J4	•	J 4		0.00	0.0	0	0.00		Skil	l Max I	Range	2	2
									X	0.	000	C-	C+
									Y	0.	000		
									Z	0.	000		
								•	Maint	ain Mad			
								_	PIA I II 6			Func.	State
⊖ Vorld	⊘ Work	O Tool	⊘ Joint	Cont	✓ x1				Auto	⊘ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	F 1	Proc Teach	NC View	NC Edit		

Servo	Break
<mark>e</mark> J1	🥚 🎱 J1
🥥 J2	🥚 🎱 J2
<mark>o</mark> J3	🥚 🎱 J3
🥹 J4	ও 🕘 J4

This page not only sets the limit, but also individually controls the servo start and brake at all axes. In the servo OFF and brake ON, the mechanism can be manually pushed to directly observe the coordinates at all axes.

The green servo indicator represents motor excitation. The green brake indicator represents the brake release of motor.



- Joint	JointPos	
-130.00	130.00	0.00
-150.00	150.00	0.00
0.00	0.00	0.00
0.00	0.00	0.00

Set the joint limit, where the values are the joint coordinates (deg), used to limit the rotation angle at all axes.

	- World Limit +									
X	0.00	0.00								
Y	0.00	0.00								
Z	0.00	0.00								

Not only the joint limit but also the moving range of the end fixture can be set. The world limit is to define this range, where the values are the world coordinates (mm) and the limit range is a space cube.

Sk	ill Max Range
X	0.000
Y	0.000
Z	0.000

When "Skill Setting" is used in the procedures, this parameter can be set to avoid accident by improper skill offset. The input values represent the permissible range of the skill offset.



3.5. File Transfer

NC file is saved in ncfiles. The file name has the special format, and the length is in 30 bytes.

Contro NC Dat NC Fil OpenHM Macro PLC Machin Setup	e e								DeleteFi port All sport One	le Files File	Х- Ү- Z-	X+ Y+ Z+
USB D	isk	fail to	mount US	B disk!					nport One port All	File Files	C-	C+
Un-Mo	unt								DeleteFi	le	Func.	State
⊘ World	⊘ ∀ork	⊖ Tool	⊘ Joint	Cont	✓ x1		▲ x100	🤗 Auto	Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Controller
NC Data
NC File
OpenHMI
Масто
PLC
Machine
Setup

Display the file type that current login permissions can access (The Manager can view "Machining Data" and "Machining File" only.).

Machining data: Including the procedure files and image files.

Machining file: NC files and module files.



USB Disk

ncfiles

Select the folder in USB memory.



Plug and unplug USB memory.

DeleteFile								
Export All Files								
Export One File								

Operate the files in the controller:

Delete File: Delete the selected file. Export All Files: Download all files to USB memory. Export Selected Files: Download the selected files to USB memory.



Operate the files in the controller:

Import Selected File: Transfer the selected file to the controller. Import All Files: Transfer all files to the controller. Delete File: Delete the selected file.



3.6. Tool

	Default		2	nd							x -	X +
	lst		3	rd							Y -	Y +
01	fset(T0))									Z-	Z+
Dire	ection(T	D) (0.000	Offset(IO)	0.000	Fool	Len(Tl	.) 0.	.000	.	<u> </u>
		1.Go to	(0.0.90)) then a	liqn		Don		K 0.	.000	C-	C+
								Ŋ	Y 0.	.000	1	
		D. 41 .	<i></i>	A 1					K 0.	.000		
		2.Go to	(0,0,-9	0) then	align		Don	le	Ý 0.	.000		
	0.01			Directio	on 🛛	0.000						
	3.0btain Offset					0.000	Ī	4.S	et to		Func.	State
∕ World	⊘ Work	⊘ Tool	0 Joint	Cont	x 1	×10		@ Auto	G Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

The tool offset can simultaneously record up to four sets of tool parameters.

Default	2nd
lst	3rd

Switch to the current tool parameters.

The operation to calibration the tool offset is described as follows:

From the top view to observe the tool installed on the front end of the robot, the arrow indicates the direction to install the tool, and the arrow tip indicates the tool end, as shown in the following figure.



When you operate, please follow the order and the description according to the buttons on the screen.



1.Go to (0,0,90) then align

1.

2.

: The arm will move the posture to (0, 0, 90), and then the XY Movement Button is used to align the tool tip with the calibration point (a fixed point set by yourself). Press the "OK" button after completed. The XY coordinates on the screen will become the world coordinates.

2.Go to (0,0,-90) then align

: The arm will move the posture

to (0, 0, -90), and then the XY Movement Button is used to move the tool tip to the calibration point aligned in the Step 1. Press the "OK" button after completed. The XY coordinates on the screen will become the world coordinates.

	2 Obto in	Direction	0.000
3	5.00talii	Offset	0.000

: Calculate the direction and

offset according to two coordinates in Step 1, and 2.

4.

Add the compensation values into the setting ones.



3.7. Touch Calibration

	No	ow Level		2 [Designer]				CrossSpace PowerOn			L	X+	
	Password Message Conf New Password Confirm StartTime(ms)						Limit F			FileIranster uchCali anguage funing		۲- ۲- С-	Y+ Z+ C+
							Ok	lechanic	Cancel	IO Network		Func.	State
e Vor	rld	⊘ Work Pos	O Tool	Ø Joint Re-	Cont Ma-	×1 Safe	x10	Ф x100 Ргос	Auto Proc	Teach	IO NC		
Lay	yer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Pop-out to inquire the dialogue frame of Touch Calibration is executed when you press the OK button.

Pop-out the Touch Calibration screen after you press the OK button.

Permount Calibration version 2,00
•
(F
· · · ·
riess touch the red point
•
• <u>Keset</u>



Click the red point in order to complete the calibration. The system will automatically start after completed, and the following screen will appear.



If you can click on the correct point and press the "YES" button, the touch calibration can be done. If you can't click the correct points, the improper touch could take place in the course of the touch calibration. Don't force to adjust the position you click YES. After the countdown ends, the controller will automatically restart and return to the condition before not calibrated.



3.8. Calibrate

Axis J1	Statu Finish	1 S M4	otorPos 0.000					M	laintain	Mode	°х-	X+
J2	Finish	123	0.000	Se	: rv o	Assist	t			1	Y-	Y+
J3	Finish	123	0.000	0.			Ca	ali Pos	0.	000	° 7-	• 7+
J4	Finish	ı23	0.000	BI	eak						- -	- ·
Find Ref							Setp1:Fi	ind Ref	Find	Ref	C-	C+
						Ste	p2:To Ca	ali Pos	Calibr	ate	1	
				Obta	inPos							
					0.000		Sav	ved Pos	0.	000		
Set Pos Previous Z Next Z							Next Z		Func.	State		
⊘ World	⊘ ∀ork	O Tool	⊘ Joint	Cont	✓ x1	∕ ∞ x10		Auto	Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

The correction method for the origin is described as follows:

- 1. Use the teaching movement option or the emergency stop button to move each joint to the position of correction point (The robot stretches in line. The color button is pushed from down to up so that can keep a limit distance about several mm.). If this robot is used for the purpose of engraving or gluing in which the accuracy of path is highly concerned, the appropriate instrument shall be used for precision correction.
- 2. After you press the "Correction" button, the system will convert "Coordinate of Correction Point" to obtain the origin coordinate, and the current coordinates will be set as the origin coordinates.



3.9. Change Language

Lang Engl Choo Trad Simp Engl	uage at ish(Buil se the n itional (lified Cl ish(Build	present d inside ew langu Chinese() hinese(B d inside	:) Build in uild ins)	side)					Conf	irm	°Х- °Ү- °С-	X+ Y+ Z+ C+
											Func.	State
❷ World	⊘ Vork	⊘ Tool	⊘ Joint	Cont	✓ x1	о х10		🤗 Auto	Teach	10		
Layer	Pos Info	Соот	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

After you select the language you want to change and press the YES button, the system will automatically reboot to change the language.



3.10. Tuning

TeachI	n Parame	ter Aut	oRun Pai	rameter	Path I	nt Parai	neter				X- X+
LineSpeed(mm/min) 5000						Line	Acc(mg)		200		°Y- °Y+
					1 1	Dine	nec(mb)		200		Z- Z+
MoveSpeed(unit/min) 5000				199							°C- °C+
											Func. State
⊘ World	⊘ ∀ork	⊘ Tool	⊘ Joint	Cont	✓ x1	а х10	▲ x100	🥝 Auto	Teach	10	
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit	
TeachIn Parameter AutoRun Parameter Path Int Parameter								9 9			
Teachl	n Parame	terAut	oRun Pa	rameter	Path 1	nt Para	meter				X- X+
TeachI Lin	n Parame 1eSpeed(1	ter Aut	oRun Pa:	rameter 1000	Path 1	int Para	meter				X- X+ Y- Y+
TeachI Lin Move	n Parame neSpeed(n eSpeed(un ault Rad	ter Aut nm/min) nit/min) ius(nm)	coRun Pa 120 60	rameter 0000 000 000	Path I	nt Para	neter Acc(ms)		100		X- X+ Y- Y+ Z- Z+
Teach I Lin Move	n Parame neSpeed(n eSpeed(un ault Rad	ter Aut mm/min) nit/min) ius(mm)	coRun Pa: 120 60 5	rameter 0000 000 0.000	Path 1	Int Para	Acc(ms)		100		X- X+ Y- Y+ Z- Z+ C- C+
Teach1	n Parame neSpeed(n 2Speed(un ault Rad	ter Aut	coRun Pa: 120 600 51	rameter 9000 900 0.000	Path I	Line	Acc(ms)		100		X- X+ Y- Y+ Z- Z+ C- C+
Teach1	n Parame neSpeed(u 2Speed(uu ault Rad	ter Aut	coRun Pa: 120 60	rameter 0000 000 0.000	Path 1	Line	Acc(ms)		100		x- x+ Y- Y+ Z- Z+ C- C+
Teach I Lin Move	n Parame neSpeed(u 2Speed(un ault Rad	ter Aut	coRun Pa: 120 60	rameter 10000 000 0.000	Path 1	Line	Acc(ms)		100		X- X+ Y- Y+ Z- Z+ C- C+
Teach1	n Parame neSpeed(n Speed(un ault Rad	ter Aut	coRun Pa:	rameter 9000 900 0.000	Path I	Line	Acc(ms)		100		X- X+ Y- Y+ Z- Z+ C- C+ Func. State
TeachI Lin Move Def	n Parame neSpeed(u eSpeed(u ault Rad	<pre>Aut nm/min) nit/min) ius(nm) Tool</pre>	CoRun Pa 120 600 50	rameter 9000 900 0.000 0.000	Path 1	Line	Acc(ms)	Auto	100 Teach	10	X- X+ Y- Y+ Z- Z+ C- C+ Func. State



Path Int Parameter	
Line Acc(ms)	100

Straight line acceleration and deceleration time (ms):

Decide the G value of acceleration and deceleration. The time is increased to slow down acceleration and deceleration. However, it will be more helpful to the smoothness of movement. It can be changed according to the requirement and the actual operation when actually used.

n ranameter
5000
5000

Suitale in the teaching mode.

Path speed (mm/min):

When the world, work, and tool coordinates are used to move, this speed can be employed. Movement speed (deg/min):

When the joint coordinates are used to move, this speed can be employed.



TeachIn Parameter Auto	Run Parameter
LineSpeed(mm/min)	120000
MoveSpeed(unit/min)	60000
Default Radius(mm)	50.000

Suitable in the auto mode.

Path speed (mm/min):

The speed is defaulted for the straight line movement command in the process.

(If the another speed is assigned in the process, the assigned one has priority.)

Movement speed (deg/min):

The speed is defaulted for the rapid movement command in the process.

(If the another speed is assigned in the process, the assigned one has priority.) Default radius:

The radius is defaulted for the arc transition in the process.

(If the another arc radius is assigned in the process, the assigned one has priority.)



3.11. IO

											9	9
No		Desc	ribe	Hard	N	0	De	scribe	H	ard	X-	X+
11	0	IN_1		80	0	0 🥝	Status	light	95		•	•
12	0	IN_2		81	0	1	0UT_1		86	-	Y-	Y+
13	0	IN_3		82	0	2	0UT_2		81		0	0
I4	0	IN_4		83	0	3	0UT_3		82		Z -	Z+
15	0	IN_5		84	0	4	OUT_4		83			•
16	0	IN_6		85	0.	5	OUT_5		84		C-	C+
17	0	IN_7		86	0	6	0UT_6		85	;		
18	0	IN_8		87	0	7	0UT_7		86	;		
19	0	IN_9		93	0	8	0UT_8		87	·		
I 10	0	IN_10		94	0	9 🙆	OUT_9		92	2		
		-		Updat	e	k	-) Մթ	date	Func.	State
0	۲	۲	0		4	9	0	0	9			
World	Wor	k Tool	Joint	Cont	x 1	x10	x100	Auto	Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

The left side and the right side show Input and Output.

No	Describe	Hard	No	Describe	Hard
11 🥥	IN_1	80	00 🥝	Status light	95
12 🥥	IN_2	81	01 🧉	OUT_1	80
13 🥥	IN_3	82	02 🧉	OUT_2	81
I4 🥥	IN_4	83	03 🧉	OUT_3	82
15 🥥	IN_5	84	04 🧉	OUT_4	83
16 🥥	IN_6	85	05 🧉	OUT_5	84
17 🥥	IN_7	86	06 🧉	OUT_6	85
18 🥥	IN_8	87	07 🧉	OUT_7	86
19 🏈	IN_9	93	08 🥝	OUT_8	87
I 10 🥥	IN_10	94	09 🧉	OUT_9	92
	← →	Upd _{ia} te		← →	Update

After clicking the number column and Update, the input signals can be inverted.




Switch the page buttons.

No	Describe	Hard
00 🥝	Status light	95
01 🥝	0UT_1	80

Click the column or the indicator for point O to directly change the output status.



3.12. Network Setting

[- I1	nterface					[Allow	IPs —				° _	• • •
	М	IAC	00-00	-29-26-	39-93			192.16	8.139.1			X-	X +
	I	Р	192.1	68.19.1	0			192.16	8.95.30			0	9
	М	lask	255.2	255.255.	0			192.16	8.95.1			¥-	¥+
	G	ateway	192.1	68.139.	1			0.0.0.	0			0	9
			🔳 Res	set IP			0.0.0.0					Ζ-	Ζ+
	- Ce	onnectio	n Settin	na ——				,				2	° C+
				- 9	Func 3	nable [n	ternet A	uto C	urrent C	onnectio	ns	<u> </u>	UT
	Т	ool Pass	sword		=				0.0.0.0				
	Γ								192.168	. 19. 100			
	N	lame							0.0.	0.0			
	1	SCARA							0.0.	0.0			
						E			0.0.	0.0		Func.	State
9				0	1	@	٥	9	ø	0			
Worl	d	Work	Tool	Joint	Cont	x 1	x10	x100	Auto	Teach	10		
Laye	er	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

If you want to change IP for SCARA, press the Reset Network button after you change IP address. Wait two seconds, and then press it again.

└ Interface ·	
MAC	00-0C-29-26-39-93
IP	192.168.19.10
Mask	255.255.255.0
Gateway	192.168.139.1
	I Reset IP

Controller IP and MAC



Allow	IPs
	192.168.139.1
	192.168.95.30
	192.168.95.1
	0.0.0.0
	0.0.0.0

Permissible IP from external connection

Current Connections						
0.0.0.0						
192.168.19.100						
0.0.0.0						
0.0.0.0						
0.0.0.0						

_

Currently connected IP



4. Coordinates

SCARA RS406-601S-H-B World coordinate system



SCARA RS403-400-150-N World coordinate system







	Pa	th Go Ba	ack		0	5	SetCoo	r	Measure	630.2	216		Close		°Х-	X+
Γ		Default	tCoo	Work	Coor		World		Work	Tool			Joint]	9	9
	X	0.0	900		0.000	X	0	.000	0.000	0.0	900	J1	0.000		Y-	Y+
	Y	0.0	900		0.000	Y	600	. 000	600-000	600-0	999	.12	0_000		Z-	Z+
l	Z	0.0	900		0.000										•	•
ŀ	A	0.0	900		0.000	Z	192	. 800	192.800	192.8	800	J3	0.000		C-	C+
	B	0.0	900		0.000	C		000	0.000		200	IA	0 000		•	
	С	0.000		0.000				.000	0.000	0.0	000	J4	0.000			
Ì				R	C 1.				1 17				D 1.1			
	Apply Set Default		Go To Work Zero		Goto Cali Position				Func.	State						
ld		⊘ Vork	⊘ To	ool	⊘ Joint	С	Cont	✓ x1	⊘ x10	▲ x100	A A	uto		10		
er		Pos Info	€ Co	100	Re- cord	Ma t:	a- rix	Safe Pos	e Iner- tia	Proc List	P: Te	roc each	NC View	NC Edit		

Path Go Back	0

The system will automatically record the path ever traveled. The number on the right shows the recorded steps. This function can return in the opposite direction according to the traveled path. In the auto mode, you just hold this button. The action will stop when it reaches or you release it. When the robot is in the movement, the coordinates will be recorded per 20ms. If the movement is found, the coordinates will be recorded up to 20000.

When the procedure is started, the coordinates will be cleared so that can return the starting point.



_	
	DefaultCoo
X	0.000
Y	0.000
Z	0.000
A	0.000
B	0.000
С	0.000

When booting, the system will set this value as the current work coordinate system. You can enter the value on the column.

Work Coor
0.000
0.000
0.000
0.000
0.000
0.000

Currently use the work coordinate system, which the value can be entered in the column.

SetCoor

Set the current world coordinates as the work coordinate system.



Reset the current tool coordinates, so that can observe the moving distance.

Note: When you press "Tool" selected by coordinates or move a path in the tool coordinate system, XYZC in the tool coordinates will become 0. The XYZ values in the tool coordinates can be used to calculate the current position and the acutal offset distance between the tool coordinate systems.



Go To Work Zero

Hold this button, so that the robot can move to the calibration points. The action will stop when it reaches or you release it (the same as Goto Calibration Point in the Boot page).

Apply

Apply the coordinates in the work coordinate system to the current working coordinate system.

Set Default

Set the current work coordinate system as the default work coordinate system, so that can be used for next booting.

Goto Cali Position

Hold this button, so that the robot moves to the origin of the work coordinate system. The action will stop when it reaches or you release it.



5. Teaching Procedure

5.1. Description of Motion Behavior and Motion Path

The motion behavior and the motion path can be briefly classified as follows:

Motion	Purpose
Behavior	
Quick	The changes in each joint are proportionally transformed according to the
Movement	difference between the current and target joint coordinates. Therefore, the target
	points can be fastest reached. Because the posture changes are related to the
	current coordinates in the course of the actual transformation, the changes can't
	be ensured. Special attention should be paid when using them.
Straight	The system will automatically generate the motion path according to the path
Line	coordinates and commands, and ensure the whole moving speed meets the setting
Movement	Straight line speed.

When the straight line movement is used, the path can be expressed by setting the point coordinate and its property in space. The following figure shows an illustration of the point property and the formed path:



Except for the tool endpoint as the basis of the calculation in the course of movement, the system will calculate the posture changes with a distance in proportion as well.



		Current	t e		Total ma time	achining	Total	machinir ber	ng m	Average	e time	0
1 8 2	PI Current cecution b c c	essoure.	th4 GM Code Jump R FastTo FastTo FastTo Jump Mark	Save		.00 / Press o machin	rer mac nce to res ing inform Param A Param B Param C Param D aram D aram L (= 0. ro q et the q nation (#1) (#2) 0 (#3) 0 (#4) 0 #16) 0 #12) 0	00 se		Х- Ŷ- С-	X+ Y+ Z+ C+
	I	ine Fol	low			8 /	0	Single	e S	tart	Func.	State
Vorld	Work	o Tool	9 Joint	Cont	×1	×10	x100	Auto	Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

5.2. Programming in Auto Mode

PRESSURE.th4

Display the current filename. Click it to open other saved files or new file. The screen is shown as follows:



H V04.0	62	World X 0.0	Z 192.8	- 60 - Alarm Reset	2018 12-05 10:12
1~1	T	1111.th4	525	2018/12/5 10:10:31	- X+
1	8:	11112.th4	21	2018/3/2 18:54:33	- o
2	7:	36HR-TEST.th4	1028	2018/12/5 10:10:49	'- Y+
3	3:	CURRENT_J1.th4	540	2018/12/5 10:10:49	
4	3:	CURRENT_J2.th4	540	2018/12/5 10:10:49	- Z+
5	2:	CURRENT_J3.th4	544	2018/12/5 10:10:49	`- °C+
7	5:	CURRENT_J4.th4	535	2018/12/5 10:10:50	
8	6:	LaserTracker.th4	767	2018/12/5 10:10:50	
*		LISTA.th4	253	2018/12/5 10:10:50	3
		LISTB.th4	264	2018/12/5 10:10:50	
		LISTC +ba	200	2019/12/5 10.10.50	
				.th4 FileFilter	inc. State
⊘ World	d Wor	Cancel Clear	Create	Copy Delete Open	
Layer	r Pos Inf	Coor Ke- Ma- cord trix	Safe 1: Pos t	ner-Proc Proc NC NC ia List Teach View Edit	



Save the currently edited file. When the file contents are changed, this button will turn to yellow to hint save, which indicates the contents are sent to the register. Please press the button once to enter the system, so that can ensure the system executes the correct contents. If you directly start without saving the file, the contents in the previous file could be executed to generate the unprecedented results.



Set to execute the current operated time/target operation time in "Cycle". If the target is set as 0, it will indicate the continuous operation. The current times can be entered by you according to the actual situation.



There are three execution modes, where "One Return" is performed according to the current procedure line, and stopped after one return: "Cycle" is repeatedly operated according to the current procedure line until the target time is reached; "Single Step" is performed according to the current procedure line, and stopped after one line is executed, so that can ensure the results in each procedure.

Start

Operate the currently synchronized contents.

The speed ratio that the procedures operate depends on the value displayed on the Title Bar, which you can press +/- to change the speed ratio.

0.00)	0	=	0.00	sec/pcs
------	---	---	---	------	---------

Display the average machining time: Click the time box to reset the count.



5.3. Procedure Edit

1~ N	F	PRESSURE.	th4	Save	В	lockOp	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code	R					50	_	.	2
2	7:		Jump R			ma	aker_mac	ro_g 3	52	_	J2-	J2+
3	3:		FastTo			ma	aker_mac	ro_m 0			9	<u>.</u>
4	3:		FastTo			I	Param A	(#1) 0			J3-	J3+
5	2:		FastTo	8		I	Param B	(#2) 0		_	.	<u>.</u>
6	1:		FastTo	GOTO)	Ŧ	Param C	(#3) 0		-	J4-	J4+
7	5:		Jump			-		(#4)		- 11		[]
8	6:		Mark		-	ł	Param D	(#4) 0		_		
*						Pa	aram P (#16) 0				
						Pa	aram L (#12) 0				
Dele	te	ք	Dn	Сору							Func.	State
⊘ World	e Work		Joint	Cont	×1			🤗 Auto	Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Note: The Procedure Edit can be operated with the permission above "Administrator".

5.3.1. Block Operation



1~1	P	RESSURE.	th4	Save	В	lockOp	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code			artDow -	A F	ing IDou	- a	411	J2-	J2+
3	3:		FastTo			aitkow .		Ind IKOw	. •			
4	3:		FastTo		Тат	rgetRow	: 0 BI	lockCopy	Block	Move	J3-	J3+
6	1:		FastTo	8 GOT	0	v		7	►		J 4-	J 4+
7	5:		Jump		0	^0	0	4	XYZ Off:	set		
*	6:		Mark		• [0]	1000 all by -	> G65 Pa		Export	NC		
Dele	te U	Þ	Dn	Сору							Func.	State
⊖ World	0 Work	⊘ Tool	0 Joint	Cont	✓ x1	▲ x10	▲ x100	Auto	O Teach	IO		
Layer	Pos Info	Соот	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Used to move the whole procedures. After you press the Block Operation, the command detail will be displayed as follows. First click the line on left, and then press "Start Line", "End Line", and "Target Line" to set the range, following to copy or move according to the requirements, press "Block Copy" and "Block Move" to operate. Press the Block Operation again to end this operation.

X	Y	Z	VV7 Offact
0	0	0	AIG UIISet

Offset XYZ coordinates by the movement command from the starting line to the end line (valid only for world and work coordinate systems).



Transform the procedure program to NC program with a filename of o1220, so that can conveniently execute by module.

%Note 1: The "GM Code" command like G65 P1220 can the used in the procedure.%Note 2: The self NC program uses G65 P1220.

5.3.2. Record



1~1	P	RESSURE .	th4	Save	B	lock0p	Re	cord	Inse	ert	J1-	J1+
1 2	8: 7:		GM Code Jump R		Se 🗆	elCoor					J2-	J2+
3 4	3: 3:		FastTo FastTo		F	astTo	Lin	ieTo	CurveCo	rner	J3-	J3+
5 6	2: 1:		FastTo FastTo	8 GOTC	Cur	vePoint	Curve	Center	Curvel	End	J 4-	J 4+
7	5:		Jump 🔽			n Pos	De	lay	Dela	у		
8	6:		Mark	_ 7								
*				Ē		On	0	ff	Output 0			
Dele	te U	D	Dn	Сору							Func.	State
⊘ World	e Vork	⊘ Tool	0 Joint	Cont	⊘ x1	∕ x10	▲ x100	🤗 Auto	∽ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

The main function of Record is to conveniently and quickly teach an action path. Therefore, there are several path commands and output control commands on the screen only.

When using, switch to the teaching mode. After the robot moves to the defined position, press the button to perforn an action for this position. This process is called as "Record". Because there are many expressions for the coordinate system of the robot position, the coordinate system in the current teaching will be directly employed when recording.

Record Command	Command Parameter			
Select Coordinate	Take the selected coordinate system as the recorded			
System	coordinate system.			
Quick Path	If you don't open "Select Coordinate System", the			
Straight Line Path	coordinate system by teaching to move is used as the			
Arc Midpoint	recorded coordinate system to generate a command			
Arc Transition	line which moves to the current position. Take the			
Arc Center	coordiate system of teaching movement as the			
Arc End Point	coordinate system of record to generate a path			



	command of moving to the current position.				
	If you open "Select Coordinate System", the selected				
	coordinate system selected behind will be used for				
	the recorded coordinate system.				
In Position/Delay	In position, delay time				
In Position/Delay	In position, delay time				
Set O	ON for output number				
Set O	OFF for output number				

5.3.3. Insert

1-1	P	RESSURE .	th4	Save	B	lock0p	Rec	ord	Ins	ert	J1-	J1+
1	8:		GM Code) Ma	rk	Jump	Jump I	Ju	IMP R	1 2	.
2	7:		Jump R		Wai	+ I	Set ()	Wait R		et R	JZ-	JZ+
3	3:		FastTo				Det v	ware n				2
4	3:		FastTo		GM (Code	nPos/Delay	JointRec WorldRec		ldRec	J3-	J3+
5	2:		FastTo	8	🔶 A	◆ Absolute ◇ World Coor ◇ Tool Coor						2
6	1:		FastTo	GOT		🔆 Relative 🛛 💠 Work Coor 🛧 Joint Coor					J4-	J4+
7	5:		Jump		Dyn	Pos FastTo LineTo		urv	eCorner			
8	6:		Mark	- 7	Set	Coor	CurvePoint	urveCen	ter Cur	veEnd		
					Sk	i11	Matrix	SafetyAr	rea			
Dele	te l	Íp	Dn	Сору							Func.	State
⊘ World	Vork	⊘ Tool	0 Joint	Cont	×1	▲ x10		Auto	Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

When you press the Add button once, each command available will be displayed. After you click one of commands, the details will be shown so that can be edited. After you edit and press the "Yes" button, the command can be added to the procedure list.

5.3.4. Edit



1~1	PI	RESSURE.	th4	Save	В	lock0p	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code						F.0.	_	9	2.0
2	7:		Jump R		4	ma	aker_mac	ro_g 3.	52	_	J2-	J2+
3	3:		FastTo			ma	aker_mac	ro_m 0		_	9	
4	3:		FastTo			F	Param A	(#1) 0			J3-	J3+
5	2:		FastTo	8		F	Param B	(#2) 0		_	0	
6	1:		FastTo	GOT	0	F	Param C	(#3) 0		-	J4-	J4+
7	5:		Jump			-	.			- 1		
8	6:		Mark		-	ł	'aram D	(#4) 0		_		
*						Ра	aram P (#16) 0				
						Ра	aram L (#12) 0				
Dele	te U	p	Dn	Сору							Func.	State
⊘ World	0 Work	O Tool	0 Joint	Cont	✓ x1			@ Auto	Contraction Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

1~**N**

Rearrange the order in the description according to the line number in the procedure. The main purpose of this action is that a user can understand the operation order, so that can convniently adjust the command orer by "Up", "Down" and "Block Operation" when the position is incorrectly added.

Delete

Delete the currently selected line.

Up

Upwardly move the currently selected line.



Dn

Downwardly move the currently selected line.

Сору

Copy the currently selected line.

5.4. Description of Procedure Content and Command

The commands included in the system may be generally categorized as follows:



Command	Command	Command	Parameters
Category	Item	Description	1 arameters
Status	Set O	Configure the status of	Numbering, On/Off/Reverse,
Setting		O point	Waiting time
	Set K	Configure the content	Numbering,
		of R-value	Absolute/Relative/Numbering/Add
	D 1		1, Value, Waiting Time
Waiting Type	Delay	Waiting time before action	Waiting time
	Wait I	Wait until I-point	Numbering, Value, Waiting time,
		meets the status, then	Failure disposal
		continue running	-
	Wait R	Wait until R-value	Numbering, Comparison Mode,
		meets the status, then	Value, Waiting time, Failure
		continue running	handling
Flow Control	Caption	Configure caption, provide as the reference for jump setting	Caption number
	Jump	Jump to a certain line	Jump mode, Lines/Line Number,
	Ĩ	directly	Times
	I-Jump	When the status of	Numbering, Status, Jump mode,
		I-point is able to meet,	Lines/Line Number,
		start to jump	
	R-Jump	When the content of	Numbering, Comparison Mode,
	1	R-value is able to	Value, Jump mode, Lines/Line
		meet, start to jump	Number
Create	GM Code	Calling for the	G, M, Parameter 1, Parameter 2,
Freely		procedure written manually by the operator	Parameter 3
Motion Control	To world record	To world record position (Straight line path)	Record ID, Speed
	To joint record	To joint record position (Rapid movement)	Record ID, Speed
	Set Work	Configure the work	Ontions (World record ID)
	Coordinate	coordinate system	(Setting value)
	System		(Secting value)
	Skill Setting	If the special moving	Disable/Enable/Enable(R-Value



Quick Path	mode is required to use for configuring the path movement, such as arc of welding. Configure running	setting) Skill Coordinate System Skill Type Skill Range Skill Proportion Skill Initial Position Absolute/Relative
Straight Line Path Arc Transition Arc Midpoint Arc Center Arc End Point	path	Coordinate System Setting Value XYZABC Speed
Go To Dynamic Position	Determine the moving position based on R-value (straight line path)	Absolute/Relative Coordinate System R Numbering of Setting Value XYZABC R Numbering of Speed

To add a line of command to the procedure, please select the position to be added in the procedure and click "Add". After the command is selected, press "Yes" to add the procedure, and then click "Add" to close.



l-N	PI	RESSURE .	th4	Save	В	lock0p	Re	cord	Ins	ert	J1-	J1+
1	8:		GM Code								.	2
2	7:		Jump R		-	DID	0				J2-	J2+
3	3:		FastTo			KID	0				9	2
4	3:		FastTo			Value	♦ 0f	f			J3-	J3+
5	2:		FastTo	8			♦ On	L			2 2	<u> </u>
6	1:		FastTo	GOT	0		🔷 To	aale			J4-	J4+
7	5:		Jump									
8	6:		Mark		-	Wait	0		ms			
*					2							
Dele	te U	Þ	Dn	Сору				ок			Func.	State
⊘ Vorld	0 Work	⊘ Tool	⊖ Joint	Cont	✓ x1	а х10	∕ ⊘ x100	🤗 Auto	⊙ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Configure the status of output point.

Numbering: O-Point ID Number

Value: Off, On, Change Phase (Change to another status based on the current status at that O-point) Wait: Configure the time for waiting before running the next line.

5.4.2. Set R



1~N	PI	RESSURE.	th4	Save	В	lock0p	Re	cord	Inse	ert	J1-	J1+
1 2 3 4 5 6 7	8: 7: 3: 3: 2: 1: 5:		GM Code Jump R FastTo FastTo FastTo FastTo Jump			RID Mode	1000	bsolute elative ID eq Add 1	θ		J2- J3- J4-	J2+ J3+ J4+
8	6:		Mark			¥alue Wait	0 0		ms			
Dele	lete Up Dn Copy							ок			Func.	State
⊘ World	⊘ Work	⊘ Tool	0 Joint	Cont	✓ x1	▲ x10	▲ x100	Auto	∽ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Configure the content of R-value.

Numbering: R-Value ID Number

Mode:

Absolute: Configure the content of R-value as the content of "Value" column directly.

Relative: Accumulate the content of "Value" column based on the current content of R-value. Numbering: Configure the R-value content of R ID number assigned in the "Value" column to this R-value.

Cycle Add 1: Add 1 to the current content of R-value. When the value is greater than the setting value in the "Value" column, configure to 0.

Value: Refer to the description of Mode.

Wait: Configure the time for waiting before running the next line. If this value is blank, the program will be executed between two positioning motions i.e. it will not ruin the motion continuity of robot. However, it will only be effective when the configured mode is "Absolute".

5.4.3. InPos/Delay



1-1	PI	RESSURE.	th4	Save	В	lock0p	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code	G							<u>.</u>	2
2	7:		Jump R								J2-	J2+
3	3:		FastTo								9	2
4	3:		FastTo			InPo	s	InPos			J3-	J3+
5	2: FastTo 1: FastTo			8		Dela	y Ø		m	s	9	<u>.</u>
6	1: FastTo 5: Jump			GOT	0		,				J4-	J4+
7	5:		Jump									
8	6:		Mark		7							
*					4							
					2							
Dele	ete Up Dn Cop			Сору				ок			Func.	State
❷ World	0 Work	O Tool	0 Joint	Cont	×1	×10		Auto	Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

In Position: When you press In Position, the system will check each axis is in position and continue to run next line.

Delay: Time to be waited.

5.4.4. Wait I



1~N	PI	RESSURE.	th4	Save	B	lockOp	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code								.	2
2	7:		Jump R			RID	0		0ff		J2-	J2+
3	3:		FastTo			Voluo	▲ Off				9	2
4	3:		FastTo			Value	~ 011		√ UII		J3-	J3+
5	2:		FastTo	8		Wait	0		ms		.	
6	1: FastTo 5: Jump			GOT	0				_		J4-	J4+
7	5: Jump				F	'ail Do	◆ Con	tinue Wa	it			
8	5: Jump 6: Mark						∲ Ign	ore This	s Row			
*					2		♦ Ala	rm 0	0			
Dele	lete Up Dn Copy							ок			Func.	State
⊘ World	⊘ Work	O Tool	0 Joint	Cont	✓ x1	а х10	∕ ⊘ x100	Auto	Teach	10		
Layer	WorkToolJointContPos InfoCoorRe- cordMa- trix		Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit			

Numbering: I-Point ID Number

Value: When the status of I-Point is able to meet this setting, the next motion will continue.

Wait: The longest waiting time.

Failure Handing: Handling approach after exceeding the waiting time.

5.4.5. Wait R



1~N	P	RESSURE.	th4	Save	В	lock0p	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code	R		חוס	Ø		25	5	.	2
2	7:		Jump R		4	KID	0				J2-	J2+
3	3:		FastTo		Cm;	p Mode	🔶 Equa	1	♦ NotEq	ual		
4	3:		FastTo								J3-	J3+
5	2:		FastTo	8	_	Value	Cons	t 💠 Reg	jist 0		2 2	<u> </u>
6	1: FastTo 5: Jump			GOT)	Wait	0		ms		J4-	J4+
7	5: Jump					walt						
8	5: Jump 6: Mark				F:	ail Do	◆ Cont	inue Wai	lt			
*							↓ Igno	re This	Row			
							♦ Alar	m 0	0			
Dele	lete Up Dn Copy							ок			Func.	State
⊘ World	0 Work	→ Tool	0 Joint	Cont	✓ x1			🤗 Auto	O Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Numbering: R-Value ID Number

Comparison Mode:

Value: Constant (fixed value). R-value (refer to the content of another R-value ID number). Right side box (constant/R-value ID number)

Wait: The longest waiting time.

Failure Handing: Handling approach after exceeding the waiting time.

5.4.6. Mark



1~N	PI	RESSURE.	th4	Save	B	lock0p	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code	G							9	2
2	7:		Jump R								J2-	J2+
3	3:		FastTo								9	2
4	3:		FastTo			M	ark	0		1	J3-	J3+
5	2:		FastTo	8				, ·			9	2
6	1:		FastTo	GOT	0						J4-	J4+
7	5:		Jump									
8	6:		Mark									
*					4							
)							
Dele	lete Up Dn Copy							ок			Func.	State
🥑 World	0 Work	O Tool	O Joint	Cont	×1	а х10	✓ x100	Auto	O Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Configure the caption of current row number for the use of jump command.

5.4.7. Jump



l~N	PI	RESSURE.	th4	Save	B	lock0p	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code	G							.	2.0
2	7:	,	Jump R		J	ump Mode		bsolute			J2-	J2+
3	3:		FastTo			-	⇒ R	elative			9	
4	3:		FastTo					lork			J3-	J3+
5	2:		FastTo	8							9	
6	1: FastTo GC 5: Jump			GOT	0		~ K	eturn(ju	mp)		J4-	J4+
7	5: Jump					Powe	0		_			
8	5: Jump 6: Mark				1	K0#(5)						
*					4	Loop	0					
Dele	lete Up Dn Copy							ок			Func.	State
⊘ World	0 Work	O Tool	0 Joint	Cont	×1	×10		🤗 Auto	O Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Jump Mode:

Absolute (that is the actual program line number).

Relative (lines relative to the current line number. For example, the current line number is the 8th

line, -4 indicates to jump to $8-4 = 4^{\text{th}}$ line).

Caption (that is the caption row configured previously)

Line Number/Lines: Refer to the Jump Mode

Times: Times for repeating this jump action

5.4.8. Jump I



1~N	PI	RESSURE	th4	Save	В	lock0p	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code	G							.	2.0
2	7:	,	Jump R		-	RID	0		0f	f	J2-	J2+
3	3:		FastTo			Volue		c.c			9	2
4	3:		FastTo			Value	· ~ 0		~ UI		J3-	J3+
5	2:		FastTo	8	J	ump Mode	• 🔷 A	bsolute				
6	1:FastToGO5:Jump				D	-	A R	elative			J4-	J4+
7	5: Jump							1				
8	5: Jump 6: Mark				1		~ M:	ark				
*					4	Row(s)	0					
Dele	elete Up Dn Copy							ок			Func.	State
⊘ World	0 Work	O Tool	O Joint	Cont	✓ x1	а х10		Auto	O Teach	10		
Layer	Pos Info	Соот	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Determine to jump to which line for continuing execution based on the status of I-point.

Numbering: I-Point ID Number

Value: When the status of I-point is able to meet this setting, the jump action will continue.

Jump Mode: Absolute (that is the actual program line number). Relative (lines relative to the current line number).

Line Number/Lines: Refer to the Jump Mode.

5.4.9. Jump R



l~N	PI	RESSURE.	th4	Save	B	lock0p	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code	6		PID	0		255	5	2	2
2	7:		Jump R			KID	• 				J2-	JZ+
3	3:		FastTo		Cmp) Mode	💠 Equa	1	♦ NotEq	ual	9	2
4	3:		FastTo								J3-	J3+
5	2:		FastTo	8		Value	◆ Cons	t 💠 Reg	gist 0	_	.	
6	1:FastTo5:Jump			GOT		Mode	🔶 Abso	lute			J4-	J4+
7	5: Jump				յուաք	Pilode		tive				
8	6:		Mark		1		♦ Mark	:				
*					2				 1			
						(ow(s)	U		•			
Dele	lete Up Dn Copy							ок			Func.	State
⊘ World	0 Work	O Tool	0 Joint	Cont	✓ x1			🤗 Auto	⊘ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Determine to jump to which line for continuing execution based on the content of R-value.

Numbering: R-Value ID Number

Comparison Mode: Determine the trigger condition

Value: Constant (fixed value). R-value (refer to the content of another R-value ID). Right side box (constant/R-value ID number)

Jump Mode: Absolute (that is the actual program line number), Relative (lines relative to the current line number), and Caption.

Line Number/Lines: Refer to the Jump Mode.

5.4.10. GM Code



1~N	PI	RESSURE.	th4	Save	В	lock0p	Re	cord	Inse	ert	J1-	J 1+
1	8:		GM Code							_	.	.
2	7:		Jump R		4	ma	aker_mac	:ro_g 0		_	J2-	J2+
3	3:		FastTo			ma	aker_mac	:ro_m 0			9	2
4	3:		FastTo			I	Param A	(#1) 0	l		J3-	J3+
5	2:Fastlo81:FastTo601					I	Param B	(#2) 0	1			
6	1:FastTo605:Jump				0	I	Param C	(#3) 0		-	J4-	J4+
7	5: Jump						n			- 11		
8	5: Jump 6: Mark					I	Param D	(#4) 0				
*						Pa	aram P (#16) 0				
						Pa	aram L (#12) 0	1			
								,				
Dele	ie Up Dn Copy							ОК			Func.	State
⊘ ∀orld		● Tool	⊖ Joint	Inc	⊘ 0.01mm	🥝 0.1mm	↓ 1mm	🥥 Auto	Teach	10		
	\downarrow											
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Configure the ID number for GM code for calling the program written with GM code by the operator to provide greater flexibility.

Directly configure the ID for G code or M code.

Param A (#1): The first parameter to be sent to G code or M code.

Param B (#2): The second parameter to be sent to G code or M code.

Param C (#3): The third parameter to be sent to G code or M code.

Param D (#4): The fourth parameter to be sent to G code or M code.

Param P (#16): The fifth parameter to be sent to G code or M code.

Param L (#12): The sixth parameter to be sent to G code or M code.

Note: The following are the commands for GM Code frequently used.

Switch Tool Parameter: G5 A1, where A is set to $0\sim3$, indicates the used tool parameter number.

Call NC module file o1234 exported by "Procedure": G65 P1234.

Check on a single safety point: G113 A0 is used to check it is in the first set of safety points.

5.4.11. World Record



l-N	PI	RESSURE.	th4	Save	В	lock0p	Re	cord	Ins	ert	J1-	J1+
1	8:		GM Code			RecID	0				2	2
2	7:		Jump R			D.					J2-	J2+
3	3:		FastTo		x		614.798	890	0.00	000	.	2
4	3:		FastTo								J3-	J3+
5	2:		FastTo	8	Y		134.42	190	600.000	900	9	
6	1:		FastTo	GOT	0 Z		-102.200	938	192.800	900	J4-	J4+
7	5:		Jump									
8	6:		Mark		С		-76.500	900	0.000	900		
*												
					Lin	eTo	Ā	Spee	ed			
Dele	lete Up Dn Copy						ок			Func.	State	
⊘ Vorld	❷ Work	● Tool	Joint	Cont	×1	×10		Auto	Teach	10		
Layer	Pos Info	Соог	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Move to the coordinates of world record.

Record ID Number: Based on the record ID number.

Coordinate Record Value: Retrieve the value of world record directly for display based on the record ID number.

World Coordinate: Display the current world coordinates.

Path: Select the movement to this record point.

Speed: If the speed is blank, it indicates that the defaulted straight line speed will be used.

5.4.12. Joint Record



l~N	Pl	RESSURE.	th4	Save	В	lockOp	Re	cord	Ins	ert	J1-	J1+
1	8:		GM Code	R		ecID	0				2	
2	7:		Jump R				ocVal	Ic	int		J2-	J2+
3	3:		FastTo		J1		-77.35	399	0.00	900	9	2
4	3:		FastTo								J3-	J3+
5	2:		FastTo	8	J2		-1.89	300	0.000	900	.	2
6	1:		FastTo	GOT	0 13		2.74	699	0_000	199	J4-	J4+
7	5: Jump		Jump									
8	6:		Mark		J 4		-0.00	038	0.000	900		
*					4							
					Fas	stTo	Ā	Sp	eed			
Dele	te U	Þ	Dn	Сору				ок			Func.	State
⊘ World	0 Work	October 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 €	0 Joint	Cont	✓ x1	а х10	С х100	🤗 Auto	Teach	10		
Layer	Pos Info	Соот	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Move to the coordinates of joint record.

Record ID Number: Based on the record ID number.

Coordinate Record Value: Retrieve the value of joint record directly for display based on the record ID number.

Joint Coordinate: Display the current joint coordinates.

Path: Select the movement to this record point.

Speed: If the speed is blank, it indicates that the defaulted straight line speed will be used.

5.4.13. Set Coordinate System



PRESSURE.th4			Save	В	BlockOp Record Insert				ert	J1-	J1+	
1	8: GM Code					r Recor	A	2				
2	2 7: Jump R											J2+
3	3 3: 1		FastTo			RecID 0				9		
4	3:		FastTo			Rec		ប	UseVal		J3-	J3+
5	2:		FastTo	8	X	0.00000 0.00000		00		<u> </u>		
6	1: F		FastTo	GOT) Y		0.0000		0.0000		J4-	J4+
7	5: Jump				Z		0.00000 0.00000		00			
8	6: Mark				A	A		0.00000		00		
*	*				B		0.0000		0.0000			
					С		0.000	900	0.000	00		
_												
Delete Up Dn Copy						ОК						State
⊘ World	0 Work	O Tool	0 Joint	Cont	✓ x1			🤗 Auto	O Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

According to the options, select or configure the current work coordinate system

- Direct setting: The contents entered in the table are used as the current work coordinate system. World Record XYZ: Configure the position of (X, Y, Z) set up in the world record ID number into "Work Coordinate System", whereas (A, B, C) is configured as 0.
- Position and Posture of World Record: Configure the positions of (X, Y, Z) and (A, B, C) set up in the world record ID number into the "Work Coordinate System".
- Coordinate System Record: Configure the coordinate system record into the "Work Coordinate System".
- Current Position and Posture: Configure the world record positions of (X, Y, Z) and (A, B, C) when the procedure executes to this line into the "Work Coordinate System".
- Dynamic Position and Posture: Read the content from the configured R-value and use it as the value for the "Work Coordinate System".

5.4.14. Skill Setting



1~N	PI	RESSURE.	th4	Save	В	lock0p	Re	cord	Ins	ert	J1-	J1+
1	8:		GM Code	R		licalla	 ♪ Fn	ahla	որություն հերություն	amic	9	2
2	7:		Jump R			184010			V DJ1		J2-	J2+
3	3:		FastTo			ill Coo	r Pa	th Dir		V		
4	3:		FastTo					J3-	J3+			
5	2:		FastTo	8		cill Type	.	<u> </u>				
6	1:		FastTo	GOT	0 Sk	ill Rang		J4-	J4+			
7	5: Jump				Sec	tion Di						
8	6: Mark											
*					Ini	t Moveme						
								Speed				
L								-				
Delete Up Dn Copy							Func.	State				
) Vorld	.⊘ ⊎ork	On the second	0 Loint	Cont	⊘ v1	۲) 10 x	 ✓ ✓	auto	🥝 Teach	10		
wor ru	WOIK	1001		CORC		×10	A100	Auto	reach			
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

The special moving mode is required if configuring the path movement, such as arc of welding.

Disable Skill: If the skill was enabled originally, this command will move the position generated by skill offset to the straight line path of original position.

Enable Skill: If the skill was disabled originally, this command will move the current position to the straight line path of skill offset position.

If the skill was enabled originally, this command will move the position generated by skill offset to the straight line path of new position.

Skill Coordinate System: The coordinate system is followed by the skill path.

Skill Types: There are circle, move back and forth, move left and right.

Moving Range: Swinging range i.e. the maximum distance offsets from the original path.

Section Distance: The swinging position will repeatedly appear after every interval of a certain section distance on the path,

Initial Movement: The initial movement in the beginning of skill while the moving distance is 0.



1~N	PI	RESSURE.	th4	Save	B	lockOp	Re	cord	Inse	ert	J1-	J1+
1	8: GM Code)isahle	amic	.	2			
2	7:		Jump R			IDUVIC	Т.				J2-	J2+
3	3:		FastTo			Skill Coor Path D		th Dir	ir 💆		9	2
4	3:		FastTo								J3-	J3+
5	2: FastTo					Offset Src Kead From K						<u> </u>
6	1: Fast			GOT	0 Offset X ID 0 0.255					255	J4-	J4+
7	5: Jump				0ffset Y ID 0 0.255							
8	6:	Mark			с. р.т.							
*	*					fset Z I	n la		٥.	255		
Delete Up Dn Copy						ОК						State
⊘ Vorld	0 Work	🥝 Tool	0 Joint	Cont	×1	а х10		🤗 Auto	⊘ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Dynamic Skill: Same as Enable Skill. It is merely that the skill parameters are determined by the contents of R value.

Note: When this function is used, the calculated skill offset must be less than the "Skill Maximum" in the "Limit" page. Otherwise, an alarm will take place.

Skill Max Range										
X	0.000									
Y	0.000									
Z	0.000									

5.4.15. LineTo



1~N	PI	RESSURE.	th4	Save	В	lockOp	Re	cord	Inse	ert	J1-	J1+
1	8:	: GM Code			Abs	Absolute 🛛 Joint Coor 🖉						.
2	7:		Jump R			Se	et¥al	J	oint		J2-	J2+
3	3:		FastTo		J1				0.000	00	9	2
4	3:		FastTo								J3-	J3+
5	2:		FastTo	8					0.0000		2 2	2 2
6	1:		FastTo	GOTO	J3			0.0006		100	J4-	J4+
7	5:		Jump									
8	6:		Mark		J4				0.00000			
*	:											
					Chan	ıgeType	GetSta	ance	Speed			
Delete Up Dn Copy						ОК						State
🥑 World	0 Work	O Tool	0 Joint	Cont	✓×1			🤗 Auto	O Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

5.4.16. CurveCorner



1~1	P	RESSURE .	th4	Save	В	lockOp	Re	cord	Ins	ert	J 1-	J1+
1	8:		GM Code		Abs	solute	Ā	Joint	Coor	Z	.	2
2	7:		Jump R			S	SetVal	J	oint		J2-	J2+
3	3:		FastTo		J 1				0.000	00	.	2
4	3:		FastTo						0.000		J3-	J3+
5	2:		FastTo	8				0.0000		199	<u> </u>	<u> </u>
6	1:		FastTo	GOTO) J3				0.0000		J4-	J4+
7	5:		Jump									
8	6:		Mark		J4				0.000	00		
*	r								k			
					Char	ıgeType	GetSta	ince	Radius			
Delete Up Dn Copy						ОК						State
⊘ World	e Work	✓ Tool	0 Joint	Cont	✓ x1	Ф х10		🧉 Auto	∕ Teach	10		
Layer	Pos Info	Соог	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

5.4.17. CurvePoint


1~N	PRESSURE.th4		th4	Save	ve BlockOp		Re	cord	Insert		J1-	J1+
1	8:		GM Code	R	Abs	solute	Ā	Joint C	001	V	2	2
2	7:		Jump R			SetVal			int		J2-	J2+
3	3 3:		FastTo		J 1				0.00000		9	2
4	3:		FastTo								J3-	J3+
5	2:	: FastTo		8					0.000	000	<u></u>	<u>, </u>
6	1:		FastTo	stTo GOTO					0.0000		J4-	J4+
7	5:		Jump									
8	6:		Mark		J4				0.000	900		
*												
					Chan	geType	GetSta	ance				
Dele	te U	D	Dn	Сору				ок			Func.	State
⊘ World	0 Work	⊘ Tool	0 Joint	Cont	✓ x1		✓ x100	🧉 Auto	⊘ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

5.4.18. CurveCenter



1~N	PI	RESSURE.	th4	Save	B	lockOp	Re	ecord	Inse	ert	J1-	J1+
1	8:		GM Code		Abs	Absolute 🗹 Joint			loor	Z	.	2
2	7:		Jump R			Set¥al			oint		J2-	J2+
3	3 3:		FastTo		J 1				0.00000		9	2
4	3:		FastTo								J3-	J3+
5	2:		FastTo	8	JZ				0.000	00	9	<u> </u>
6	6 1:		FastTo GOTO) J3				0.00000		J4-	J4+
7	5:		Jump 🔽									
8	6:		Mark		J4				0.000	100		
*												
					Chan	geТуре	GetSt	ance				
Dele	te U	D	Dn	Сору				ок			Func.	State
🥑 World	0 Work	O Tool	0 Joint	Cont	✓ x1		✓ x100	@ Auto	O Teach	10		
Layer	Pos Info	Соот	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

5.4.19. CurveEnd



1~N	PI	RESSURE .	th4	Save	В	lock0p	Re	cord	Ins	ert	J 1-	J1+
1	8:		GM Code		Abs	Absolute 🗹 Joint Coor					.	2.2.
2	7:		Jump R			SetVal Joint				J2-	J2+	
3	3 3:		FastTo		J J 1				0.00	900	.	2
4	3:		FastTo						0.0000		J3-	J3+
5	5 2:		FastTo	stTo 8					0.000	000	.	
6	1:		FastTo	GOT	0 J3				0.00	900	J4-	J4+
7	5:		Jump									
8	8 6: I		Mark		J4				0.00	900		
*					4		1					
) Chan	geТуре	GetSta	ince	Speed			
Dele	te U	p	Dn	Сору				ок			Func.	State
⊘ World	0 Work	October 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 € 100 €	0 Joint	Cont	✓ x1	▲ x10		🤗 Auto	✓ Teach	10		
Layer	Pos Info	Соот	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		
Line	Го	CurveC	orner	E Cu	rvePoint	[CurveCe	enter	Curve	e end		

Absolute/Relative: Indicate the contents of setting value are absolute to the selected coordinate system or relative to the current coordinate under the currently selected coordinate system. Coordinate System: Indicate the coordinate system used by the contents of the setting value. Setting Value: Coordinate point reached by this movement.

Coordinate: Current coordinate value.

Speed: If the speed is blank, it indicates that the defaulted straight line speed will be used. Get Current Coordinate: According to the selected coordinate system, fill the current coordinate of that coordinate system in the setting value.

Change Type: Switch the movement type.

5.4.20. Dynamic Position



1~N	PI	RESSURE.	th4	Save	B	lockOp	Re	cord	Inse	ert	J1-	J1+
1	8:		GM Code		Abs	olute	Ā	Joint C	oor	<u>v</u>	9	2
2	7:		Jump R			R	ID	R Value	Joint	t	J2-	JZ+
3	3:		FastTo		J 1					9.000	9	2
4	3:		FastTo							0.000	J3-	J3+
5	2:		FastTo	8						0.000		
6	1:		FastTo	GOT) J3					9.000	J4-	J4+
7	5:		Jump									
8	6:		Mark		J4					9.000		
*					2							
					Spe	ed RID						
Dele	te U	p	Dn	Сору				ок			Func.	State
⊘ World	0 Work	✓ Tool	O Joint	Cont	✓ x1		а х100	Auto	⊘ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Absolute/Relative: Indicate the contents of setting value are absolute to the selected coordinate system or relative to the current coordinate under the currently selected coordinate system.

Coordinate System: Indicate the coordinate system used by the content of the setting value.

R Number: Get the source registers of XYZABC coordinate information. If this column is blank, it indicates that the previous coordinate will be continued to use.

R Value: The value in the R-number register.

Speed R Number: Get the source registers of speed information. If this column is blank, it indicates that the defaulted straight line speed is used.

Go to Dynamic Position always uses "Straight Line Path" mode.

This command is applicable for working with the visual system or PC to fill in the target position and notify the robot of performing motions.



6. List

Del S	Select			5	Single				Run Se	lect	J1-	J1+
	0				9	8					J2-	J2+
	1				9	9					. 13-	. 13+
0	2					10						
9	3				4	11					J4-	J4+
9	4				9	12						
0	5				9	13						
0	6				9	14						
9	7				9	15					Func.	State
⊖ World	0 Work	⊘ Tool	⊘ Joint	Cont	✓ x1	×10	✓ x100	🍊 Auto	Teach	10		
Layer	Pos Info	Соот	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

This page is used to record the frequently used filenames of teaching procedure so that can facilitate the follow-up usage. It can also select the record ID number through external I point and work with the Start button to directly start the selected procedure without requiring the Teaching Pendant.

0 CY.th4 1 BV.th4	16 positions to record the filename, where the red indicator in the front represents the file in the number is the item selected by external I point, the gray box in the middle can be clicked to select the item. When the item is selected, it will turn to green background. If you click the white filename box, you can select the corresponding procedure filename.
Del Select	Clear the procedure filename for the clicked item.
Run Select	Start the procedure filename selected on the screen.



Single Cycle	There are two actions, where "One Turn" indicates to stop per one execution, and "Cycle" indicates to					
	repeatedly execute.					
	Currently executed time/execution time by target					
0 / 0	program. If the target is set as 0, it indicates to					
	continuously execute without stopping. The current time					
	can be also filled in according to the actual condition.					
if Select Changed	Select the handling method in cycling:					
Cycle Stop	Stop the procedure currently executing.					
	Continue to execute the original procedure.					
if Select Changed	Switch new procedure.					
Cycle old Select						
if Select Changed Cycle new Select						



7. NC Edit

no	files		Show	.txt	Sa	ve Sa	iveAs		Compact		J1-	J1+
1	#1=600	90						Coor(G5	4X) Inl	Pos(609)		2
2	#2=0						ŏ	Coor(65	4P) I-I	Rec(G10)	J2-	J2+
3											2	2
4	G00 L3	X0 Y0	Z0 A0 F(;	#1/6)			lacksquare	Fast(Ge	10) V-1	Rec(G11)	J3-	J3+
5							136	Line(GO)	SO) Va	itI(G20)	2	2
6	WHILE(1)					GOTO	Page(C01	S1) Wa	i+D(621)	J4-	J4+
7	FOR #	50 = 0	TO 1				\bigcirc	1 455(00)	(JI) ^w a	(021)		
8							X	Mid(G01	S2) Se	t O(G22)		
9	G00 L.	3 X67.3	80 Y-67.3	380 ZO A	-92.8 F((#1/6)		Cen(GO1	S3) Se ⁻	t R(G23)		
10								E 1(001		(004)		
Up	Dn	Delet	te Inser	t Copy	/	Se	arch	End(601	54) De	lay(604)	Func.	State
❷ World	⊘ Work	October 100 Tool	0 Joint	Cont	✓ x1			Auto	⊘ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

The function of this page is:

- 1. Directly record the procedure file by NC.
- 2. Make some modifications for the saved file.

ncfiles	Select the folder. When you
ROTTED	permit to login as
	"Manager", you can select
	"ncfiles" only. When you
	permit to login the level over
	"Developer", you can select
	"macro_maker".
Show that	When you click this button,
Show. LAC	you can select the saved file
	or new file.
Several Several	Operate by the selected
	program.



Up Dn	Delete	Insert Copy	Search a file.
Sea	urch		Clicking the number
			column can popout the text
			box for modification.
1 #1=60	000		The types of text input are
2 #2—A			shown when you select
2 82-0			Edit,"Simplified Keyboard"
			and "Full Keyboard".
Comp	act		Record the commands,
			whose functions are
		1	described in text.
Coor(654¥)	InPog(C00)		Operate by the selected
C001(054X)	111 05(005)		program.
Coor(G54P)	J-Rec(G10)		
Fast(G00)	V-Rec(G11)		
Line(G01S0)	WaitI(G20)		
Pass(G01S1)	WaitR(G21)		
Mid(G01S2)	Set 0(G22)		
Cen(G01S3)	Set R(G23)		
End(G01S4)	Delay(G04)		

Note 1: The file can be saved as o2234, and called to use in the "Procedure".

Note 2: The end command for the procedure is PROG_END.

Note 3: The command to return the main procedure is M99.



8. NC View

	World Pos		#1=60000 #2=0)					-5		် J1-	о Ј1+
X	0.0	00	* 2									
v	600 0		G00 L3 X	0 YØ ZØ	A0 F(#1	/6)			Show.	txt	ိ 2-	° 2⊥
1	000.0	‴⊩									JZ-	JZ +
Z	192.8	:00	WHILE(I)								0	0
			FOR #50	= 0 TO :	1						J3-	J3+
С	0.0	0.000 G00 L3 X67.380 Y-67.380 Z0 A-92.8 F(#1/										
	Work Pos	ork Pos G01 T8 L0 E1 Q0 U50 V10 W0 F(#1/6)									J4-	JAT
Y	9.0	00	G01 T5 L	0 X300 I	F(#1/2)							
Ŷ	0.0		G01 T5 L	0 X-300	F(#1/2)				Pause			
Y	600.0	00	G01 T8 L	0 E0 F#	1							
Z	192.8	:00	IF(#2 =	: 0)								
			#1=60000	1								
С	0.0	00	ELSE					Kes	et			
	#1=30000										Func.	State
4								6				
Worl	d Work	Tool	Joint	Cont	x1	x10	x100	Auto	Teach	10		
	Dee		In.	н.	C. E.	T	Dere		110	NC		
Laye	ayer Pos Coor Re Info Coor co		cord	ma- trix	Pos	tia	List	Teach	NC View	Edit		

The function of this page is to directly execute ncfiles.

				Display the coordinates. Click the coordinate
W	orld Pos		Work Pos	title to change the displayed coordinate
X	0.000	X	0.000	system.
Y	Y 600.000 Y 600.000		600.000	
Z	Z 192.800		192.800	
С	0.000	С	0.000	
	F			Currently executing line, -5 indicates the
	-5			procedure is not started.
CL .				Currently executing filename, click to select
210	ow.txt			the saved file.
Sta	rt Pa	use	Reset	Execution control on the procedure.



9. Point Record

0	World Rec			0			Joint R	ec		о J1-	J1+	
1	0			Get World	1	0			Get Jo	oint		
2	1 R	efCoor		614 70		1			11 7	2.254	J2-	J2+
2	2 R	efCoor2		014.75	· · · · ·	2			JI -/	1.354	<u>່</u> ວ	<u>ຼ</u>
3	3 ₩	K1.	-	134.42	2	3			J2 -	1.893	J3-	J3+
4	4				4	4					о <u>, с</u>	2
5	5		Z	-102.20	0 5	5			J3 2	2.747	J4-	J4+
6	6				6	6	?B					
7	7			-76.50	0 7	7	A?		J4 (9.000		
8	8				8	8						
9	9			Line To	9	9			Fast	То		
											Func.	State
⊘ World	⊘ Vork	⊘ Tool	⊘ Joint	Cont	✓ x1	x10		🥝 Auto	Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

The coordinate record includes two (2) categories: world record and joint record. Press the "Point Record" button to show the coordinate record page as follows:

There are 100 sets of record each. You not only can click the column of the record number to select and record, but also click the column beside the record number to set the name for the point position. The length of the name can be up to 11 English letters.

There are two function buttons for the world/joint record:

: Update the currently selected world/joint coordinates to the

current world/joint record.

Line To	Fast To
---------	---------

: Calculate the staright line path for movement based on the

current and target positions.



10. Matrix

0	Des	criptio	n				X	0.000	Get	P0	ິ J1-	J1+
1	5						Y	600.000			<u>ບ</u>	 ວ
			_	Postur	e		Z 192.800		Goto	9 PØ	J2-	J2+
2	6	A	6	9.000	Save Pos	ture	X	-492.118	Get	P1	<u>ບ</u>	2
3	7	В	6	9.000			Y	-14.352			J3-	J3+
		C	6	000.0	Goto Pos	ture	Z	192.800	Goto	• P1	0	
4	8					[Y	-189 598	\exists		J4-	J4+
P2			Co	ol Count	(C)	13	^	175 027	Get	P2		
*		→ T-1	Ro	v Count	(R)	16	I	100.000	Goto	P2		
R 🔫		>		Total (1	[) 2	208	2	192.800				
-							Daint 1			ID		
PO	C	P1	2	2 Distan	ce Ø	.000	FOIMU .		Goto	עני	Func.	State
A	2	0			0	0	0	10				
World	Work	Tool	Joint	Cont	x1	x10	x100	Auto	Teach	10		
Layer	Pos Info	Соот	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

This function is provided for the convenience of picking and placing material with matrix approach. Easily through the correction of three point positions and entering column/row count, it will be able to obtain each position point. The system provides nine (9) sets of matrix for save.

0	Descrip
1	5
2	6
3	7
4	8

1. _____, select the matrix set order $(0 \sim 8)$ to be configure. For the convenience of

identification, the text can be entered in the "Description" column for the description.

2. After entering the "Teaching Mode", the posture ABC will be adjusted to the monitoring view.

3. Click _____ to record the posture.



4. Click X+, X-, Y+, Y-, Z+, Z- to adjust the position.



9. Switch to the "Auto Mode".

10. Click	Save Postur	e to turn the	posture to the	recorded appearance by machine.
11. Click	Goto P0	Goto Pl	Goto P2	to move the robot to the connection position.
Poi	nt ID 0	Goto ID	Enter the p	point identification, and then click "Go to ID" to

move the robot to the point identification in the matrix (The number point starts from 0.).

13. For the course of the actual operation, please refer to G16 in G Code.



11. Coordinate System

11.1. Purpose of Coordinate System

Because the relative position between the place where workpiece is loaded and the robot body will not be the same when programming, a method must be provided to adapt the variation between positions. The coordinate system is used for such purpose. Not only the offset of spatial point but also the rotation and tilt in the coordinate system of the robot can be compensated.

Because the robot may be simultaneously used at the multiple working areas, this system can provide up to ten (10) sets of work coordinate for the use of the customer use according to the actual requirements.

There are two areas divided in the figure below. The left area is used to view the current coordinate system records. The right area uses the 3-point coordinate system method to assist calculating the position offset, the direction of rotation and the tilt of the coordinate system.

0	Coor I	Record		PO(Zero) A AAA	P1		P2 0.000				о J1-	J1+
1	Get XYZ	Get ABC	Y	0.000	0 0	.000	0.000	P2			ິ J2-	J2+
2	X	0.000	Z	0.000 or dir) 0 matio	.000 1 for 3	0.000 P Coordii	р • +Х	P1	P1	ပ ၂၃))]
4	Y	0.000	A	0.000	P0 ->	• P1 +	X ⊻			+Y P0) 12-	0 124
5	Z	0.000	C	0.000	P0 ->	• P2 +	⊦X <u>▼</u>			P2 .	J4-	J4+
6	A B	0.000	D	irection	for Cal	ibratio	on G	let P0	Goto	9 P0		
7	С	0.000	A	0.0	90 S	Save Din	rG	et Pl	Goto	• P1		
9	Set Cu	ırrent	С	0.0	00 0	ioto Din	r G	let P2	Goto	9 P2	Func.	State
⊘ Vorld	⊘ Work	●Tool	⊘ Joint	Cont	✓ x1			🤗 Auto	⊘ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

After 3-point is used to fix the coordinate system, it can be saved in the coordinate system for the use of the procedure.



11.2. Records of Coordinate System

0	1	2	ŝ	4	5	6	7	∞	6

 $0 \sim 9$: Click to select the number of the coordinate system to be operated.

Get XYZ

Get XYZ: Bring XYZ of P0 on the right side into the records of the coordinate system.

Get ABC

Get ABC: Bring ABC in the "Posture of Coordinate System" calculated by 3-point coordinate system into the records of the coordinate system.

Set Current

Set Current: Set up the recording value of the selected coordinate system as the present work coordinate system.



11.3. Principle and Operation of 3-Point Coordinate System

In mathematics, we can determine a coordinate system through the positions of three (3) points, where:

P0: Origin of the coordinate system

- P1: Upward point of primary axis
- P2: Upward point of secondary axis (on plane)

According to the differences of actual workpieces or the motion direction, the direction of primary axis may be possibly one point on +X, -X, +Y, -Y, +Z, -Z, so are the direction of secondary axis. Therefore, there are twenty-four (24) types of 3-point coordinate system.



After you select the relative position between the workpiece in the working area and the robot, the 3-point coordinate system can be set. The operating approaches are described as follows:

- 1. When it is used at the first time, you will set up the posture to be taught. The arm posture will be adjusted as the posture to be taught, and then you click "Record Calibrated Posture" so that can be taught with the same posture every time.
- 2. Click "To Calibrated Posture" to adjust the robot as the recorded calibration posture.
- 3. First select the origin P0, P1 and P2 used for the basis of calculating the coordinate system.
- 4. According to the axial direction where P1 and P2 are located, click the selection of the axial direction on the top to switch the axis.
- 5. Move the robot to align the tool end point to P0, and then click "Get P0" to bring "Present World Coordinate" into P0 coordinate.
- 6. If you only intend to use the position of the offset coordinate system without changing the rotation of the coordinate system, you just need to correct P0.
- 7. Move the robot to align the tool end point to P1, and then click "Get P1" to bring "Present World Coordinate" into P1 coordinate.
- 8. Click the XYZABC below to align the tool end point to P2, and then click "Get P2" to bring "Present World Coordinate" into P2 coordinate.
- 9. The system will automatically calculate the posture of the coordinate system.



12. Safety Point

When the procedure runs, the sudden power disconnection or reset could take place, so that the restarting position is different from the ideal one. If the robot stops in a position where may cause the interference, it will be dangerous to start the procedure hastily. Therefore, this system provides this function to conveniently check the current position of the robot in the program, which can reduce the danger and property loss.

There are four (4) sets (0~3) of position checking intervals as planned by the system. The position interval can be set through the following page: by repeating the adjustment of the robot position to the permissible boundary and then click "Bring In" to easily get the configured interval.

Sele	ct Set O	rder										
	1			MinVa	1	Cur	rent		MaxVal		о 11-	° 1+
		X	Bring	₁ In 12	829.597		0.000	7793.	837 B	ringIn		
2	3	Y	Bring	JIn 19	192.513	60	0.000	67.	155 B	ringIn	J2-	J2+
World	Coor	Z	Bring	19 Jn	540.511	19	2.800	0.	000 B	ringIn	ั 13-	о 3+
	_											
Range	2										J4-	ິJ4+
Get	Range	C	Bring	IIn	0.000		0.000	0.	000 B	ringIn		
Րիզ	ck Pos						_		/			
			Br	ing the	current			Bring	g the cur	rent		
То	Center		coord	inate to	minimu	m		coordina	ite to ma	iximum	Euro	State
			-	value se	tting			va	lue settii		runc.	State
⊘ Vorld	0 Work	⊘ Tool	⊘ Joint	Cont	✓ x1	×10		🥝 Auto	✓ Teach	10		
Layer	Pos Info	Coor	Re- cord	Ma- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		

Coordinates

World Coor

Coordinate type of safety point.



Using current coordinates of the robot plus and minus the range setting as the range



of safety point.

Check Pos

Check the current coordinates are in the setting range.

To Center

Calculate the half summation of the maximum and minimum values as the target

point of the movement, and hold this button to move toward the target point. If you release it, it will stop.

During the procedure process, the safety point can check the current position through G13.

The operation principle is that when a code is used to transmit the checked set order, G13 will put the checked results into the all-domain variable @40. When the results are successfully checked, the value of @40 is 1. If they are failed, the value of @40 is 0.

The following are the macro contents of G113:

G13A0 ;check if the current coordinates are in the setting interval of the zeroth set. IF (@40!=1)

ALARM("Position check fail!!") END_IF PROG_END



In order to conveniently use in the teaching procedure, the system pack the check as the additional G code. As long as the command of GM Code is used, G113 will be assigned and brought into the set order parameters A(0~3). If the check fails, the incorrect messages will be shown and the procedure execution will be stopped.

13. Inertia

When SCARA installs the object (such like end fixture/jig) on J3 axis, the inertia moment of load must be considered. The inertia moment that RS406 can sustain is 0.01 kgm^2 , where the maximum one is 0.12 kgm^2 . When load inertia at the end of SCARA exceeds the rating inertia, you must set



inertia as the current column. There is a progress bar under the column to remind of the current value being located in the range (If inertia in the current column isn't 0, the System will automatically set the maximum speed corresponding to inertia.).



The Sheet provides a simple calculation of inertia, where h, b, m and L represent the length, the width, the weight and gravity offset of end fixture.

14. G Code

14.1. Summary Table

G Code	Function	Description
G00	Quick Movement	L: 0 for world, 1 for work, 2 for tool, 3 for joint
G01	Path Movement	(default: work)
		M: 0 for absolute, 1 for relative (default: absolute)
		X: coordinate X or J1



		Y: coordinate Y or J2
		Z: coordinate Z or J3
		A: coordinate A or J4
		B: coordinate B or J5
		C: coordinate C or J6
		F: Speed
G04	Delay	
G05	Switch Tool Parameters	Used to switch the tool
G09	Correct Position	
G10	Joint Record Movement	
G11	World Record Movement	
G13	Safety Point Check	
G16	Matrix Point Calculation	
G20	Wait I	
G21	Wait R	
G22	Set O	
G23	Set R	
G31	Sense Stop	
G54	Set Coordinate System	O0: Directly assign the offset position and the posture
		O1: Use the position in the world record
		O2: Use the position and the posture in the world record
		O3: Use the record of coordinate system
		O4: Use the current position and the posture

14.2. Quick Movement (G00)

G00 X100 Y100 Z10 C39 F4000	Move to the position of the work
	coordinate (100, 100, 10, 39) with 4000
	deg/min
G00 L0 X100 Y100 Z10 C39 F4000	Move to the position of the world
	coordinate (100, 100, 10, 39) with 4000
	deg/min
G00 M1 X100 Y100 Z0 F4000	Move to the position relative to the



	current work coordinate (100, 100, 0)
	with 4000 deg/min
G00 L0 M1 X100 Y100 Z0 F4000	Move to the position relative to the
	current world coordinate (100, 100, 0)
	with 4000 deg/min
G00 L2 M1 Z-20 F4000	Move to the position relative to -20 at Z
	axis of the current tool coordinate with
	4000 deg/min
G00 L3 X100 Y100 Z10 A39 F4000	Move to the position f the joint
	coordinate (100, 100, 10, 39) with 4000
	deg/min

14.3. Path Movement (G01)

14.3.1. Straight Line (S0)

Use G01 S0 for setting. Since S0 is the default value, no need to write.

G01 X100 Y100 Z10 C39 F4000	Straight line to the position of the work
	coordinate(100, 100, 10, 39) with 4000
	mm/min
G01 L0 X100 Y100 Z10 C39 F4000	Straight line to the position of the world
	coordinate (100, 100, 10, 39) with 4000
	mm /min



G01 M1 X100 Y100 Z0 F4000	Straight line to the position relative to the
	current work coordinate (100, 100, 0)
	with 4000 mm /min
G01 L0 M1 X100 Y100 Z0 F4000	Straight line to the position relative to the
	current world coordinate (100, 100, 0)
	with 4000 mm /min
G01 L2 M1 Z-20 F4000	Straight line to the position relative to -20
	at Z axis of the current tool coordinate
	with 4000 mm/min
G01 L3 X100 Y100 Z10 A39 F4000	Straight line to the position of the joint
	coordinate (100, 100, 10, 39) with 4000
	mm /min

14.3.2. Arc Transition (S1)

Use G01 S1 to set up arc transition point.

The R code is the radius of arc transition.

G01 S1 X100 Y100 Z10 C39 R50 F4000	Arc transition to the position of the work
	coordinate (100, 100, 10, 0, 0, 39) with 4000
	mm/min.

14.3.3. 3-Point Arc (S2, S4)

G01 S2 is used to set up the point on arc. G01 S4 is used to set up the arc end point.

G01 <mark>S2</mark> X100 Y90 Z80	Take the current position as starting point. The
G01 <mark>S4</mark> X100 Y100 Z10 C39 F4000	work coordinates (100, 90, 80) are one point
	on arc, and the work coordinates (100, 100,
	10) are the arc end point.

14.3.4. Arc Center (S3, S4)

G01 S3 is used to set up the arc center. G01 S4 is used to set up the arc end point. When using G01, D2 and D3 will be used to assign clockwise-arc or counterclockwise-arc.



G01 <mark>S3</mark> X100 Y90 Z80	Take the work coordinate (100, 90, 80) as the
G01 <mark>S4 D2</mark> X100 Y100 Z10 C39 F4000	arc center, the arc end point as work
	coordinate (100, 100, 10) to draw the
	clockwise-arc. When the arc end point is
	reached, the posture is $(0, 0, 39)$.

14.4. Delay (G04)

G04 P100	Delay 100 ms
G04 X1	Delay 1 sec

14.5. Switch Tool Parameters (G05)

- G05 A0 Switch to the default tool parameters.
- G05 A1 Switch to the first set of tool parameters.
- G05 A2 Switch to the second set of tool parameters.
- G05 A3 Switch to the third set of tool parameters.

14.6. Joint Record Movement (G10)

G10 P2 F1000	Quickly move the position of No. 2 "Joint
	Record" with 1000 deg /min.

14.7. World Record Movement (G11)

G11 P67 F2000	Straight line to the position of No. 67 "World
	Record" with 2000 mm/min.

14.8. Safety Point (G13)

G13 A0	Check the current coordinate is in the interval of the 0 th set.
	After executed, check @40 equal to 1 represents in the safety range.

14.9. Matrix Point (G16)

G16 T1 P5	Get the coordinate of 1 st group, 5 th point.
G16 T3 P0 H20	Get the coordinate of 3 rd group, 20mm over 0 th point.
G16 T0 P7 H50	Get the coordinate of 0 group, 50mm over 7 th point.

After calling G16, the position of matrix point will be saved in the global variable @51~@56. The height of the upward movement will follow the Z-axis direction (P0~P1 cross P0~P2) of the



coordinate system for point in Matrix 3. An example is taken as follows.

G16 T1 P2	;call the first set of the coordinate point for the
second point in matrix	
G01 X@51 Y@52 Z(@53+50) C@56 F3000	;move to the position in Z axis for +50 at the point
G01 X@51 Y@52 Z@53 C@56 F10000	;drop to the point

14.10. Wait I-Point (G20)

G20 I2 S1	Wait I2 for changing to 1.	
G20 I2 S0 T1000 F1	Wait I2 for changing to 0. If the waiting time exceeds	
	1000ms, this line will be skipped.	
G20 I2 S1 T2000 F2 A29010 B3	Wait I2 for changing to 1. If the waiting time exceeds	
	2000ms, an alarm of R29010.3 will be alerted.	

I: I-Point Number

S: Comparison Value (Waiting Value)

T: Waiting Time

F: Failure Processing Mode, where 0 for continue waiting, 1 for skip this line, and 2 for alarm

- A: Alarm ID Number
- B: Alarm Bit

14.11. Wait R-Value (G21)

G21 R1100 V1	Wait R1100 for changing to 1.
G21 R1100 V0 T1000 F1	Wait R1100 for changing to 0. If the waiting
	time exceeds 1000 ms, this line will be skipped.
G21 R1100 M1 V99 T1000 F1	Wait R1100 for changing equal to R99. If the
	waiting time exceeds 1000 ms, this line will be
	skipped.
G21 R1100 M1 V99 C1 T1000 F1	Wait R1100 for changing not equal to R99. If the
	waiting time exceeds 1000 ms, this line will be
	skipped.
G21 R1100 V1 T2000 F2 A29010 B3	Wait R1100 for changing to 1. If the waiting
	time exceeds 2000 ms, an alarm of R29010.3



will be alerted.

R: R-Value ID Number

- C: Comparison Mode, where 0 for equal to and 1 for not equal to
- M: Mode, where 0 for constant and 1 for R value
- V: Comparison Value (Waiting Value)
- T: Waiting Time
- F: Failure Handling Mode, where 0 for continue waiting, 1 for skip this line, and 2 for alarm
- A: Alarm Number
- B: Alarm Bit

14.12. Set O (G22)

G22 O1 S0 P200	After O1 is set as OFF, it will pause 200ms.	
G22 O1 S1	Set O1 as ON	
G22 O1 S2	Switch the status of O1	

O: Number of Output Point

S: Status of Output Point, where 0 for OFF, 1 for ON, and 2 for Toggle

P: Waiting Time in ms

14.13. Set R (G23)

G23 R2010 T0 V3 P200	After R2010 is set as 3, it will pause 200ms.
G23 R2011 T1 V2	R2011 = R2011 + 2
G23 R2012 T2 V2060	R2012 = R2060
G23 R2013 T3 V10	R2013 = R2013+1. If R2013>10, set R2013=0.

R: R Number

T: Value Type (0 for absolute, 1 for relative, 2 for numbering, and 3 for cycle + 1)

- V: Status of Output Point
- P: Waiting Time in ms

14.14. Sense Stop (G31)

G31 M1 Z-100 F3000 R6130 S1 T1	Drop 100mm with 3000 mm/min. If R6130.0 = 1 in
	the course of drop, the actions not completed by this



	command will be omitted without execution.
G31 Z-100 F3000 R6130 S3 T3	Move Z axis to -100mm in the work coordinates with
	3000 mm/min. If R6130.0 = 1 and R6130.1 = 1 in the
	course of drop, the actions not completed by this
	command will be omitted without execution.

Except for R, S and T codes, other G codes will be the same with using the G01 command.

- R: R Number
- S: Mask value operated with the value of R number by AND. For example, when the bit0 of R value is monitored only, S1 can be used; when bit1 if R value is monitored only, S2 can be used; when bit0 and bit1 are simultaneously monitored, S3 can be used.

T: The values operated by AND are the same with ones for this code to stop by trigger.

Note: I70~I73 will be built in the system to correspond to R6130.x, which the I point triggered to stop can be set as this number to conveniently use this function.

14.15. Set Work Coordinate System (G54)

The rotation and tilt of the work coordinate system may refer to the example as illustrated in 2.2. There are three (3) ways to assign the work coordinate system described as follows:

14.15.1.	O0 (Default)	Directly	Assign	Offset	Position	and	Posture
----------	--------------	----------	--------	--------	----------	-----	---------

G54 X0 Y100 Z300 A0 B0 C0	Set up (0,100,300) as the origin of the work
	coordinate system
	No rotation and tilt
G54 X20 Y100 Z300 A0 B0 C30	Set up (20,100,300) as the origin of the work
	coordinate system
	Horizontally rotate at 30°
G54 X20 Y100 Z300 A0 B10 C30	Set up (20,100,300) as the origin of the work
	coordinate system
	Posture of the coordinate system as (0, 10, 30)



14.15.2. O1 Use Position XYZ in World Record

G54 O1 P8	Use XYZ of No. 8 (P8) world record as the
	work coordinate system. No rotation and tilt.

14.15.3. O2 Use Position and Posture XYZABC in World Record

G54 O2 P6	Use XYZABC of No. 6 (P6) world record as
	the work coordinate system.

14.15.4. O3 Use Coordinate System Record

	G54 O3 P8	Use No.8 coordinate system record.
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14.15.5. O4 Use Present Position and Posture

G54 O4	Use the coordinate XYZABC of procedure at
	that time as the work coordinate system.

15. Macro Syntax

15.1. Variable

15.1.1. Local Variable:

There are 200 local variables (floating point type) in each file:

 $#1 \sim #26$: If macro files are called, 26 variables in macro correspond to 26 letters in A~Z. When calling macro, A~Z codes can be used in the command and brought to the variables corresponding to macro file. If they are Ncfiles programmed by a user, the purpose can be planed by a user. #27~#199: Planned by a user.

15.1.2. Global Variable:

When the procedure runs, the global variable can be used (floating type): $@1 \sim @50$: There are 50 variables which can be planned by a user.

The global variables can be accessed by the files. Therefore, they can be used as a channel among the different files.



15.2. Resource Access

The following table is a list of all resources and access functions in the articulated robot.

Resource	Read for R, write for W	Read for R, write for W	Read for R, write for W	Description
	(Immediately execute	(Execute	(Execute when	
	after the program is	when the	the program is	
	started)	program is	executed to the	
		executed to	line)	
		the line)	synchronously	
			execute with the	
			action command	
I (Input)	R_MLC_I_F	R_MLC_I		Set the software
O (Output)	R_MLC_O_F	R_MLC_O	W_MLC_O_AT	number to correspond
	W_MLC_O_F	W_MLC_O		
				the actually output
				hardware point.
R (Register)	R_REG_F	R_REG		



	W_REG_F	W_REG	
R_BIT	R_REG_BIT_F W_REG_BIT_F	R_REG_BIT W_REG_BIT	

$#32 = R_MLC_I(206)$	Read the contents of I206 to local variable No. 32			
W_MLC_O(123, 1)	Set O123 as ON			
$#35 = R_REG(1200)$	Read the contents of R1200 to local variable No. 35			
$#35 = R_{REG_{BIT}(1200, 0)}$	Read the contents of 0 th bit of R1200 to local variable No. 35			
W_REG(1200, 3434)	When the program is executed to the line, the contents of			
	R1200 will be set as 3434.			
W_REG_BIT(1200, 0, 1)	When the program is executed to the line, the 0 th bit of R1200			
	will be set as 1.			
W_REG_F(1200, 3434)	When the program is started, the contents of R1200 will be			
	immediately set as 3434.			
W_REG_AT(1200, 3434)	When the program is executed to the line, the contents of			
	R1200 will be set as 3434 to synchronously execute with the			
	action command (avoid action pause).			

#1.00 => indicate Bit0 of #1

#1.03 => indicate Bit3 of #1

#1.32 => When 32 bits or more are assigned, an alarm will sound.

 $#1.01 \Rightarrow R_MLC_I(1) \Rightarrow$ The assigned value of Bit1 in #1 is one for input signal 1.

15.3. Math Function

The following table is the math functions supported in the robot system.

Math Function	Description
SIN(DEG)	SIN function
COS(DEG)	COS function
TAN(DEG)	TAN function
ASIN(VALUE)	ASIN function
ACOS(VALUE)	ACOS function
ATAN(VALUE1 , VALUE2)	ATAN function
SQRT(VALUE)	Get the root mean square value
ABS(VALUE)	Get the absolute value
ROUND(VALUE)	Get the value rounded off
FIX(VALUE)	Round off without condition



MOD(VALUE, VALUE2)	Get the remainder			
+	Add two numbers			
-	Subtraction of two numbers			
*	Multiplying two numbers			
/	Dividing two numbers			
	or			
&&	and			
!=	Not equal			
==	equal			

15.4. Program Flow Control

The following table is syntax of program flow control supported in the articulated robot.

Flow Control Command	IF ~GOTO			
Select Statement	IFELSE			
Select Statement	SELECT			
Loop	FOR END_FOR, EXIT_FOR			
Loop	DOUNTIL, EXIT_DO			
Call Function	CALL_SUB, EXIT_SUB			

15.4.1. Select Statement (IF...ELSE, SELECT)

• IF...ELSE

If the condition statement holds, it will execute. If not, it will skip.

Example

$#1 = R_REG(100)$; Read the value of R100 and assign to variable $\#1$.
IF(#1 == 1) W REG(50 1)	;When #1 == 1, write 1 to R50.
ELSEIF $(#1 == 2)$;When #1 == 2, write 1 to R51.
W_REG(51, 1) ELSE	
W_REG(52, 1)	;When #1 doesn't meet the conditions above, write 1 to R52.
END IF	;End IF condition.

• SELECT

Select the executed block according to the parameters.



Example

 $#1 = R_REG(100)$

SELECT(#1)	; Determine variable #1
CASE 0:	;When #1 is 0, execute G01 X10.
G01 X10	
CASE 1:	;When #1 is 1, execute G01 X20.
G01 X20	
CASE 3,4,5:	;When #1 is 3, 4 and 5, execute G01 X30.
G01 X30	
CASE_ELSE	;When #1 doesn't meet the conditions above, execute G01 X40.
G01 X40	
END_SELECT	

15.4.2. Flow Command (IF...GOTO)

• Conditional jump, unconditional jump

Example

IF(#1 == 100)	GOTO	200	;When #1=100, jump to N200.
G01 X30			
END_IF			
GOTO 100			;Jump to N100
N100			
G01 X20			
N200			
G01 X10			

15.4.3. Loop (FOR, DO UNYIL, WHILE)

• FOR



Use the parameter accumulation to determine the execution loop

```
      Example

      FOR
      \#1 = 1 \text{ TO } 10
      ;\#1 = 1 \text{ to } 10

      G00 X#1
      ;\#2 = R\_MLC\_I(55)

      IF(#2 == 1)
      ;When #2 == 1, it will exit the FOR loop.

      EXIT_FOR
      END_IF

      END_FOR
      ;When #1 == 10, it will end the FOR loop.
```

• DO UNTIL

If the determination of the condition statement is not held, repeatedly execute the loop.

Example

```
DO

IF(\#1 == 8); When \#1 = 8, exit the loop.

EXIT_DO

END_IF

G0 X#1

\#1 = \#1 + 1

UNTIL(\#1 \ge 20); When \#1 \ge 20, end the loop.
```

• WHILE

If the determination of the condition statement is held, repeatedly execute the loop.

Example

WHILE(#1<20) ;When #1 is less than 20, execute the program in the loop.



IF(#1 == 10) ;When #1 = 10, exit the WHILE loop. EXIT_WHILE END_IF G04 X1 ;Wait for one second. #1 = #1 + 1END_WHILE

15.4.4. Call Subfunction (CALL_SUB)

• Call the function in the same program (The string in CALL_SUB "Function Name" can include Chinese, English and number.)

Example

$#1 = R_REG(555)$;Information read
CALL_SUB"HIWIN"	;Call sub-program "HIWIN"
G04 P500	
PROG_END	;End the program
SUB"HIWIN"	;Sub-program "HIWIN"
IF(#1 == 1)	;When $\#1=1$, exit the subfunction and return to the main program.
EXIT_SUB	
END_IF	
G01 X5	
END_SUB	



15.4.5. Call Macro

• File Call

After a piece of program is saved as macro program, the main program can be used to call by G code (G65). (The name to save macro can be the lowercase English or number, which needs to be saved in ncfiles<no extension filename> of a project folder).

Example

G04 X5	
G65 "hiwin" L2 A1 B2 C3	;Call the name of file macro ("hiwin"), execute twice (parameter L), and
	bright into #1=1, #2=2, #3=3.
G01 X30	;M99 is needed to add on the latest end of subprogram "iwin", so that
	can return to this line and continue.

Variable Table:



A~Z_Alphabet										
NC File.	A	В	С	D	E	F	G	Н	Ι	J
Local variable	#1	#2	#3	#4	#5	#6	\ge	#8	#9	#10
NC File.	K	L	М	N	0	Р	Q	R	S	Т
Local variable	#11	#12	#13	\boxtimes	#15	#16	#17	#18	#19	#20
NC File.	U	V	W	X	Y	Z				
Local variable	#21	#22	#23	#24	#25	#26				

• G Code Defined by User

After a piece of program is saved as macro program, the main program can be used to call by G code (The saved name is maker_macro_gXXX, which is saved in the system folder < macro_maker >.). G code defined by a user is among G1000~G1100.

Example

G04 X5G1000 A1 B2 C3;Use G1000 to call macro (maker_macro_g1000), and bring to #1=1, ;#2=2,
and #3=3.G01 X30; M99 is needed to add on the lastest end of subprogram
"maker_macro_g1000", so that can return to this line and continue.

M99 description: Return after the subprogram ends

When NC in the main program is executed to M99, it will return the beginning of the program to execute it again. In the subprogram, M99 must be used as the program end, so that the program can execute to return the main program.



15.5. Example Program of Ncfile

The following is an example of NCFile using the command above-mentioned:

#1 = 10000; Set the movement speedG00 L3 X-90 Y90 Z0 A0 F#1;Move to the joint coordinateWHILE(1);Execute the infinite loopG20 I3 S1 T100 F0;Wait for I3 to input and continue to executeIF(R_MLC_I(1) == 1);Determine I1 is inputG01 T5 L0 X-300 Y400 Z192.8 C0 F#1G04 P100ELSEIF(R_MLC_I(2) == 1);Determine I2 is inputG01 T5 L0 X300 Y400 Z192.8 C0 F#1



```
G04 P100
    ELSE
                                      ;Execute when I1 and I2 are not input
        G01 T5 L0 X0 Y400 Z192.8 C0 F#1
        G04 P100
    END_IF
    SELECT(R_REG(7000))
                                      ;Read the value in Register 7000 and determine
                                      ;Execute when Register 7000 = 0
        CASE 0:
                                      ;Call PROG1
            CALL_SUB "PROG1"
                                      ;Execute when Register 7000 = 1
        CASE 1:
            G301
                                      ;Call G 301(maker_macro_g301)
                                      ;Execute when Register 7000 = 2, 3, and 4
        CASE 2,3,4:
            G00 L3 X-90 Y90 Z0 A0 F#1
            G04 P100
    END SELECT
                                      ;Execute the FOR loop for five times
    FOR #2 = 1 TO 5
        G00 L3 X-90 Y90 Z0 A0 F#1
        G00 L3 X0 Y0 Z0 A-100 F#1
        G00 L3 X90 Y-90 Z0 A0 F#1
        G00 L3 X0 Y0 Z0 A-100 F#1
    END_FOR
END_WHILE
SUB "PROG1"
                                      ;PROG1
    G01 L0 X300 Y400 Z100 C0 F#1
    G01 L0 S2 X0 Y590 Z100 C0 F#1
    G01 L0 S4 X-300 Y400 Z100 C0 F#1
END_SUB
```

PROG_END


16. Built-in I/O and Register

16.1. Summary Table

Input	Note	Description		
I1~I39	IN Point	Input signal for customer		
I42	Safety Grating	When a signal is triggered the relativill revise		
I43	Safety Grating	when a signal is triggered, the robot will pause.		
I44	Reset	Reset and clear the alarm status		
I51	NC Start	Start NC File		
I52	Teaching Start	Start the current procedure		
I53	Pause	Pause the path		
I54	Path Reset	Reset the path		
I55	Record Start	Start the record selected by a list		
156	Machine Reset	Interrupt the procedure in time and execute		
		macro		
I57	IN Point	Input signal for customer		
I47	Safety Grating	When a signal is triggered, the robot will pause.		
I60	IN 1	Latourforman A man		
I61	IN 2	- Interference Area		



I62	IN 3				
I63	IN 4				
I64	IN 5				
I70	Skip for I Point				
I71	Skip for I Point				
I72	Skip for I Point				
I73	Skip for I Point				
I75	Bit 0				
I76	Bit 1				
I77	Bit 2	4 DII SCICCI CASE			
I78	Bit 3				
I83	ListIN1				
I84	ListIN2	List the record selection			
185	ListIN3]			
186	ListIN4				
Output	Note	Description			
O1~39	OUT Point	Output signal for customer			
O40	Alarm Status				
O50	Running				
O51	Pausing				
052	Prepared				
O60	OUT 1				
O61	OUT 2				
O62	OUT 3	Interference Area			
O63	OUT 4				
O64	OUT 5				
075	Bit 0				
O76	Bit 1	CASE transforming 4 Bit output			
077	Bit 2	CASE transforming 4 bit output			
O78	Bit 3				
Register	Note	Description			
501	4 Bit Select CASE				
502	CASE Transforming				
	4 Bit Output				
542	Trigger Function	R542.0: NC start			
		R542.1: Teaching start			
		R542.2: Pause			



R542.3: Path reset

16.2. Protection of I42 and I43 Work Area (Using Signal from

Grating)

I42	Safety Grating	This signal should be connected to the grating signal
I43 S	Safety Grating	installed on the surrounding of the machine. When the
		signal is trigger, the robot will pause.

If the system uses I42 and I43 as the signal source of the work area, any signal is riggered to pause the ongoing action. If you want to continuouslt execute the work, you must press the Start button once on the the Teaching Pendant or trigger the start signal from other operation interface.

16.3. Bit (IN) Select CASE

175, 176, 177 and 178 correspond to Bit0, Bit1, Bit2 and Bit3.

Bit3	Bit2	Bit1	Bit0	Total
2^3	2^2	2^1	2^0	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
1	1	1	1	15

*The total values will be saved in the number R501.

Example:



WHILE(1)				
IF(R_MLC_I(51)==1) ;Determine I51 is input				
SELECT(R_REG(501)) ;Read the value in Register 501 and determine				
CASE 1:				
G01 T2 L3 X90 Y90 Z0 A0 F4000				
CASE 5:				
G01 T2 L3 X-90 Y-90 Z0 A0 F4000				
CASE 11:				
G01 T2 L3 X60 Y60 Z10 A0 F4000				
CASE 15:				
G01 T2 L3 X30 Y30 Z0 A0 F4000				
CASE_ELSE				
G01 T2 L3 X90 Y90 Z0 A0 F4000				
END_SELECT END_IF END_WHILE PROG_END				

Add the document file, and edit CASE 0~15.

- 1. Upload txt to a folder of ncfile.
- 2. Select the case from I75~I78, and start by I51 (NC Start).

16.4. Machine Reset Control

When certain signals take place in some circumstances, the on-going procedure will be immediately stopped. Meanwhile, the machine executes the other procedure to reset to the safe position. The system uses the signal source of mechanical reset for I47. If the other procedure is executing after the command for mechanical reset is started, it will be stopped and then reset macro (add Macro 119) is started. Because the application situation is dfferent, the action to reset will vary. Macro for reset action defaulted by the system will not do anything. A user can edit macro for reset (maker_func_ins_macro119) to overwrite the reset action defaulted by the system.

16.5. Procedure Control

151	NC Start	Start	the	procedure	selected	in	the	"NC	Execution"
		page.							



152	Teaching Procedure Start	Start the procedure in the current "Procedure" page.
153	Pause	Pause the procedure execution.
I54	Path Reset	Reset the procedure.

16.6. List Procedure Start

183	List Procedure Select Bit0	
I84	List Procedure Select Bit1	
185	List Procedure Select Bit2	
186	List Procedure Select Bit3	
155	Record Start	Start the procedure in the list comprising I83~I86

16.7. Interference Area

1(0	Forbid Entering Interference	Output signal for external signal to Interference Area			
100	Area 1	1			
O60	Output Signal for Entering Interference Area 1	If the tool tip enters the Interference Area after the Interference Area 1 in this system is started, the system will send the output signal O60.			
When I60 and O60 are simultaneously ON, the system will sound an alarm.					

	Interference	Area 2~5	in the	similar	method
--	--------------	----------	--------	---------	--------

161	Forbid	Entering	Interference	Output signal for external system to Interference Area
101	Area 2			2
1(2	Forbid	Entering	Interference	Output signal for external system to Interference Area
162	Area 3			3
163	Forbid	Entering	Interference	Output signal for external system to Interference Area



	Area 4	4	
TC A	Forbid Entering Interference	Output signal for external system to Interference Area	
104	Area 5	5	
061	Output signal when entering the	Output signal for tool tip optaring Interference Area 2	
001	Interference Area 1	Surput signal for tool up entering interference Area	
	Output signal when entering the	Output signal for tool tip optaring Interference Area 3	
002	Interference Area 1	Sulput signal for tool up entering interference Area	
063	Output signal when entering the	Output signal for tool tip entering Interference Area Output signal for tool tip entering Interference Area	
063	Interference Area 1		
O64	Output signal when entering the		
	Interference Area 1		

16.8. Sense Stop Signal

170	Skip for point I	
I71	Skip for point I	Discos refer to the later dustion to C21
I72	Skip for point I	Please refer to the introduction to G31
173	Skip for point I	

16.9. CASE Transforming to Bit (OUT)

O75, O76, O77, and O78 correspond to Bit0, Bit1, Bit2, and Bit3.

Bit3	Bit2	Bit1	Bit0	Total
2^3	2^2	2^1	2^0	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
1	1	1	1	15

You can enter 16 sets of signal by using the R value (R502).

Example: When you enter 5 0r 1 (ON state) in R502, it will correspond to O75 or O77.



17. Controller Communication

17.1. Introduction to Communication Protocol

There are many built-in communication protocols in the system, including COM port and Ethernet port.

Each communication protocol corresponds to the parameterw file with ini. The parameter file is correctly set so that the communication contents are correct. If you have any requirements, please contact the agent to obtain the corresponding parameter file and load it into the controller.

Com Protocol

- 1. Modbus RTU Server: Provide to access the controller contents by external machines.
- 2. Modbus RTU Client: Read and write the data contents from the controller to the peripheral machines.

Ethernet Protocol

- 1. Modbus Server TCP: Provide to access the controller contents by external machines.
- 2. Modbus Client TCP: Read and write the data contents from the controller to the peripheral machines.

17.2. MODBUS Setting

17.2.1. RTU Mode

Format setting:

Step1: After opening Scon, yo can enter the Communication page.

Communication	I/O Mapping	Files	Monitor
10000000000000000000000000000000000000		1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1	10.00 0.00 0.0000

Step2: Select RS232, RS422 and RS485.

Com2	RS485	-
	RS232	
	RS422	
	RS485	

Step3: Select SCARA as ModbusServerRTU (Slave) or ModbusClientRTU (Master).

Protocol (Settir	n <mark>g)</mark>
ModbusServerRT	U -
None	
ModbusServerRT	U
ModbusClientRTU	



Parameter setting:

Set File can be searched in the machine on the SCARA via Scon.

Com2_ClientModbusRTU
 Com2_ServerModbusRTU
 Eth_ModbusClientTCP
 Eth_ModbusServerTCP

RTU set at Server (Slave):





RTU set at Client (Master):





17.2.2. TCP Mode

Format setting:

Set SCARA as Modbus Server TCP (Slave) or Modbus Client TCP (Master).

None	-
None	
ModbusServerTCP	
ModbusClientTCP	

Parameter setting:

Set File can be searched in the machine on the SCARA via Scon.

Com2_ClientModbusRTU	
Com2_ServerModbusRTU	
Eth_ModbusClientTCP	
Eth_ModbusServerTCP	

TCP set at Server (Slave):

	ServerModbusTCP	lini	Ex: PLC set remote address = 1000 SCARA address=500
	[Common]	If Debugland 2 Very series	the sector falls and the sector is the secto
	DebugLevel=0	If DebugLevel=2, You can see	E the content of the communication whe
	Port=502	Sot Port	change to background.
	Timoout=50	Set Timoout	
	DegisterMode=22	16bit 22bit	
R5001 value :	RegisterMode=52	IODIL, SZDIL	ant address is the local address
0:Close	k	II Registeriviode=32 , Client	set address is the local address
1:Open		multiplied by two.	
	OpenPortResultAddr	=5001 Register of open p	oort result
	IdleTimeAddr=5002	Number of Not receive th	e packet (Show the register)
	CounterAddr=5003	Number of packets have b	peen sent(Show the register)
	ErrDataAddr=5004	Number of error data pac	kets (Show the register)
	ErrAddrAddr=5005	Number of error address	packets(Show the register)
	PkgThisAddr=5006	Number of receive the co	rrect packets(Show the register)
	PkgOtherAddr=5007	Number of packets is sen	t of other Slave(Show the register)
	PkgRspAddr=5008	Number of packets receiv (Show the register)	ved in response to the other Slave
	PkgExecptionAddr=5	009 Number of received exce Slave(Show the register)	ptional response packets from other



TCP set at Client (Master):

	ClientModbusTCP.i	ni
	DebugLevel=0	If DebugLevel=2, You can see the content of the communication when you use keyboard "CtI+Alt+F2" change to background.
	ServerCount=2 [Server0]	Set connect count
	Addr=192.168.139.20	3 Connect IP
R3001 value :	Port=502	Connect port
0:Connection	Timeout=500	Timeout
close	MaxRetry=3	Max retry count
1:In connection	RegisterMode=32	16bit, 32bit
fail	Ŭ	
3:Connection	StatusAddr=3001	Register of connection status
success	TxPkgAddr=3002	Number of packets have been sent(Show the register)
4:Connection	RxPkgAddr=3003	Number of receive the correct packets (Show the register)
not response	EcpPkgAddr=3004	Number of exceptional packets
	ActCount=2	
	[Act0_0]	
	FuncID=15	FuncID
	RemoteAddr=0	Register of remote address
	Count=100	Register count
	LocalAddr=1000	Register of local address

The operations can be changed by setting FuncID.

FuncID:
1 (Remote O to Local A)
2 (Remote I to Local A)
3 (Remote D to Local R)
4 (Remote R to Local R)
15 (Local R to Remote O)
16 (Local R to Remote R)



17.3. Upload File to SCARA

Upload the file to the SCARA after you finish.

CARA configure ((v1.0)				TT		×
onnected	Restart				H		V®
mmunication	I/O Mapping	Files Moni	tor		Motion Co	introl and System Techr	nology
0000000	▼ C:	\Users\sean168\Desktop\Sc	on(v1.0)	\00000000\machine		Open File	
Data	C	ontroller					-
NCFile		File	КВ	Time	^	Refresh	
OpenHMI		0000.str	215929	2016-9-29 8:56:19			
Macro		AbsHiwin.ini	1235	2016-9-29 8:56:19		Delete	
Machine		aiomap.ini	1800	2016-9-29 8:57:18		Delete All	
Setup		boot.ini	650	2016-9-29 8:56:19		Delete All	
Exe		Com2_ClientModbusRT	933	2016-9-29 8:56:19		Download	
Security		Com2_ServerModbusR	308	2016-9-29 8:56:19			
Log		Com3_ClientModbusRT	859	2016-9-29 8:56:19	*	Download All	
Language						Status :Ready!	
	L	ocal					
		File	KB	Time		Refresh	
		Com2_ClientModbusRT	933	2016-09-23 16:52:39			
		Com2_ServerModbusR	308	2016-09-23 16:53:47		Delete	
		Eth_ModbusClientTCP.ini	1091	2016 09 20 09:25:22			
		Eth_ModbusServerTCP.ini	240	2016-09-06 13:32:19		Delete All	
			1	1 1		Upload	C
		Select the file to b	e uplo	aded			
		according to the s	etting a	above			

Restart the SCARA after uploading the file.



18. PC Communication Function

Provide the communication functions for PC (The operating system needs Window.) and the developer with API library to save the time for developing the communication protocol. With API library, you can access most information in the system, and control the system. For example:

- 1. Coordinates
- 2. IO status
- 3. Alarm
- 4. Read and write parameters
- 5. Start, pause, and reset
- 6. Movement command

18.1. API Concept

The API (Application Programming Interface) is mainly used as the applications at the upper layer and the communication media for the controller. The applications at the upper layer can save the commands and data in command queue and mirror memory via API, and communicate with the controller by Ethernet to read or write the data. Therefore, the communication between API and the applications at the upper layer can be completed, where the direct queue, the polling queue and the mirror memory data in the command queue are detailed in the section of Connection Function Flow and Communication Command Data below.





18.1.1. Read/Write Register

The use of the API can read or write the data to the controller, including read SCARA coordinates, control I/O status and so on, so that SCARA can be integrated with the peripherals. Before reading/writing the data in the controller, you need to understand the memory planning inside the controller and the IP meanings. A user can use one part of memory resources, and the other parts will be defined by the controller in advance. When a user read or write the data in the memory, the SCARA will act according to the command represented by the memory position. For the commonly used memory resource planning table, please refer to 18.4.





18.1.2. Connection Function Flow and Communication Command Data





*The function name X represents the different types of data pattern, including R, I, O...and so on. For example: ReadR/WriteR is to read/write the R value in the memory, ReadI is to read the input value, and ReadO/WriteO is to read/write the output value.

(1) <u>Initialize</u>: When you use the API, the priority step is to initialize scif_Init(). The initialization contents include the connected controller number, the connection quantity, the resource usage quantity and the supplier identification password. By initializing the connection number and identification password, the controller can be connected to control and the identification can be confirmed to connect with the controller, as well as threading can be established. If the password is incorrectly entered, the initialization will fail and the library can't be normally operated.

1	Controller Connection	Each controller can simultaneously support up to five		
		connections. The connection number is needed to set		
		when connected by software.		
2	Connection Quantity	The connected controller quantity is used to monitor.		
		When a computer and two controllers are		
		simultaneously comprise a system, many controllers		
		will be needed to connect. This value represents the		
		connected controller quantity.		
3	Resource Usage	In order to conveniently use the library, a mirror		
	Quantity	memory will be established for each connection at		
		the PC side to save the data read from the controller.		
		When there are many connections, special attention		
		must be paid to the opened memory size in this		
		claim, so that all memories in PC will be occupied.		
4	Supplier ID Password	Used to identify the supplier ID, and connect to the		
		controller after a use ID is identified.		

- (2) <u>Connect</u>: After initializing and connecting to scif_LocalConnectIP(), the controller IP you want to connect must be entered. After the connection is started to ensure the connection is successful, scif_GetTalkMsg() must be called to acquire the connection information. When the successful connection is returned, the API is fully connected.
- 3 Set Cycle Command: In order to establish the communication data with the 122



controller, the functions can be classified by the user requirement as:

- ✓ scif_cmd_ReadX() for continuous data communication: The continuous data communication means to read the continuous interval address (For example, the address interval is 0~10.).
- ✓ scif_cb_ReadX() for discrete data communication: The discrete data communication means to read discontinuous address in one time (For example, the address is set as 1, 5, 10.).

Except that the data address is read, the patterns of communication command in queue are classified as:

✓ SC_POLLING_CMD for continuous update:

This command will be saved in Polling Queue. The address set to read will be synchronously updated.

✓ SC_DIRECT_CMD for single execution:

This command will be saved in Direct Queue. The address to be read or written will be prioritized to execute, whereas it will be deleted after executed in signal time. When you use the library, it will be used to write the functions in the controller. The communication pattern is defaulted as

SC_DIRECT_CMD.

*<u>Special Note</u>: If the mirror memory used in this connection needs to continually update, the communication command must be set as SC_POLLING_CMD.

After SC_POLLING_CMD is defined, the data can be sorted again by scif_StartCombineSet() and scif_FinishCombineSet() to achieve the purpose that reduces the package quantity.

Assembled Packet Examplechar serverindex;scif_StartCombineSet(serverindex);scif_cmd_ReadI(SC_POLLING_CMD, serverindex, 0, 100);scif_cmd_ReadR(SC_POLLING_CMD, serverindex, 10, 50);scif_FinishCombineSet(serverindex);

- (4) <u>Read Mirror Memory Data</u>: After the mirror memory data are established, scif_ReadX() can be used to enter the data address and read the values in the address memory.
- (5) <u>Set Direct Command</u>: In the direct command, scif_WriteX() can be used to write the



data, and the command can be deleted after completed.

6 <u>End Library</u>: After the API is connected, scif_Destroy() must be used to end the connection.

* For the related libraries mentioned in the flows above, please see <u>Appendix A</u>.

18.2. Communication Example for SCARA

This section will connect with the SCARA controller by the API. First, PC needs to connect with the controller. After you open the network setting in the computer and the "Network Setting" page in the "Permissions" of the Teaching Pendant to confirm PC and controller IP are in the same domain, the permissible address of "Network Setting" in the Teaching Pendant is set as PC IP and "Reset Network" is pressed to complete setting. The program syntax at the upper layer is described in the actual examples how to communicate with the controller via the API, so that can complete to read the coordinate value of the SCARA, JOG and I/O status.



Local Area Connection 6 Properties		
Networking Sharing		
Connect using:		
Intel(R) I210 Gigabit Network Connection #5		
<u>C</u> onfigure		
This connection uses the following items:		
 Client for Microsoft Networks File and Printer Sharing for Microsoft Networks 		
QoS Packet Scheduler		
 Link-Layer Topology Discovery Responder 		
✓		
Internet Protocol Version 4 (TCP/IPv4)		
Install Uninstall Properties Description 2		
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.		
OK Cancel		



Internet Protocol Version 4 (TCP/IPv4) Properties			
General			
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.			
Obtain an IP address automatically			
Use the following IP address:			
IP address:	192.168.19.11		
S <u>u</u> bnet mask:	255.255.255.0		
Default gateway:	· · ·		
Obtain DNS server address automatically			
O Use the following DNS server add	dresses:		
Preferred DNS server:			
<u>A</u> lternate DNS server:	• • •		
Validate settings upon exit	Ad <u>v</u> anced		
	OK Cancel		

[- Interfac MAC	e	C-29-26-	39-93	_	Allow	IPs — 192.16	8.139.1			ິ J1 -	ິ J1 +
	TP Mask	192.1	168.19.6 255.255.	0	Contro	ller IP	192.16 192.16	8.95.30 8.95.1	Compu	ter IP	J2-	ິJ2+
	Gateway	192.1 ⊒ Res	168.139. set IP	1			0.0.0. 0.0.0.	0 0	_		ິ J3 -	ິJ3+
	- Connect i	on Setti	ng —	Func	Snable In	ternet Å	uto C	urrent C	onnectio	08	J4-	ິJ4+
	Tool Pas	svord	_	II II	=	1		0.0. 0.0.	0.0 0.0			
	Nane SCARA		_	=	=	1		0.0. 0.0.	0.0 0.0			
				Π	F	1	= [0.0.	0.0		Func.	State
⊘ Worle	d ^O Work	Or Tool	0 Joint	Inc	0.01nn	0. 1nm	⊘ lnn	4uto	e Teach	10	Б	
Laye	Pos Info	Coor	Re- cord	Na- trix	Safe Pos	Iner- tia	Proc List	Proc Teach	NC View	NC Edit		



18.2.1. Connection Example

Connection Example				
Syntax	Description			
#include "scif.h"	Header File			
<pre>int rt; DLL_USE_SETTING DllSetting; DllSetting.SoftwareType = 5; DllSetting.TalkInfoNum = 10; DllSetting.MemSizeI = I_NUM; DllSetting.MemSizeO = O_NUM; DllSetting.MemSizeC = C_NUM; DllSetting.MemSizeS = S_NUM; DllSetting.MemSizeA = A_NUM; DllSetting.MemSizeR = R_NUM; DllSetting.MemSizeTT = 0; DllSetting.MemSizeTT = 0; DllSetting.MemSizeTS = 0;</pre>	The initialized items and the software type represent the connected controller number. TalkInfoNum is the connection quantity.			
DIlSetting.MemSizeTV= 0;DIlSetting.MemSizeCS= 0;DIlSetting.MemSizeCV= 0;DIlSetting.MemSizeF= 0;				
<pre>rt = scif_Init(&DllSetting,23594510, "0B9287F3AE9D949A7751D8C8E51A50BE46FBA406D 7E9CE0B"); if (rt!=100) { printf("initialization of library failed!"); return 0;}</pre>	The initialization is the supplier number and the encoded string, and used to determine the function is successfully initialized.			
<pre>int ok; ok = scif_LocalConnectIP(0,"192.168.19.200") if(ok != 1) { printf("connection failed!\n"); return 0;</pre>	Set the controller IP and determine the connection is established successfully.			



<pre>}printf("connected successfully!\n");</pre>	
scif_StartCombineSet(0)	
<pre>scif_cmd_ReadS(SC_POLLING_CMD, 0, 3000, 4);</pre>	
scif_cmd_ReadR(SC_POLLING_CMD, 0, 3000, 80);	Provide alarm, warning, and I/O detect via ReadS(),
scif_cmd_ReadR(SC_POLLING_CMD, 0, 6300, 50);	and define ReadR, ReadO, and ReadI must
scif_cmd_ReadR(SC_POLLING_CMD, 0, 6000, 80);	synchronously update the data blocks
<pre>scif_cmd_ReadO(SC_POLLING_CMD, 0, 0, 100);</pre>	
<pre>scif_cmd_ReadI(SC_POLLING_CMD, 0, 0, 100);</pre>	
scif_FinishCombineSet(0)	
while (1)	
{	
if (scif_GetTalkMsg(0, SCIF_CONNECT_STATE)	The data are successfully connected after the use of
== SC_CONN_STATE_OK)	<pre>scif_GetTalkMsg() is confirmed. If it is successfully</pre>
{	connected, the connection and the data are established.
printf("data successfully connected!\n");	
break;}	
Sleep(100);}	



18.2.2. Transform Example

Transform Example – Read the coordinate value				
Syntax	Description			
int Unit_Transform = 100000;				
float World_X,World_Y,World_Z,World_C;	The values in the controller are transformed (divided			
	by 100 thousand time) as the actual coordinate ones,			
World_X = (float)((int)scif_Read(6321))/	where scif_Read() reads the coordinate ones (R6321~			
Unit_Transform;	R6323 are the XYZ coordinate ones and R6326 is the			
World_Y = (float)((int)scif_Read(6322))/	C coordinate one.)			
Unit_Transform;				
World_Z = (float)((int)scif_Read(6323))/				
Unit_Transform;				
World_C = (float)((int)scif_Read(6326))/				
Unit_Transform;				

Transform Example - controller mode - teaching mode and auto mode				
Syntax	Description			
<pre>int Current_Mode; Current_Mode = scif_ReadR(6039); if (Current_Mode==0) { printf("maintenance mode\n");} else if(Current_Mode == 1) { printf("auto mode\n");} else {</pre>	Read R6039 address via scif_ReadR() to obtain the current controller mode			
scif_cmd_WriteR(0,804, 1); scif_cmd_WriteR(0,180204,0); scif_cmd_WriteR(0,47508,1);	Set the controller mode as the auto mode			
scif_cmd_WriteR(0, 805, 1); scif_cmd_WriteR(0,180204,1); scif_cmd_WriteR(0,47508,1);	Set the controller mode as the teaching mode			



JOG Example-> continue movement to +X direction of the world

coordinate				
Syntax	Description			
//JOG button not pressed				
scif_cmd_WriteR(0, 6301, 0);	R6301 is the axis command, which is numbered as			
	1~6 according to XYZABC coordinates. R6302 is 1			
//JOG button not pressed	to indicate the continue mode. R6303 is 5 to			
scif_cmd_WriteR(0, 6302, 1);	indicate the percentage of movement speed in the			
scif_cmd_WriteR(0, 6303, 5);	continue mode. R6300 is 0 to indicate the world			
scif_cmd_WriteR(0, 6300, 0);	coordinate system.			
scif_cmd_WriteR(0, 6301, 1);				

* Special Note:

Before you select the axis command R6301 as the X-axis direction (R6301 = 1), you must set R6302 for the action mode, R6303 for the speed mode and R6300 for the coordinate system. Otherwise, after R6301 in program is set as the axis direction $1\sim6$, the commands will immediately act according to the current controller status.

JOG example -> increment movement to -Y direction of the work				
coordinate				
Syntax	Description			
<pre>//JOG button not pressed scif_cmd_WriteR(0, 6301, 0);</pre>	R6301 is the axis command, which is numbered as 1~6 according to XYZABC coordinates. R6302 is 0 to indicate the increment mode. R6303 is -10 to			
<pre>//JOG button not pressed scif_cmd_WriteR(0, 6302, 0);</pre>	indicate the movement distance (-10mm) in the increment mode, where the minus sign represents			
scif_cmd_WriteR(0, 6303, -10); scif_cmd_WriteR(0, 6300, 1); scif_cmd_WriteR(0, 6301, 2);	the opposite direction. R6300 is 1 to indicate the work coordinate system.			



18.3. Communication Example by Visual System

The robot has been widely integrated with the visual system. With the communication from the visual system, the information on the object coordinates will be uploaded to the application at the upper layer. With the API, the coordinates will be written to the controller memory. The controller will call the macro command to read the memory address, so that can move the robot to the object identification position.

Macro example			
Example when the robot moves to the object identification position			
Syntax	Description		
scif_cmd_WriteR(0, 8503, X);	The object identification position		
<pre>scif_cmd_WriteR(0, 8504, Y);</pre>	(X, Y, C) obtained by the visual		
<pre>scif_cmd_WriteR(0, 8505, C);</pre>	system is written to the user-defined		
scif_cmd_WriteR(0, 17004, 300);	memory position, and the macro		
scif_cmd_WriteC(0, 22, 1);	filename maker_func_ins_macro300		
Sleep(100);	is called by R17004, and the macro		
scif_cmd_WriteC(0, 22, 0);	is triggered to start by C22.		

The commands in the macro content are edited by the notepad. The filename is saved as maker_func_ins_macroXXX (example: XXX is 300.), and the filename extension is deleted. With SconConnection Setting, you can select macro folder in "File" (Please see Chapter 20 for uploading.). The edited macro files will be uploaded to the controller. You can insert and start macro via R17004 and C22.

Macro content			
Syntax	Description		
#1=(R_REG(8503)/100000);			
#2=(R_REG(8504)/100000);	Read the memory position to obtain the		
#3=(R_REG(8505)/100000);	object data, and move to the coordinates of		
	the object position. After delaying in		
G01 L1 X#1 Y#2 C#3 F20000	300ms, move to the loading area, send the		
G04 P300	output signal, and end the program.		
G00 L0 M0 X250 Y300 Z0 C0 F20000			
W_MLC_O(5,1)			
PROG_END			



Register	Comment	Description
		World Coordinate: : R2403001 Axis No. No.
R-value record	World Coordinate Joint Coordinate	Joint Coordinate: : R2400001 Axis No.
		ex. R2403016 \rightarrow C axis of P1 R2403201 \rightarrow X axis of P20
R550	Deceleration	R550 is the speed percentage (need to be multiplied by 100) when grating is decelerated to trigger. Ex.: When you want to set I57 as ON, the speed of SCARA will drop to 2%. 2*100=200, and set R550=200.
R1001	Provide for a	These 3999 registers will not be saved after power shutoff
to	customer to define	
R4999	his own running	
	dynamic data	
R8001~	Provide for a	These 999 registers will be saved after power
R8999	customer to define	shutoff.
	his own parameters	
R6011	Machining Mode	One round for 0, one cycle for 1, single step for 2
R6037	Path status	0 for Not Prepared 1 for Prepared 2 for Cycle
		Start 2 for Hold and 4 for Star
R6039	Maintenance,	
	Automatic, Teaching	0 for maintenance 1 for auto and 2 for teaching
R6300	Mode (K)	Sotting of Coordinate System:
10300	Coordinate Type	0 for World Coordinate System:
		Coordinate System, 2 for Tool Coordinate System,
		and 3 for Joint Coordinate System

18.4. Resource Planning Table



R6301	Selection of Axis Direction	Number of Axis Direction 1~6 Corresponding Number: 1, 2, 3, 4, 5, 6 World Coordinate: X, Y, Z, A, B, C Work Coordinate: X, Y, Z, A, B, C Tool Coordinate: X, Y, Z, A, B, C Joint Coordinate: J1, J2, J3, J4, J5, J6				
R6302	Motion Mode	Teach the movement mode:				
		0 for increment, 1 for continue				
R6303	Distance/Speed	When 6302=0, the unit is 0.01mm multiplied by the				
	Setting	current value; when 6302=1, the current value is				
		speed %.				
R6307	Distance/Speed	Continue mode/increment mode				
	Display	1: x1/0.01mm				
		10: x10/0.1mm				
		100: x100/1mm				
R6321	Coordinate X					
R6322	Coordinate Y					
R6323	Coordinate Z	Current world coordinate				
R6326	Coordinate C					
R6331	Coordinate X					
R6332	Coordinate Y					
R6333	Coordinate Z	Current working coordinate				
R6336	Coordinate C	_				
R6341	Coordinate X					
R6342	Coordinate Y	-				
R6343	Coordinate Z	Current tool coordinate				
R6346	Coordinate C					



R6351	Coordinate J1			
R6352	Coordinate J2			
R6353	Coordinate J3	Current joint coordinate		
R6354	Coordinate J4			
R17004	Macro Control	Insert the macro name. Macro retrieve will read		
		from the folder macro_maker. The retrieved name is		
		maker_func_ins_macro99. It indicates R17004=99.		
R48109	Speed Ratio	Use R to modify the speed. 10000 indicate 100%,		
		5000 indicate 50%, and so on.		
A812	Decrease Ratio	Use this value to modify the ratio.		
A810	Increase Ratio	Use this value to modify the ratio.		
C0	Start	General start		
C1	Pause	Pause		
C2	Path Reset	Path reset		
C22	Macro Start	Use to trigger macro start		
C3000	Reset	Reset and clear alarm		
S0	Start Status	Display the start status		
S1	Pause Status	Display the pause status		
S22	Macro Start Status	Display the macro start status		
A803	Maintenance Mode (W)	Trigger by pulse signal		
A804	Automatic Mode (W)	Trigger by pulse signal		
A805	Teaching Mode (W)	Trigger by pulse signal		
A830	World Coordinate (W)	Select the coordinate system in the teaching mode.		
A831	Work Coordinate (W)	Select the coordinate system in the teaching mode.		
A832	Tool Coordinate (W)	Select the coordinate system in the teaching mode.		
A833	Joint Coordinate (W)	Select the coordinate system in the teaching mode.		



A842	Teaching speed (W)	Teach the movement mode	
		continuous: X1 (speed); increment: 0.01mm	
		(distance)	
A843	Teaching Speed (W)	Teach the movement mode	
		continuous: X10 (speed); increment: 0.1mm	
		(distance)	
A844	Teaching Speed (W)	Teach the movement mode	
		continuous: X100 (speed); increment: 1mm	
		(distance)	



19. Scon Teaching

19.1. Preparation

Check IP at the PC side (Red Box 1) and SCARA (Red Box 2) are in the same domain.
 *SCARA IP check & modify: From Permissions → Network Setting on Teaching Pendant, you can it is the same domain with PC. If it isn't, click Reset after changing IP.

Internet Protocol Version 4 (TCP/IPv4)	Properties ?									
General										
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.										
Obtain an IP address automatical	у									
Use the following IP address:										
IP address:	192.168.19.11									
S <u>u</u> bnet mask:	255 . 255 . 255 . 0									
Default gateway:	· · ·									
Obtain DNS server address autom	natically									
• Use the following DNS server addr	resses:									
Preferred DNS server:										
<u>A</u> lternate DNS server:	· · ·									
🔲 Vaļidate settings upon exit	Ad <u>v</u> anced									
	OK Cancel									

_ Interface		Allow IPs	
MAC	00-0C-29-26-39-93	192.168.139.1	
IP	192.168.19.6	192.168.95.30 Comp	uter IP
Mask	255.255.255.0 Col	atroller IP 192.168.95.1	
Gateway	192.168.139.1	0.0.0	
	⊒ Reset IP	0.0.0	



19.2. Interface Function

SCARA config	ure (v1.0)						
Connect	Restart				4	HI	WI
Communicatio	n I/O Mapping	Files	Monitor		Ν	Aotion Contro	l and System Tech
Mo	dbus Configure						
	abab configure						
	RTU (Com2))					
				Com2	None	Ŧ	
	Protoc	col (Setting)	Protocol (Runing)	Count		_	
	None	•	None	0	Reset	t	
	Status	:					
	TCP (RJ45)						
	Nana		None	0	Depet		
	None	•	THORE .	U U	Reset	L	
	Status	:					
Į.							

Red Box 1: Connect and Restart buttons, click the Connect button to enter the Connection Setting window (same as 1.3), and then click Restart to restart SCARA.

Red Box 2: Change the different pages.

Red Box 3: Display the Function page.

Red Box 4: Click HIWIN to display all file versions available in the controller.



19.3. Connection Setting

Step1: Click the "Connect" button in the red box to enter the Connection Setting window as follows:

Connect	Restart				HI	WIN
Communication	I/O Mapping	Files	Monitor		Motion Contr	rol and System Technology
Modb	us Configure					
	Protoco	l (Setting)	Protocol (Runing	Com2) Count	None -	
	None Status :	•	None	0	Reset	
	TCP (RJ45)					
	None	•	None	0	Reset	
	Status :					

Step2: Click the "Detect" button to search for the SCARA Controller.

Connection Setting	X
LocalDetectControllers	Detect Connect



Step3: After you find the SCARA Controller, click the "Connect" button for the connection setting.

Connection Setting	×
LocalDetectControllers	
	Detect Connect
1. Scara : 192.168.19.200	

onnection Setting			
LocalDetectControllers		1	
		Detect	Disconnect
	2		
1. Scara : 192.168.19.	200>Ca	onnected	

Red Box 1: After the connection setting succeeds, the button will turn to "Disconnect". At this time, you can click the button to interrupt the connection setting.

Red Box 2: After you click the Connect button, you can check the status related to SCARA Connection. After the connection setting succeeds, you can close the Connection Setting window.



19.4. Communication Setting Page

SCARA currently adopts Modbus protocol, which can provide external controllers for connection setting and data transfer. Because it is established on RTU and TCP/IP, RTU (RS232, RS422, RS485) or TCP/IP (RJ45) must be used to connect with SCARA; the Communication page can be used to complete Modbus settings (For the Modbus setting, please refer to Chapter 18.).

SCARA configure	(v1.0)					
Connected	Restart				HI	WIN ®
Communication	I/O Mappin	g Files	Monitor		Motion Control	and System Technology
Modbu	us Configure					
1	RTU (Co	m2)				
	1	2	1	3 Com2	2 RS485 -	
	Pr	otocol (Setting)	Protocol (Runing)	Count		
	None	•	None	3	Reset	
	4 Sta	tus :]	
2	TCP (RJ	15)	6			
	5 None	Ŧ	None	0	Reset	
	7 Sta	tus :]	

Red Box 1: Area to set ModbusRTU.

Red Box 2: Area to set ModbusTCP.

Blue Box 1: Set RTU as Server (Slave) or Client (Master).

Blue Box 2: Display the current setting status of RTU.

Blue Box 3: Set RTU as RS232, 422, or 485.

Blue Box 4: Display the communication status of RTU.

Blue Box 5: Set TCP as Server (Slave) or Client (Master).

Blue Box 6: Display the current setting status of TCP.

Blue Box 7: Display the current communication status of TCP.



19.5. I/O PAGE

19.5.1. Interface Operation

The IO status, I/O mapping and comment modification can be displayed on the IO page.

O SCARA configure (v1.0)					
Connected Restart				1	HIWIN
Communication I/O Mapping Files Monitor	2			Mot	tion Control and System Technolo
Input(Female)				1	
	No.	Soft		Status	Comment
	1	1	-	Off	IN_1
	2	2	-	Off	IN_2
	3	3	•	Off	IN_3
N24	4	4	•	Off	IN_4
	- 1	- 1			· · · · · · · · · · · · · · · ·
Output(Male)		-		17	
	No.	Soft		Status	Comment
01 02 03 04 05 06 07 08	1	1	•	Off	OUT_1
	2	2	•	Off	OUT_2
	3	3	-	Off	OUT_3
P24	4	4	•	Off	OUT_4
	- 1	-		- **	I
Robot I/O(Female)		-		1	
	No.	Soft	1	Status	Comment
II6 II5 II4	1	14	•	Off	IN_14
000000000000000000000000000000000000000	2	15	•	Off	IN_15
	3	16	•	Off	IN_16
N24 P24 015 014 013	14	13	-	Off	OUT_13
	L			1 - ~	··

Red Box 1: Monitor I/O status, corresponding to the hardware pins of the control panel. Red Box 2: Software I/O No. and I/O comment can be modified here.



19.5.2. Software I/O

Input:

Input	Remark	Description
I42	Safety Grating	When triggered by signals, the robot
I43	Safety Grating	will stop.
I44	Reset	Reset and clear the alarm status
I51	NC Start	Start NC File
I52	Teaching Start	Start the current procedure
153	Pause	Pause the path
I54	Path Reset	Reset the path
155	Record Start	Start the record started by List
I47	Machine Reset	Interrupt the procedure in real time and
		execute Macro
I75	Bit 0	
I76	Bit 1	CASE Transforming 4 Bit
I77	Bit 2	CASE Transforming 4 Bit
I78	Bit 3	
183	ListIN1	Selection recorded by List
I84	ListIN2	
185	ListIN3	
I86	ListIN4	

Output:

Output	Remark	Description
O40	Alarm Status	
O50	Running	
O51	Pausing	
O52	Prepared	
075	Bit 0	
O76	Bit 1	CASE Transforming 4 Bit
O77	Bit 2	Output
O78	Bit 3	


19.5.3. I/O Operation

I/O mapping:

1,			-			2_			-		
No	Soft		Status	Comment		No.	Soft		Status	Comment	1
1	1	-	Off	IN_1	E	1	51	•	On	NC Start	
2	1	-	Off	IN_2		2	52	•	On	Teaching Start	
3	3	III	Off	IN_3		3	53	•	On	Pause	
4	4		Off	IN_4		4	4	+	Off	IN_4	
-	6			1	-	-			- **	l	1
_	7			1			1	_		1	
No	8	-	Status	Comment	^	No.	Soft		Status	Comment	-
1	1	-	Off	OUT_1	=	1	1	-	Off	OUT_1	II
2	2	•	Off	OUT_2		2	2	•	Off	OUT_2	
3	3	•	Off	OUT_3		3	3	٠	Off	OUT_3	
4	4	•	Off	OUT_4		4	4	+	Off	OUT_4	1
- 1				l	-	-	-	in the	- **	1	1 -
				1				_			-
No.	Soft		Status	Comment	^	No.	Soft		Status	Comment	-
1	14	•	Off	IN_14		1	14	-	Off	IN_14	
2	15	•	Off	IN_15	B	2	15	•	Off	IN_15	1
3	16	•	Off	IN_16		3	16	•	Off	IN_16	
14	13	•	Off	OUT_13		14	13	+	Off	OUT_13	
					-			1662			1.

Method: Click the pop-down menu (Red Box 1) in the Soft column to select the software number (The functions are described as the previous page.), and then press the Enter button to complete I/O mapping (Red Box 2).

TIO	ъ	•
I/O	Reve	rsing:

^	Comment	Status		Soft	No.
ш	IN_1	Off	-	1	1
	IN_2	Off	•	2	2
	IN_3	Off	-	3	3
	IN_4	Off	•	4	4
*				-	-
•	Comment	Status		Soft	No.
=	OUT_1	Off	-	1	1
	OUT_2	Off	-	2	2
	OUT_3	Off	-	3	3
	OUT_4	Off	•	4	4
*	l			- 1	-
•	Comment	Status		Soft	No.
	IN_14	Off	-	14	1
E	IN_15	Off	-	15	2
	IN 16	Off	-	16	3

13 -

14

Off

- --

OUT_13

	3	3_		_	
No.	Soft		Status	Comment	•
1	1	-	*On	IN_1	H
2	2		Off	IN_2	
3	3		*On	IN_3	
4	4		Off	IN_4	
	-	10	- **	l	+
No.	Soft		Status	Comment	
1	1	-	Off	OUT_1	E
2	2		On	OUT_2	-
3	3		On	OUT_3	
4	4	-	Off	OUT_4	
-			- **	I	*
No.	Soft		Status	Comment	•
1	14	-	Off	IN_14	
2	15	-	*On	IN_15	H
3	16	-	Off	IN_16	
14	13	-	On	OUT_13	
		19		· ·	*



Double-click the item in the Red Box 3 to change the current status.

Input: Reverse input after double-clicked. The box will be turned to yellow background after reversed, and a "*" will be displayed.

Output: Double-click to turn on/off output.

Modification of I/O comment

I/O comment is modified in Scon, which can be used as the determination of signal source.

No	1	Describe	No	2	Describe	
I 1	\bigcirc	IN_1	00		Status light	Close
12	\bigcirc	IN_2	01	\odot	OUT_1	
13	\bigcirc	IN_3	02	\odot	OUT_2	
I4	\bigcirc	IN_4	03	\odot	OUT_3	
17	\odot	IN_7	04	\odot	OUT_4	
I 40	\bigcirc	SafetyButton	05	\odot	OVT_5	
I 44	\bigcirc	Alarm_Clear	06	\odot	OUT_6	
I45	\bigcirc	Brakebutton	07	\odot	OUT_7	
I 48	\bigcirc	EMG	08	\odot	OUT_8	
I 49	\bigcirc	EMGBOX	09	\bigcirc	OUT_9	Update
		(← →	

No.	Soft		Status	Comment	<u>_</u>
1	1	•	Off	IN_1	=
2	2	•	Off	IN_2	
3	3	•	Off	IN_3	
4	4	•	Off	IN_4	
-21	-	1		1	1+
No.	Soft		Status	Comment	- I
1	1	•	Off	OUT_1	=
2	2	•	Off	OUT_2	
3	3 -		Off	OUT_3	
4	4	•	Off	OUT_4	
-	-		- **	1	1+
No.	Soft		Status	Comment	
1	14	-	Off	IN_14	
2	15	•	Off	IN_15	=
3	3 16 •		Off	Off IN_16	
14	13	-	Off	OUT_13	
			- **	I	*



The comments in the I/O page correspond to those on Teaching Pendant (such as Blue Box 1, 2 and 3).

After you modified the comment, cnc_plc_000X.str (Note 1) in plc folder will be uploaded to SCARA and SCARA (need to correspond to files uploaded by language) will be restarted to change the comment on the Teaching Pendant.

Note 1: Language (cnc_plc_0000.str), Simplified Chinese (cnc_plc_0000.str), Simplified Chinese (cnc_plc_0001.str), or English (cnc_plc_0002.str), can be selected in the Monitor page.



19.6. File Transfer

Connected	Restart	Files			
Communication	I/O Mapping		Monitor	3	Motion Control and System Fee
00000000	• C:	\Users\sean168\Des	ktop\Scon(v1.0)	\0000000	Open File
Data	- C	ontroller			
NCFile	4	File	KB	Time	Refresh
OpenHMI		36HR-TEST.th4	1366	2016-8-12 10:15:12	
		LISTA.th4	253	2016-7-27 15:51:52	Delete
Machine		LISTB.th4	264	2015-11-27 16:22:45	Delete All
Setup		LISTC.th4	308	2015-11-27 16:22:46	Delete All
Exe		NOISE-J1.th4	497	2016-9-21 16:26:2	Download
Security		NOISE-J2.th4	497	2016-9-22 11:11:16	
Log		NOISE-J3.th4	544	2016-8-1 17:50:10	- Download All
Language					Status 'Ready!
	Lo	ocal			otatab interatiji
	5	File	KB	Time	Refresh
	3	123.th4	503	2016-07-25 20:11:17	
		36HR-TEST.th4	1366	2016-07-25 20:11:14	Delete
		ABC.th4	540	2016-07-25 20:11:17	
		FF.th4	21	2016-05-30 19:47:12	Delete All
		LISTA.th4	253	2016-07-25 20:11:14	Upload
		LISTB.th4	264	2016-07-25 20:11:14	Opioad
		LICTCHA	200	2010 07 25 20.11.14	

Red Box 1: Select the folder in the root path.

Red Box 2: File folder as the table below.

Red Box 3: File path.

Red Box 4: File data in the controller.

Red Box 5: Files in the root folder.

Red Box 6: Open the folder in the path of Red Box 3.

Red Box 7: Run, add, delete, download to PC by controller file.

Red Box 8: Run, add, delete, upload to Controller in the root folder.

Red Box 9: File status.



Name	Function
Data	Folder saving the procedure file.
NCFile	Folder saving NC program.
OpenHMI	Save the folder of human-machine interface file.
Macro	Save the number of maker_macro_g and maker_func_ins_macro.
PLC	Save PLC_ladder in the Controller.
Machine	Save the parameter files of the Controller.
Setup	Save the update file of the Controller.
Security	Save the security file of the Controller (If it is lost, the Teaching
	Pendant can't be started.).
Image	Save the Boot and human-machine interface files.
Log	Save the Alarm information.
Language	Save the language file.

Red Box 10: If you want to upload the files in the red box, SCARA will be restarted to take effect.



19.7. Monitor Page

The values in all registers can be monitored by the Monitor page. The purpose is used to obtain the internal value.

I O C S A R RBit Local Global 繁體中文 Addr Num Show Comment 51 0 NC Start 51 4 V 1 52 0 Teaching Start 13 3 V 53 0 Pause 3 4 5 6 13 0 IN_13 14 0 IN_14 15 1 IN_15	Connected Communication	Re:	start Mappin	g	Files	Mor	nitor			Motion Cont	rol and System Tech
Addr Num Show Comment 51 4 V 1 1 8 1 52 0 Teaching Start 13 3 V 1 53 0 Pause 54 0 Path Reset 13 0 IN_13 13 3 V 14 0 IN_14 15 1 IN_15 1 IN_15	I	0		C	S	A	R	RBit	Local	Global	
51 4 V 52 0 Teaching Start 1 8 1 53 0 Pause 13 3 V 54 0 Path Reset 13 0 IN_13 14 0 IN_14 15 1 IN_15 1 IN_15	Addr	Num	Show	Commer	nt		51	0	NC	Start	
1 8 53 0 Pause 13 3 V 54 0 Path Reset 3 4 5 6 6 6	51	4	v				52	0	Tea	aching Start	
13 3 V 3 4 5 6 6	1	8					53	0	Pau	use	
3 · 4 · 5 · 6 · 13 0 IN_13 14 0 IN_14 15 1 IN_15 7	13	3	v				54	0	Pat	h Reset	
3. 4. 5. 6. <u>14 0 IN_14</u> <u>15 1 IN_15</u>							13	0	IN	_13	
6 . <u>15 1 IN_15</u>	3 e	4.	5.0				14	0	IN	_14	
7						6.	15	1	IN	15	

Red Box 1: Change the values of I, O, C, S, A, R, R Bit in the Controller.

Red Box 2: Select the comment language.

Red Box 3: Register address to be monitored.

Red Box 4: Quantity to be monitored.

Red Box 5: Display.

Red Box 6: Display and modify the values in the register, display the comment.

Red Box 7: Run register address.

SCARA Robot Software (Original Instructions) User Manual

Publication Date : December 2018, first edition

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