SYNTEC CNC

Application manual

by : SYNTEC

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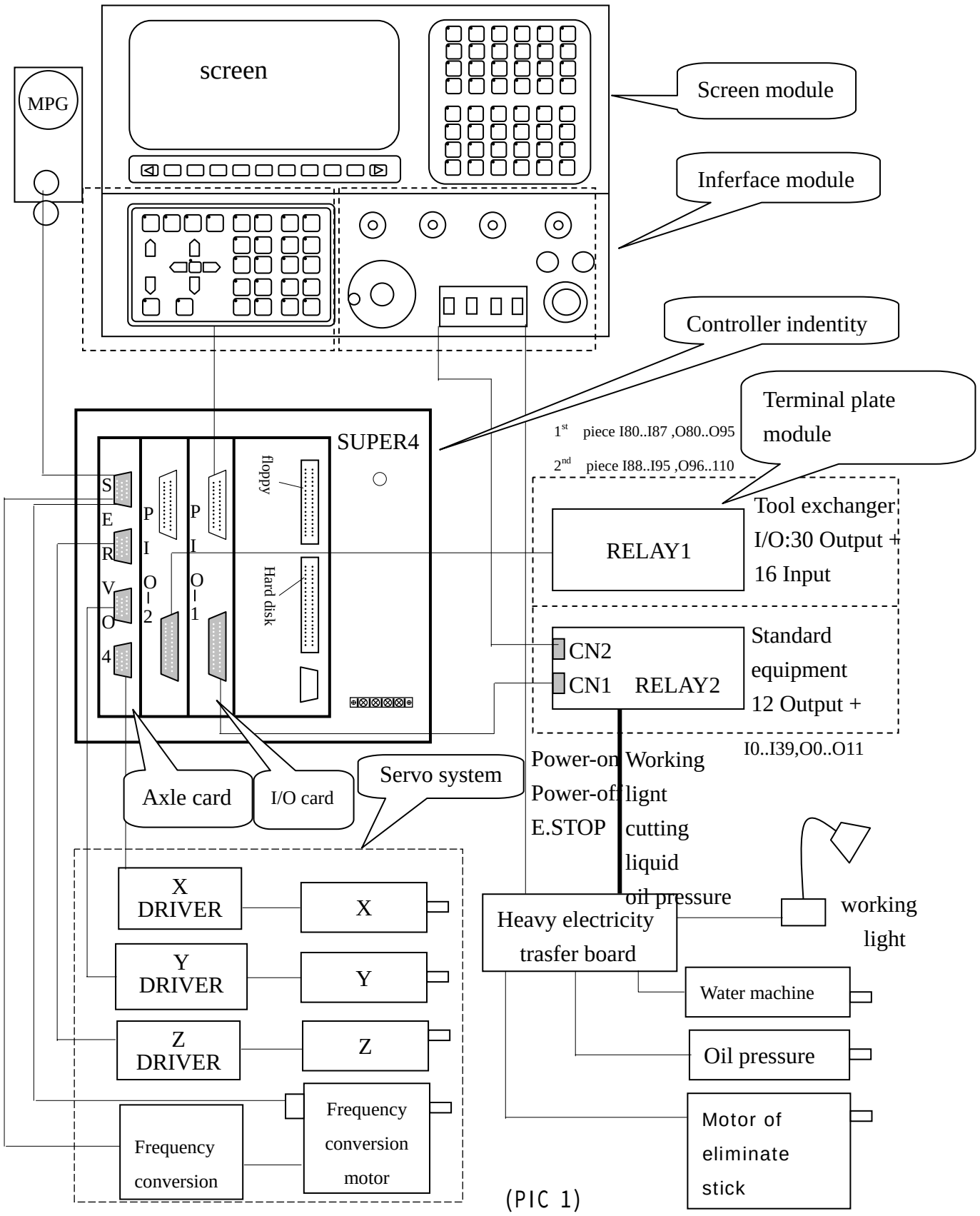
Vision edit record

No.	Modify Content	data	editor	New Vision
01	Add new spc. introduce	2006/08/10	Jerry_Lai	V10.0
02				
03				

1. system frame PIC



(PIC 1)

1.1 SYNTEC CNC sytem frame instruction:

SYNTEC CNC system fram,as (PIC one)~ (PIC four),divide to several parts:

一、 screen/interface module:there are different interface module compose in each type of controller

* 900T , 900M:screen module(9" CRT、 8.4" or 10.4"TFT) + second operation interface
* 940I :operation keys in screen module(9" CRT、 8.4" or 10.4"TFT)

二、controller indentity:two different types

* Super4 contorller:1/2 card size,collocate four axial controller card, 4 ISA
* Super8 contorller:1/2 card size,collocate four axial controller card, 8 ISA

三、I/O card:

* PIO3: for CN1(D type 25PIN mother)+CN2(D type 25PIN public) two connect。
  CN1 need to collocate Relay2, CN2 can choose to connect second operation interface or Relay 1
  use second operation interface or 940i screen module, need a PIO3 at least
  SYNTEC CNC can use 3 pieces of PIO3 most
* PIO4:have 3 20PIN joint, among that CN1 and CN2 are input signals, CN3 is output signal
  each PIO4 has 32 Input and 16 Output
  SYNTEC CNC can use 3 pieces of PIO4 most
* PIO5：have 6 20PIN joint, among that XI1~XI3 are input sognals, XO1~XO3 is output signal
  there are a XO7(D type 25PIN public) and a XO8(D type 15PIN mther) joint ,XO7 can connect with second interface and RELAY board, XO8 is MPG INPUT signal.

SYNTEC CNC can let PIO3 and PIO4 use together, the detail consult I/O board module setup instruction

四、terminal platform module:

controller provide transfer booard,decrease difficulties when diagnose machine (RELAY1、RELAY2、TB16IN、TB16OUT)

* RELAY2 : 40 Input + 12 relay output
* RELAY1 : 8 Input + 15 relay Output
* TB16IN : 16 Input
* TB16OUT : 16 Output

五、axle card:

1.SERVO4 Four axial control Card

→Port1~Port4 offer P_Command control signal output ,and Port4 offer one set V-Command control signal output port,MPG A/B phase Signal Input x1。
(SYNTEC CNC allow 4-cards SERVO4 work together at one controller)

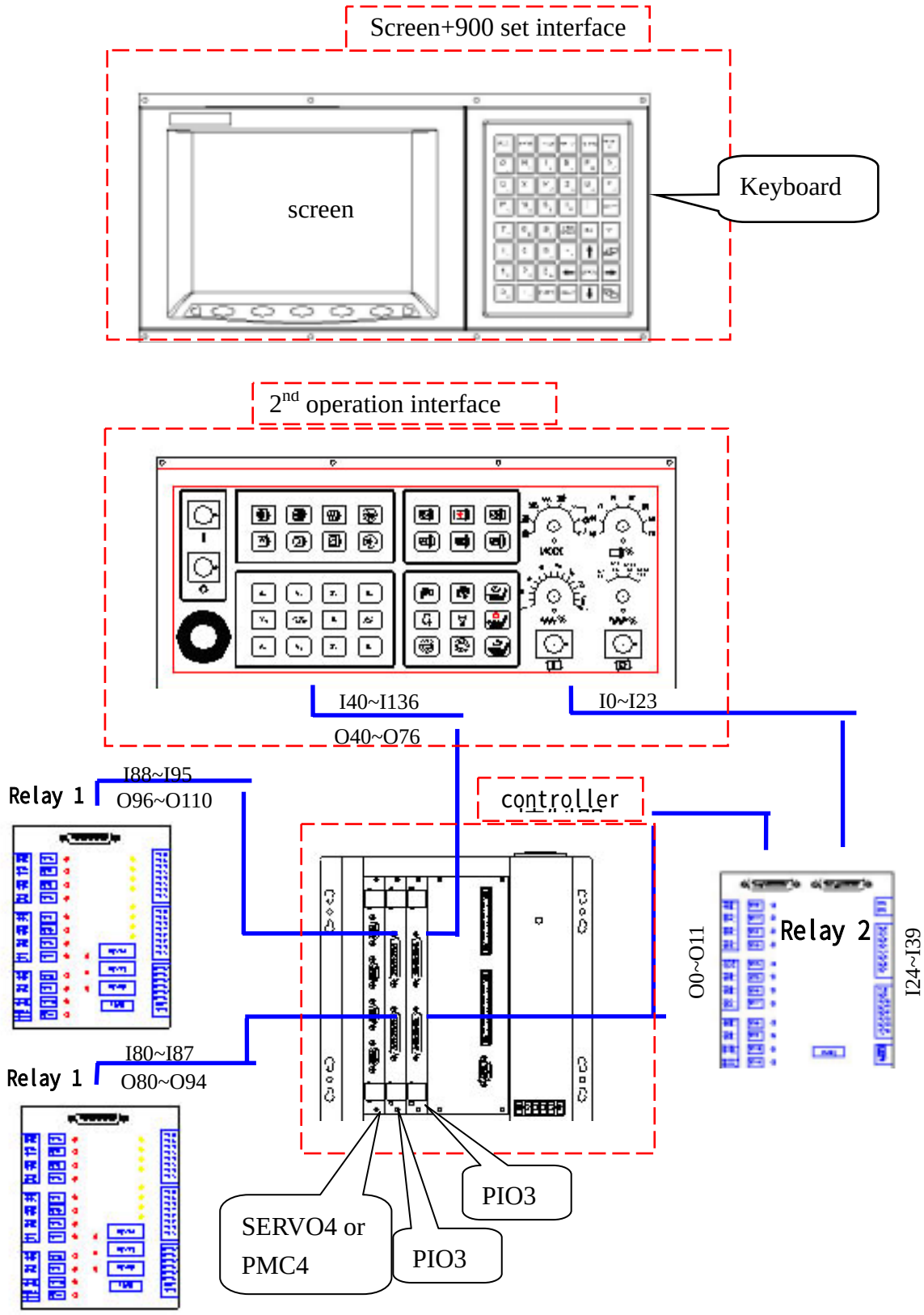
2.SERVO6 Six axial control Card

→Port1~Port4 can output P-Command or V-Command control signal by switch Jumper on the borad, Port5 ~Port6 can offer both P-Command and V-Command control signal output.(the signal are the same)
(SYNTEC CNC only allow one SERVO6 card at one controller)

3.PMC4 four axial control card only offer V_Command control signal.
(SYNTEC CNC allow install 2 pieces of PMC4 at one controller)

System frame one

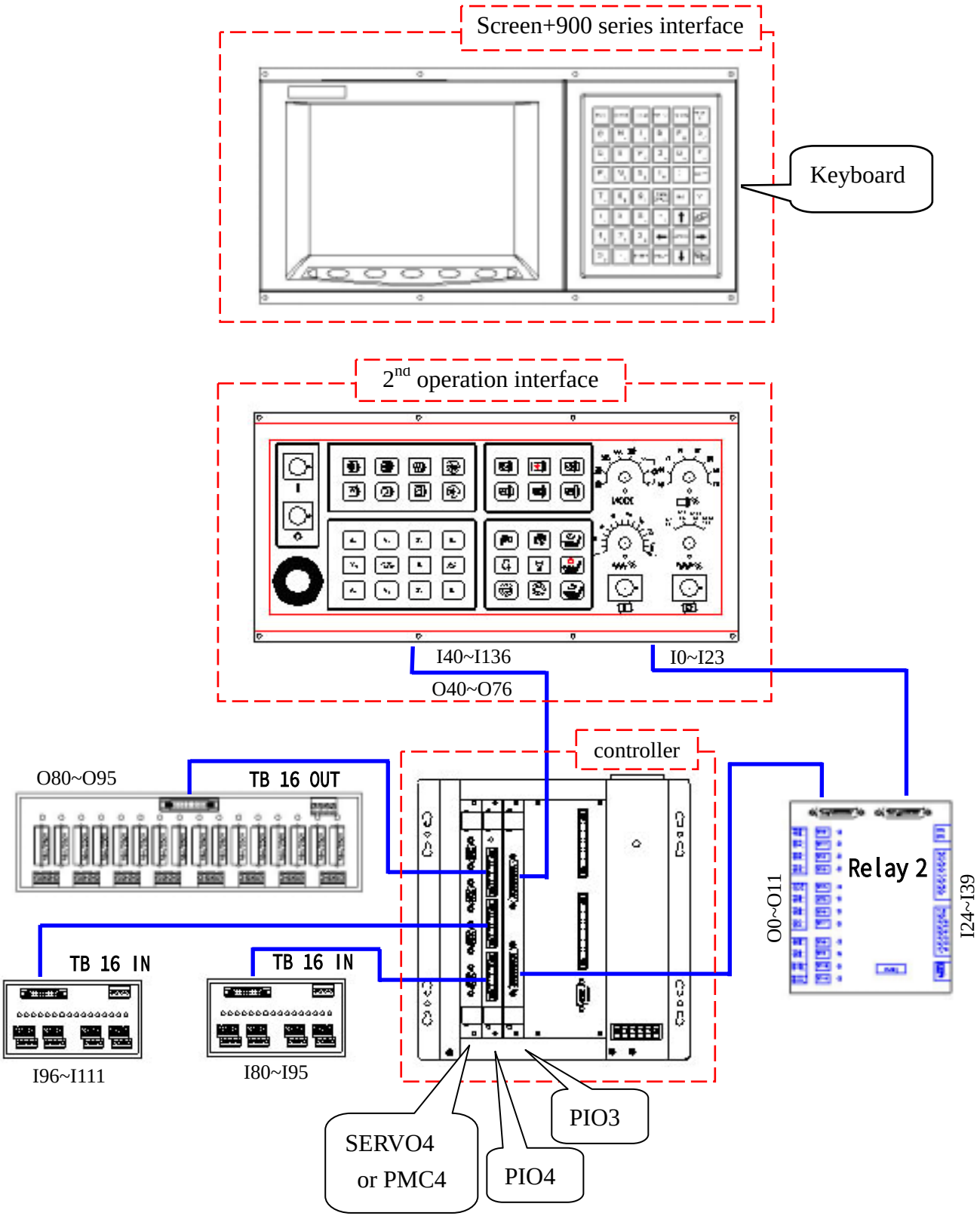
(system parameter 5 setup value→2)



(PIC 2)

System frame 2

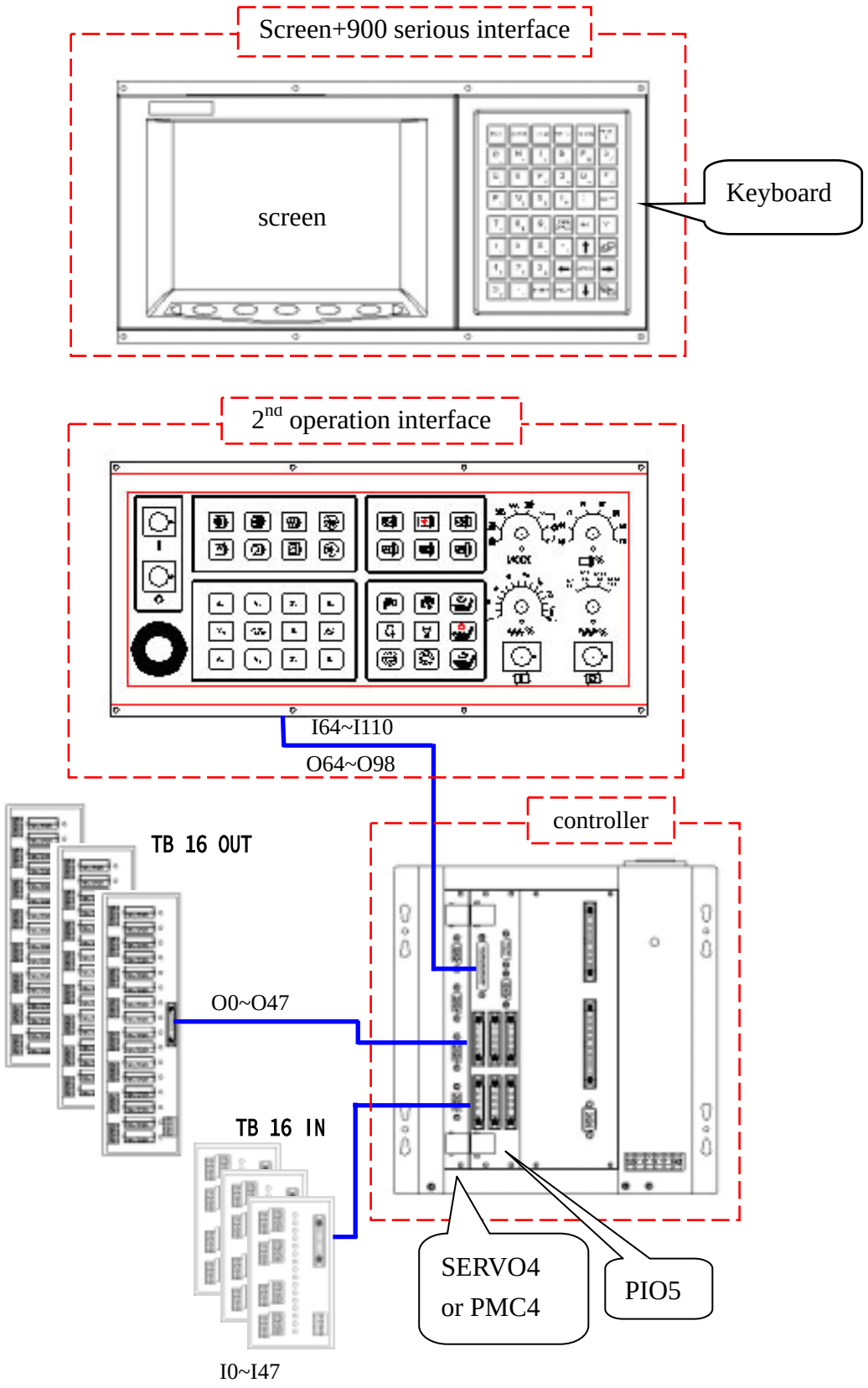
(system parameter 5 set value→5)



(PIC 3)

System frame 3

(system parameter 5 set value→6.7)

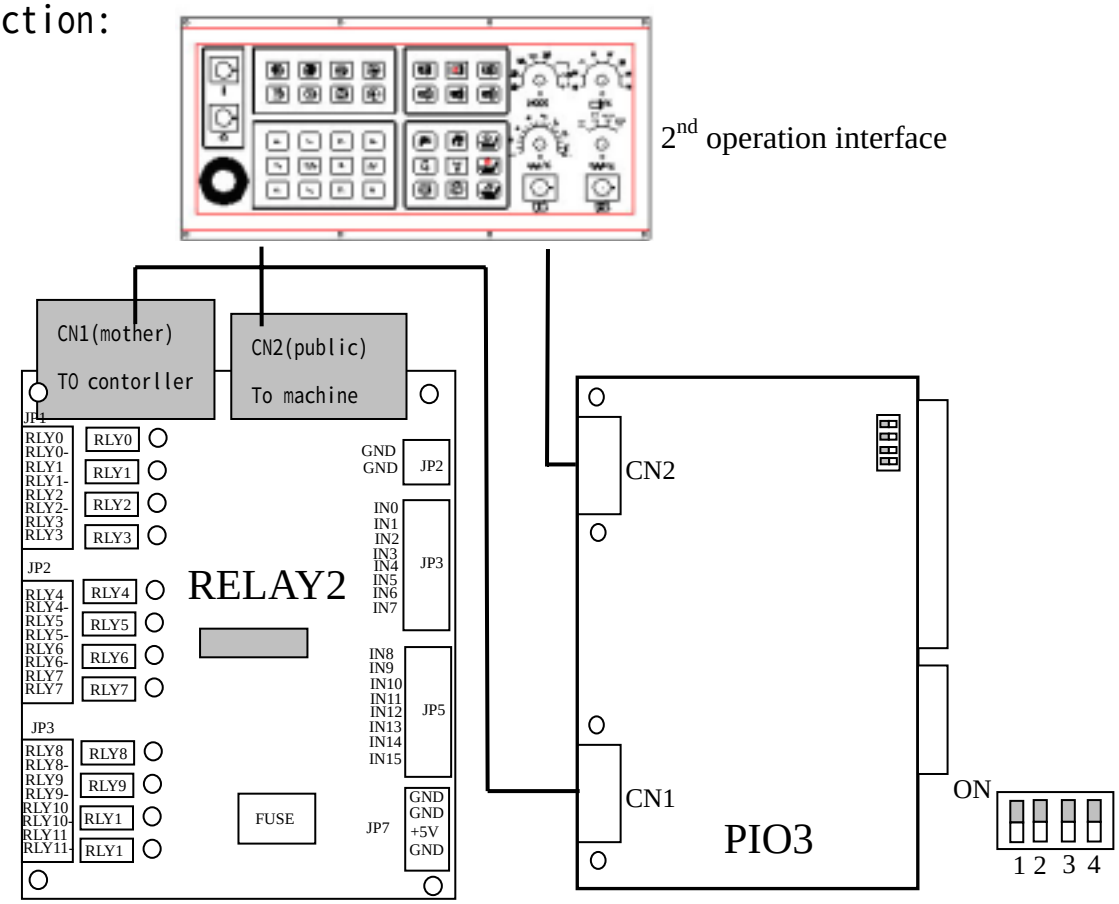


(PIC 4)

1.2 I/O card operation instruction：

SYNTEC CNC I/O card have PIO3 and PIO4、PIO5 three kinds, explain：

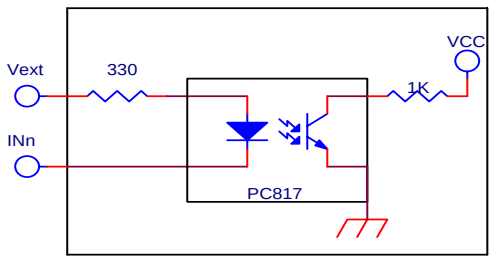
PIO3 collocate with Relay2 and the second operation interface operation instruction:



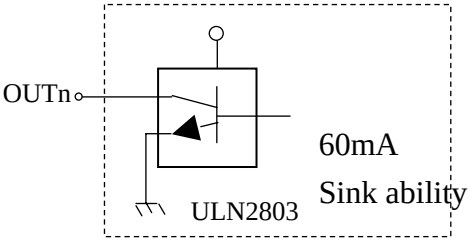
description :

1. standard I/O compose with:PIO3 + second operation interface + RELAY2
2. CN1 of PIO3 connect to CN1 of RELAY2 ,CN2 of PIO2 connect the connector of second operation interface
3. turned switch of second operation interface connect to CN2(24 INPUT) of RELAY2
4. CN1(mother) of PIO3,CN2 pin(public) have same definition,the definition:
   1:00 2:02 3:04 4:06 5:08 6:010 7:012 8:014 9:Vext 10:IN1 11:IN3 12:IN5 13:IN7
   14:01 15:03 16:05 17:07 18:09 19:011 20:012 21:Egnd 22:IN0 23:IN2 24:IN4 25:IN6
5. Vext/Vgnd is outside power,PCB current limit resistance 330 ohm/0.125W,is 5V circuit standards,if Vext is 24V,need to add current limit resistance

PIO side INPUT line chart

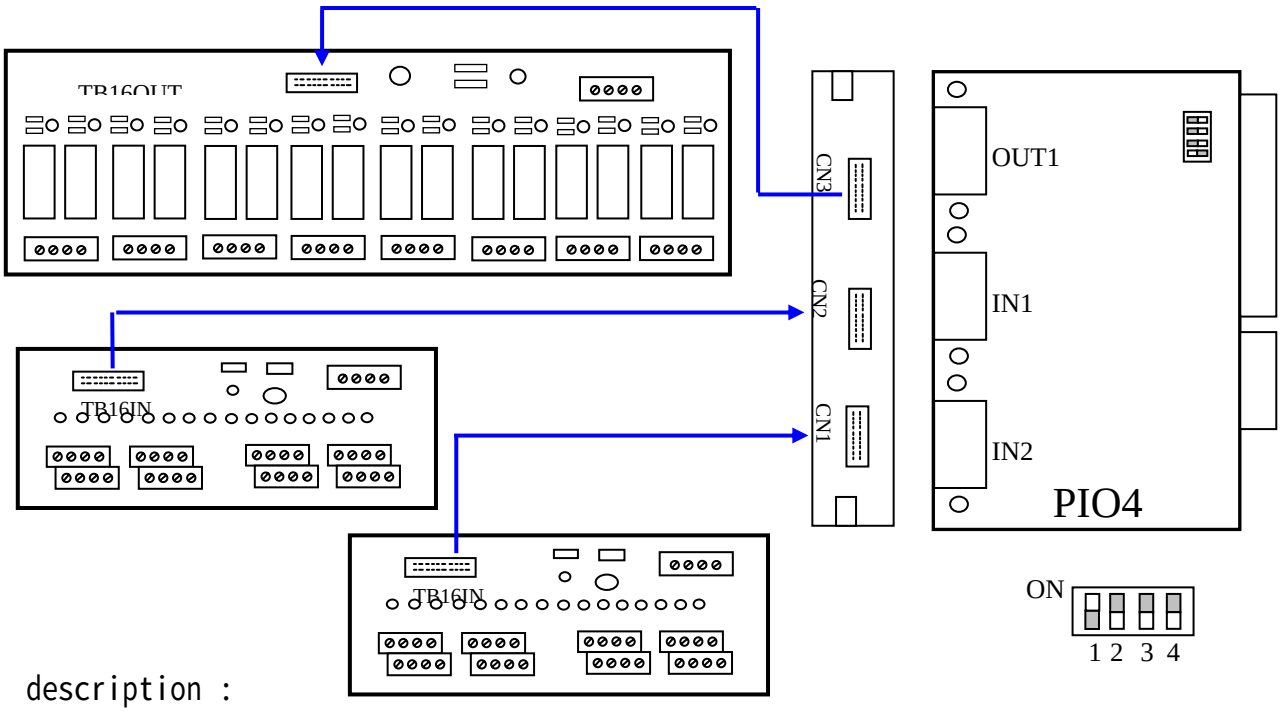


PIO side OUTPUT line chart



PIO3 higher CONNECTOR(CN2) connect the higher interface HARDKEY,lower CONNECTOR (CN1) connect the RELAY board

PIO4 collocate with TB16IN and TB16OUT (Currnt Sink standards) operation instruction:



description :

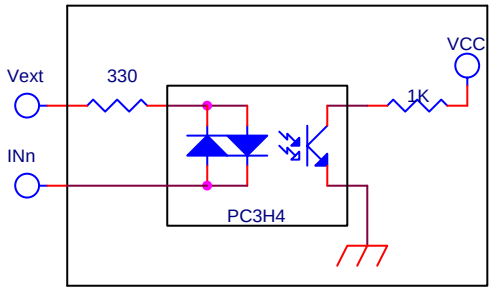
1.standard I/O compose with:PIO4 + SYNTEC TB16IN+SYNTEC TB16OUT (all SINK standard)

CN1-CN2(INPUT)PIN OF PIO4 define according to PIC:

CN3(OUTPUT)PIN of PIO4 define according to PIC:

2.INPUT:light coincidence machine (PC817) input interface, follow the PIC, 8bits of INPUT share a Vext power and Output is the same power, there is current limit resistance 3.3k/0.5w inside the board

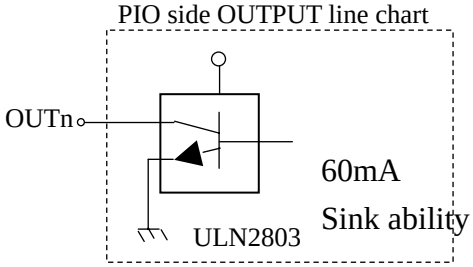
PIO side INPUT line chart



PIO side INPUT joint definition

1	+24V	2	+24V
3	NONE	4	NONE
5	IN7	6	IN15
7	IN6	8	IN14
9	IN5	10	IN13
11	IN4	12	IN12
13	IN3	14	IN11
15	IN2	16	IN10
17	IN1	18	IN9
19	IN0	20	IN8

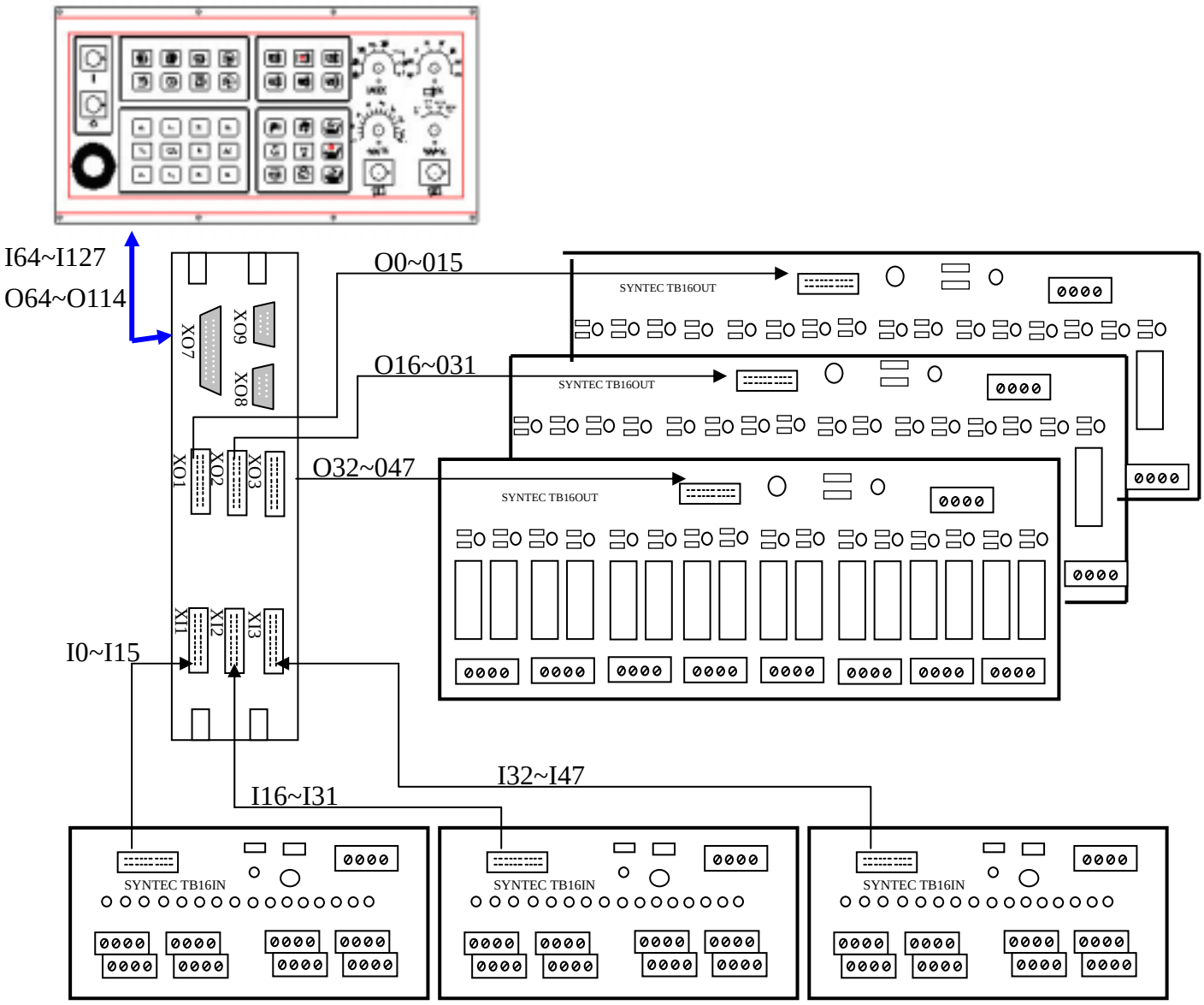
PIO side OUTPUT line chart



PIO side OUTPUT joint definition

1	+24V	2	+24V
3	GND	4	GND
5	OUT7	6	OUT15
7	OUT6	8	OUT14
9	OUT5	10	OUT13
11	OUT4	12	OUT12
13	OUT3	14	OUT11
15	OUT2	16	OUT10
17	OUT1	18	OUT9
19	OUT0	20	OUT8

PIO5 collocate with TB16IN、TB16OUT(Current Source standards) and operation instruction of second interface:

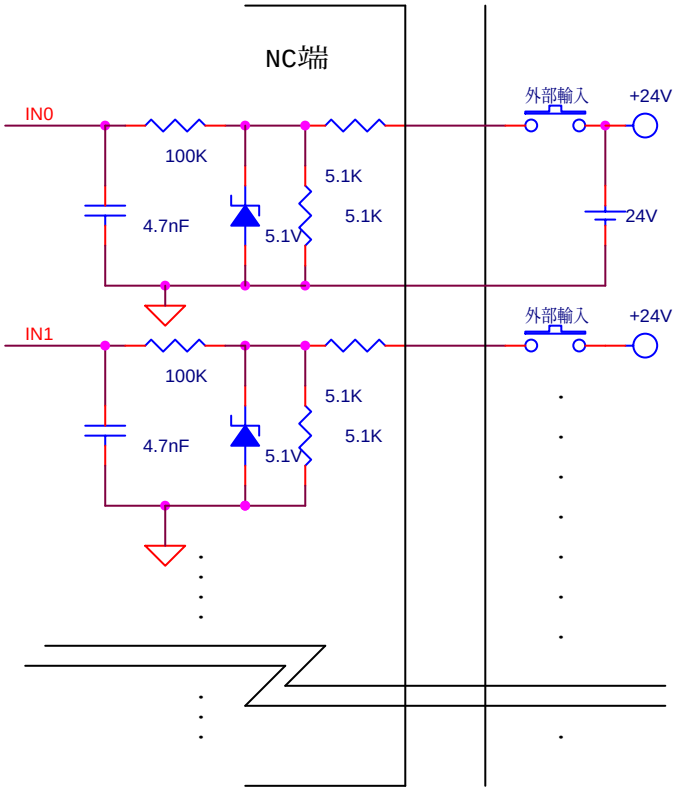


description :

1. standard I/O compose with:PIO5 + hard key board of second inerface + SYNTEC TB16IN+SYNTEC TB16OUT
2. PIO5 XI1~XI3 connect to TB16IN , XO1~XO3 connect to TB16OUT, XO7 connect to hard key board of second interface。
3. XI1~XI3(public)PIN define according to PIC (I0~I47) :
4. XO1~XO3(public)PIN define according to PIC(O0~047):
5. DB25(mother)PIN definition below (connect to second interface HARDKEY) :

1:OUT48 2:OUT50 3:OUT52 4:OUT54 5:OUT56 6:OUT58 7:OUT60 8:OUT62 9:VEXT+5V 10:IN49 11:IN51 12:IN53 13:IN55 14:OUT49 15:OUT51 16:OUT53 17:OUT55 18:OUT57 19:OUT59 20:OUT61 21:VGND 22:IN48 23:IN50 24:IN52 25:IN54

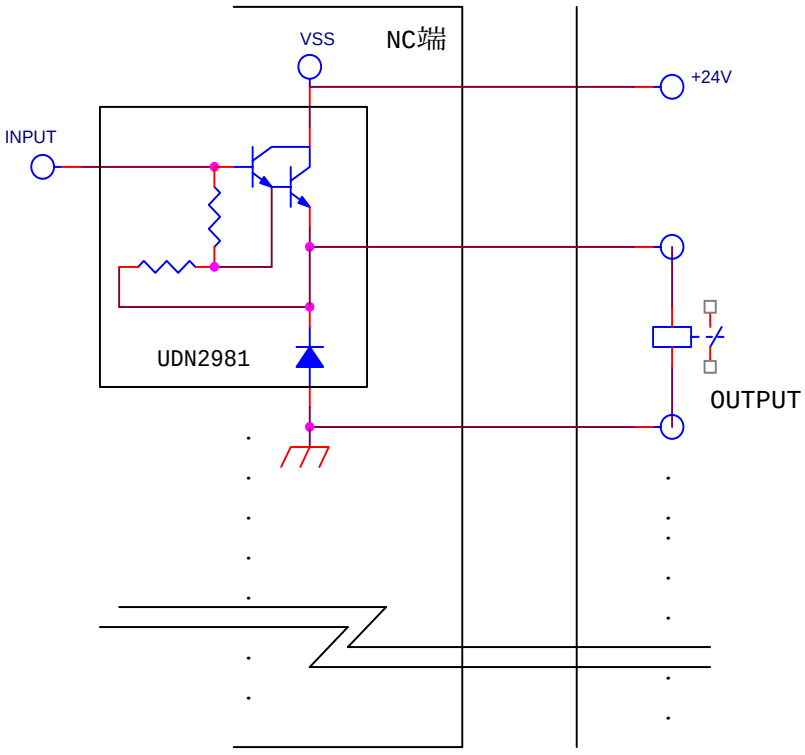
PIO5 side INPUT line chart



1	+24V	2	+24V
3	GND	4	GND
5	IN7	6	IN15
7	IN6	8	IN14
9	IN5	10	IN13
11	IN4	12	IN12
13	IN3	14	IN11
15	IN2	16	IN10
17	IN1	18	IN9
19	IN0	20	IN8

PIO5 side INPUT XI1~XI3 contact definition

PIO5 side OUTPUT line chart



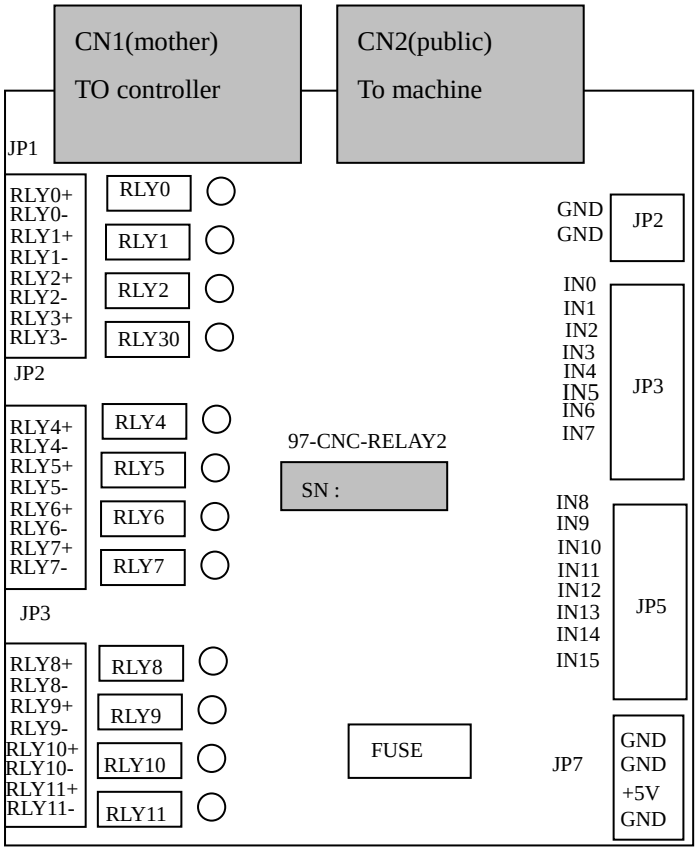
1	+24V	2	+24V
3	GND	4	GND
5	OUT7	6	OUT15
7	OUT6	8	OUT14
9	OUT5	10	OUT13
11	OUT4	12	OUT12
13	OUT3	14	OUT11
15	OUT2	16	OUT10
17	OUT1	18	OUT9
19	OUT0	20	OUT8

PIO5 side OUTPUT XO1~XO3 contact definition

1.3 termianl platform module operation instruction:

RELAY 2 operation instruction：

standards:size 140MM＊170MM
I/O points:12 RELAY OUTPUT + 40 INPUT



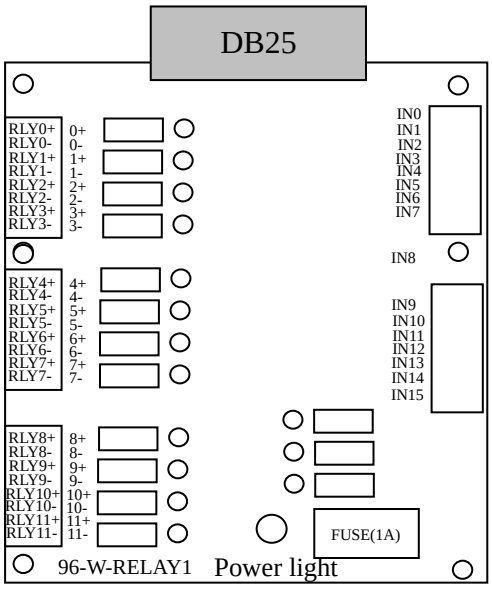
description:

1. 12 RELAY contacts,contact standards:normal open,electic standards:1A ,220V
2. each RELAY has a RED led to display, show relay action status,bright, for relay on
3. 40 input contacts,build by Europe form terminal platform in 16 points input (I0..I15) , configure by screwdriver, receive open,short signal
4. oher 24 points input(I16..I39) are put in CN2(public), build by 25 pin D type ,pin25 GND other pin1..pin24 opposite (I16..I39),24 I point at all
5. all I/O system need a +5V power supply(D68 green light display),this can share with encoder power in signal good situation
6. CN1 is D type 25 pins(mother), connect to CN1(public) of PIO3

RELAY1 operation instruction :

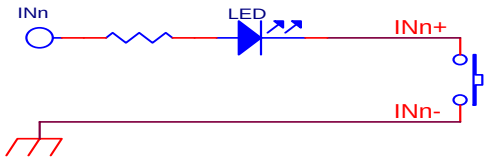
Standards：size 140MM＊170MM

I/O points:15 RELAY OUTPUT + 8 INPUT

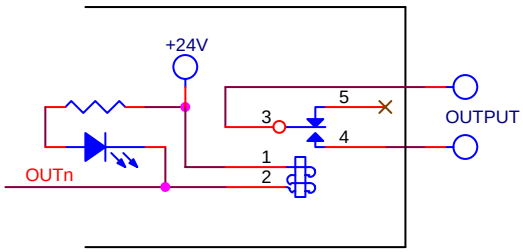


description:

1. relay board standards:15 output relay + 8 OPEN/SHORT input
2. this RELAY board is optional
3. each input point has a own led display(yellow),led on for contact is short,line instruction belows:



4. each output point has a own led display (red) ,led on for contact is short, line instruction bellows



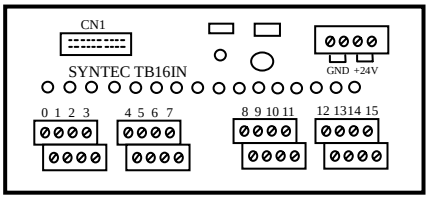
5. power consider:board Default is +5V,if use other controlled power,need to change relay & Rext

6.conserve consider:there is a led(green) on board, show Vext status,led does not bright, please check Vext, or FUSE(1A) burned to break or not

7. it connects with CNC is according to a 25pins D CNT(mother),and connects to CN1 of CNC PIO3 board

TB16IN／TN16OUT operation instruction :

SYNTEC TB16IN standards instruction：



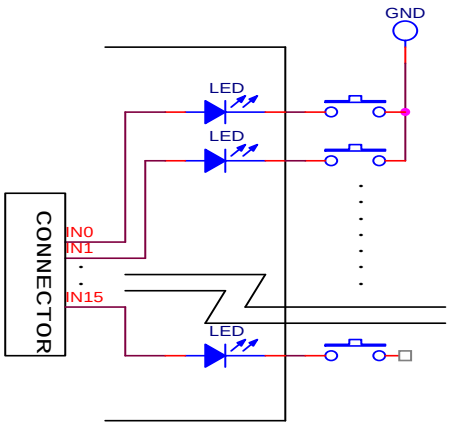
description:

1.16 input contacts,contacts standards:Current source. or Current sink.

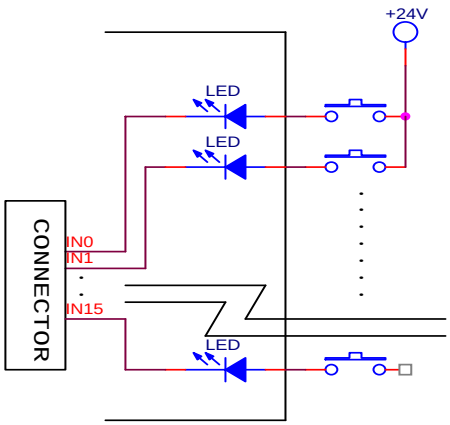
2.PIO4 is SINK standards, collocate with TB16 SINK-IN, PIO5 is SOURCE standards, collocate with TB16 SOURCE-IN

3.Current source and Current sink are different from COM points, source is VCC, sink is GND

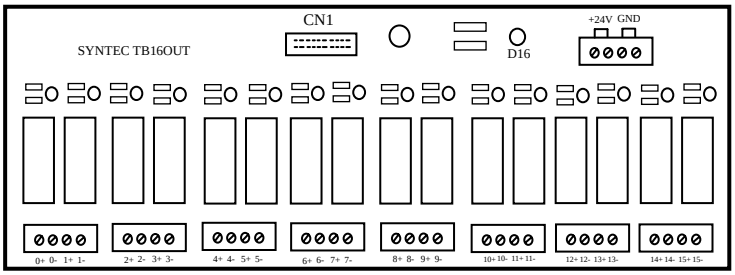
TB16 SINK- IN interface circuit



TB16 SOURCE- IN interface circuit



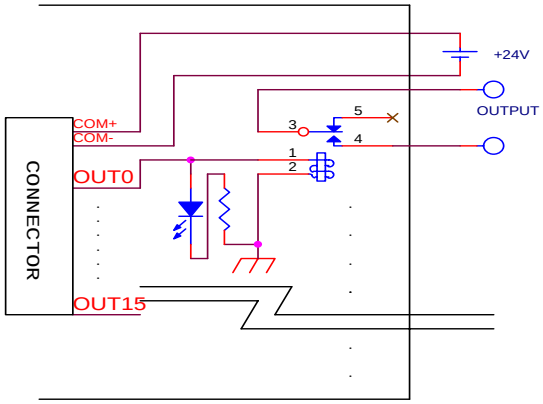
SYNTEC TB16OUT standards instruction：



description:

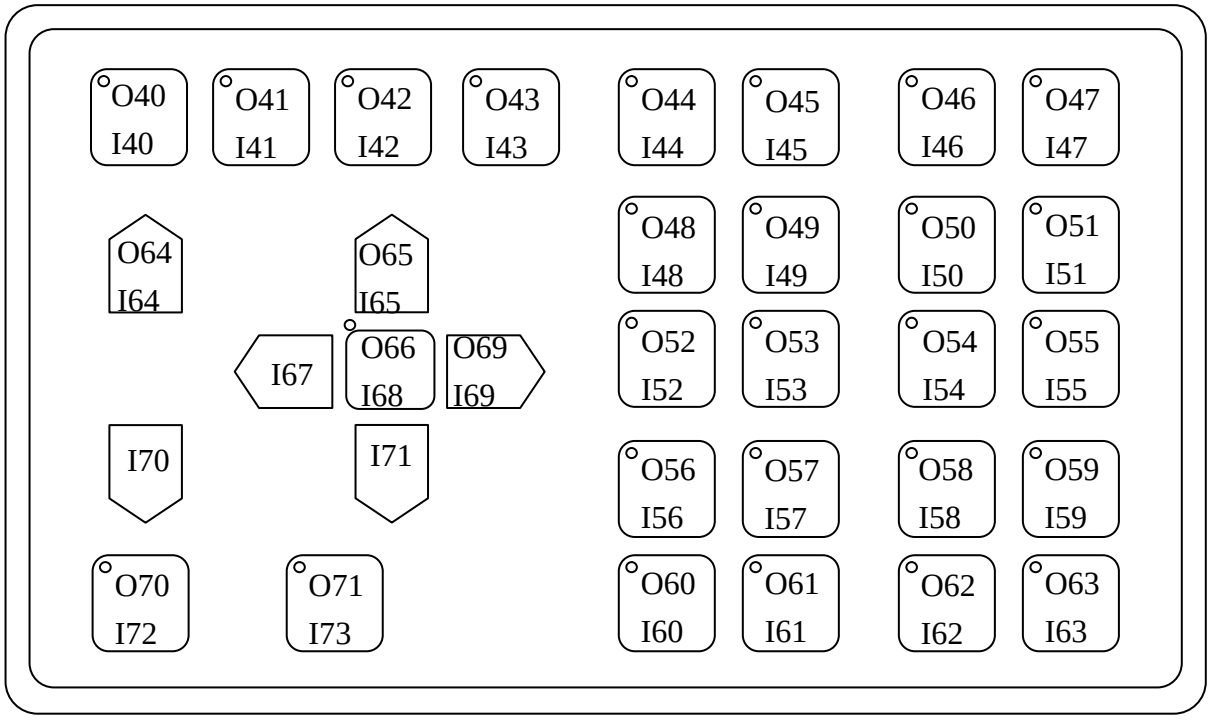
1. 16 output contacts, RELAY0..RWELAY15, standards：16A, 250V, each RELAY is N.O.
2. CN1 is open style header 20 PINS(public), connect to PIO5(public) definition according to PIC：

TB16 OUT interface circuit



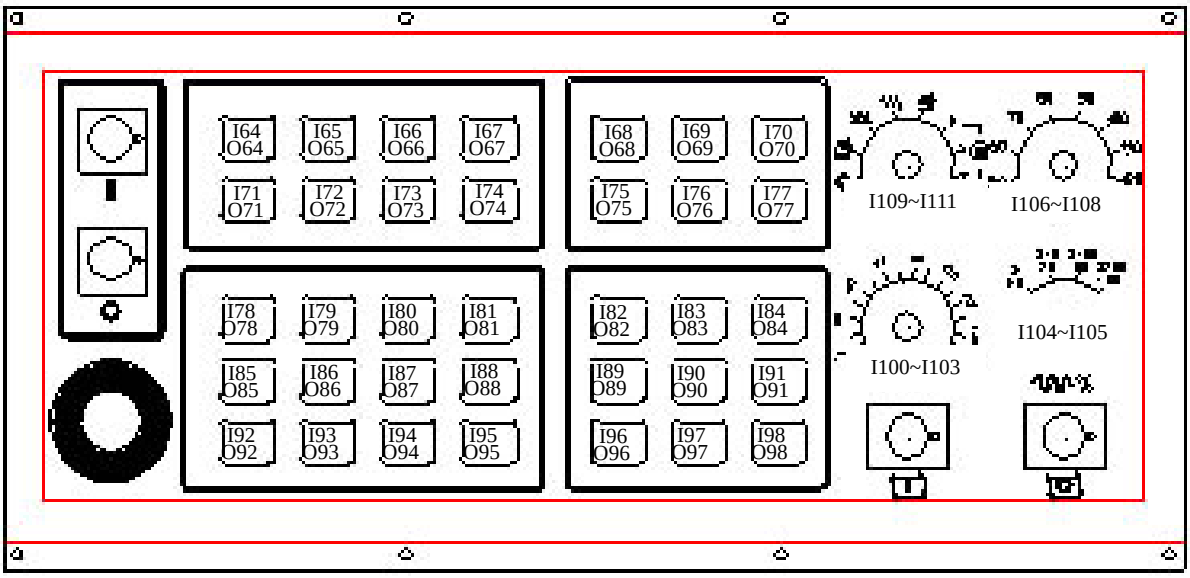
1.4 screen interface button I/O definition:

lathe and miller I/O definition



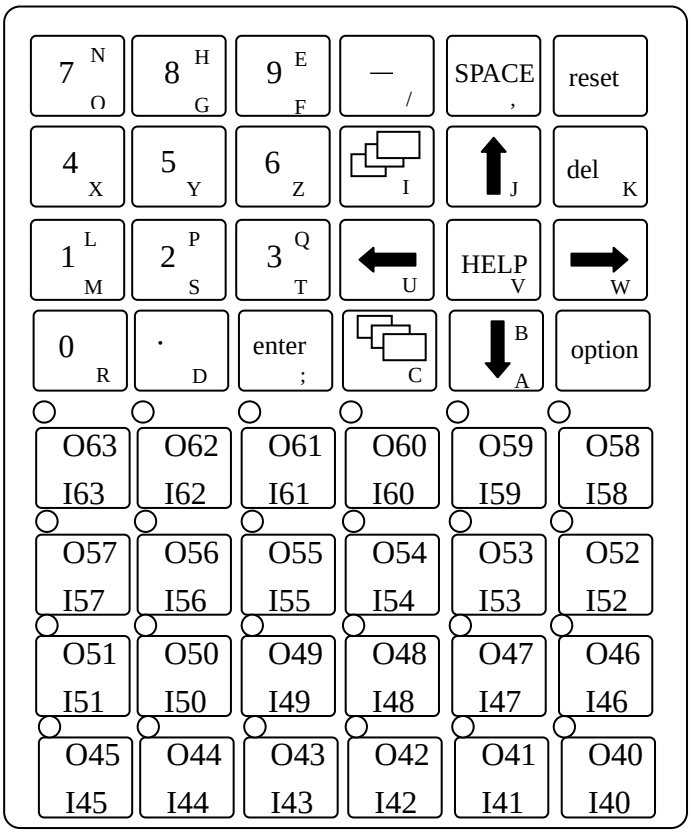
(PIC 5)

Second operation interface I/O definition

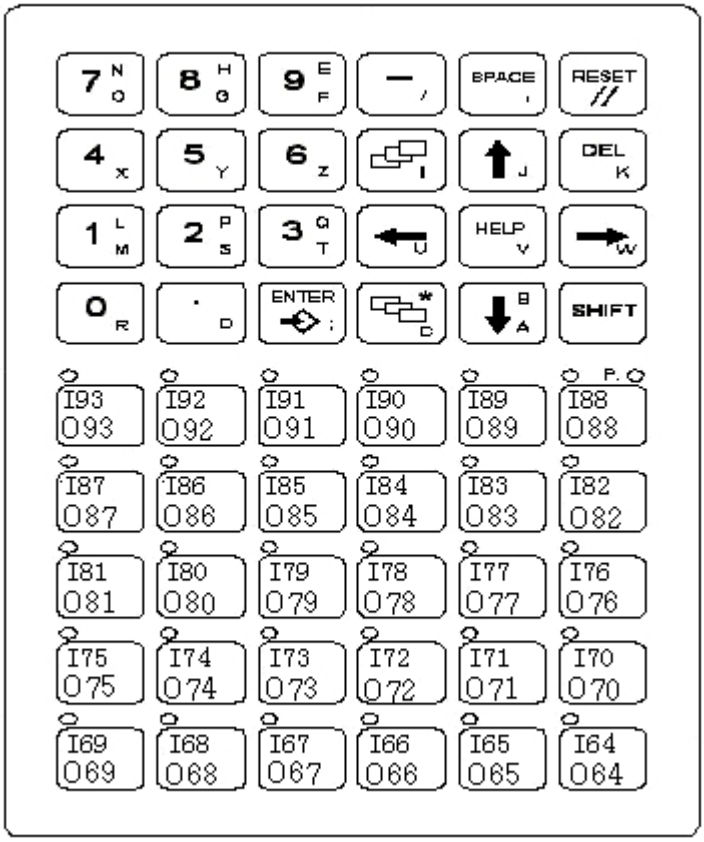


(PIC 6)

9 inches 940I I/O definition



10.4 inches 940I I/O definition



1. 5 axle card standards instruction:

axle card selection and parameter setup description：

SYNTEC CNC provide two axle card forms：

(1) SERVO4 → fit to position circuit control frame。

(2) SERVO6 → fit to position circuit and velocity control frame。

(3) PMC4 → fit to velocity circuit control frame。

The list contents is control mode and the kinds of mapping axle card and CNC controller parameter setup。

Control mode	Selection of axle card	CNC parameter 9 Setup value	description
P Command (position circuit type)	SERVO4 (note 1)	1	Cancel axle card wiring PIN7、PIN8 the check function of servo driver alarm signal
		2	Axle card wiring PIN7、PIN8 the check function of servo driver alarm signal is in NC(normal open) contact mode
		3	Axle card wiring PIN7、PIN8 the check function of servo driver alarm signal is in NO(normal close) contact mode
V Command (velocity circuit type)	PMC4	4	V Command special axle card
	SERVO6 (note 2)	5	V_P Command axle card selecte by change jump on the card

Note 1： SERVO4 axle card counter to servo driver alarm provide 3 kinds of check, mapping to 1、2 or 3 of CNC controller parameter 9, after CNC parameter 9 set, all CNC controller axle card active in the same way of alarm check。

Note 2： SERVO6 axle card counter to servo driver alarm provide 2 kinds of check, mapping to 0 or 1 of CNC controller parameter 10, after CNC parameter 10 set, all CNC controller axle card active in the same way of alarm check。

(0→ Normal Open ,1→ Normal Close)

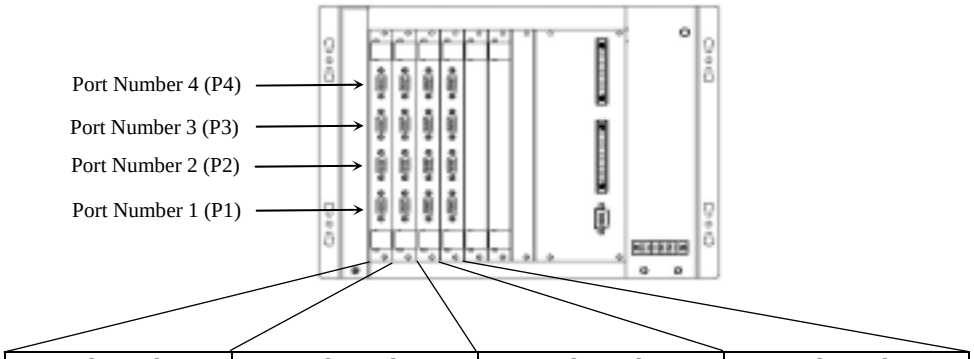
SERV04 axle card operation instruction：

Controller can use 4 pieces of servo4 axle card, each axle card can contrl 4 form of P_Command servo system, so it can control 16 form of P_Command servo system。

The way of axle card get number is divided by the four switches on/off of JP13 ~JP16 on axle card。

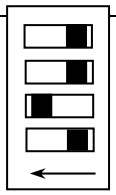
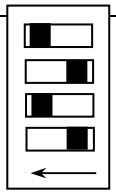
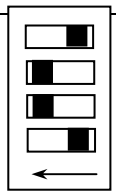
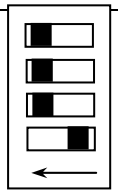
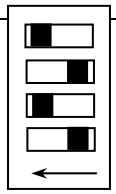
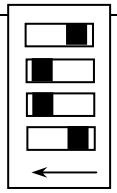
Each axle card setup and servo axle number：

1. axle card Port Number and parameter setup number contrast table：

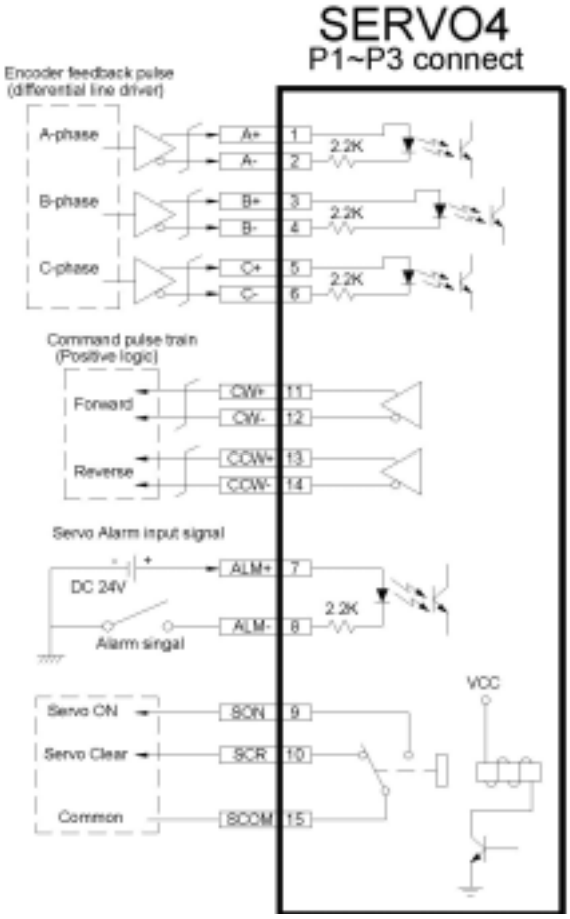


Axle card 4		Axle card 3		Axle card 2		Axle card 1	
Port	CNCparameter number	Port	CNC parameter number	Port	CNC parameter number	Port	CNC parameter number
P4	spindle/MPG	P4	spindle /MPG	P4	spindle /MPG	P4	spindle /MPG
	Servo axle 19		Servo axle 14		Servo axle 9		Servo axle 4
P3	Servo axle 18	P3	Servo axle 13	P3	Servo axle 8	P3	Servo axle 3
P2	Servo axle 17	P2	Servo axle 12	P2	Servo axle 7	P2	Servo axle 2
P1	Servo axle 16	P1	Servo axle 11	P1	Servo axle 6	P1	Servo axle 1

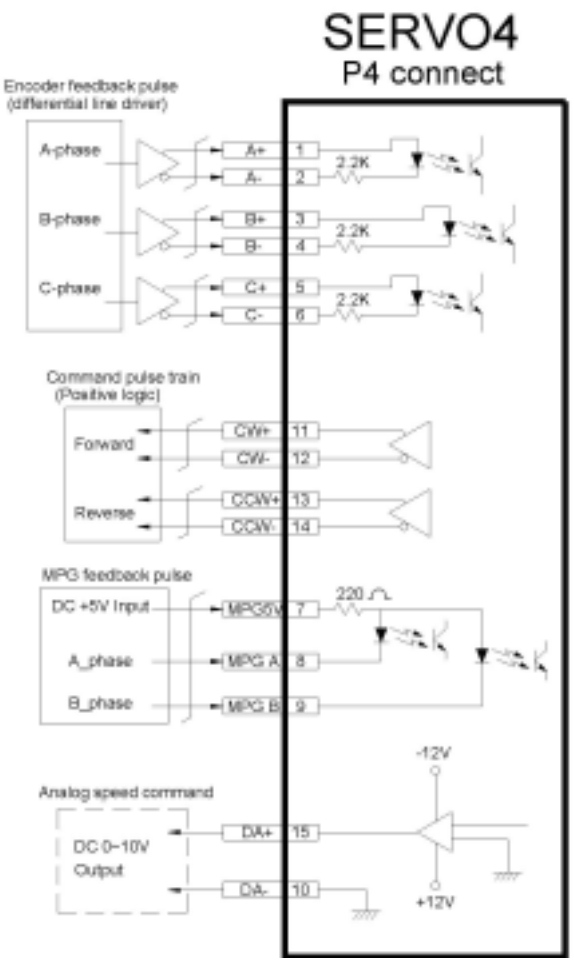
2. each axle card mapping I/O base address and jump wire rule：

NO. of axle card		4	3	2	1
Mapping axle NO.		13~16	9~12	5~8	1~4
Above 8 axles	I/O base address	0X280 (640)	0X340 (832)	0X320 (800)	0X300 (768)
	JP16(4)				
	JP15(3)				
	JP14(2)				
	JP13(1)				
Under 8 axles (included)	I/O base address			0X340 (832)	0X320 (800)
	JP16(4)				
	JP15(3)				
	JP14(2)				
	JP13(1)				

SERVO4 axle card joint PIN Define：



PIN No.	Define
1	Encoder feedback A+
2	Encoder feedback A-
3	Encoder feedback B+
4	Encoder feedback B-
5	Encoder feedback C+
6	Encoder feedback C-
7	(+24V)Servo ALARM
8	(COM) Servo ALARM
9	SERVO_ON
10	SERVO_CLR
11	CW+/A+
12	CW-/A-
13	CCW+/B+
14	CCW-/B-
15	OUT_COM



PIN No.	Define
1	Encoder feedback A+
2	Encoder feedback A-
3	Encoder feedback B+
4	Encoder feedback B-
5	Encoder feedback C+
6	Encoder feedback C-
7	MPG+5V
8	MPG_A
9	MPG_B
10	DA_CMD-
11	CW+/A+
12	CW-/A-
13	CCW+/B+
14	CCW-/B-
15	DA_CMD+

PMC4 axle card operation instruction：

Controller can use 2 pieces of PMC4 axle card at once, each axle card can control 4 form of V_Command servo system, so it can control 8 form V_Command servo system at once。

The way of axle card get number is divided by the three jump wire(sw0~sw2) on/off 。Each axle card setup and servo axle number：

1. axle card Port Number and parameter setup number contrast table：

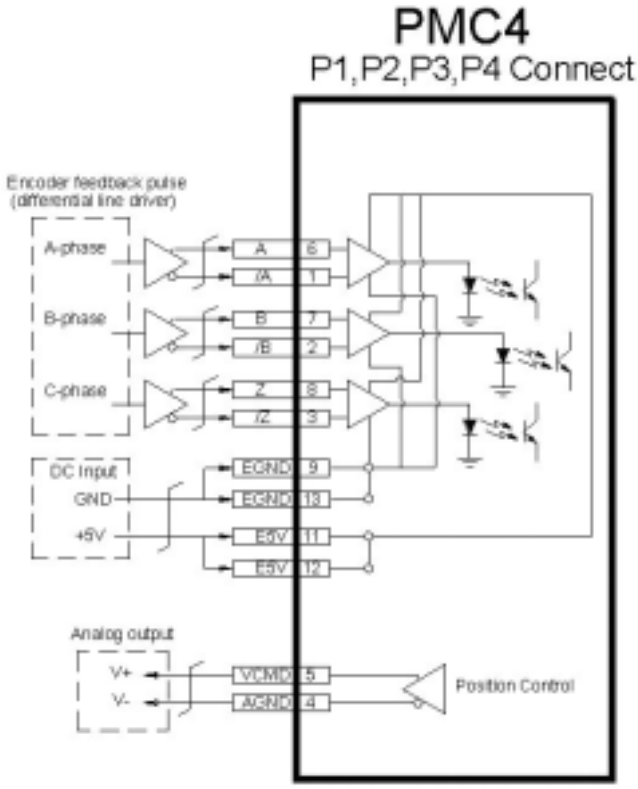
Second axle card		First axle card	
Port	CNC parameter number	Port	CNC parameter number
P4	9th servo axle/MPG	P4	4th servo axle/MPG
P3	8th servo axle	P3	3rd servo axle
P2	7th servo axle	P2	2nd servo axle
P1	6th servo axle	P1	1st servo axle

2. each axle card mapping I/O base address and jump wire rule：

Axle card number	Mapping axle number	I/O Base address	BASE ADDRESS		
			SW0	SW1	SW2
1st	1~4	0x2C0 (704)	Short	Open	Open
2nd	5~8	0x300 (768)	Open	Short	Short

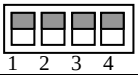
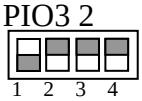
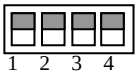
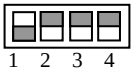
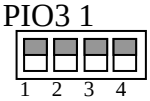
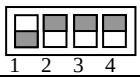
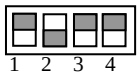
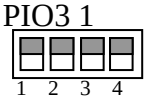
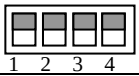
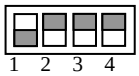
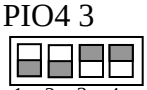
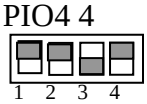
PMC4 axle joint PIN Define：

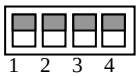
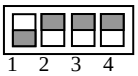
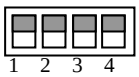
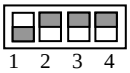
*PIN 11,12 must input DC +5V and PIN 9,13 must input DC 0V.



PIN No.	Define
1	Encoder feedback A-
2	Encoder feedback B-
3	Encoder feedback C-
4	Analog Ground
5	V Command Output
6	Encoder feedback A+
7	Encoder feedback B+
8	Encoder feedback C+
9	Encode Power Ground
10	-
11	Encode power +5V DC
12	Encode Power Ground
13	Home Sensor Power
14	Home Sensor
15	Encode power +5V DC

1.6 I/O board mode setup instruction(system parameter5)

組態	主 I/O 板	接頭	I/O 板型態	I/O 對照表
0	EIO80 1			I0~I39;O0~O39
	EIO80 2			I40~I79;O40~O79
1	PIO3 1 	CN1(母)	Relay1	I0~I7;O0~O14
		CN2(公)	Relay1	I8~I15;O16~O30
	PIO3 2 	CN1(母)	Relay1	I80~I87;O80~O94
		CN2(公)	Hardkey	I40~I79;O40~O79
2	PIO3 1 	CN1(母)	Relay2	I0~I39;O0~O11
		CN2(公)	Hardkey	I40~I79;O40~O79
	PIO3 2 	CN1(母)	Relay1	I80~I87;O80~O94
		CN2(公)	Relay1	I88~I95;O96~O110
3	PIO3 1 	CN1(母)	Relay2	I0~I39;O0~O11
		CN2(公)	Relay1	I40~I47;O40~O54
	PIO3 2 	CN1(母)	Relay1	I80~I87;O80~O94
		CN2(公)	Relay1	I88~I95;O96~O110
	PIO3 3 	CN1(母)	Relay2	I120~I159;O120~O131
		CN2(公)	Relay1	I48~I55;O56~O70
4	PIO3 1 	CN1(母)	Relay2	I0~I39;O0~O11
		CN2(公)	Harkey2	I40~I136;O40~O76
	PIO3 2 	CN1(母)	Relay1	I160~I167;O160~O174
		CN2(公)	Relay1	I168~I175;O176~O190
5	PIO3 	CN1(母)	Relay2	I0~I39;O0~O11
		CN2(公)	Hardkey	I40~I79;O40~O79
	PIO4 1 			I80~I111(32 點) O80~O95(16 點)
	PIO4 2 			I120~I151(32 點) O120~O135(16 點)
	PIO4 3 			I160~I191(32 點) O160~O175(16 點)
	PIO4 4 			I160~I191(32 點) O160~O175(16 點)

組態	主 I/O 板	接頭	I/O 板型態	I/O 對照表
6	PIO5 1 	XI1~XI3	TB16 IN	I0~I47
		XO1~XO3	TB16 OUT	O0~O47
		XO7	一對一輸出	I48~I55;O48~O62
		XO8		I56~I63
	PIO5 2 	XI1~XI3	TB16 IN	I128~I175
		XO1~XO3	TB16 OUT	O128~O175
		XO7	一對一輸出	I176~I183;O176~O190
		XO8		I184~I191
7	PIO5 1 	XI1~XI3	TB16 IN	I0~I47
		XO1~XO3	TB16 OUT	O0~O47
		XO7	Hardkey	I64~I98;I100~I111;O64~O103
		XO8		I56~I63
	PIO5 2 	XI1~XI3	TB16 IN	I128~I175
		XO1~XO3	TB16 OUT	O128~O175
		XO7	Hardkey	I192~I226;I228~I239;O192~O231
		XO8		I184~I191

2. Descriptions of System Parameters

NO	Descriptions	Range	Unit	Detail setting description
1	*Motion board base address	[0~65535]		**SERVO 4：** Less than two piece card setting 800(320H)。 More than three piece card setting 768(300H) **SERVO6：** Setting 768(300H) **Embedded：** Setting 512(200H) Default value 800 (320H)
3	*I/O board base address	[0~65535]	512	PIO2,PIO3,PIO5,Embedded all setting is **512(200H)**
5	*I/O board type	[0~7]	7	0:2PIO4+1PIO3(R1+HK) 1: HK + 3R1 2: HK + R2 + 2R1 3: 2R2 + 4R1 4: HK2 + R2 + 2R1 5: HK + R2 + 4PIO4 6: PIO5(disable matrix scan function) 7:PIO5(enable matrix scan function with HK) 9:Virtual IO card
9	*Servo board type	[0,5]		0:EMP2 1:SERVO4 NoAlarm 2:SVO4+ Alarm Normal Open 3:SVO4+Alarm Normal Close 4:EMP4 5:SERVO6 9:Virtual axle card
10	*SERVO 6 Alarm Type	[0,1]		0: Normal Open 1: Normal Close Note: only for SERVO6 card
11	*Servo board clock source	[0,2]		The clock pulse source: 0:from the SERVO card for the CNC. 1:Share the IPC Bus pulse for simulation software. 2.VIA(Clock come from mainborad)
13	*Number of servo boards	[0,4]		To set the number of servo boards.
15	I/O board digital filter type	[0,3]		The larger value for better filter effect of the noise, but also reduce the sensitivity of the I/O Signal.
17	*Control precision	[1,3]	BLU	To set the resolution of the

NO	Descriptions	Range	Unit	Detail setting description
	1:10um 2:um 3:0.1um			controller. The selection of metric or imperial unit will not affect the Basic Length Unit (BLU) . 1: 0.01 mm, 0.01 deg, 0.001 inch; **2: 0.001 mm,** **0.001 deg,** **0.0001 inch;** 3: 0.0001 mm, 0.0001 deg 0.00001 inch; Set all parameters related to the BLU after the change of this parameter. Especially, the tool data need to be set again.
21~40	X~16th axis to Servo channel no.	[0,20]		*Correspondent axis to the servo chanels on the servo board.
41~60	X axis motor Command polarity	[0,1]		The definition of motor rotation direction to the machine movement. 0: Same 1: Reverse the direction.
61~80	ENCODER PULSE COUNT	[100, 2500000]	pulse/rev pulse/mm	The resolution of the position sensor. (Pulse/rev for encoder, Pulse/mm for optical scale)
81~100	Encoder feedback gain of the servo board.	[1,4]		For ENCODER, set all as 4.
101~120	Gain of the motor velocity loop.	[1,8000]	RPM/V	The gain value of the motor command. That is how many rpm for the motor rotation refer to the 1 DCV output.
121~160	Gear number at the ballscrew side. Gear number at the motor side.	[1, 999999999]		To set the gear parameters by these parameters.
161~180	Pitch of the ballscrew	[1,1000000]	BLU	The lead for one turn of the ballscrew.
181~200	Loop Gain of the position loop	[1,3000]	1/sec	The larger this values are, the better rigidity the system gets. However, too large value will cause the machine to resonance. (the setting need to the same as setting of the driver position loop gain parameter)
201~220	Type of Position Sensor	[0,1]		0:Encoder 1:Optical scale 2:No Position Sensor Feedback

NO	Descriptions	Range	Unit	Detail setting description
221~240	Type of servo axis	[0,5]		0:linear axis 1-5:Rotary axis
241~260	*The second sensor input axis of dual feedback system refer to the machine axis.	[0,20]		To set the dual feedback (Optical scale) refer to the machine axis.
261~280	The resolution of second sensor for the dual feedback. (Pulse/mm)	[100, 2500000]	pulse/mm	The resolution of second sensor for the dual feedback. (Pulse/mm) A/B frequency.
281~300	Type of the Radius and Diameter display in axis.	[0,1]		0:Radius 1:Diameter After change the setting all following parameters are set as the display. For example if the display is in diameter, then all the following values are also in diameter： **Zero offset** **Reference point** **Software travel limit**
301~320	The feedback gain of the second sensor in dual loop system.	[1,4]		All are set as 4 for encoder or optical scale.
321~340	Name of the axis	[00100,10999]		To set the name of the axis 1st & 2nd number for axis Name display or not 00=>enable; 01=>disable; 3th number for the alpha of axis as following: X=>1; Y=>2; Z=>3; A=>4; B=>5; C=>6; U=>7; V=>8; W=>9; Last two number for low case number。 Example： X_2 setting is102, W_{23} setting is 923 X setting is 100
341~360	Division of position command gain	[1,999999999]		Division of position command gain

NO	Descriptions	Range	Unit	Detail setting description
361~380	Element of position command gain	[1,999999999]		Element of position command gain
381~400	Servo driver control mode	[0,2]		0: CW/CCW Position control mode 1: Voltage control mode 2: A/B Phase Position control mode
401	Acceleration and deceleration time for cutting feedrate	[0,60000]	ms	Acceleration and deceleration time for G01, G02, G03, G33. The larger the value, the smoother the movement is. But the accuracy will no reduced. The suggested value for CNC is 100.
402	S-curve time for cutting	[0,60000]	ms	Version before 10.35 suggest setting is 20 Version sfter 10.35 suggest setting is 150
404	Post-Acceleration and Post-deceleration time for cutting	[0,60000]	ms	This parameter is used to smoother the movement, But the accuracy will reduced. The suggested value for CNC is 15-25.
405	Maximum cutting feedrate	[0,3600000]	mm/min deg/min 0.1 in/min	Set for the max cutting speed at (G01, /G02/G03/G31/G33)
406	Corner refer Speed	[6,3600000]	mm/min	
408	5mm Radius ARC the most cutting feedrate	[6,3600000]	mm/min	
409	Thread cutting acceleration time	[0,60000]	ms	Acceleration and deceleration time during helical cutting G33
410	MPG Movement acceleration time	[10,60000]	ms	Setting MPG Movement acceleration time(default Value 200)
411	Rapid Travel(G00) type	[0,1]		G00 transverse type 0:Linear interpolation 1:All axes move in maximum speed independently.
413	Reserve local coordinate after reset	[0,1]		Reset the work coordinate set by G92 or G52 after reset
414	Reserve Workpiece Coordinate System after reset	[0,2]		0:After Reset reserve to default (G54) 1:After Reset no reserve to default (G54) 2:After Reset or Turn-OFF no reserve to default (G54)
415	*Res. cur. tool length. After reset/off (0:No;1:Yes)	[0,1]		0: for NO 1: for YES
417	Rigid tapping acceleration/deceleration gain	[0,4000]		

NO	Descriptions	Range	Unit	Detail setting description
418	Rigid tapping velocity gain	[0,4000]		
419	Rigid tapping spindle deceleration time	[0,60000]	ms	
421~440	Axis cutting in-pos. window(BLU)	[0,300000]	BLU	Performance of BLOCK ,to make sure the accuracy , but too small set , will effect the speed of process.
441~460	X axis rapid travel (G00) acc. time	[0,60000]	ms	Set acceleration and deceleration time of G00 or JOG ,suggest : G01 once above the acceleration and deceleration
461~480	X axis max. rapid travel feedrate	[0,3600000]	mm/min deg/min 0.1 in/min	The speed set of G00 , this accept the interface of RAPID OVERRIDE setup (F0,25,50,100)
481~500	Rapid travel in-pos. window	[0,300000]	BLU	The range of G00 IN POSITION CHECK
501~520	Rapid travel F0 feedrate	[0,15000]	mm/min deg/min 0.1 in/min	When G00 RAPID OVERRIDE set to F0 , the speed of machine
521~540	JOG feedrate	[0,3600000]	mm/min deg/min 0.1 in/min	Speed set of each axis of JOG , accept interface turned button of OVERIRDE
541~560	Axis Acceleration and deceleration time for cutting feedrate	[0,60000]	ms	Setting the acceleration and deceleration time of axis (G01/G02/G03/G31) ,system will use the parameter with Pr621~640 to calculatethe most Acceleration and deceleration.
561~580	axis loss pulse check window	[50,300000]	0.001 mm	Controller in the motor stopped，will check the feedback position of motor and if loss pulse over the range of parameter set，if it’s over, it will set the lost position alarm
581~600	Axis velocity feed forward percentage	[0,200]		
601~620	Axis Corner refer Speed	[6,3600000]	mm/min	
621~640	Axis Maximum cutting feedrate	[0,3600000]	mm/min deg/min 01. in/min	Cutting maximum cutting Feedrate
641~660	Axis S-curve time for cutting	[0,60000]	ms	
701~720	Axis group setting	[1,15]		Setting the axis group of every axis. About the axis group control interface please refer to R520~R559 introduce. Bit 0 1st axis group Bit 1 2nd axis group Bit 2 3th axis group

NO	Descriptions	Range	Unit	Detail setting description
				Bit 3 4th axis group Example： Set 1 the axis belong to 1st axis group Set 2 the axis belong to 2nd axis group Set 3 the axis belong to 1st and 2nd axis group Set 15 the axis belong to 1st 2nd 3th and 4th axis group
721~724	Axis group MST channel No.	[1,4]		Setting axis group MST channel No. Syntec controller offer 4 independent MST channel for CNC and PLC communicate. Different axis group can use the same channel. 1st MST channel PLC interface is C38/S30/S29/S54/S69 R1~R3 2nd~4th MST channel PLC interface please refer to R615~R626 introduce
731	CNC main axis group	[1,4]		Assign CNC main system inclube axis group No. The axis group No. over this setting user can control by PLC. Please refer to R520~R559 introduce. Set 1 ➔only 1st axis group controlled by CNC main system($1) ,other axis group controlled by PLC interface Set 2 ➔1st & 2nd axis group controlled by CNC main system($1,$2) ,other axis group controlled by PLC interface Set 3 ➔1st 2nd & 3th axis group controlled by CNC main system ($1,$2,$3),other axis group controlled by PLC interface Set 4 ➔All axis group controlled by CNC main system ($1,$2,$3,$4)
~800	Reserved for system			Reserved
803	*Home Dog signal (0:I/O; 1:Motion)	[0,1]		HOME DOG signal from the I/O card , or Servo card , suggestion setting 『0』. Note: only for EMP4 card

NO	Descriptions	Range	Unit	Detail setting description
821~840	Homing feedrate	[0,3600000]	mm/min deg/min 0.1 in/min	Setting the feedrate to search the HomeDog when axis is Home Back . set to 1000 mm/min , if it's okay , then set the speed to target vaule.
841~860	Homing 2nd low travel feedrate	[0,360000]	mm/min deg/min 01 in/min	Setting the feedrate to search the index of Motor when axis is home back after leave the HomeDog . At first ,suggestion set 1000 mm/min , if it's okay , then set the speed to target vaule.
861~880	Homing direction	[0,1]		Setting the direction of axis to find HomeDog; 0 is positive 1 is negative
881~900	Home offset	[-999999999, +999999999]	BLU	Change the mechical coordiate origin to the new position ,the parameter is the distance from the index of motor to new origin. This parameter usually use in setting the machine coordinate to one way range
921~940	Home dog polarity (0:pos;1:neg)	[0,1]		Set HOME DOG polarity , the normal write is NORMAL CLOSE , but in the advance switch case is NORMAL OPEN Note: only for EMP4 card
941~960	Home grid function (0:OFF;1:ON)	[0,1]	0	When Home Dog position is too close to motor guide signal ，will effect the find origin is not exact。When it occur after finishing setting Home Dog，please open this performance。After it opened，finding origin will ignore the close guide signal automatically。
961~980	Home search method	[0,1]		0:By HomeDog Sensor 1:By Reference index of Motor
~1200	Reserved for system			Reserved
1221~ 1240	Enable backlash compensation	[0,1]		Backlash compensation enable or disable. When backlash measure active , must disable backlash compensation
1241~ 1260	Backlash amount	[0, 999999999]	BLU	After backlash compensation start , according to this setup , do backlash compensation
1301~ 1320	Pitch error comp. type	[0,2]		0:No compensation 1:Unidirection 2:Bidirectiion
1321~	Pitch error comp.	[1000,	BLU	After interval compensation start ,

NO	Descriptions	Range	Unit	Detail setting description
1340	Interval	99999999]		according to this setup , set the pitch of compensation
1341~ 1360	Table index for reference(home)	[1~100]		After interval compensation start , what number is mechanical origin in table for compensation , suggest 50
1361~1380	axis pos. quad-peak error comp.	[0,9999]	BLU	The compensation of quad-peak between axis moving direction from negative to positive
1381~1400	axis quad-peak error time constant(ms)	[0,60000]	ms	
1401~1420	axis mechanical comp. time constant(ms)	[0,60000]	ms	The compensation of backlash and pitch-err is exponent . This parameter is setting the time constant of exponent.
1421~1440	aixs max. static dual error(BLU)	[100,100000]		Setting the limitation of Error between Motor position and Liear scale position feedback
1441~1460	axis neg. quad-peak error comp.(BLU)	[0,9999]	BLU	The compensation of quad-peak between axis moving direction from positive to negative
1581	The time of Feed forward comp.	[0,1000]	ms	
1621~ 1630	spindles servo channel no. or axis no.	[0,20]		If spindle is controlled by inverter control mode ,please setting the servo channel on the servo card. If spindle is controlled by position command mode or voltage command control mode ,please setting the axis number of system.
1631~ 1640	Spindle bias for zero speed	[-100000, +100000]	0.001 RPM	OFFSET quantity of main spindle origin
1641~ 1650	Spindle encoder polarity(0:Pos;1:Neg)	[0,1]		Clockwise and counterclockwise setup of main spindle
1651~ 1660	Spindle encoder resolution(pulse/rev)	[100, 2500000]		ENCODER number of main spindle
1661~ 1670	Spindle encoder scaling factor	[1,4]		Frequency number of main spindle encoder is 4
1671~ 1680	Spindle gain(RPM/V)	[1,8000]	RPM/V	Spindle revolutions gain setup ,in frequency converter situation ,in principle ,system max RPM/axle card max output(+10V) ,EX: spindle max 4500RPM ,then this value set to 450
1681~ 1700	Spindle gear one gear number at screw side /Spindle gear one gear number at motor side	[1, 999999999]		The wheel gear rate of main spindle one gear
1711~ 1720	*Spindle pos. sensor	[0,1]		Spindle RPM is displayed by encoder actual feeback value or not

NO	Descriptions	Range	Unit	Detail setting description
	exist?(0:No;1:Yes)			
1721~ 1730	Spindle zero floating speed(RPM)	[0,1000]	RPM	When main spindle inch moves start , speed of main spindle (low speed) , the same as JOG and AUTO ,, it's no limit from main spindle lowest speed.
1731~ 1740	Minimum spindle speed(RPM)	[0,30000]	RPM	Minimum spindle speed in automatic and manual
1741~ 1750	Speed for spindle orientation stop(RPM)	[0,30000]	RPM	Main spindle location active，its location speed，not effect from limit of minimum spindle speed.
1751~ 1760	Spidnle S.O.S. reference offset	[-3600000, +3600000]	0.001 deg	Main spindle location active，the bias angle of located potion，this angle is opposite to same cycle signal main spindle encoder。So this parameter must adjust when change motor、encoder or belt
1761~ 1770	Spindle orientation stop dec. time	[1,60000]	ms	Main spindle location active，deceleration time of location
1771~ 1780	Spindle home reference offset	[-360000, +360000]	0.001deg	Main spindle position origin opposite to bias of main spindle encoder guide signal。Let show position of PLC R35 spindle。
1781~ 1790	Min. speed for spindle orientation stop	[0,500]	RPM	Main spindle location active，minimum of location speed，this speed is not effected by main spindle speed
1791~ 1800	*Spindle motor type	[0,1]		Select motor type，0 for frequency motor，1 for serve motor
1801	Maximum spindle speed	[1,80000]	RPM	
1811	Spindle encoder mount location	[0,1]		(0:Spindle;1:Motor)
1901~ 1920	Spindle gear second gear number at screw side Spindle gear second gear number at motor side	[1, 999999999]		Gear rate of spindle second gear
1921~ 1940	Spindle gear third gear number at screw side Spindle gear third gear number at motor side	[1, 999999999]		Gear rate of spindle third gear
~2000	Reserved for system			Reserved

NO	Descriptions	Range	Unit	Detail setting description
2001	MPG 4th scaling factor	[100,1000]	LIU	MPG manual (JOG) step at 4 LIU of each pulse, LIU minimum input unit，this is effected by input of metric and customary system。
2003	MPG program simulation from hand wheel No.	[1,3]		MPG program simulation from MPG number
2021~ 2030	* MPG signal to servo channel no.	[0,20]		MPG opposite to what spindle of serve spindle , usually set to last
2031~ 2040	MPG related axis(0:MLC;1~6:axes)	[0,6]		Set mapping coordinate when MPG JOG。 0 ：that opposite coordinate is selected by MLC C16 ~ C19 1~6：fixed mapping X, Y, Z, A, B, C spindle，the relationship is not effected by C16~ C19。
2041~ 2050	MPG resolution	[100, 2500000]		MPG resolution
2051~ 2060	MPG scaling factor	[1,4]		MPG scaling factor , set to 4
2061~ 2080	MPG gear number at screw side	[1, 999999999]		Gear rate setup , input motor's gear number ,and screw side tooth number
~2400	Reserved for system			Reserved
2401~ 2440	Software travel limit	[-999999999, +999999999]	BLU	Normal working range , setup steps 1. find HOME 2. use MPG move to OT slowly 3. when touch OT then back 5mm ,use this position setup for first stroke limit
~2800	Reserved for system			Reserved
2801~ 2860	2nd reference point	[-999999999, +999999999]	BLU	2^{nd} ~4^{th} parameter point setup
~3200	Reserved for system			Reversed
3201	*lathe convention (0:No;1:C;2:A;3:B)	[0,1]		Set this system is lathe convention or not(EX:: input caliber , threading…)
3202	*I/O scan time	[100,5000]	0.001ms	I/O scan time，normal set for 2000 (2ms)
3203	*Interpolation time interval	[500, 2000000]	0.001ms	Interpolation time interval ,normal set for 2000 (2ms)
3204	*PLC scan time	[500, 2000000]	0.001ms	PLC scan time，normal set for 10000 (10ms)
3205	*Function key type(0:5 key;1:8 key)	[0,1]		Select function key type 5 key or 8 key
3207	*C/S interface version number	[1,2]		1. override is reality % range:-200% ~ +200 % (industrial mechanical setup) 2. override default steps

NO	Descriptions	Range	Unit	Detail setting description
				range: 1-20 (lathe and miller setup)
3209	*Language setting	[0,3]		0:English 1:Trad. Chinese 2:location language 3:Simp. Chinese
3211	*Display type	[0,1]		0:Color 1:Mono
3213	*Removable Device Name	[0,3]		0:A 1:B 2:D 3:Net
3215	*call sub-program when select the tool	[0,1]		0:no;1:call T0000
3217	*select the type of control interface	[0,10]		0:PC Standard keyboard (with C,S-Bit function) 1: 9 ” CRT 900 type keyboard 、 8.4 ” TFT 900 type keyboard and Embedded silica keyboard 2: 10.4 ” TFT 900 type keyboard 3:Old 9 ” CRT 900 type keyboard 4: 8.4 ”、 10.4 ” TFT 940 type keyboard 9:PC standard keyboard
3219	*select system mode	[0,4]		0: NO SRAM : all data and system program put in the same DOC C:。 1: SRAM : user’s dynamic data and tool program put in SRAM, A:。 user’s dynamic data put in A:\CNC\USER； tool program put in A:\CNC\NCFILES Dialogue program put in A:\CNC\GNCFILES 2: HARDDISK : user’s dynamic data put in SRAM A:，tool program put in another hard disk D:(or second DOC)。 user’s dynamic data put in A:\CNC\USER； tool program put in D:\CNC\NCFILES Dialogue program put in D:\CNC\GNCFILES

NO	Descriptions	Range	Unit	Detail setting description
				3: tool program put in another hard disk C:，in order to consist the older version that has hard disk。 4:reversed
3221	Start marco one way execute	[0,1]		0:disable；1:enable
3223	System administer	[0,1]		0:disable；1:enable
3225	Screen saver delay time	[0,9999]	min	Set screen saver delay time，unit is minute，0 for disable。
3227	Screen resolution	[0,1]		Set screen resolution 0: 640x480 1: 800x600
3229	Disable workpiece coordinate setting screen display	[0,1]		0: enable；1: disable
3230	Disable lathe tool length setting screen display	[0,1]		0: enable；1: disable
3231	**COM1 Remote Device	[0,3]		0:Disable 1:FX2 HMI 2: Touch panel 3:FX2-V2 HMI (This setting can read or write Register R0~R4095)
3232	**COM2 Remote Device	[0,3]		0:Disable 1:FX2 HMI 2: Touch panel 3:FX2-V2 HMI (This setting can read or write Register R0~R4095)
*3241	decimal point type	[0,1]		0:standard 1:pocket
3243	keyboard reset process by PLC	[0,1]		0:by MMI 1:by PLC
3245	Max inc. value of input for tool wear compen.(BLU)	[1,200000]	BLU	
3247	Feedrate display method	[0,1]		0: mm/min 1: m/min
*3251	*Touch Screen Type	[0,1]		0:無 1:PenMount
*3252	*Touch Screen Xmin side	[1~9999]		
*3252	*Touch Screen Xmax side	[1~9999]		
*3252	*Touch Screen Ymin side	[1~9999]		
*3252	*Touch Screen	[1~9999]		

NO	Descriptions	Range	Unit	Detail setting description
	Ymax side			
3401~ 3600	MLC mode Parameter			
3601~3610	*register M code to call marco			register M code to call marco。
3801	feed tight couple with spindle position under G95	[0,1]		0: G95 mode feed tight couple with spindle command position 1: G95 mode feed tight couple with spindle encoder feedback position
3802	default feedrate control mode	[0,2]		0:G64 normal cutting mode 1:G62 3-D surface cutting mode 2:G62.1 specific Field machine control mode
3804	Part count M code	[1,999999]		Setting Workpiece cutting finish counter M code number
3805	static dual feedback error timeout	[2,60000]	ms	
3807	Destination not on arc check window	[1,1000]	BLU	The error of radius from start-point to end-ponit
3809	*Are UVW inc. command of XYZ axes(0:No;1:Yes)	[0,1]		0:UVW is UVW axis command 1:UVW is XYZ axis inc. command
3811	*Start address of persist working global variable	[0~400]		0:@1~@400 data all reset after power off 1~400:Start address of persist working global variable EX: setting 100 ,@100~@400 data will persist after power off
3813	*Number of extended global varaibles	[0~20000]		Setting the number of extended global variables from @60000. EX: Setting 1000 ,extended global variables from @60000 to @60999
3815	Tool radius compensation preview(0:No;1:Yes)	[0,1]		刀具半徑補償預看模式 0: normal mode 1: preview mode, G41/G42 enable from the nearest G00 or G01 block
3816	Tool length compensation mode(0:Z;1:Single;2 :Multi)	[0,2]		0：Only Z-Axis 1：Single axis perpendicular to the cutting place 2: mutil axis perpendicular to the cutting place Note:Lathe system always setting 2 by system
3817	Fatal dual feedback error(BLU)	[100,100000]		Dynamic check the error of Motor and linear scale feedback position
3819	Overcut check mode	[0,2]		0:No check and No Alarm 1:Check and alarm

NO	Descriptions	Range	Unit	Detail setting description
				2:Modify the path by system
3821	*1st coupling master axis number	[0,20]		
3822	*1st coupling slave axis number	[0,20]		
3823	*1st coupling master axis ratio factor	[1,999999]		
3824	*1st coupling slave axis ratio factor	[-999999999, 999999999]		
3825	*1st coupling type(0:No;1:Mach;2:PSyn;3:Super;4:MSyn)	[0,4]		Axis coupling type: 0:No coupling 1:machical coupling Coupling start from power on 2: PeerSynchronization coupling 3:Superimposition coupling 4:MasterSlaveSynchronization coupling Note: 2~4 axis coupling if C46 on
3826	1st coupling couple time(ms)	[0,60000]	ms	
3827	1st coupling decouple time(ms)	[0,60000]	ms	
3831	*Discharge resolution(0.001us)	[1,999999999]	0.001us	
3832	*Discharge ignition delay	[1,999999999]		
3841	Z+ contact surface position(BLU)	[-999999999, +999999999]	BLU	
3842	Z- contact surface position(BLU)	[-999999999, +999999999]	BLU	
3843	X+ contact surface position(BLU)	[-999999999, +999999999]	BLU	
3844	X- contact surface position(BLU)	[-999999999, +999999999]	BLU	

3851	tool break handler program No.	0~999999		0:disable
				System default break handler program is O99900(please setting 999000)：
				O999900
				% @MACRO
				G10 L1100 P1820 R0; // disable mute mode
				#1=#1046; // backup programmed federate
				#2=#1008; // backup G94/G95 mode
				#3=#1004; // backup G90/G91 mode
				M#1054 S#1034; // turn on

NO	Descriptions	Range	Unit	Detail setting description

				spindle
				G54 P#1040; // restore workpiece coordinate number
				G90 G00 X#1411 Y#1412; // rapid move to programmed (x,y)
				G94 G01 Z#1413 F1000.; // cutting move to programmed (z) by 1 m/min
				G#3 G#2 F#1; // restore G94/G95,G90/G91 mode, programmed federate
				M99;

3861~3889	*2nd~4st axis coupling setting parameter			Please refer Pr.3821
3943	Second exchange code type	[0,2]		0: ASCII; 1: EIA; 2: ISO;
3944	COM1 control code (0:no;1:DC2;2:DC4; 3:DC2&DC4)	[0,3]		0: no DC control code; 1: add DC2 to start of data; 2: add DC4 to end of data; 3: add DC2 to start of data and add DC4 to end of data;
3945	COM1 end-of-block output code(0:EOB;1:CR& EOB)	[0,1]		0: EOB; 1:add CR before EOB
3946	COM1 DC3 control code parity (0:off ; 1:on)	[0,1]		0: no; 1: yes this parameter is meaningful when that is set to 2 in 3947
3947	COM2 flow control mode			0: no; 1: CTS/RTS hardware mode; 2: Xon/Xoff software mode;
3948	COM2 parity check			0: no; 1: odd corresponding; 2: even corresponding;
3949	COM1 stop bit			1: 1 bit; 2: 2 bit;
~4000	Reserved for coordinate system			Reserved
4001~ 5000	Reserved for CNC developer's custom macro Parameters			Reserved
5001~ 6000	Reserved for manufacturer's custom macro Parameters			Reserved
6001~ 8000	Reserved for new parameter group			Reserved

NO	Descriptions	Range	Unit	Detail setting description
8001~ 10000	Pitch error compensate , compensation table	[-999999, 999999]	BLU	Setup principle : 1. use HOME to be the compensation datum point 2. cancel pitch error compensation setup 3. use Block Gauge or laser to get the exactly inaccuracy(absolute) 4. mechanical coordinate is positive , add 50 , 51 … ., mechanical coordinate is negative ,add 49,48,47… 5. after finishing , restart compensation and do one more , compensation effect or not 6. when set one-way compensation, only enter positive compensation number 7. two-way compensation usually use in laser measurement 8. input is absolute compensation , not absolute inaccuracy (they are different from a negative sign)

*that parameter effect when next reboot

3.LADDER SOFTWARE INTERFACE C, S, R :

3.1 C BITS (FROM PLC TO CNC) DESCRIPTIONS

Descriptions:

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
C000	ST	Cycle Start	CNC star to execute the NC program after this bit on under auto mode
C001	SP	Feed Hold	CNC pause the execution of the NC program after this bit on under auto mode
C006	XP	X Axis JOG+	JOG MODE Press X+ key on the panel, LADDER enable FLAG ON and also let the machine to move along the X+ direction
C007	XN	X Axis JOG -	Same as above
C008	YP	Y Axis JOG +	Same as above
C009	YN	Y Axis JOG -	Same as above
C010	ZP	Z Axis JOG+	Same as above
C011	ZN	Z Axis JOG -	Same as above
C012	CP	C(6^{th}) Axis JOG +	Same as above
C013	CN	C(6^{th}) Axis JOG -	Same as above
C016	MPGX	X Axis MPG Selection	Select MPG to control X axis, enable this FLAG ON, controller move the machine along the X axis according to the input of the MPG.
C017	MPGY	Y Axis MPG Selection	Same as above
C018	MPGZ	Z Axis MPG Selection	Same as above
C019	MPGC	C(6^{th}) Axis MPG Selection	Same as above
C020	MPSM	MPG Simulation	Enable this bit ON under Auto mode, the feedrate override of G00, G01, G02, G03 is controlled by the MPG turning speed. The MPG turns faster, the override get bigger. The movement is stop when the MPG stop.
C023	RT	Rapid Traverse	Under the CON JOG mode, the movement changes to RAPID mode from the CON JOG after press this key and enable this FLAG ON.
C025	SEMAX	Set X Axis Machine Position	To set the machine coordinate of X axis. The set value is written in R38 first and when the X axis servo-of C bit C31 is ON, then the value will be set as the R38 value.
C026	SEMAY	Set Y Axis Machine Position	Same as above

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
C027	SEMAZ	Set Z Axis Machine Position	Same as above
C028	SEMAC	Set C(6^{th}) Axis Machine Position	Same as above
C031	XOFF	X Axis MANUAL CONTROL	When this C bit on, the controller changes from the close loop servo mode to only POSITION DISPLAY mode. This function is for the conventional user want to cut the part by turning hand wheel manually. Ladder program need to integrate the servo off of the servo system and also this mode. When this bit off, the controller returns to the close loop control again.
C032	YOFF	Y Axis MANUAL CONTROL	Same as above
C033	ZOFF	Z Axis MANUAL CONTROL	Same as above
C034	COFF	C(6^{th}) Axis MANUAL CONTROL	Same as above
C036	ESP	Emergency Stop	When the Emergency Stop button is pressed, LADDER enable this flag and CNC stops all the movement of the machine and change to NOT READY status. When the E-stop button release, this flag is disable and CNC generate the REST command automatically to change the status back to READY.
C037	ERS	External Reset	Send the RESET signal to the CNC from external device.
C038	MSTF	M.S.T Finish	When the LADEER program executing M, S, T codes. CNC go to next block till this flag is ON. Then the LADDER enables this flag after finish the MST codes.
C039	M99HLD	M99 stop request	When this bit ON, the M99 in main program will let the execution feed hold(B-STOP)
C040	SBK	Single Block	The program will feed hold after one block is finished when this bit is ON. Press the CYCLE START to continue next block.
C041	BDT1	Optional Skip	The program execution will skip the block with "/" at the beginning then go to next when this flag ON and under OPTIONAL SKIP mode.
C042	DRN	Dry Run	All the movement travel in G00 speed when this Flag is ON and under the

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
			DRAY RUN mode
C043	MLK	Machine Lock	All the travel command generate no movement when this Flag is ON and under the MACHINE LOCK mode. Only the coordinate display change. This is for the program checking.
C044	OPS	Optional Stop	The program feed hold when it reach the block with M01 and this flag ON. When the flag is off, the M01 is skipped.
C045	ZLOCK	Z Axis Lock	The program stops the movement along the Z axis when this flag is ON. This for checking the program.
C046	COUPLE	Axes couple state	The system parameter NO 3825 is set as axes couple, then the axes couple status is decided by this bit. When this flag is ON, the master and slave axes will be enable to couple. Then the slave move in proportion to the master axis.
C047		Inhibit Persist State Flush	When this FLAG ON ,Inhibit system Persist the state. If this flag state change from off to on, system will persist state .
C050	XOTP	Over Travel X+	The signal from X+ limit switch enables the flag ON, then the controller change to feed hold mode and can retract only in the opposite direction by MPG or JOG.
C051	XOTN	Over Travel X-	Same as above
C052	YOTP	Over Travel Y+	Same as above
C053	YOTN	Over Travel Y-	Same as above
C054	ZOTP	Over Travel Z+	Same as above
C055	ZOTN	Over Travel Z-	Same as above
C056	COTP	Over Travel C(6^{th})+	Same as above
C057	COTN	Over Travel C(6^{th})-	Same as above
C060	SO	Spindle JOG Mode	JOG the spindle as the value set in system parameter NO. 1721 when this bit is ON. This is used to control the spindle integrate with the gear change or the bar feeder.
C061	SOS	Spindle Orientation Stop	The spindle executes the spindle orientation function when this flag is ON. This function is for the spindle with encoder and the spindle rotating speed set by the system parameter NO. 1741. The orientation angle is set at NO. 1751. Each time change the motor or the encoder, NO.1761 need

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
			to be set again. S61 to notice the spindle orientation finished signal.
C062	SKIP	Skip Signal State	The measuring escape command G31 will record current machine coordinate when this bit is ON and also interrupt the command.
C063	SPDOFF	Spindle OFF	Wen the system parameter NO. 1791 spindle motor type is set as 1 P servo, this flag ON let the spindle change to position control mode. When this flag is OFF, then the spindle changes back to velocity control. The rotation directionS are set by the C64/C65.
C064	SPDCW	Rotating the spindle clockwise	Rotating the spindle clockwise
C065	SPDCCW	Rotating the spindle counterclockwise	Rotating the spindle counterclockwise
C066®	XPLC	X axis controlled by PLC	The PLC controls the X axis when this flag is on. The controller takes over the X axis control when this bit is OFF. If PLC generate the command during the execution of the program, then controller generates the command interference alarm.
C067®	YPLC	Y axis controlled by PLC	Same as above
C068®	ZPLC	Z axis controlled by PLC	Same as above
C069®	CPLC	C axis(6^{th}) controlled by PLC	Same as above
C071	MPG1	Enable MPG No1	When this flag is ON, the first MPG input generate the movement command and control the corespondent axis to move.
C072	MPG2	Enable MPG No2	Same as above
C073	MPG3	Enable MPG No3	Same as above
C076	CLRMPG1	Clear MPG1 position	When this flag is on, current position of first MPG in R6 is cleared when the flag is ON.
C077	CLRMPG2	Clear MPG2 position	When this flag is on, current position of second MPG in R7 is cleared when the flag is ON.
C078	CLRMPG3	Clear MPG3 position	When this flag is on, current position of third MPG in R8 is cleared when the flag is ON.
C079	XDOG	X HOME DOG	Enable the HOME DOG signal from the IO board. LADDER set this bit to enable the function
C080	YDOG	Y HOME DOG	Same as above
C081	ZDOG	Z HOME DOG	Same as above

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
C082	CDOG	C(6^{th}) HOME DOG	Same as above
C083		Stroke Limit Two Switch	On:enable Off:disable
C089	EDITINHI	Edit inhibition	The mode setting of program edition. 0: for enable 1: for forbidding edition
C090	SCPRG	Program Edit Screen	Select programming mode
C091	SCGPH	Graph Dialog Screen	Select the dialog mode
C092	SCAUTO	Monitor Screen	Select the RUN mode and monitor the program execution.
C093	SCPOS	Position Screen	Select the coordinate display mode.
C094		Tool Offset Screen	Select the Tool Offset Screendisplay mode
C101~C132	CVAR	Macro mapping variable	Mapping to the variable of the macros (#6001~#6032)
C140	OTP4	4^{th} Axis OT +	The signal from A+ limit switch enables the flag ON, then the controller change to feed hold mode and can retract only in the opposite direction by MPG or JOG.
C141	OTN4	4^{th} Axis OT -	Same as above
C142	OTP5	5^{th} Axis OT +	Same as above
C143	OTN5	5^{th} Axis OT -	Same as above
C144	OTP7	7^{th} Axis OT +	Same as above
C145	OTN7	7^{th} Axis OT -	Same as above
C146	OTP8	8^{th} Axis OT +	Same as above
C147	OTN8	8^{th} Axis OT -	Same as above
C148	OTP9	9^{th} Axis OT +	Same as above
C149	OTN9	9^{th} Axis OT -	Same as above
C150	OTP10	10^{th} Axis OT +	Same as above
C151	OTN10	10^{th} Axis OT -	Same as above
C152	OTP11	11^{th} Axis OT +	Same as above
C153	OTN11	11^{th} Axis OT -	Same as above
C154	OTP12	12^{th} Axis OT +	Same as above
C155	OTN12	12^{th} Axis OT -	Same as above
C156	OTP13	13^{th} Axis OT +	Same as above
C157	OTN13	13^{th} Axis OT -	Same as above
C158	OTP14	14^{th} Axis OT +	Same as above
C159	OTN14	14^{th} Axis OT -	Same as above
C160	OTP15	15^{th} Axis OT +	Same as above
C161	OTN15	15^{th} Axis OT -	Same as above
C162	OTP16	16^{th} Axis OT +	Same as above
C163	OTN16	16^{th} Axis OT -	Same as above
C170®	AXP4	4^{th} Axis JOG +	JOG MODE Press A+ key on the panel, LADDER enable FLAG ON

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
			and also let the machine to move along the A+ direction
C171®	AXN4	4th Axis JOG -	Same as above
C172®	AXP5	5th Axis JOG +	Same as above
C173®	AXN5	5th Axis JOG -	Same as above
C174®	AXP7	7th Axis JOG +	Same as above
C175®	AXN7	7th Axis JOG -	Same as above
C176®	AXP8	8th Axis JOG +	Same as above
C177®	AXN8	8th Axis JOG -	Same as above
C178®	AXP9	9th Axis JOG +	Same as above
C179®	AXN9	9th Axis JOG -	Same as above
C180®	AXP10	10th Axis JOG +	Same as above
C181®	AXN10	10th Axis JOG -	Same as above
C182®	AXP11	11th Axis JOG +	Same as above
C183®	AXN11	11th Axis JOG -	Same as above
C184®	AXP12	12th Axis JOG +	Same as above
C185®	AXN12	12th Axis JOG -	Same as above
C186®	AXP13	13th Axis JOG +	Same as above
C187®	AXN13	13th Axis JOG -	Same as above
C188®	AXP14	14th Axis JOG +	Same as above
C189®	AXN14	14th Axis JOG -	Same as above
C190®	AXP15	15th Axis JOG +	Same as above
C191®	AXN15	15th Axis JOG -	Same as above
C192®	AXP16	16th Axis JOG +	Same as above
C193®	AXN16	16th Axis JOG -	Same as above
C200	DOG4	4th Axis Home Dog	Enable the HOME DOG signal from the IO board. LADDER set this bit to enable the function
C201	DOG5	5th Axis Home Dog	Same as above
C202	DOG7	7th Axis Home Dog	Same as above
C203	DOG8	8th Axis Home Dog	Same as above
C204	DOG9	9th Axis Home Dog	Same as above
C205	DOG10	10th Axis Home Dog	Same as above
C206	DOG11	11th Axis Home Dog	Same as above
C207	DOG12	12th Axis Home Dog	Same as above
C208	DOG13	13th Axis Home Dog	Same as above
C209	DOG14	14th Axis Home Dog	Same as above
C210	DOG15	15th Axis Home Dog	Same as above
C211	DOG16	16th Axis Home Dog	Same as above
C215	MPG4	4th Axis MPG Selection	Select MPG to control A axis, enable this FLAG ON, controller move the machine along the A axis according

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
			to the input of the MPG.
C216	MPG5	5th Axis MPG Selection	Same as above
C217	MPG7	7th Axis MPG Selection	Same as above
C218	MPG8	8th Axis MPG Selection	Same as above
C219	MPG9	9th Axis MPG Selection	Same as above
C220	MPG10	10th Axis MPG Selection	Same as above
C221	MPG11	11th Axis MPG Selection	Same as above
C222	MPG12	12th Axis MPG Selection	Same as above
C223	MPG13	13th Axis MPG Selection	Same as above
C224	MPG14	14th Axis MPG Selection	Same as above
C225	MPG15	15th Axis MPG Selection	Same as above
C226	MPG16	16th Axis MPG Selection	Same as above
C230	SEMA4	Set 4th Axis Mach-ine.Position	To set the machine coordinate of A axis. The set value is written in R38 first and when the A axis servo-of C bit C230 is ON, then the value will be set as the R38 value.
C231	SEMA5	Set 5th Axis Mach-ine.Position	Same as above
C232	SEMA7	Set 7th Axis Mach-ine.Position	Same as above
C233	SEME8	Set 8th Axis Mach-ine.Position	Same as above
C234	SEME9	Set 9th Axis Mach-ine.Position	Same as above
C235	SEME10	Set 10th Axis Mach-ine.Position	Same as above
C236	SEME11	Set 11th Axis Mach-ine.Position	Same as above
C237	SEME12	Set 12th Axis Mach-ine.Position	Same as above
C238	SEME13	Set 13th Axis Mach-ine.Position	Same as above
C239	SEME14	Set 14th Axis Mach-ine.Position	Same as above
C240	SEME15	Set 15th Axis Mach-ine.Position	Same as above
C241	SEME16	Set 16th Axis Mach-ine.Position	Same as above
C245	OFF4	4th Axis MANUAL CONTROL	When this C bit on, the controller changes from the close loop servo mode to only POSITION DISPLAY mode. This function is for the conventional user want to cut the part by turning hand wheel manually. Ladder program need to integrate the servo off of the servo system and also

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
			this mode. When this bit off, the controller returns to the close loop control again.
C246	OFF5	5th Axis MANUAL CONTROL	Same as above
C247	OFF7	7th Axis MANUAL CONTROL	Same as above
C248	OFF8	8th Axis MANUAL CONTROL	Same as above
C249	OFF9	9th Axis MANUAL CONTROL	Same as above
C250	OFF10	10th Axis MANUAL CONTROL	Same as above
C251	OFF11	11th Axis MANUAL CONTROL	Same as above
C252	OFF12	12th Axis MANUAL CONTROL	Same as above
C253	OFF13	13th Axis MANUAL CONTROL	Same as above
C254	OFF14	14th Axis MANUAL CONTROL	Same as above
C255	OFF15	15th Axis MANUAL CONTROL	Same as above
C256	OFF16	16th Axis MANUAL CONTROL	Same as above
C260®	PLC4	4th axis controlled by PLC	The PLC controls the 4th axis when this flag is on. The controller takes over the 4th axis control when this bit is OFF. If PLC generate the command during the execution of the program, then controller generates the command interference alarm. controller takes over the A axis control when this bit is OFF. If PLC generate the command during the execution of the program, then controller generates the command interference alarm.
C261®	PLC5	5th axis controlled by PLC	Same as above
C262®	PLC7	7th axis controlled by PLC	Same as above
C263®	PLC8	8th axis controlled by PLC	Same as above
C264®	PLC9	9th axis controlled by PLC	Same as above
C265®	PLC10	10th axis controlled by PLC	Same as above
C266®	PLC11	11th axis controlled by PLC	Same as above
C267®	PLC12	12th axis controlled by PLC	Same as above
C268®	PLC13	13th axis controlled by PLC	Same as above
C269®	PLC14	14th axis controlled by PLC	Same as above
C270®	PLC15	15th axis controlled by PLC	Same as above

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
C271®	PLC16	16th axis controlled by PLC	Same as above
C301	MJINV1	1th axis MPG jog direction inverse	The direction of movement controlled by MPG is inverse when this bit is on. For example, the movement along + direction when the MPG tun CW, the bit off, the movement will be in -.
C302	MJINV2	2th axis MPG inverse	Same as above
C303	MJINV3	3th axis MPG inverse	Same as above
C304	MJINV4	4th axis MPG jog direction inverse	Same as above
C305	MJINV5	5th axis MPG jog direction inverse	Same as above
C306	MJINV6	6th axis MPG jog direction inverse	Same as above
C307	MJINV7	7th axis MPG jog direction inverse	Same as above
C308	MJINV8	8th axis MPG jog direction inverse	Same as above
C309	MJINV9	9th axis MPG jog direction inverse	Same as above
C310	MJINV10	10th axis MPG jog direction inverse	Same as above
C311	MJINV11	11th axis MPG jog direction inverse	Same as above
C312	MJINV12	12th axis MPG jog direction inverse	Same as above
C313	MJINV13	13th axis MPG jog direction inverse	Same as above
C314	MJINV14	14th axis MPG jog direction inverse	Same as above
C315	MJINV15	15th axis MPG jog direction inverse	Same as above
C316	MJINV16	16th axis MPG jog direction inverse	Same as above
C401~C488	KEY	Standard keyboard Scan Code	Mapping to the stand PC keyboard to 1~88
C489	OMEK89	OEM extended key	Extension keys from 89-111， Mapping to PC keyboard ALT-1
C490	OMEK90		Mapping to PC keyboard ALT-2
C491	OMEK91		Mapping to PC keyboard ALT-3
C492	OMEK92		Mapping to PC keyboard ALT-4
C493	OMEK93		Mapping to PC keyboard ALT-5
C494	OMEK94		Mapping to PC keyboard ALT-6
C495	OMEK95		Mapping to PC keyboard ALT-7
C496	OMEK96		Mapping to PC keyboard ALT-8
C497	OMEK97		Mapping to PC keyboard ALT-9
C498	OMEK98		Mapping to PC keyboard ALT-0

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
C499	OMEK99		Mapping to PC keyboard ALT-B
C500	OMEK100		Mapping to PC keyboard ALT-V
C501	OMEK101		Mapping to PC keyboard ALT-E
C502	OMEK102		Mapping to PC keyboard ALT-F
C503	OMEK103		Mapping to PC keyboard ALT-I
C504	OMEK104		Mapping to PC keyboard ALT-J
C505	OMEK105		Mapping to PC keyboard ALT-K
C506	OMEK106		Mapping to PC keyboard ALT-L
C507	OMEK107		Mapping to PC keyboard ALT-W
C508	OMEK108		Mapping to PC keyboard ALT-N
C509	OMEK109		Mapping to PC keyboard ALT-S
C510	OMEK110		Mapping to PC keyboard ALT-T
C511	OMEK111		Mapping to PC keyboard ALT-U

All the C bits will be read simultaneously and only the C bit with ® is handle at real time. The others will be send to the stack and run by sequence。

3.2 S Bit (From CNC to PLC) S DESCRIPTIONS

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
S000	STL	Cycle Start Light	CNC enable this flag ON to indicates the BUSY status of the CNC.
S001	SPL	Feed Hold Light	CNC enable this flag ON to indicates the FEEDHOLD status of the CNC.
S002	BTP	Block stop	CNC enable this flag ON to indicates the BLOCK STOP status of the CNC.
S003	FEINH	Feedhold inhibit	The flag ON to indicates forbid feedhold.
S004		Rigid Tapping	When this FLAG is ON,the 1st is on rigid tapping mode (G63)
S006	XBUSY	X Axis Busy	The flag on to indicates the X axis busy and can not accept new command. When the flag is OFF, then the X axis can accept the new command.
S007	YBUSY	Y Axis Busy	Same as above
S008	ZBUSY	Z Axis Busy	Same as above
S009	CBUSY	C(6th) Axis Busy	Same as above
S016	HMOKX	X Axis Home Finish	X Homing OK , This flag ON after X axis finished the HOME operation. The software travel limit is enable after this flag is ON. Must check this before the cycle start in the LADDER program.
S017	HMOKY	Y Axis Home OK	Same as above
S018	HMOKZ	Z Axis Home OK	Same as above
S019	HMOKC	C(6th) Axis Home OK	Same as above
S029	MF	M Code Read	During CNC doing M CODE, enable this flag ON to notice LADDER to execute the M code. The value of M code is saved in R1. CNC enable this flag till the LADDER sends the C bit MST finished to disable. Then execute the next block after the flag is OFF.
S030	DEN	Distribution End	MOTION G done a BLOCK send a DEN signal ,usually use in the situation when G,M CODE action together.

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
S031	AL	Alarm	When CNC inside occur ALARM ， so must Feedhold ,will send S BIT ,DDA overflow，software limit exceed.
S032	RST	Reset	When click RESET ,S BIT this FLAG will send ONE SHOT message.
S033	MA	NC Ready	Finished open the machine ,and the system is normal, will send NC READY FLAG
S034	PARFIN	Require Part Count Reached	When needed jobs reached，this S FLAG will turn ON, when Cycle Start or Reset FLAG will turn OFF
S035	M99	The M99 in main program	When main program doing M99 output to FLAG ON/OFF a pulse
S036		In Guidance Mode	When CNC on Guidance Function mode, this falg will turn ON
S037		Loss data	When user data is loss ,this flag will turn ON
S041		PLC Alarm	When system appear PLC ALARM , this flag will turn on.When the alarm disappear ,this flag will turn OFF. This flag only work in WinCE controller.
S054	SF	S Code Read	When CNC doing S CODE ,this FLAG turn ON ,and tell LADDER to do S CODE ,the contents of S CODE is in R2, after CNC send this FLAG ,until S CODE FIN's C BIT FLAG ON , it will start to do next BLOCK
S061	SOSRDY	Spindle Orientation Stop Finish	Main axis placed finished signal
S063	SPDAX	Spindle axis mode	When S BIT ON ， represent main axis in position control mode；when S BIT OFF ， represent main axis in spindle speed control mode。
S069	TF	T Code Read	When CNC doing T CODE ,this FLAG turn ON ,and tell LADDER to do T CODE ,the contents of T CODE is in R2, after CNC send this FLAG ,until T CODE FIN C BIT FLAG ON ,it will start to do next BLOCK
S070	START	At start point	When this signal is ON represent in the start of process。
S071	ATEND	At end point	When this signal is ON represent is the end of process。
S101~S132	SVAR		Mapping macro system variable

ITEM	ABBREV-IATION	DESCRIPTION	FUNCTIONS
			(#6001~#6032)
S140	HMOK4_	4th Axis Home OK	4th axis Homing OK , This flag ON after 4th axis finished the HOME operation. The software travel limit is enable after this flag is ON. Must check this before the cycle start in the LADDER program.
S141	HMOK5	5th Axis Home OK	Same as above
S142	HMOK7	7th Axis Home OK	Same as above
S143	HMOK8	8th Axis Home OK	Same as above
S144	HMOK9	9th Axis Home OK	Same as above
S145	HMOK10	10th Axis Home OK	Same as above
S146	HMOK11	11th Axis Home OK	Same as above
S147	HMOK12	12th Axis Home OK	Same as above
S148	HMOK13	13th Axis Home OK	Same as above
S149	HMOK14	14th Axis Home OK	Same as above
S150	HMOK15	15th Axis Home OK	Same as above
S151	HMOK16	16th Axis Home OK	Same as above
S155	BUSY4	4th Axis Busy	The flag on to indicates the 4th axis busy and can not accept new command. When the flag is OFF, then the 4th axis can accept the new command.
S156	BUSY4	4th Axis Busy	Same as above
S157	BUSY5	5th Axis Busy	Same as above
S158	BUSY7	7th Axis Busy	Same as above
S159	BUSY8	8th Axis Busy	Same as above
S160	BUSY9	9th Axis Busy	Same as above
S161	BUSY10	10th Axis Busy	Same as above
S162	BUSY11	11th Axis Busy	Same as above
S163	BUSY12	12th Axis Busy	Same as above
S164	BUSY13	13th Axis Busy	Same as above
S165	BUSY14	14th Axis Busy	Same as above
S166	BUSY15	15th Axis Busy	Same as above
S167	BUSY16	16th Axis Busy	Same as above
S401~488	KEY	Keyboard Scan Code	Mapping to the keyboard scan code 1~88
~S511		Reserved for CNC	System reserved

3.3 S/C Bit correspondent to the English PC keyboard

Basic key area

Esc 401	F1 459	F2 460	F3 461	F4 462	F5 463	F6 464	F7 465	F8 466	F9 467	F10 468	F11 487	F12 488		
` 441	1 402	2 403	3 404	4 405	5 406	6 407	7 408	8 409	9 410	0 411	- 412	= 413	\ 443	Back 414
Tab 415	Q 416	W 417	E 418	R 419	T 420	Y 421	U 422	I 423	O 424	P 425	[426	] 427	Enter 428	
Caps 458	A 430	S 431	D 432	F 433	G 434	H 435	J 436	K 437	L 438	; 439	‘ 440			
Shift	Z 444	X 445	C 446	V 447	B 448	N 449	M 450	, 451	. 452	/ 453	Shift 454			
Ctrl 429		Alt 456		Space 457								Alt 456		Ctrl 429

Extension key area

Print	Scroll 470	Pause
Inster 482	Home 471	Up 473
Delete 483	End 479	Down 481
	↑ 472	
← 475	↓ 480	→ 477

Num 469	/ 453	* 455	– 474
7 Home 471	8 ↑ 472	9 Up 473	+ 478
4 ← 475	5 476	6 → 477	
1 End 479	2 ↓ 480	3 Down 481	Enter 428
0 482		. 483	

3.4 MLC Register Definition

R Bit definition

NO.	Descriptions	Write/Read rules		Saved in Bit	Permanent keep
		MACRO MMI	PLC		
R0~R39	CNC System Interface	R	By next table	Yes	No
R40~R49	PLC Alarm Message				
R50~R80	User Defined	W/R	W/R	Yes	No
R81~R100	Refer to System Parameter NO. 3401~3420 for PLC	R	R	Yes	No
R101~R102	Tool Status	W/R	W/R	Yes	Yes
R103~R255	User Defined	W/R	W/R	Yes	Yes
R255~R511					No
R512~R639	CNC System Interface	R	By next table	Yes	No
R640~R1023				No	
R1023~R4095	User Defined	W/R	W/R	No	No

CNC communiction interface definition

Item	Code	Name、range	Description	PLC R/W
R0				
R1	MCODE	M Code (00~99)	When CNC doing M CODE , will put the contents of M CODE in here, let LADDER to read.	R
R2	SCODE	S Code (0000~9999)	When CNC doing S CODE , will put the contents of S CODE in here, let LADDER to read.	R
R3	TCODE	T Code (0000~9999)	When CNC doing T CODE , will put the contents of T CODE in here, let LADDER to read.	R
R6	MPGPOS1	MPG 1 Position	First MPG position	R
R7	MPGPOS2	MPG 2 Position	Second MPG position	R
R8	MPGPOS3	MPG 3 Position	Third MPG position	R
R13®	MODE	Mode selection 1: Edit, 2: Auto, 3: MDI, 4: JOG, 5:INCJOG, 6: MPG, 7: HOME	Process mode select , use the REGISTER to tell CNC	W
R14	INCF	Increment Feed INCJOG: 1: x1, 2: x10, 3: x100, 4: x1000 MPG: 1: x1, 2: x10, 3: x100, 4: x set by the parameter NO.2001	The select of MPG segment count ,and setup of inch move segment count	W
R15	SPOV	Spindle Override 1: 50%, 2: 60%, 3: 70%, 4: 80%, 5: 90%, 6: 100%, 7: 110%, 8: 120%	AUTO MODE ,JOG MODE are valid	W
R16	FOV	Feedrate Override 1: 10%, 2: 20%, ….., 20: 200%	G01,G02,G03 segment count setup	W
R17	JOV	JOG Override 1: 10%, 2: 20%, ….., 20: 200%	JOG segment count setup	W
R18	RTOV	Rapid Traverse Override 1: F0, 2: 25%, 3: 50%, 4: 100%	G00 segment count setup , when JOG click fast key ,the speed of machine is as same as this speed ,when REGISTER set to 1 ,the machine will use F0 speed moved ,this F0 speed can be set by parameter	W
R21		Active Session ID		W
R22	MPG2OV	MPG: 1: x1, 2: x10, 3: x100, 4: x100	Second MPG segment count select	W
R23	MPG3OV	MPG: 1: x1, 2: x10, 3: x100, 4: x100	Third MPG segment count select	W

Item	Code	Name、range	Description	PLC R/W
R24	SGEAR	Spindle Gear selection 0,1 for 1st 2 for 2nd 3 for 3rd and 9 for neutral	Main axis gear setup，0,1 represent the first gear，2 represent the second gear，3 represent the third gear，9 represent the blank gear	W
R26	PCX	Program Coordinate X	X axis program coordinate position，the unit is the minimum input unit，LIU。 When control precision is micro meter and the number: 0.01 mm 0.01 deg, 0.0001 inch	R
R27	PCY	Program Coordinate Y	Same as above	R
R28	PCZ	Program Coordinate Z	Same as above	R
R29	PCC	Program Coordinate C(6th)	Same as above	R
R31	MCX	Machine Coordinate X	X axis machine coordinate position，the unit is the minimum input unit，LIU。 When control precision is micro meter and the number: 0.01 mm 0.01 deg, 0.0001 inch	R
R32	MCY	Machine Coordinate Y	Same as above	R
R33	MCZ	Machine Coordinate Z	Same as above	R
R34	MCC	Machine Coordinate C(6th)	Same as above	R
R35	MCS	Spindle Machine Position	Main axis machine position，unit is 0.001 degree。	R
R36	SPLS	Spindle Speed	Main axis speed，unit is RPM	R
R37	DIR	Movement direction relative to current working plane	Movement direction of tool，opposite to current working plan，unit is 0.001 degree。	R
R38	ARG1	Argument one	Argument one，significance from use the C Bit function to define it	W
R39	AD1	Relay 2 A/D value	Relay2 A/D converter value	W
R40	MSG1	PLC Alarm Message #1 ~ #16	System default alarm area Bit 0~15 #1 ~ #16 PLC Alarm Message, save to history. Bit16~31 #251 ~ #266 PLC Waring Message, no save to history	W
R41	MSG2	PLC Alarm Message #17 ~ #32	System default alarm area Bit 0~15 #17 ~ #32 PLC Alarm Message, save to history. Bit16~31 #267 ~ #282 PLC	W

Item	Code	Name、range	Description	PLC R/W
			Warning Message, no save to history	
R42	MSG3	PLC Alarm Message #33 ~ #48	System default alarm area Bit 0~15 #33~ #48 PLC Alarm Message, save to history. Bit16~31 #283 ~ #298 PLC Warning Message, no save to history.	W
R43	MSG4	PLC Alarm Message #49 ~ #64	System default alarm area Bit 0~15 #49 ~ #64 PLC Alarm Message, save to history. Bit16~31 #299 ~ #314 PLC Warning Message, no save to history.	W
R44	MSG5	PLC Alarm Message #65 ~ #80	User define alarm message Bit 0~15 #65 ~ #80 PLC Alarm Message, save to history. Bit16~31 #315 ~ #330 PLC Waring Message, no save to history.	W
R45	MSG6	PLC Alarm Message #81 ~ #96	User define alarm message Bit 0~15 #81 ~ #96 PLC Alarm Message, save to history. Bit16~31 #331 ~ #346 PLC Warning Message, no save to history.	W
R46	MSG7	PLC Alarm Message #97 ~ #112	User define alarm message Bit 0~15 #97 ~ #112 PLC Alarm Message, save to history. Bit16~31 #347 ~ #362 PLC Warning Message, no save to history.	W
R47	MSG8	PLC Alarm Message #113 ~ #128	User define alarm message Bit 0~15 #113 ~ #128 PLC Alarm Message, save to history. Bit16~31 #363 ~ #378 PLC Warning Message, no save to history.	W
R48	MSG9	PLC Alarm Message #129 ~ #144	User define alarm message Bit 0~15 #129 ~ #144 PLC Alarm Message, save to history. Bit16~31 #379 ~ #394 PLC Warning Message, no save to history.	W
R49	MSG10	PLC Alarm Message #145 ~ #160	User define alarm message Bit 0~15 #145 ~ #160 PLC Alarm Message, save to history. Bit16~31 #395 ~ #410 PLC Warning Message, no save to history.	W

Item	Code	Name、range	Description	PLC R/W
R50~R80	APP	User define	User define	R/W
R81~R100	MLC PARAM	MLC System Parameter	System parameter No.3401 ~ No.3420 of MLC parameter , To program the same LADDER to use in different machine ,tool exchange….	R/W
R101	TLPOS	Turret tool number	Magazine position status	R/W
R102	TOOL	Spindle tool number	Spindle tool number status	R/W
R103~R511	APP	User define	User define	R/W
R520~R529		First Axis Group Control Registers	R520 Command Register R521 State Register R522 program No. (0~999999) R523 Feedrate Override (-200%~200%) R524 Rapid travl Override (-100~100) R525~529 Reveser Command Register maunal： R520.0 Cycle Start R520.1 Feedhold R520.2 Reset/Abort R520.3 MPG Simulation R520.4 Block Optional Skip State Register maunal： R521.0 System BUSY R521.1 FEEDHOLD	
R530~R539		Second Axis Group Control Registers	R530 Command Register R531 State Register R532 program No. (0~999999) R533 Feedrate Override (-200%~200%) R534 Rapid travl Override (-100~100) R535~539 Reveser Command Register maunal： R530.0 Cycle Start R530.1 Feedhold R530.2 Reset/Abort R530.3 MPG Simulation R530.4 Block Optional Skip State Register maunal： R531.0 System BUSY	

Item	Code	Name、range	Description	PLC R/W
			R531.1 FEEDHOLD	
R540~ R549		Third Axis Group Control Registers	R540 Command Register R541 State Register R542 program No. (0~999999) R543 Feedrate Override (-200%~200%) R544 Rapid travl Override (-100~100) R545~549 Reveser Command Register maunal： R540.0 Cycle Start R540.1 Feedhold R540.2 Reset/Abort R540.3 MPG Simulation R540.4 Block Optional Skip State Register maunal： R541.0 System BUSY R541.1 FEEDHOLD	
R550~ R559		Fourth Axis Group Control Registers	R550 Command Register R551 State Register R552 program No. (0~999999) R553 Feedrate Override (-200%~200%) R554 Rapid travl Override (-100~100) R555~559 Reveser Command Register maunal： R550.0 Cycle Start R550.1 Feedhold R550.2 Reset/Abort R550.3 MPG Simulation R550.4 Block Optional Skip State Register maunal： R551.0 System BUSY R551.1 FEEDHOLD	
R580		Spindle PLC Control Mode	Setting the spindle contril mode Bit0,5-31➔Reserved BIT 1 ➔1st spindle controlled by PLC BIT 2 ➔2nd spindle controlled by PLC BIT 3 ➔3th spindle controlled by PLC BIT 4 ➔4th spindle controlled by	

Item	Code	Name、range	Description	PLC R/W
			PLC	
R581		Spindle OFF	When spindle control mode is servo mode，this Register can switch the speed mode or position mode.When spindle switch to speed mode, the rotation directionis controlled by R583/R584. Bit 0,1,5-31➔Reserved Bit 2 ON ➔2nd spindle positon control mode Bit 2 OFF➔2nd spindle speed control mode Bit 3 ON ➔3th spindle positon control mode Bit 3 OFF➔3th spindle speed control mode Bit 4 ON ➔4th spindle positon control mode Bit 4 OFF➔4th spindle speed control mode Note: 1st spindle is controlled by C63	
R582		Spindle axis mode	Display the spindle controlled mode Bit 0,5-31➔Reserved Bit 1 ON ➔1st spindle positon control mode Bit 1 OFF➔1st spindle speed control mode Bit 2 ON ➔2nd spindle positon control mode Bit 2 OFF➔2nd spindle speed control mode Bit 3 ON ➔3th spindle positon control mode Bit 3 OFF➔3th spindle speed control mode Bit 4 ON ➔4th spindle positon control mode Bit 4 OFF➔4th spindle speed control mode	
R583		Rotating the spindle clockwise	Bit0,1,5-31➔Reserved BIT 2 ➔ Rotating the 2nd spindle clockwise BIT 3 ➔ Rotating the 3th spindle clockwise BIT 4 ➔ Rotating the 4th spindle clockwise Note: 1st spindle clockwise is	

Item	Code	Name、range	Description	PLC R/W
			controlled by C64	
R584		Rotating the spindle counterclockwise	Bit0,1,5-31➔Reserved BIT 2 ➔ Rotating the 2nd spindle counterclockwise BIT 3 ➔ Rotating the 3th spindle counterclockwise BIT 4 ➔ Rotating the 4th spindle counterclockwise Note: 1st spindle counterclockwise is controlled by C65	
R585		Spindle JOG Mode	Spindle Jog Mode Bit0,1,5-31➔Reserved BIT 2 ON ➔ 2nd spindle JOG mode BIT 3 ON➔ 3th spindle JOG mode BIT 4 ON➔ 4th spindle JOG mode Note: 1st spindle JOG mode is controlled by C60	
R586		Spindle Orientation Stop	This Register can execute Spindle to do Orientation. But the flag state need to be ON until Orientation finish. Bit0,1,5-31➔Reserved BIT 2 ON ➔ 2nd spindle Orientation BIT 3 ON➔ 3th spindle Orientation BIT 4 ON➔ 4th spindle Orientation Note: 1st spindle Orientation is controlled by C61	
R587		Spindle Orientation Stop Finish	Bit0,1,5-31➔Reserved BIT 1 ON ➔1st spindle Orientation finish BIT 2 ON ➔ 2nd spindle Orientation finish BIT 3 ON➔ 3th spindle Orientation finish BIT 4 ON➔ 4th spindle Orientation finish	
R588		Rigid Tapping Mode	BIT 1 ON ➔1st spindle rigid tapping mode BIT 2 ON ➔ 2nd spindle rigid tapping mode BIT 3 ON➔ 3th spindle rigid tapping mode BIT 4 ON➔4th spindle rigid	

Item	Code	Name、range	Description	PLC R/W
			tapping mode	
R589		Multiple Axis Group MST associated information	Bit 1 ➔ S29/S54/S69 is executed by M/S/T code in 1st axis group program($1) Bit2 ➔ S29/S54/S69 is executed by M/S/T code in 2nd axis group program($2) Bit 3 ➔ S29/S54/S69 is executed by M/S/T code in 3th axis group program($3) Bit4 ➔ S29/S54/S69 is executed by M/S/T code in 4th axis group program($4)	
R590~ R599	PLCHINT	PLC warning message PLC warning message，each BIT stand for one warning，there are 32 warning for one register. Totally there are 320 warning message can be defined. R590.0 empty warning message R590.1 for 1st warning message R590.2 for 2nd warning message R590.31 for 31ed warning message R591.0 for 32ed warning message	PLC warning message area，each bit represent one warning，there are 32 warning for one register. Totally there are 320 warning message can be used。 R590.0 empty warning message R590.1 for 1st warning message R590.2 for 2nd warning message .. R590.31 for 31ed warning message R591.0 for 32ed warning message .. R592.0 for 64ed warning message .. R593.0 for 96ed warning message .. warning message is defined from Character string list 23001，in another words 23001 mapping to the 1st contents of hint, 23002 mapping to the 2nd contents of hint，follow the rule。	
R600	MLOCK	Machine lock	Machine lock。 Bit 0 not used Bit 1 for 1st axis (X) lock Bit 2 for 2nd axis (Y) lock Bit 3 for 3rd axis (Z) lock Bit 4 for 4ed axis lock …	W
R601	AXMPGS	Axis MPG simulation	Under PLC axis program，when mapping to 1，the speed of that PLC axis when processing is according to MPG's rolling speed，roll faster ,the machine	

Item	Code	Name、range	Description	PLC R/W
			goes fast，MGP reverse，the machine reverse，MPG stops，the machine stops，it's great for testing and processing。 Bit 0 not used Bit 1 for 1st axis (X) MPG simulation Bit 2 for 2nd axis (Y) MPG simulation Bit 3 for 3rd axis (Z) MPG simulation Bit 4 for 4ed axis MPG simulation …	
R602		Spindle Y-Delta Request Mode	Bit1 ON➔1st spindle UVW is Delta connected Bit1 OFF➔1st spindle UVW is Y connected Bit2 ON➔2nd spindle UVW is Delta connected Bit2 OFF➔2nd spindle UVW is Y connected Bit3 ON➔3rd spindle UVW is Delta connected Bit3 OFF➔3rd spindle UVW is Y connected Bit4 ON➔4th spindle UVW is Delta connected Bit4 OFF➔4th spindle UVW is Y connected	
R604	TEACHIN	Teach In command	Teach the interface to enter command area Bit 0 fast placed end teach Bit 1 the straight line slice end teach Bit 2 the circle line slice teach，the first touch is the middle of circle input，the second touch is the end of the circle input。	
R606~ R608		Reserved		
R609		Axis Coupling Status	Bit1➔1st set axis is coupling Bit2➔2nd set axis is coupling Bit3➔3rd set axis is coupling Bit4➔4th set axis is coupling	
R610	SKIP	Skip Position Latched	G31 or G28.1 skip command touch the skip signal and record that position。 Bit 0 not used Bit 1 for first axis (X) skip occur Bit 2 for second axis (Y) skip	R

Item	Code	Name、range	Description	PLC R/W
			occur Bit 3 for third (Z) skip occur Bit 4 for 4th skip occur …	
R611	AXMO	Axis Movement Flag	Each axis movement status Bit 0 not used Bit 1 for 1st axis (X) is moving Bit 2 for 2nd axis (Y) is moving Bit 3 for 3rd axis (Z) is moving Bit 4 for 4ed axis is moving …	
R612		Machine Positive Direction Lock	Bit 0 not used Bit 1 for 1st axis (X) Bit 2 for 2nd axis (Y) Bit 3 for 3rd axis (Z) Bit 4 for 4th axis …..	
R613		Machine Negiaive Direction Lock	Bit 0 not used Bit 1 for 1st axis (X) Bit 2 for 2nd axis (Y) Bit 3 for 3rd axis (Z) Bit 4 for 4th axis …..	
R614		Axis Coupling Request	Bit 0,1 not used Bit2➔2nd set axis is coupling request Bit3➔3rd set axis is coupling request Bit4➔4th set axis is coupling request	
R615~ R618		Second M/S/T Execution Channel	Second M/S/T code R615 command and status R616 M code R617 S code R618 T code R615.0 MST code finish (PLC=>CNC) R615.1 DEN moving command finish (CNC=>PLC) R615.2 M code read (CNC=>PLC) R615.3 S code read (CNC=>PLC) R615.4 T code read (CNC=>PLC) … R615.8 M/S/T code is executed by 1st axis group($1) R615.9 M/S/T code is	

Item	Code	Name、range	Description	PLC R/W
			executed by 2nd axis group($2) R615.10 M/S/T code is executed by 3rd axis group($3) R615.11 M/S/T code is executed by 4th axis group($4)	
R619~ R622		Third M/S/T Execution Channel	R619 command and status R620 M code R621 S code R622 T code	
R623~ R626		Fourth M/S/T Execution Channel	R623 command and status R624 M code R625 S code R626 T code	
R629	AXMCO	Axis M code	This register provide PLC axis M code request signal，when that axis doing during M code, the mapping bit will turn ON, to tell PLC program the new M code request, the content of M code is put in mapping R681~R696 , after controller send this request , until M code finished the signal，R630，after response ,and continue next single stanza Bit 0 not used Bit 1 for 1st axis (X) M code request Bit 2 for 2nd axis (Y) M code request Bit 3 for 3rd axis (Z) M code request Bit 4 for 4ed axis M code request	R
R630	AXMFIN		M code finished the signal (reference R629) Bit 0 not used Bit 1 for 1st axis M code finished Bit 2 for 2nd axis M code finished Bit 3 for 3rd axis M code finished Bit 4 for 4ed axis M code finished	W
R631~ R640		Reserved for CNC	Reserved for system	
R641	MPGR1		Manual comparison constant, set the rate when MPG inch move。 Actual valid rate equal to MPG segment count(decide from R14 , R22 , R23) multiply by the rate of temporary,	W

Item	Code	Name、range	Description	PLC R/W
			This temporary 1000 is for the rate 1.0 1 for rate 0.001, but when 0 the rate is set to 1.0。	
R642	MPGR2		Same as above	W
R643	MPGR3		Same as above	W
R644	MPGR4		Same as above	W
R645	MPGR5		Same as above	W
R646	MPGR6		Same as above	W
R647	MPGR7		Same as above	W
R648	MPGR8		Same as above	W
R649	MPGR9		Same as above	W
R650	MPGR10		Same as above	W
R651	MPGR11		Same as above	W
R652	MPGR12		Same as above	W
R653	MPGR13		Same as above	W
R654	MPGR14		Same as above	W
R655	MPGR15		Same as above	W
R656	MPGR16		Same as above	W
R657~ R660		Reserved for CNC	Reserved for system	
R661	AX1OV		Set 1st axis do PLC program percentage range -200~200，the default 100	W
R662	AX2OV		Same as above	W
R663	AX3OV		Same as above	W
R664	AX4OV		Same as above	W
R665	AX5OV		Same as above	W
R666	AX6OV		Same as above	W
R667	AX7OV		Same as above	W
R668	AX8OV		Same as above	W
R669	AX9OV		Same as above	W
R670	AX10OV		Same as above	W
R671	AX11OV		Same as above	W
R672	AX12OV		Same as above	W
R673	AX13OV		Same as above	W
R674	AX14OV		Same as above	W
R675	AX15OV		Same as above	W
R676	AX16OV		Same as above	W
R677~ R680		Reserved for CNC	Reserved for system	
R681	AX1MC	1st axis M code	(reference R629)	R
R682	AX2MC	2nd axis M code	(reference R629)	R

Item	Code	Name、range	Description	PLC R/W
R683	AX2MC	3rd axis M code	(reference R629)	R
R684	AX2MC	4th axis M code	(reference R629)	R
R685	AX2MC	5th axis M code	(reference R629)	R
R686	AX2MC	6th axis M code	(reference R629)	R
R687	AX2MC	7th axis M code	(reference R629)	R
R688	AX2MC	8th axis M code	(reference R629)	R
R689	AX2MC	9th axis M code	(reference R629)	R
R690	AX2MC	10th axis M code	(reference R629)	R
R691	AX2MC	11th axis M code	(reference R629)	R
R692	AX2MC	12th axis M code	(reference R629)	R
R693	AX2MC	13th axis M code	(reference R629)	R
R694	AX2MC	14th axis M code	(reference R629)	R
R695	AX2MC	15th axis M code	(reference R629)	R
R696	AX2MC	16th axis M code	(reference R629)	R
R700		Actual compound feedrate	Unit:LIU/min	
R701~ R716	AX1VE~ AX16VE	Axis Velocity	Unit:BLU/min	
R721~ R736	PROG1~ PROG16	Program Coordinate	Axis program coordinate position，unit is the minimum input unit，LIU。 When control precision is micro meter and the number: 0.01 mm 0.01 deg, 0.0001 inch	R
R741~ R756	MACH1~ MACH16	Machine Coordinate	Axis machine coordinate position，unit is the minimum input unit，LIU。 When control precision is micro meter and the number: 0.02 mm 0.02 deg, 0.0001 inch	R
R761~ R764	SMACH	Spindle Machine Position	R761➔ 1st spindle R762➔2nd spindle As above	R
R771~ R774	SSPD	Spindle Speed	R771➔ 1st spindle R772➔2nd spindle As above	R
R781~ R784	SGEAR	Spindle Gear selection	Spindle Gear setting define： 1➔1st Gear 2➔2nd Gear 3➔3rd Gear 9➔4th Gear R782 for 2nd spindle	R

Item	Code	Name、range	Description	PLC R/W
			R783 for 3rd spindle As above Note:1st apindle is controlled by R24 setting	
R791~ R794	SPDSEL	Cutting Spindle Selection		
R801~ R830	MLC PARAM	MLC System Parameter		
R831~ R840		MLC System Parameter		
R851~ R860		Spindle Override		
R861~ R876		Break point machine position		
R871~ R874		Spindle Effective Speed Command		
R880~ R895		D/A value	D/A converter value, 8 channel per servo 6 board	
R896~ R899		A/D value	A/D converter value, 2 channel per servo 6 board	
R901~ R916		Axis temperature compensation amount	R901 for 1st axis(X) R902 for 2nd axis(Y) … R916 for 16th axis	
R920		EDM discharge enable.		
R921		EDM control mode		
R922		EDM normal ON time		
R923		EDM normal OFF time		
R924		EDM arc ON time		
R925		EDM arc OFF time		
R926		Reserved		
R927		Total Discharge Count		
R928		Normal Discharge Count		
R929		Abnormal Discharge Count		
~R940		Reserved for CNC		
R941~ R944		PLC Spindle Command	R580➔this function enable R941➔1st spindle	唯讀

Item	Code	Name、range	Description	PLC R/W
			R942➔2nd spindle R943➔3rd spindle R944➔4th spindle	
R951		Active interpolation mode		
R961~ R976		Home Dog Shift		R
R981~ R996		Axis Absolute Counter		
R1000		Part count	Part count。	R
R1010		Cutting time per cycle	Process time for one item，unit is second 。Not reserve when shutdown。	R
R1011		Accumulate cutting time	Process time for total，unit is second 。Reserve when shutdown，user can clear the data and turn to zero from man machine。	R
R1012		Power-on time	Power-on time，unit is second。Not reserve when shutdown。	R
R1013		Accumulate power-on time	Power-on time for total，unit is second 。Reserve when shutdown，user can clear the data and turn to zero from man machine。	R
R1014		Installation cutting time	Installation processing time for total，unit is hour。Reverse when shutdown，only can clear when the first installation。	R
R1015		Installation power-on time	Installation power-on time for total，unit is hour。Reverse when shutdown，only can clear when the first installation。	R
R1016		System date	YYYYMMDD YYYY:year;MM:month;DD:day	R
R1017		System time	HHMMSS HH:hour;MM:minute;SS:second	R
R1018		Cutting time per cycle	Last item process time，refresh when every item finished，unit is m。Not reverse when shutdown。	R
~R1023		Reserved for CNC	Reserved for system	
R1024~ R4095	APP	User define	User define	R/W

3.5 system ALARM code

program execute error check, COR

001	Array index can’t be floating point or empty
002	Variable is not initial when using
003	Error when dividing 0
004	Error in operation area
005	Could not find the program
006	Arc is not on the working plane
007	Radius of arc is too short
008	The end of arc is not on the arc
009	Mraco call too deep arrangement of ideas
010	Fixed mode mraco call too deep arrangement of ideas
011	Sub-program call too deep arrangement of ideas
012	Too many cancel command of module,G67
013	In G code string ,G65,G66 must be the last one
014	No program number
015	Too many M codes
016	Illegal variable access
017	Could not find the table
018	Could not find the line
019	No program leave point, M02/M03, or M99
020	Too many G codes
021	Too many IJK parameter
022	No define working plane coordinates
023	Meaning error
024	Arc radius error
025	Processing shape to much rough and uneven
026	System program error
027	Marco send the alarm
028	System program error
029	Change tool compensation in arc
031	Cancel radius compensation in arc
032	Start radius compensation in arc
033	Not suit ,A,R or,C command
034	Command and meaning get a conflict
035	Corner too small ,can not inster corner around or chamfer
036	Not suit ,A point of view command
037	Corner too small ,can not inster corner around or chamfer
038	Incorrect single block skip switch number
039	Can’t start tool radius compensation when using measure function
040	Single block displacement over software route limit
099	Mapping logic axle or spindle alarm

Axial alarm, MOT

001	Servo axle A,B encoder back signal error
002	Servo axle error, counter overflow
003	Servo axle encoder module error
004	Servo axle no index interrupted signal
005	Servo axle DDA command over normal rated value
008	Servo lost position command
009	Servo axle and servo driver alarm
017	Axial over positive software route limit
018	Axial over negative software route limit
019	Axial follow error overtake
020	Axial can’t change to control mode when moving
021	Axial need to find home again
022	Axial oriogin position does not exact
023	Axial follow error overtake serious
024	Axial double circuit position error overtake
025	Axial overtake positive hardware route limit
026	Axial overtake negative hardware route limit

Spindle alarm, SPD

001	Servo axle A,B encoder back signal error
002	Servo axle error , counter overflow
003	Servo axle encoder module error
004	Servo axle has no index interrupted signal
005	Servo axle DDA command overtake normal rated value
008	Servo lost position command
009	Servo axle servo driver alarm
017	Spindle locate position check error

Grammar check alarm, COM

001	Run into the symbol of file end in the note
002	String that has no string symbol end
003	Sentence structure error
004	No avail variable
005	Too complex in math
006	EXIT clause out of repeat circle
007	Rapaet circle too deep
008	No end symbol “ ; “ in clause
009	Wrong symbol ':= '
010	No right side')'
011	No right side']'
012	Key word is in FOR clause，can’t find 'FOR'
013	Key word is in FOR clause，can’t find 'DO'
014	Key word is in FOR clause，can’t find 'END_FOR'
015	Key word is in REPEAT clause，can’t find 'UNTIL'
016	Key word is in REPEAT clause，can’t find 'END_REPEAT'
017	Key word is in WHILE clause，can’t find 'DO'
018	Key word is in WHILE clause，can’t find 'END_WHILE'
019	Key word is in IF clause，can’t find 'THEN'
020	Key word is in IF clause，can’t find 'ELSE' or 'END_IF'
021	Key word is in IF clause，can’t find 'END_IF'
022	Key word is in CASE clause，can’t find 'OF'
023	Key word is in CASE clause，can’t find 'ELSE' or 'END_CASE'
024	Key word is in CASE clause，can’t find 'END_CASE'
025	Key word is in CASE clause，can’t find ':' or ','

Mechanical logic control alarm, MLC

001	R40.0	X axle over positive hardware route limit
002	R40.1	X axle over negative hardware route limit
003	R40.2	X axle not back to the origin
004	R40.3	X axle servo driver alarm
009	R40.8	Y axle over positive hardware route limit
010	R40.9	Y axle over negative hardware route limit
011	R40.10	Y axle not back to the origin
012	R40.11	Y axle servo driver alarm
017	R41.0	Z axle over positive hardware route limit
018	R41.1	Z axle over negative hardware route limit
019	R41.2	Z axle not back to the origin
020	R41.3	Z axle servo driver alarm
025	R41.8	A axle over positive hardware route limit
026	R41.9	A axle over negative hardware route limit
027	R41.10	A axle not back to the origin
028	R41.11	A axle servo driver alarm
033	R42.0	B axle over positive hardware route limit
034	R42.1	B axle over negative hardware route limit
035	R42.2	B axle not back to the origin
036	R42.3	B axle servo driver alarm
041	R42.8	C axle over positive hardware route limit
042	R42.9	C axle over negative hardware route limit
043	R42.10	C axle not back to the origin
044	R42.11	C axle servo driver alarm
049	R43.0	Spindle servo driver alarm
050	R43.1	Process liquid motor over load
051	R43.2	Oil pressure system alarm
052	R43.3	Air pressure not enough
053	R43.4	Lubricant not enough
054	R43.5	Process liquid not enough
055	R43.6	Gripper is not closed
056	R43.7	Tool system alarm

ALARM message and HELP manufacture method :

Show user default mechanical logic control alarm message (ALARM MESSAGE):

Time : when ladder or macro send the alarm ,can send the related message of this alarm at the same time , let operator to understand reason of alarm

How to :

correct \CNC\APP file appchi.str(Chinese version),appeng.str(English version) ,the form below：

indentify code = “1;MSG= alarm contents description”

among，indentify code = 20000 add alarm code。

example：want to show NO.65 contents of alarm is air pressue not enough，the form below：

20065 = "1;MSG= air pressure not enough"

alram NO.1 to NO.64(R40~R43) is system reserve，user can not definit in this area，or

conflict occur when update system software。Alarm NO.65 to NO.160(R44~R49) is user default area，user can definit own alarm message in this area。

How to show user default alarm message advanced (ALARM HELP) :

Time : when alarm message ,need to provide advanced explain ,can build ALARM HELP When ALARM occur, only point to that line alarm click “ENTER” ,controller will POP UP this ALARM HELP screen

how to :

1. correct \CNC\APP file helpchi.txt(Chinese version),helpeng.txt(English version) ,the form below：

[ALARM identify code] in that，indentify code equal to related alarm indentify code。

3. when controller start ”HELP” explain , will POP UP words which under this indentify code to screen

example：want to show NO.65 alarm air pressure not enough，the form below：

[ALARM 20065]

1. possible reason :

(I) air pressure does not come in

(II) air pressure valve running bad

2. how to solve :

(I) check the pressure of air pressure source is normal or not

(II) check relay 3 active normal or not...

3.6 how to write M,S,T code ladder

substantive explain :

M_code read : CNC do NC program and runs into M code ,controller S bit S29(M_code read) turns ON ,tell ladder start to do M_code ,after finishing doing M code ,ladder answer MST FIN(C38) signal ,CNC will do follow-up NC code

S_code read : CNC do NC program and runs into S code ,controller S bit S54(S_code read)turns ON ,tell ladder start to do S_code ,after finishing doing ,ladder need to answer MST FIN(C38) singal ,CNC will do follow-up NC code

T_code read : CNC do NC and runs into T code ,controller S bit S69(T_code read) tell ladder starts to do T_code ,after doing ,ladder need to answer MST FIN(C38) signal ,CNC will do follow-up NC code

M_code contents : CNC do NC program and runs into M code ,controller will put contents of M code into ladder Register interface R01 ,let ladder do related action

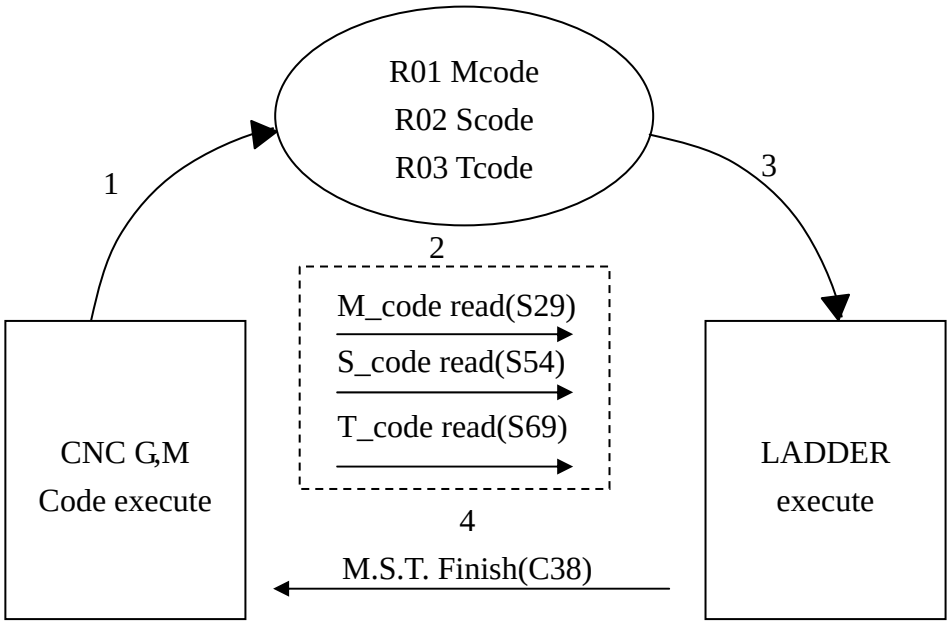
S_code contents : CNC do NC program and runs into S code ,controller will put the value that S code given ,into ladder Register interface R02 ,action of sending command to frequency converter , is done inside the CNC ,but it will do after ladder answer M,S,T FIN signal (C38)

T_code contents : CNC do NC program and runs into T code ,controller will put the contents of T code into ladder Register interface R03 ,do related action by ladder

LADDER write suggestion :

- use MSD graph concept to write MST code of related ladder
- define M_START ,S_START ,T_START opposite to A bits
- define M_execute ,S_execute ,T_execute opposite to A bits
- define M_FIN ,S_FIN ,T_FIN opposite to A bits
- When M,S,T code comes ,set M,S,T START A bits ON immediately
- second state enter M,S,T execute STATE A BITS ON ,and that time,START A bits OFF
- after doing related M,S,T code ,enter M,S,T FIN status A bits ON ,and that time ,EXECUTE A bits OFF
- C38=(M_FIN Abit && S_FIN Abit && T_FIN Abit) ,it means when three related A bits ON both ON ,and then C38 ON

M.S.T. code write logic:



Action description:

1. when process do to M.S.T. code,will put the contents of M.S.T. code into R01 , R02, R03 of register
2. CNC will send M.S.T. code of S29,S54,S69 to LADDER to run, after LADDER send the finish signal, and continue process
3. LADDER receive code read signal, and start to do ladder
4. after finish all the M.S.T., and send M.S.T. finish(c38) signal to CNC
5. after CNC receive C38,finish M.S.T.,continue doing process program

notes:

1. if user write M.S.T. code in the same line,and CNC will send S29,S54,S69 of FLAG to LADDER at the same time

4. servo system diagnosis and testing steps :

before power-on :

connect the wire ,before power-on ,must check controller & screen ,is set to 220V or not

1. check connect wire short or not
2. use tree used meter to measure three-phase electricity ,other AC ,DC short or not

after power-on :

1. E.STOP keep pushing , push down POWER ON ,controller ,screen ,I/O will up ,servo driver ,frequency converter, oil pressure ect. heavy electicity will not up
2. When POWER OFF push down ,system will power-off
3. I point check : E.STOP keep pushing ,POWER ON ,from the diagnosis screen ,check I point is normal or not , the item below :
   - interface I/O
   - knob switch
   - machine INPUT : OT+.OT-,HOME …..
4. check E.STOP : E.STOP loose , heavy electric ON ,when push down ,heavy electric OFF
5. check other OUTPUT point

4.1 controller diagnosis screen system data description :

0	Man machine interface execute ,number of times	16	X max allowed follow error value	32	X reasonable follow error value
1	Motion difference value ,number of times	17	Y max allowed follow error value	33	Y reasonable follow error value
2	PLC scan time	18	Z max allowed follow error value	34	Z reasonable follow error value
3	I/O scan time	19	C max allowed follow error value	35	C reasonable follow error value
4	Motion difference value time	20		36	
5	PLC scan time	21		37	
6	SRAM written times	22		38	
7	System memory remnant value	23	Percentage of motion difference value of real time base	39	
8	X axle follow error value	24	X axle absolute position encoder pulse feeback value	40	X axle absolute position command value
9	Y axle follow error value	25	Y axle absolute position encoder pulse feeback value	41	Y axle absolute position command value
10	Z axle follow error value	26	Z axle absolute position encoder pulse feeback value	42	Z axle absolute position command value
11	C axle follow error value	27	C axle absolute position encoder pulse feeback value	43	C axle absolute position command value
12	Spindle DA value	28	Spindle angle(opposite index signal)	44	Spindle speed command value
13		29	NO.1 MPG absolute	45	

			position counter		
14		30	NO.2 MPG absolute position counter	46	
15		31	NO.3 MPG absolute position counter	47	

0 :main loop times,show main program execute speed

1 :ISR times,if axle card address setup correctly, can see the number jump

2 :encoder index times,when motor rotate,can see this value increase,can check the connected wire is normal or not,if this number is normal,find HOME function will be normal

3 :the real time of insert value:as same as the ISR time of setup of parameter

8,9,10,11 :X,Y,Z,A axle error counter valus,stctic error value should be 0,dymanic error value is following error

12 :spindle DA value ,send the actual value to card EPM2 or card PMP2 ,this value should be (spindle command/spindle gained)*4095/10

16,17,18,21 :protection set value of each axle max following error,this value is the result of CNC software compute, should be the twice of theory value, so in the real running, if over this value, controller will send alarm message

24,25,26,27 :the position value of axle absolute position recorder ,record each axle real displacement value after power-on

28 :spindle absolute positon

29 :MPG absolute value

40..44 : order absolute coordinates value , accumulate the oder that CNC send to axle card ,this value will clear to 0 when the first time finding HOME .

48	X axle index position counter	64	X axle double loops absolute posotion encoder pulse feeback value
49	Y axle index position counter	65	Y axle double loops absolute posotion encoder pulse feeback value
50	Z axle index position counter	66	Z axle double loops absolute posotion encoder pulse feeback value
51	C axle index position counter	67	C axle double loops absolute posotion encoder pulse feeback value
52	Spindle index position counter	68	
53		69	
54		70	
55		71	
56	X axle limit shift value	72	X axle mechanical coordinate
57	Y axle limit shift value	73	Y axle mechanical coordinate
58	Z axle limit shift value	74	Z axle mechanical coordinate
59	C axle limit shift value	75	C axle mechanical coordinate
60		76	
61		77	
62		78	Total time of process (not include pause)
63		79	Software version number

48..51 each axle index counter : when index comes ,hardwrare copy value of absolute position recoder to index counter,this value can be lost pulse check ,in theory , accumulation of index counter ,should be equal to the distance of machine's movement when motor start rotate ,this value will clear to 0 when the first time finding HOME

56..60 each axle limit shift value : recorde the distance from limit switch to INDEX when finding HOME, ideal value is between motor 1/4 – 3/4 revolve ,or set the value in 1/2 revovle

79 software version number : controllers that SYNTEC build all have software version number ,when you write the problem list ,please recorder this number at the same time

80		96		112	
81		97		113	
82		98		114	
83		99		115	
84		100		116	
85		101		117	
86		102		118	
87		103		119	
88	X axle double circuit position error value	104	X axle double circuit optics ruler absolute position encoder pulse feeback value	120	X axle mechanical coordinate
89	Y axle double circuit position error value	105	Y axle double circuit optics ruler absolute position encoder pulse feeback value	121	Y axle mechanical coordinate
90	Z axle double circuit position error value	106	Z axle double circuit optics ruler absolute position encoder pulse feeback value	122	Z axle mechanical coordinate
91	C axle double circuit position error value	107	C axle double circuit optics ruler absolute position encoder pulse feeback value	123	C axle mechanical coordinate
92		108		124	
93		109		125	
94		110		126	
95		111		127	

Software 593 version to 656 version,can see this screen

Parameter 88..91 : for double circuit encoder and optical ruler error value (start at origin)

Parameter 104..107 : for optical ruler encoder pulse feeback absolute value

128	X axle double circuit optical ruler index position counter	144	
129	Y axle double circuit optical ruler index position counter	145	
130	Z axle double circuit optical ruler index position counter	146	
131	C axle double circuit optical ruler index position counter	147	
132		148	
133		149	
134		150	
135		151	
136	X axle origin shift correct value	152	
137	Y axle origin shift correct value	153	
138	Z axle origin shift correct value	154	
139	C axle origin shift correct value	155	
140		156	
141		157	
142		158	
143		159	

Software 594 version to 656 version ,can see this screen

Parameter 128..131 : show double circuit optical ruler index position counter

80	X axle double circuit position encoder pulse feeback error value	96	X axle absolute position encoder pulse feeback value	112	X axle double circuit absolute position encoder pulse feeback value
81	Y axle double circuit position encoder pulse feeback error value	97	Y axle absolute position encoder pulse feeback value	113	Y axle double circuit absolute position encoder pulse feeback value
82	Z axle double circuit position encoder pulse feeback error value	98	Z axle absolute position encoder pulse feeback value	114	Z axle double circuit absolute position encoder pulse feeback value
83	4th axle double circuit position encoder pulse feeback error value	99	4th axle absolute position encoder pulse feeback value	115	4th axle double circuit absolute position encoder pulse feeback value
84	5th axle double circuit position encoder pulse feeback error value	100	5th axle absolute position encoder pulse feeback value	116	5th axle double circuit absolute position encoder pulse feeback value
85	6th axle double circuit position encoder pulse feeback error value	101	6th axle absolute position encoder pulse feeback value	117	6th axle double circuit absolute position encoder pulse feeback value
86	7th axle double circuit position encoder pulse feeback error value	102	7th axle absolute position encoder pulse feeback value	118	7th axle double circuit absolute position encoder pulse feeback value

87	8th axle double circuit position encoder pulse feeback error value	103	8th axle absolute position encoder pulse feeback value	119	8th axle double circuit absolute position encoder pulse feeback value
88	9th axle double circuit position encoder pulse feeback error value	104	9th axle absolute position encoder pulse feeback value	120	9th axle double circuit absolute position encoder pulse feeback value
89	10th axle double circuit position encoder pulse feeback error value	105	10th axle absolute position encoder pulse feeback value	121	10th axle double circuit absolute position encoder pulse feeback value
90	11th axle double circuit position encoder pulse feeback error value	106	11th axle absolute position encoder pulse feeback value	122	11th axle double circuit absolute position encoder pulse feeback value
91	12th axle double circuit position encoder pulse feeback error value	107	12th axle absolute position encoder pulse feeback value	123	12th axle double circuit absolute position encoder pulse feeback value
92	13th axle double circuit position encoder pulse feeback error value	108	13th axle absolute position encoder pulse feeback value	124	13th axle double circuit absolute position encoder pulse feeback value
93	14th axle double circuit position encoder pulse feeback error value	109	14th axle absolute position encoder pulse feeback value	125	14th axle double circuit absolute position encoder pulse feeback value
94	15th axle double	110	15th axle absolute	126	15th axle double

	circuit position encoder pulse feeback error value		position encoder pulse feeback value		circuit absolute position encoder pulse feeback value
95	16th axle double circuit position encoder pulse feeback error value	111	16th axle absolute position encoder pulse feeback value	127	16th axle double circuit absolute position encoder pulse feeback value

Can see this screen after software 657 version

128	X axle mechanical coordinate	144	X axle double circuit index position counter
129	Y axle mechanical coordinate	145	Y axle double circuit index position counter
130	Z axle mechanical coordinate	146	Z axle double circuit index position counter
131	4th axle mechanical coordinate	147	4th axle double circuit index position counter
132	5th axle mechanical coordinate	148	5th axle double circuit index position counter
133	6th axle mechanical coordinate	149	6th axle double circuit index position counter
134	7th axle mechanical coordinate	150	7th axle double circuit index position counter
135	8th axle mechanical coordinate	151	8th axle double circuit index position counter
136	9th axle mechanical coordinate	152	9th axle double circuit index position counter
137	10th axle mechanical coordinate	153	10th axle double circuit index position counter
138	11th axle mechanical coordinate	154	11th axle double circuit index position counter
139	12th axle mechanical	155	12th axle double circuit

	coordinate		index position counter
140	13th axle mechanical coordinate	156	13th axle double circuit index position counter
141	14th axle mechanical coordinate	157	14th axle double circuit index position counter
142	15th axle mechanical coordinate	158	15th axle double circuit index position counter
143	16th axle mechanical coordinate	159	16th axle double circuit index position counter

Can see this screen after software 657 version

160	X axle follow error value	176	X axle absolute position encoder pulse feeback value	192	X axle absolute position command value
161	Y axle follow error value	177	Y axle absolute position encoder pulse feeback value	193	Y axle absolute position command value
162	Z axle follow error value	178	Z axle absolute position encoder pulse feeback value	194	Z axle absolute position command value
163	4th axle follow error value	179	4th axle absolute position encoder pulse feeback value	195	4th axle absolute position command value
164	5th axle follow error value	180	5th axle absolute position encoder pulse feeback value	196	5th axle absolute position command value
165	6th axle follow error value	181	6th axle absolute position encoder pulse feeback value	197	6th axle absolute position command value
166	7th axle follow error value	182	7th axle absolute position encoder pulse feeback value	198	7th axle absolute position command value
167	8th axle follow	183	8th axle absolute	199	8th axle absolute

	error value		position encoder pulse feeback value		position command value
168	9th axle follow error value	184	9th axle absolute position encoder pulse feeback value	200	9th axle absolute position command value
169	10th axle follow error value	185	10th axle absolute position encoder pulse feeback value	201	10th axle absolute position command value
170	11th axle follow error value	186	11th axle absolute position encoder pulse feeback value	202	11th axle absolute position command value
171	12th axle follow error value	187	12th axle absolute position encoder pulse feeback value	203	12th axle absolute position command value
172	13th axle follow error value	188	13th axle absolute position encoder pulse feeback value	204	13th axle absolute position command value
173	14th axle follow error value	189	14th axle absolute position encoder pulse feeback value	205	14th axle absolute position command value
174	15th axle follow error value	190	15th axle absolute position encoder pulse feeback value	206	15th axle absolute position command value
175	16th axle follow error value	191	16th axle absolute position encoder pulse feeback value	207	16th axle absolute position command value

Can see this screen after software 657 version

208	X reasonabel follow error value	224	X max allowed follow error value
209	Y reasonabel follow error value	225	Y max allowed follow error value
210	Z reasonabel follow error value	226	Z max allowed follow error value
211	4th reasonabel follow error value	227	4th max allowed follow error value
212	5th reasonabel follow error value	228	5th max allowed follow error value
213	6th reasonabel follow error value	229	6th max allowed follow error value
214	7th reasonabel follow error value	230	7th max allowed follow error value
215	8th reasonabel follow error value	231	8th max allowed follow error value
216	9th reasonabel follow error value	232	9th max allowed follow error value
217	10th reasonabel follow error value	233	10th max allowed follow error value
218	11th reasonabel follow error value	234	11th max allowed follow error value
219	12th reasonabel follow error value	235	12th max allowed follow error value
220	13th reasonabel follow error value	236	13th max allowed follow error value
221	14th reasonabel follow error value	237	14th max allowed follow error value
222	15th reasonabel follow error value	238	15th max allowed follow error value
223	16th reasonabel follow error value	239	16th max allowed follow error value

Can see this screen after software 657 version

240	1st axle follow error value	256	1st axle feedforward compesation following error value	272	1st axle servo circuit DA value
241	2nd axle follow error value	257	2nd axle feedforward compesation following error value	273	2nd axle servo circuit DA value
242	3rd axle follow error value	258	3rd axle feedforward compesation following error value	274	3rd axle servo circuit DA value
243	4th axle follow error value	259	4th axle feedforward compesation following error value	275	4th axle servo circuit DA value
244	5th axle follow error value	260	5th axle feedforward compesation following error value	276	5th axle servo circuit DA value
245	6th axle follow error value	261	6th axle feedforward compesation following error value	277	6th axle servo circuit DA value
246	7th axle follow error value	262	7th axle feedforward compesation following error value	278	7th axle servo circuit DA value
247	8th axle follow error value	263	8th axle feedforward compesation following error value	279	8th axle servo circuit DA value
248	9th axle follow error value	264	9th axle feedforward compesation following error	280	9th axle servo circuit DA value

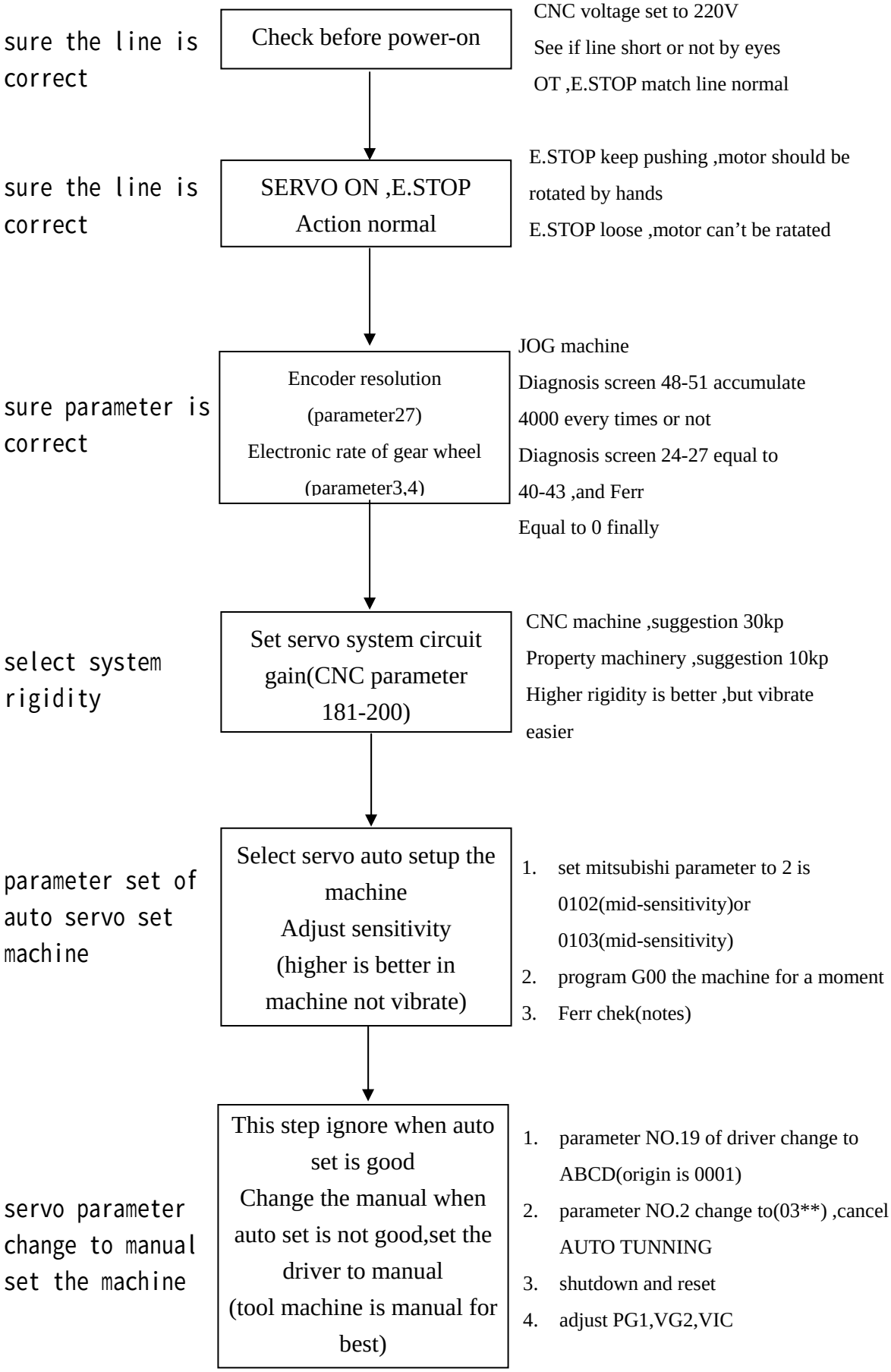
			value		
249	10th axle follow error value	265	10th axle feedforward compesation following error value	281	10th axle servo circuit DA value
250	11th axle follow error value	266	11th axle feedforward compesation following error value	282	11th axle servo circuit DA value
251	12th axle follow error value	267	12th axle feedforward compesation following error value	283	12th axle servo circuit DA value
252	13th axle follow error value	268	13th axle feedforward compesation following error value	284	13th axle servo circuit DA value
253	14th axle follow error value	269	14th axle feedforward compesation following error value	285	14th axle servo circuit DA value
254	15th axle follow error value	270	15th axle feedforward compesation following error value	286	15th axle servo circuit DA value
255	16th axle follow error value	271	16th axle feedforward compesation following error value	287	16th axle servo circuit DA value

Can see this screen after software 657 version

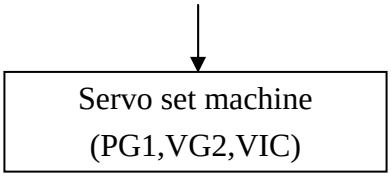
288	X axle limit shift value	304	X axle index position counter
289	Y axle limit shift value	305	Y axle index position counter
290	Z axle limit shift value	306	Z axle index position counter
291	4th axle limit shift value	307	4th axle index position counter
292	5th axle limit shift value	308	5th axle index position counter
293	6th axle limit shift value	309	6th axle index position counter
294	7th axle limit shift value	310	7th axle index position counter
295	8th axle limit shift value	311	8th axle index position counter
296	9th axle limit shift value	312	9th axle index position counter
297	10th axle limit shift value	313	10th axle index position counter
298	11th axle limit shift value	314	11th axle index position counter
299	12th axle limit shift value	315	12th axle index position counter
300	13th axle limit shift value	316	13th axle index position counter
301	14th axle limit shift value	317	14th axle index position counter
302	15th axle limit shift value	318	15th axle index position counter
303	16th axle limit shift value	319	16th axle index position counter

Can see this screen after software 657 version

4.2 position driver setup the machine steps(Mitsubishi J2 super)



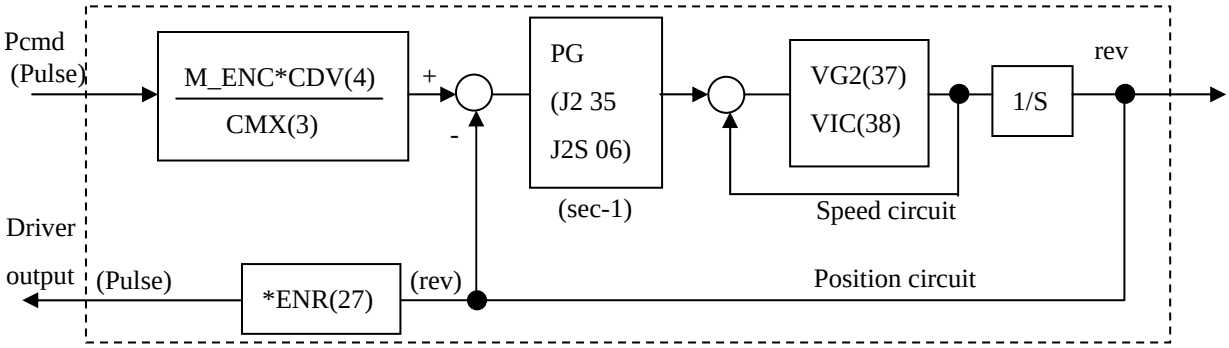
parameter of manual servo set machine



1. adjust PG1(parameter 06) let diagnosis screen Ferr parameter 8-11 equal to 32-35
2. set VG2(parameter 37)Ferr jump smaller is better
3. set VIC(parameter 38)=20ms
4. Ferr check

notes:CON JOG machine,diagnosis screen 8-11,equal to (32-35),real value equal to theory value,if loose the hands,Ferr should converge to 0 soon, use hand to touch the machine ,should feel the machine run smoothly

Mitsubish manual servo parameter setup(J2 ,J2 super):



Servo system block chart Driver chart

Manual set machine parameter description:

PG1:position circuit gain real setup value(J2 parameter 35,J2 super:parameter 06)

VG2:speed circuit gain real setup value (parameter 37)

VIC:speed integral circuit real setup value(parameter 38)

Manual parameter setup description:

Step 1、parameter change to manual servo parameter adjust:

1. driver parameter 19 change to ABCD(origin is 0001)
2. parameter 2 change to(J2:0202 ,super:0308),cancel AUTO TUNNING
3. shutdown and reset
4. adjust PG1,VG2,VIC

step 2、position circuit gain adjust(J2 adjust PG2(35),J2 super adjust PG1(06)):

1. first set the needed servo circuit gain Kp in CNC system,CNC parameter 181(CNC tool machine,encoder Kp set to 30,optical ruler set to 20)
2. adjust servo parameter PG1,let Ferr jump theory value equal to real value (CNC diagnosis screen parameter 8,9,10 equal to 32,33,34,35)

step 3、VG2 adjustion(speed circuit rigidity):

1. VG2 is the adjustion of speed circuit rigidity,VG2 bigger ,rigidity stronger,reach a value ,the machine will vibrate, decrease this value 10-20%
2. use 1m/min speed,Ferr jump small at 20μm(the smaller is better)
3. CNC tool machine in usual,direct connect situation VG2=PG1*(10~40)

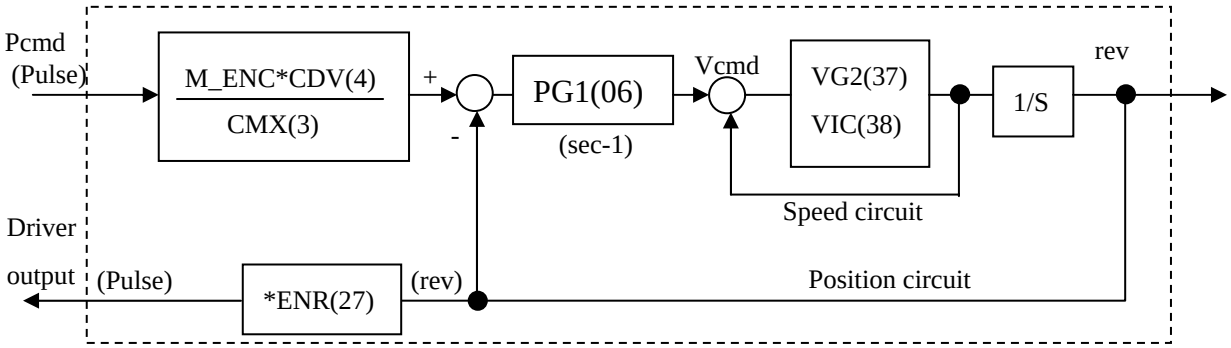
Step 4、VIC adjust(integral constant):

1. VIC speed circuit integral machine suggest set to 20ms ,the machine bigger the steady stay error is bigger ,servo response become lower

P.S.

1. J2 super NO.3 parameter CMX,setting value is J2 4 times(by 4)
2. parameter NO.4 CDV setting value is J2 1/2 times(divide 2)

servo resolution setup(J2 super):



Servo system block chart Driver chart

Servo parameter description:

M_ENC:motor max resolution when leave the factory
J2 FF series (400W):8192 ,J2 SF series (500W,1kW,2kW..):
J2 super SF series :131072(16384*8)

CMX:command pulse multiplying factor numerator(parameter 3)

CDV:command pulse multiplying factor denominatorr(parameter 4) ,pulse value per revolution

*ENR:driver send CNC encoder the output resolution(parameter 27)

motor real run cpacity=Pulse_CMD*M_ENC*CDV/CMX

pulse value of motor actual feeback value *ENR

CNC parameter description:

Parameter 61.. 80:each axle encoder pulse number in each revolution(servo parameter *ENR/4)

example:

1. set servo resolution first,set CNC parameter,suggestion resolution in machine is 1μ/Pluse
   EX:direct driving 5mm ball screw set to 5000P/revolution,then the parameter set below (J2 SF)
   CDV=5000 , CMX=16384 ,*ENR=5000
   CNC parameter 61..80=1250 ,CNC parameter 81..100=4.
2. servo driver can receive 500K Pulse order max,when set the resolution,notice can't bigger then max input frequency of driver:
   EX:12 m/min motion speed ,resolution 1μ/Pulse,then 200K Pulse/s,in this example, max resolution can rise to 0.5μ/Pulse
3. axle card max output Pulse,2048 Pulse/motion interrupt time(parameter 3203)
   EX:interrupt time 5ms, max output Pulse each seconds is 480K P/Sec

notes:

1. above parameter setup error,when move the machine,"lost position command","follow error too big"...ect.servo alarm message occur.

Servo system set the machine probable problem:

1. phenomenon:after connecting wire,E.STOP open,find the servo motor still soft,or JOG machine, but machine doesn't move
   possible problem:
   1. CW,CCW wire does not connect
   2. OT wire does not connect, driver parameter 41 does not set to 0110

2. phenomenon:JOG machine,machine start running,but just a moment,return to stop, controller occur follow error too big alarm(or lost position command)
   possible problem:
   1. CW,CCW and encoder pulse feeback direction opposite
   2. the setup is not the same in electronic rate of gear wheel and encoder pulse feeback
   3. Kp setup and driver PG2 setup are different

   Diagnosis method:
   1. INC_JOG*1000 run a step,diagnosis screen 40-43 of value increase 1000,if CW,CCW reverse,and screen 24-27 of value increase negative
   2. INC_JOG*1000 run a step,diagnosis screen 40-43 of value increase 1000,if screen 24-27 of value do not increase 1000,and when move a step more,error will accumulate, should be the wrong at rate of gear wheel and encoder setup
   3. INC_JOG*1000 run a step,diagnosis screen 40-43 of value increase 1000, and screen 24-27 of value also increase 1000 ,when CON_JOG ,Ferr diagnosis 8-11 is not equal to 32-34,should CNC circuit gain does not equal to driver PG2 setup

3. phenomenon:static status,motor has vibration voice
   possible problem:
   1. VG2 set too big, adjust the value can solve it

4. phenomenon:INC JOG*1000, motor has overshot situation, Ferr has positive and negative exchange situation can be seen by diagnosis screen 8-11
   possible problem:
   1. PG2 set too big ,adjust the value can solve it
   2. VG2 set too smanll

5. phenomenon:diagnosis screen 8-11 Ferr in INC JOG*1000 situation ,converge slowly
   possible poblem:
   1. VIC set too big,suggestion:20ms
   2. PG2,VG2 set too small

6. phenomenon:CON JOG diagnosis screen 8-11 Ferr value jump big(ideal jump should

be no more than +/-10)
possible problem:
1. rigidity of machine is bad
2. setup machine of servo is bad(VG2 too small)

optical ruler application point for attention :

1. connect wire :
   I. II. Optical ruler output A+,A-,B+,B-,Z+,Z- connect to axle card Pin1..6 ,optical ruler power need to import +5V,GND ,can share a power with RELAY2 +V ,GND in signal good application enviroment
2. parameter setup :
   paramrter 241..246 : optical ruler opposite to mechanical axle ,2nd axle card opposite axle 6..10
   parameter 261..266 : optical ruler resolution setup ,CNC unofficial 4 times frequency ,so only import optic real resolution (example : 1um oprical ruler , resolution set to 250 Pulse/mm)
   2nd axle card setup : two axle cards above ,please 2nd card address of DIP switch 1,3 OFF ,2,4 ON ,take off ISR Jumper ,parameter 13 the number of axle card set to 2 ,in priciple ,servo alxe mass to 1st axle card ,optical ruler,MPG ,spindle mass to 2nd board
   diagnosis screen message : parameter 104..107 optical ruler feeback real value
   diagnosis screen message : parameter 128,129,130 optical ruler index counter value
3. check the connected wire :
   I. connect the circuit of encoder first ,all of the wire,the parameter setup is the same as the encoder ,optial ruler set not to feeback ,after the machine can run normally,set optical ruler feeback axle number(parameter 241..244) ,CNC start optical ruler feeback increment JOG automatically ,when the machine running ,should see the absolute position recoder of diagnosis screen optical ruler 104..107 changed ,it shows the signal of optical ruler has came ,the change value direct raion to movement of machine
   II. wrong connecting wire : when the machine runs ,patameter 104..107 can't jump ,possible reason ,there is no power in optical ruler ,or signal A+,A-,B+,B- do not come in .
   III. optical ruler positive feeback : when increment JOG 10um ,parameter 104..107 will keep accumulating ,until CNC send the alarm(content:double circuit position error over) ,for the optical ruler positive feeback ,please switch A+,A-
   IV. optical ruler parameter setup error : when increment JOG ,it will not send alarm in short distance ,but move longer distance ,CNC will send the alarm(content: double circuit position error over) ,should setup wrong in CNC optical ruler resolution parameter 261..266 .
   V. optical ruler A,B is normal ,but can't find Home ,should INDEX of optical ruler not come ,can see the value of 128,129,130 in diagnosis screen ,when index comes in ,mechancal coordinate Latch or not ,if no,for index does not come in .

4. optical ruler application unusual deal :
   I. when machine runs ,only encoder circuit can not tremble, cirsuit tremble hard when add optical ruler ,possible problem is optical ruler installation rigidity not good
   II. first ,do not start pitch error compensation ,diagnosis screen parameter 104-107 is the same as mechanical coordinate ,for CNC servo locate function normal(servo set the machine O.K.)
   III. servo locate normal ,but when machine measure position by laser ,it seems to have backlash ,please measure contact position of machine and the haed of optical ruler by laser ,make sure laser measurement is the same position as optical ruler (104-107) if they are different and have backlash ,that shows rigidity not enough in connection area
   IV. do not start pitch error compensation ,measure by laser ,do many times,measurement reappear is bad ,it shows machine rigidity not good ,should deal machine rigidity not good first ,reappear is bad in machine ,can not get the result of pitch error compensation of high precision optical ruler .
   V. do not start pitch error compensation , measure by laser ,do many times,measurement reappear is good, but precision is bad ,it shows there is error in optical ruler,reach high precision needed only start pitch error compensation

4.3 following error(Ferr) parameter definition :

Ferr quality : because servo quality ,location of servo motor ,cannot react the command of controller immediately ,fall behind occur ,this value is related by two reasons :

- speed command(Vcmd) : higher speed ,fall behind more ,lower speed ,fall behind less
- circuit gain setup(Kp) : the gain more ,less fall behind
- public form : Ferr = Vcmd/Kp

noun explain :

servo circuit gain : rigidity set of servo system ,gain value more ,orbit track precision better ,process precision better(call on parameter 181-200 description)

Error counter : the error between the command that contoller send to axle card with actual valuethat encoder back to axle card ,when static this value for offset ,when in motion mode this value for Ferr ,this value shows in diagnosis screen parameter 8,9,10,11

reasonable Ferr : controller will show the mapping reasonable value of motion speed now in diagnosis screen NO. 32,33,34,35 parameter ,let the person consult to set the machine ,compare parameter 8,9,10,11 ,can check set of parameter unreasonable

Maxium Ferr : setting value of controller inside ,when Ferr reach to unreasonable value(Maxium Ferr) ,means there is a big problem in system ,controller will pause the movement now ,send ALARM message ,this ALARM will remove automatically when Ferr back to reasonable range ,no need to push “REAET “ key ,this value shows in diagnosis screen NO. 16,17,18,19 parameter

Steps of set the machine and diagnosis :

1. enter all the mechanical parameter in mechanical check table ,to parameter of controller
2. enter all thr servo parameter to controller in electronic control check table
3. go in to diagnosis screen ,let servo offset value adjust to 0(paameter 8,9,10,11)
4. move the machine by CON JOG ,compare diagnosis screen Ferr value(8,9,10,11) to reasonable Ferr value(32,33,34,35) ,if they are the same ,means setup of system is correct
5. if there is a big error between Ferr value and reasonable value ,change CON JOG speed ,see if the error is bigger or not ,if not ,it shows the error come from mechanical problem ,if blow up in the same rate ,it should set error of related parameter ,please check related parameter
6. mechanical related parameter : the rate of gear wheel(121-160) ,pitch of screw(161-180)
7. electronic control related parameter : encoder resolution(61-80) ,axle card frequency(81-100) ,motor gained(101-120)
8. servo parameter setup : servo system circuit gained(181-200)

note :

- this value has big effect of process precision ,set the servo machine must set to the actual value close to reasonable value

- set the two value very close in the axle that move together ,or the process circle may not be a circle
- Ferr check in motion ,it is important protect to machine ,when screen occur alarm message of following error too big ,please go to the diagnosis procedure above

Lattice value setup

phenomenon : continue Homing many times ,occur origin position err a revolution of motor sometimes(ex: 4mm)

reason : because the motion position of origin limit switch ,is close to the encoder INDEX position ,cause when find Home limit switch may before or after INDEX ,so ,position of Home will err a revolution of motor .

noun explain :

limit shift distance : the distance from find Home limit switch ,to find INDEX ,this value can read from diagnosis screen
56(X) ,57(Y) ,58(Z) ,59(A) ,60(spindle) ,this value shows the percentage ,normal is 20-80%

lattice value : parameter can set the Min limit shift distance is 50% of pitch ,when find HOME ,if CNC find limit shift distance is smaller than this set value ,will find next INDEX ,use next INDEX to be origin of this axle ,parameter 941(X),942(Y),943(Z),944(A) ,in convenient CNC application person ,only set if start lattice protection or not ,CNC will set lattice value protection value automatically

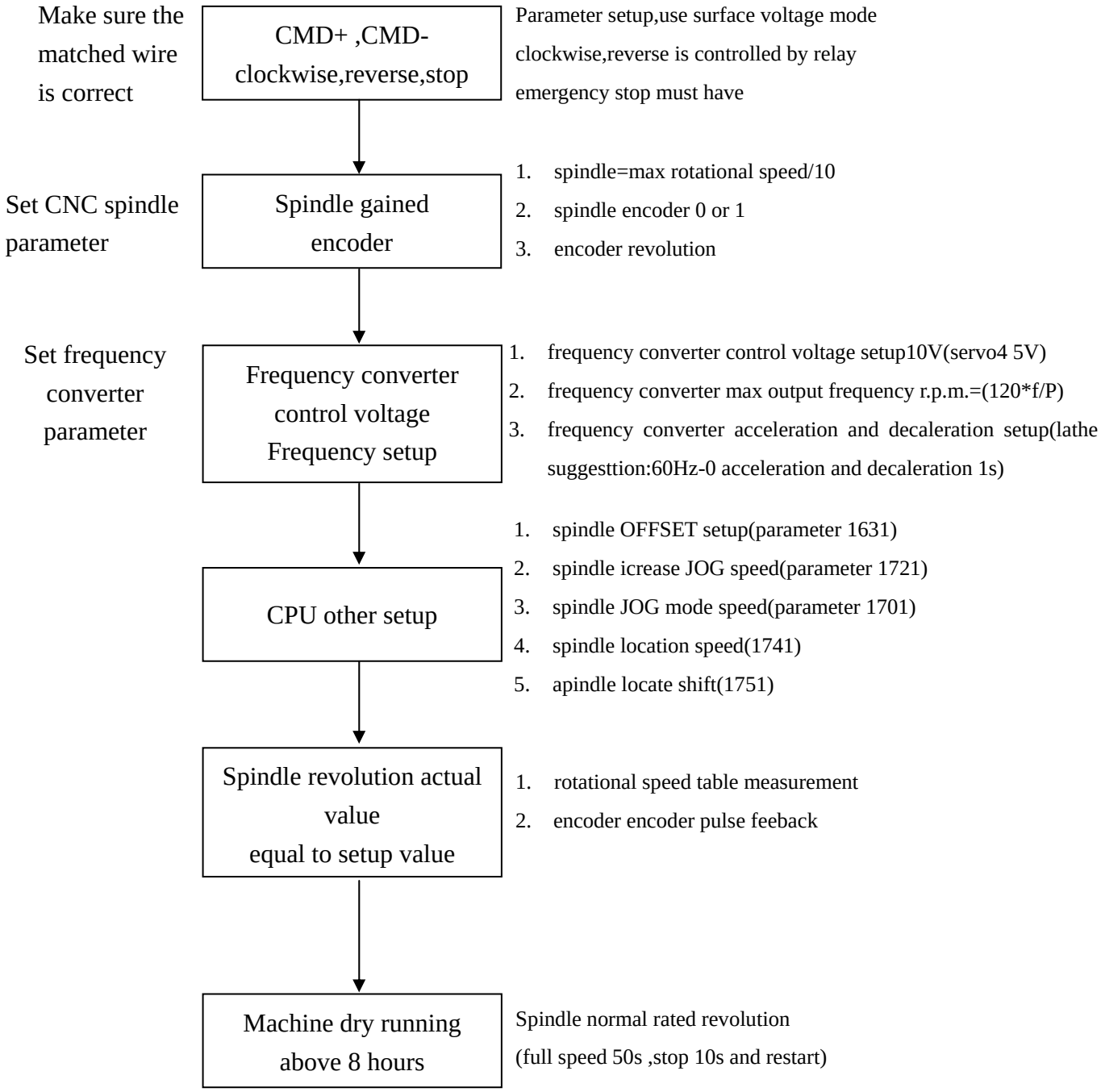
result way :

1. when test the machine ,set limit switch ,find Home
2. enter into diagnosis screen ,see parameter 56(X),57(Y),58(Z) ,59 if this value is too big or too small ,show distance of LIMIT and INDEX too close ,suggesttion : the position 20% to 80% of motor
3. the principles of set the lattice value protection : let origin INDEX axle has a safty distance to limit switch(1/5 revolution above) ,if the original limit shift value is 1/5-4/5 revolution of encoder ,do not start lattice value protection ,if shift value smaller than 1/5 or bigger than 4/5 revolution ,then start lattice value protection(contorller set 50% of ball screw automatically)
4. after set the parameter ,do Homing again ,see if limit shift value bigger than 1/2 revolution in every times ,if it did ,show that ignore INDEX near limit switch ,this lattice value protection become effective
5. if the quality of limit switch is too bad ,limit shift is too big when each time Homing ,can set the speed small in find HOME second step(parameter 841-860) , it will rise the reapper of finding limit shift value ,help the setup of lattice value protection

note : make sure if the problem of mechanism

- when coordinate move in screen ,machine should move right away ,but dial guage is not move ,usually there is a problem of mechanism transmissin when over 30um
- when friction of machine is too big ,also produce backlash value ,the error value of friction can be seen by error counter (command and encoder pulse feeback are different) ,there is a phenomenon when use INC jog or MPG to start the machine ,do not move several um ,when total to a value ,finish in once ,if it is bigger than 3um ,may it is not smoothly in machine fabricate ,occur the friction is too big ,please check the relationship

4.4 spindle set the machine steps：



Spindle machine diagnosis Q and A :

1. tool machine use frequency converter to be spindle control ,command is controlled by analogy voltage that axle card output ,so frequency converter need to set related variable ,ex: TelTa frequency converter ,Pr-00 set to d0000 ,Pr-01 set to d0002 ,open the machine after finishing setup , frequency converter display should show the revolution opposite this analogy voltage ,if not ,should the paramter setup error
2. spindle clockwise and reverse ,control by two relay on relay board ,one is clockwise ,one is reverse ex: TelTa set Pr-38 d0000 ,use FWD ,REV ,DCM contacts , frequency converter display should show the control status of clockwise and reverse ,if not ,should have error in connecting wire or parameter setup
3. emergency stop(switch contact output)go into frequency converter directly ex: 台達 frequency converter E.STOP connect to MI1 ,Pr-39 set to d0007 (NC-contact) , frequency converter display should show the status of opposite E.STOP , if not ,should have error in connecting wire or parameter setup
4. parameter setup ,set the frequency converter to the max frequency that system need ,public form : r.p.m= 120*f/P ex: 4P motor ,60Hz ,R.P.M.=1800r.p.m.,controller setup parameter 1671 ,spindle motor gained ,because reaction motor is controlled by slip ,actual speed is lower than command speed ,therefore , frequency converter can set to higher revolution
5. frequency converter only recieve +10V-0V one way voltage ,when check the wire ,depend on the spindle speed the screen showed ,use electric meter measure spindle input command value is correct or not ,opposite the value ,above frequency converter interface ,should map a frequency value ,if not ,should the error of connecting the wire
6. if there is an encoder in spindle ,can set parameter 1711 equal to 1 ,at this time ,screen of spindle speed shows the actual speed of spindle ,if frequency converter display output frequency is steady ,but screen of spindle speed jumped very big(10% above) ,should there is a problem during encoder installation ,or during connect the wire ,when there is an encoder in spindle ,should set NO. 1651 parameter encoder pulse number each revolution
7. when there is an encoder in spindle ,use S 1000 ,the screen should show 1000 revolution round ,if not ,please check related parameter ,because frequency converter use slip control ,so actual speed a little smaller than set speed ,therefore ,can let paramter 1671 spindle gained decrease 5% round ,the actual motor speed will more close to the command value
8. tool machine spindle acceleration and deceleration is important ,please set the time 2s (TelTa parameter)

spindle high or low gear related setup:

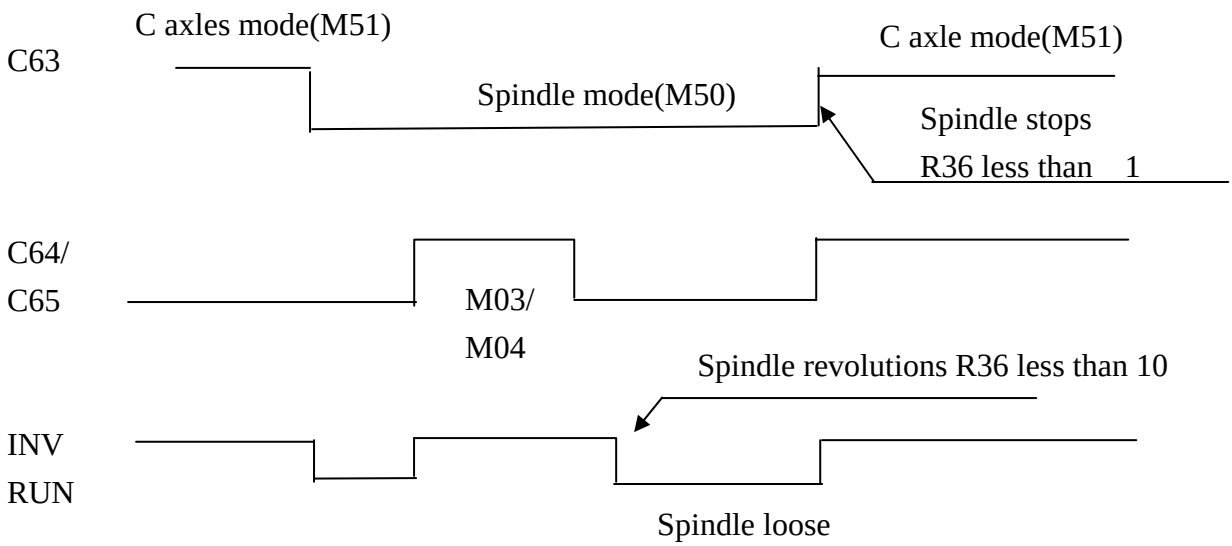
1. set CNC parameter 1681-1700 1st gear the rate of gear wheel ,parameter 1901-1920 2nd gear the rate of gear wheel,parameter 1921-1940 3rd gear the rate of gear wheel
2. set CNC parameter 1671-1780 spindle motor gained ,usually motor max revolution diveide the max output of axle card ,EX:motor max 4500r.p.m.then this setup value 450rpm/V
3. Ladder need to locate the spindle gear ,and send to Register R24 ,1st gear:1 ,2nd gear:2 ,3rd gear:3 ,R24 is set(equal to 0) ,it runs by 1st gear parameter
4. CNC will depend the setup at this time ,calculate the voltage send to frequency converter automatically(0-10V)(auto transform)

Spindle location Q and A:

1. spindle lacation shift value(parameter 1751) : when setup the spindle location , the distance of spindle head location point and index point ,setup steps : use hand to turn the spindle head to the location position ,record the value of diagnosis screen 28 parameter(spindle absolute position value) , record this value to parameter 1751 ,when actual change the tool(M19) ,see the diagnosis screen value of 28 ,close to that value or not ,if not ,it fixes offset the same value ,please adjust this value ,this value must be adjust when adjust spindle mechanism
2. spindle location speed : collocate with spindle location time ,in priciple ,spindle location speed set to 300 –500 r.pm.
3. spindle location time : the same as above ,in priciple, spindle location time set to 500ms
4. Mitsubishi frequency converter acceleration and deceleration time setup : 0.5s

Servo spindle spindle/C axle exchange:

1. SYNTEC CNC can use the servo motor to be spindle ,at this time ,the control of spindle can be exchanged by LADDER between C axle and spindle
2. parameter 1791 set to 1 or 2 spindle is P type or V type servo motor ,at this time ,CNC will auto change to servo spindle mode(allow spindle/C axle exchange)
3. parameter 26,mecanical axle that C axle map to ,setup way is the same as X,Y,Z axle ,ex:3rd axle then mechanical axle set to 3 ,4th axle set to 4
4. parameter 1621 set the mapping mechanical axle fixed to 6(because C axle logic decide to 6)
5. Ladder C63 OFF for the spindle mode ,turn or reverse is started by C64/C65 ,spindle revolutions are controlled by process program S code,ex:M03 S1000;when ladder do M03 ,C64 ON
6. Ladder C63 ON for off the spindle mode ,change spindle mode to C axle mode ,controller of spindle is controlled by C axle command in NC process program ex:G01 C100. F200.;
7. the time as below :



8. Ladder design notes :
   1. design two M code to be the mode exchange(ex: M51:C axle mode ,M50:spindle mode)
   2. when controller on ,decide to spindle mode inside(M50)
   3. E_STOP ,Reset , M02 ,M30 back to spindle mode(M50)
   4. when Ladder do M51 ,make sure spindle is in stop status(R36 less than 1) ,can change C63 to High only when stop
   5. when Ladder do M05 spindle stops ,when revolutions of spindle lower than 10 r.p.m. (R36) ,please let contact of INV RUN OFF ,can loose the spindle (INV RUN in spindle mode M03,M04 ,and is ON in C axle mode)

4.5 rigid tapping machine diagnosis steps

valid version

Version 7.10 or newer version
Version 7.11 or newer version, add parameter 418 to adjust acceleration circuit gained
Version 7.12 or newer version, add parameter 1641 to set polarity of encoder
Version 7.15 or newer version, add parameter 419 to set spindle of rigid tapping deceleration time

Connecting wire check

Check the derection of spindle：system data 28 is the angle of spindle, unit 0.001 degree。Please check when M03 spindle clockwise, system data 28 increase, M04 decrease, if not, please spindle position encoder A+,A- signal, or let parameter 1641 spindle encoder polarity set to 1(negative polarity)。

Set the machine steps

Related system data description
NO.13：spindle and Z axle along the Z direction following error max change range, unit BLU。
NO.14：spindle and Z axle along the Z direction following error, unit BLU。
NO.15：spindle and Z axle along rotate direction following error, unit degree。

Related parameter description
NO.417：rigid tapping speed circuit gain, use to adjust the intensity of Z axle follow spindle in the same speed step, Z axle fall behaind spindle more when this value less, this value bigger, Z axle fall behind less, but when this value too big ,exceed or swing will occur。
NO.418：rigid tapping acceleration circuit gain, use to adjust the intensity of Z axle follow spindle in the acceleration step, Z axle fall behaind spindle more when this value less, this value bigger, Z axle fall behind less, but when this value too big ,exceed or swing will occur。
NO.419：rigid tapping spindle 1000RPM deceleration time, adjust the over cutting when tapping。

Adjust steps
1.write a tapping program, as below example, no material, only tapping go and back。
2.adjust parameter 417 let the following error of go and back(system data 14/15)are the same in symbol and proportions。
3.adjust parameter 418 let the changed range in Z direction following error(system

data 13) is less than better。And make sure the changed range is less than 100BLU。

5. use as spindle 1000 rpm, adjust parameter 419, depth overcutting close to 0。

Program example

Tooth distance is 2mm ,use 1000 revolution to tapping three times
(G84 operation instruction consult program fabricate manual)

milling machine：G94 mode

```
(G94) M03 S1000;
G00 Z50.;
G84 X10. Y10. Z-100. R10. F2000. P1. K3;
M99;
```

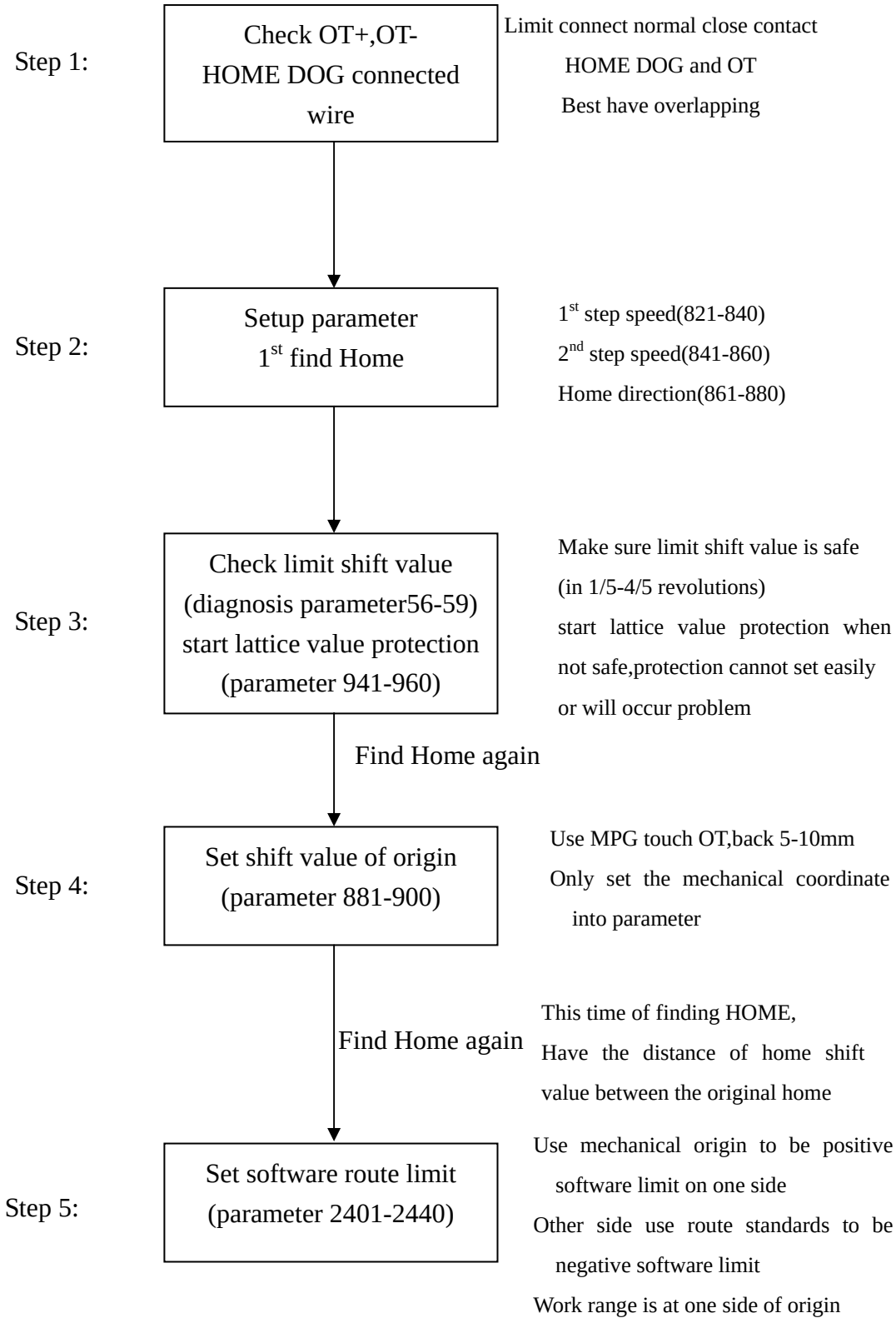
Milling machine：G95 mode

```
G95 M03 S1000;
G00 Z50.;
G84 X10. Y10. Z-100. R10. F2.0 P1. K3;
M99;
```

lathe：Z direction tapping

```
G00 Z10.;
G00 X0.;
M03 S1000;
G84 Z-20. R2. F2.0 P1. K3;
M99;
```

4.6 find Home related steps：



the most ideal result above-mentioned ,should be the same distance between positive negative software and hardware limit

Mitsubish A500 location card spindle location :

1. power distribution :
   *. Connect spindle encoder signal to frequency converter ,and connect output of frequency converter encoder to CNC
   *. Except spindle turn and reverse signal(STF/STR/SD)need to distribution
   *. And ditribute location control(RL&RM short /SD : ON) : start location function
   *. Finish locating : RUN/SE
2. M19 location :
   *. M19 On ,RL/RM/SD start
3. parameter adjust :
   *. Pr.180 set to 22
4. action :
   1. first let spindle OFF (M05 ,STF/STR OFF)
   2. after stop fully ,and send RL/RM/SD ON
5. spindle location shift value(parameter 1751) : when set spindle location ,the distance of location point of spindle head and index point ,setup steps : use hand to turn spindle head to location position ,record the value of diagnosis screen parameter 28 (spindle absolute position value) ,record this value to parameter 1751 ,when actual change the tool(M19) ,see the value of 28 in diagnosis screen ,is near that value or not ,if not ,that is fixed offset value ,please adjust this value ,this value must be adjusted when adjust spindle mechanism
6. spindle location speed : must be matched with spindle location time ,in principle ,spindle location speed set about 300 –500 r.pm.
7. spindle location time : the same as above ,in principle ,spindle location time is about 500ms
8. Mitsubishi frequency converter acceleration and deceleration time setup : 0.5s

4.7 presion compensation :

item :

- Backlash compensation
- Pitch error compensation

Noun explain :

Backlash compensation : between machine motor and ball screw ,through belt to transmission ,or a gear drive ,because of backlash it will occur the motor rotate but the machine does not rotate ,so need to do backlash compensation

Pitch error compensation : although we use ball screw ,but because of the manufacture ,in the situation that use low level screw ,the pitch is not accurate ,so need to do pitch error compensation

Backlash compensation operation steps :

1. turn off backlash compensation first(1221-1240)
2. shutdown and reset ,find Home
3. use mocrotable to measure the value of backlash : use increse JOG ,run in one way ,after touching micro meter indicator ,let the micro meter indicator return 0 ,and run reverse ,see the distance how many monitor coordinate goes ,and micro meter indicator starts to move ,this is the value of backlash
4. enter backlash value to parameter 1241-1260 ,at the same time ,start compensation function (parameter 1221-1240)
5. shutdown and reset ,find Home ,use micro meter indicator to measure compensation function is O.K. or not

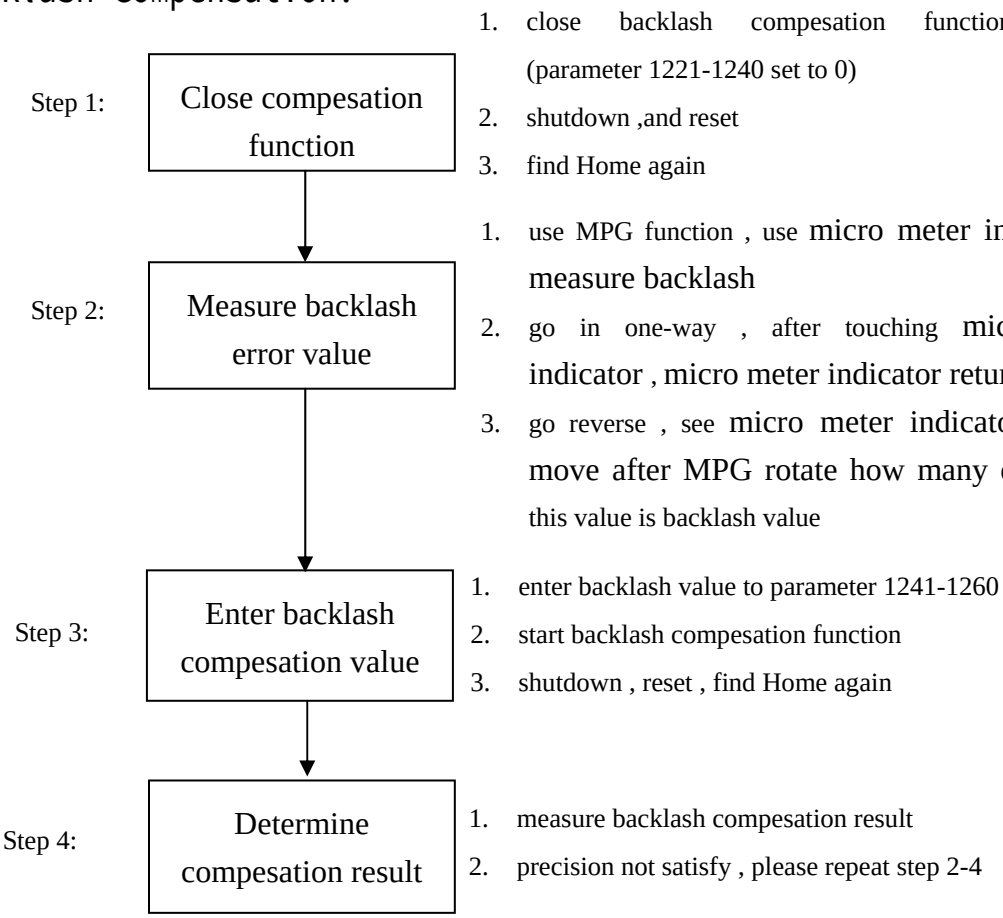
pitch error compensation operation steps :

1. turn off pitch error compensation function(parameter 1301-1320) ,shutdown then restart ,find Home again
2. setup compensation interval(parameter 1321-1340)
3. positon of origin in compensaton table(parameter 1341 –1360) ,suggesttion use the middle value(50)
4. use HOME to be compensation datum point ,use block gage or laser to measure the absolute value of each pitches opposite to origin actual error value
5. enter error value to parameter (8001-10000) pitch compesation table ,if mechanical coordinate is positive ,compensate 50,51⋯.,if mechanical coordinate is negative ,compensate 49,48,47⋯
6. after finishing setup ,start compensation function(1301-1320) ,reset ,find Home ,measure once see the compensation is active or not
7. when setup is one-way compesation (parameter 1301-1320) ,it can only enter positive compesation value ,two-way compesation usually use in laser measurement situation

note :

backlash compesation and pitch error compesation are active after reset and find Home

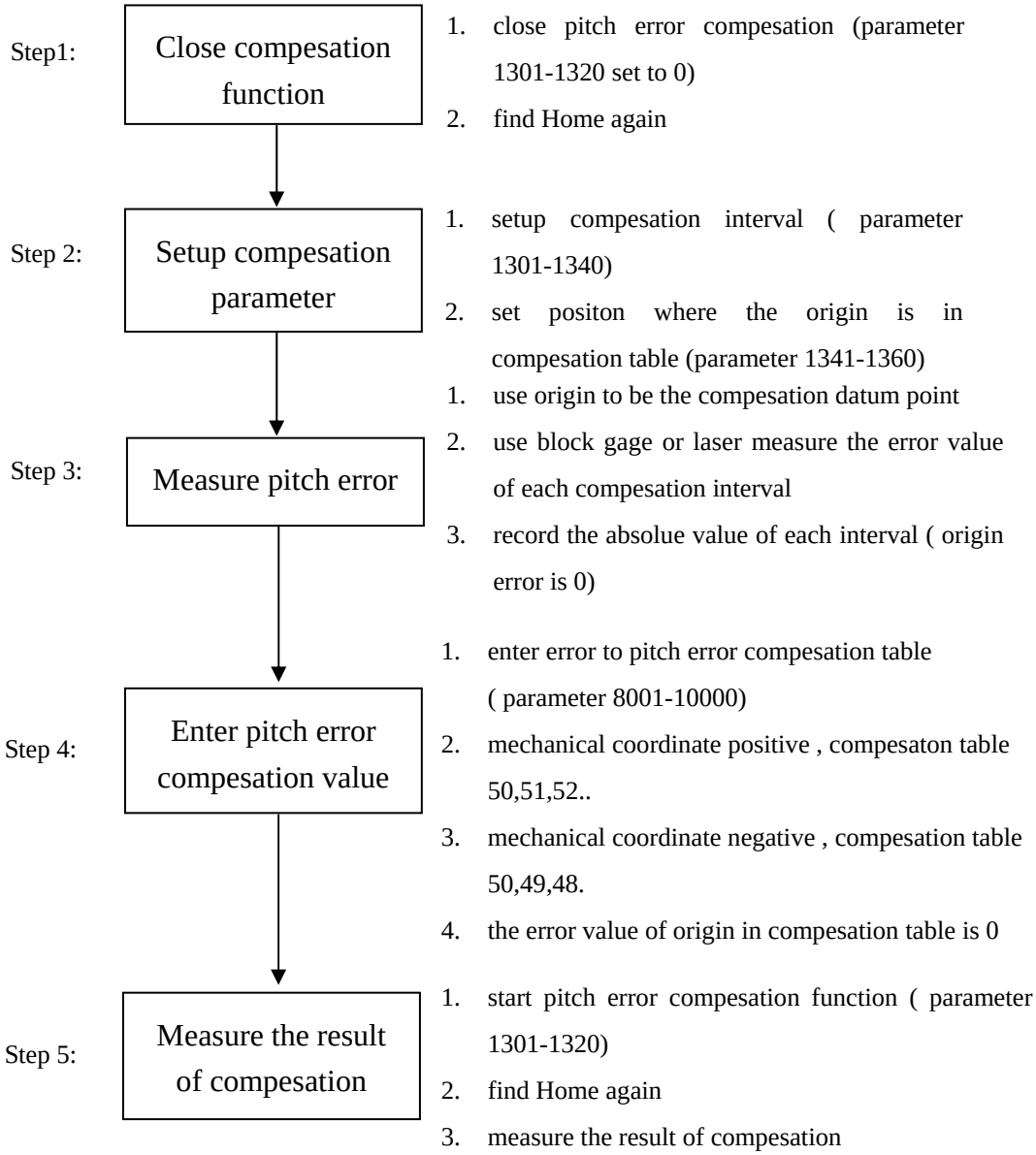
backlash compensation:



Backlash compesation point for attention:

1. backlash compesation function is active after finding Home
2. not use backlash compesation when using optical situation
3. not use backlash compesation when using two-way pitch error compesation siuation
4. the result of backlash compesation ,is the same as reappered of machine ,therefore ,the success of pitch error compesation is related with precision of machine fabricate and the correct setup of servo

pitch error compesation:



Pitch error compesation point for attention：

1. one-way pitch error compesation ,before starting pitch error compesation ,need to finish backlash compesation ,and make sure the backlash function can be active
2. not to do backlash compesation when using optical ruler situation
3. two-way compesation ususlly use in laser precision check ,we do not do backlash compesation when in two-way compesation situation ,close backlash compesation function (parameter 1221-1223 set to 0)
4. start two-way compesation ,if machine go through positive direction it will read poisitive direction table,machine go through negative direction it will read negative direction table to do the compesation
5. the result of pitch error compesation ,is the same as the reapper of machine , therefore ,the success of pitch error compesation is related with precision of machine fabricate and the correct setup of servo

5. SYNTEC CNC sysem diagnosis

5.1 CNC hardware diagnosis :

1. check by eyes : each cards in controller is fixed ,and lock the screw ,lock the screw in each contacts
2. check axle card : make sure CNC setup is correct ,after open the machine ,diagnosis screen parameter 0,1,2 will jump fast ,for axle card is correct setup
3. I/O card check : axle card setup is correct ,I/O card will run correctly ,if I/O card does not run correctly ,please check the setup of I/O card is correct or not
4. RELAY2 check :
   - See if the green light of power light is bright or not
   - See if three yellow lights of relay2 twinkle continuiusly or not ,for it is correct to connect to CNC
   - Each output of RELAY ,there is a red light for it ,when is bright ,REALY ON , standards of each relay 1A ,relay gets broken ,the red light is normal ON,OFF ,but relay can not ON ,OFF ,please check by electronic meter
5. HARDKEY check : I/O setup is correct ,but hardkey does not work ,most possible the power line of hardkey or the contact of cable loose
6. Keyboard check : keyboard always happen interference ,please check the connect line of keyboard have shielding or not ,and ground connection is good
7. knob switch : see the knob swicth encode is normal or not from diagnosis screen R bit

5.2 servo system problem diagnosis :

problem : the location precision of machine have deviation after using a period of time ,how to diagnose that is a electronic control problem or a problem of machine(EMP2 card or SERVO5) ?

noun definition :

1. mechanical coordinate : return to origin after finding Home ,when the machine moves ,mechanical coordinate must move afterward
2. absolute position recoder : axle total the encoder signal which encoder pulse feebackd to axle card ,when 1st time to find Home ,absolute position recoder will be clear to 0 ,after 2nd time to find Home it will not clear to 0 ,in normal ,this value is almost the same as mechanical coordinate ,this value record in diagnosis screen three system data 24(X),25(Y),26(Z),27(A),28(spindle) ,29(MPG)
3. command absolute coordinate value : total the command value which CNC send to axle card , this value will clear to 0 when 1st time to find Home ,does not clear after 2nd time to find Home ,in normal ,this value is almost the same as mechanical coordinate , this value record in diagnosis screen three system data 40(X),41(Y),42(Z),43(A)
4. error counter : the difference between display controller value and encoder pulse feebackd value ,clear to 0 when open the machine ,this value is almost the same as the command value which controller send to speed circuit ,therefore when E.STOP loose ,this value should be 0 ,if not ,may the servo zero point (OFFSET) not return to 0 , this value record in diagnosis screen three system data 8(X),9(Y),10(Z),11(A)
5. index position recoder(only servo5 has) : every time when encoder index ,hardware will latch the absolute position ,put into this recorder ,according absolute position recoder and index position recoder can determine loss pulse or not , this value record in diagnosis screen three system data 48(X),49(Y),50(Z),51(A)

SERV04 card diagnose way :

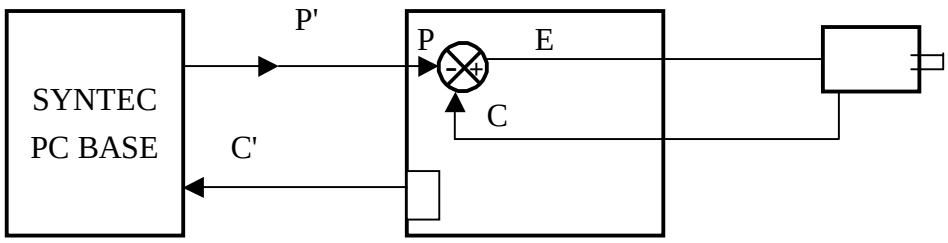
1. 1st step : after opening the machine ,find Home ,at this time ,mechanical coordinate ,absolute position recoder(C) ,command absolute position recoder(P) ,should be clear to 0 at the same time , P',C' of driver clear to 0 too
2. 2nd step : start to operate the machine normal ,or process in a long time ,when there is something wrong in position of machine ,do not shutdown ,please stop operating ,enter the followed check steps
3. 3rd step : determine the signal from motor encoder to driver is normal or not ,find Home once again ,see if C' of driver is 0 ,if not ,signal is interferenced form motor encoder to driver ,see if P' of driver is 0 ,if not ,it shows there is command be clear during the motion ,possible problem : SERVO ON be turned to OFF ,SERVO CLR ,SERVO RST ,E.STOP have action in signal
4. 4th step : make sure the signal from CNC to servo driver is not interferenced
   Find Home again ,C' of driver is 0 ,see the diagnosis screen of controller ,C value of system data parameter 24,25,26 is 0 or not ,if not ,for the signal of driver and encoder is interferenced when it goes back to controller ,P of driver is 0 ,diagnosis screen data 40,41,42 P should be 0 ,if not ,CNC command to driver is interferenced .
   How to go into the screen :

*. ESC back to the main screen

*. Click " ◥ " ,enter sub-screen ,F1 : parameter setup ,F2 : diagnosis function

*. Click F2 "diagnosis function " enter sub-screen ,F1: PLC ,F2:system data

*. Click F2 : "system data"enter diagnosis screen ,parameter 24,25,26 is absolute position recoder



P：command pulse wave　　Static E=0 , P should equal to C

C：execute pulse wave　　Move E=P-C , GAIN higher , E less

E:not execute pulse wave

Mitsubishi servo driver diagnose way when breakdown :

appearance : when diver open then jump to A16(encoder unusual),jump to A51 (overload 2) in a second

possible problem : encoder breakdown ,encoder is bad in connect wire(break or short)

how to checl : after opening the machine ,push emergency stop ,at this time ,servo will loose , use hand to roate the motor to 1/2 revolutions ,see diagnosis screen parameter 24(X axle),25(Y axle),26(Z axle) servo encoder pulse feebackd value ,if increase or decrease to 2000 or not , and return to the original position ,see diagnosis screen parameter ,if encoder pulse feebackd value has vibration or can not back near 0 ,motor encoder must be breakdown

how to solve :

1. check the line from motor to driver is short or break
2. change a motor

6.analogy servo system wiring description :

PMP2 card wiring :

Axle card(PMP2) one card two axles ,line is all from PMP2 card CN1

XY alxe card ,three lines out from CN1 ,one 8PINS to X axle driver(C06 6PIN,CO4 2PIN) ,one 8 PINS to Y axle ,one 2 PINS to +5V,GND power

ZA axle card ,four lines out from CN1 ,one 8PINS to Z axle ,one 2PINS to CMD+,CMD- to frequency conversion ,8 PINS to ENCODER back the spindle ,2 PINS to power +5V,GND

MPG axle card ,take two line out ,4 pins to MPG ,2 PINS to power +5V,GND

IRT servo driver wiring :

RST connect to power 220V

U,V,W connect to motor

CO6 is encoder signal contact ,six lines connect to PMP2 joint

CO4 need signal as below :

SPEED COMMAND+/SPEED COMMAND- (2,3) connect to PMP2 card

SERVO ON(14,15) connect to RELAY2 board O5

SERVO ALARM (9,10) connect to RELAY2 board (I11..I14)

6.1 SERVO 4 wiring description(A/B version) :

1. SERVO 4 standards :
   servo 4 control :
      pulse output(CW,CCW) : it can connect pulse type servo driver ,or stepper motor driver
      encoder encoder pulse feebackd(A,B,C) : when encoder pulse feeback ,will change A,B signal into quadruple frequency value and react on the absolute position recoder(absolute counter) ,this value and pulse output is independent ,the opposite relationship ,is deal with software
      index hardware latch : each time when index(C) comes ,will let the value of absolute position recoder ,latch on index counter
   spindle control : this card is on P4 joint ,there are two pin output spindle analogy signal
   MPG import : this card is on P3 joint ,there are three pins connet to MPG (+5V,A,B) ,it can read the value of MPG

2. each joint PIN definition
   P1 : 1:1A+ ,2:1A- ,3:1B+ ,4:1B- ,5:1C+ ,6:1C- ,7: ALM+(+24V) ,8:ALM-
        11:1CW+ ,12:1CW- ,13:1CCW+ ,14:1CCW-
   P2 : 1:2A+ ,2:2A- ,3:2B+ ,4:2B- ,5:2C+ ,6:2C- ,7: ALM+(+24V) ,8:ALM-
        11:2CW+ ,12:2CW- ,13:2CCW+ ,14:2CCW-
   P3 :1:3A+ ,2:3A- ,3:3B+ ,4:3B- ,5:3C+ ,6:3C- ,7 :ALM+(+24V) ,8:ALM-,
        9:MPG+5V ,10:MPGA ,15:MPGB11:3CW+ ,12:3CW- ,13:3CCW+ ,14:3CCW-
   P4 : 1:4A+ ,2:4A- ,3:4B+ ,4:4B- ,5:4C+ ,6:4C- , ,7: ALM+(+24V) ,8:ALM-
        10:CMD- ,15:CMD+ 11:4CW+ ,12:4CW- ,13:4CCW+ ,14:4CCW-

3. software setup :
   X:1st axle ,Y:2nd axle ,Z:3rd axle ,A:4th axle ,spindle:4th axle ,MPG :5th axle

6.2 SERVO 4 wiring description(C/D/E version) :

1. SERVO 4 standards :
   SERVO 4 control :
   pulse output(CW,CCW) : it can connect pulse type servo driver ,or stepper motor driver
   encoder pulse feeback(A,B,C) : when encoder pulse feeback ,will change A,B signal into quadruple frequency value and react on the absolute position recoder(absolute counter) ,this value and pulse output is independent ,the opposite relationship ,is deal with software
   index hardware latch : each time when index(C) comes ,will let the value of absolute position recoder ,latch on index counter
   spindle control : this card is on the P4 joint ,there are two pin output spindle analogy signal
   MPG import : this card is on P4 joint ,threre are three pins connect to MPG (+5V,A,B) ,can read the value of MPG

2. each joint PIN definition
   P1 : 1:1A+ ,2:1A- ,3:1B+ ,4:1B- ,5:1C+ ,6:1C- ,7: ALM+(+24V) ,8:ALM- ,9 SERVO_ON
   10:SERVO_CLR 11:1CW+ ,12:1CW- ,13:1CCW+ ,14:1CCW- 15: OUT_COM
   P2 : 1:2A+ ,2:2A- ,3:2B+ ,4:2B- ,5:2C+ ,6:2C- ,7: ALM+ (+24V)8:ALM-,9 SERVO_ON
   10:SERVO_CLR 11:2CW+ ,12:2CW- ,13:2CCW+ ,14:2CCW- 15:OUT_COM
   P3 : 1:3A+ ,2:3A- ,3:3B+ ,4:3B- ,5:3C+ ,6:3C- ,7: ALM+(+24V) ,8:ALM-,9 SERVO_ON
   10:SERVO_CLR 11:3CW+ ,12:3CW- ,13:3CCW+ ,14:3CCW-15:OUT_COM
   P4 : 1:4A+ ,2:4A- ,3:4B+ ,4:4B- ,5:4C+ ,6:4C- ,7:MPG5V ,8:MPG_A ,9:MPG_B
   10:DA_CMD- ,11:4CW+ ,12:4CW- ,13:4CCW+ ,14:4CCW- ,15:DA_CMD+

6.3 SERVO 5 wiring description :

1. SERVO 5 standards :
   SERVO 5 control :
      pulse output(CW,CCW) : can connect pulse type servo driver ,or stepper motor driver
      encoder pulse feeback(A,B,C) : when encoder pulse feeback , will change A,B signal into quadruple frequency value and react on the absolute position recoder(absolute counter) ,this value and pulse output is independent ,the opposite relationship ,is deal with software
      index hardware latch : each time when index(C) comes ,will let the value of absolute position recoder ,latch on index counter
      servo IO control : servo alarm ,SERVO reset ,SERVO_RST ,SERVO_ON
   spindle control : there 2 pin independent joint in this card ,output spindle analogy signal(0-10V)

2. each joint PIN definition
   P1 : 1:1A+ ,2:1A- ,3:1B+ ,4:1B- ,5:1C+ ,6:1C- ,7: ALM+(+24V) ,8:ALM- ,9 SERVO_ON
        10:SERVO_CLR 11:1CW+ ,12:1CW- ,13:1CCW+ ,14:1CCW- 15: OUT_COM
   P2 : 1:2A+ ,2:2A- ,3:2B+ ,4:2B- ,5:2C+ ,6:2C- ,7: ALM+ (+24V)8:ALM-,9 SERVO_ON
        10:SERVO_CLR 11:2CW+ ,12:2CW- ,13:2CCW+ ,14:2CCW-15:OUT_COM
   P3 : 1:3A+ ,2:3A- ,3:3B+ ,4:3B- ,5:3C+ ,6:3C- ,7: ALM+(+24V) ,8:ALM-,9 SERVO_ON
        10:SERVO_CLR 11:3CW+ ,12:3CW- ,13:3CCW+ ,14:3CCW-15:OUT_COM
   P4 : 1:4A+ ,2:4A- ,3:4B+ ,4:4B- ,5:4C+ ,6:4C- ,7: ALM+(+24V) ,8:ALM-,9 SERVO_ON
        10:SERVO_CLR 11:4CW+ ,12:4CW- ,13:4CCW+ ,14:4CCW-15:OUT_COM
   P5 : 1:5A+ ,2:5A- ,3:5B+ ,4:5B- ,5:5C+ ,6:5C- ,7: ALM+(+24V) ,8:ALM- ,9 SERVO_ON
        10:SERVO_CLR 11:5CW+ ,12:5CW- ,13:5CCW+ ,14:5CCW-15:OUT_COM
   P6 : spindle CMD+,CMD-(2 pins)

9. software setup :
   X:1st axle ,Y:2nd axle ,Z:3rd axle ,spindle:4th axle ,MPG :5th axle(in MPG situation may not use spindle ,it can add control to 4th axle ,5th axle)
10. wiring description :
   - in principle ,each axle one cable ,match all servo signal inside cable ,including encoder encoder pulse feebackd ,pulse output command ,ALARM ,SERVO CLR ,SERVO_RST ,SERVO_ON
   - other wire only connect the normal close contact of emergency stop switch in principle

- how to connect the wire at controller :

name	controller - driver	name	controller - driver
A+ :	Pin1 – CN1A.6	A- :	Pin2 – CN1A.16
B+ :	Pin3 – CN1A.7	B- :	Pin4 – CN1A .17
C+ :	Pin5 - CN1A5	C- :	Pin6 - CN1A .15
CW+ :	Pin11 – CN1A.3	CW- :	Pin12 - CN1A.13
CCW+ :	Pin13 - CN1A.2	CCW- :	Pin14 - CN1A.12
ALM+:	Pin7 - CN1B.13&3	ALM-:	Pin8 - CN1B.18

SERVO ON : pin9 - CN1B .5
SERVO_CLR : Pin10 - CN1A.8&CN1B.14
OUT_COM : Pin15 - CN1A.10

note :
ALARM signal use the inside power(+24V) of driver ,so let driver 13 pin and 3 pin of CN1B short ,
SERVO_CLR and SERVO_RST this two signal should short in driver side ,when push down emergency stop(CNC not ready) ,five axles board SERVO_CLR and OUT_COM ,short will be output ,this signal should do reset & clear to driver at the same time ,so CN1A 8 pin and CN1B 14 pin of driver should short

- emergency stop : surface wire(normal close contact)

depend on CE ,when there is emergent thing occur ,operator push emergency stop button ,must cut off the heavy electricity on surface line ,even though SERVO 5 in CNC not ready status ,it will cut off SERVO ON ,servo will stop ,but still prevent some accident ,servo under control ,emergency stop button can force SERVO_OFF ,EMG contact of driver connect to the normal close contact of interface E.STOP ,EMG(CN1B.15) can connect to CN1B.20 or CN1B.10

- how to connect MPG :

five axles card is all five axles controller board ,encoder interface is differential input interface ,therefore it may use MPG single ended situation ,need connect A+,B+ to +5V ,how to as below :

name	contorller - MPG	name	controller - MPG
A+ :	Pin1 – +5V	A- :	Pin2 – A
B+ :	Pin3 – +5V	B- :	Pin4 – B

- standard cable :

one 15 Pin D type ,aonther are two 3M joint ,there are 15cm between two joint , emergency stop line left 100cm (blue line ,0.75mm**2) ,length : 1.5 m

6.4 mechanaical check table :

machinery plant : company : checker : date :

item	X axle	Y axle	Z axle
Gear number at the ball screw side			
Gear number at the motor side			
Pitch mm			
Suitable position of machince limit switch			
Suitable tight of Synchronous Belts			
Ball screw map to bearing feeback need to smaller than 10um			
HUNT POWER DRIVES PANAMECH fixes actually between ball screw and motor			
Spindle head	1. parallel degree with Z axle less then 10um 2.		
Oil pressure	1. joint fix actually 2.		
Check the connection of servo motor UVW			

Sign by manager :

note : after finishing this table ,please copy three copies ,one follow the machine ,one preserve by company ,one preserve by checker

6.5 Mitsubishi servo driver wiring description :

1. driver standards :
   position control mode : it can connect pulse type command(CW,CCW) ,parameter set the control mode is position control mode ,parameter number
   encoder encoder pulse feebackd(A,B,C)output : motor encoder pulse feeback to driver CN2 ,let A,B ,C signal output from driver(CN1) to controller axle card at the same time ,encoder resolution can be set by parameter , parameter NO. : setup value : 1000P/rev
   OT+,OT- : one way stop control ,can use hardware to cut driver ,in principle not connect when connect the wire ,but parameter 41 set to 0110
   E.STOP : hardware cut driver directly ,not CE way to connect ,E.STOP connect directly to driver E.STOP contact(CN1) when mtach the wire,CE connecton ,E.STOP contact connect to electromagnetc switch when connect the wire ,skip driver U,V,W heavy electricity
   Servo On : after CNC ready ,then enable driver to run ,when controller happen serius alarm ,need let Servo on disable
   Servo Alarm signal : Open/Short ,

2. each joint PIN definition
   CN1 : 3:CW+,21:CW- ,4:CCW+ ,22:CCW- ,6:A+ ,16:A- ,7:B+ ,17B- ,5:C+ ,15C-
   This joint is connect with controller four axles card(one alxe one cable)
   CN2 : connect motor encoder and output
   CN3 : RS232 parameter input
   CN4 : I/O signal output ,CNC need to use SERVO ON,E.STOP ,SERVO ALARM ,OT+,OT-
   OUTPUT : SERVO ON:pin5 ,EMPG:15 ,OT+:16 ,OT-:17
   OUTPUT the same point : SG:10,20
   INPUT : SERVO alarm: 18 ,INPUT the same point : 13

3. how to connect heavy electricity
   L1,L2,L3 : driver back pole crystal heavy electricity
   L11,L21 : driver front pole control the power of circuit
   Not CE connect way : L1,L11 parallel connection ,L2,L21 parallel connection , connect to R,S,T heavy electricity ,E.STOP contact connect to driver CN1 pin15,pin10
   CE connect way : R,S,T power connect to electromagnetic switch ,L11,L21 connect to electromagnetic switch input side ,L1,L2,L3 connect to electromagnetic switch output ,E.STOP connect to electromagnetic switch control contact ,when E.STOP run ,only cut the heavy electricity ,do not cut the controller electricity

Setup machine steps :

1. use AUTO turnning that provide by Mitsubishi to find the fit value ,first set servo echo to the low echo(parameter 02 set to 0102 or 0101) ,after machine run a period time by using 500r.p.m. ,driver will find a mechanical parmeter reasonable value automatically
2. after AUTO turning ,please check actual Ferr(diagnosis screen parameter 8,9,10,11) if close to reasonable Ferr(diagnosis screen paramter 32,33,34,35) or not ,if it is close ,all are O.K. ,if not ,please adjust echo(pamater 02 increase or decrease)
3. confirm after setting machine :
   - increment JOG(INC JOG) *1000 ,see if Ferr converge to 0 right away ,and no overshoot (diagnosis parameter 8,9,10 error counter symbol doesnot change positive and negative)
   - continue manual(CON JOG) ,by speed 1m/min ,see if Ferr vibration small ,and close to reasonable value

note :

if increment JOG converge soon ,but cannot reach 0 ,please increase PG2(NO.35)

6.6 PANA servo driver wiring description :

1.driver terminal description : need to match CL(30) ,A_CLR(31) ,ALM(37) ,COM+(7) connect 24V,COM-(41) connect GND ,SERVO ON(29)

2. driver wiring description :

position command : CNC CW+(11),CW-(12) ,CCW+(13),CCW-(14) connect to driver PULS1(3) ,PULS2(4) ,SIGN1(5),SIGN2(6)

encoder encoder pulse feebackd : CNC A+(1),A-(2),B+(3),B-(4),C+(5),C-(6) connect to driver A+(21),A-(22),B+(48),B-(49),Z+(23),Z-(24) ,

Servo On : CNC SERVO_ON(9) ,connect to driver SERVO_ON(29) (above 1KW ,SERVO ON please control by outside RELAY)

SERVO CLR : CNC SERVO_CLR(10) ,connect to driver CL(30),A_CLR(31)

Servo Alarm signal : CNC ALM-(8) connect to driver ALM(37) ,CNC ALM+(7) connectto driver COM+(7)

Surface power(+24,GND) : +24V connect to driver COM+(7) ,GND connect to driver COM-(41)

3. SERVO driver property : above 1KW ,need back pole heavy electricity fully connect to power ,then can start SERVO ON therefore Ladder espacilly need to control this difference of time(about 0.5s) ,therefore ,SERVO ON please control by surface RELAY ,after connecting to heavy electricity a period of time ,SERVO_ON RELAY closed ,or ,back pole electricity L1,L2,L3 please ON always ,SERVO ALARM CLR (Pin30,31 short) ,

4. how to connect the heavy electricity

L1,L2,L3 : driver back pole crystal heavy electricity

L11,L21 : driver front pole control power of circuit

Not CE connection : L1,L11 parallel connection ,L2,L21 parallel connection , connect to R,S,T three-phase current ,electron box handle switch ON ,back pole heavy electricity ON right away .

6.7 electric control check table :

machinery plant : company : checker date

item	X axle	Y axle	Z axle	A axle	check
Origin lattice value (%)	Diagnosis screen 56:	Diagnosis screen 57:	Diagnosis screen 58:	Diagnosis screen 59:	
Software travel limit setup (2401-2440)	2401: 2402:	2403: 2402:	2405: 2406:	2407: 2408:	
Servo Ferr check	Diagnosis screen 8:	Diagnosis screen 9:	Diagnosis screen 10:	Diagnosis screen 11:	
Rate of servo motor loaded					
Spindle motor check	Spindle loaded : clockwise and reverse of spindle: Spindle speed: acceleration and deceleration time of spindle:				
Alarm check (wiring&ladder)	Spindle alarm : OT check :				
Check the line	1.the signal of line match to wiring PIC 2. tight the PCB & joint 3.tight the screw of terminal				
Continue running 8 hours	* G01 1m/min diagnosis screen 8,9,10,11 following error is same * when stop ,diagnosis screen 8,9,10,11 following error is 0 or +1 or -1 *. spindle 100% 10s ,stop 5s ,continue running				
Electric leakage check	system,water machine ,spindle, R S T mapping to F.G. cannot be less than 20KΩ transformer….R S T mapping to F.G. cannot be less 20KΩ				
Repair documents	1: wiring PIC 3. print the parameter file 2: I,O,A definition 4. make PLC Ladder file				

Sign by manager :

note : after finishing this table ,please copy three copies ,one follow the machine ,one preserve by company ,one preserve by checker

6.9 spindle(frequency conversion motor) C axle(servo motor) how to use when coexist :

1. in wiring ,spindle DA matches to frequency conversion ,parameter 1621 to setup 4th axle(same as C axle)
2. spindle encoder parameter 1711 set to 1 ,spindle resolution 1651 setup and the resolution of C axle motor encoder
3. setup in spindle parameter is the same as normal frequency conversion lathe
4. C axle parameter set 4th axle(26)
5. C axle wiring way ,SERVO ON is controlled by one single relay ,this RELAY synchronism wih C bit C34 ,servo alarm read by single I point
   (SERVO 4 does not provide C axle servo alarm signal check and exit)
6. LADDER cooperate : before M03,M04 relay ON ,need to check control RELAY of C axle is SERVO OFF ,(AND C34 ON status)
7. before the C axle command ,M51 first ,make sure that spindle stop first(see if the encoder value of spindle is close to stop ex: 0.1s motion less than 1 degree) , then C axle servo ON ,LADDER is designed by M.S.D .
8. after C axle command ,execute M50 ,C axle SERVO OFF ,let C 34 ON(C axle go to ,manual control)
9. M00,M01,M02,M30 ,RESET ,E.STOP need to let C axle SERVO OFF (in not process status ,C axle need SERVO OFF ,control by single relay)

note :

*. The rate of gear wheel between servo motor and spindle 1: 1 ,or there will be problem in thread cutting.

appendix

RS232C setup and how to use

Suit version

Build 683 and newer version

Hardware wiring

CNC controller(public) ⇔ rack side(mother)

9 pin ⇔ 9 pin

GND-GND	pin5(CNC side)	-	pin5(rack side)
TRA-REC	pin3(CNC side)	-	pin2(rack side)
RTS-CTS	pin7(CNC side)	-	pin8(rack side)
REC-TRA	pin2(CNC side)	-	pin3(rack side)
CTS-RTS	pin8(CNC side)	-	pin7(rack side)

9 pin ⇔ 25 pin

GND-GND	pin5(CNC side)	-	pin7(rack side)
TRA-REC	pin3(CNC side)	-	pin2(rack side)
RTS-CTS	pin7(CNC side)	-	pin4(rack side)
REC-TRA	pin2(CNC side)	-	pin3(rack side)
CTS-RTS	pin8(CNC side)	-	pin5(rack side)

rack side(public) ⇔ PC(mother)

9 pin ⇔ 9 pin

2,3,5,7,8 pin connect one to one

25 pin ⇔ 9 pin

GND-GND	pin7(rack side)	-	pin5(PC side)
TRA-REC	pin3(rack side)	-	pin3(PC side)
RTS-CTS	pin5(rack side)	-	pin7(PC side)
REC-TRA	pin2(rack side)	-	pin2(PC side)
CTS-RTS	pin4(rack side)	-	pin8(PC side)

Parameter setup

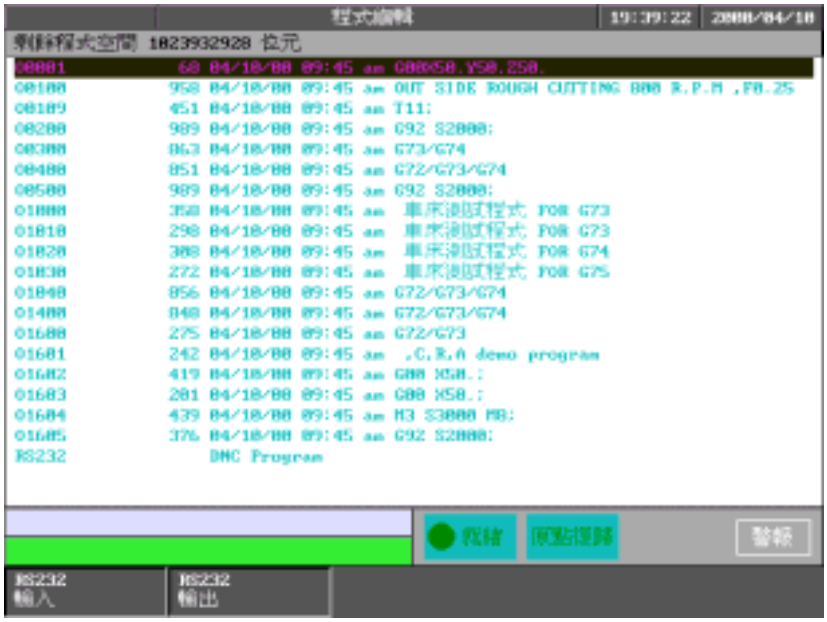
NO	Description	Range	Unit	Detail setting description
3901	master and slave mode	[0,1]		0: controller; 1: peripheral or PC; this paramerter is meaningful when flow rate control mode set to 2
3903	Data transfer communication port position	[1,2]		1: COM1; 2: COM2;
3921	Speed of first port communicate	[0,6]	bit per second	0: 2400; 1: 4800; 2: 9600; 3: 19200; 4: 38400; 5: 57600; 6: 115200;
3922	Bytes of first port data	[7,8]		7: 7 bytes 8: 8 bytes
3923	First port changed code form	[0,2]		0: ASCII; 1: EIA; 2: ISO;
3924	First port data output and peripheral control mode	[0,3]		0: no DC code; 1: add DC2 to start of data; 2: add DC4 to end of data; 3: add DC2 to start of data and add DC4 to end of data;
3925	First port single block end (EOB) output mode	[0,1]		0: EOB; 1: add CR before EOB
3926	First port DC3peripheralcontrol code is appositive or not	[0,1]		0: no; 1: yes this parameter is meaningful when 3927 flow rate control way set to 2(software flow rate control)
3927	First port flow rate control mode			0: no; 1: CTS/RTS hardware mode;

NO	Description	Range	Unit	Detail setting description
				2: Xon/Xoff software mode;
3928	First port corresponding check way			0: no; 1: odd corresponding; 2: even corresponding;
3929	First port stop byte			1: 1 bytet; 2: 2 bytes;
3941	Second communication port speed	[0,6]	bit per second	0: 2400; 1: 4800; 2: 9600; 3: 19200; 4: 38400; 5: 57600; 6: 115200;
3942	Second port data bytes	[7,8]		7: 7 bytes 8: 8 bytes
3943	Second port changed code form	[0,2]		0: ASCII; 1: EIA; 2: ISO;
3944	Second data output and peripheral control form	[0,3]		0: no DC control code; 1: add DC2 to start of data; 2: add DC4 to end of data; 3: add DC2 to start of data and add DC4 to end of data;
3945	Second port single block end (EOB) output form	[0,1]		0: EOB; 1: add CR before EOB
3946	Second port DC3 peripheral control code is appositive or not	[0,1]		0: no; 1: yes this parameter is meaningful when 3947 flow rate control way set to 2(software flow rate control)
3947	Second port flow rate control mode			0: no; 1: CTS/RTS hardware mode; 2: Xon/Xoff software mode;
3948	Second port check			0: no;

NO	Description	Range	Unit	Detail setting description
	way in appositive			1: odd corresponding; 2: even corresponding;
3949	Second port stop bytes			1: 1 byte; 2: 2 bytes;

RS232 load the file

1. press [edit] [files] to file control screen, then press [=>] to show

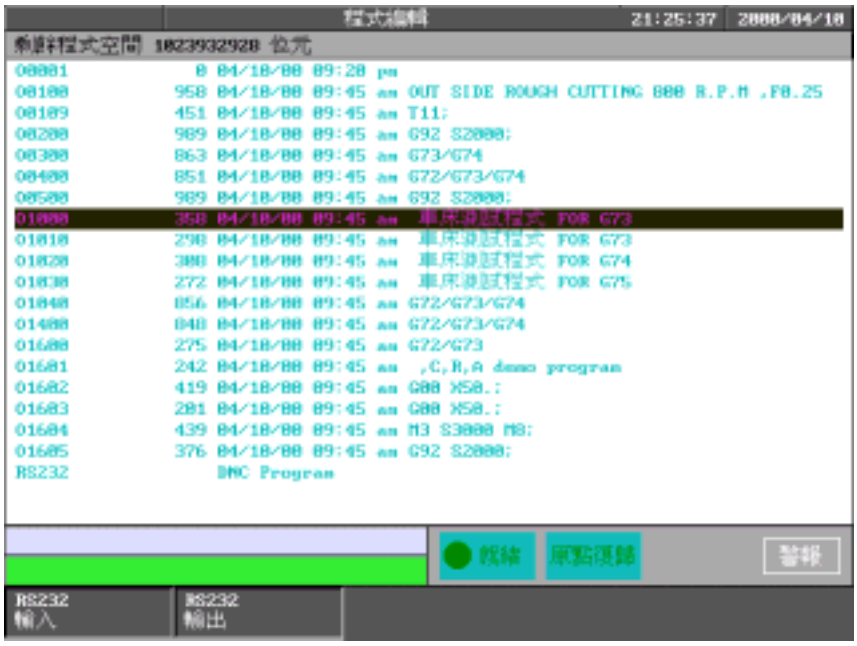


2. press [RS232 input], below screen appear

3. after enter the name, press[OK], then program goes into the status raedy to recive, display transfer status during transfer

files output

1. press [edit] [files] to file control screen, then press [=>] to show, and press up and down to select the file name, ex O1000



2. press [RS232 output], below screen appears

3. after pressing [OK], strat transfer program, and display transfer status

How SYNTEC CNC connect with EasyView

SYNTEC CNC controller can be PLC independent ,through RS232C matched with man machine interface module ,such as EasyView , HiTech , Digital ...ect. commercialized man machine interface development environment ,Syntec CNC allowed with 三菱火狐貍 PLC (Mitsubishi FX series) fully consist man machine interface communication convention ,the definition as below :

INPUT	: X ---	I	0~127
OUTPUT	: Y ---	O	0~127
Supporting contact	: M ---	A	0~511
Register	: DL --	R	0~255
*timer contact value	: T ---	Timer contact status	
*counter contact value	: C ---	Counter contact status	
*timer actual value	: TV ---	Timer presently value	
*counter actual value	: CV ---	Counter presently value	

application point for attention as below :

1. this fuction use man machine interface develop environment which is provided by 遠端 man machine interface panel ,to write the screen for client
2. this controller provide the communication convention that consist with Mitsubishi Fx, please set the output form to Mitsubishi FX communication convention when connect to CNC。
3. X,Y,M,T,C,TV,CV are difined by user
4. because R is 32-bit register, so one R map to two D, ex.R0 mapping DL0; R1 mapping DL2; R2 mapping DL4; R3 mapping DL6;R255 mapping DL510 ,detail definition of R is according to SYNTEC CNC difinition ,dail definition consult SYNTEC CNC application manual
5. reality I/O control ,control by SYNTEC CNC Ladder ,how to write Ladder ,please consult SYNTEC MLC manual .
6. RS232 setup :Baud Rate:9600,Parity:Even,Data Bits:7,Stop Bits:1,Mode:Terminal,Code:ASCII。

*for not provide in presently version。

The open machine screen make steps

一、 Use Windows paints to load the screen

二、 Select [image][property] in list of paints, select
  unit：pixel
  color：colors
  width：640
  height：480
  then press[OK]

三、 Select [file][save as new file] in list, please choose
  File type：16 colors BMP
  Please enter the new file name, then press [Done]

四、 Use GhostGraphic to transfer the file, transfer that 16 colors BMP file to .PCX file

五、 Rename that file to SYNTEC.PCX, put under CNC\DATA, and delete CNC\EXE file SYNTEC.SYS

Dialogue graph screen PIC file manufacture steps

1. load the PIC file to Windows paints
2. Select [image][property] in list of paints, select
   unit：pixel
   color：colors
   width：picture width
   hieght：picture hieght
   then press [Done]
3. Select [file][save as new file] in list, please choose
   File type：16 colors BMP
   Please enter the new file name, then press [Done]
4. Use GhostGraphic to transfer the file, transfer that 16 colors *.BMP file to *.PCX file

transfer file tool installation and how to use :

1. please the related program unzip in the same path
2. execute : “GWS”
3. select the BMP file which want to transfer
4. press the “CONVERT” in the left up side of the screen ,select the PCX form in POP UP window
5. finish all action automatically

custom software installation steps

installation decription

1. when press [diagnosis][system][software install], CNC will check floppy have SETUP.BAT or not, it will show out if hve

   please keep the install disk in floppy,
   please shutdon, and reet to continue installation

2. after reset, CNC will run SETUP.BAT in floppy, then enter CNC system automatically

therefore only write your own SETUP.BAT then you can custom install the files

example：

want to copy cnc.lad to cnc\app direction
want to copy panel.pcx to cnc\data direction

SETUP.BAT contents as below

```
copy  b:\cnc.lad  c:\cnc\app
copy  b:\panel.pcx  c:\cnc\data
```

screen color adjust

valid version

Build 696.03 or newer version

description

screen color define by [Colors] section in CUSTOM.INI, this file is under CNC\DATA direction, if you want to correct to screen color ,please correct this file。

When this file does not exist, system will create this file by default color when open the machine first time, this file can be covered when system program renew, do not worry the default color disapper when system program renew。

Color definition form

[Colors]

color keyword = color code

example

```
[Colors]
AlarmActual = 15        // alarm screen words set to bright white
AlarmHistory = 15       // history alarm screen words set to bright white
CoordinateData = 15     // coordinate value words set to bright white
CoordinateTitle = 10    // coordinate title words set to bright white
```

Color code

code	Color
0	Black
1	Blue
2	Green
3	Cyan
4	Red
5	Purple
6	Brown
7	White
8	Gray
9	Light blue
10	Light green
11	Sky blue
12	Bright red
13	Bright purple
14	Yelloe
15	Bright white

Color key word list

AlarmActual	Alarm screen words color
AlarmHistory	History alarm screen words color
CoordinateData	Coordinate value color

CoordinateTitle	Coordinate title color
FuncKeyBack	Function key background color
FuncKeyFore	Function kry words color
GlobalDataBack	Public global data screen background color
GlobalDataFore	Public global data screen words color
GlobalItemBack	Public global item background color
GlobalItemFore	Public global item words color
GuideText	Operation guide screen words color
HelpDialog	Assist dialogue box background color
LadderConnect	Ladder table line color
LadderLight	Ladder table contact color when ON
MonitorProgText	Program display words color when doing process
ParamDataBack	Parameter screen data backgound color
ParamDataFore	Parameter screen data words color
ParameItemBack	Parameter screen item background color
ParamItemFore	Parameter screen item words color
ParamTitleBack	Parameter screen title background color
ParamTitleFore	Parameter screen title words color
PLCData	PLC status screen data words color or OFF status words Color
PLCData2	PLC status screen data words color
PLCDataLight	PLC status screen data words color when ON status
PLCTitle	PLC status screen title words color
ProgramEditor	Program edit screen words color
ProgramFileMgr	File manager screen words color
ProgramInfoBack	Program edit screen state fence background color
SettingData	Data setup value words color
SettingHeader	Data setup main title words color
SettingTitle	Data setup value title words color
WorkSpace	Working space background color
WorkSpaceDate	Working space date backgrounf color
WorkSpaceGlobal	Public variable screen background color
WorkSpaceHint	Working space hint background color
WorkSpaceInput	Working space input background color
WorkSpaceParam	Parameter screen background color
WorkSpaceRunProg	Working space processing program name background color
WorkSpaceStatus	Working space status background color
WorkSpaceTime	Working space time background color
WorkSpaceTitle	Working space title background color

How to use external editor

Valid version

Build 700.05 or newer version

Description

external editor is appointed by [HugeEditor] section of CUSTOM.INI, this file is under CNC\DATA direction, if you need external editor please adjust that file。

When this file does not exist, system will create this file by default value when start the machine first time, this file can be covered when system program renew, do not worry the default color disapper when system program renew。

notices：

some external editor need to use disk to be swap, therefore before running external editor ,change working direction to a safe direction, can change to hard disk, bacause hard disk has large space let external editor to use, return to C: system disk when finish。

contents

```
[HugeEditor]
command = HugeEdit.bat
enable = 1
```

description：command keyword use to appoint the name *.bat of running external editor。Enable keyword use to start external editor, this value is 0 for not use external editor, in program edit screen will not appear [large file edit] function key, enable is 1 for using this external editor, then program edit function key will appear [large file edit] key。

HugeEdit.bat contents

```
d:
md \temp
cd \temp
c:\he5\he5 %1
c:
```

description：this *.bat file create a work direction “temp” in D:, then change direction to temp, run that editor, after finishing, change direction to C: and finish program, return to system。

load ZIP file

fit version

Build 663 and newer version

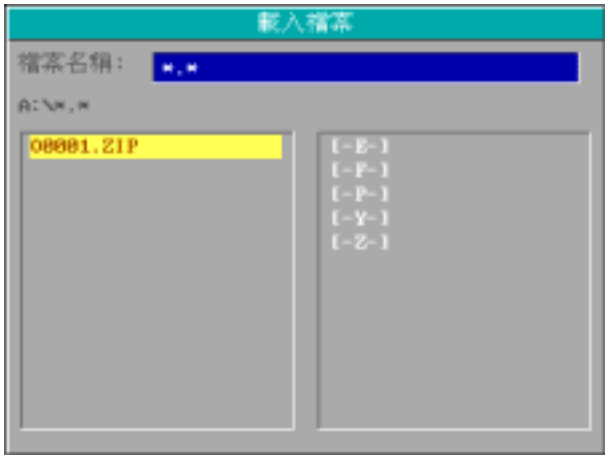
Compress procedure

1. compress work program and put it in disk, ex. O0001.ZIP

load procedure

1. insert the disk to floppy, and press [edit] [files] to file manager screen

2. press disk import, then select that file, and press import



3. then enter what file name you want, program will run the ZIP file automatically, and put it to assigned file name

system module setup description(system parameter 3219)

system shared data saved position

System program	C:\CNC\EXE
Ladder program	C:\CNC\APP
System parameter	C:\CNC\APP
Macro program	C:\CNC\MACRO
String file, PIC, TXT	C:\CNC\DATA

User data saved positon in different system

System parameter 3219

0(no SRAM)	Work program	C:\CNC\NCFILES
	OPLIST dialogue mode program	C:\CNC\GNCFILES
	Tool data bank	C:\CNC\USER
	Workpiece coordinate shift value	
	TEACHIN data	
1(have SRAM)	Workpice program	A:\CNC\NCFILES
	OPLIST dialogue mode program	A:\CNC\GNCFILES
	Tool data bank	A:\CNC\USER
	Workpiece coordinate shift value	
	TEACHIN data	
2(have SRAM , have harddisk)	Workpice program	D:\CNC\NCFILES
	OPLIST dialogue mode program	D:\CNC\GNCFILES
	Tool data bank	A:\CNC\USER
	Workpiece coordinate shift value	
	TEACHIN data	

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