LNC-M515i

Maintenance Manual

2011/1 Ver.：V04.00.001(4408210086)

Leading Numerical Controller

LNC Technology Co., Ltd.

Table of contents

1 SPECIFICATION

LNC-M515i Series is a standard DOS-Based controller and also an integrated numerical controller product which is designed by LNC Technology. Its stability in quality is best suitable for applications of middle complexity, such as milling, grinding and all other kinds of industrial and automatically tools

1.1 Normal Specification & Option Specification

Normal Specification

- Normal G/M Code Operating
- Background Editing
- MACRO Program Function
- External/Internal Program Transmitting Function for DNC
- Multiple Language Selection (English, Traditional/Simplify Chinese)
- Picture Simulation Display
- Soft Interface Extension
- Hardware Self-Diagnostic Display
- Additional back-up of Installation floppy disk
- PLC Ladder Diagram Display
- Internet Function

Option Specification

- CAD/CAM

2 Software Maintenance

2.1 LNC-M515i Installation Description

This system has 3 installation diskettes wich are [O.S UTILITY], [LNC_M515i INSTALL DISK], Text Font Disk and also three anti-virus program diskettes, details are as below：

2.1.1 [O.S UTILITY]

Insert [O.S UTILITY] disk to floppy(A:) or run R.BAT, it shows as below：

```
†    WELCOME TO INSTALL LNC SERIES   †
THIS WILL GUIDE YOU TO CREATE AN
PLATFORM FOR LNC .APP AND UTILITIES.
--------------VER 2.5---------------
1.QUICK MAKE AN BOOTABLE H.D(C)
2.INSTALL MLC UTILITIES
3.INSTALL NETWORK UTILITIES
4.VIRUS SCAN
5.QUIT

CHOISE AN OPTION[1,2,3,4,5]?
```

- **QUICK MAKE AN BOOTABLE H.D(C)**

  This will install OS to your IPC and make it bootable. Here is the step：

  a. Prepare a formatted CF card
  b. Set the boot sequence of IPC to A: first
  c. Insert [O.S UTILITY] disk to A
  d. RESET and boot with A:（CTRL+ALT+DEL or RESET）
  e. Run this option
  f. After all have done, reboot again and change boot sequence of IPC to C ONLY

- **INSTALL MLC UTILITIES**

  This will install MLC utilities to your IPC(OS required), but you need to install Operation System firstly and proceed this software. After pressing install button, system will show if you are sure of it, then press 「Y」

- **INSTALL NETWORK UTILITIES**

  This will install network utilities to your IPC(OS required). After pressing, system will pop up confirm button, press <Y> to continure.

- **VIRUS SCAN**

  To scan if the system has virus(OS and scan program required).

- **QUIT**

  To quit installation

2.1.2 [LNC_M515i INSTALL DISK]

Execute G.BAT of install disk, the screen will show as below：

```
==================================
  WELCME TO INSTALL LNC-M515i SERIES
==================================
  Please read the belows NOTICE first
  before INSTALL task.
  [1]Installing..below tasks are no
     prompting!
   a.The previous File/Directory that
     named "*.BAK" will be kil LED!
   b.The exist File/Directory that c-
     onflict with SETUP will be rena-
     med as "*.bak"!
```

Press any key to continue：

```
==================================
    LNC-M515i INSTALL UTILITY V1.20
Copyright (C) POU CHEN 2002 05/07/2001
==================================
1.Install
2.Maintain
3.Quit and Restart

Choice an Option[1,2,3]?
```

- **Install**

  For first time full install or hard disk reconstraction. LNC-T600i SERIES has been instal LED in the disk before selling. This selection is useless under normal usage unless the disk has been formated again.

- **Maintain**

  Maintenance selection, there are 3 items below：

```
1.PCscan
  Virus checking
2.DISK doctor
  Disk diagnostic and errer-fix
3.DEFRAG
  Disk access performance enhancement

0.Quit
```

（1） PCscan：to scan if there are virus in the disk or not.
（2） DISK Doctor：to scan the disk is broken or not.
（3） DEFRAG：disk defragment

- **Quit**

To quit install program and return to DO.

2.1.3 Font Disk

To install fonts, execute G.BAT of install disk.

2.2 System Update

2.2.1 System Update

This function can only be executed under imcomplete preparation, press EMG-STOP and press system update, below picture will be shown on the screen, users can choose each item to continue：

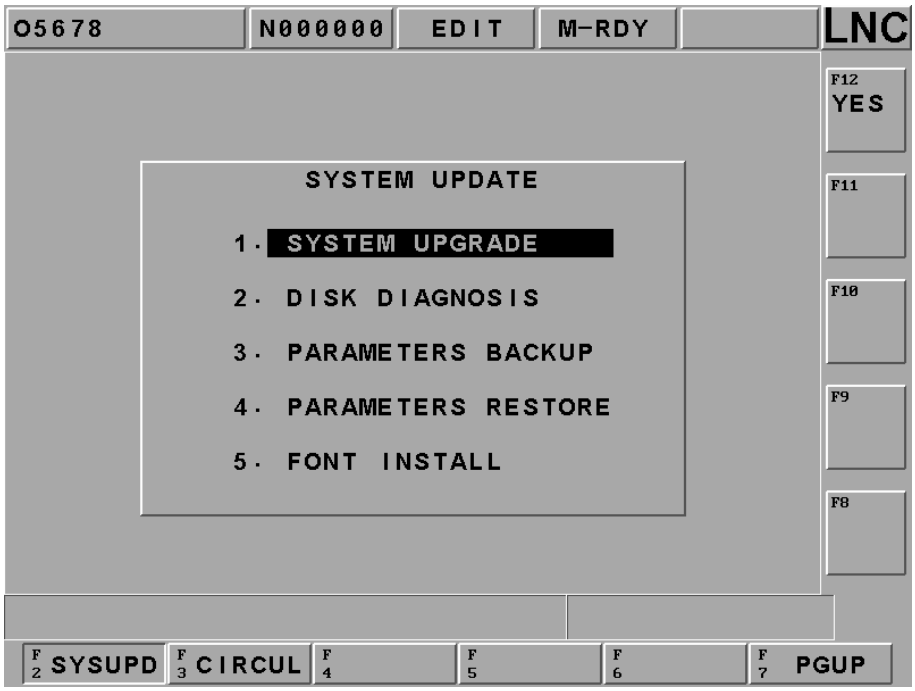


Figure 2.2-1 System Update Main Page

1. System update：

   This function offers two ways for update: general disk/RS232 transmission. Details are as below：

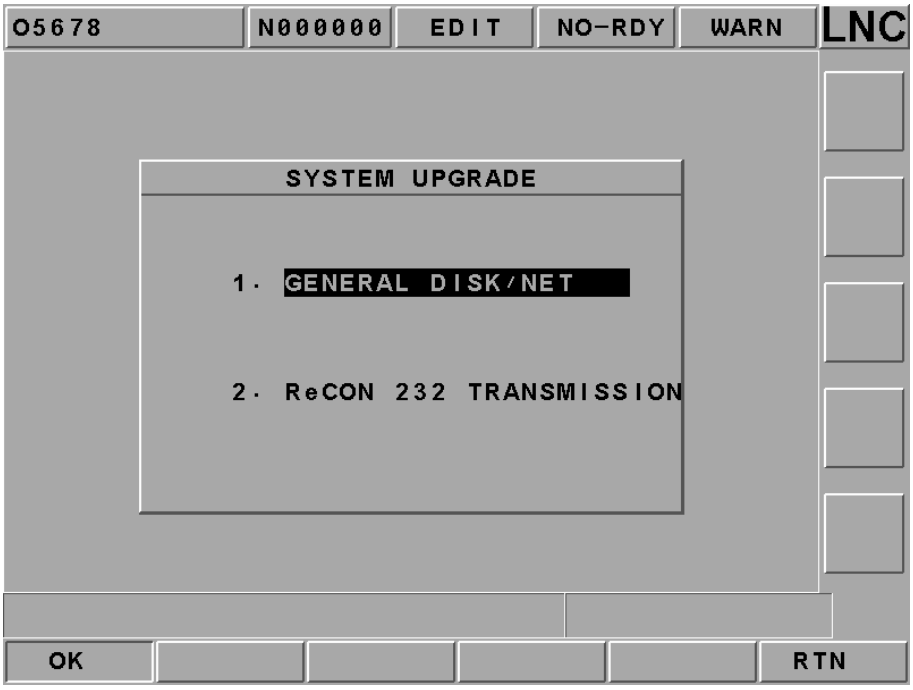
   a. Go to system.

   b. Press right down side DGNOS button, go to system and switch to DGNOS page.

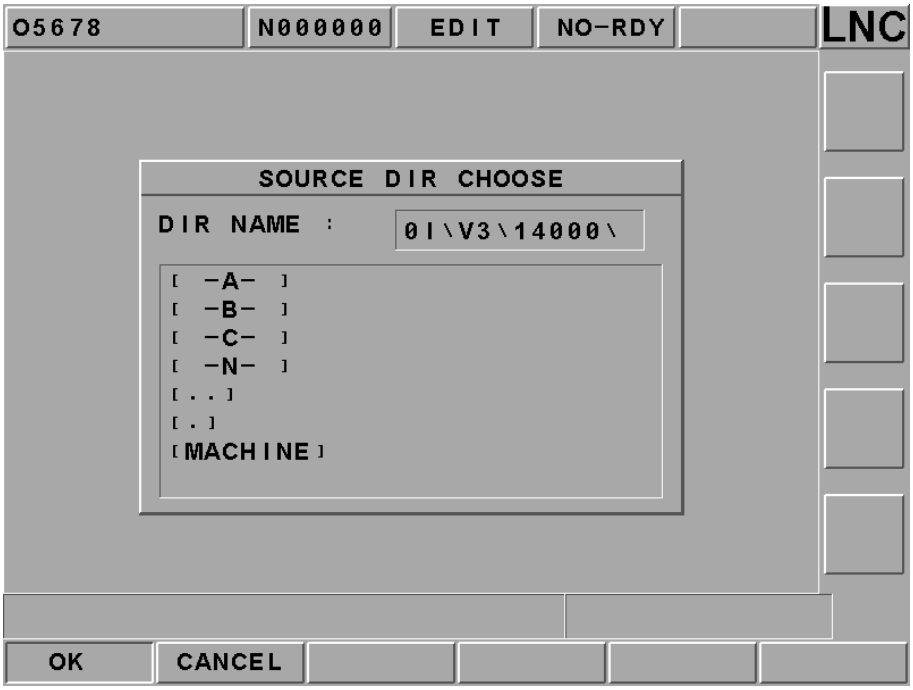
   c. Press (EMG_STOP)

   d. Press system update button, show as below Figure2.2-2

   e. Move cursor to【1.system update】> After pressing confirm, system will pop up dialog box for users to choose update method. If your update file comes from disk or other internet computer, please kindly choose「disk/ethernet」; if the source is another computer which connected by transmission cable, please kindly choose「RS232」, Figure as below：



f. Choose「disk/RS232 transmission」, screen is as below：



g. If the installation source is from floppy, please input A:\（default route is floppy）at the input line, and press OK; Or use up/down/left/right to move cursor to choose sources and press OK. Please note the final cursor need to stay at input line and press『OK』to process next step, screen as below：

h. Press『OK』to leave system and start upgrade process, later situation is the same to new installation, refer to maintenance manual「chapter 2」

2.3 System Direction Description

Users will find the following files in the system hardware after running LNC-M515i series installation program.

2.3.1 [OS.UTILTIY] Results

Name	Files
C：\DOS\	IBM PC_DOS 2000 files(partially)
C：\ANTIVIR\	Anti-Virus
C：\MLC：\MLC\	Ladder editor

2.3.2 [LNC_M515i INSTALL DISK] Results

Name	Files
C：\LNCM515i.BAK	Backup of LNCM515i directory(last edition) If new installation, current LNCM515i backup.
C：\LNCM515i.B2	Backup of LNCM515i directory (recently edition)
C：\LNCM515i\EXE	System files
C：\LNCM515i\RESOURCE	Environment relative data files （refer to DIR.DOC）
C：\LNCM515i\MACHINE	LADDER and system files
C：\LNCM515i\MACRO	Canned cycle macro for Standard Lathe （user's NC files should not be here）
C：\LNCM515i\NCFILES	User's NC files （file name must be O0000~O8999）
C：\LNCM515i\CAMPRJ	CAM project files （extended file name is *.DAT）

3 Hardware Maintenance

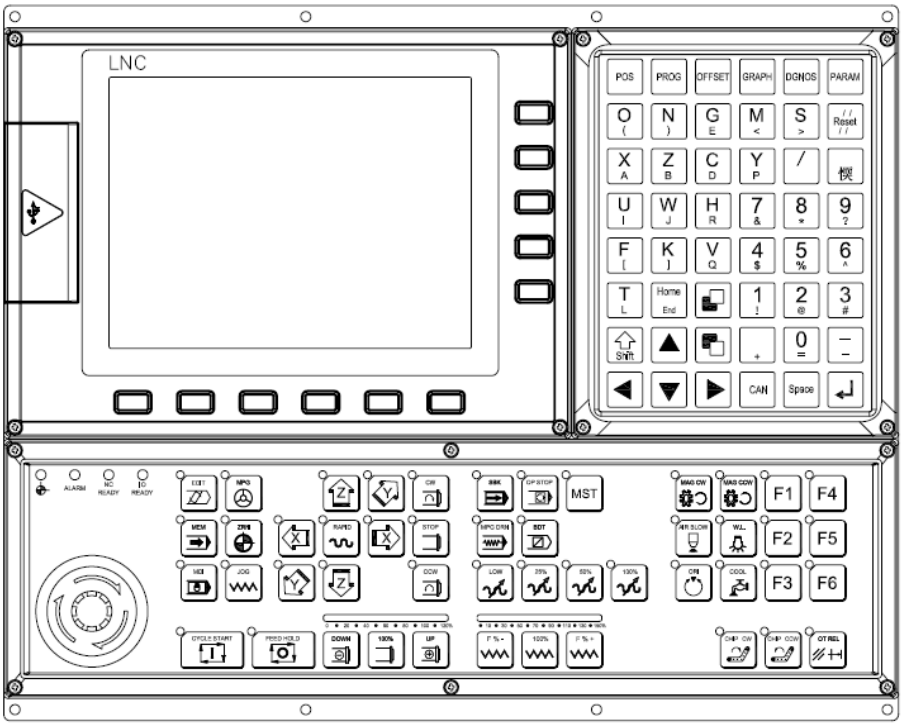
3.1 Product Display

LNC-M515i	SPEC
Monitor	8" TFT LCD
SDRAM	128M bytes or above
System CF Card	1Gor above
PCMotherboard	Industrial PC board
Data Interface	USB or CF Card
Remote I/O	128 Input/128 Output
USER I/O	20Input/16 Output
Servo System	Offer position loop/Speed loop control (Optional)
DNC	RS232 19200 Baud Rate
Operation Panel	Standard Milling OP
MPG Interface	3 in 1 MPG
Control Axes	Max. 4 axes
Power	AC 110V/230V 50Hz/60Hz input power

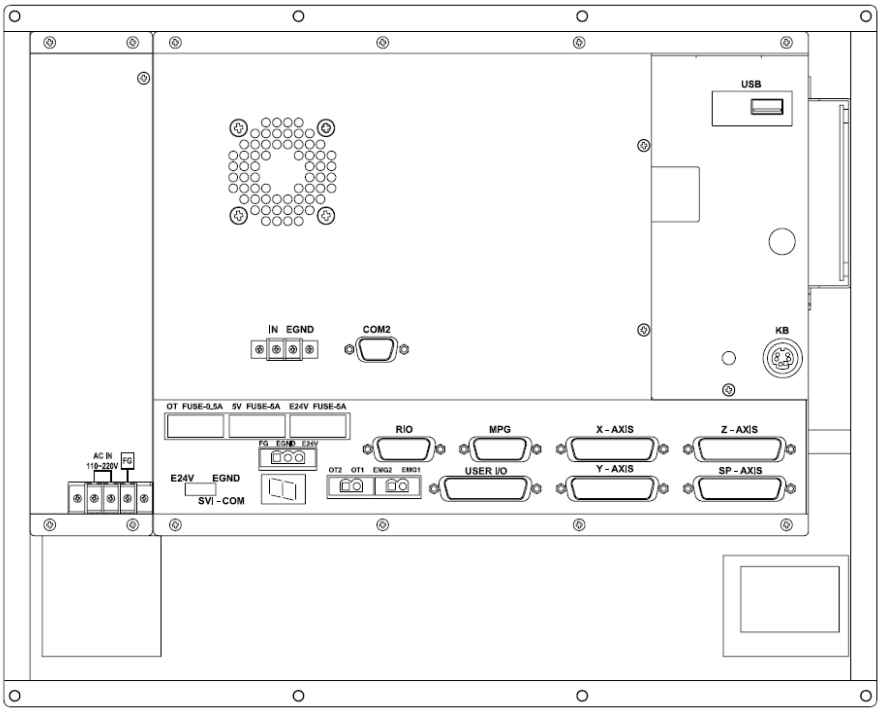
LNC-515i System Power Demand

Power Category	Specification	Usage	NOTE
System Power	AC110V/230V 50Hz/60Hz	For System	
External Power(24V）	DC24V/（4A UP）	For external IO	

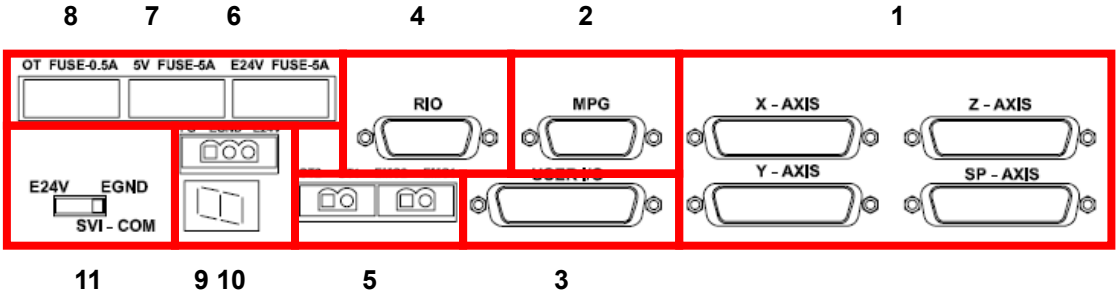
3.2 Port and interface



Controller Front View

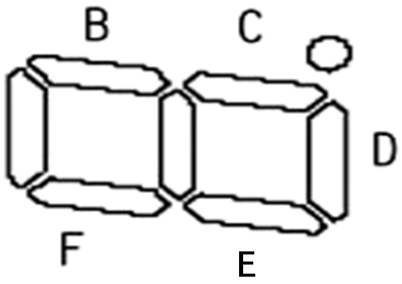


Controller Back View



12

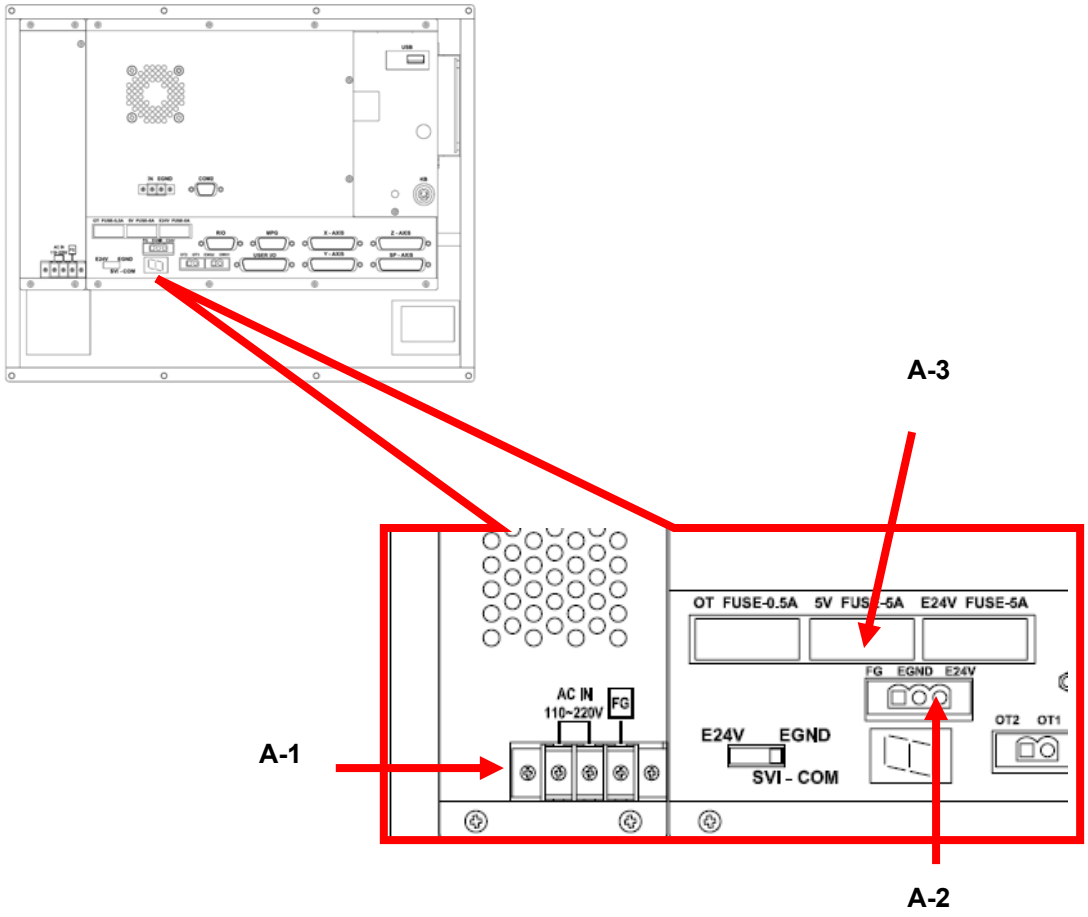
Mark	Icon Code	Function	Connection Format	Note
1	X、Y、Z、SP AXIS	Axis servo control	D-SUB 25 PIN(Jack)	
2	MPG	MPG PIN	D-SUB 15 PIN(Jack)	Command and IN
3	USER I/O	20IN/16OUT	HD_D-SUB 44 PIN(Plug)	To connect REL
4	RIO	IO control port	D-SUB 15 PIN(Plug)	To connect SIO
5	EMG/OT	Connect	Hardware protection	
6	E24V FUSE	Fuse	5.2*20mm Fuse	5A/250V
7	5V FUSE	Fuse	5.2*20mm Fuse	5A/250V
8	OT FUSE	Fuse	5.2*20mm Fuse	0.5A/250V
9	FG、EGND、E24V	External Power 24V	3pin 5.08mm terminal	
10	7 segments display	Digital display		
11	SVI-COM	Servo COM	Switch	Default EGND
12	HS	In for T	JP terminal	
	NPN/PNP	USER IN standard	Switch	switch at right side
	CF	Industrial CF card	CF Card PIN	
	KB	Keyboard port	Ps2PIN	
	COM2	UARTport	D-SUB 9 PIN(Plug)	



LNC-515i 7segments of digital display at back side：			
LED lights	ON Description	OFF Description	Exam and check
B	External E24V input lights on	No external E24V input	Confirm E24V
C	Servo reset lights on	Servo is not at reset step	
D	Servo start lights on	Servo is not at start step	Confirm servo
E	Didn’t pass stroke lights on(OT1、OT2short circuit)	OT1、OT2 open circuit	Confirm OT
F	External E5V input lights on	No external E5V input	Confirm E24V

3.3 LNC-M515i system connection and description

A、Power：



A-1：System Power Supply

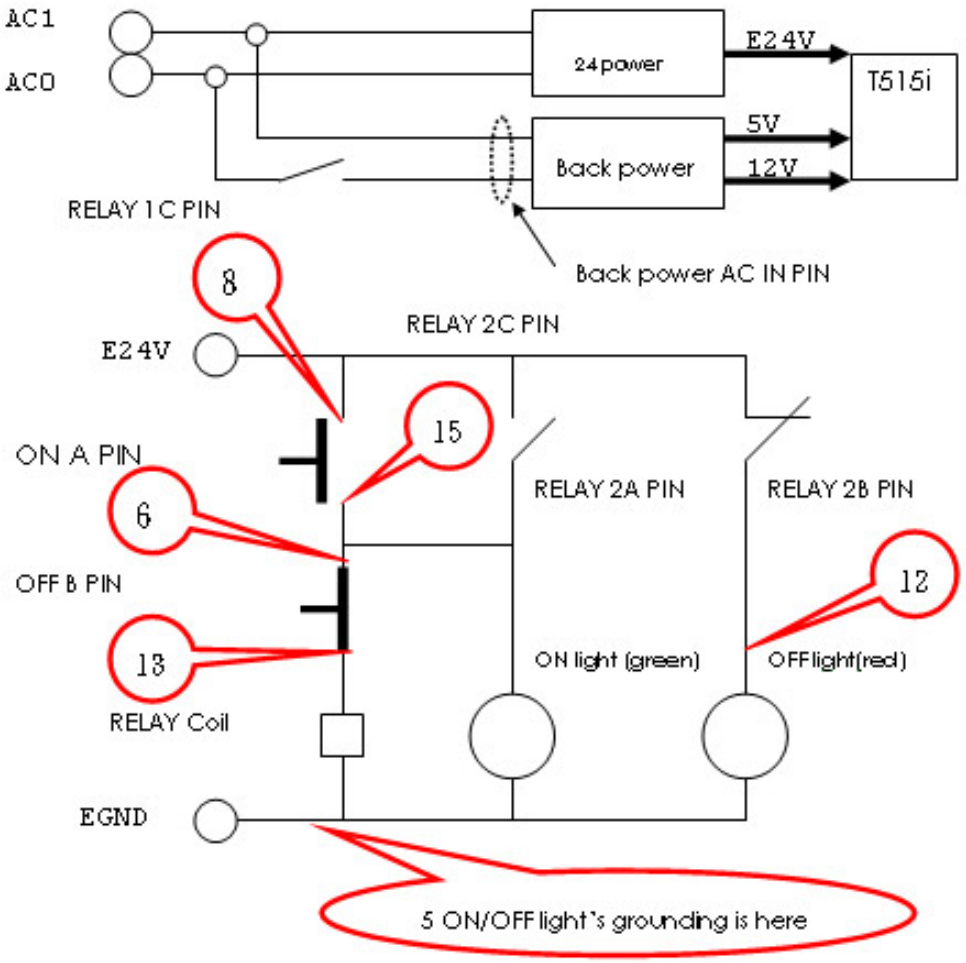
◎Description：Offer 5V.12V power for system.

◎Connection：Connection as below：

Put AC110V/230V power connect to power supply's AC IN, FG to grounding, please connect with metal chassis (grounding)

External ON/OFF switch to do system power control

Description：Put AC power to the back power of LNC-515i, and system will on, but if the external power is needed, wiring and TRF9500 wiring is below：



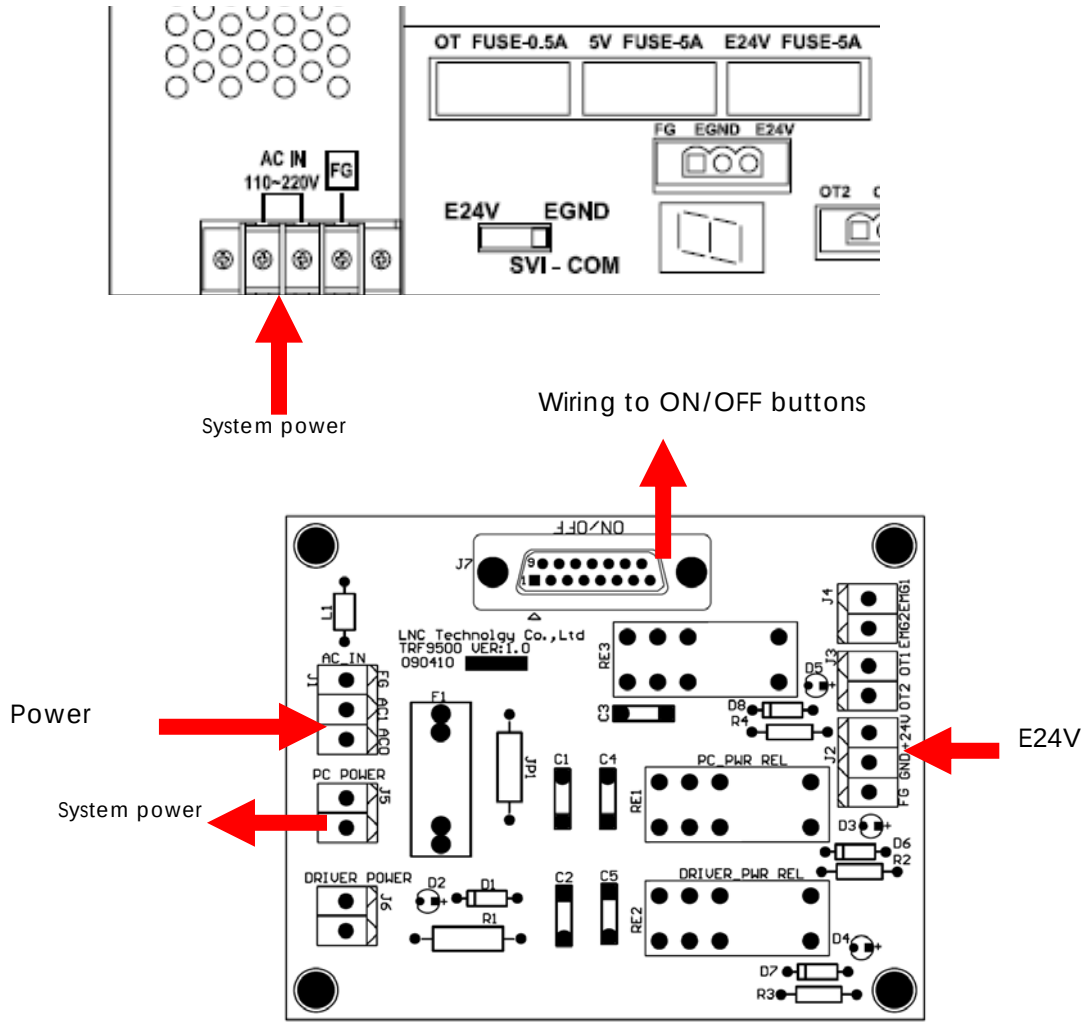
Note：1.The numbers in this graph is to show TRF9500 ON/OFF Connector PIN.

2.please weld the ON switch light with PIN15.

TRF9500 wiring is as below：

1、By the definition of ON/OFF Connector, welding with ON/OFF button switch.

2、Connecting with 515i system.



TRF9500 ON/OFF Connector PIN definition：

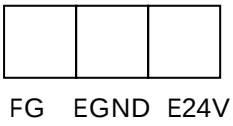
PIN	Name	Description
1	-	-
2	-	-
3	-	-
4	-	-
5	EGND	E24V power GND
6	OFF1	OFF button PIN 1
7	-	-
8	ON1	ON button PIN 1(E24V)
9	-	-
10	-	-
11	-	-
12	OFFL	OFF button light control
13	OFF2	OFF button PIN 2
14	-	-
15	ON2	ON button PIN 2

- **AC power cable：we recommend you use PVC cables and the cable diameter is 0.75 mm2 or above material (better within 5m).**
- **Before sending electricity, please make sure the wiring is correct. (please do not connect AC power to FG, otherwise the controller will be burned out.)**

A-2：External E24V Connector

◎Description：E24V is for controller, power control and external I/O to use.

◎Connector Description：As below：



E24V and EGND connect to external power supply AC output side；FG to grounding, please connect with metal chassis (grounding)

◎Power Demand：(1)E24V/5A above

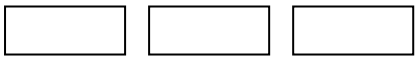
(2)Output voltage ripple and noise is smaller then 150mVp-p.

- **We recommend you to use the power supply of LNC (E24V/5.8A、E5V/3A). With using this model, LNC have passed the CE test. We can not guarantee your needs without using this model.**
- **When using this power supply, please make sure the installation location will not be too far(DC output may have drop voltage.) After booting, E24V power supply voltage will need to stay within E24V±0.5V.**

A-3：FUSE

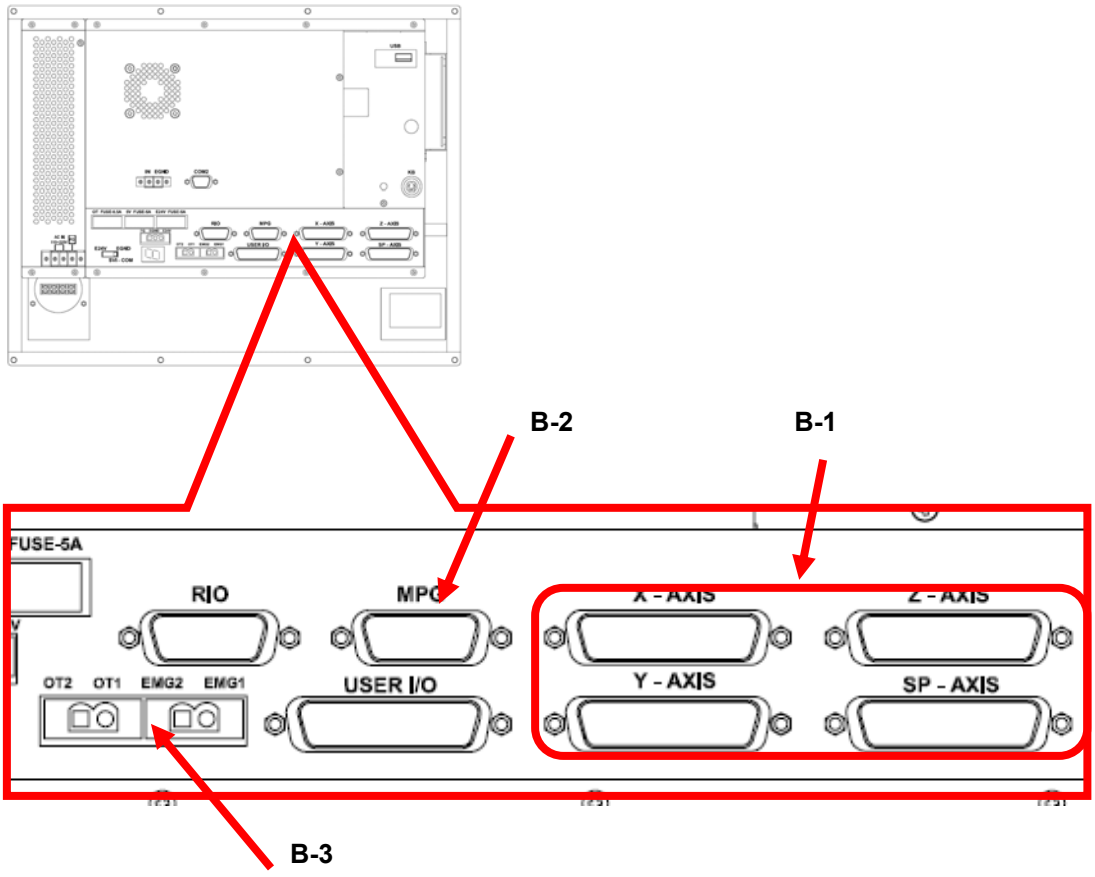
◎Description：Fuse is the circuit protection. When controller has strange situation, please check if fuse is OK.

◎Position Description：Relating position is as below：



◎Specification Description： 5V/E24V/5V are all 250V/5A；OT is 250V/0.5A。

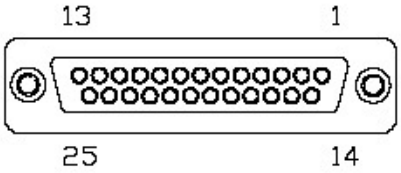
B、Motion Control：



B-1：Servo Control Connector

◎Description：B-1 offers 4 axis control pin(X、Y、Z、SP) to connect and control back side drives.

◎Connector Description：Use D_SUB 25PIN(Jack) connect, details as below：



PIN	Name	Description	PIN	Name	Description
1	/PB	Pulse output /B	14	/PA	Pulse output /A
2	PB	Pulse output B	15	PA	Pulse output A
3	E5V	External E5V for linear scale	16	-	-
4	EGND	External grounding	17	DACO	Analog voltage output
5	AGND	Analog output grounding	18	E24V	External power E24V
6	SRV_ON	Servo start control	19	ALARM	Servo alarm
7	EGND	External power grounding (E5V、E24V)	20	SVI_COM	Servo COM setting
8	SVI_COM	Servo COM setting	21	EGND	External power grounding
9	SRV_RST	Signal reset signal	22	-	-
10	C	Encoder C	23	/C	Encoder /C
11	A	Encoder A	24	/A	Encoder /A
12	B	Encoder B	25	/B	Encoder /B
13	FG	Chassis grounding	-	-	-

◎Description：(1) Pulse output and encoder feedback are all differential signaling.

(2)Analog voltage output is ±10V.

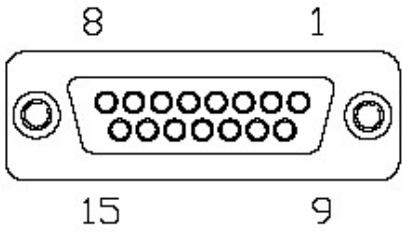
(3)The analog voltage output of SP Connector is standard selection, the analog voltage output of other axes are optional.

- **When making the connection cables of control pin and back-end driver, please use better shielding cover and cables (A.W.G24 UP) And make sure the connection of shielding cables to reduce the chance of noise interference. LNC offers standard cables for selection.**
- **Please don't bind signal control cables with power cables at the same time or put at the same cable box.**

B-2：MPG Control Connector

◎Description：This connector is for MPG to use which includes pulse and IO signal.

◎Connector Description：Use D_SUB 25PIN(Jack) connect, details as below:



PIN	Name	Description	PIN	Name	Description
1	E5V	MPG IO power	9	EGND	MPG power grounding
2	MPG4	MPG 4	10	FG	Chassis grounding
3	E/B	Encoder /B	11	EB	Encoder B
4	E/A	Encoder /A	12	EA	Encoder A
5	X100	MPG ratio 100	13	X10	MPG ratio 10
6	MPGZ	MPG Z	14	MPGY	MPG Y
7	MPGX	MPG X	15	E5V	MPG E5V power
8	E5V	MPG E5V power	-	-	-

◎Description：(1) Encoder feedback is differential signal.

(2)This pin offer 6 sets of 5V input for axis direction and ratio selection to use.

B-3：OT& EMG Connect

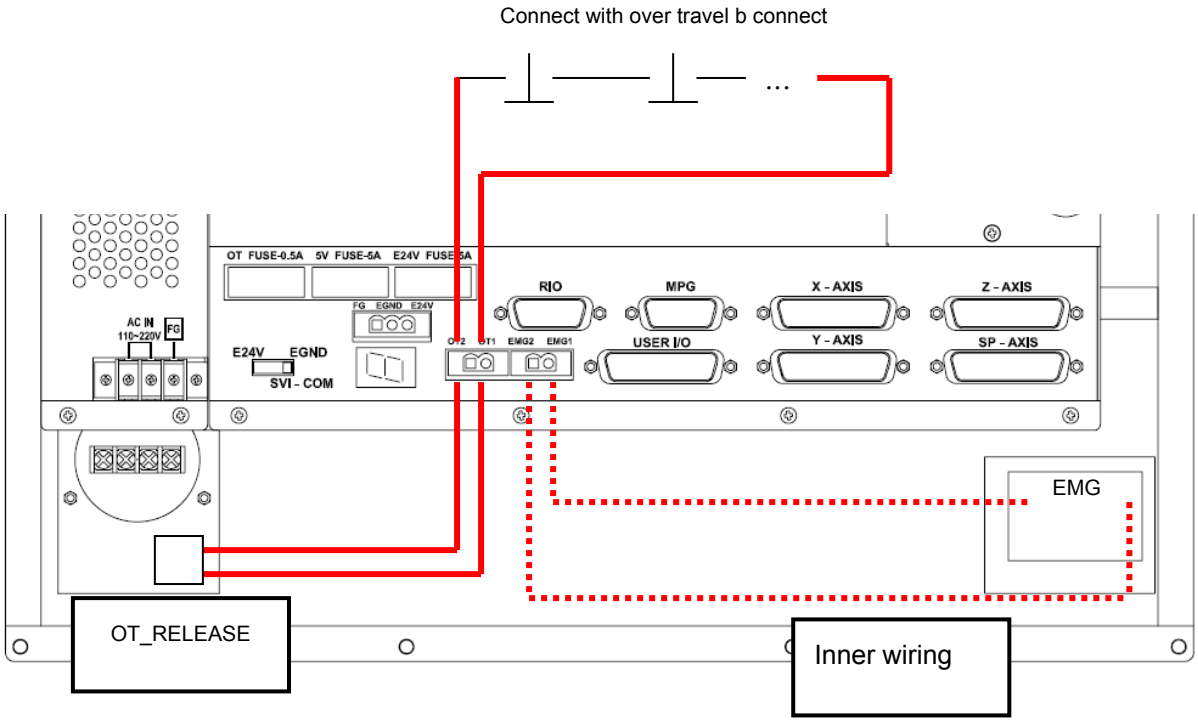
◎Description：(1) OT connect is the over travel point and a safe point to protect hardware. Normally will be at short-circuit situation.

(2) When you want to make servo on, you will need to make OT and EMG to be short circuit, therefore OT object is close pin. When using several OT objects, please connect with serial way, and EMG will be short circuit state at normal using.

◎OT Connector Description：As below

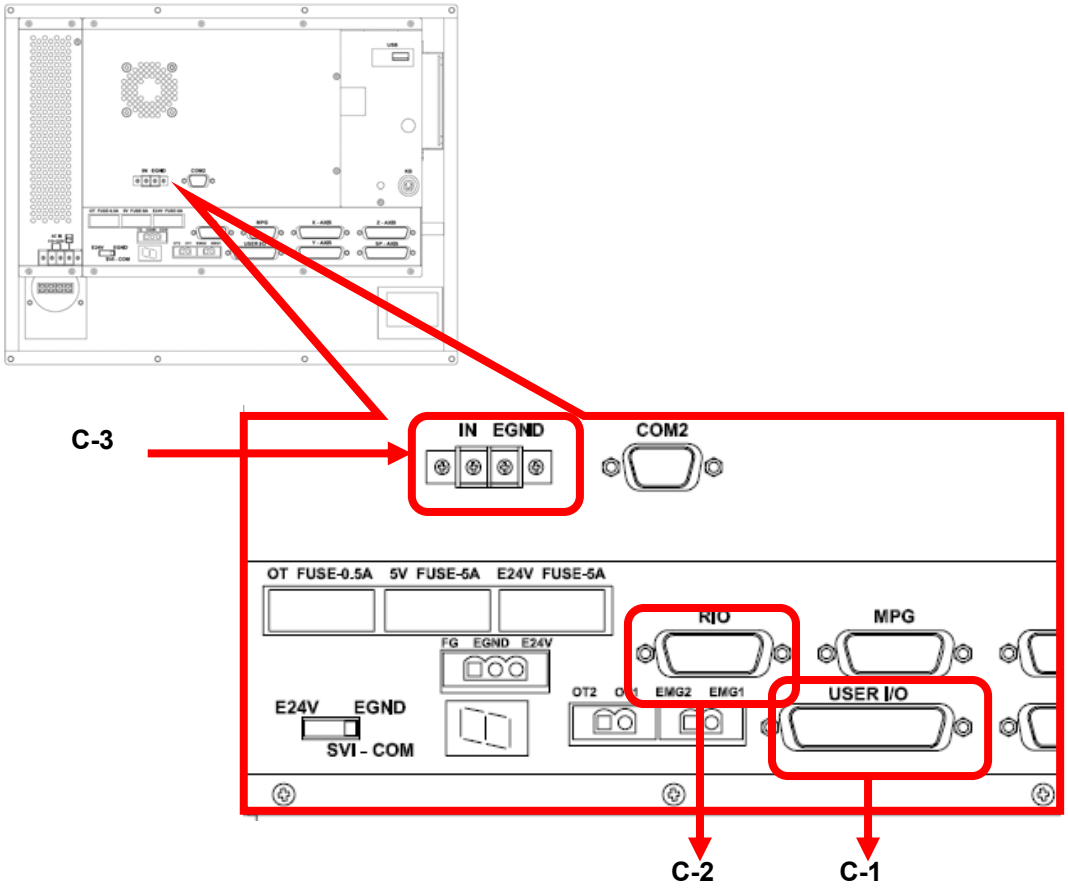
◎EMG Connector Description：As below

OT/EMG wiring is as below：



- **Because the OT Connector will have usage of parallel connection (1 hole with 2 lines), please make sure the connection is firm in order to prevent malfunction caused by poor contact.**
- **If the OT and EMG PIN is not used, please make it at short-circuit situation.**

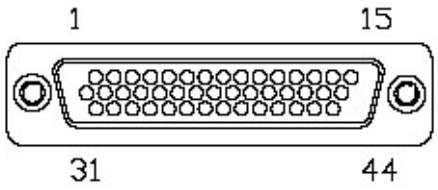
C、IO Control：



C-1：USER IO Connector

◎Description：C-1offers 20IN/16 OUT-IO interface, usually for connection with REL.

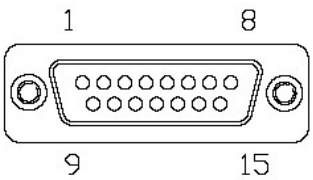
◎Connector Description：Adopts HD_SUB 44PIN(Plug), please refer to annex 2 for definition：



C-2：RIO Connector

◎Description：C-2 offers IO expansion interface, when USER IO is not enough, you can connect with SIO/EIO from here to do expansion of IO points.

◎Connector Description：Adopts D_SUB 15PIN(Plug) to connect with SIO, one on one.

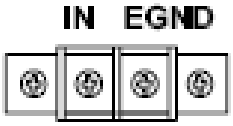


- **When making the connection cables of control pin and back-end driver, please use better shielding cover and cables (A.W.G24 UP) And make sure the connection of shielding cables to reduce the chance of noise interference. LNC offers standard cables for selection**
- **(1、9)；(2、10)；(3、11)；(4、12)require the use of stranded cables to prevent noise interference**
- **Please don't bind signal control cables with power cables at the same time or put at the same cable box.**

C-3：Quick IN Connector

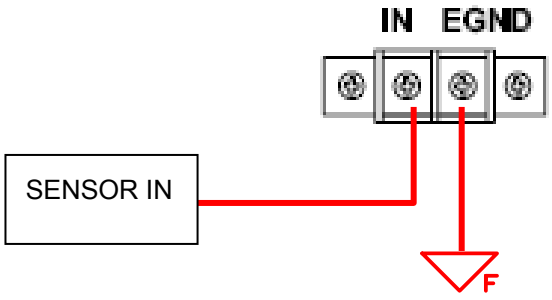
◎Description：C-3 offers 1 IN for tool measuring.

◎Connector Description：Connectors use 2PIN JP terminal, details are as below：

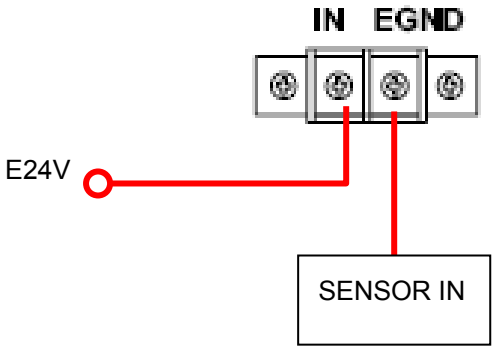


Quick IN Connector wiring：

1.When the sensor is PNP (HIGH motion)



2.When the sensor is NPN (LOW motion)

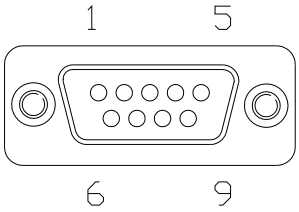


- **IN is 24V standard.**

C-4：COM2

◎Description：C-4 is COM2 connector, RS232/422/485 can be set by BIOS.

◎Connector Description：COM2 connector is D_SUB 9 PIN(plug)connector, as below：



RS232/ RS422 / RS485

PIN	Definition	PIN	Definition
1	DCD2/**422TX-**/485-	2	RXD2/**422TX+**/485+
3	TXD2/**422RX+**	4	DTR2/**422RX-**
5	GND	6	DSR2
7	RTS2	8	CTS2
9	RI2	10	NC

3.4 OP Panel I/O Chart

I Point Name	I Point Number	O Point Name	O Point Number
EDIT	I320	EDIT LED	O396
MEM	I336	MEM LED	O362
MDI	I368	MDI LED	O361
MPG	I321	MPG LED	O397
ZRN	I337	ZRN LED	O364
JOG	I369	JOG LED	O363
Spare(I0.2)	I322	Spare (R9.6)	O398
←X	I338	←X LED	O366
Y↙	I370	Y↙ LED	O365
↑Z	I323	↑Z LED	O399
RAPID	I339	RAPID LED	O369
↓Z	I371	↓Z LED	O368
Y↗	I324	Y↗ LED	O372
→X	I340	→X LED	O371
Spare (I6.4)	I372	Spare (O6.2)	O370
CW	I325	CW LED	O375
STOP	I341	STOP LED	O374
CCW	I373	CCW LED	O373
SBK	I326	SBK LED	O352
MPG DRN	I342	MPG DRN LED	O353
LOW	I374	LOW LED	O354
OP STOP	I327	OP STOP LED	O321
BDT	I343	BDT LED	O324
25%	I375	25% LED	O327
MST	I328	MST LED	O320
Spare (I3.0)	I344	Spare (R0.3)	O323
50%	I360	50% LED	O326
Spare (I1.1)	I329	Spare (R8.0)	O384
Spare (I3.1)	I345	Spare (R0.2)	O322
100%	I361	100% LED	O325
MAG CW	I330	MAG CW LED	O387
AIR BLOW	I346	AIR BLOW LED	O386
ORI	I362	ORI LED	O385
MAG CCW	I331	MAG CCW LED	O388
W.L.	I347	W.L. LED	O341
COOL	I363	COOL LED	O338
CHIP CW	I350	CHIP CW	O389
F1	I332	F1 LED	O388
F2	I348	F2 LED	O340
F3	I364	F3 LED	O337
CHIP CCW	I334	CHIP CCW	O390
F4	I333	F4 LED	O342
F5	I349	F5 LED	O339
F6	I365	F6 LED	O336
CYCLE START	I377	CYCLE START LED	O360
FEED HOLD	I378	FEED HOLD LED	O367
SP Speed DOWN	I379		
SP Speed 100%	I380		
SP Speed UP	I381		
Feedrate F%-	I382		

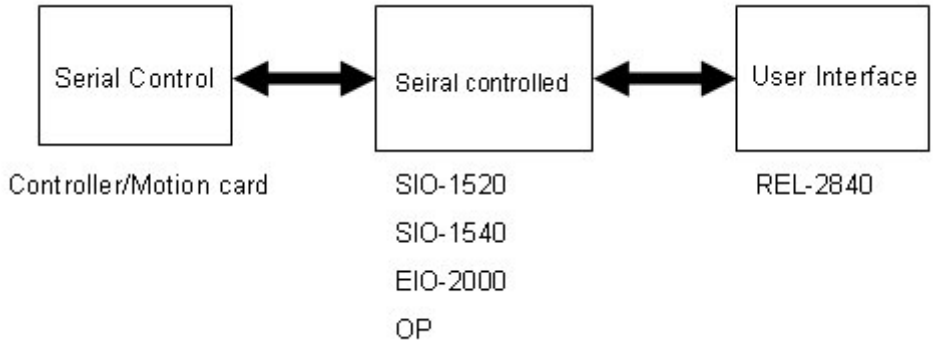
I Point Name	I Point Number	O Point Name	O Point Number
Feedrate 100%	I383		
Feedrate F%+	I366		
EMG STOP	I376		
P4Spare I(0)	I352		
P4Spare I(1)	I353		
P4Spare I(2)	I354		
P4Spare I(3)	I355		
P5Spare I(0)	I356		
P5Spare I(1)	I357		
P5Spare I(2)	I358		
P5Spare I(3)	I359		
		ZRN LED	O392
		ALARM LED	O393
		NC READY LED	O394
		IO READY LED	O395
		OT REL LED	O391
		SP Speed OR(0%) LED	O383
		SP Speed OR(10%) LED	O382
		SP Speed OR(20%) LED	O381
		SP Speed OR(30%) LED	O380
		SP Speed OR(40%) LED	O379
		SP Speed OR(50%) LED	O378
		SP Speed OR(60%) LED	O377
		SP Speed OR(70%) LED	O376
		SP Speed OR(80%) LED	O355
		SP Speed OR(90%) LED	O356
		SP Speed OR(100%) LED	O357
		SP Speed OR(110%) LED	O358
		SP Speed OR(120%) LED	O359
		Feedrate OR(0%) LED	O335
		Feedrate OR(10%) LED	O334
		Feedrate OR(20%) LED	O333
		Feedrate OR(30%) LED	O332
		Feedrate OR(40%) LED	O331
		Feedrate OR(50%) LED	O330
		Feedrate OR(60%) LED	O329

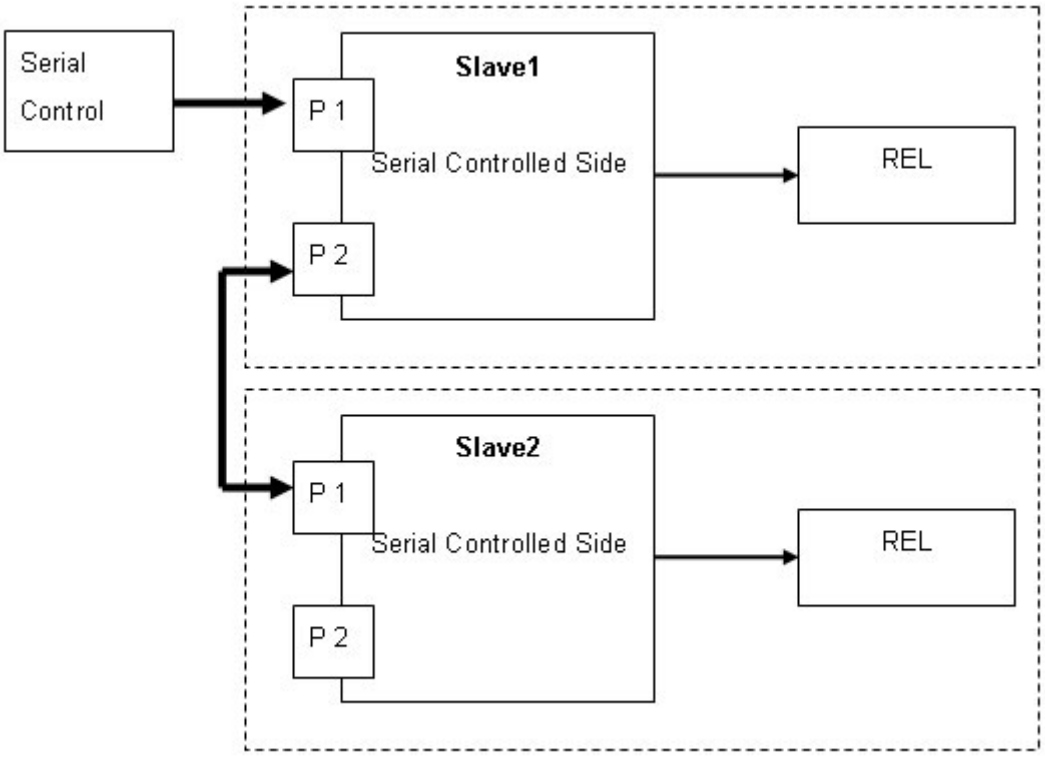
I Point Name	I Point Number	O Point Name	O Point Number
		Feedrate OR(70%) LED	O328
		Feedrate OR(80%) LED	O351
		Feedrate OR(90%) LED	O350
		Feedrate OR(100%) LED	O349
		Feedrate OR(110%) LED	O348
		Feedrate OR(120%) LED	O347
		Feedrate OR(130%) LED	O346
		Feedrate OR(140%) LED	O345
		Feedrate OR(150%) LED	O344

3.5 I/O card- SIO module

Not only the 20 Input/16 Output module that LNC 515i offers, user can choose different I/O module to expand to 128 IN / 128 OUT, below is the easy wiring description.

- **Serial I/O module configuration：**





- **Serial I/O expansion wiring：(each port can accept 2 sets of controlled components.)**

Serial I/O expansion description：

1.Each component specification：

Control side (MASTER)		
Hardware	I/O expansion port	Note
LNC-515i	1	

Controlled side (SLAVE；each hardware can connect with series)		
Hardware	I/O Control	Note
SIO-1540	40IN / 32OUT	
EIO-2000-1	40IN / 32OUT	
EIO-2000-2	60IN / 48OUT	
SIO-1520	40IN / 32OUT	For OP
OP-2520	64IN / 64OUT	For OP

User Interface		
Hardware	I/O Control	Note
REL-2840	20IN / 16OUT	

2.I/O Calculation example：

(1) If use LNC-515i to coordinate with EIO-2000-2, max I/O is

1(control port) × 2(EIO-2000-2) × 60 IN = 120 IN

1(control port) × 2(EIO-2000-2) × 48 OUT = 96 OUT

(2) If use LNC-515i to coordinate with SIO-1540, max I/O is

1(control port) × 2(SIO-1540) × 40 IN = 80 IN

1(control port) × 2(SIO-1540) × 32 OUT = 64 OUT

And so on…..

- **Each hardware usage, please refer to each module manual.**

3.6 I/O card-SIO1520

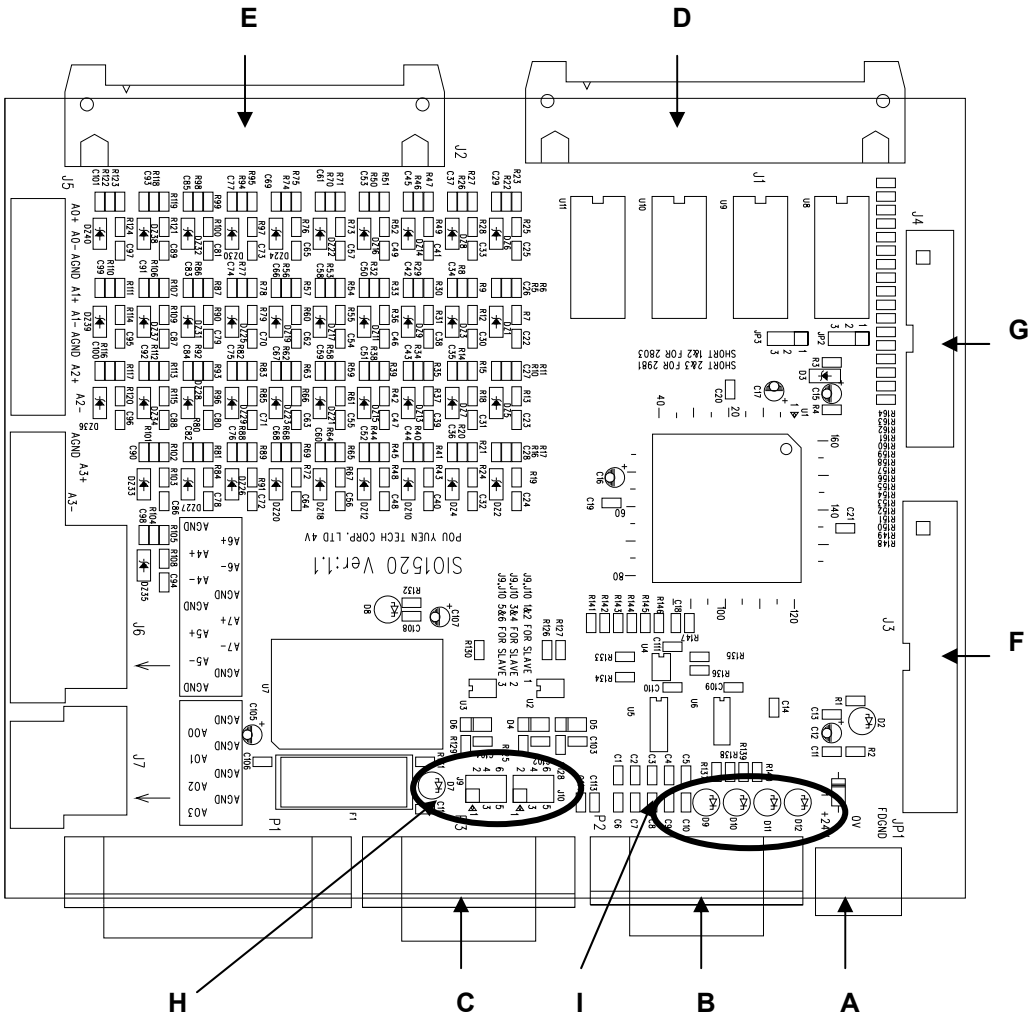
I/O card specification

1、Specification Description：

1) SIO-1520 only offers 40IN /32 OUT (also 24 IN / 32 OUT optional)

2) Usually used for OP. If customers want to make customized OP, we recommend you use this IO card.

2、Hardware Layout：



3、Connector Description：

Power			
Picture	Component	Function	Description
A	3PIN 5.08mm head	DC(24V)power input	Connect to POWER
IO Connector			
Picture	Component	Function	Description
B	D_SUB LD 15PIN Plug	Serial port	Connect to controller RIO
C	D_SUB LD 15PIN Jack	Serial port	Connect to controller RIO
D	40PIN 2.54 mm head	32 OUT	24V Output
E	40PIN 2.54 mm head	40IN	24V Standard
F	40PIN 2.54 mmeasy head	Spare 32 O points	Option
G	26PIN 2.54 mmeasy head	Spare 24 I points	Option
Setting			
Picture	Component	Function	Description
H	2.54mm JUMPER	SLAVE pointed	Detail
Indicator			
Picture	Component	Function	Description
I	E5V green LED(D8)	E5V indicator light	E5V normal>ON
	E24V green LED(D2)	E24V indicator light	E24V normal>ON
	CS yellow LED(D11)	Sending state light	Connect to controller>On
	DO yellow LED(D12)	Sending state light	Connect to controller>On
	DI yellow LED(D9)	Sending state light	OK>Lights on
	LK yellow LED(D10)	Sending state light	OK>Lights on

4、Setting：

A：E24V Power Connector

◎Description：This pin is for O point output power, if this pin has problem, O point output will be error. (has no effect to IN point)

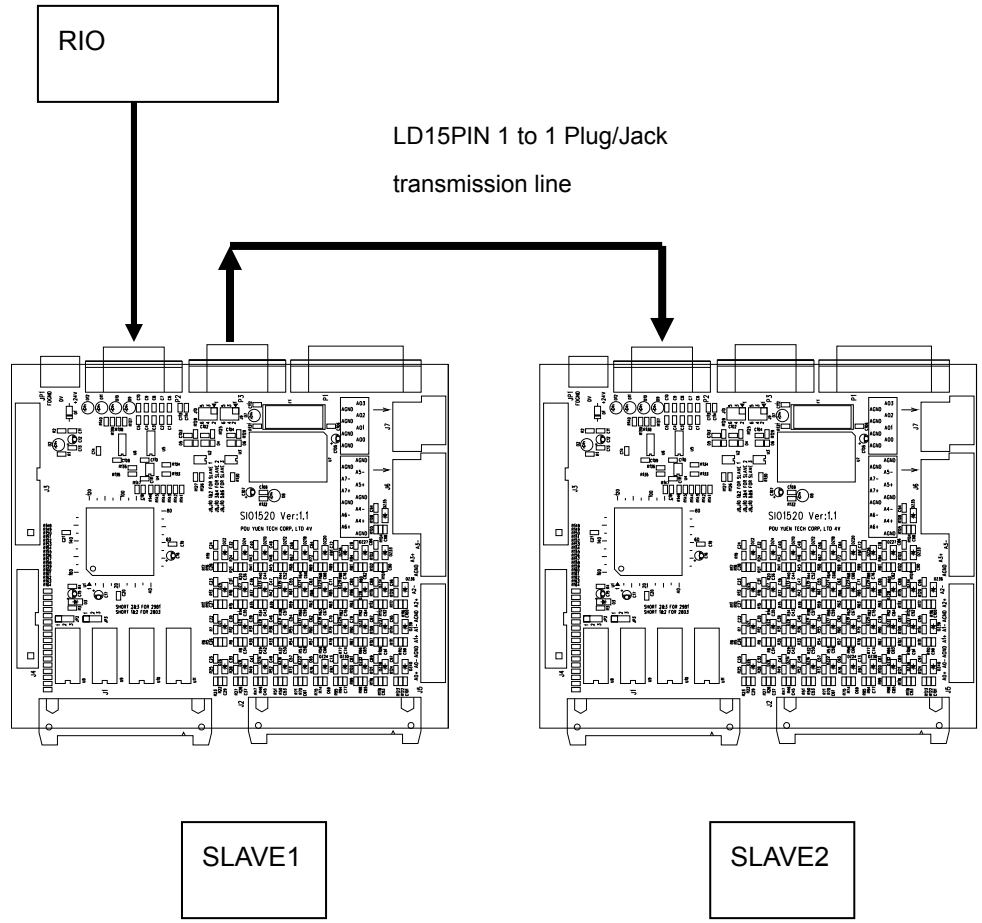
◎Rated Capacity：E24V±0.5V (3A UP)

B、C：Serial Connection

◎Description：1 B,C head is for serial connection, need to connect with controller's RIO port.

2 B,C head is pararell signal, is for serial expansion to use.

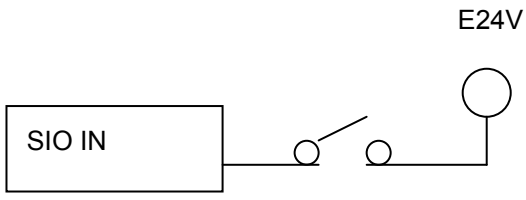
◎Serial expansion example：Serial connection for 2 SIO-1520 cards：



D、E：IO port

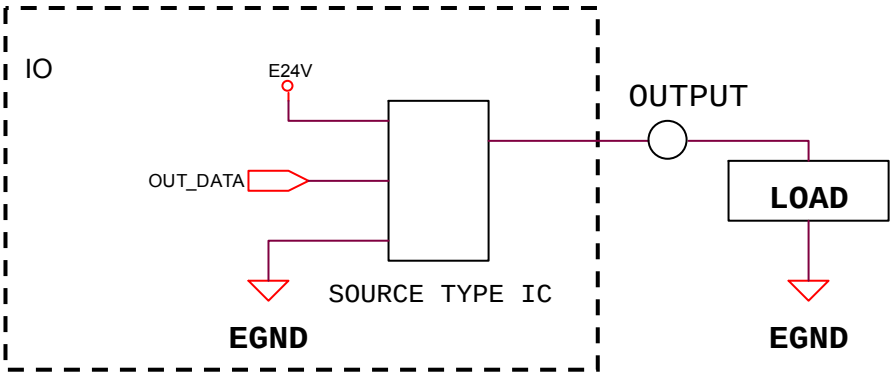
◎Description：D head contains 32 sets of 24V OUT, and E head contains 40 sets of IN.

◎IN points as below：



◎O point direct usage：

O type is SOURCE TYPE, motion output is E24V, max voltage is 60mA.



- **Please do not make the current more then 60 mA, when doing load selection. Otherwise it may have damage to components. E24V/60 mA=400Ω ← Load resistance can not be less than this value.**
- **When O point grounds, if shortcircuit happens, IC will burn out instantly, please pay special attention to is.**

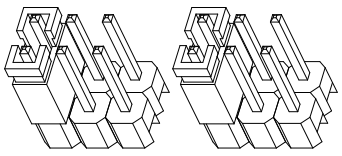
F、G：Spare IO Connector

◎Description：1.F、E head reserve 32OUT/24IN-IO『control interface』, this interface can not be directly used, need to coordinate with SIO-1530 card

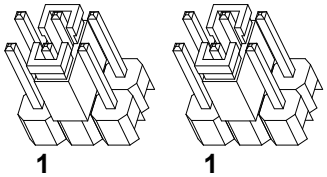
H：SLAVE JUMPER

◎Description：SLAVE number setting, after setting, you need to coordinate with software, PLC plan to work normally. Please do not change randomly.

◎Setting sample：



To be SLAVE1, JUMPER Setting



To be SLAVE2, JUMPER Setting

I：Communication/Power Indicator Light

◎Description：

(1) E5V Indicator light：when SIO-1520 module connects with controller system, sending power, indicator light will be ON, that means the module power is complete.

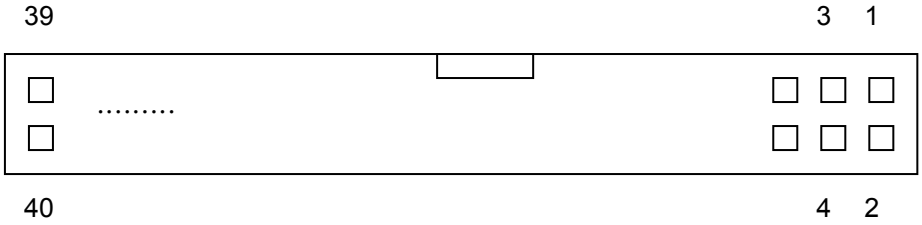
(2) CS、DO Indicator light：If SIO-1520 connect with controller correctly, sending power, CS and DO will ON. If these two lights didn't ON at the same time, there may be some errors in it, there will also have problems after later transmission.

(3) LK、DI Indicator light：When CS、DO Indicator light On, If SIO-1540 module's SLAVE number setting is the same to PLC setting, LK、DI will ON.

(4) E24V Indicator light：When E24V Indicator light ON, that means the O interface power OK, but if it's OFF, O point will not have feedback.

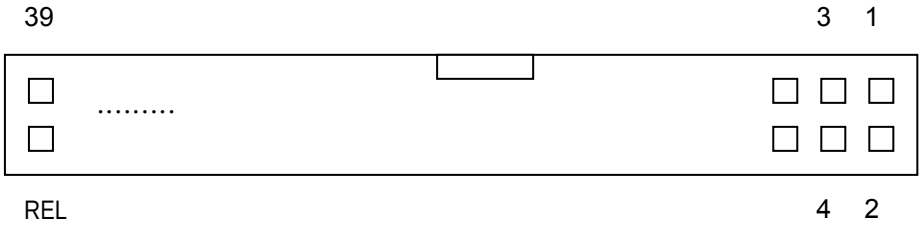
5、Connector PIN definition

1.D：40PIN 2.54 mm SHROUDED HEADER DEFINITION (OUT00~OUT31，TOTAL 32 PINS)



PIN	Definition	PIN	Definition
1	FG	2	FG
3	EGND	4	EGND
5	OUT 31	6	EGND
7	OUT 29	8	OUT 30
9	OUT 27	10	OUT 28
11	OUT 25	12	OUT 26
13	OUT 23	14	OUT 24
15	OUT 21	16	OUT 22
17	OUT 19	18	OUT 20
19	OUT 17	20	OUT 18
21	OUT 15	22	OUT 16
23	OUT 13	24	OUT 14
25	OUT 11	26	OUT 12
27	OUT 09	28	OUT 10
29	OUT 07	30	OUT 08
31	OUT 05	32	OUT 06
33	OUT 03	34	OUT 04
35	OUT 01	36	OUT 02
37	E24V	38	OUT 00
39	E24V	40	E24V

2.E：40PIN 2.54 mm SHROUDED HEADER DEFINITION (IN00~IN39，TOTAL 40 PINS)



PIN	Definition	PIN	Definition
1	IN39	2	IN38
3	IN37	4	IN36
5	IN35	6	IN34
7	IN33	8	IN32
9	IN31	10	IN30
11	IN29	12	IN28
13	IN27	14	IN26
15	IN25	16	IN24
17	IN23	18	IN22
19	IN21	20	IN20
21	IN19	22	IN18
23	IN17	24	IN16
25	IN15	26	IN14
27	IN13	28	IN12
29	IN11	30	IN10
31	IN09	32	IN08
33	IN07	34	IN06
35	IN05	36	IN04
37	IN03	38	IN02
39	IN01	40	IN00

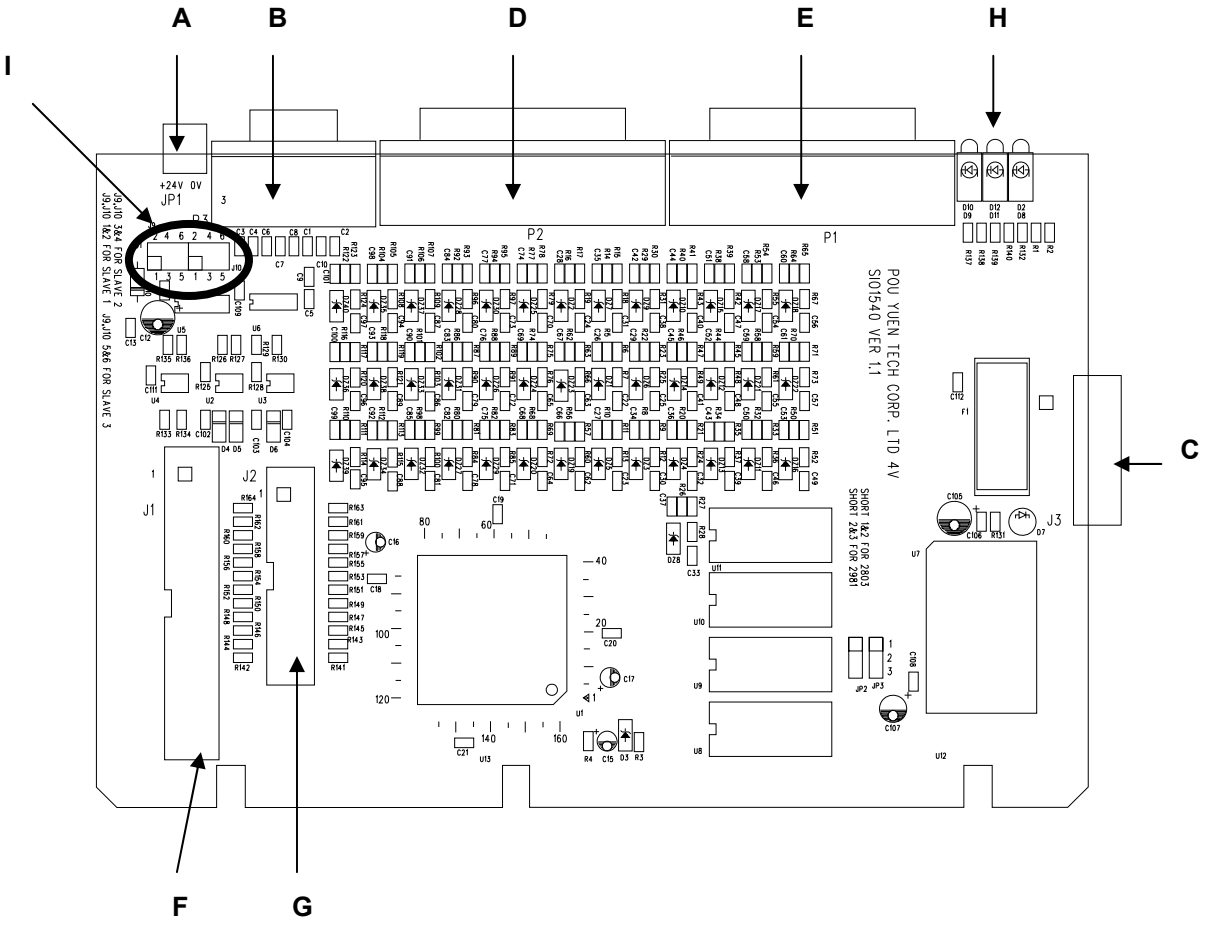
3.7 I/O SIO 1540

I/O-SIO 1540 definition

1、Description：

1.SIO-1540 offers 40 IN /32 OUT(also 24 IN / 32 OUT option)

2、Hardware layout：



3、Connector description：

Power			
Picture	Type	Function	Usage
A	3PIN 3.81mm head	DC(24V) POWER INPUT	To POWER
Light			
Picture	Type	Function	Usage
H	E5V GREEN LED	E5V indicator light	E5V normal>ON
	E24V GREEN LED	E24V indicator light	E24V normal>ON
	CS YELLOW LED	Transmission Light	Connect to controller>On
	DO YELLOW LED	Transmission Light	Connect to controller>On
	DI YELLOW LED	Transmission Light	OK>Lights on
	LK YELLOW LED	Transmission Light	OK>Lights on
IO Connector			
Picture	Type	Function	Usage
B	D_SUB HD 15PIN Jack	Serial Port	To Controller RIO
C	16PIN 2.54mm easy head	Serial Port	To Controller RIO
D	D_SUB HD 44PIN Plug	Back 20 IN/16 OUT	To REL
E	D_SUB HD 44PIN Jack	Front 20 IN/16 OUT	To REL
F	40PIN 2.54 mm easy head	Spare 32 O points	OPTION
G	26PIN 2.54 mm easy head	Spare 24 I points	OPTION
Setting			
Picture	Type	Function	Usage
I	2.54mm JUMPER	SLAVE number setting	Later chapter

4、Setting：

A：E24V Power Connector

◎Description：This pin is for O point outpur power, if this pin has problem, O point output will be error. (Has no effect to IN point).

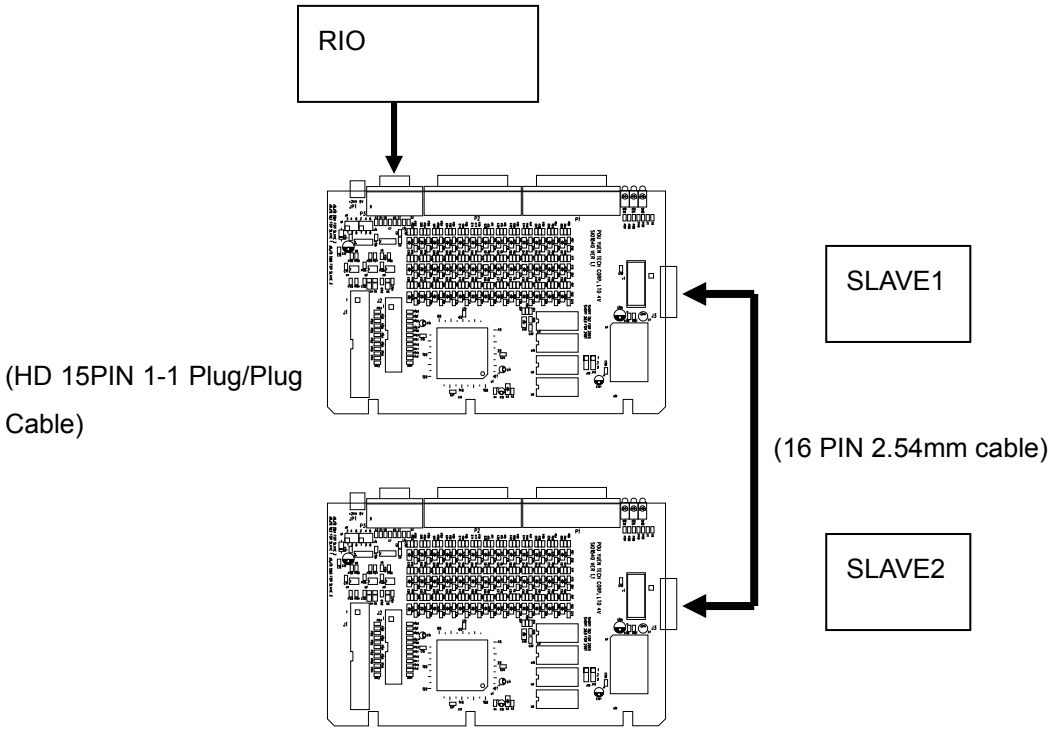
◎Rated Capacity：E24V±0.5V (3A UP)

B、C：Serial Communication Connector

◎Description：1 B、C Connector is for serial connection, need to connect with controller's RIO port.

2 B、C Connector is for pararell signal, is for serial expansion to use.

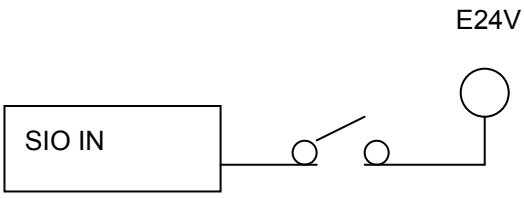
◎Serial expansion example：Serial connection for 2 SIO-1540 cards.



D、E：IO Port

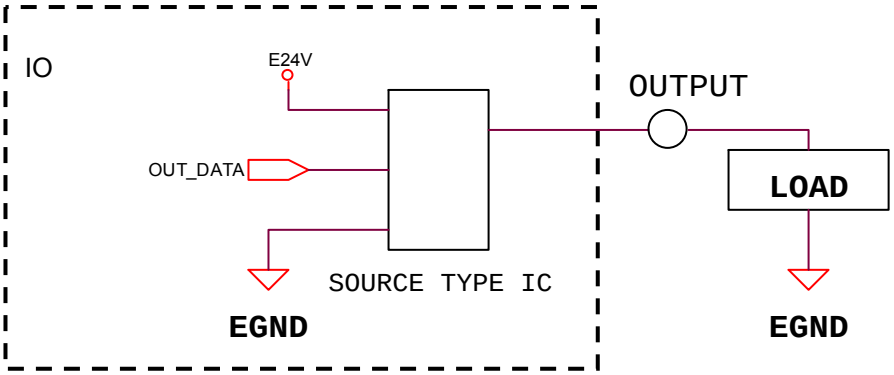
◎Description：1.D、E head connects to REL to do IO controller. Each port can control 20IN/16OUT to coordinate with REL board.

◎IN points as below：(REL is not used together)



◎O point direct usage：(REL is not used together)

O type is SOURCE TYPE, motion output is E24V, max voltage is 60mA



- **Please do not make the current more then 60 mA, when doing load selection. Otherwise it may have damage to components. E24V/60 mA=400Ω ← Load resistance can not be less than this value.**
- **When O point grounds, if shortcircuit happens, IC will burn out instantly, please pay special attention to is.**

F、G：Spare IO Connector

◎Description：1 F、E head reserve 32OUT/24IN-IO『control interface』, this interface can not be directly used, need to coordinate with SIO-1530 card.

H：Communication/Power Light

◎Description：

(1) E5V Indicator light：when SIO-1540 module connects with controller system, sending power, indicator light will be ON, that means the module power is complete.

(2) CS、DO Indicator light：If SIO-1540 connect with controller correctly, sending power, CS and DO will ON. If these two lights didn't ON at the same time, there may be some errors in it, there will also have problems after later transmission.

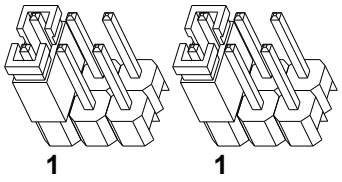
(3) LK、DI Indicator light：When CS、DO Indicator light On, If SIO-1540 module's SLAVE number setting is the same to PLC setting, LK、DI will ON.

(4) E24V Indicator light：When E24V Indicator light ON, that means the O interface power OK, but if it's OFF, O point will not have feedback.

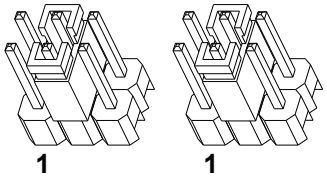
I：SLAVE JUMPER

◎Description：SLAVE number setting, after setting, you need to coordinate with software, PLC plan to work normally. Please do not change randomly.

◎Setting Sample：



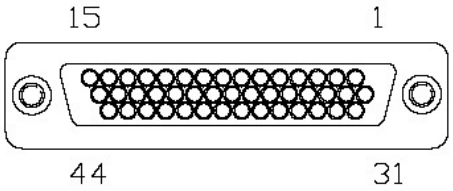
To be SLAVE1，JUMPER Setting



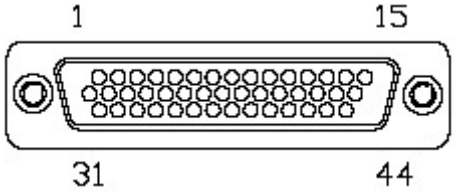
To be SLAVE2，JUMPER Setting

5、PIN Definition

1.E：44 PIN HD Connector (Jack) definition, please refer to annex 2



2.D：44 PIN HD Connector（Plug）definition, please refer to annex 2



3.8 I/O EIO2000 Definition

Specification

1.Type(1)- 40 IN / 32 OUT ; Type(2)- 60 IN / 48 OUT

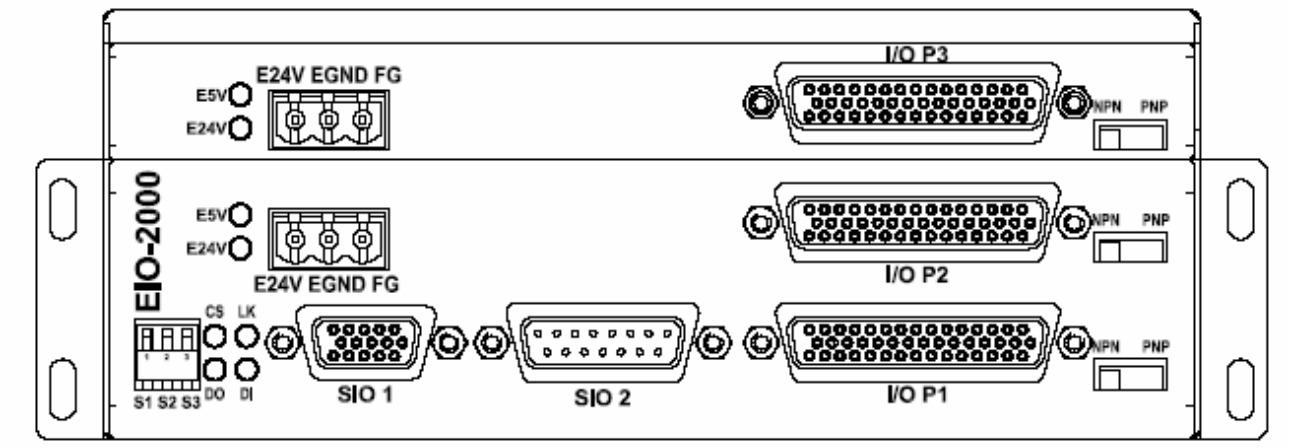
2.Every serial port can connect with 2 sets of EIO-2000；Max to be 120 IN / 96 OUT.

3.NPN and PNP mode setting.

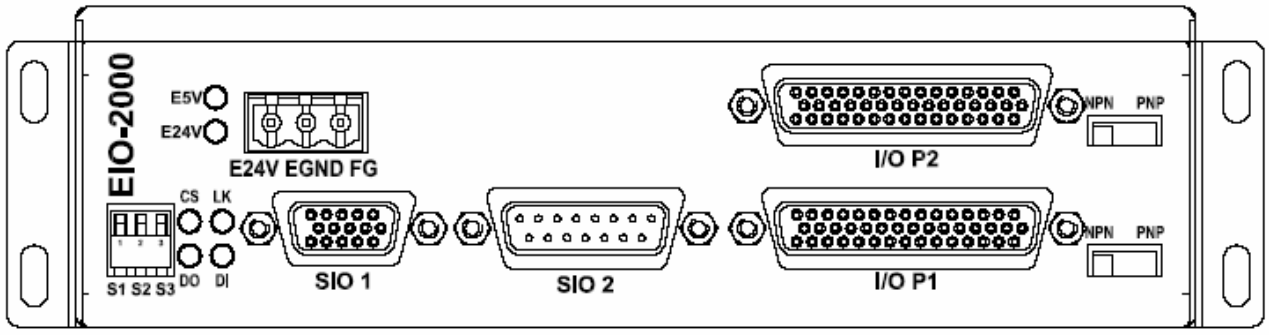
4.SLAVE number setting (1~3).

Hardware：

EIO-2000(60in 48out)



EIO-2000(40in 32out)



Connector Light Description

Power			
Picture	Component	Function	Description
E24V EGND FG	3PIN 5.08mm	DC(24V)POWER/FG	Connect to Power/chassis
Light			
Picture	Component	Function	Description
E5V	Green LED	E5V light	
E24V	Green LED	E24V light	
CS	Yellow LED	Sending state light	Connect to controller>On
DO	Yellow LED	Sending state light	Connect to controller>On
DI	Yellow LED	Sending state light	OK>Lights on
LK	Yellow LED	Sending state light	OK>Lights on
IO Connector			
Picture	Component	Function	Description
SIO1	HD_SUB 15PIN Jack	Serial port	To controller RIO port
SIO2	D_SUB 15PIN Jack	Serial port	To controller RIO port*1
I/O P1	HD_SUB 44PIN Jack	20IN/16OUT IO port	To REL
I/O P2	HD_SUB 44PIN Jack	20IN/16OUT IO port	To REL
I/O P3	HD_SUB 44PIN Jack	20IN/16OUT IO port	To REL
Setting			
Picture	Component	Function	Description
S1 S2 S3		SLAVE number setting	The one is『ON』, others are OFF
NPN PNP		IN mode	20 IN are all at the same mode

*1 SIO1 and SIO2 is one on one parallel circuit for serial connection.

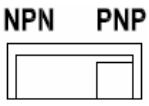
Setting and light description

(A) PNP & NPN switch：

You can use this switch to change EIO-2000 IN mode to make the 20 IN to be the same mode. (P1~P3), each connector can be set independently.

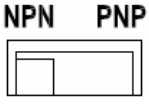
(1)PNP mode：(default)

When changing to PNP, this IN will be set to be PNP mode> external signal is E24V, at this time this IN works.



(2) NPN mode：

When changing to NPN, this IN will be set to be NPN mode> external signal is EGND, at this time this IN works.



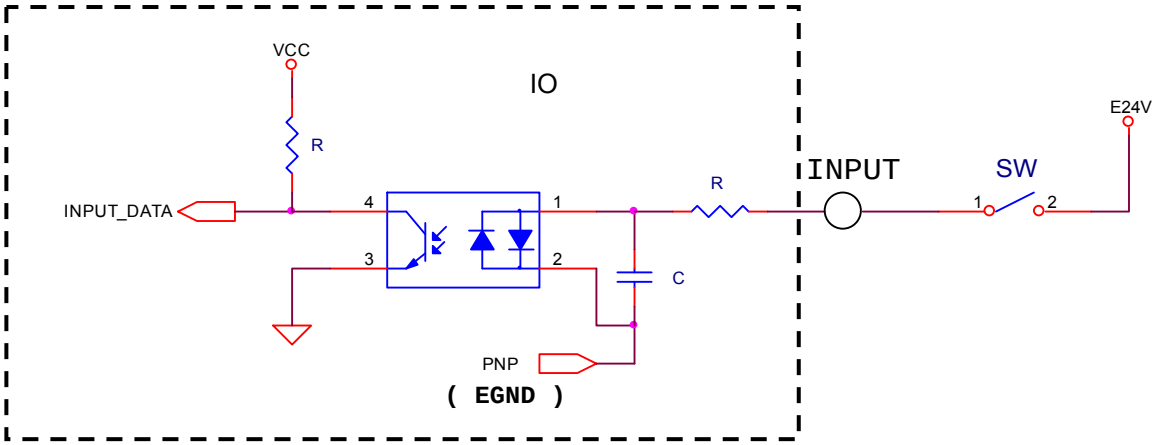
- **Component powet should be the same with E24V and EGND, otherwise the IN will be invalid.**
- **Please switch off E24V power and do mode switching, make sure not to do switching while electricity ON.**

(B) IO Port (P1、P2、P3)：

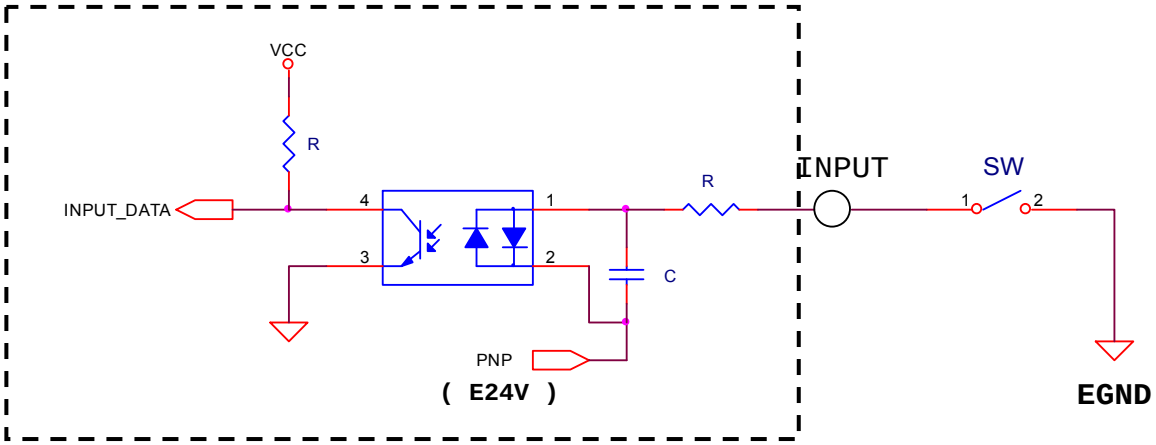
This Pin is to REL board to do IO control. Every port can control 20IN/16OUT with REL board.

(1) IN Usage (Take A point to be example)

PNP：

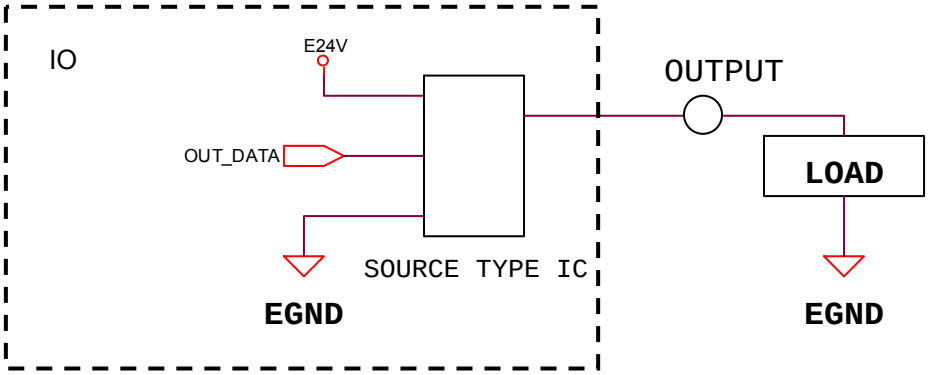


NPN：



(2) OUT Usage

OUT type is SOURCE TYPE, motion output is E24V, max voltage is 60mA.



Notice：

- **Please do not make the current more then 60 mA, when doing load selection. Otherwise it may have damage to components. E24V/60 mA=400Ω ← Load resistance can not be less than this value.**
- **When O point grounds, if shortcircuit happens, IC will burn out instantly, please pay special attention to is.**

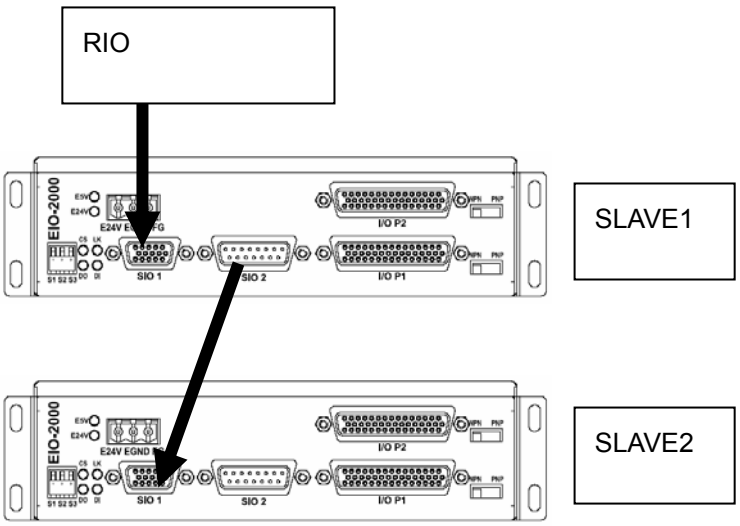
(C) Serial Port SIO1、SIO2：

1.SIO1、SIO2 is serial communication control connector, need to connect with controller RIO port.

2.SIO1、SIO2 are 2 serial connectors for serial connection to expand.

Usage is as below：

(Take serial connection of 2 sets of 40IN/32OUT for example)

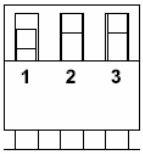


- **Serial connection cable is one on one cables, please make sure the shielding of wire, refer to annex 1.**

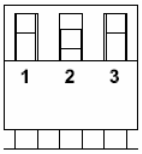
(D) SLAVE Switch：

This switch is slave number setting, you need to use software, PLC planning to coordinate with this, please do not change randomly.

1.(S1) pull to the end, 2 and 3 pull to upper side, this IO mode is SLAVE1.



2.(S2) pull to the end, 1 and 3 pull to upper side, this IO mode is SLAVE2.



(E) E24V/EGND power input terminal：

1.40 IN /32 OUT module has 1 power connector, and 60IN /48 OUT module has 2 power connector. This power is for IO input and output. When using this module, please input E24V at 2 connectors to make the power stable.

2.When the power is introduced correctly, the E24V light will on.

- **Input voltage range is between 22V~26V.**
- **FG connect to power chassis, not to EGND. If the chassis connects to EGND, system will have error, please pay more attention on the wiring.**

(F) Light description：

E5V Light：

After EIO2000 and controller connecting to each other, send electricity and this light is ON> Module power is OK.

CS、DO Light：

After EIO2000 and controller connecting to each other, send electricity and CS、DO will be ON, but if not> there is error and the communication will be error too.

LK、DI Light：

When CS、DO is ON > if the EIO2000's SLAVE number setting is in accordance with PLC> the communication is OK>LK、DI will be ON.

E24V Light：

E24V is on> IO interface power is correct, if this light is OFF, IO will not have action.

IO Connector PIN definition is 3 connectors, please refer to annex 2.

3.9 REL 2840 definition

REL2840

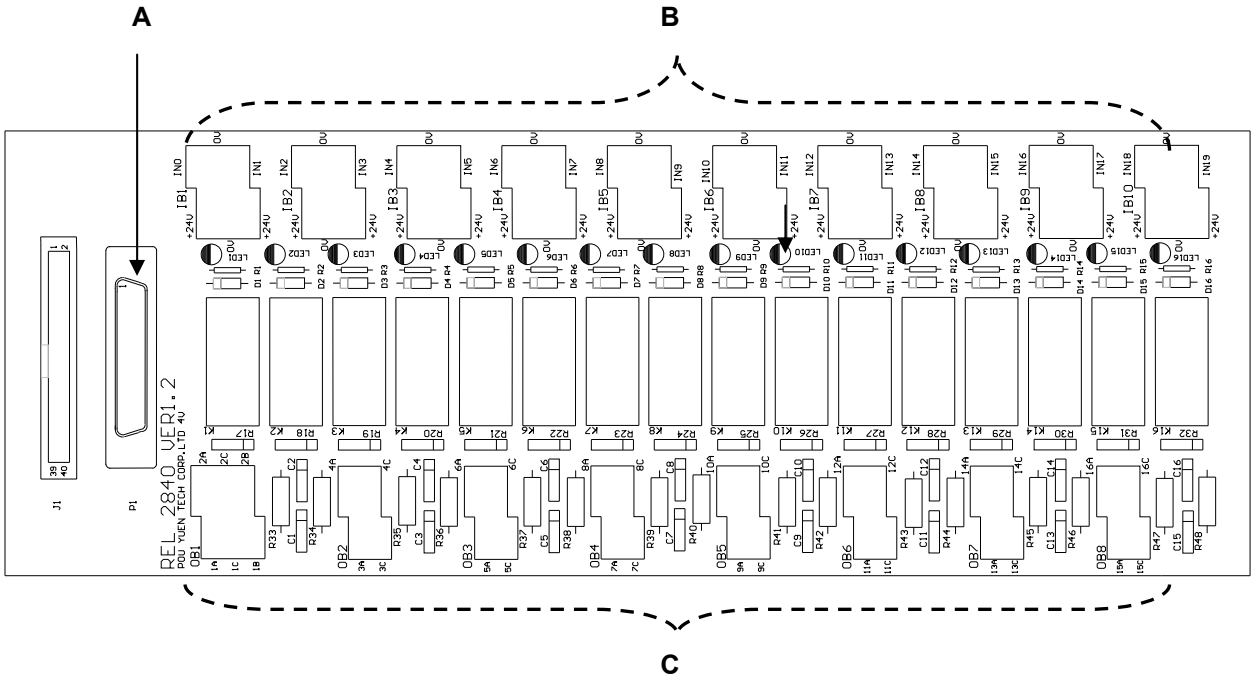
1、Description：

1) Offers 20 sets of IN and E24V/EGND input point with terminal lock.

2) Output side offers 2 sets of A、B、C connects and 14 sets of A、C connects, total for 16 sets of output.

3) Input connect capacity is AC 6A/250V.

2、Hardware layout：



3、Connector description：

IO Connector			
Picture	Component	Function	Description
A	D_SUB HD 44PIN Jack	20 IN / 16 OUT	SIO
B	5.08mm Connector with lock	IN Connector	To external component
C	5.08mm Connector with lock	OUT Connector	To external component

Note 1：B Connector with terminal lock offers 20 sets of EGN and 20 sets of E24V Connector to cooperate with input.

Note 2：Every RELAY will have its own red LED, when the output is ON, the LED will be ON. Users can use this to debug for relay and output points.

4、Setting：

A：IO Control Connector

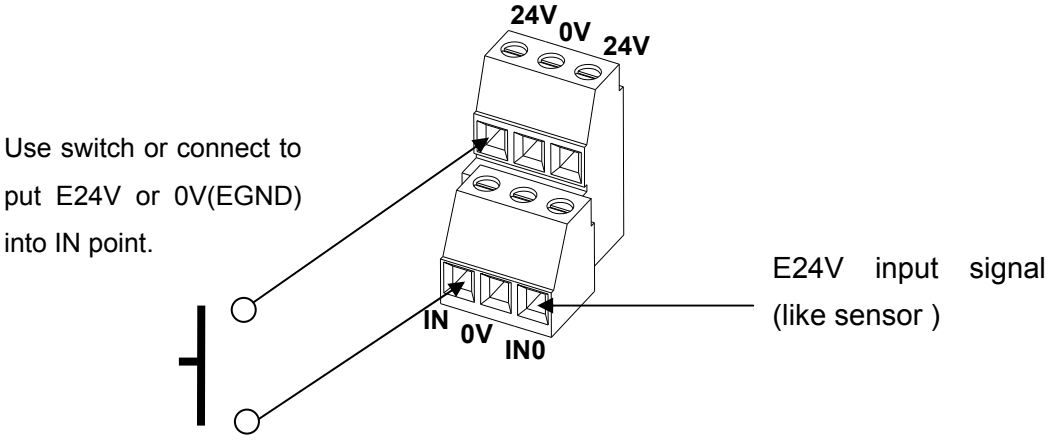
◎Description：This connector is 20 IN/16 OUT IO control connector to connect 與 with SIO and EIO.

B：IN Connector

◎Description：1.IN signal will be lead in by these connectors, via IO control connector to return back to SIO and EIO.

2.The E24V and EGND(0V) of Connector was lead by SIO and EIO, via IO control connector to REL-2840.

◎IN Connector usage sample：

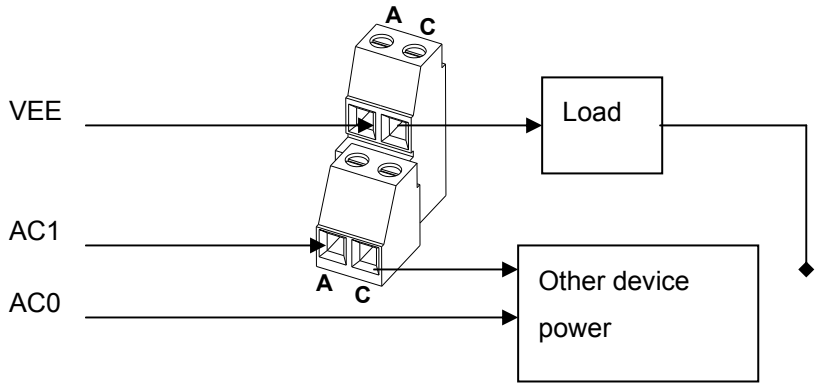


- **When using NPN IN, please make sure the SIO and EIO support NPN mode.**
- **Please follow direction to do wiring, not make E24V and EGND at short circuit situation.**

C：OUT Connector

◎Description：REL-2840 O Connector is at RELAY A and C, capacity is 6A / 250V.

◎OUT Connector usage sample：



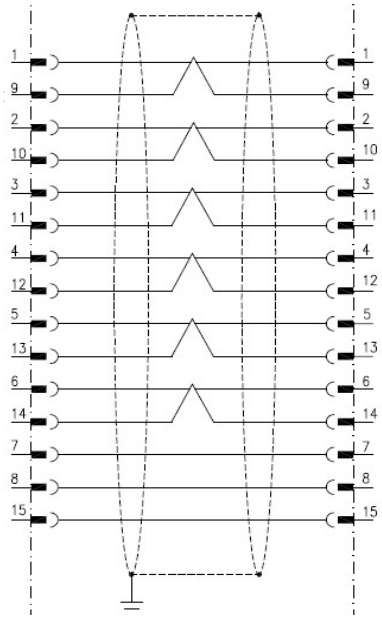
Annex 1：

SIO serial communication cable information:

*Cable is one on one.

*Use pair twisted cables

*The metal shield must be connected.



Annex 2：

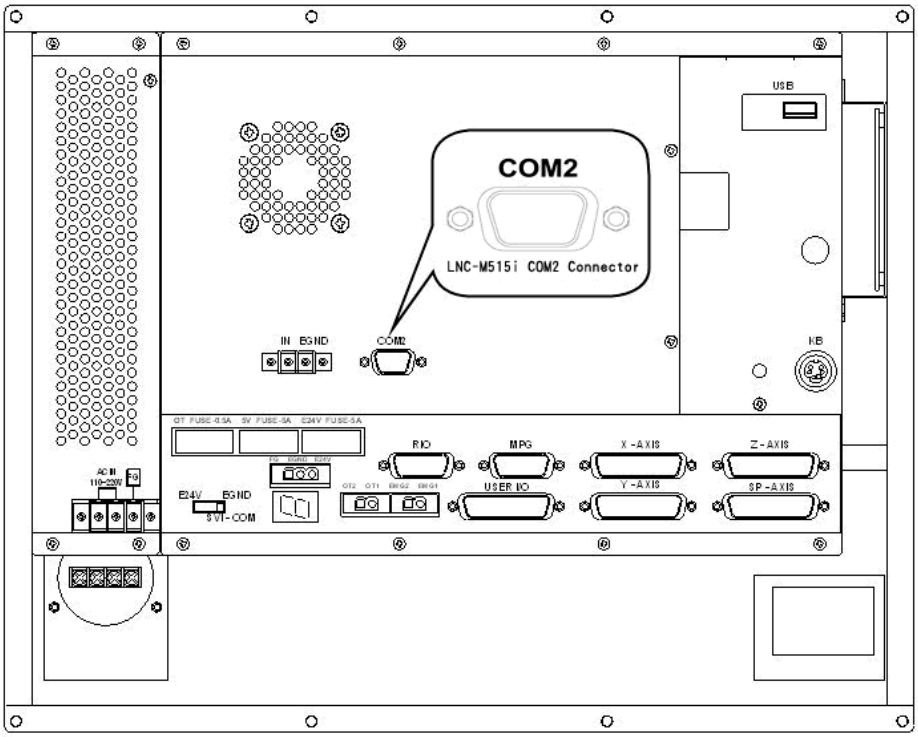
HD_SUB 44PIN(1) definition『USER IO(plug)/SIO1540(Jack)/EIO2000(Jack)』					
PIN	Definition	PIN	Definition	PIN	Definition
1	IN 00	16	IN 01	31	IN 02
2	IN 03	17	IN 04	32	IN 05
3	IN 06	18	IN 07	33	IN 08
4	IN 09	19	IN 10	34	IN 11
5	IN 12	20	IN 13	35	IN 14
6	IN 15	21	IN 16	36	IN 17
7	IN 18	22	IN 19	37	OUT 02
8	OUT 00	23	OUT 01	38	OUT 05
9	OUT 03	24	OUT 04	39	OUT 08
10	OUT 06	25	OUT 07	40	OUT 11
11	OUT 09	26	OUT 10	41	OUT 14
12	OUT 12	27	OUT 13	42	-
13	OUT 15	28	-	43	E24V
14	-	29	-	44	E24V
15	EGND	30	EGND	-	-

HD_SUB 44PIN(2)definition 『SIO1540(Plug)/EIO2000(Jack)』					
PIN	Definition	PIN	Definition	PIN	Definition
1	IN 20	16	IN 21	31	IN 22
2	IN 23	17	IN 24	32	IN 25
3	IN 26	18	IN 27	33	IN 28
4	IN 29	19	IN 30	34	IN 31
5	IN 32	20	IN 33	35	IN 34
6	IN 35	21	IN 36	36	IN 37
7	IN 38	22	IN 39	37	OUT 18
8	OUT 16	23	OUT 17	38	OUT 21
9	OUT 19	24	OUT 20	39	OUT 24
10	OUT 22	25	OUT 23	40	OUT 27
11	OUT 25	26	OUT 26	41	OUT 30
12	OUT 28	27	OUT 29	42	-
13	OUT 31	28	-	43	E24V
14	-	29	-	44	E24V
15	EGND	30	EGND	-	-

HD_SUB 44PIN(3) definition『EIO2000(Jack)(60IN / 48OUT) has this Connector 』					
PIN	Definition	PIN	Definition	PIN	Definition
1	IN 40	16	IN 41	31	IN 42
2	IN 43	17	IN 44	32	IN 45
3	IN 46	18	IN 47	33	IN 48
4	IN 49	19	IN 50	34	IN 51
5	IN 52	20	IN 53	35	IN 54
6	IN 55	21	IN 56	36	IN 57
7	IN 58	22	IN 59	37	OUT 34
8	OUT 32	23	OUT 33	38	OUT 37
9	OUT 35	24	OUT 36	39	OUT 40
10	OUT 38	25	OUT 39	40	OUT 43
11	OUT 41	26	OUT 42	41	OUT 46
12	OUT 44	27	OUT 45	42	-
13	OUT 47	28	-	43	E24V
14	-	29	-	44	E24V
15	EGND	30	EGND	-	-

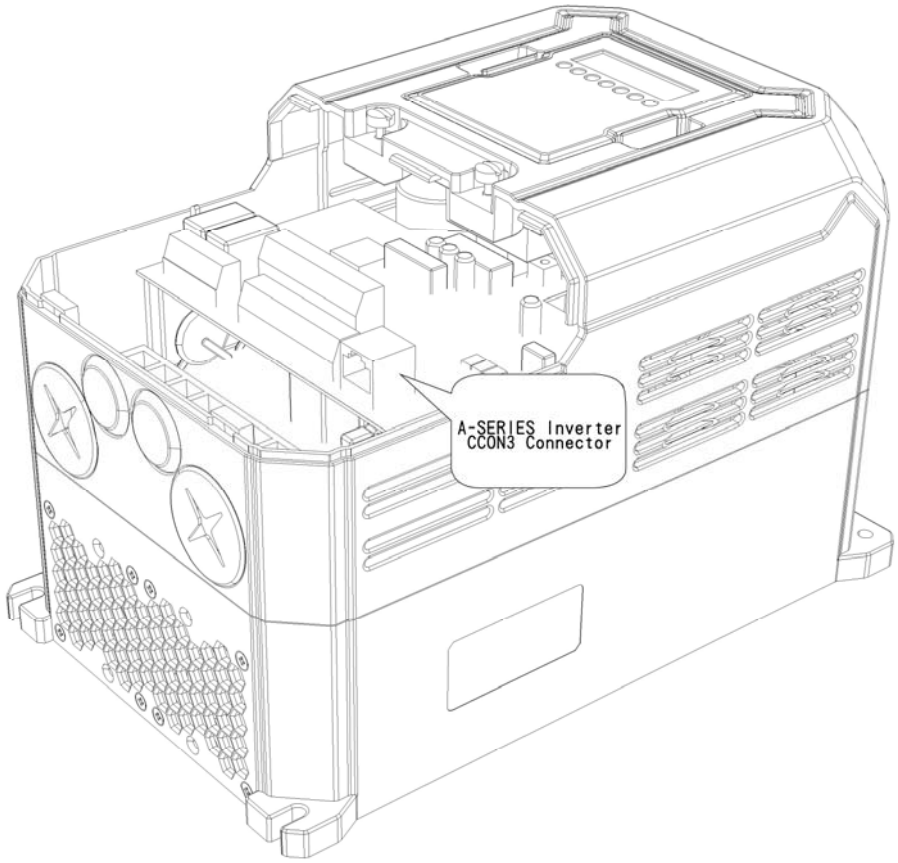
3.10 LNC-M515i + A-SERIES Inverter communication wiring description :

1.LNC-M515i port：



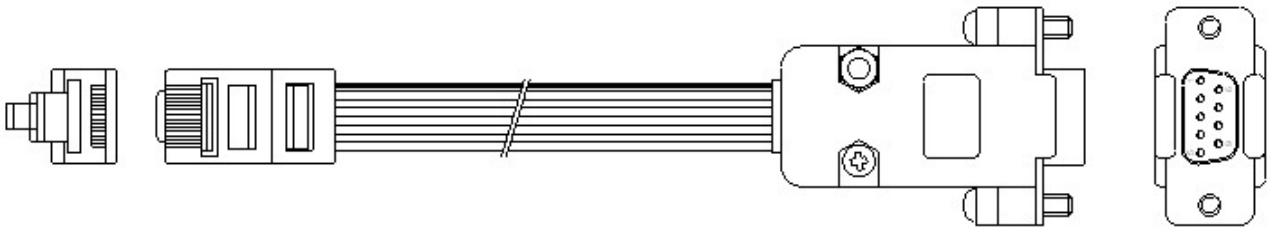
Use LNC-M515i COM2 Port

2.A-SERIES Inverter port：



Use A-SERIES CCON3 Port

3.Cable type：



A-SERIES Inverter communication cable

4.PIN definition：

PIN	A-SERIES CCON3 Port	LNC-M515i COM2 Port
1 PIN	RX-	TX-
2 PIN	RX+	TX+
3PIN	TX+	RX+
4 PIN	TX-	RX-
5 PIN		
6 PIN		
7 PIN		
8PIN		
9 PIN		

5.Notice：

1.LNC-M515i: Need to make COM2 to be RS422.

2.A-SERIES Inverter communication cable is special cable, need to choose from LNC.

3.There are 1M、3M、5M、7M for selection.

4 MLC Maintenance -- C，S BITS & Register

4.1 C BIT Definition

C BIT PLC→CNC

BIT #	SYMBOL	DESCRIPTION	PAGE
000	ST	CYCLE START	68
001	SP	FEED HOLD	68
003	PPROT	PROGRAM PROTECTION	68
004	MANRET	MANUAL RETURN	68
005	MWSWT	Manual Working Coordinate Measurement Write	68
006	+X	SELECT AXIS & DIRECTION: ＋X	69
007	-X	SELECT AXIS & DIRECTION: －X	69
008	+Y	SELECT AXIS & DIRECTION: ＋Y	69
009	-Y	SELECT AXIS & DIRECTION: －Y	69
010	+Z	SELECT AXIS & DIRECTION: ＋Z	69
011	-Z	SELECT AXIS & DIRECTION: －Z	69
012	+4	+4 Axis Direction	69
013	-4	-4 Axis Direction	69
014	MOFSIN	Manual Tool Geometry OFFSET Measuring Mode Signal	69
015	MWSRQ	Condition Request of Manual Working Coordinate Measurement	71
016	HX	SELECT MPG AXIS: X AXIS	71
017	HY	SELECT MPG AXIS: Y AXIS	71
018	HZ	SELECT MPG AXIS: Z AXIS	71
019	H4	Handle 4th Axis	71
020	MPGDRN	MPG DRY RUN	71
021	SCNSAV	QUIT SCREENSAVER	71
022	CUTREL	Cutting Command Release Signal	71
023	RT	RAPID TRAVEL	71
024	SRVOFF	Servo OFF	71
031	HOMEX	HOME DOG: X AXIS	72
032	HOMEY	HOME DOG: Y AXIS	72
033	HOMEZ	HOME DOG: Z AXIS	72
034	HOME4	4th Axis Home DOG Signal	72
036	ESP	EMERGENCY STOP	72
037	ERS	EXTERNAL RESET	72
038	FIN	M, S, T CODE FINISH	72

BIT #	SYMBOL	DESCRIPTION	PAGE
040	SBK	SINGLE BLOCK	72
041	BDT	OPTIONAL BLOCK SKIP	72
042	DRN	DRY RUN	73
043	MLK	MACHINE LOCK	73
044	OPS	M01 OPTIONAL STOP	73
045	ZNG	IGNORE SERVO AXIS: Z AXIS	73
046	AFL	AUXILIARY FUNCTION LOCK	73
049	4NG	SERVO AXIS IGNORE SERVO AXIS: THE 4TH AXIS	73
050	+LX	AXIS OVER TRAVEL: ＋X	74
051	-LX	AXIS OVER TRAVEL: －X	74
052	+LY	AXIS OVER TRAVEL: ＋Y	74
053	-LY	AXIS OVER TRAVEL: －Y	74
054	+LZ	AXIS OVER TRAVEL: ＋Z	74
055	-LZ	AXIS OVER TRAVEL: －Z	74
056	+L4	+4th Axis OT	74
057	-L4	-4th Axis OT	74
059	INTLKX	AXIS INTERLOCK: X AXIS	75
060	INTLKY	AXIS INTERLOCK: Y AXIS	75
061	INTLKZ	AXIS INTERLOCK: Z AXIS	75
062	INTLK4	4th Axis Interlock	75
064	WINRW	PLC WINDOW READ/WRITE	84
065	WINREQ	PLC WINDOW COMMAND	84
066	HIX	HANDLE INTERRUPT: X AXIS	75
067	HIY	HANDLE INTERRUPT: Y AXIS	75
068	HIZ	HANDLE INTERRUPT: Z AXIS	75
069	HI4	4th Axis: Select Axis Direction Signal of Handle INT	75
072	S1JOG	1st Spindle JOG	75
073	S2JOG	2rd Spindle JOG	75
074	S3JOG	3rd Spindle JOG	75
075	SVAX	SERVO ALARM: X AXIS	75
076	SVAY	SERVO ALARM: Y AXIS	75
077	SVAZ	SERVO ALARM: Z AXIS	75
078	SVA4	4th Axis Servo Alarm	75
080	S3CW	3rd Spindle CW	76
081	S3CCW	3rd Spindle CCW	76
082	S1CW	1st Spindle CW	76
083	S1CCW	1st Spindle CCW	76

BIT #	SYMBOL	DESCRIPTION	PAGE
085	ORT	Spindle Orientation	**76**
087	S2CW	2nd Spindle CW	**76**
088	S2CCW	2nd Spindle CCW	**76**
089	MRX	ENABLE MIRROR: X AXIS	**76**
090	MRY	ENABLE MIRROR: Y AXIS	**76**
091	MRZ	ENABLE MIRROR: Z AXIS	**76**
092	MR4	4th Axis Servo Alarm	**76**
095	SFPOS	Select Semi-Constand Position of Spindle	**76**
097	S1GR1	1st Spindle Gear #1	**77**
098	S1GR2	1st Spindle Gear #2	**77**
099	S1GR3	1st Spindle Gear #3	**77**
100	UI0	MACRO Variable $120	**77**
101	UI1	MACRO Variable $121	**77**
102	UI2	MACRO Variable $122	**77**
103	UI3	MACRO Variable $123	**77**
104	UI4	MACRO Variable $124	**77**
105	UI5	MACRO Variable $125	**77**
106	UI6	MACRO Variable $126	**77**
107	UI7	MACRO Variable $127	**77**
108	UI8	MACRO Variable $128	**77**
109	UI9	MACRO Variable $129	**77**
110	UI10	MACRO Variable $130	**77**
111	UI11	MACRO Variable $131	**77**
112	UI12	MACRO Variable $132	**77**
113	UI13	MACRO Variable $133	**77**
114	UI14	MACRO Variable $134	**77**
115	UI15	MACRO Variable $135	**77**
116	S2GR1	2nd Spindle Gear #1	**77**
117	S2GR2	2nd Spindle Gear #2	**77**
118	S2GR3	2nd Spindle Gear #3	**77**
119	ZP2ZDC	MOTION PROHIBITION FOR AREA BELOW THE 2ND ZERO POINT OF Z AXIS	**78**
120	PMCGO	COMMAND SIGNAL OF PMC AXIS	**78**
121	S3GR1	3rd Spindle Gear #1	**77**
122	S3GR2	3rd Spindle Gear #2	**77**
123	S3GR3	3rd Spindle Gear #3	**77**
125	RTST	Enable Signal in Rigid Tapping	**78**
128	+MIT1	Manual Tool Geometry OFFSET Measurment Touching Signal:+X	**69**

BIT #	SYMBOL	DESCRIPTION	PAGE
129	-MIT1	Manual Tool Geometry OFFSET Measurment Touching Signal:-X	**69**
130	DTX	X Axis Detach	**78**
131	DTY	Y Axis Detach	**78**
132	DTZ	Z Axis Detach	**78**
133	DT4	4th Axis Detach	**78**
134	PRTCLR	CLEAR PART COUNT NUMBER	**78**
136	TCDE	Lathe Thread-Cutting Cycle: Right Angle Tool-Shifting Enable Signal	**78**
137	TCUE	Lathe Thread-Cutting Cycle: Right Angle Tool-Lifting Enable Signal	**78**
138	+MIT2	Manual Tool Geometry OFFSET Measurment Touching Signal:+Z	**69**
139	-MIT2	Manual Tool Geometry OFFSET Measurment Touching Signal:-Z	**69**
140	2NDSLX	THE 2ND SOFT-LIMIT: ＋X	**79**
141	2NDSLX	THE 2ND SOFT-LIMIT: －X	**79**
142	2NDSLY	THE 2ND SOFT-LIMIT: ＋Y	**79**
143	2NDSLY	THE 2ND SOFT-LIMIT: －Y	**79**
144	2NDSLZ	THE 2ND SOFT-LIMIT: ＋Z	**79**
145	2NDSLZ	THE 2ND SOFT-LIMIT: －Z	**79**
146	2NDSL4	2nd +4th Axis Software Limit Choice	**79**
147	2NDSL4	2nd -4th Axis Software Limit Choice	**79**
172	UCLF1	1st Spindle Release	**80**
173	CLF1	1st Spindle Lock	**80**
201	AERSTX	Absolute encoder Reset Ready Signal:X Axis	**83**
202	AERSTY	Absolute encoder Reset Ready Signal:Y Axis	**83**
203	AERSTZ	Absolute encoder Reset Ready Signal:Z Axis	**83**
204	AERST4	Absolute encoder Reset Ready Signal:4th Axis	**83**
207	AERDYX	Absolute Encoder Data Ready Signal:X Axis	**83**
208	AERDYY	Absolute Encoder Data Ready Signal:Y Axis	**83**
209	AERDYZ	Absolute Encoder Data Ready Signal:Z Axis	**83**
210	AERDY4	Absolute Encoder Data Ready Signal:4th Axis	**83**
213	AEB0X	Absolute Encoder Data Bit 0Transmitting Signal : X Axis	**83**
214	AEB0Y	Absolute Encoder Data Bit 0Transmitting Signal : Y Axis	**83**
215	AEB0Z	Absolute Encoder Data Bit 0Transmitting Signal : Z Axis	**83**
216	AEB04	Absolute Encoder Data Bit 0Transmitting Signal : 4th Axis	**83**
219	AEB1X	Absolute Encoder Bit 1 Transmit: X Axis	**83**
220	AEB1Y	Absolute Encoder Bit 1 Transmit: Y Axis	**83**
221	AEB1Z	Absolute Encoder Bit 1 Transmit: Z Axis	**83**
222	AEB14	Absolute Encoder Bit 1 Transmit: 4th Axis	**83**
230	S2FB	Selecting the 2nd spindle Encoder as Loop Signal Source	**84**

BIT #	SYMBOL	DESCRIPTION	PAGE
231	S3FB	Selecting the 3rd spindle Encoder as Loop Signal Source	**84**

4.2 S BIT Definition

S BIT CNC→PLC

BIT #	SYMBOL	DESCRIPTION	PAGE
000	STL	CYCLE START	**85**
001	SPL	FEED HOLD	**85**
002	EDITL	MODE: EDIT	**85**
003	MEML	MODE: MEM	**85**
004	MDIL	MODE: MDI	**85**
005	JOGL	MODE: JOG	**85**
006	INCJOG	MODE: INC JOG	**85**
007	MPGL	MODE: MPG	**85**
008	HOMEL	MODE: HOME	**85**
010	MREADY	MACHINE READY	**85**
011	MDIPRS	MDI KEYS	**85**
016	ZP1X	STATUS OF X AXIS AT THE 1ST ZERO POINT	**85**
017	ZP1Y	STATUS OF Y AXIS AT THE 1ST ZERO POINT	**85**
018	ZP1Z	STATUS OF Z AXIS AT THE 1ST ZERO POINT	**85**
019	ZP14	4th 1st Axis Point Return End	**85**
020	ZP2X	STATUS OF X AXIS AT THE 2ND ZERO POINT	**85**
021	ZP2Y	STATUS OF Y AXIS AT THE 2ND ZERO POINT	**85**
022	ZP2Z	STATUS OF Z AXIS AT THE 2ND ZERO POINT	**85**
023	ZP24	4th 2nd Axis Point Return End	**85**
028	WRN	SYSTEM ALARM	**86**
029	MF	M CODE STROBE	**86**
030	DEN	INTERPOLATION FINISH	**86**
031	AL	SYSTEM ALARM	**86**
032	RST	SYSTEM RESET	**86**
033	NCRDY	SYSTEM READY	**86**
035	X1000	STATUS OF MPG RATE: x1000	**86**
036	X1	STATUS OF MPG RATE: x1	**86**
037	X10	STATUS OF MPG RATE: x10	**86**
038	X100	STATUS OF MPG RATE: x100	**86**
040	SBKL	STATUS OF SINGLE BLOCK	**86**
041	BDTL	STATUS OF OPTIONAL BLOCK SKIP	**87**

BIT #	SYMBOL	DESCRIPTION	PAGE
042	DRNL	STATUS OF DRY RUN	**87**
043	MLKL	STATUS OF MACHINE LOCK	**87**
044	OPSL	STATUS OF OPTIONAL STOP	**87**
045	RTL	STATUS OF RAPID TRAVERSE	**87**
046	ZNGL	STATUS OF Z-AXIS NEGLECT	**87**
047	AFLL	STATUS OF AUXILIARY FUNCTION LOCK	**87**
052	S2ZSA	2nd Spindle Zero Speed Arrival	**91**
053	S2SA	2nd Spindle Speed Arrival	**90**
054	S1STB	S CODE STROBE	**87**
055	S2STB	2nd Spindle S Code	**87**
056	S3STB	2nd Spindle S Code	**87**
057	S3ZSA	3rd Spindle Zero Speed Arrival	**91**
058	S3SA	3rd Spindle Speed Arrival	**90**
061	SK2	SOFT PANEL KEY: Z-AXIS NEGLECT	**87**
062	SK3	SOFT KEY: MPG DRY RUN	**88**
063	SK4	SOFT KEY: AUXILIARY FUNCTION LOCK OF M, S, T CODE	**88**
068	MPGDRN	MPG DRY RUN	**88**
069	TSTB	T CODE STROBE	**88**
071	SK6	SOFT KEY: MACHINE LOCK	**89**
072	SK7	SOFT KEY: DRY RUN	**89**
073	SK8	SOFT KEY: OPTIONAL BLOCK SKIP	**89**
074	SK9	SOFT KEY: OPTIONAL STOP	**90**
079	PLCFN	PLC WINDOW COMPLETED	**93**
080	M00	M00 STROBE	**90**
081	M01	M01 STROBE	**90**
082	M02	M02 STROBE	**90**
083	M30	M30 STROBE	**90**
086	ORTFIN	FINISH SPINDLE ORIENTATION	**90**
088	S1SA	THE 1ST SPINDLE REACHES ROTATION SPEED	**90**
091	G80	STATUS OF G080 IN CANNEL CYCLE	**90**
092	S1ZSA	THE 1ST SPINDLE REACHES ZERO SPEED	**91**
094	S1PLS	Spindle Command Format is Pulse signal	**91**
095	SFPOSF	Spindle Semi-Constant Positioning Finish	**91**
096	UCLR1	Request Signal of 1st Spindle Release	**91**
097	CLR1	Request Signal of 1st Spindle Lock	**91**
100	UO0	MACRO Variable $320	**91**
101	UO1	MACRO Variable $321	**91**

BIT #	SYMBOL	DESCRIPTION	PAGE
102	UO2	MACRO Variable $322	**91**
103	UO3	MACRO Variable $323	**91**
104	UO4	MACRO Variable $324	**91**
105	UO5	MACRO Variable $325	**91**
106	UO6	MACRO Variable $326	**91**
107	UO7	MACRO Variable $327	**91**
108	UO8	MACRO Variable $328	**91**
109	UO9	MACRO Variable $329	**91**
110	UO10	MACRO Variable $330	**91**
111	UO11	MACRO Variable $331	**91**
112	UO12	MACRO Variable $332	**91**
113	UO13	MACRO Variable $333	**91**
114	UO14	MACRO Variable $334	**91**
115	UO15	MACRO Variable $335	**91**
120	PMCFIN	PMC AXIS	**92**
128	RTMODE	RIGID TAPPING	**92**
130	MOVX	MOTION STATUS OF SERVO AXIS: X AXIS	**92**
131	MOVY	MOTION STATUS OF SERVO AXIS: Y AXIS	**92**
132	MOVZ	MOTION STATUS OF SERVO AXIS: Z AXIS	**92**
133	MOV4	MOTION STATUS OF SERVO AXIS: THE 4TH AXIS	**92**
134	WPARV	Max Working Piece Arrival	**92**
154	MOVDX	MOTION DIRECTION OF SERVO AXIS: X AXIS	**93**
155	MOVDX	MOTION DIRECTION OF SERVO AXIS: Y AXIS	**93**
156	MOVDX	MOTION DIRECTION OF SERVO AXIS: Z AXIS	**93**
157	MOVDX	MOTION DIRECTION OF SERVO AXIS: THE 4TH AXIS	**93**
201	AETFX	Enter into Absolute Encoder Data Transmitting Mode:X Axis	**93**
202	AETFY	Enter into Absolute Encoder Data Transmitting Mode:Y Axis	**93**
203	AETFZ	Enter into Absolute Encoder Data Transmitting Mode:Z Axis	**93**
204	AETF4	Enter into Absolute Encoder Data Transmitting Mode:4th Axis	**93**
207	AETFRX	Absolute Encoder Data Transmitting:X Axis	**93**
208	AETFRY	Absolute Encoder Data Transmitting:Y Axis	**93**
209	AETFRZ	Absolute Encoder Data Transmitting:Z Axis	**93**
210	AETFR4	Absolute Encoder Data Transmitting:4th Axis	**93**
213	AERSTX	Absolute Encoder Reset:X Axis	**93**
214	AERSTY	Absolute Encoder Reset:Y Axis	**93**
215	AERSTZ	Absolute Encoder Reset:Z Axis	**93**
216	AERST4	Absolute Encoder Reset:4th Axis	**93**

4.3 Register Definition

REGISTER

BIT #	SYMBOL	DESCRIPTION	PAGE
001	M_CODE	M CODE	**94**
002	S_CODE	S CODE	**94**
003	T_CODE	T CODE	**94**
004	SPAS	ACTUAL ROTATION SPEED OF THE SPINDLE	**94**
005	S2_CODE	2nd spindle rotational speed command	**94**
006	S2AS	2nd Spindle Actual Speed	**94**
007	S3_CODE	3rd spindle rotational speed command	**94**
008	S3AS	3rd Spindle Actual Speed	**94**
012	TMNO	Manual Tool Geometry Measuring Number	**94**
013	OPMDOE	MODE SELECTION 1：EDIT，2：MEM，3：MDI，4：JOG，5：INCJOG，6：MPG，7：HOME	**95**
014	INCFED	MPG RATE　2: x10, 3: x100, OTHERS: x1 INCREMENTAL JOG OVERRIDE　2: x10, 3: x100, 4：x1000, OTHERS: x1	**95**
015	SPDOV	ROTATION SPEED OVERRIDE OF THE SPINDLE 0 ~ 12 REPRESENT 0% ~ 120%, RESPECTIVELY; OTHERS: SET VALUE × 0.01	**96**
016	FEEDOV	CUTTING OVERRIDE 0 ~ 20 REPRESENT 0% ~ 200%, RESPECTIVELY; OTHERS: SET VALUE × 0.001	**96**
017	JOGOV	JOG OVERRIDE 0 ~ 20 REPRESENT 0% ~ 200%, RESPECTIVELY; OTHERS: SET VALUE × 0.001	**97**
018	RTOV	RAPID TRAVERSE OVERRIDE 0, 1: F0, 2: 25%, 3: 50% ~ 4: 100%: OTHERS: SET VALUE × 0.001	**97**
019	S2OV	2nd Spindle Rotaing Mode Override	**96**
020	S3OV	3rd Spindle Rotaing Mode Override	**96**
021	PMCF	OVERRIDE OF PMC AXIS, UNIT: mm/min.	**97**
022	PMCC	PMC AXIS CONTROL	**98**
024	PMCXMM	MOTION COMMAND OF PMC AXIS: X AXIS, mm part	**98**
025	PMCXUM	MOTION COMMAND OF PMC AXIS: X AXIS, μm part	**98**
026	PMCYMM	MOTION COMMAND OF PMC AXIS: Y AXIS, mm part	**98**
027	PMCYUM	MOTION COMMAND OF PMC AXIS: Y AXIS, μm part	**98**
028	PMCZMM	MOTION COMMAND OF PMC AXIS: Z AXIS, mm part	**98**
029	PMCZUM	MOTION COMMAND OF PMC AXIS: Z AXIS, μm part	**98**
030	PMC4MM	PMC Function of 4th-Axis Command Amount, Unit=mm	**98**
031	PMC4UM	PMC Function of 4th-Axis Command Amount, Unit=μm	**98**

BIT #	SYMBOL	DESCRIPTION	PAGE
040	OPMES1	PLC ALARM	**98**
041	OPMES2	PLC ALARM	**98**
042	OPMES3	PLC ALARM	**98**
043	OPMES4	PLC ALARM	**98**
044	OPMES5	PLC ALARM	**98**
045	OPMES6	PLC ALARM	**98**
060	PLCFN	PLC WINDOW FUNCTION	**98**
061	PLCSF1	PLC WINDOW FUNCTION NO.1	**98**
062	PLCSF2	PLC WINDOW FUNCTION NO.2	**98**
063	PLCD1	PLC WINDOW READ/WRITE VALUE 1	**98**
064	PLCD2	PLC WINDOW READ/WRITE VALUE 2	**98**
065	PLCD3	PLC WINDOW READ/WRITE VALUE 3	**98**
066	PLCD4	PLC WINDOW READ/WRITE VALUE 4	**98**
067	PLCD5	PLC WINDOW READ/WRITE VALUE 5	**98**
068	PLCD6	PLC WINDOW READ/WRITE VALUE 6	**98**
069	PLCD7	PLC WINDOW READ/WRITE VALUE 7	**98**
070	PLCD8	PLC WINDOW READ/WRITE VALUE 8	**98**
071	PLCD9	PLC WINDOW READ/WRITE VALUE 9	**98**
072	PLCD10	PLC WINDOW READ/WRITE VALUE 10	**98**
073	PLCD11	PLC WINDOW READ/WRITE VALUE 11	**98**
074	PLCD12	PLC WINDOW READ/WRITE VALUE 12	**98**

4.4 C Bits Description

C Bit 000	CYCLE START

In MEM or MDI mode, to set C000 from OFF to ON actuates the system to enter CYCLE START status. At the same time, the system sets S000 to ON to notify the ladder to turn on the cycle start light. If the system is in FEED HOLD or BLOCK STOP status, the system will set S000 to OFF to notify the ladder to turn off the feed hold light first. However, C000 is not accepted by the system in the following conditions:

a. When the system is not in MEM or MDI mode.
b. When the system is already in “NC NOT READY or “CYCLE START status.
c. When the system is having an alarm.

C Bit 001	FEED HOLD

In MEM or MDI mode and also in CYCLE START status, to set C001 from OFF to ON actuates the system to enter FEED HOLD status. At the same time, the system sets S000 to OFF to notify the ladder to turn off the cycle start light, and also sets S001 to ON to notify the ladder to turn on feed hold light. However, please note that this signal is invalid for PMC axis function.

C Bit 003	PROGRAM PROTECTION

When C003 is ON, part programs can not be edited.

C Bit 004	MANUAL RETURN

In the middle of executing some part program in MEM or MDI mode, if switching to MANUAL modes such as JOG or MPG, etc. and moving the machine away manually from its last position in MEM or MDI mode, there are two options to return to MEM or MDI mode and resume the original program:

1. Manual Return: Resume the original program by moving the machine to its last position in MEM or MDI mode.
2. Resume the original program from the current position; however, there will be an offset amount for the following positions.

When C004 is ON, Manual Return function is activated, and vice versa.

C Bit 005	Manual Working Coordinate Measurement Write

Moving tools to touch the tool part face under Manual mode. Then, setting this signal to ON in order to notify NC to do working coordinate OFFSET calculation. And then, the calculation result will be key-in into the 00 coordinate system automatically.

C Bit 006	SELECT AXIS & DIRECTION: ＋X
C Bit 007	SELECT AXIS & DIRECTION: －X
C Bit 008	SELECT AXIS & DIRECTION: ＋Y
C Bit 009	SELECT AXIS & DIRECTION: －Y
C Bit 010	SELECT AXIS & DIRECTION: ＋Z
C Bit 011	SELECT AXIS & DIRECTION: －Z
C Bit 012	+4 Axis Direction
C Bit 013	-4 Axis Direction

C006~C011 are used to select the corresponding motion direction for each axis. In different modes, there are the corresponding actions as listed below:

a. JOG mode:
When set to ON, the system sends a motion command at the same JOG speed as set for the corresponding axis until this signal is OFF.

b. RAPID mode:
When set to ON, the system sends a motion command at the same RAPID speed as set for the corresponding axis until this signal is OFF.

c. HOME mode:
When set from OFF to ON, the corresponding axis will execute Home return.

C Bit 014	Manual Tool Geometry OFFSET Measuring Mode Signal
C Bit 128	Manual Tool Geometry OFFSET Measurment Touching Signal:+X
C Bit 129	Manual Tool Geometry OFFSET Measurment Touching Signal:-X
C Bit 138	Manual Tool Geometry OFFSET Measurment Touching Signal:+Z
C Bit 139	Manual Tool Geometry OFFSET Measurment Touching Signal:-Z

(C BIT 014、128、129、138、139、Register 012, please refer to below description)

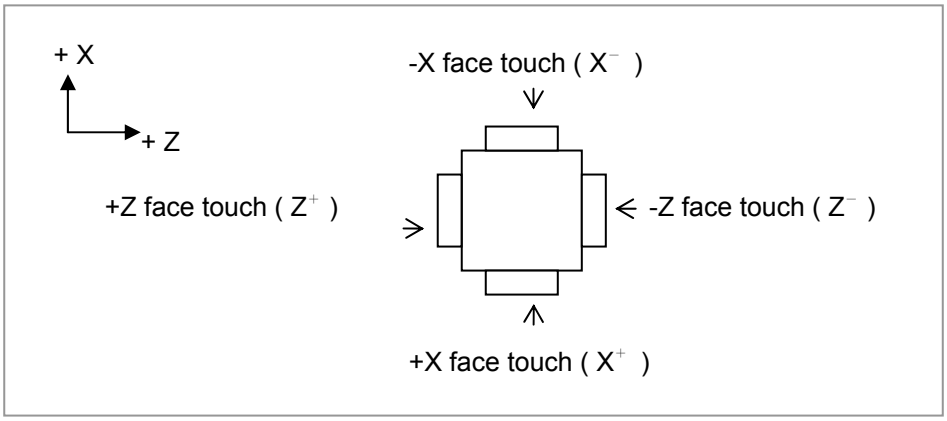
Lathe manual tool length measurement

User can manual moves tools to touch any face of Touch Sensor. Once the touch signal is trigged, NC will auto-calculate the tool geometry OFFSET amount.

Touch Sensor

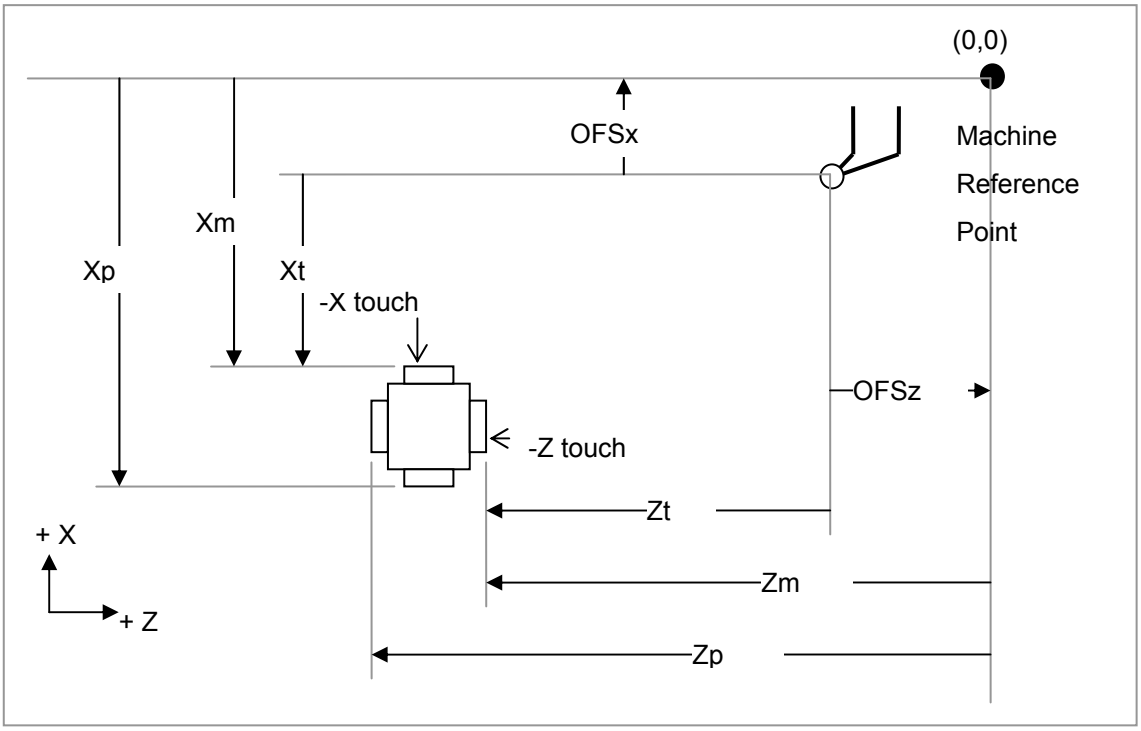
Every axis will provide +/- ive directions touching face. Please refer to the below diagram and description:

X^+：Touch signal of +ive X axis direction (X axis coordinate increase direction).
X^-：Touch signal of -ive X axis direction (X axis coordinate decrease direction).
Z^+：Touch signal of +ive Z axis direction (Z axis coordinate increase direction).
Z^-：Touch signal of -ive Z axis direction (Z axis coordinate decrease direction)



R Register 012： Offset number of manual tool geometry measurement.
Using Para. # 0868 setting value as the default OFFSET number. When the setting value of Para. # 0868 is not zero, it indicates that the default OFFSET number is set by this parameter. However, if want to modify the OFFSET number, please use the direction key to move the cursor to the wanted modifying OFFSET number.
PLC assigns the OFFSET number. When Para. # 0868 setting value is 0, it means that the OFFSET number is decided by R012. In this case, if want to modify the assigned number, user must use the PLC to modify the R012 value in order to move the cursor to the wanted OFFSET number.

Calculating formula of tool geometry OFFSET value:
Tool geometry OFFSET value = machine coordinate when touching – distance between touching face to machine reference.



Calculating formula of tool geometry OFFSET value:
Tool geometry OFFSET value = machine coordinate when touching – distance between touching face to machine reference.

Xp：Distance from machine reference point to +X sensor face (Para. # 1160).
Xm：Distance from machine reference point to -X sensor face (Para. # 1161).
Zp：Distance from machine reference point to +Z sensor face (Para. # 1162).
Zm：Distance from machine reference point to -Z sensor face (Para. # 1163).
Xt：When tool touches –X face, X axis direction gets machine coordinate.
Zt：When tool touches –Z face, Z axis direction gets machine coordinate.
OFSx：OFFSET value of X axis tool geometry measurement，OFSx = Xt – Xm.
OFSz：OFFSET value of Z axis tool geometry measurement，OFSz = Zt – Zm.

C Bit 015	Condition Request of Manual Working Coordinate Measurement

Assumed NC is in manual mode and NC ready mode. NC will switch to “coordinate OFFSET” automatically when PLC sends out “Enter into manual working coordinate measuring when signal C15=ON.” Meanwhile, when the HMI condition column displays “MEA (coordinate measuring)”, it indicates that NC is accepted and entered into manual working coordinate measuring condition.

Note 1: Enter into this condition and NOT to accept other condition requisition.
Note 2: When C15=OFF, NC will exit the manual working coordinate measuring condition. Meanwhile, “Other” condition will be appears on HMI.

C Bit 016	SELECT MPG AXIS: X AXIS
C Bit 017	SELECT MPG AXIS: Y AXIS
C Bit 018	SELECT MPG AXIS: Z AXIS
C Bit 019	Handle 4th Axis

C016~C018 are used in MPG mode to select a servo axis. For example, when C016 is ON, the selected MPG axis is X, so MPG controls the motion of X axis.

C Bit 020	MPG DRY RUN

In MEM or MDI mode, when C020 is ON, the feed rate is controlled by MPG. The faster MPG is turned, the faster the motion is. When MPG stops, motion stops.

C Bit 021	QUIT SCREENSAVER

C021 is used by PLC to notify the system to stop screensaver and recount activation time.

C Bit 022	Cutting Command Release Signal

Using a C bit 22 to prohibit whether or not NC is in cutting motion. When this signal is ON, cutting G code is release. On the other hand, when this signal is OFF, cutting G code is restricted.
Remark: Parameter 870 to set whether or not to enable this function.

C Bit 023	RAPID TRAVEL

In JOG mode, if C023 is ON, feed rate turns into rapid rate as it is in RAPID mode. In HOME mode, please set C023 to ON so HOME return can be executed at rapid rate.

C Bit 024	Servo OFF

Enable this signal to notify the system to cancel servo connection when using MPG.

C Bit 031	HOME DOG: X AXIS
C Bit 032	HOME DOG: Y AXIS
C Bit 033	HOME DOG: Z AXIS
C Bit 034	4th Axis Home DOG Signal

C031~C033 are used to notify NC about the home dog signal of each axis.
NOTE: C031~C033 are effective only when Pr.0175 is set to 1, meaning, when the input signal of HOME DOG is a remote input signal.

C Bit 036	EMERGENCY STOP

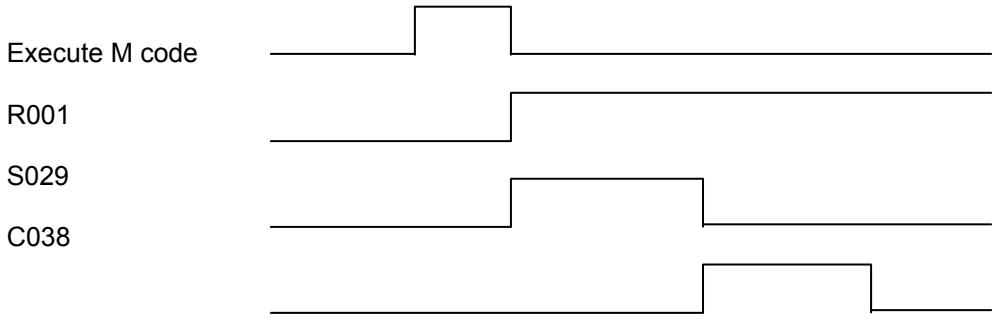
When C036 is ON, the system is reset, all motions stop, and the system status becomes NOT READY.

C Bit 037	EXTERNAL RESET

C037 is the external reset signal and functions the same as pressing RESET bottom.

C Bit 038	M, S, T CODE FINISH

In MEM or MDI mode, when the program executes some M code, the value of the M code is filled into R001, and the signal “M Code Read” (S029) is sent out at the same time. After finishing the execution of the corresponding M code, the ladder notifies the system by sending back the signal “M, S, T Finish” (C038). The timing chart is as below:



a. When executing M77, 77 is filled into R001.
b. If some M code and some motion command are in the same block, and the M code must be executed after the motion command is processed, then this signal must be applied at the same time with S030 in the ladder.
c. This timing chart is not applicable to M00, M01, M02, M30, M98, & M99.

C Bit 040	SINGLE BLOCK

In CYCLE START status and also in MEM mode, if C040 is ON and some single block is executed, the system will stop and enter BLOCK STOP status, and the cycle start status S000 will be OFF.

C Bit 041	OPTIONAL BLOCK SKIP

In CYCLE START status and also in MEM mode, if C041 is ON, the system will ignore and will not execute the block that has “／” in the program.

C Bit 042	DRY RUN

In MEM or MDI mode, when C042 is ON, the original feed rate set by the program will be ignored. And the feed rate will be reset as below:
G00: When C023 is ON = RAPID feed rate (RAPID feed).
When C023 is OFF = JOG feed rate (JOG feed).
G01: JOG feed rate (JOG feed).

C Bit 043	MACHINE LOCK

In MANUAL or AUTO mode, when C043 is ON, no motion command will be sent to the servo system, but the program's coordinates will still be updated.

C Bit 044	M01 OPTIONAL STOP

When C044 is ON and M01 is executed, the system will stop and S000 will be OFF. The system will resume the previous work when cycle start signal (C000) is set to ON,

C Bit 045	IGNORE SERVO AXIS: Z AXIS

When C045 is ON, the command for the corresponding axis will not be executed.
For example: When Z axis is set to be ignored and a block "G01 X10 Z10 C10" is executed, the command of "Z10" will be neglected.

C Bit 046	AUXILIARY FUNCTION LOCK

When C046 is ON, M, S, T codes in a block will be ignored, meaning, M, S, T codes will not be sent to PLC.

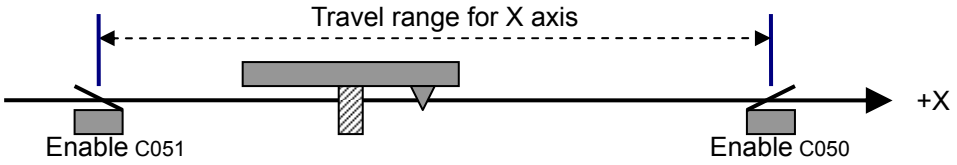
C Bit 049	SERVO AXIS IGNORE SERVO AXIS: THE 4TH AXIS

When C049 is ON, the command for the corresponding axis will not be executed.
For example: When the 4^{th} axis is set to be ignored and a block "G01 X10 Z10 C10" is executed, the command of "C10" will be neglected.

C Bit 050	**AXIS OVER TRAVEL: ＋X**
C Bit 051	**AXIS OVER TRAVEL: －X**
C Bit 052	**AXIS OVER TRAVEL: ＋Y**
C Bit 053	**AXIS OVER TRAVEL: －Y**
C Bit 054	**AXIS OVER TRAVEL: ＋Z**
C Bit 055	**AXIS OVER TRAVEL: －Z**
C Bit 056	**+4th Axis OT**
C Bit 057	**-4th Axis OT**

C050 ~ C057 are over travel signals for each axis. When some axis is over traveling, PLC will notify NC system, the system alarm will be triggered, and the axis is only allowed to motion reversely. In the chart below, please find the definition for each C Bit:

C BIT	Definition
50	PLC travel limit of X axis's positive direction
51	PLC travel limit of X axis's negative direction
52	PLC travel limit of Y axis's positive direction
53	PLC travel limit of Y axis's negative direction
54	PLC travel limit of Z axis's positive direction
55	PLC travel limit of Z axis's negative direction
56	PLC travel limit of the 4th axis's positive direction
57	PLC travel limit of the 4th axis's negative direction



The system's PLC over travel warning messages for each axis is listed as the chart below:

Warning ID	Warning Message
OP 6001	PLC over travel of X axis's positive direction
OP 6002	PLC over travel of X axis's negative direction
OP 6003	PLC over travel of Y axis's positive direction
OP 6004	PLC over travel of Y axis's negative direction
OP 6005	PLC over travel of Z axis's positive direction
OP 6006	PLC over travel of Z axis's negative direction
OP 6007	PLC over travel of the 4th axis's positive direction
OP 6008	PLC over travel of Z axis's negative direction

Discharge a(n) Warning/Alarm:
After some axis triggers the system alarm as mentioned above, the alarm will be discharged when the axis motions towards the opposite direction and PLC turns the corresponding C Bit from ON to OFF.
In JOG/RAPID or MPG mode, if some warning message of PLC Travel Limit（OP 6001 ~ OP 6008） appears, to motion the axis towards the opposite direction until it leaves the over travel range will then discharge the warning message.

In MEM, MDI, or Home mode, if some warning message of PLC Travel Limit（OP 6001 ~ OP 6008） appears, press RESET to withdraw the message.

ALARM ID	Alarm Message
OP 1020	OVER PLC TRAVEL LIMIT

C Bit 059	**AXIS INTERLOCK: X AXIS**
C Bit 060	**AXIS INTERLOCK: Y AXIS**
C Bit 061	**AXIS INTERLOCK: Z AXIS**
C Bit 062	**4th Axis Interlock**

When the signal of the corresponding axis is ON, the axis will not motion, but the axis's coordinates will still be updated.

C Bit 066	**HANDLE INTERRUPT: X AXIS**
C Bit 067	**HANDLE INTERRUPT: Y AXIS**
C Bit 068	**HANDLE INTERRUPT: Z AXIS**
C Bit 069	**4th Axis: Select Axis Direction Signal of Handle INT**

In MEM mode, users can use "Manual Handle Interrupt" function to increase/decrease tool offset amount and to modify the path. To activate this function, users must first set the proper C Bit for the chosen axis and also set the MPG ratio (R014), then use MPG to modify the tool position. However, because the absolute coordinates will not be changed by "Handle Interrupt," there will be an offset amount between the original and the manually-adjusted tool paths; this offset amount can be deleted by executing zero point return manually.

C Bit 072	**1st Spindle JOG**
C Bit 073	**2rd Spindle JOG**
C Bit 074	**3rd Spindle JOG**

1st spindle JOG.

C Bit 075	**SERVO ALARM: X AXIS**
C Bit 076	**SERVO ALARM: Y AXIS**
C Bit 077	**SERVO ALARM: Z AXIS**
C Bit 078	**4th Axis Servo Alarm**

C075~C077 are used to notify the system about any abnormality of the corresponding axis's motor driver.

C Bit 080	3rd Spindle CW
C Bit 081	3rd Spindle CCW
C Bit 082	1st Spindle CW
C Bit 083	1st Spindle CCW
C Bit 087	2nd Spindle CW
C Bit 088	2nd Spindle CCW

When C bit of clockwise is ON, spindle rotates in clockwise direction.
When C bit of counter-clockwise is ON, spindle rotates in counter-clockwise direction.
If the above two are both OFF, spindle stops rotating.
Note 1: The above C bits are enabled in normal spindle speed control mode, which is spindle clockwise, counter-clockwise and stop.
Note 2: If the spindle CW and CCW are controlled by inventor's CW and CCW connection point control, the above signals will only notify NC that the current spindle is in CW or CCW condition.

C Bit 085	Spindle Orientation

This signal will be enabled when spindle orientation is decided by encoder and in JOG mode. Please notice that if Pr.0019, Pr.1055, Pr.1056 are not set for orientation position, spindle will be re-orientated again.

C Bit 089	ENABLE MIRROR: X AXIS
C Bit 090	ENABLE MIRROR: Y AXIS
C Bit 091	ENABLE MIRROR: Z AXIS
C Bit 092	4th Axis Servo Alarm

In MEM mode, when C089 ~ C091 are on, the motion direction of the corresponding axis will be reversed.

C Bit 095	Select Semi-Constand Position of Spindle

Lathe semi-constant M code.

C Bit 097	**1st Spindle Gear #1**
C Bit 098	**1st Spindle Gear #2**
C Bit 099	**1st Spindle Gear #3**
C Bit 116	**2nd Spindle Gear #1**
C Bit 117	**2nd Spindle Gear #2**
C Bit 118	**2nd Spindle Gear #3**
C Bit 121	**3rd Spindle Gear #1**
C Bit 122	**3rd Spindle Gear #2**
C Bit 123	**3rd Spindle Gear #3**

Setting the gear ratio between spindle motor and spindle. Every spindle provides 4sets of parameter # of gear ratio. The system default is to use the 4th set of gear ratio. If user want to modify other sets of gear ratio, user can select the suitable gear ratio from each spindle's corresponding gear ratio C bit.

Spindle	Gear	C bit	# of Motor Tooth	# of Spindle Tooth
1st Spindle	1	C97=ON	Pr. 0049	Pr. 0050
	2	C98=ON	Pr. 0051	Pr. 0052
	3	C99=ON	Pr. 0178	Pr. 0179
	4	C97,98,99=OFF	Pr. 0181	Pr. 0182
2nd Spindle	1	C116=ON	Pr. 0664	Pr. 0665
	2	C117=ON	Pr. 0666	Pr. 0667
	3	C118=ON	Pr. 0668	Pr. 0669
	4	C116,117,118=OFF	Pr. 0670	Pr. 0671
3rd Spindle	1	C121=ON	Pr. 0672	Pr. 0673
	2	C122=ON	Pr. 0674	Pr. 0675
	3	C123=ON	Pr. 0676	Pr. 0677
	4	C121,122,123=OFF	Pr. 0678	Pr. 0679

C Bit 100	**MACRO Variable $120**
C Bit 101	**MACRO Variable $121**
C Bit 102	**MACRO Variable $122**
C Bit 103	**MACRO Variable $123**
C Bit 104	**MACRO Variable $124**
C Bit 105	**MACRO Variable $125**
C Bit 106	**MACRO Variable $126**
C Bit 107	**MACRO Variable $127**
C Bit 108	**MACRO Variable $128**
C Bit 109	**MACRO Variable $129**
C Bit 110	**MACRO Variable $130**
C Bit 111	**MACRO Variable $131**
C Bit 112	**MACRO Variable $132**
C Bit 113	**MACRO Variable $133**
C Bit 114	**MACRO Variable $134**
C Bit 115	**MACRO Variable $135**

C100 ~ C115 are equal to the system variables $120~$135 of Macro, which serve as the input signals from the ladder. For example: If C100 is set to ON in the ladder, $120 will be 1.

C Bit 119	MOTION PROHIBITION FOR AREA BELOW THE 2ND ZERO POINT OF Z AXIS

When C119 is ON, the motion of Z axis in the area below the 2nd zero point is prohibited. When some program path in the area below the 2nd zero point is to be executed, the system will send a warning signal. The function of the signal is to prevent tool collision.

C Bit 120	COMMAND SIGNAL OF PMC AXIS

When all motion data of PMC axis is ready, set this signal to ON to enable the motion of PMC axis.

C Bit 125	Enable Signal in Rigid Tapping

Rigid tapping (M29). When this signal is on, Z axis moving amount will follow the spindle encoder's pulse amount. So user must use M28 to delete the signal when rigid tapping is done in order to prevent any wrong motion from the system.

C Bit 130	X Axis Detach
C Bit 131	Y Axis Detach
C Bit 132	Z Axis Detach
C Bit 133	4th Axis Detach

When this signal is ON, it indicates this axis is detached. This signal is enabled and disabled by M code. Please notice that user defines M code number.

C Bit 134	CLEAR PART COUNT NUMBER

When M02, M30 or the M code assigned by Pr.0089 is executed, NC will add 1 to the part count number. If the part count number is larger than or equal to the preset maximum part count number, NC will send S134 to notify PLC to take the corresponding action; when PLC sends C134 back to NC, NC will clear the part count number and set it to 0.

C Bit 136	Lathe Thread-Cutting Cycle: Right Angle Tool-Shifting Enable Signal
C Bit 137	Lathe Thread-Cutting Cycle: Right Angle Tool-Lifting Enable Signal

When C BIT136 is ON, enable Lathe Thread-Cutting Cycle: Right Angle Tool-Shifting. When C BIT137 is ON, enable Lathe Thread-Cutting Cycle: Right Angle Tool-Lifting.

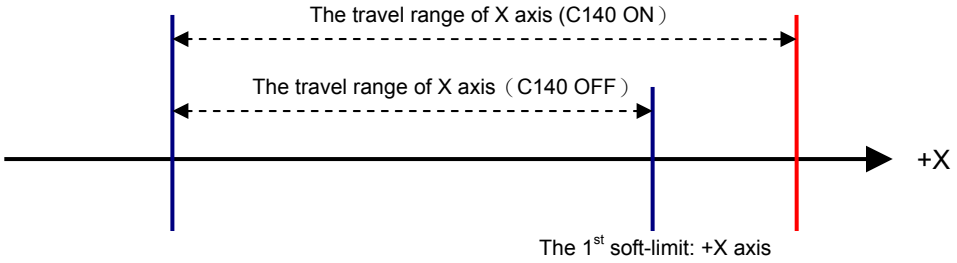
C Bit 140	**THE 2ND SOFT-LIMIT: ＋X**
C Bit 141	**THE 2ND SOFT-LIMIT: －X**
C Bit 142	**THE 2ND SOFT-LIMIT: ＋Y**
C Bit 143	**THE 2ND SOFT-LIMIT: －Y**
C Bit 144	**THE 2ND SOFT-LIMIT: ＋Z**
C Bit 145	**THE 2ND SOFT-LIMIT: －Z**
C Bit 146	**2nd +4th Axis Software Limit Choice**
C Bit 147	**2nd -4th Axis Software Limit Choice**

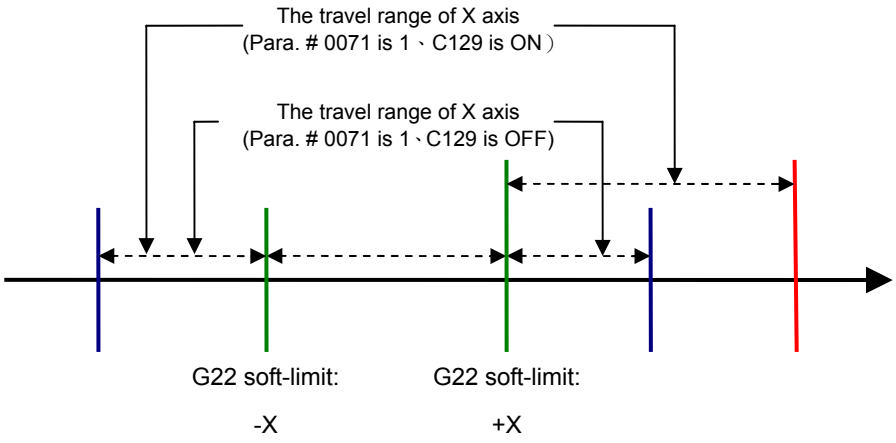
The 1st soft-limit：Set by Pr.1006 ~ Pr.1013. The values set by these parameters will be enabled only after Home return is executed. The default value of the positive axial soft-limit is 99999.999mm, and the negative default value is -99999.999mm.

The 2nd soft-limit：Set by Pr.1034 ~ Pr.1041. The values set by these parameters will be enabled only after Home return is executed. The default value of the positive axial soft-limit is 99999.999mm, and the negative default value is -99999.999mm.

A corresponding C Bit is used to switch between the 1st and 2nd soft-limit for each axis, meaning, there will be only one set of soft-limits to be enabled each time.

Soft-limit	C BIT
Soft-limit: +X axis	C140: OFF, adopt the 1st soft-limit; ON, adopt the 2nd soft-limit.
Soft-limit: -X axis	C141: OFF, adopt the 1st soft-limit; ON, adopt the 2nd soft-limit.
Soft-limit: +Y axis	C142: OFF, adopt the 1st soft-limit; ON, adopt the 2nd soft-limit.
Soft-limit: -Y axis	C143: OFF, adopt the 1st soft-limit; ON, adopt the 2nd soft-limit.
Soft-limit: +Z axis	C144: OFF, adopt the 1st soft-limit; ON, adopt the 2nd soft-limit.
Soft-limit: -Z axis	C145: OFF, adopt the 1st soft-limit; ON, adopt the 2nd soft-limit.
Soft-limit: +The 4th axis	C146: OFF, adopt the 1st soft-limit; ON, adopt the 2nd soft-limit.
Soft-limit: -The 4th axis	C147: OFF, adopt the 1st soft-limit; ON, adopt the 2nd soft-limit.





C Bit 172	**1st Spindle Release**
C Bit 173	**1st Spindle Lock**

C 172、173 are used to position CH：

C(absolutely angle, relative to the angle at the origin of spindle), H(relative angle, relative to the angle of last position of spindle) can execute in manufacturing program, and to position the angle of spindle which is assigned by C H code the process of C(H) position M code（parameter 0835）of spindle.

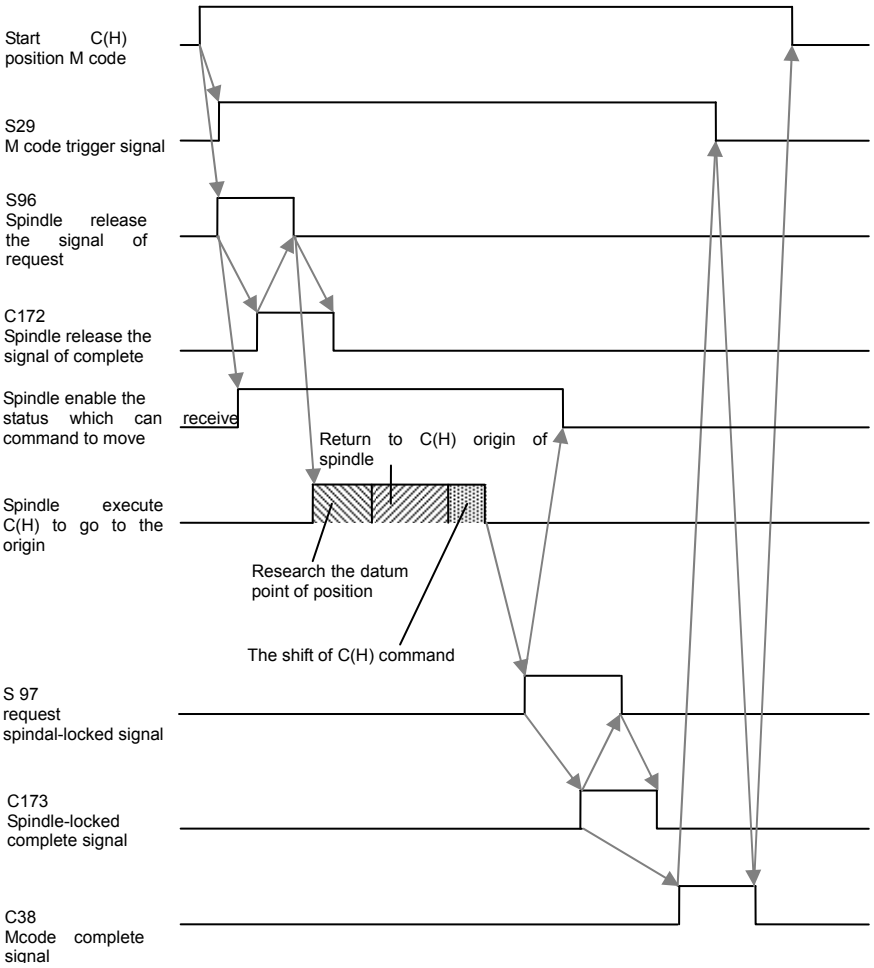


figure of ordinal process about spindle C(H) position mode to enter M code

1. The action process to leave spindle C(H) position M code(param.836)

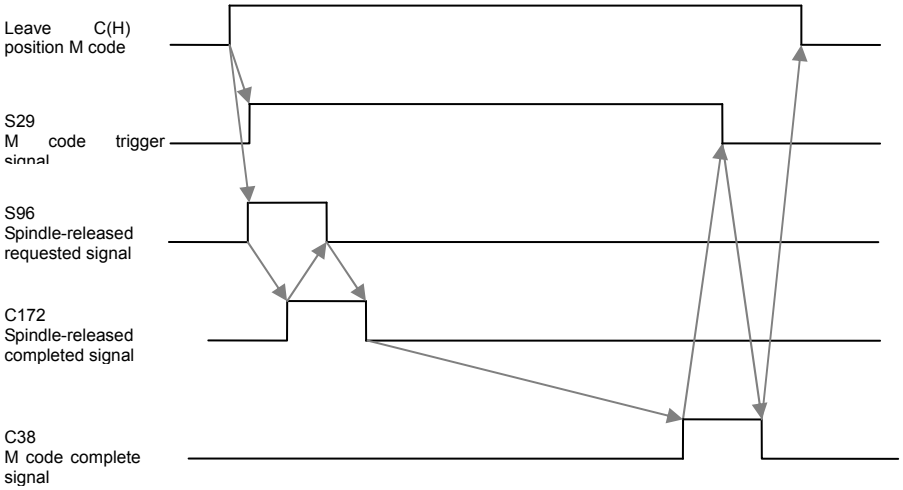


figure of ordinal process about spindle C(H) position mode to leave M code

2. The action process of spindle C(H) position

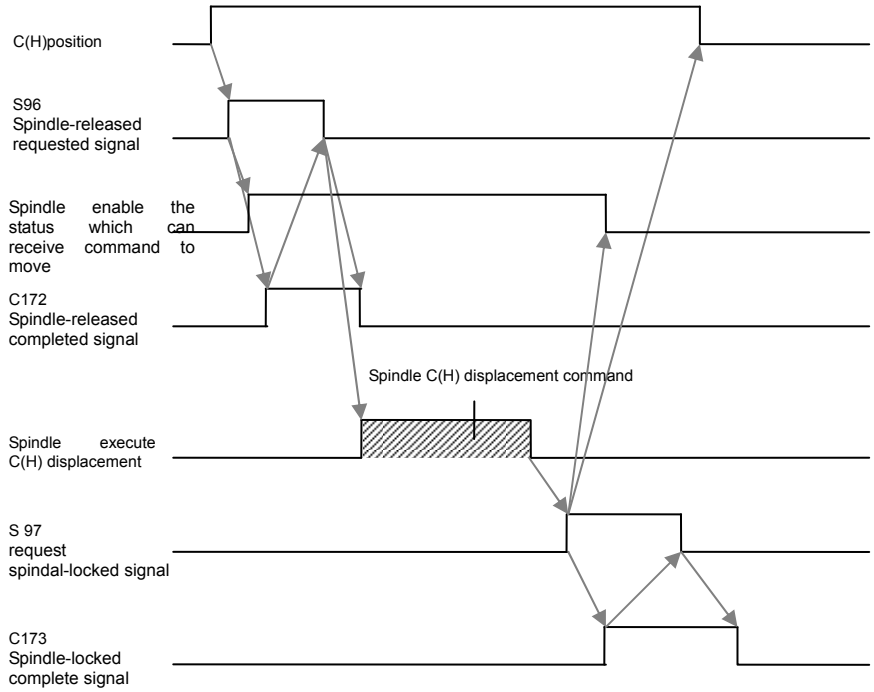


figure of ordinal process about spindle C(H)

C Bit 201	Absolute encoder Reset Ready Signal:X Axis
C Bit 202	Absolute encoder Reset Ready Signal:Y Axis
C Bit 203	Absolute encoder Reset Ready Signal:Z Axis
C Bit 204	Absolute encoder Reset Ready Signal:4th Axis

When LADDER finishes absolute encoder zero return, this signal needs to be sent out to notify NC that.

C Bit 207	Absolute Encoder Data Ready Signal:X Axis
C Bit 208	Absolute Encoder Data Ready Signal:Y Axis
C Bit 209	Absolute Encoder Data Ready Signal:Z Axis
C Bit 210	Absolute Encoder Data Ready Signal:4th Axis

LADDER will notify NC when driver enters into ABS transmitting mode and driver data are ready.

C Bit 213	Absolute Encoder Data Bit 0Transmitting Signal : X Axis
C Bit 214	Absolute Encoder Data Bit 0Transmitting Signal : Y Axis
C Bit 215	Absolute Encoder Data Bit 0Transmitting Signal : Z Axis
C Bit 216	Absolute Encoder Data Bit 0Transmitting Signal : 4th Axis

Assumed absolute encoder data reading is sent by serial transmitting. Also, assumed 2 bits of Encoder will be transmitted every time. So, when this bit is ON, it indicates that the signal of transmitting 2 bits data from driver to NC is 1.

C Bit 219	Absolute Encoder Bit 1 Transmit: X Axis
C Bit 220	Absolute Encoder Bit 1 Transmit: Y Axis
C Bit 221	Absolute Encoder Bit 1 Transmit: Z Axis
C Bit 222	Absolute Encoder Bit 1 Transmit: 4th Axis

Assumed absolute encoder data reading is sent by serial transmitting. Also, assumed 2 bits of Encoder will be transmitted every time. So, when this bit is ON, it indicates that the signal of transmitting 2 bits data from driver to NC is 1.

C Bit 230	Selecting the 2nd spindle Encoder as Loop Signal Source
C Bit 231	Selecting the 3rd spindle Encoder as Loop Signal Source

Spindle loop signal choice：when using 2nd spindle to rigid tap, PLC uses C125 to notify NC entering rigid tap mode, and ON C230 to notify NC to choose encoder of 2nd spindle to be the source of loop signal at the same time。1st spindle is the default to be the source of loop signal。
C230choose 2nd spindle encoder to be the source of loop signal
C231choose 3rd spindle encoder to be the source of loop signal

C230	C231	effect
OFF	OFF	Choose 1st spindle
ON	OFF	Choose 2nd spindle
ON	ON	
OFF	ON	Choose 3rd spindle

C Bit 064	PLC WINDOW READ/WRITE
C Bit 065	PLC WINDOW COMMAND

Please refer to the description of 4.7 PLC Window Mechanism.

4.5 S Bits Description

S Bit 000	CYCLE START

When this signal turns ON, the system is in CYCLE START status. After finishing automatic execution or the machine is in FEED HOLD status, this signal turns to OFF.

S Bit 001	FEED HOLD

When S001 is ON, the system enters Feed Hold status, and the system is in Feed Hold status.

S Bit 002	MODE: EDIT
S Bit 003	MODE: MEM
S Bit 004	MODE: MDI
S Bit 005	MODE: JOG
S Bit 006	MODE: INC JOG
S Bit 007	MODE: MPG
S Bit 008	MODE: HOME

When S002~S008 are ON, the system enters the corresponding operation mode.

S Bit 010	MACHINE READY

When S10 is ON, the system is in MACHINE READY status.

S Bit 011	MDI KEYS

1.The system will send out this signal when some key in MDI is pressed.
2.This signal notifies PLC to turn on LCD and recount LCD power-off time.

S Bit 016	STATUS OF X AXIS AT THE 1ST ZERO POINT
S Bit 017	STATUS OF Y AXIS AT THE 1ST ZERO POINT
S Bit 018	STATUS OF Z AXIS AT THE 1ST ZERO POINT
S Bit 019	4th 1st Axis Point Return End

When these signals are ON, the corresponding axis has finished HOME return and stops at the zero point.

S Bit 020	STATUS OF X AXIS AT THE 2ND ZERO POINT
S Bit 021	STATUS OF Y AXIS AT THE 2ND ZERO POINT
S Bit 022	STATUS OF Z AXIS AT THE 2ND ZERO POINT
S Bit 023	4th 2nd Axis Point Return End

When these signals are ON, the corresponding axis has finished the 2^{nd} (or 3^{rd}, 4^{th}) HOME return and stops at the 2^{nd} (or 3^{rd}, 4^{th}) zero point.

S Bit 028	SYSTEM ALARM

The signal notifies PLC about any alarm occurring in the system. As soon as the alarm is cleared, the system's alarm message will be cancelled automatically, and this signal will turn to OFF.

S Bit 029	M CODE STROBE

When NC executes some M code, the signal is ON and notifies the ladder to process M code until PLC responds with FIN signal. Please refer to the description of C038 (M code Finish signal).

S Bit 030	INTERPOLATION FINISH

In MEM or MDI mode, the signal is ON when Interpolation is finished. When some M code and some Motion G code are in the same block, the signal is used to control whether to execute the M code after the G code or not.

S Bit 031	SYSTEM ALARM

When there is an alarm of the system, S031 is ON.

S Bit 032	SYSTEM RESET

When the system receives a RESET command, this signal is ON in one PLC's cycle time and notifies the ladder to reset the system.

S Bit 033	SYSTEM READY

After the controller is turned ON and all programs are executed normally, S033 is ON.

S Bit 035	STATUS OF MPG RATE: x1000
S Bit 036	STATUS OF MPG RATE: x1
S Bit 037	STATUS OF MPG RATE: x10
S Bit 038	STATUS OF MPG RATE: x100

S035 ~ S038 are used to show the current MPG rate in use:

MPG Rate	S035	S036	S037	S038
x1	0	1	0	0
x10	0	0	1	0
x100	0	0	0	1
x1000	1	0	0	0

S Bit 040	STATUS OF SINGLE BLOCK

The signal refers to the status of Single Block (SBK).

S Bit 041	STATUS OF OPTIONAL BLOCK SKIP

S041 refers to the status of Optional Block Skip (BDT).

S Bit 042	STATUS OF DRY RUN

S042 refers to the status of Dry Run (DRN).

S Bit 043	STATUS OF MACHINE LOCK

S043 refers to the status Machine Lock (MLK).

S Bit 044	STATUS OF OPTIONAL STOP

S044 refers to the status of Optional Stop (OPS).

S Bit 045	STATUS OF RAPID TRAVERSE

S045 refers to the status of Rapid Traverse (RT).

S Bit 046	STATUS OF Z-AXIS NEGLECT

S046 refers to the status of Z-Axis Neglect. (ZNG).

S Bit 047	STATUS OF AUXILIARY FUNCTION LOCK

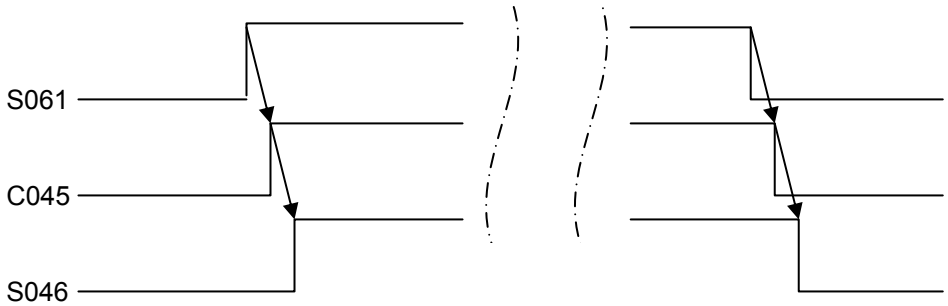
S047 refers to the status of Auxiliary Function Lock (AFL).

S Bit 054	S CODE STROBE
S Bit 055	2nd Spindle S Code
S Bit 056	2nd Spindle S Code

When NC executes some S code, S054 is ON to notify the ladder to process the S code until PLC responds with the signal FIN.

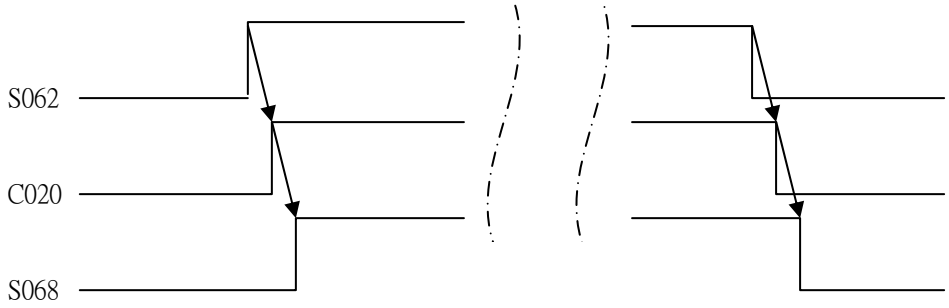
S Bit 061	SOFT PANEL KEY: Z-AXIS NEGLECT

S061 notifies the ladder about the ON/OFF status of Z-Axis Neglect key on the soft panel. The timing chart is as below:



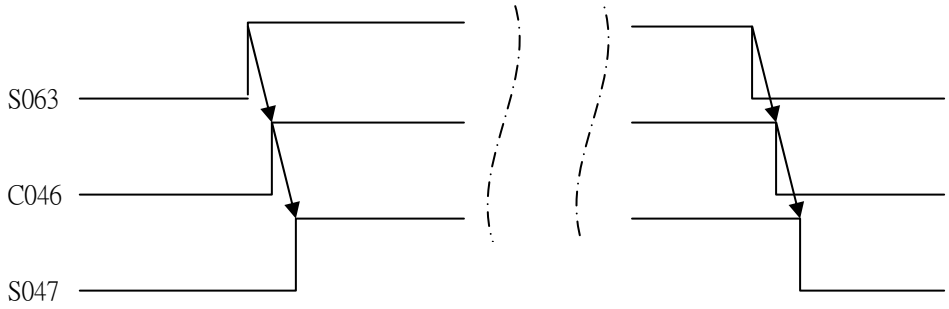
S Bit 062	SOFT KEY: MPG DRY RUN

S062 notifies LADDER about the ON/OFF status of MPG DRY RUN key on the soft panel. The timing chart is as below:



S Bit 063	SOFT KEY: AUXILIARY FUNCTION LOCK OF M, S, T CODE

S063 notifies LADDER about the ON/OFF status of AUXILIARY FUNCTION LOCK key on the soft panel. The timing chart is as below:



S Bit 068	MPG DRY RUN

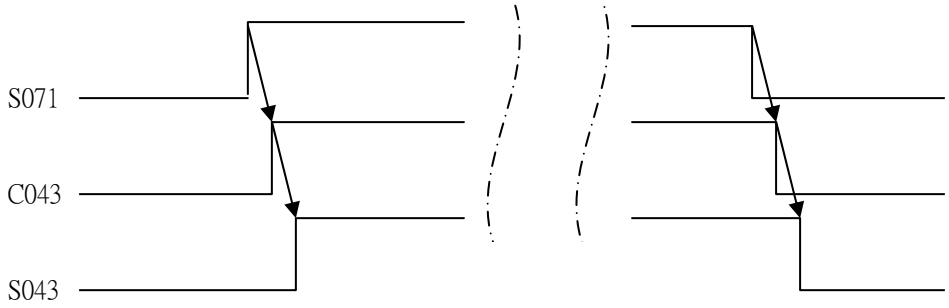
S068 indicates the corresponding status of MPG DRY RUN (MPGDRN).

S Bit 069	T CODE STROBE

When T code is executed in the system, S069 is ON to notify LADDER to process T code until PLC responds with FIN signal.

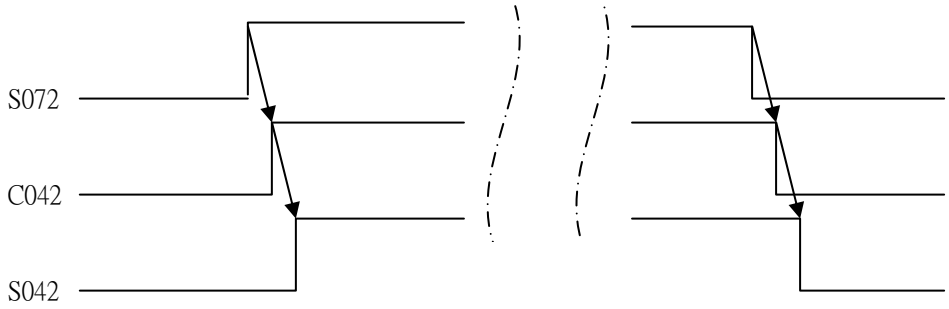
S Bit 071 **SOFT KEY: MACHINE LOCK**

S071 notifies LADDER about the ON/OFF status of MACHINE LOCK key on the soft panel. The timing chart is as below:



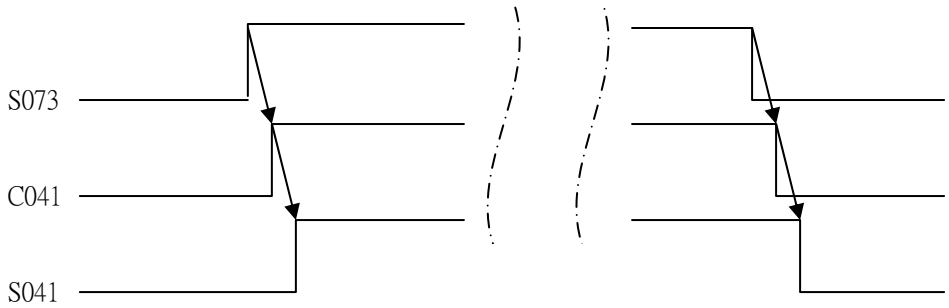
S Bit 072 **SOFT KEY: DRY RUN**

S072 notifies LADDER about the ON/OFF status of DRY RUN key on the soft panel. The timing chart is as below:



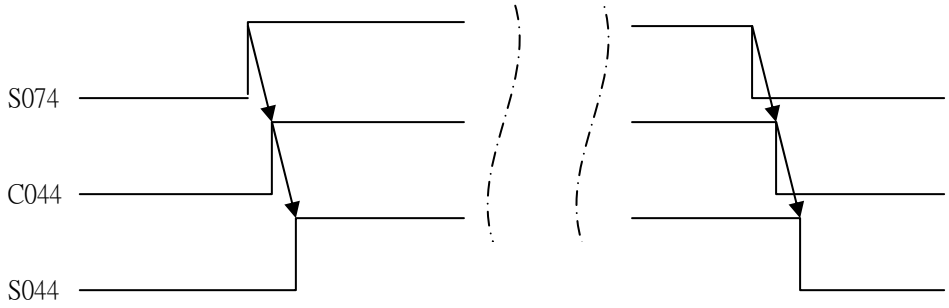
S Bit 073 **SOFT KEY: OPTIONAL BLOCK SKIP**

S073 notifies LADDER about the ON/OFF status of OPTIONAL BLOCK SKIP key on the soft panel. The timing chart is as below:



S Bit 074	SOFT KEY: OPTIONAL STOP

S074 notifies LADDER about the ON/OFF status of OPTIONAL STOP key on the soft panel. The timing chart is as below:



S Bit 080	M00 STROBE
S Bit 081	M01 STROBE
S Bit 082	M02 STROBE
S Bit 083	M30 STROBE

M00: S080~S083 will be ON after M00 is interpreted. (Remain one cycle time of PLC)
M01: S080~S083 will be ON after M01 is interpreted. (Remain one cycle time of PLC)
M02: S080~S083 will be ON after M02 is interpreted. (Remain one cycle time of PLC)
M30: S080~S083 will be ON after M31 is interpreted. (Remain one cycle time of PLC)

S Bit 086	FINISH SPINDLE ORIENTATION

After the spindle finishes spindle orientation, S086 is ON. If PLC cancels the spindle orientation command C085, S086 turns from ON to OFF.

S Bit 053	2nd Spindle Speed Arrival
S Bit 058	3rd Spindle Speed Arrival
S Bit 088	THE 1ST SPINDLE REACHES ROTATION SPEED

When the spindle speed reaches the expected speed, S088 is ON. Pr. 1054 is used to set the deviation range of spindle speed.

S Bit 091	STATUS OF G080 IN CANNEL CYCLE

When the system is in canned cycle status, S091 is OFF, and the valid G code of 09 group cannot be 80; when not in canned cycle status, S091 turns ON, and the valid G code of 09 group must be 80.

S Bit 052	**2nd Spindle Zero Speed Arrival**
S Bit 057	**3rd Spindle Zero Speed Arrival**
S Bit 092	**THE 1ST SPINDLE REACHES ZERO SPEED**

When the rotation speed of each spindle is lower than the value set by the parameters below, the system will send this signal to notify PLC.
The 1st spindle: Pr. 1063.
The 2nd spindle: Pr. 0299.
The 3rd spindle: Pr. 0882.

S Bit 094	**Spindle Command Format is Pulse signal**

The signal will sent out when the form of control command of spindle is Pulse mode.

S Bit 095	**Spindle Semi-Constant Positioning Finish**

After spindle complete to rotate the semi-constant positioning angle, NC send out semi-constant positioning finish signal S95.

S Bit 096	**Request Signal of 1st Spindle Release**
S Bit 097	**Request Signal of 1st Spindle Lock**

S96、S97 are used to position CH：
C(absolutely angle, relative to the angle at the origin of spindle), H(relative angle, relative to the angle of last position of spindle) can execute in manufacturing program, and to position the angle of spindle which is assigned by C H code
S96：the signal to request releasing 1st spindle
S97：the signal to request locking 1st spindle

S Bit 100	**MACRO Variable $320**
S Bit 101	**MACRO Variable $321**
S Bit 102	**MACRO Variable $322**
S Bit 103	**MACRO Variable $323**
S Bit 104	**MACRO Variable $324**
S Bit 105	**MACRO Variable $325**
S Bit 106	**MACRO Variable $326**
S Bit 107	**MACRO Variable $327**
S Bit 108	**MACRO Variable $328**
S Bit 109	**MACRO Variable $329**
S Bit 110	**MACRO Variable $330**
S Bit 111	**MACRO Variable $331**
S Bit 112	**MACRO Variable $332**
S Bit 113	**MACRO Variable $333**
S Bit 114	**MACRO Variable $334**
S Bit 115	**MACRO Variable $335**

These signals are the MACRO system variables $320~$335, which are MACRO outputs to LADDER point. Example: set $320 as 1 in MACRO, then UO0 will be ON in LADDER, which means that MACRO output signals will be used as external control for LADDER.

S Bit 120	PMC AXIS

After PMC axis completes its motion, S120 is ON.

S Bit 128	RIGID TAPPING

NC sends the signal S128 to notify PLC whether NC already enters “RIGID TAPPING” mode or not.

S Bit 130	MOTION STATUS OF SERVO AXIS: X AXIS
S Bit 131	MOTION STATUS OF SERVO AXIS: Y AXIS
S Bit 132	MOTION STATUS OF SERVO AXIS: Z AXIS
S Bit 133	MOTION STATUS OF SERVO AXIS: THE 4TH AXIS

S130 ~ S133 indicate the motion statuses of each axis.
ON：In motion.
OFF：Stop.

S Bit 134	Max Working Piece Arrival

When the number of working piece is greater than or equal to that of the maximum setting-working piece, S134 will be sent out to inform PLC. If setting the maximum working piece to zero, then this signal will not be sent out. PLC will use C134 to inform NC to clear working piece.

Application Description:

Enter into user parameter to do function selection and set parameter No. 12 as 1. When the working piece number reaches the setting working piece number, it will enter into the Feed Hole condition and send out warning message (Wrokpiece is full).

At this time, user can do any needed motion. If there is no need to do any other motion, please press “Cycle Start” key directly. Then the working piece number will be cleared to zero automatically. Furthermore, it will start working automatically and counting working piece number from zero. If no need this function at all, then set parameter No.12 as 0. Circulating work of working piece will not be affected.

01	Program Editing	0	11	Power Off Delay Time	5
02	Home Point Search Priority	1	12	Work Piece Alarm	1
03	Return Home Axis Priority	1	13		
04	Rapidly Moving 50%	0	14		
05	Total Number of Turret	0	15		
06	Safety Door	0	16		
07	Enforce Track Lubrication	0	17		
08	Lubricate ON Time	5	18		
09	Lubricate OFF Time	30	19		
10	Auto Power Off Function	1	20		

S Bit 154	MOTION DIRECTION OF SERVO AXIS: X AXIS
S Bit 155	MOTION DIRECTION OF SERVO AXIS: Y AXIS
S Bit 156	MOTION DIRECTION OF SERVO AXIS: Z AXIS
S Bit 157	MOTION DIRECTION OF SERVO AXIS: THE 4TH AXIS

When a servo axis is in motion, S154 ~ S159 indicate the motion directions of each axis. If the motion is towards the positive direction, the corresponding S bit is set to ON; if towards the negative direction, set to OFF.

S Bit 201	Enter into Absolute Encoder Data Transmitting Mode:X Axis
S Bit 202	Enter into Absolute Encoder Data Transmitting Mode:Y Axis
S Bit 203	Enter into Absolute Encoder Data Transmitting Mode:Z Axis
S Bit 204	Enter into Absolute Encoder Data Transmitting Mode:4th Axis

To use this signal to notify servo driver to enter into ABS transmitting mode.

S Bit 207	Absolute Encoder Data Transmitting:X Axis
S Bit 208	Absolute Encoder Data Transmitting:Y Axis
S Bit 209	Absolute Encoder Data Transmitting:Z Axis
S Bit 210	Absolute Encoder Data Transmitting:4th Axis

To use this signal to request ABS transmitting from servo driver.

S Bit 213	Absolute Encoder Reset:X Axis
S Bit 214	Absolute Encoder Reset:Y Axis
S Bit 215	Absolute Encoder Reset:Z Axis
S Bit 216	Absolute Encoder Reset:4th Axis

To use this signal to notify servo driver to eliminate absolute Encoder zero return motion.

S Bit 079	PLC WINDOW COMPLETED

Please refer to 4.7 PLC Window structure for a detailed description.

4.6 Register Description

R Bit 012	Manual Tool Geometry Measuring Number

No Description

R Bit 001	M CODE

R001 sends out M code value when M code is being executed.
Range: 00 ~ 99.

R Bit 002	S CODE

R002 sends out S code value when S code is being executed.
Range: 0000 ~ 9999.

R Bit 003	T CODE

R001 sends out T code value when T code is being executed.
Range: 0000 ~ 9999.

R Bit 004	ACTUAL ROTATION SPEED OF THE SPINDLE

R004 indicates the actual rotation speed of the spindle.

R Bit 005	2nd spindle rotational speed command

The command of 2nd spindle's rotational speed.

R Bit 006	2nd Spindle Actual Speed

Actually rotational speed of 2nd spindle.

R Bit 007	3rd spindle rotational speed command

The command of 3rd spindle's rotational speed.

R Bit 008	3rd Spindle Actual Speed

Actually rotational speed of 3rd spindle.

R Bit 013

MODE SELECTION
1：EDIT，2：MEM，3：MDI，4：JOG，5：INCJOG，6：MPG，7：HOME

The register value of each operation module is listed as the chart below:

Operation Module	REG 013
EDIT	1
MEM	2
MDI	3
JOG	4 （C23=OFF）
RAPID	4 （C23=ON ）
INCJOG	5
MPG	6
HOME	7

R Bit 014

MPG RATE 2: x10, 3: x100, OTHERS: x1
INCREMENTAL JOG OVERRIDE 2: x10, 3: x100, 4：x1000, OTHERS: x1

The register value of each MPG rate is listed as the chart below:

MPG Rate	REG 014
X1	1 (Or Others)
x10	2
x100	3

R Bit 015	**ROTATION SPEED OVERRIDE OF THE SPINDLE** **0 ~ 12 REPRESENT 0% ~ 120%, RESPECTIVELY; OTHERS: SET VALUE × 0.01**
R Bit 019	**2nd Spindle Rotaing Mode Override**
R Bit 020	**3rd Spindle Rotaing Mode Override**

The register value of each spindle rotation speed's override is listed as the chart below:

%	REG 015
0%	0
10%	1
20%	2
30%	3
40%	4
50%	5
60%	6
70%	7
80%	8
90%	9
100%	10
110%	11
120%	12
1%	Others

R Bit 016	**CUTTING OVERRIDE** **0 ~ 20 REPRESENT 0% ~ 200%, RESPECTIVELY; OTHERS: SET VALUE × 0.001**

The register value of each cutting override is listed as the chart below:

%	REG 016
0%	0
10%	1
20%	2
30%	3
40%	4
50%	5
60%	6
70%	7
80%	8
90%	9
100%	10
110%	11
120%	12
130%	13
140%	14
150%	15
160%	16
170%	17
180%	18
190%	19
200%	20
‰ (Thousandth)	Others

R Bit 017	**JOG OVERRIDE** **0 ~ 20 REPRESENT 0% ~ 200%, RESPECTIVELY; OTHERS: SET VALUE × 0.001**

The register value of each manual override is listed as the chart below:

%	REG 017
0%	0
10%	1
20%	2
30%	3
40%	4
50%	5
60%	6
70%	7
80%	8
90%	9
100%	10
110%	11
120%	12
130%	13
140%	14
150%	15
160%	16
170%	17
180%	18
190%	19
200%	20
‰ (Thousandth)	Others

R Bit 018	**RAPID TRAVERSE OVERRIDE** **0, 1: F0, 2: 25%, 3: 50% ~ 4: 100%: OTHERS: SET VALUE × 0.001**

The register value of each rapid feed override is listed as the chart below:

%	REG 18
F0%	0
F0%	1
25%	2
50%	3
100%	4
1%	Others

NOTE: The actual rapid override of F0% is set by Pr. 0040.

R Bit 021	**OVERRIDE OF PMC AXIS, UNIT: mm/min.**

R021 sets the override of PMC axis.

R Bit 022	PMC AXIS CONTROL

R022 sets the axis to be controlled by PMC.
Bit 1, Bit 0：00 for G00; 01 for G01; 10 for G53
Bit 2：1 spindle.
Bit 3：Reserved.
Bit 4：1 X axis
Bit 5：1 Y axis
Bit 6：1 Z axis
Bit 7：1 The 4th axis

R Bit 024	MOTION COMMAND OF PMC AXIS: X AXIS, mm part
R Bit 025	MOTION COMMAND OF PMC AXIS: X AXIS, μm part
R Bit 026	MOTION COMMAND OF PMC AXIS: Y AXIS, mm part
R Bit 027	MOTION COMMAND OF PMC AXIS: Y AXIS, μm part
R Bit 028	MOTION COMMAND OF PMC AXIS: Z AXIS, mm part
R Bit 029	MOTION COMMAND OF PMC AXIS: Z AXIS, μm part
R Bit 030	PMC Function of 4th-Axis Command Amount, Unit=mm
R Bit 031	PMC Function of 4th-Axis Command Amount, Unit=μm

R024 ~ R029 set the assigned motion distance for each PMC axis when executing a motion command. Motion distances must be set by entering two parts, mm & um, respectively into each register.

R Bit 040	PLC ALARM
R Bit 041	PLC ALARM
R Bit 042	PLC ALARM
R Bit 043	PLC ALARM
R Bit 044	PLC ALARM
R Bit 045	PLC ALARM

R040 ~ R045 enables alarms. There are 6 registers (word), and 96 messages in total for definition and actuation. For example, if the alarms #1 & #3 are to be enabled, LADDER must enter R40 into constant 5 (bit 1 & bit 3) with a MOV command. At the same time, messages must be pre-defined in the corresponding position in ENG_ PLC.ERR. To clear the PLC alarm, simply set R40 to 0.

R Bit 060	PLC WINDOW FUNCTION
R Bit 061	PLC WINDOW FUNCTION NO.1
R Bit 062	PLC WINDOW FUNCTION NO.2
R Bit 063	PLC WINDOW READ/WRITE VALUE 1
R Bit 064	PLC WINDOW READ/WRITE VALUE 2
R Bit 065	PLC WINDOW READ/WRITE VALUE 3
R Bit 066	PLC WINDOW READ/WRITE VALUE 4
R Bit 067	PLC WINDOW READ/WRITE VALUE 5
R Bit 068	PLC WINDOW READ/WRITE VALUE 6
R Bit 069	PLC WINDOW READ/WRITE VALUE 7
R Bit 070	PLC WINDOW READ/WRITE VALUE 8
R Bit 071	PLC WINDOW READ/WRITE VALUE 9
R Bit 072	PLC WINDOW READ/WRITE VALUE 10
R Bit 073	PLC WINDOW READ/WRITE VALUE 11
R Bit 074	PLC WINDOW READ/WRITE VALUE 12

Please refer to the description of 4.7 PLC Window mechanism.

4.7 PLC Window Function

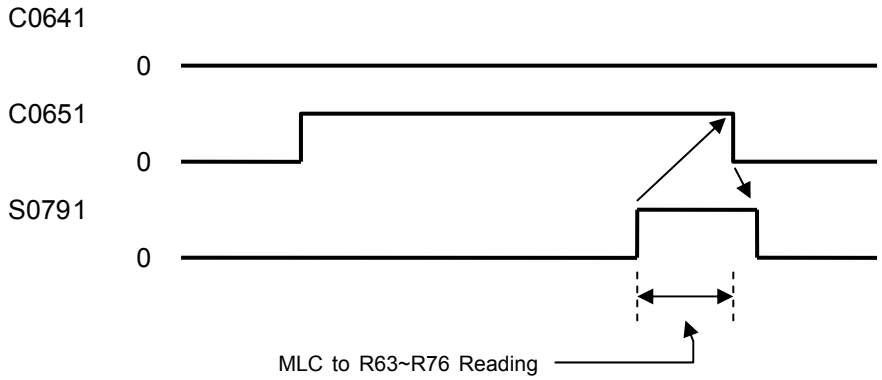
After Ladder key-in the desired item codes in R60 ～ R62, setting C640 (0: read, 1 write). When completed, using C65 to inform NC. NC will enter the desired item into the corresponding R register (C64 is 0) according to the setting of R60 ～ R62 and C64. Or read the setting value (C64 is 1) from the corresponding R register. When completed the task, using S79 to inform Ladder. This function is enabled (raising edge trigger) when C65 becomes 1 from 0; S79 will become OFF after C65 has become OFF.

R Register Definition:

R Register	Definition	Remarks
60	Item Code 1：read absolute coordinate value； 2：read machine coordinate value； 3：read & write macro global variables； 4：read parameter value；	1：read only； 2：read only； 3：read & write； 4：read only；
61	Sub-Item Code 1 (different depends on R60) R60：3, means the starting numbers of macro global variables(1 ~ 500) that are read and wrote R60：4, the starting parameter #s that are read	
62	Sub-Item Code 2 (different depends on R60 and R61) R60：3，means the desired read/write macro global variables' numbers (starting from the number that is designated by R61)，maximum 8. R60：4，means the desired read/write parameter variables' numbers(starting from the number that is designated by R61) ，maximum 8.	Use R61 and R62 to order read and write multiple macro global variables continuously (max 8 variables),or the designated parameter continuously.
63	**Read/Write Value (different depends on R60~R62)** R60：1，means X axis absolute coordinate mm part； R60：2，means X axis machine coordinate mm part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
64	**Read/Write Value (different depends on R60~R62)** R60：1，means X axis absolute coordinate um part； R60：2，means X axis machine coordinate um part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
65	**Read/Write Value (different depends on R60~R62)** R60：1，means Y axis absolute coordinate mm part； R60：2，means Y axis machine coordinate mm part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.

R Register	Definition	Remarks
66	Read/Write Value (different depends on R60~R62) R60：1，means Y axis absolute coordinate um part； R60：2，means Y axis machine coordinate um part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
67	**Read/Write Value (different depends on R60~R62)** R60：1，means Z axis absolute coordinate mm part； R60：2，means Z axis machine coordinate mm part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
68	**Read/Write Value (different depends on R60~R62)** R60：1，means Z axis absolute coordinate um part； R60：2，means Z axis machine coordinate um part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
69	Read/Write Value (different depends on R60~R62) R60：1，means 4th axis absolute coordinate mm part； R60：2，means 4th axis machine coordinate mm part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
70	**Read/Write Value (different depends on R60~R62)** R60：1，means 4th axis absolute coordinate um part； R60：2，means 4th axis machine coordinate um part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.

Timing Procedure Diagram：



Attention：

1. For read only items, if Ladder sets C64 to 1, NC will ignore it. Using the same principle for the writing items, if Ladder sets C64 to 0, NC will ignore it.
2. Macro variables belong to DOUBLE type. But the present Ladder can only take care of the value in INT type. So if Ladder reads macro global variables via MLC Window, NC will check whether or not the macro global variable value is between -32768 ~ 32767. If yes, the macro global variables will change to INT type and then enter into the corresponding R register. If no, then the alarm【OP 1019 DESIRED MACRO VARIABLES OVER RANGE】will occur.
3. Using R61 and R62, Ladder can read/write multiple macro global variables (maximum 8 variables) continuously. Example: set R60 to 3, R61 to 200 and R62 to 5. When C64 is OFF, it means the total current value of the designated reading/writing @200 ~ @204, total 5 macro global variables. But, if (R61 + R62 – 1) > 500, then alarm message【OP 1018 DESIRED MACRO GLOBAL VARIABLES NOT EXISTED】will occur.
4. Macro local variables not able to execute read and write via MLC Window.
5. The reading parameter value must be an integrate number (INT) or long integrate number (LONG). But the present Ladder can only take care of the values in INT type. So if Ladder reads parameter value via MLC Window, NC will check whether or not that parameter value is between -32768 ~ 32767. If yes, the parameter will change to INT type, and then enter into the corresponding R register. If not, the alarm message 【OP 1022 DESIRED PARAMETER VARIABLES OVER RANGE】 will occur.

6. Using R61 and R62, Ladder can read/write multiple parameter variables (maximum 8 variables) continuously. Example: set R60 to 3, R61 to 200 and R62 to 5. When C64 is OFF, it means the total value of the reading parameter variables 0200 ~ 0204, total 5 parameter variables. If it is over the valid parameter range, the alarm message【OP 1023 DESIRED PARAMETER VARIABLES NOT EXISTED】will occur.
   Valid parameter variable range： 0 ~ 220，300 ~ 899，1000 ~ 1200。
7. Parameter is not able to execute setting via MLC Window.

- **Alarm Message：**
  i. OP 1018：DESIRED MACRO GLOBAL VARIABLES NOT EXISTED.
  ii. OP 1019：DESIRED MACRO VARIABLES OVER RANGE.
  iii. OP 1022：DESIRED PARAMETER VARIABLES OVER RANGE.
  OP 1023：DESIRED PARAMETER VARIABLES NOT EXISTED.

4.8 PLC Initial Setting Description (PLCIO.CFG)

In LNCMILL\MACHINE, file name is PLCIO.CFG, this file is to set MLC I/O configuration and definition, file content is as following:

```
InputSignalInverse=0        // I Point Reverse Rotates, 0=No ,1= Yes
OutputSignalInverse=0       // O Point Reverse Rotates,0=No,1=Yes
BaseAddress=0x200 // pcc1620 base address
Set1Slave1=1          // whether or not using Slave 1 of Set 1, 0=No, 1=Yes
Set1Slave2=0          // whether or not using Slave 2 of Set 1, 0=No, 1=Yes
Set2Slave1=1          // whether or not using Slave 1 of Set 2, 0=No, 1=Yes
Set2Slave2=0          // whether or not using Slave 2 of Set 2, 0=No, 1=Yes
I     0     1     0x200     // Columns [I or O] [NUMBER]    [SET]       [ADDRESS] [REMARKS]
I     8     1     0x201     // no empty space in between
I     16    1     0x202     // I or i
I     24    1     0x203     // O or o
I     32    1     0x204     // SET=1 means SET1, SET=2 means SET2
I     40    2     0x200     // must start from I0
I     48    2     0x201
I     56    2     0x202
I     64    2     0x203
I     72    2     0x204
O     0     1     0x200     // due to EPCIO, O Point must be set as even number
O     8     1     0x201
O     16    1     0x202
O     24    1     0x203
```

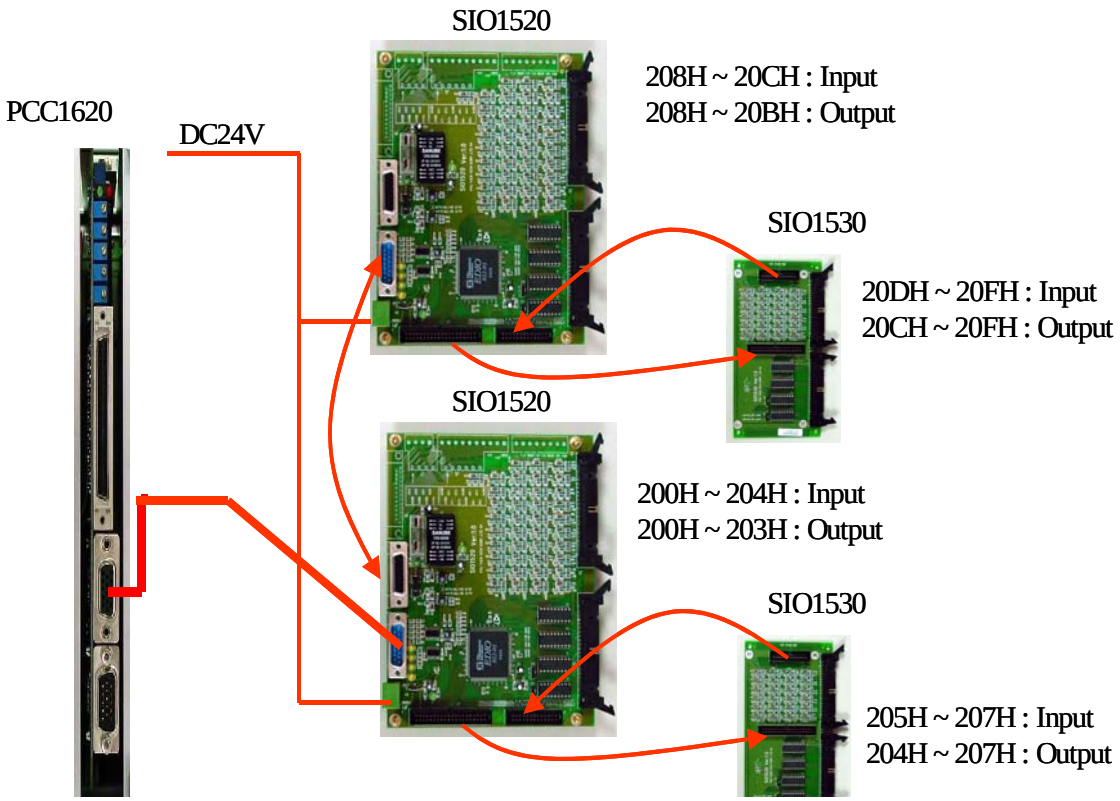
One of I 0 1 0x200,

I is the input connection point,

0 means LADDER configures from I0 ~ I7

1 means SET 1, for PCC1620, it means this I/O board is connected from RIO 1.

0x200 means the corresponding hardware address (the following explains how to set)



Due to user option I/O board and different connection methods, need to define on different I/O address. For the above diagram, due to connect to RIO1, the I/O address must be defined to SET 1.

5 Parameters

5.1 Parameters List

System parameters can be divided into seven segments: servo parameters, machine parameters, spindle parameters, hand wheel parameters, compensation parameters, zero return parameters, and operation parameters.

NOTE：

1. You have to exit and restart the system to enable the parameters you've set.
2. Some parameters are set in BIT to enable a certain function of each axis. Usually BIT0 corresponds to X-axis, BIT1 corresponds to Y-axis, BIT2 corresponds to Z-axis, and BIT3 corresponds to the fourth axis. Below section explains the setting:

   BIT0：if set as 1, corresponds to 1 in decimal;

   BIT1：if set as 1, corresponds to 2 in decimal;

   BIT2：if set as 1, corresponds to 4 in decimal;

   BIT3：if set as 1, corresponds to 8 in decimal;

   BIT4：if set as 1, corresponds to 1 in decimal;

   …… and so on.

   If you want to set a certain BIT of a parameter as 1, you only have to add all the decimal correspondences together, and set the addition value into the parameter. For example, if you want to set BIT1 and BIT 3 as I, the set value of this parameter is 10 (2+8).

No	Group	Description	Effective	Level	Page
1	Servo	SYSTEM LOOP GAINS FOR V CMD	⊙	Machine Maker	**123**
2	Servo	MAX. SERVO LAG OF X AXIS, μm	R	Machine Maker	**124**
3	Servo	MAX. SERVO LAG OF Y AXIS, μm	R	Machine Maker	**124**
4	Servo	MAX. SERVO LAG OF Z AXIS, μm	R	Machine Maker	**124**
5	Servo	MAX. SERVO LAG OF THE 4TH AXIS, μm	R	Machine Maker	**124**
6	Servo	IN-POSITION CHECK WINDOW OF X AXIS, μm	R	Machine Maker	**124**
7	Servo	IN-POSITION CHECK WINDOW OF Y AXIS, μm	R	Machine Maker	**124**
8	Servo	IN-POSITION CHECK WINDOW OF Z AXIS, μm	R	Machine Maker	**124**
9	Servo	IN-POSITION CHECK WINDOW OF THE 4TH AXIS, μm	R	Machine Maker	**124**
10	Servo	G00'S ACCEL./DECEL. TIME OF X AXIS, ms	⊙	Machine Maker	**125**
11	Servo	G00'S ACCEL./DECEL. TIME OF Y AXIS, ms	⊙	Machine Maker	**125**
12	Servo	G00'S ACCEL./DECEL. TIME OF Z AXIS, ms	⊙	Machine Maker	**125**
13	Servo	G00'S ACCEL./DECEL. TIME OF THE 4TH AXIS, ms	⊙	Machine Maker	**125**
14	Servo	G01 ACCEL./DECEL. TIME	⊙	Machine Maker	**125**
15	MPG	CORRESPONDING MECHANICAL AXIS OF MPG SIMULATED AXIS	⊙	Machine Maker	**158**
16	Spindle	ACC/DEC TIME OF 1ST SPINDLE	⊙	Machine Maker	**141**
18	Servo	THREAD CUTTING ACC/DEC TIME	⊙	Machine Maker	**125**
19	Zero Point	SOLUTIONS WHEN HOME IS ON DOG	R	Machine Maker	**166**
20	Zero Point	DEFAULT SETTING OF HOME RETURN BIT	⊙	Machine Maker	**166**
21	Spindle	RPM OF THE 1ST SPINDLE'S ORIENTATION	R	Machine Maker	**141**
24	Servo	CORRESPONDING SERVO AXIS NUMBER OF X AXIS	⊙	Machine Maker	**126**
25	Servo	CHANNEL NO FOR Y AXIS	⊙	Machine Maker	**126**
26	Servo	CORRESPONDING SERVO AXIS NUMBER OF Z AXIS	⊙	Machine Maker	**126**
27	Servo	CORRESPONDING SERVO AXIS NUMBER OF THE 4TH AXIS	⊙	Machine Maker	**126**
28	MPG	MPG CONNECTION PORT OF X AXIS	⊙	Machine Maker	**158**
29	Spindle	THE CORRESPONDING SERVO AXIS NUMBER OF THE 1ST SPINDLE	⊙	Machine Maker	**141**
30	Zero Point	OFFSET AMOUNT OF HOME RETURN: X AXIS μm	R	Machine Maker	**167**

No	Group	Description	Effective	Level	Page
31	Zero Point	OFFSET AMOUNT OF HOME RETURN: Y AXIS μm	R	Machine Maker	**167**
32	Zero Point	OFFSET AMOUNT OF HOME RETURN: Z AXIS μm	R	Machine Maker	**167**
33	Zero Point	OFFSET AMOUNT OF HOME RETURN: THE 4TH AXIS μm	R	Machine Maker	**167**
34	Zero Point	IDLE DURATION FOR X AXIS TO SEARCH FOR ZERO POINT 10ms	R	Machine Maker	**167**
35	Zero Point	IDLE DURATION FOR Y AXIS TO SEARCH FOR ZERO POINT 10ms	R	Machine Maker	**167**
36	Zero Point	IDLE DURATION FOR Z AXIS TO SEARCH FOR ZERO POINT 10ms	R	Machine Maker	**167**
37	Zero Point	IDLE DURATION FOR THE 4TH AXIS TO SEARCH FOR ZERO POINT 10ms	R	Machine Maker	**167**
38	Compensation	BACKLASH COMPENSATION UNIT 0)PULSE 16)μm	⊙	Machine Maker	**159**
40	Servo	G00'S LOWEST OVERRIDE AT F0	R	User	**126**
41	Operation	SYNCHRONIC MOTION OF G00 COMMAND 0)NO 1)YES	R	User	**181**
43	Operation	FLAG OF EXACT CHECK	R	User	**182**
44	Compensation	BACKLASH COMPENSATION AMOUNT OF X AXIS μm	R	Machine Maker	**159**
45	Compensation	BACKLASH COMPENSATION AMOUNT OF Y AXIS μm	R	Machine Maker	**159**
46	Compensation	BACKLASH COMPENSATION AMOUNT OF Z AXIS μm	R	Machine Maker	**159**
47	Compensation	BACKLASH COMPENSATION AMOUNT OF THE 4TH AXIS μm	R	Machine Maker	**159**
48	Zero Point	HOME SEARCH METHOD BIT	⊙	Machine Maker	**168**
49	Spindle	MOTOR'S TOOTH NUMBER OF THE 1ST SPINDLE IN 1ST GEAR	⊙	Machine Maker	**142**
50	Spindle	THE 1ST SPINDLE'S TEETH NUMBER IN 1ST GEAR	⊙	Machine Maker	**142**
51	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 2ND GEAR	⊙	Machine Maker	**143**
52	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE IN 2ND GEAR	⊙	Machine Maker	**143**
53	Servo	ENCODER FEEDBACK MULTIPLIER OF THE 4TH AXIS 1/2/4	⊙	Machine Maker	**126**
54	Servo	ENCODER FEEDBACK MULTIPLIER OF X AXIS 1/2/4	⊙	Machine Maker	**126**
55	Servo	ENCODER FEEDBACK MULTIPLIER OF Y AXIS 1/2/4	⊙	Machine Maker	**126**
56	Servo	ENCODER FEEDBACK MULTIPLIER OF Z AXIS 1/2/4	⊙	Machine Maker	**126**
57	Spindle	FEEDBACK RATE OF THE 1ST SPINDLE	⊙	Machine Maker	**144**
61	Spindle	1ST SPINDLE ENCODER PPR	⊙	Machine Maker	**144**
62	Machine	UNIT OF Pr.0104 ~ Pr.0107 0) METRIC 1) IMPERIAL	⊙	Machine Maker	**137**
63	Operation	SET RELATIVE COORDINATES ACCORDING TO ABSOLUTE COORIDNATES 0)NO 1)YES	R	User	**182**

No	Group	Description	Effective	Level	Page
64	Zero Point	HOME DOG SENSOR IS 0)NC 1)NO	⊙	Machine Maker	**168**
65	Servo	ABSOLUTE ENCODER BIT 0-3	⊙	Machine Maker	**127**
66	Servo	SET THE 4TH AXIS AS A 0)RATORY 1)LINEAR AXIS	⊙	Machine Maker	**127**
68	Machine	TOOTH NUMBER OF X AXIS MOTOR (DENOMINATOR IN GEAR RATIO)	⊙	Machine Maker	**137**
69	Machine	TOOTH NUMBER OF Y AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)	⊙	Machine Maker	**137**
70	Machine	TOOTH NUMBER OF Z AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)	⊙	Machine Maker	**137**
71	Operation	PATH CHECK G22 ADOPTS 0)OUTSIDE 1)INSIDE	R	User	**183**
72	Machine	TOOTH NUMBER OF THE 4TH AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)	⊙	Machine Maker	**137**
73	Operation	ACCELERATION/DECELERATION OF G31 0)NO 1)YES	⊙	Machine Maker	**183**
74	Operation	EXECUTE SINGLE BLOCK OF MACRO	R	User	**183**
75	MPG	MPG CONNECTION PORT OF THE 4TH AXIS	⊙	Machine Maker	**158**
76	Zero Point	SET ABSOLUTE COORD. AFTER HOME RETURN 0)NO 1)YES	R	Machine Maker	**169**
77	Zero Point	G00 1)DISABLED 0) 1)EFFECTIVE	R	User	**169**
79	Zero Point	X AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG	R	Machine Maker	**170**
80	Zero Point	Y AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG	R	Machine Maker	**170**
81	Zero Point	Z AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG	R	Machine Maker	**170**
82	Zero Point	THE 4TH AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG	R	Machine Maker	**170**
83	Operation	G00 IS 0)DISABLED 1)EFFECTIVE IN DRY RUN	R	User	**184**
84	Spindle	THE 1ST SPINDLE ORIENTATION 0)SENSOR 1)ENCODER	R	Machine Maker	**144**
85	Servo	MAX FOLLOWING ERROR X100	R	Machine Maker	**128**
87	MPG	MPG CONNECTION PORT OF Y AXIS	⊙	Machine Maker	**158**
88	MPG	MPG CONNECTION PORT OF Z AXIS	⊙	Machine Maker	**158**
89	Operation	SET M CODE COMMAND OF PART COUNT BY USER	R	User	**184**
90	Spindle	THE 1ST SPINDLE DISPLAYS 0)COMMAND 1) SENSOR		Machine Maker	**145**
92	Spindle	SPINDLE D/A SCALE RPM/10V	R	Machine Maker	**145**
94	Operation	EDIBILITY OF 09XXX 0)NO 1)YES		Machine Maker	**185**
95	Spindle	MIN. SPEED OF THE 1ST SPINDLE	R	Machine Maker	**145**
96	Spindle	MAX SPEED OF 1ST SPINDLE	R	Machine Maker	**145**

No	Group	Description	Effective	Level	Page
98	Spindle	VOLTAGE COMMAND'S OFFSET VALUE OF THE 1ST SPINDLE'S RPM	R	Machine Maker	**146**
100	Machine	BALL SCREW'S TOOTH NUMBER OF X AXIS (NUMERATOR IN GEAR RATIO)	⊙	Machine Maker	**138**
101	Machine	BALL SCREW'S TOOTH NUMBER OF Y AXIS (NUMERATOR IN GEAR RATIO)	⊙	Machine Maker	**138**
102	Machine	BALL SCREW'S TOOTH NUMBER OF Z AXIS (NUMERATOR IN GEAR RATIO)	⊙	Machine Maker	**138**
103	Machine	BALL SCREW'S TOOTH NUMBER OF THE 4TH AXIS (NUMERATOR IN GEAR RATIO)	⊙	Machine Maker	**138**
104	Machine	BALL SCREW PITCH. OF X AXIS	⊙	Machine Maker	**138**
105	Machine	BALL SCREW PITCH. OF Y AXIS	⊙	Machine Maker	**138**
106	Machine	BALL SCREW PITCH. OF Z AXIS	⊙	Machine Maker	**138**
107	Machine	BALL SCREW PITCH. OF THE 4TH AXIS	⊙	Machine Maker	**138**
108	Servo	RPM TO VOLTAGE RATIO FOR X AXIS RPM/1V	⊙	Machine Maker	**128**
109	Servo	RPM TO VOLTAGE RATIO FOR Y AXIS RPM/1V	⊙	Machine Maker	**128**
110	Servo	RPM TO VOLTAGE RATIO FOR Z AXIS RPM/1V	⊙	Machine Maker	**128**
111	Servo	RPM TO VOLTAGE RATIO FOR THE 4TH AXIS RPM/1V	⊙	Machine Maker	**128**
112	Compensation	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF X AXIS	⊙	Machine Maker	**159**
113	Compensation	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Y AXIS	⊙	Machine Maker	**159**
114	Compensation	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Z AXIS	⊙	Machine Maker	**159**
115	Compensation	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF THE 4TH AXIS	⊙	Machine Maker	**159**
116	Servo	MOVING DIR OF EACH AXIS	⊙	Machine Maker	**129**
117	Compensation	BACKLASH COMPENSATION FUNCTION BIT	R	Machine Maker	**160**
118	Compensation	DIRECTION OF PITCH ERROR COMPENSATION BIT	⊙	Machine Maker	**160**
119	Compensation	PITCH ERROR COMPENSATION FUNCTION BIT	⊙	Machine Maker	**160**
120	Zero Point	DIRECTION OF HOME RETURN FOR EACH AXIS BIT	⊙	Machine Maker	**170**
122	Operation	NAME THE 4TH AXIS (ABCUVW)	⊙	Machine Maker	**185**
123	Operation	UNIT SYSTEM 0)G21 METRIC 1)G20 IMPERIAL	⊙	User	**185**
124	Operation	INITIAL MOTION COMMAND 0)G00 1)G01	⊙	User	**185**
125	Operation	OFFSET NUMBER POSITION TYPE	R	Machine Maker	**186**
126	Operation	ENABLE T0 OFFSET CANCEL	R	User	**186**
127	Operation	DIGITS OF T CODE	R	Machine Maker	**186**

No	Group	Description	Effective	Level	Page
128	Operation	T4 CODE ASSIGNE TYPE	R	Machine Maker	**186**
130	Operation	UNIT OF INPUT VALUE	R	User	**187**
131	Operation	CUTTER COMPENSATION TYPE 0)A 1)B	R	Machine Maker	**187**
132	Operation	D/R MEASUREMENT FOR X	⊙	Machine Maker	**187**
135	Operation	DEFAULT COORDINATES 0)ABSOLUTE G90 1)INCREMENTAL G91	⊙	User	**187**
140	Operation	GLOBAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED	R	User	**188**
141	Operation	LOCAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED	R	User	**188**
145	Operation	DEFAULT PLANE 0)XY 1)ZX 2)YZ	⊙	Machine Maker	**188**
146	Operation	M CODE FOR MACRO O9001	R	Machine Maker	**188**
147	Operation	M CODE FOR MACRO O9002	R	Machine Maker	**188**
148	Operation	M CODE FOR MACRO O9003	R	Machine Maker	**188**
149	Operation	DEFAULT FEED RATE	⊙	User	**189**
150	Operation	TOOL ESCAPE AMOUNT IN DRILLING CYCLE	R	User	**189**
151	Operation	DIAMETER/RADIUS COMPENSATION	R	Machine Maker	**190**
152	Operation	ROTARY PATH OF THE 4TH AXIS	R	User	**190**
153	Operation	G CODE TYPE 0)B 1)A 2)C	⊙	Machine Maker	**190**
154	Operation	DISABLE G71/G72 PROFILE CHK	R	User	**191**
155	Operation	UNIT OF INITIAL FEED RATE 0)MM/REV 1)MM/MIN	⊙	User	**191**
156	Servo	COMMAND TYPE OF X AXIS 0)AB 1)CW 2)PD 3)V	⊙	Machine Maker	**129**
157	Servo	COMMAND TYPE OF Y AXIS 0)AB 1)CW 2)PD 3)V	⊙	Machine Maker	**129**
158	Servo	COMMAND TYPE OF Z AXIS 0)AB 1)CW 2)PD 3)V	⊙	Machine Maker	**129**
159	Servo	COMMAND TYPE OF THE 4TH AXIS 0)AB 1)CW 2)PD 3)V	⊙	Machine Maker	**129**
160	Spindle	1ST SPD ENC MOUNT 0)SPL 1)MTR	R	Machine Maker	**146**
161	Operation	M CODE FOR MACRO O9004	R	Machine Maker	**191**
162	Operation	M CODE FOR MACRO O9005	R	Machine Maker	**191**
163	Operation	M CODE FOR MACRO O9006	R	Machine Maker	**191**
164	Operation	M CODE FOR MACRO O9007	R	Machine Maker	**191**
165	Operation	M CODE FOR MACRO O9008	R	Machine Maker	**191**
166	Operation	G CODE FOR MACRO O9010	R	Machine Maker	**191**

No	Group	Description	Effective	Level	Page
167	Operation	G CODE FOR MACRO O9011	R	Machine Maker	**191**
168	Operation	G CODE FOR MACRO O9012	R	Machine Maker	**191**
169	Operation	T CODE CALLS O9020	R	Machine Maker	**191**
172	Servo	G00 ACCEL./DECEL. TYPE 1)LINE 2) CURVE	⊙	Machine Maker	**130**
173	Servo	G01 ACC. TYPE 0)LINE 1)S CURVE	⊙	Machine Maker	**131**
175	Zero Point	HOME DOG I POINT 0)LOCAL 1)REMOTE	⊙	Machine Maker	**171**
176	Operation	LOCAL PORT NO FOR G31 P1	R	Machine Maker	**192**
177	Operation	G31 SIGNAL SOURCE TYPE 0)NC 1)NO	R	Machine Maker	**192**
178	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 3RD GEAR	⊙	Machine Maker	**146**
179	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE IN 3RD GEAR	⊙	Machine Maker	**147**
180	Operation	MANUAL RETURN	R	User	**192**
181	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 4TH GEAR	⊙	Machine Maker	**147**
182	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE IN 4TH GEAR	⊙	Machine Maker	**148**
183	Spindle	COMMAND TYPE OF THE 1ST SPINDLE'S SPEED	⊙	Machine Maker	**148**
184	Spindle	LOCAL INPUT OF THE 1ST SPINDLE'S ORIENTATION	R	Machine Maker	**149**
185	Servo	INV POS FEEDBACK OF EACH AXIS	⊙	Machine Maker	**132**
187	Operation	AUTO ARC FEED RATE CLAMP 0)NO 1)YES	R	User	**194**
188	Servo	POSITION LOOP GAIN OF SERVO AXIS IN PULSE COMMAND 1/sec.	R	Machine Maker	**132**
189	Spindle	DEFAULT INITIAL SPEED OF THE 1ST SPINDLE	⊙	User	**149**
190	Spindle	POSITION COMMAND TYPE	⊙	Machine Maker	**150**
191	Servo	ENCORDER SIGNAL TYPE OF X AXIS	⊙	Machine Maker	**133**
192	Servo	ENCORDER SIGNAL TYPE OF Y AXIS	⊙	Machine Maker	**133**
193	Servo	ENCORDER SIGNAL TYPE OF Z AXIS	⊙	Machine Maker	**133**
194	Servo	ENCORDER SIGNAL TYPE OF THE 4TH AXIS	⊙	Machine Maker	**133**
195	Spindle	SIGNAL TYPE OF THE 1ST SPINDLE'S ENCODER	⊙	Machine Maker	**150**
196	Operation	G78(G92) CUT DOWN CHAMFER LEN.	R	User	**195**
197	Operation	G78(G92) CUT DOWN CHAMFER ANGLE	R	User	**195**
198	Operation	G78(G92) CUT UP CHAMFER LENGTH	R	User	**195**
199	Operation	G78(G92) CUT UP CHAMFER ANGLE	R	User	**195**
200	Operation	FEEDRATE DISPLAY 0)COMMAND 1)ACTUAL FEEDBACK	R	User	**195**

No	Group	Description	Effective	Level	Page
201	Operation	D/R MEASUREMENT FOR Y	⊙	Machine Maker	**187**
202	Operation	OPERATION LANGUAGE 0)ENGLISH 1)TRADITIONAL CHINESE 2)SIMPLIFIED CHINESE	⊙	User	**196**
203	Operation	PROGRAM RESET SWITCH MEM MODE	R	User	**196**
204	Zero Point	ZERO POINT RECORDED BY NC BIT	R	Machine Maker	**172**
205	Operation	TOOL COMPENSATION 0)ABSOLUTE 1) RELATIVE INPUT	R	User	**196**
211	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
212	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
213	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
214	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
215	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
216	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
217	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
218	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
219	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
220	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**196**
221	Operation	DIGITAL FILTER FREQUENCY (KHZ)	⊙	Machine Maker	**197**
222	Spindle	ACC/DEC TIME OF SPD. CH POS.	⊙	Machine Maker	**150**
231	Operation	HIDE INFORMATION OF X AXIS		Machine Maker	**198**
232	Operation	HIDE INFORMATION OF Y AXIS		Machine Maker	**198**
233	Operation	HIDE INFORMATION OF Z AXIS		Machine Maker	**198**
234	Operation	HIDE INFORMATION OF THE 4TH AXIS		Machine Maker	**198**
238	Operation	REL/ABS GEOM VALUE	R	User	**198**
239	Operation	MAX WEAR VALUE TO INPUT		User	**198**
240	Spindle	CLOSE LOOP GAIN OF THE 1ST SPINDLE'S ORIENTATION	R	Machine Maker	**150**
242	Operation	LOCAL PORT NO FOR G31 P2	R	Machine Maker	**192**
243	Operation	LOCAL PORT NO FOR G31 P3	R	Machine Maker	**192**
244	Operation	LOCAL PORT NO FOR G31 P4	R	Machine Maker	**192**
245	Operation	CONTACT TYPE OF G31 P2	R	Machine Maker	**192**
246	Operation	CONTACT TYPE OF G31 P3	R	Machine Maker	**192**
247	Operation	CONTACT TYPE OF G31 P4	R	Machine Maker	**192**
249	Operation	DISPLAY ABNORMALITY OF RAMDISK 0)OFF 1)ON	⊙	Machine Maker	**198**
293	Zero Point	REFERENCE OF SERVO AXIS'S ZERO POINT	⊙	Machine Maker	**172**
294	Spindle	CORRESPONDING TO 2ND SPINDLE	⊙	Machine Maker	**141**

No	Group	Description	Effective	Level	Page
295	Spindle	CORRESPONDING TO 3RD SPINDLE	⊙	Machine Maker	**141**
296	Spindle	COMMAND TYPE OF THE 2ND SPINDLE'S SPEED	⊙	Machine Maker	**148**
297	Spindle	COMMAND TYPE OF THE 3RD SPINDLE'S SPEED	⊙	Machine Maker	**148**
298	Spindle	RPM REACHES SET RANGE OF THE 2ND SPINDLE	R	Machine Maker	**153**
299	Spindle	THE 2ND SPINDLE REACHES ZERO SPEED RPM	R	Machine Maker	**154**
300	Compensation	PITCH ERROR COMPENSATION OF 001 SESSION OF X AXIS μm	R	Machine Maker	**161**
349	Compensation	PITCH ERROR COMPENSATION OF 050 SESSION OF X AXIS μm	R	Machine Maker	**161**
351	Operation	UNIT OF CUTTING OVERRIDE FEED RATE	⊙	Machine Maker	**199**
352	Operation	UNIT OF JOG OVERRIDE	⊙	Machine Maker	**199**
353	Operation	UNIT OF RAPID TRAVERSDE OVERRIDE	⊙	Machine Maker	**199**
354	Spindle	OVERRIDE UNIT OF THE 1ST SPINDLE'S RPM	⊙	Machine Maker	**151**
355	Spindle	OVERRIDE UNIT OF THE 2ND SPINDLE'S RPM	⊙	Machine Maker	**151**
356	Spindle	OVERRIDE UNIT OF THE 3RD SPINDLE'S RPM	⊙	Machine Maker	**151**
360	Operation	SET OPERATION SCREEN COLOR (0~3)	⊙	User	**199**
361	Operation	SET THE NUMBER FOR BLACK (0~16)	⊙	User	**200**
362	Operation	SET THE NUMBER FOR BLUE (0~16)	⊙	User	**200**
363	Operation	SET THE NUMBER FOR GREEN (0~16)	⊙	User	**200**
364	Operation	SET THE NUMBER FOR CYAN (0~16)	⊙	User	**200**
365	Operation	SET THE NUMBER FOR RED (0~16)	⊙	User	**200**
366	Operation	SET THE NUMBER FOR PURPLE (0~16)	⊙	User	**200**
367	Operation	SET THE NUMBER FOR BROWN (0~16)	⊙	User	**200**
368	Operation	SET THE NUMBER FOR WHITE (0~16)	⊙	User	**200**
369	Operation	SET THE NUMBER FOR GRAY (0~16)	⊙	User	**200**
370	Operation	SET THE NUMBER FOR LIGHT BLUE (0~16)	⊙	User	**200**
371	Operation	SET THE NUMBER FOR LIGHT GREEN (0~16)	⊙	User	**200**
372	Operation	SET THE NUMBER FOR LIGHT CYAN (0~16)	⊙	User	**200**
373	Operation	SET THE NUMBER FOR LIGHT RED (0~16)	⊙	User	**200**
374	Operation	SET THE NUMBER FOR LIGHT PURPLE (0~16)	⊙	User	**200**
375	Operation	SET THE NUMBER FOR BLACK COLOR (0~16)	⊙	User	**200**
376	Operation	SET THE NUMBER FOR BRIGHT WHITE COLOR (0~16)	⊙	User	**200**
377	Operation	SET THE NUMBER FOR CURSOR (0~16)	⊙	User	**200**
378	Operation	SET THE NUMBER FOR HIGHLIGHT (0~16)	⊙	User	**200**
379	Operation	SET THE NUMBER FOR UPPER FRAME (0~16)	⊙	User	**200**

No	Group	Description	Effective	Level	Page
380	Operation	SET THE NUMBER FOR LOWER FRAME (0~16)	⊙	User	**200**
394	Operation	SCREENSAVER WAIT TIME	⊙	User	**200**
450	Compensation	PITCH ERROR COMPENSATION OF 001 SESSION OF Y AXIS μm	R	Machine Maker	**161**
499	Compensation	PITCH ERROR COMPENSATION OF 050 SESSION OF Y AXIS μm	R	Machine Maker	**161**
600	Compensation	PITCH ERROR COMPENSATION OF 001 SESSION OF Z AXIS μm	R	Machine Maker	**161**
649	Compensation	PITCH ERROR COMPENSATION OF 050 SESSION OF Z AXIS μm	R	Machine Maker	**161**
663	Spindle	1ST SPD ORIENT ACC/DEC TIME	⊙	Machine Maker	**151**
664	Spindle	MOTOR'S TOOTH NUMBER OF THE 2ND SPINDLE IN 1ST GEAR	⊙	Machine Maker	**142**
665	Spindle	THE 2ND SPINDLE'S TEETH NUMBER IN 1ST GEAR	⊙	Machine Maker	**142**
666	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 2ND GEAR	⊙	Machine Maker	**143**
667	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE IN 2ND GEAR	⊙	Machine Maker	**143**
668	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 3RD GEAR	⊙	Machine Maker	**146**
669	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE IN 3RD GEAR	⊙	Machine Maker	**147**
670	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 4TH GEAR	⊙	Machine Maker	**147**
671	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE IN 4TH GEAR	⊙	Machine Maker	**148**
672	Spindle	MOTOR'S TOOTH NUMBER OF THE 3RD SPINDLE IN 1ST GEAR	⊙	Machine Maker	**142**
673	Spindle	THE 3RD SPINDLE'S TEETH NUMBER IN 1ST GEAR	⊙	Machine Maker	**142**
674	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 2ND GEAR	⊙	Machine Maker	**143**
675	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE IN 2ND GEAR	⊙	Machine Maker	**143**
676	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 3RD GEAR	⊙	Machine Maker	**146**
677	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE IN 3RD GEAR	⊙	Machine Maker	**147**
678	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 4TH GEAR	⊙	Machine Maker	**147**
679	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE IN 4TH GEAR	⊙	Machine Maker	**148**
680	Operation	Enable Angular Axis Control	⊙	Machine Maker	**201**
681	Operation	Enable Return along AngularAxis	⊙	Machine Maker	**201**
682	Operation	Inclination Angle for AAC	⊙	Machine Maker	**201**
683	Operation	Axis Number of Slanted Axis	⊙	Machine Maker	**201**
684	Operation	Axis Number of Cartesian Axis	⊙	Machine Maker	**201**

No	Group	Description	Effective	Level	Page
750	Compensation	PITCH ERROR COMPENSATION OF 001 SESSION OF THE 4TH AXIS μm	R	Machine Maker	**161**
799	Compensation	PITCH ERROR COMPENSATION OF 050 SESSION OF THE 4TH AXIS μm	R	Machine Maker	**161**
800	Servo	G00'S IN-POSITION CHECK WINDOW OF X AXIS, μm	R	Machine Maker	**133**
801	Servo	G00'S IN-POSITION CHECK WINDOW OF Y AXIS, μm	R	Machine Maker	**133**
802	Servo	G00'S IN-POSITION CHECK WINDOW OF Z AXIS, μm	R	Machine Maker	**133**
803	Servo	G00'S IN-POSITION CHECK WINDOW OF THE 4TH AXIS, μm	R	Machine Maker	**133**
806	Operation	MAXIMUM OFFSET TOLERANCE OF CORNER μm	R	User	**201**
808	Operation	ENABLE CORNNER ACC CONTROL	R	User	**201**
809	Operation	SPIKE OFFSET TOLERANCE μm	R	User	**202**
811	Compensation	BALL BAR COMPENSATION G CODE 0)G2 G3 1) ALL	R	Machine Maker	**162**
812	Compensation	REVERSAL SPIKE COMPENSATION: +X	R	Machine Maker	**162**
813	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: +X	R	Machine Maker	**162**
814	Compensation	REVERSAL SPIKE LAG COMPENSATION: +X	R	Machine Maker	**162**
815	Compensation	REVERSAL SPIKE COMPENSATION: −X	R	Machine Maker	**163**
816	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: −X	R	Machine Maker	**163**
817	Compensation	REVERSAL SPIKE LAG COMPENSATION: −X	R	Machine Maker	**163**
818	Compensation	REVERSAL SPIKE COMPENSATION: +Y	R	Machine Maker	**162**
819	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: +Y	R	Machine Maker	**162**
820	Compensation	REVERSAL SPIKE LAG COMPENSATION: +Y	R	Machine Maker	**162**
825	Compensation	REVERSAL SPIKE COMPENSATION: −Y	R	Machine Maker	**163**
826	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: −Y	R	Machine Maker	**163**
827	Compensation	REVERSAL SPIKE LAG COMPENSATION: −Y	R	Machine Maker	**163**
828	Compensation	REVERSAL SPIKE COMPENSATION: +Z	R	Machine Maker	**162**
829	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: +Z	R	Machine Maker	**162**
830	Compensation	REVERSAL SPIKE LAG COMPENSATION: +Z	R	Machine Maker	**162**
831	Compensation	REVERSAL SPIKE COMPENSATION: −Z	R	Machine Maker	**163**
832	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: −Z	R	Machine Maker	**163**
833	Compensation	REVERSAL SPIKE LAG COMPENSATION: −Z	R	Machine Maker	**163**

No	Group	Description	Effective	Level	Page
834	Zero Point	READING DURATION OF ABSOLUTE ENCODER	R	Machine Maker	**173**
835	Spindle	SPD. CH POS. ENABLE M CODE	⊙	Machine Maker	**151**
836	Spindle	SPD. CH POS. RELEASE M CODE	⊙	Machine Maker	**151**
837	Spindle	THE START M CODE OF SPD POS	R	Machine Maker	**152**
838	Spindle	COUNT OF SPD POS. M CODE	R	Machine Maker	**152**
839	Spindle	TOLERANCE OF THE 1ST SPINDLE DURING ORIENTATION	R	Machine Maker	**152**
840	Compensation	ENABLE AXIS X TDC FUNCTION	⊙	Machine Maker	**164**
841	Compensation	X TDC MAX COMP. IN TIME C.S	⊙	Machine Maker	**164**
842	Compensation	X TOTAL COMP VALUE IN TDC μm	⊙	Machine Maker	**164**
843	Compensation	X TDC MAX COMP. IN TIME STOP	⊙	Machine Maker	**164**
851	Compensation	ENABLE AXIS Y TDC FUNCTION	⊙	Machine Maker	**164**
852	Compensation	Y TDC MAX COMP. IN TIME C.S	⊙	Machine Maker	**164**
853	Compensation	Y TOTAL COMP VALUE IN TDC μm	⊙	Machine Maker	**164**
854	Compensation	Y TDC MAX COMP. IN TIME STOP	⊙	Machine Maker	**164**
856	Compensation	ENABLE AXIS Z TDC FUNCTION	⊙	Machine Maker	**164**
857	Compensation	Z TDC MAX COMP. IN TIME C.S	⊙	Machine Maker	**164**
858	Compensation	Z TOTAL COMP VALUE IN TDC μm	⊙	Machine Maker	**164**
859	Compensation	Z TDC MAX COMP. IN TIME STOP	⊙	Machine Maker	**164**
861	Compensation	ENABLE AXIS 4TH TDC FUNCTION	⊙	Machine Maker	**164**
862	Compensation	4TH TDC MAX COMP. IN TIME C.S.	⊙	Machine Maker	**164**
863	Compensation	4TH TOTAL COMP VALUE IN TDC μm	⊙	Machine Maker	**164**
864	Compensation	4TH TDC MAX COMP. IN TIME STOP	⊙	Machine Maker	**164**
866	Operation	LOCAL PORT NO FOR MEASURE	R	Machine Maker	**202**
867	Operation	CONTACT TYPE OF MEASURE 0)NC 1)NO	R	Machine Maker	**202**
868	Operation	TOOL OFFSET NO FOR MEASURE	R	User	**202**
869	Operation	ENABLE MEASURE ACCELERATION	⊙	Machine Maker	**203**
870	Operation	ENABLE CUTTING START SIGNAL	R	Machine Maker	**203**
871	Operation	WAITING TIME BEFORE CHECK CFSS	R	Machine Maker	**203**

No	Group	Description	Effective	Level	Page
872	Operation	G78(G92) CUT DOWN FEED RATIO	R	Machine Maker	**203**
873	Operation	G78(G92) CUT UP FEED RATIO	R	Machine Maker	**204**
875	Spindle	DEFAULT INITIAL SPEED OF THE 2ND SPINDLE	⊙	User	**149**
876	Spindle	MAX SPEED OF 2ND SPINDLE	R	Machine Maker	**145**
877	Spindle	MIN. RPM OF THE 2nd SPINDLE	R	Machine Maker	**145**
878	Spindle	INITIAL RPM OF THE 3RD SPINDLE	⊙	User	**145**
879	Spindle	MAX. RPM OF THE 3RD SPINDLE	R	Machine Maker	**145**
880	Spindle	MIN. RPM OF THE 3RD SPINDLE	R	Machine Maker	**145**
881	Spindle	RPM REACHES SET RANGE OF THE 3RD SPINDLE	R	Machine Maker	**153**
882	Spindle	THE 3RD SPINDLE REACHES ZERO SPEED RPM	R	Machine Maker	**154**
883	Spindle	CORRESPONDING RPM OF THE 2ND SPINDLE MOTOR'S INPUT VOLTAGE 10V	R	Machine Maker	**145**
884	Spindle	VOLTAGE COMMAND'S OFFSET VALUE OF THE 2ND SPINDLE'S RPM	R	Machine Maker	**146**
885	Spindle	ACC/DEC TIME OF 2ND SPINDLE	⊙	Machine Maker	**141**
886	Spindle	CORRESPONDING RPM OF THE 3rd SPINDLE MOTOR'S INPUT VOLTAGE 10V	R	Machine Maker	**145**
887	Spindle	VOLTAGE COMMAND'S OFFSET VALUE OF THE 3RD SPINDLE'S RPM	R	Machine Maker	**146**
888	Spindle	ACCEL./DECEL. TIME PER KILO-REV.OF THE 3RD SPINDLE	⊙	Machine Maker	**141**
889	Spindle	PPR OF THE 2ND SPINDLE'S ENCODER	⊙	Machine Maker	**144**
890	Spindle	FEEDBACK RATE OF THE 2ND SPINDLE	⊙	Machine Maker	**144**
891	Spindle	SIGNAL TYPE OF THE 2ND SPINDLE'S ENCODER	⊙	Machine Maker	**150**
892	Spindle	INSTALL THE 2ND SPINDLE'S ENCODER ONTO THE 0)SPINDLE 1)MOTOR	R	Machine Maker	**146**
893	Spindle	PPR OF THE 3RD SPINDLE'S ENCODER	⊙	Machine Maker	**144**
894	Spindle	FEEDBACK RATE OF THE 3RD SPINDLE	⊙	Machine Maker	**144**
895	Spindle	SIGNAL TYPE OF THE 3RD SPINDLE'S ENCODER	⊙	Machine Maker	**150**
896	Spindle	INSTALL THE 3RD SPINDLE'S ENCODER ONTO THE 0)SPINDLE 1)MOTOR	R	Machine Maker	**146**
897	Spindle	THE 2ND SPINDLE DISPLAYS 0)COMMAND 1) SENSOR	R	Machine Maker	**145**
898	Spindle	THE 3RD SPINDLE DISPLAYS 0)COMMAND 1) SENSOR	R	Machine Maker	**145**
899	Operation	APPLY CE REGULATIONS 0)NO 1)YES	R	Machine Maker	**204**
1000	Servo	G00 MAX. SPEED OF X AXIS IN RAPID TRAVERSE, μm/min	R	Machine Maker	**133**

No	Group	Description	Effective	Level	Page
1001	Servo	G00 MAX. SPEED OF Y AXIS IN RAPID TRAVERSE,μm/min	R	Machine Maker	**133**
1002	Servo	G00 MAX. SPEED OF Z AXIS IN RAPID TRAVERSE, μm/min	R	Machine Maker	**133**
1003	Servo	G00 MAX. SPEED OF THE 4TH AXIS IN RAPID TRAVERSE, μm/min	R	Machine Maker	**133**
1004	Servo	G01 MAX. SPEED OF LINEAR CUTTING, μm/min	R	Machine Maker	**134**
1006	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +X μm	R	Machine Maker	**204**
1007	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - X μm	R	Machine Maker	**205**
1008	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Y μm	R	Machine Maker	**204**
1009	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Y μm	R	Machine Maker	**205**
1010	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Z μm	R	Machine Maker	**204**
1011	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Z μm	R	Machine Maker	**205**
1012	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +THE 4TH μm	R	Machine Maker	**204**
1013	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - THE 4TH AXIS μm	R	Machine Maker	**205**
1014	Zero Point	ABSOLUTE COORDINATES OF X AXIS AFTER RETURNING TO HOME POINT μm	R	Machine Maker	**173**
1015	Zero Point	ABSOLUTE COORDINATES OF Y AXIS AFTER RETURNING TO HOME POINT μm	R	Machine Maker	**173**
1016	Zero Point	ABSOLUTE COORDINATES OF Z AXIS AFTER RETURNING TO HOME POINT μm	R	Machine Maker	**173**
1017	Zero Point	ABSOLUTE COORDINATES OF THE 4TH AXIS AFTER RETURNING TO HOME POINT μm	R	Machine Maker	**173**
1018	Compensation	SESSION INTERVAL OF PITCH ERROR COMPENSATION: X AXIS μm	⊙	Machine Maker	**165**
1019	Compensation	SESSION INTERVAL OF PITCH ERROR COMPENSATION: Y AXIS μm	⊙	Machine Maker	**165**
1020	Compensation	SESSION INTERVAL OF PITCH ERROR COMPENSATION: Z AXIS μm	⊙	Machine Maker	**165**
1021	Compensation	SESSION INTERVAL OF PITCH ERROR COMPENSATION: THE 4TH AXIS μm	⊙	Machine Maker	**165**
1022	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**173**
1023	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**173**
1024	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**173**
1025	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**173**

No	Group	Description	Effective	Level	Page
1026	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**174**
1027	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**174**
1028	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**174**
1029	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**174**
1030	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**174**
1031	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**174**
1032	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**174**
1033	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**174**
1034	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +X μm	R	Machine Maker	**205**
1035	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -X μm	R	Machine Maker	**206**
1036	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Y μm	R	Machine Maker	**205**
1037	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Y μm	R	Machine Maker	**206**
1038	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Z μm	R	Machine Maker	**205**
1039	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Z μm	R	Machine Maker	**206**
1040	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +4TH AXIS μm	R	Machine Maker	**205**
1041	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -4TH AXIS μm	R	Machine Maker	**206**
1042	Servo	G31 PRESET FEED RATE	R	Machine Maker	**134**
1043	Operation	G83 Drilling 0)High 1)Normal		User	**206**
1044	Operation	G87 Drilling 0)High 1)Normal		User	**206**
1045	Operation	P2 Pause Time (ms)		User	**206**
1046	Compensation	START POSITION OF PITCH ERROR: X AXIS μm	⊙	Machine Maker	**165**
1047	Compensation	START POSITION OF PITCH ERROR: Y AXIS μm	⊙	Machine Maker	**165**
1048	Compensation	START POSITION OF PITCH ERROR: Z AXIS μm	⊙	Machine Maker	**165**
1049	Compensation	START POSITION OF PITCH ERROR: THE 4TH AXIS μm	⊙	Machine Maker	**165**
1054	Spindle	RPM REACHES SET RANGE OF THE 1ST SPINDLE	R	Machine Maker	**153**

No	Group	Description	Effective	Level	Page
1056	Spindle	SPD ORIENTATION OFFSET ANGLE	R	Machine Maker	**153**
1059	Spindle	ACCEL./DECEL. TIME PER KILO-REV. OF THE 1ST SPINDLE DURING RIGID TAPPING	R	Machine Maker	**153**
1061	Servo	MAX. SPEED OF LATHE TAPPING	R	Machine Maker	**134**
1062	Spindle	BASIC ANGULE OF SPD POS.	R	Machine Maker	**154**
1063	Spindle	THE 1ST SPINDLE REACHES ZERO SPEED RPM	R	Machine Maker	**154**
1064	Spindle	COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING	R	Machine Maker	**154**
1065	Spindle	COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S ACCELERATION DURING RIGID TAPPING	R	Machine Maker	**154**
1066	Spindle	COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING	R	Machine Maker	**155**
1069	Spindle	SPD1 RIGTAP SPD STOP CHECK	R	Machine Maker	**155**
1070	Spindle	COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S ACCELERATION SPEED DURING RIGID TAPPING	R	Machine Maker	**155**
1072	Servo	PULSE WIDTH μs	⊙	Machine Maker	**135**
1075	Spindle	TOLERANCE OF THE 1ST SPINDLE IN CONTROL MODE	R	Machine Maker	**156**
1076	Spindle	SPD1 RIGTAP DEC TIME/1000 RPM	R	Machine Maker	**156**
1081	Operation	MRCCD μm	R	User	**207**
1082	Operation	MRCDT μm	R	User	**207**
1083	Operation	PESCX μm	R	User	**207**
1084	Operation	PESCZ μm	R	User	**207**
1085	Operation	PATIM μm	R	User	**207**
1086	Operation	GROOVE μm	R	User	**207**
1087	Operation	THRPT	R	User	**208**
1088	Operation	THANG	R	User	**208**
1089	Operation	THCLM μm	R	User	**208**
1090	Operation	THDFN μm	R	User	**208**
1095	Spindle	HOME OF SPD. C(H) POSITION	R	Machine Maker	**156**
1100	Servo	JOG SPEED FOR X AXIS μm/min	R	Machine Maker	**136**
1101	Servo	JOG SPEED FOR Y AXIS μm/min	R	Machine Maker	**136**
1102	Servo	JOG SPEED FOR Z AXIS μm/min	R	Machine Maker	**136**
1103	Servo	JOG SPEED FOR THE 4TH AXIS μm/min	R	Machine Maker	**136**
1104	Zero Point	HOME RETURN AT THE 1ST SPEED: X AXIS μm/min	R	Machine Maker	**174**
1105	Zero Point	HOME RETURN AT THE 1ST SPEED: Y AXIS μm/min	R	Machine Maker	**174**

No	Group	Description	Effective	Level	Page
1106	Zero Point	HOME RETURN AT THE 1ST SPEED: Z AXIS μm/min	R	Machine Maker	**174**
1107	Zero Point	HOME RETURN AT THE 1ST SPEED: THE 4TH AXIS μm/min	R	Machine Maker	**174**
1108	Zero Point	HOME RETURN AT THE 2ND SPEED: X AXIS μm/min	R	Machine Maker	**175**
1109	Zero Point	HOME RETURN AT THE 2ND SPEED: Y AXIS μm/min	R	Machine Maker	**175**
1110	Zero Point	HOME RETURN AT THE 2ND SPEED: Z AXIS μm/min	R	Machine Maker	**175**
1111	Zero Point	HOME RETURN AT THE 2ND SPEED: THE 4TH AXIS μm/min	R	Machine Maker	**175**
1112	Servo	ENCODER.X PULSES/ROTATION	⊙	Machine Maker	**127**
1113	Servo	ENCODER.Y PULSES/ROTATION	⊙	Machine Maker	**127**
1114	Servo	ENCODER.Z PULSES/ROTATION	⊙	Machine Maker	**127**
1115	Servo	ENCODER.4TH PULSES/ROTATION	⊙	Machine Maker	**127**
1117	Spindle	SPEED OF SPD. CH POSITION	R	Machine Maker	**156**
1118	Zero Point	INDEX PROTECTION	R	User	**175**
1121	Spindle	JOG RPM OF THE 1ST SPINDLE	R	Machine Maker	**157**
1122	Spindle	JOG SPEED OF 2ND SPINDLE	R	Machine Maker	**157**
1123	Spindle	JOG SPEED OF 3RD SPINDLE	R	Machine Maker	**157**
1158	Operation	SHOW F2~F12 FOR FUN. KEY	⊙	User	**208**
1159	Operation	PROGRAM READING OVERTIME		User	**209**
1160	Operation	DISTANCE OF CONTACT X+	R	Machine Maker	**210**
1161	Operation	DISTANCE OF CONTACT X-	R	Machine Maker	**210**
1162	Operation	DISTANCE OF CONTACT Z+	R	Machine Maker	**210**
1163	Operation	DISTANCE OF CONTACT Z-	R	Machine Maker	**210**
1164	Spindle	SPD2 RIGTAP ACC/DEC TIME	R	Machine Maker	**153**
1165	Spindle	SPD3 RIGTAP ACC/DEC TIME	R	Machine Maker	**153**
1166	Spindle	SPD2 RIGTAP VELOCITY COMP.	R	Machine Maker	**154**
1167	Spindle	SPD3 RIGTAP VELOCITY COMP.	R	Machine Maker	**154**
1168	Spindle	SPD2 RIGTAP ACCELERATED COMP.	R	Machine Maker	**154**
1169	Spindle	SPD3 RIGTAP ACCELERATED COMP.	R	Machine Maker	**154**
1170	Spindle	SPD2 RIGTAP VEL. FILTER FACTOR	R	Machine Maker	**155**
1171	Spindle	SPD3 RIGTAP VEL. FILTER FACTOR	R	Machine Maker	**155**

No	Group	Description	Effective	Level	Page
1172	Spindle	SPD2 RIGTAP ACC. FILTER FACTOR	R	Machine Maker	**155**
1173	Spindle	SPD3 RIGTAP ACC. FILTER FACTOR	R	Machine Maker	**155**
1174	Spindle	SPD2 RIGTAP SPD STOP CHECK	R	Machine Maker	**155**
1175	Spindle	SPD3 RIGTAP SPD STOP CHECK	R	Machine Maker	**155**
1176	Spindle	SPD2 RIGTAP DEC TIME/1000 RPM	R	Machine Maker	**156**
1177	Spindle	SPD3 RIGTAP DEC TIME/1000 RPM	R	Machine Maker	**156**

5.2 SEVRO PARAMETER

1	SYSTEM LOOP GAINS FOR V CMD

Range： 1 ~ 20000
Effective： Effective After Reboot
Access level： Machine Maker
Default： 30
Unit： 1/sec

This parameter is to set maximum following error amount of X axis (SERVO LAG). When the following error amount of X axis is over this parameter setting value, System Alarm【MOT 4006 : X Axis Servo LAG Over Para. # 0002 Setting Value】will occur.
lag = F/Kp
F is the feedrate, Kp is the position Loop incremental value.
From the above formula, the bigger the feedrate, the bigger the following error amount. So, user only need to key-in the X axis maximum speed into the above formula to get the maximum following error amount of X axis.
Example:
X axis position Loop incremental value is sec-1, speed of G00 is 20000mm/min. Moving is the constant speed under RAPID TRAVERSE and the following error amount is:

$$lag = \frac{20000000(\mu m)}{60(s) \times 100(\frac{1}{s})} = 3333.3\mu m$$

Please notice that the following error amount of X axis must not over 3334 μm under any normal condition. Therefore, recommending to multiply the calculated value by a save number (approximately 1.1) first and then key-in the value into Para. # 0002.

2	**MAX. SERVO LAG OF X AXIS, μm**
3	**MAX. SERVO LAG OF Y AXIS, μm**
4	**MAX. SERVO LAG OF Z AXIS, μm**
5	**MAX. SERVO LAG OF THE 4TH AXIS, μm**

Range： 1 ~ 30000
Effective： Effective After RESET
Access level： Machine Maker
Default： 30000
Unit： μm

This parameter sets the max. servo lag for each axis. When the servo lag of some axis exceeds this parameter's set value, the alarm "MOT 4006 ~ 4009 AXIS SERVO LAG OVERFLOW" will be triggered.
When a servo axis travels at a constant speed, its servo lag can be deduced from the formula below:
lag = F/Kp
In this formula, F is the override, and Kp is the position loop gain.
As indicated by the formula, the larger the override is, the more the servo lag will be. Hence, simply input the highest speed of each axis into the formula above, and the max. servo lag of each axis will be produced.
Example:
If X axis travels at a constant speed in RAPID TRAVERSE, its position loop gain is $100(\frac{1}{s})$, the speed of G00 is 20000mm/min, and the servo lag would be:

$$lag = \frac{20000000(\mu m)}{60(s)\times 100(\frac{1}{s})} = 3333.3\mu m$$

When the machine functions normally, the servo lag amount of X axis should not exceed 3334 μm at any time. Hence, the recommendation is to multiply this value by a safe coefficient (about 1.1) and enter the product into Pr. 0002.

6	**IN-POSITION CHECK WINDOW OF X AXIS, μm**
7	**IN-POSITION CHECK WINDOW OF Y AXIS, μm**
8	**IN-POSITION CHECK WINDOW OF Z AXIS, μm**
9	**IN-POSITION CHECK WINDOW OF THE 4TH AXIS, μm**

Range： 1 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 50
Unit： μm

This parameter sets the in-position check window of each axis in the Exact Stop mode. When some axis's
| command position – actual position | $\leqq$ this parameter's set value,
this means that this axis has completed cutting feed and stopped. Please also refer to the setting description of Pr. 0043.

10	**G00'S ACCEL./DECEL. TIME OF X AXIS, ms**
11	**G00'S ACCEL./DECEL. TIME OF Y AXIS, ms**
12	**G00'S ACCEL./DECEL. TIME OF Z AXIS, ms**
13	**G00'S ACCEL./DECEL. TIME OF THE 4TH AXIS, ms**

Range： 3 ~ 1500
Effective： Effective After Reboot
Access level： Machine Maker
Default： 230
Unit： ms

This parameter sets each axis's acceleration & deceleration time of rapid traverse. The smaller the parameter is, the faster each axis reaches the designated motion speed. However, this might also cause vibration of each axis.
For 486IPC version (IPO is 5ms), the maximum value of this parameter is 2000.
For 586IPC version (IPO is 3ms), the maximum value of this parameter is 1500.
If the set value is smaller than IPO cycle or exceeds the tolerance of the above values, the alarm "MOT4031 ~ 4034 SET PAR ERROR " will be triggered.

14	**G01 ACCEL./DECEL. TIME**

Range： 3 ~ 1500
Effective： Effective After Reboot
Access level： Machine Maker
Default： 100
Unit： ms

This parameter is to set the acceleration/deceleration time of G00 of all servo axes. The smaller this parameter is, the faster the servo axis reaches the specified speed; vibration, however, would be more indispensable. For 486IPC version (the IPO is 10ms), the max. value is 2000; for 586IPC version (the IPO is 3ms), the max. value is 1500.
If the set value exceeds the above limit, the alarm "MOT 4030 SET PAR 14 ERROR" will be triggered.

18	**THREAD CUTTING ACC/DEC TIME**

Range： 1 ~ 1000
Effective： Effective After Reboot
Access level： Machine Maker
Default： 50
Unit： ms

This parameter is to set the cutting axis acceleration/deceleration time under Lathe-Tapping cutting command. The smaller the parameter value, the faster the cutting axis reaches the designated moving speed. However, it may cause vibration of cutting axis.
In 486IPC（IPO is 5ms）, max. value of this parameter is 1000.
In 586IPC（IPO is 3ms）, max. value of this parameter is 1000.
When the setting value is less than IPO interval of the above restricted value, System Alarm【MOT 4056: Lathe-Tapping Acc/Dec Time (Para. # 0018) Setting Error】will occur.

24	CORRESPONDING SERVO AXIS NUMBER OF X AXIS
25	CHANNEL NO FOR Y AXIS
26	CORRESPONDING SERVO AXIS NUMBER OF Z AXIS
27	CORRESPONDING SERVO AXIS NUMBER OF THE 4TH AXIS

Range： 0 ~ 6
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

If the lead of X (Y, Z, the 4th) axis is connected to the Nth axis of the transit card, then set this parameter to N; if not connected to a motor, set to 0.

40	G00'S LOWEST OVERRIDE AT F0

Range： 0 ~ 25
Effective： Effective After RESET
Access level： User
Default： 10
Unit： %

This parameter sets the actual override value in percentage when the override rotary switch of rapid traverse is turned to 0%. For example, if this parameter is set to 10, and the rotary switch of rapid traverse is turned to 0%, then the actual corresponding value is 10%.

53	ENCODER FEEDBACK MULTIPLIER OF THE 4TH AXIS 1/2/4
54	ENCODER FEEDBACK MULTIPLIER OF X AXIS 1/2/4
55	ENCODER FEEDBACK MULTIPLIER OF Y AXIS 1/2/4
56	ENCODER FEEDBACK MULTIPLIER OF Z AXIS 1/2/4

Range： 1 ~ 4
Effective： Effective After Reboot
Access level： Machine Maker
Default： 4
Unit： Nul

This parameter sets the encoder feedback multiplier of each axis. This parameter is valid only when the types of encoder feedback signals are A/B PHASE. If each axis's encoder feedback signals are the CW/CCW or PULSE/DIRECTION type (the set value is 1 or 2, respectively), then the encoder feedback multiplier would always be 1.
In Pulse Command mode, the product of this parameter multiplying the output pulse number for each motor encoder to make one revolution is equal to the pulse command amount that NC demands to enable each axial motor to make one revolution.

1112	ENCODER.X PULSES/ROTATION
1113	ENCODER.Y PULSES/ROTATION
1114	ENCODER.Z PULSES/ROTATION
1115	ENCODER.4TH PULSES/ROTATION

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 2500
Unit： pulse

If the pulse number output by the motor encoder of some axis is 2500, then set this parameter to 2500. Please also refer to the setting description of Pr.0053 ~ Pr.0056.

65	ABSOLUTE ENCODER BIT 0-3

Range： 0 ~ 15
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

BIT 0：Setting 0 to indicate X axis uses Incremental Encoder and 1 to indicate X axis uses Absolute Encoder.
BIT 1：Setting 0 to indicate Y axis uses Incremental Encoder and 1 to indicate Y axis uses Absolute Encoder.
BIT 2：Setting 0 to indicate Z axis uses Incremental Encoder and 1 to indicate Z axis uses Absolute Encoder.
BIT 3：Setting 0 to indicate the 4th axis uses Incremental Encoder and 1 to indicate the 4th axis uses Absolute Encoder.

66	SET THE 4TH AXIS AS A 0)RATORY 1)LINEAR AXIS

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

0: Rotary axis;
1: Linear axis.
If the 4^{th} ~ 6^{th} axes are linear axes, the ball screw's pitch should be set according to its actual value; if the axes are rotary axes, the ball screw's pitch should be set to 360 (which indicates 360°).

85	MAX FOLLOWING ERROR X100

Range： 0 ~ 15
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

BIT0：when set as 1, the maximum following error of X-axis (parameter # 0002) is magnified 100 times.
BIT1： when set as 1, the maximum following error of Y-axis (parameter # 0003) is magnified 100 times.
BIT2：when set as 1, the maximum following error of Z-axis (parameter # 0004) is magnified 100 times.
BIT3：when set as 1, the maximum following error of 4TH-axis (parameter # 0005) is magnified 100 times.

108	RPM TO VOLTAGE RATIO FOR X AXIS RPM/1V
109	RPM TO VOLTAGE RATIO FOR Y AXIS RPM/1V
110	RPM TO VOLTAGE RATIO FOR Z AXIS RPM/1V
111	RPM TO VOLTAGE RATIO FOR THE 4TH AXIS RPM/1V

Range： 1 ~ 20000
Effective： Effective After Reboot
Access level： Machine Maker
Default： 200
Unit： RPM/1V

This parameter sets the RPM that corresponds to 1V of input voltage for each axis motor. For example, if the input voltage is 10V, and the rotation speed of each axis motor is 2000RPM, then this parameter's set value would be 200.
This parameter is only effective when the control mode of each axis is V Command.

116	MOVING DIR OF EACH AXIS

Range： 0 ~ 31
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

BIT0：when set as 1, the X-axis should move in reverse direction against previous movement. When set as 0, there is no reverse movement.
BIT1：when set as 1, the Y-axis should move in reverse direction against previous movement. When set as 0, there is no reverse movement.
BIT2：when set as 1, the Z-axis should move in reverse direction against previous movement. When set as 0, there is no reverse movement.
BIT3：when set as 1, the 4^{TH}-axis should move in reverse direction against previous movement. When set as 0, there is no reverse movement.
BIT4：when set as 1, the spindle-axis should rotate in reverse direction against previous. When set as 0, there is no reverse rotation. This only effects only when the spindle is under PULSE COMMAND, such as spindle orientation and rigid tapping.

Description: Take the X-axis for example, under JOG mode, if you pressed the +x button on the OP panel, the machine X-axis moves in negative direction, it means motor's positive rotation is in reverse to +X axis direction. Please set BIT0 as 1. if you pressed the +x button on the OP panel, the machine X-axis moves in positive direction as well, please set BIT0 as 0. Such is the same with all the rest axis.

156	COMMAND TYPE OF X AXIS 0)AB 1)CW 2)PD 3)V
157	COMMAND TYPE OF Y AXIS 0)AB 1)CW 2)PD 3)V
158	COMMAND TYPE OF Z AXIS 0)AB 1)CW 2)PD 3)V
159	COMMAND TYPE OF THE 4TH AXIS 0)AB 1)CW 2)PD 3)V

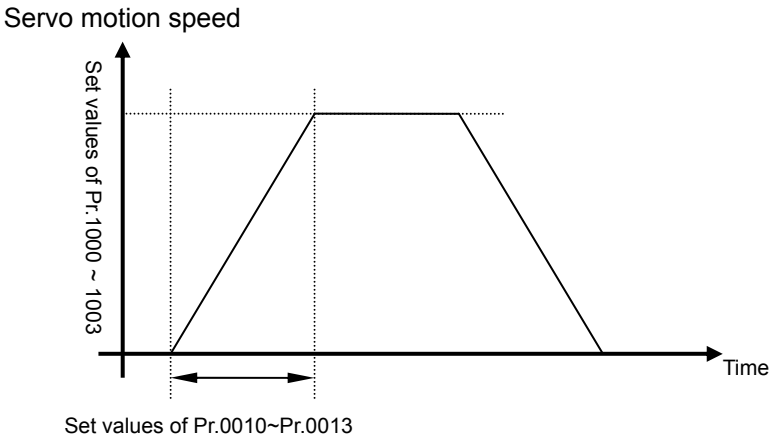
Range： 0 ~ 3
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

0：A/B PHASE；
1：CW/CCW；
2：PULSE/DIRECTION。

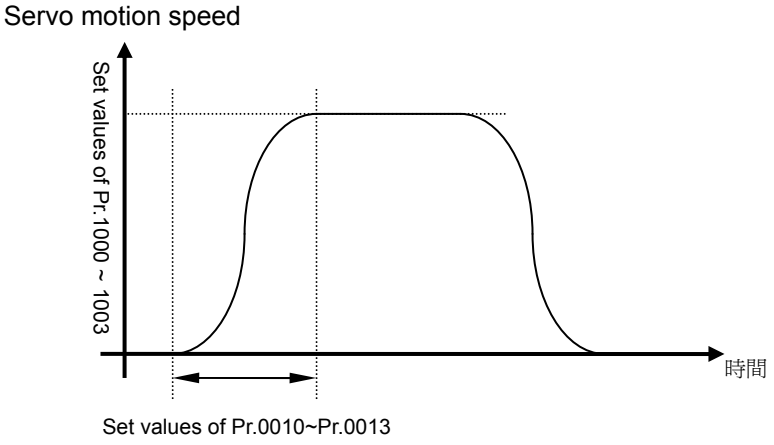
When some pulse command type is set at NC side, the same pulse command type must be also set for the motor driver. If the set value is 1 or 2, users must either set the rising width of output pulse (Pr. 1072) or enable Pr. 0186 so the rising width of output pulse will be adjusted to 50% automatically. For A/B PHASE, NC axis card adjusts itself to 50% duration automatically and does not require additional settings.

172	G00 ACCEL./DECEL. TYPE 1)LINE 2) CURVE

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul
0：Linear acceleration/deceleration
1：S-curve acceleration/deceleration



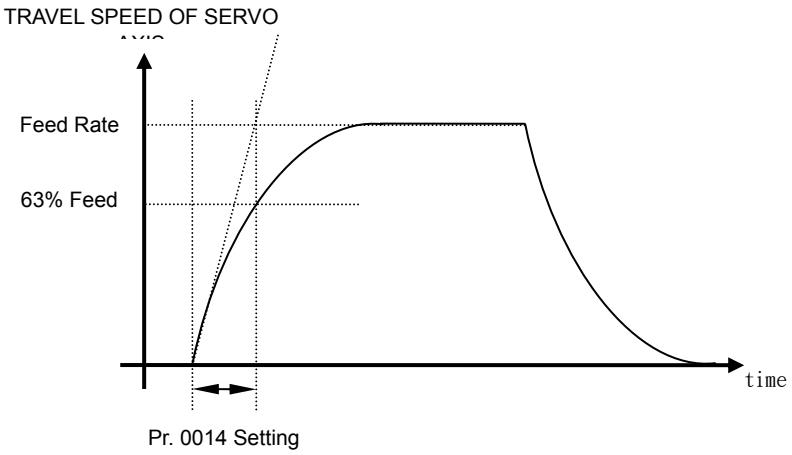
Linear accel./decel. type



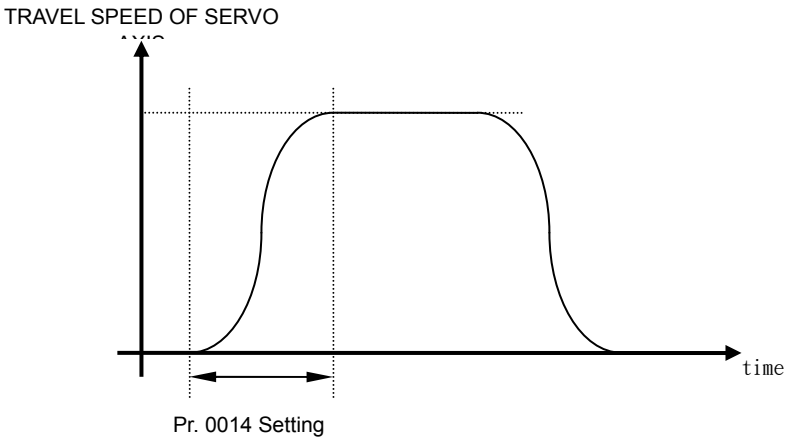
S curve accel./decel. type

173	G01 ACC. TYPE 0)LINE 1)S CURVE

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul
0：Expolantial acceleration/deceleration
1：S-curve acceleration/deceleration



Linear Accel./Decel.



S Curve Accel./Decel.

185 **INV POS FEEDBACK OF EACH AXIS**

Range： 0 ~ 31
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

BIT0：when set as 1, means negative X-axis ENCODER feedback signal
BIT1：when set as 1, means negative Y-axis ENCODER feedback signal
BIT2：when set as 1, means negative Z-axis ENCODER feedback signal
BIT3：when set as 1, means negative 4TH-axis ENCODER feedback signal
BIT4：when set as 1, means negative spindle ENCODER feedback signal
【Setting timing】
Take X-axis for example, if X-axis is set as PULSE TYPE, when you press the +X button of OP panel, the machine X-axis moves in positive direction, but the value of system data #000(X-axis following error) continuously increases, and this value doesn't decrease down to the range of ±1, it means that you have to reverse the X-axis ENCODER signal.
(Usually this is caused when the BIT0 of parameter # 0116 is set as 1.) In this case, please set the BIT0 of parameter # 0116 as 1. If the above didn't occur, please set the BIT0 of parameter # 0116 as 0. If X-axis is under V COMMAND mode, when you press the +X button of OP panel, the machine X-axis rushes, it means that you have to reverse the X-axis ENCODER signal. In this case, please set the BIT0 of this parameter as1.
So is the same with all the other axis.

188 **POSITION LOOP GAIN OF SERVO AXIS IN PULSE COMMAND 1/sec.**

Range： 1 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 30
Unit： 1/sec

This parameter is to calculate the actual contour of ARCH error set by ARCH FEEDRATE AUTO CLAMP function (please refer to Pr. 0187 for further details of this function). In PULSE TYPE, because position control loop is processed by servo driver, NC is unable to obtain the set value of this parameter. In order to allow NC to obtain the set value of this parameter when ARCH FEEDRATE AUTO CLAMP function is enabled, a position loop gain must be set manually in advance. Please note that the position loop gain of each axis must be the same, otherwise the actual contour of ARCH command will become an ellipse.
Please also refer to the descriptions of related parameters: Pr.0187 & Pr.0809.

191	ENCORDER SIGNAL TYPE OF X AXIS
192	ENCORDER SIGNAL TYPE OF Y AXIS
193	ENCORDER SIGNAL TYPE OF Z AXIS
194	ENCORDER SIGNAL TYPE OF THE 4TH AXIS

Range： 0 ~ 3
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul
0：A/B PHASE
1：CW/CCW
2：PULSE/DIRECTION
3：n/A

This parameter sets the output signal type of X axis's motor encoder . Please refer to the setting of motor driver. If X axis does not have an encoder (ex. a stepping motor), please set this parameter to 3.

800	G00'S IN-POSITION CHECK WINDOW OF X AXIS, μm
801	G00'S IN-POSITION CHECK WINDOW OF Y AXIS, μm
802	G00'S IN-POSITION CHECK WINDOW OF Z AXIS, μm
803	G00'S IN-POSITION CHECK WINDOW OF THE 4TH AXIS, μm

Range： 1 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 1000
Unit： μm
This parameter sets the in-position check window of each axis when the exact stop function of rapid positioning is enabled. When some axis's
| command position – actual position | $\leqq$ this parameter's set value,
this means that this axis has already completed rapid positioning and stopped.

1000	G00 MAX. SPEED OF X AXIS IN RAPID TRAVERSE, μm/min
1001	G00 MAX. SPEED OF Y AXIS IN RAPID TRAVERSE,μm/min
1002	G00 MAX. SPEED OF Z AXIS IN RAPID TRAVERSE, μm/min
1003	G00 MAX. SPEED OF THE 4TH AXIS IN RAPID TRAVERSE, μm/min

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 5000000
Unit： μm/min
This parameter sets the max. motion speed of each axis during rapid traverse.

1004 **G01 MAX. SPEED OF LINEAR CUTTING, μm/min**

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 2000000
Unit： μm/min

This parameter sets the following values:
1. The max. feed rate of the linear cutting command G01;
2. The max. feed rate of the curve cutting command G02/03;
3. The feed rate of the cutting commands G01/02/03 in DRY RUN mode.

This parameter's set value is taken by NC as the maximum allowed feedrate even when the actual feedrate set on the operation panel might exceed this parameter's set value.

1042 **G31 PRESET FEED RATE**

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 2000
Unit： μm/min

If assigning a feed rate in the block of G31 command, the block would take the command value as its feed rate; if there is no feed rate assigned in the block of G31 command, the feed rate is set by this parameter.

1061 **MAX. SPEED OF LATHE TAPPING**

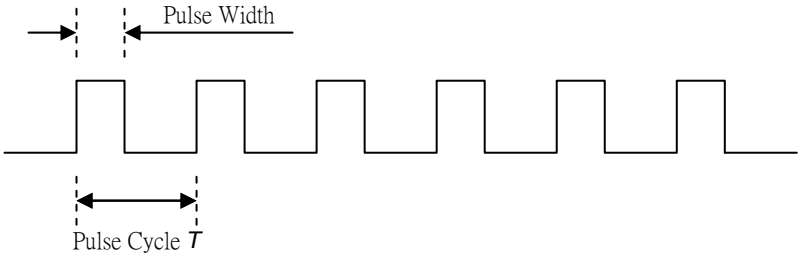
Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 10000000
Unit： μm

The cutting feed rate is decided by the spindle's rotation speed and thread pitch during lathe tapping. If the feed rate produced by these two elements exceeds the set value of this parameter, the alarm "MOT 4061: LATHE TAPPING SPEED OVER SETTING VALUE" will be triggered to prevent any danger that might be caused by false programming.

1072	PULSE WIDTH μs

Range： 1 ~ 50
Effective： Effective After Reboot
Access level： Machine Maker
Default： 20
Unit： μs

When the pulse command type is CW/CCW or PULSE/DIRECTON, this parameter sets the pulse width as shown in the figure below.



Below is the formula for pulse cycle (ex. a linear axis)：

$$1/T = \frac{feedrate}{pitch} \times GR \times Pulse/rev \times \frac{1}{60000}$$, unit：ms

Example：
In this example, the thread pitch of X axis is 10mm, the gear ratio is 2 (Deceleration ratio: When the motor makes 2 rev., the ball screw makes 1 rev.), the pulse/rev. is 10000, and the feed rate is 2000mm/min., and the required output pulse/1ms would be:

$$Pulses = \frac{2000}{10} \times 2 \times 10000 \times \frac{1}{60000} \approx 67\ pulses/ms$$

And the pulse cycle would be：

$$T = \frac{1000}{67} \approx 15\mu s$$

Under this condition, the pulse width should be set as 7us to keep the pulse command as 50% of DURATION. If the set value of this parameter is too large, the pulse width might exceed the pulse cycle during high-speed motion, and the motor driver could not read the overlapping pulse command lines to actuate the motor's rotation normally.
However, if the set value is too small, the motor driver might also be unable to identify the pulse command lines. Therefore, the max. value of this parameter should be set according to the max. width within which tolerance that pulse command lines do not overlap each other. And the min. value should be set according to the min. width within which tolerance the motor can identify pulse command lines.

1100	JOG SPEED FOR X AXIS μm/min
1101	JOG SPEED FOR Y AXIS μm/min
1102	JOG SPEED FOR Z AXIS μm/min
1103	JOG SPEED FOR THE 4TH AXIS μm/min

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 2000000
Unit： μm/min
This parameter sets the moving speed of each axis in JOG mode.

5.3 MACHINE PARAMETER

62	UNIT OF Pr.0104 ~ Pr.0107 0) METRIC 1) IMPERIAL

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

This parameters sets the unit system of Pr.0104 ~ Pr.0107 to be metric or imperial.

68	TOOTH NUMBER OF X AXIS MOTOR (DENOMINATOR IN GEAR RATIO)
69	TOOTH NUMBER OF Y AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)
70	TOOTH NUMBER OF Z AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)
72	TOOTH NUMBER OF THE 4TH AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the tooth number of each axis motor, which equals to setting an axis's denominator in gear ratio.

$$\text{Gear ratio of some axis} = \frac{\text{Ball screw's tooth number}}{\text{Motor's tooth number (this parameter)}}$$

If the gear ratio of some axis is larger than 1, motor speed is decelerated by ball screw; if smaller than 1, motor speed is accelerated by ball screw. Please refer to the following formula for the setting method:

$$\text{Motor's tooth number} \times \text{Motor's rotation speed} = \text{Ball screw's tooth number} \times \text{Ball screw's rotation speed}$$

100	BALL SCREW'S TOOTH NUMBER OF X AXIS (NUMERATOR IN GEAR RATIO)
101	BALL SCREW'S TOOTH NUMBER OF Y AXIS (NUMERATOR IN GEAR RATIO)
102	BALL SCREW'S TOOTH NUMBER OF Z AXIS (NUMERATOR IN GEAR RATIO)
103	BALL SCREW'S TOOTH NUMBER OF THE 4TH AXIS (NUMERATOR IN GEAR RATIO)

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the ball screw's tooth number of each axis, which equals to setting the numerator in gear ratio of each axis.

$$\text{Gear ratio of some axis} = \frac{\text{Ball screw's tooth number (this parameter)}}{\text{Motor's tooth number}}$$

If the gear ratio of some axis is larger than 1,motor speed is decelerated by ball screw; if smaller than 1, motor speed is accelerated by ball screw. Please refer to the following formula for the setting method:

$$\text{Motor's tooth number} \times \text{motor's rotation speed} = \text{Ball screw's tooth number} \times \text{ball screw's rotation speed}$$

104	BALL SCREW PITCH. OF X AXIS
105	BALL SCREW PITCH. OF Y AXIS
106	BALL SCREW PITCH. OF Z AXIS
107	BALL SCREW PITCH. OF THE 4TH AXIS

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 360
Unit： μm

This parameter sets the ball screw pitch of each axis.

Additional Machine Parameter Setting:

In general, $GearRatio = \frac{\text{Another Side No. Teeth}}{\text{Active Side No. Teeth}} = \frac{\text{Active Side No. Revolution}}{\text{Another Side No. Revolution}}$, if this ratio is bigger than 1, it means the transmit structure is the deceleration structure. On the other hand, if this ratio is less than 1, it means the transmit structure is the acceleration structure. If this ratio is 1, then this is a direct transmit structure.

For linear axis, the above machine parameter is set according to the machine structure setting value. For rotary axis (i.e., the 4th axis), parameters 0072 and 0103 are set according to the machine structure setting value. But, parameter 0107 must be set as 360 (please set 0 for parameter 0066).

For unit, the degree (°) for rotary axis is equal to “mm” in the linear axis. Assumed 36000 should be entered in parameter 1017 initially. However, because this parameter is an INT type (integrate number) that means 360000 is out of setting range. In this case, please use NC to multiply 1000 by the setting number.

The above parameters will addition of parameters 0053 ~ 0056（each servo ENCODER feedback multiple factor ）、parameters 1112 ~ 1115（each servo motor ENCODER total pulse per rotation），are mainly used to calculate each servo’s CMR（COMMAND MODIFICATION RATIO）.

CMR（COMMAND MODIFICATION RATIO），the smallest moving unit to the corresponding PULSE value. Under metric unit system, the smallest moving unit is um; under inch unit system, the smallest moving unit is 0.0001 inch. For rotary axis, the smallest unit is 0.001 degree. The calculating formula is as following:

$$CMR = \frac{No.Pulse/\mathrm{Re}v}{BallScrew\_Pitch} \times \frac{BallScrew\_Side\_No.Teeth}{Motor\_Side\_No.Teeth} \times Feedback\_Multiple\_Factor$$

Example： Total pulse per rotation of a servo motor ENCODER is 2500PULSES/REV，ENCODER feedback multiple factor is 4，denominator of motor gear ratio is 1，numerator of ball screw gear ratio is 2，ball screw pitch 10000um，then CMR of this spindle is:

$$CMR = \frac{2500 \cdot 4}{10000} \times \frac{2}{1} = 2 \text{ PULSES / um}$$

This means if want to move 1um of this spindle, NC needs to send out 2 PULSES to the motor driver.

The truth is that after receiving command, the NC internal will use the smallest unit to calculate the moving distance for each spindle. Then, it will multiply the moving distance by CMR of each spindle and then NC will send the PULSE value to each driver spindle. For some special application cases, need to use X axis – Z axis as rotary axis. Now only able to use linear axis to simulate rotating axis. At this time, please refer to the above mathematic formal for those parameter's setting.

Example： Assumed on an application example, needs to use X axis as rotary servo axis, then this the total pulse per rotation of the spindle motor ENCODER is 2500PULSES/REV, ENCODER feedback multiple factor is 4, denominator of motor gear raptor is 5, numerator of ball screw ratio is 2262, the CMR will be:
PULSES/0.001degree

This means if wants to make X axis to turn 0.0001° , NC needs to send out 12.567 PULSES to motor driver. From the above calculation, the pitch of X axis needs to be set as 360000. But, as mentioned before, this parameter is an INT (integrate number) type, so 360000 is out of the range. If we take out the factor, which is 1000, from 3600 and then multiply it by the denominator of motor gear ratio (i.e., 5 in this case), the whole formula is unchanged. So the parameter setting for the spindle is as following. Parameter 0054 is set as 4, parameter 1112 is set as 2500, parameter 0068 is set as 5000, and parameter 0100 is set as 2262. and parameter 0104 is set as 360.

5.4 Spindle Parameter

16	**ACC/DEC TIME OF 1ST SPINDLE**
885	**ACC/DEC TIME OF 2ND SPINDLE**
888	**ACCEL./DECEL. TIME PER KILO-REV.OF THE 3RD SPINDLE**

Range： 0 ~ 10000
Effective： Effective After Reboot
Access level： Machine Maker
Default： 500
Unit： Nul

When the command output formant of the spindle is in pulse format or ±10V, this parameter sets the acceleration/deceleration time of the spindle's speed.

21	**RPM OF THE 1ST SPINDLE'S ORIENTATION**

Range： 1 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 100
Unit： RPM

This parameter sets the spindle's rotation speed during orientation. This parameter also decides the spindle's rotation speed when the spindle is being oriented. To prevent deviation caused by different rotation speeds, please do not change the set value of this parameter after finishing the orientation adjustment of the spindle.

29	**THE CORRESPONDING SERVO AXIS NUMBER OF THE 1ST SPINDLE**
294	**CORRESPONDING TO 2ND SPINDLE**
295	**CORRESPONDING TO 3RD SPINDLE**

Range： 0 ~ 6
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

If the spindle's wiring is connected to the N^{th} axis of the transit card, set this parameter to N; if there is no spindle, set to 0.

49	MOTOR'S TOOTH NUMBER OF THE 1ST SPINDLE IN 1ST GEAR
664	MOTOR'S TOOTH NUMBER OF THE 2ND SPINDLE IN 1ST GEAR
672	MOTOR'S TOOTH NUMBER OF THE 3RD SPINDLE IN 1ST GEAR

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the motor's tooth number of some spindle in 1st gear, which equals to setting the denominator in gear ratio of some spindle in 1st gear. When some spindle is in 1st gear (C097 is ON)：

$$\text{Gear ratio of the spindle} = \frac{\text{Tooth number of spindle (Pr.0050)}}{\text{Tooth number of motor (this parameter)}}$$

If the spindle's gear ratio is larger than 1, there is a deceleration relationship between motor and spindle; if the ratio is smaller than 1, there is a acceleration relationship between motor and spindle. Please refer to the following formula for the setting method：

$$\text{Motor's tooth number} \times \text{Motor's rotation speed} = \text{Spindle's tooth number} \times \text{Spindle's rotation speed}$$

50	THE 1ST SPINDLE'S TEETH NUMBER IN 1ST GEAR
665	THE 2ND SPINDLE'S TEETH NUMBER IN 1ST GEAR
673	THE 3RD SPINDLE'S TEETH NUMBER IN 1ST GEAR

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the motor's tooth number of some spindle in 1st gear, which equals to setting the numerator in gear ratio of some spindle in 1st gear. When some spindle is in 1st gear (C097 is ON)：

$$\text{Gear ratio of the spindle} = \frac{\text{Tooth number of spindle (this parameter)}}{\text{Tooth number of motor (Pr. 0049)}}$$

If the spindle's gear ratio is larger than 1, there is a deceleration relationship between motor and spindle; if the ratio is smaller than 1, there is an acceleration relationship between motor and spindle. Please refer to the following formula for the setting method：

$$\text{Motor's tooth number} \times \text{Motor's rotation speed} = \text{Spindle's tooth number} \times \text{Spindle's rotation speed}$$

51	TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 2ND GEAR
666	TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 2ND GEAR
674	TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 2ND GEAR

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the tooth number of some spindle's motor in 2nd gear, which equals to setting the denominator in gear ratio of some spindle in 2nd gear. When some spindle is in 2nd gear (C098 is ON)：

$$\text{Gear ratio of the spindle} = \frac{\text{Tooth number of spindle (Pr.0052)}}{\text{Tooth number of motor (this parameter)}}$$

If the spindle's gear ratio is larger than 1, there is a deceleration relationship between motor and spindle; if the ratio is smaller than 1, there is an acceleration relationship between motor and spindle. Please refer to the following formula for the setting method：

$$\text{Motor's tooth number} \times \text{Motor's rotation speed} = \text{Spindle's tooth number} \times \text{Spindle's rotation speed}$$

52	TOOTH NUMBER OF THE 1ST SPINDLE IN 2ND GEAR
667	TOOTH NUMBER OF THE 2ND SPINDLE IN 2ND GEAR
675	TOOTH NUMBER OF THE 3RD SPINDLE IN 2ND GEAR

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the tooth number of some spindle in 2nd gear, which equals to setting the numerator in gear ratio of some spindle in 2nd gear. When some spindle is in 2nd gear (C098 is ON)：

$$\text{Gear ratio of the spindle} = \frac{\text{Tooth number of spindle (this parameter)}}{\text{Tooth number of motor (Pr.0051)}}$$

If the spindle's gear ratio is larger than 1, there is a deceleration relationship between motor and spindle; if the ratio is smaller than 1, there is an acceleration relationship between motor and spindle. Please refer to the following formula for the setting method：

$$\text{Motor's tooth number} \times \text{Motor's rotation speed} = \text{Spindle's tooth number} \times \text{Spindle's rotation speed}$$

57	FEEDBACK RATE OF THE 1ST SPINDLE
890	FEEDBACK RATE OF THE 2ND SPINDLE
894	FEEDBACK RATE OF THE 3RD SPINDLE

Range： 1 ~ 4
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the feedback rate multiplier of some spindle's encoder and is only effective when the feedback signal type is AB PHASE (Pr.0195 is set to 0). If the feedback signal type of the spindle's encoder is CW/CCW or PULSE/DIRECTION (Pr.0195 is 1 or 2, respectively), the feedback rate multiplier would always be 1.
When the spindle's control mode is PULSE COMMAND (in SPINDLE ORIENTATION or RIGID TAPPING modes), the product of this parameter's set value and Pr.1116's set value (pulse/rev of the spindle motor's encoder) is the pulse command amount of NC to make one revolution of the spindle motor. If the spindle's control mode is V Command, the product of this parameter's set value and Pr.1116's set value is used to calculate the spindle's actual rotation speed only.

61	1ST SPINDLE ENCODER PPR
889	PPR OF THE 2ND SPINDLE'S ENCODER
893	PPR OF THE 3RD SPINDLE'S ENCODER

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1024
Unit： pulse

Assuming pulse/rev. of some motor encoder is 2500, then set this parameter to 2500.

84	THE 1ST SPINDLE ORIENTATION 0)SENSOR 1)ENCODER

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

0：Use a positioning sensor as the reference for spindle orientation.
1：Use an encoder index as the reference for spindle orientation.

90	THE 1ST SPINDLE DISPLAYS 0)COMMAND 1) SENSOR
897	THE 2ND SPINDLE DISPLAYS 0)COMMAND 1) SENSOR
898	THE 3RD SPINDLE DISPLAYS 0)COMMAND 1) SENSOR

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： Nul

0：Display the command value
1：Display the actual value, meanwhile NC calculates the actual rotation speed according to the feedback signal of the spindle's motor ENCODER and displays the product on HMI

If some spindle motor does not have an encoder, please set this parameter to 0 in case RPM check can not reach the assigned speed.

92	SPINDLE D/A SCALE RPM/10V
883	CORRESPONDING RPM OF THE 2ND SPINDLE MOTOR'S INPUT VOLTAGE 10V
886	CORRESPONDING RPM OF THE 3rd SPINDLE MOTOR'S INPUT VOLTAGE 10V

Range： 1 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 6000
Unit： RPM

Assume 10V of the spindle is corresponding to 3000RPM, then set this parameter to 3000. This parameter is effective only when the spindle's driver in Velocity Command mode.

95	MIN. SPEED OF THE 1ST SPINDLE
96	MAX SPEED OF 1ST SPINDLE
876	MAX SPEED OF 2ND SPINDLE
877	MIN. RPM OF THE 2nd SPINDLE
878	INITIAL RPM OF THE 3RD SPINDLE
879	MAX. RPM OF THE 3RD SPINDLE
880	MIN. RPM OF THE 3RD SPINDLE

Range： 0 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： RPM

This parameter sets the RPM range to prevent any part's damage of the machine caused by executing a command at a RPM that exceeds the acceptable range.

98	VOLTAGE COMMAND'S OFFSET VALUE OF THE 1ST SPINDLE'S RPM
884	VOLTAGE COMMAND'S OFFSET VALUE OF THE 2ND SPINDLE'S RPM
887	VOLTAGE COMMAND'S OFFSET VALUE OF THE 3RD SPINDLE'S RPM

Range： -5000 ~ 5000
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： 0.3mV

This parameter sets the offset value of the spindle's voltage command. After the required voltage command is deduced based on the spindle command RPM, minus this parameter's set value from the voltage command, then the user can obtain the actual voltage command that needs to be sent to the spindle's A/C. The present DAC of the system's motion card is 16 bits, which corresponds to ±10V, so the dpi is 10/32768 = 0.3mV, which is the unit of this parameter.

160	1ST SPD ENC MOUNT 0)SPL 1)MTR
892	INSTALL THE 2ND SPINDLE'S ENCODER ONTO THE 0)SPINDLE 1)MOTOR
896	INSTALL THE 3RD SPINDLE'S ENCODER ONTO THE 0)SPINDLE 1)MOTOR

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

This parameter sets the installation position of the spindle's encoder.
0: Onto the spindle.
1. Onto the motor.

178	TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 3RD GEAR
668	TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 3RD GEAR
676	TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 3RD GEAR

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the tooth number of some spindle's motor in 3rd gear, which equals to setting the denominator in gear ratio of some spindle in 3rd gear. When some spindle is in 3rd gear (C099 is ON)：

$$\text{Gear ratio of the spindle} = \frac{\text{Tooth number of spindle (Pr.0179)}}{\text{Tooth number of motor (this parameter)}}$$

If the spindle's gear ratio is larger than 1, there is a deceleration relationship between spindle and motor; if the ratio is smaller than 1, there is an acceleration relationship between spindle and motor. Please refer to the following formula for the setting method：

$$\text{Motor's tooth number} \times \text{Motor's rotation speed} = \text{Spindle's tooth number} \times \text{Spindle's rotation speed}$$

179	TOOTH NUMBER OF THE 1ST SPINDLE IN 3RD GEAR
669	TOOTH NUMBER OF THE 2ND SPINDLE IN 3RD GEAR
677	TOOTH NUMBER OF THE 3RD SPINDLE IN 3RD GEAR

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the tooth number of some spindle in 3rd gear, which equals to setting the numerator in gear ratio of some spindle in 3rd gear. When some spindle is in 3rd gear (C099 is OFF)：

$$\text{Gear ratio of the spindle} = \frac{\text{Tooth number of spindle (this parameter)}}{\text{Tooth number of motor (Pr.0178)}}$$

If the spindle's gear ratio is larger than 1, there is a deceleration relationship between spindle and motor; if the ratio is smaller than 1, there is an acceleration relationship between spindle and motor. Please refer to the following formula for the setting method：

$$\text{Motor's tooth number} \times \text{Motor's rotation speed} = \text{Spindle's tooth number} \times \text{Spindle's rotation speed}$$

181	TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 4TH GEAR
670	TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 4TH GEAR
678	TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 4TH GEAR

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the tooth number of some spindle's motor in 4TH gear, which equals to setting the denominator in gear ratio of some spindle in 4TH gear. When some spindle is in 4TH gear (C097 ~ C099 are all OFF)：

$$\text{Gear ratio of the spindle} = \frac{\text{Tooth number of spindle (Pr.0182)}}{\text{Tooth number of motor (this parameter)}}$$

If the spindle's gear ratio is larger than 1, there is a deceleration relationship between spindle and motor; if the ratio is smaller than 1, there is an acceleration relationship between spindle and motor. Please refer to the following formula for the setting method:

$$\text{Motor's tooth number} \times \text{Motor's rotation speed} = \text{Spindle's tooth number} \times \text{Spindle's rotation speed}$$

182	TOOTH NUMBER OF THE 1ST SPINDLE IN 4TH GEAR
671	TOOTH NUMBER OF THE 2ND SPINDLE IN 4TH GEAR
679	TOOTH NUMBER OF THE 3RD SPINDLE IN 4TH GEAR

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the tooth number of some spindle in 4th gear, which equals to setting the numerator in gear ratio of some spindle in 4th gear. When some spindle is in 4th gear (C097 ~ C099 are all OFF)：

$$\text{Gear ratio of the spindle} = \frac{\text{Tooth number of spindle (this parameter)}}{\text{Tooth number of motor (Pr.0181)}}$$

If the spindle's gear ratio is larger than 1, there is a deceleration relationship between spindle and motor; if the ratio is smaller than 1, there is an acceleration relationship between spindle and motor. Please refer to the following formula for the setting method：

$$\text{Motor's tooth number} \times \text{Motor's rotation speed} = \text{Spindle's tooth number} \times \text{Spindle's rotation speed}$$

183	COMMAND TYPE OF THE 1ST SPINDLE'S SPEED
296	COMMAND TYPE OF THE 2ND SPINDLE'S SPEED
297	COMMAND TYPE OF THE 3RD SPINDLE'S SPEED

Range： 0 ~ 4
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

This parameter sets the command type of some spindle's rotation speed. The system's preset command type is voltage output. If the motor driver of the spindle has a PG card or the spindle motor is a servo motor, the output command type of the spindle can be set in the pulse type that the motor driver accepts.

184	LOCAL INPUT OF THE 1ST SPINDLE'S ORIENTATION

Range： 1 ~ 10
Effective： Effective After RESET
Access level： Machine Maker
Default： 9
Unit： Nul

Bit 2	Bit 1	Bit 0	Description
0	0	1	Connected to Local input 1 (HS1 on the transit card) (Default)
0	1	0	Connected to Local input 2 (HS2 on the transit card)

Bit 3	Description
0	Normally close
1	Normally open. (Default)

Bit 0 ~ Bit 2：Set the input number of the spindle's orientation sensor signal. Set to 1, the local input is connected to HS1 on the transit card; set to 2, the local input is connected to HS2 on the transit card.
Bit 3：Set the signal type of the spindle's orientation sensor. Set to 0: Normally Close (NC); set to 1: Normally Open. (NO).
Set to 1：The local input port of spindle positioning sensor signal is HS1, the signal type is Normally Close (NC);
Set to 9：The local input port of spindle positioning sensor signal is HS1, the signal type is Normally Open (NO);
Set to 2：The local input port of spindle positioning sensor signal is HS2, the signal type is Normally Close (NC);
Set to 10：The local input port of spindle positioning sensor signal is HS2, signal type is Normally Open (NO).

189	DEFAULT INITIAL SPEED OF THE 1ST SPINDLE
875	DEFAULT INITIAL SPEED OF THE 2ND SPINDLE

Range： 0 ~ 20000
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： RPM
When the system is started, this parameter is the preset initial rotation speed of the spindle.

190	POSITION COMMAND TYPE

Range： 0 ~ 3
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

0：A/B PHASE
1：CW/CCW
2：PULSE/DIRECTION

System is use PULSE COMMAND to drive Spindle when it s doing Spindle orientation and is under rigid tapping mode. This parameter is to set this commanding PULSE format. Please set the commanding PLUSE format according to Spindle inventor.

195	SIGNAL TYPE OF THE 1ST SPINDLE'S ENCODER
891	SIGNAL TYPE OF THE 2ND SPINDLE'S ENCODER
895	SIGNAL TYPE OF THE 3RD SPINDLE'S ENCODER

Range： 0 ~ 3
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

This parameter sets the feedback signal type of the encoder.
0：A/B PHASE
1：CW/CCW
2：Pulse/Dir
3：No feedback.

222	ACC/DEC TIME OF SPD. CH POS.

Range： 1 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 100
Unit： Nul

Acc/Deceleration time for spindle to execute C(H) positioning.

240	CLOSE LOOP GAIN OF THE 1ST SPINDLE'S ORIENTATION

Range： 0 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 30
Unit： 1/S

When the spindle's command type in control mode is V command (Pr.0190 = 3), this parameter sets the spindle's proportional gain during positioning.

354	OVERRIDE UNIT OF THE 1ST SPINDLE'S RPM
355	OVERRIDE UNIT OF THE 2ND SPINDLE'S RPM
356	OVERRIDE UNIT OF THE 3RD SPINDLE'S RPM

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul
Set to 0：The 1st (2nd & 3rd) spindle's rotation override speed = R015 (R019、R020) register value * 10%；
Set to 1：The 1st (2nd & 3rd) spindle's rotation override speed = R015 (R019、R020) register value* 1%。

663	1ST SPD ORIENT ACC/DEC TIME

Range： 0 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 100
Unit： ms
This parameter sets the acceleration/deceleration of the spindle during orientation (including spindle adjustment).

835	SPD. CH POS. ENABLE M CODE

Range： 0 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul
When the system executes this M code, the spindle enters C(H) positioning mode.

836	SPD. CH POS. RELEASE M CODE

Range： 0 ~ 32767
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul
When the system executes this M code, the spindle exits C(H) positioning mode.

837	THE START M CODE OF SPD POS
838	COUNT OF SPD POS. M CODE

Range： -1 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 5
Unit： Nul

The corresponding augment amount of angle shift value for M code can be deduced as the chart below by having the information of the semi-fixing starting M code (α) (parameter No. 0837), the numbers (n) (Pr.0838) of semi-fixing positioning M code, and the basic angle (β) (Pr.1062).

Relationship of M code & positioning angle

M code	Angle shift amount	The shift value of basic angle β =30°
M α	β	30°
M (α +1)	2 β	60°
M (α +2)	3 β	90°
M (α +3)	4 β	120°
：	：	：
M (α + n)	(n + 1) β	

839	TOLERANCE OF THE 1ST SPINDLE DURING ORIENTATION

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 1000
Unit： 0.001degree

This parameter sets the deviation tolerance of the spindle during orientation. When spindle orientation is being executed, if the deviation between the spindle's stop position and the actual reference mark is smaller than this parameter's set value, spindle orientation is deemed as finished. However, if the deviation is larger than this parameter's set value, the alarm "MOT 4049 SPINDLE ORIENTATION EXCEED ALLOWABLE ERROR" will be triggered.

298	RPM REACHES SET RANGE OF THE 2ND SPINDLE
881	RPM REACHES SET RANGE OF THE 3RD SPINDLE
1054	RPM REACHES SET RANGE OF THE 1ST SPINDLE

Range： 1 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 50
Unit： RPM

When sensor value of this parameter is 1 (spindle RPM indicates the actual speed), the system calculates the actual RPM by using the feedback signal of the spindle encoder. When
| Spindle's actual RPM － Spindle's command RPM | ＜this parameter's set value, the system will set S088 to ON to notify PLC that the spindle's actual RPM already reaches the command value. If this parameter's set value is too small, the system might detect a speed deviation between the actual RPM and the command RPM that is not within the tolerance range, and hence the system would not set S088 to ON to finish S code or M3, M4 command.

1056	SPD ORIENTATION OFFSET ANGLE

Range： -360000 ~ 360000
Effective： Effective After RESET
Access level： Machine Maker
Default： 30000
Unit： 0.001degree

During spindle orientation, this parameter sets the offset amount between the orientation stop point and the reference zero point.
For the unit of offset amount, please set to pulse or 0.0001 degree by Pr.0248.

1059	ACCEL./DECEL. TIME PER KILO-REV. OF THE 1ST SPINDLE DURING RIGID TAPPING
1164	SPD2 RIGTAP ACC/DEC TIME
1165	SPD3 RIGTAP ACC/DEC TIME

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： ms

This parameter sets the acceleration/deceleration time of the spindle during rigid tapping. As the motion amount of Z axis in Rigid Tapping status/mode is also calculated by the spindle's rotational amount, hence this parameter also sets the acceleration/deceleration time of Z axis.

1062	BASIC ANGULE OF SPD POS.

Range： -360000 ~ 360000
Effective： Effective After RESET
Access level： Machine Maker
Default： 30000
Unit： 0.001°

This parameter sets the Spindle semi-constant position basic angle shifting amount（β）. When the angle is a positive value, Spindle rotates in Encoder increasing direction. On the other hand, when the angle is a negative value, Spindle rotates in Encoder decreasing direction.

299	THE 2ND SPINDLE REACHES ZERO SPEED RPM
882	THE 3RD SPINDLE REACHES ZERO SPEED RPM
1063	THE 1ST SPINDLE REACHES ZERO SPEED RPM

Range： 1 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 10
Unit： RPM

When Pr.0090 is 1 (the spindle's RPM shows the actual speed), the system will calculate the actual RPM by using the feedback signals of the spindle encoder. When the spindle's actual RPM is equal to this parameter's set value, the system will set S092 to ON to notify PLC that the spindle's actual RPM already reaches zero speed.

1064	COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING
1166	SPD2 RIGTAP VELOCITY COMP.
1167	SPD3 RIGTAP VELOCITY COMP.

Range： 0 ~ 100000
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

After rigid tapping adjustment is finished, enter the value shown by system info No.023 on DGNOS page to this parameter.

1065	COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S ACCELERATION DURING RIGID TAPPING
1168	SPD2 RIGTAP ACCELERATED COMP.
1169	SPD3 RIGTAP ACCELERATED COMP.

Range： 0 ~ 100000
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

After the adjustment of rigid tapping is finished, enter the value shown by system info No.022 on DGNOS page to this parameter.

1066	COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING
1170	SPD2 RIGTAP VEL. FILTER FACTOR
1171	SPD3 RIGTAP VEL. FILTER FACTOR

Range： 0 ~ 20
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

The larger this parameter's set value is, the less vibration is produced. However, this also extends the lag time during rigid tapping. When this parameter is set to 0, there will be completely no filer effect. When set to its maximum value 20, there will be a complete filter effect, meaning, the signal will be filtered out completely. Please modify this parameter's set value during the adjustment of rigid tapping.

1069	SPD1 RIGTAP SPD STOP CHECK
1174	SPD2 RIGTAP SPD STOP CHECK
1175	SPD3 RIGTAP SPD STOP CHECK

Range： 0 ~ 200
Effective： Effective After RESET
Access level： Machine Maker
Default： 20
Unit： Pulse

To set the maximum distortion amount of Encoder while Spindle stops under rigid tapping mode. The recommending setting value is 2. Please notice that is the setting value is too small, the system will not determine when Spindle should stop, which will cause Spindle to stay at hole bottom and not returning back during rigid trapping. On the other hand, if the setting value is too big, tapping error may increase.

1070	COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S ACCELERATION SPEED DURING RIGID TAPPING
1172	SPD2 RIGTAP ACC. FILTER FACTOR
1173	SPD3 RIGTAP ACC. FILTER FACTOR

Range： 0 ~ 20
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

The larger this parameter's set value is, the less vibration will be. Also, this could shorten the lag time (although not definitely). When this parameter is set to 0, there will be completely no filter effect. When set to its maximum value 20, there will be a complete filter effect, meaning, the signal will be filtered out completely. Please modify this parameter's set value during the adjustment of rigid tapping.

1075	TOLERANCE OF THE 1ST SPINDLE IN CONTROL MODE

Range： 0 ~ 100000
Effective： Effective After RESET
Access level： Machine Maker
Default： 4096
Unit： Pulse

After the adjustment of rigid tapping is finished, multiply the value shown by the system info No.026 on DGNOS page by 5 ~ 10 times and enter the product to this parameter. If this parameter's set value is too small, the alarm "MOT 4055 SPD SERVO LAG OVERFLOW" might be triggered during rigid tapping.

1076	SPD1 RIGTAP DEC TIME/1000 RPM
1176	SPD2 RIGTAP DEC TIME/1000 RPM
1177	SPD3 RIGTAP DEC TIME/1000 RPM

Range： 0 ~ 100000
Effective： Effective After RESET
Access level： Machine Maker
Default： 1000
Unit： ms

This parameter sets the time per 1000rpm needed for the spindle to stop in rigid tapping mode. It also affects the hole's bottom position of rigid tapping.

1095	HOME OF SPD. C(H) POSITION

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： 0.001degree

The zero point of the spindle's C(H) positioning (the corresponding shift angle to the index point).

1117	SPEED OF SPD. CH POSITION

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 36000
Unit： Nul

The speed when the spindle executes C(H) positioning

1121	JOG RPM OF THE 1ST SPINDLE
1122	JOG SPEED OF 2ND SPINDLE
1123	JOG SPEED OF 3RD SPINDLE

Range： 1 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 200
Unit： RPM
When C072 is ON, this parameter sets the spindle's RPM.

5.5 MPG Parameter

15	CORRESPONDING MECHANICAL AXIS OF MPG SIMULATED AXIS

Range： 1 ~ 19
Effective： Effective After Reboot
Access level： Machine Maker
Default： 6
Unit： Nul
This parameter sets the number of MPG connection port when MPG is in Dry Run status (only effective in MEM or MDI mode).

28	MPG CONNECTION PORT OF X AXIS
75	MPG CONNECTION PORT OF THE 4TH AXIS
87	MPG CONNECTION PORT OF Y AXIS
88	MPG CONNECTION PORT OF Z AXIS

Range： 1 ~ 19
Effective： Effective After Reboot
Access level： Machine Maker
Default： 6
Unit： Nul
This parameter sets the MPG connection port's number of X axis in MPG mode.

5.6 Compensation Parameter

Please refer to Appendix at back of this manual for parameter settings of backlash, pitch error and circular spike compensation.

38	BACKLASH COMPENSATION UNIT 0)PULSE 16)μm

Range： 0 ~ 16
Effective： Effective After Reboot
Access level： Machine Maker
Default： 16
Unit： Nul
This parameter sets the unit system used by the backlash parameters (Pr.0044 ~ Pr.0047) and also the pitch compensation parameters (Pr.0300 ~ Pr.0349, 0450 ~ 0499, 0600 ~ 0649, 0750 ~ 0799).

44	BACKLASH COMPENSATION AMOUNT OF X AXIS μm
45	BACKLASH COMPENSATION AMOUNT OF Y AXIS μm
46	BACKLASH COMPENSATION AMOUNT OF Z AXIS μm
47	BACKLASH COMPENSATION AMOUNT OF THE 4TH AXIS μm

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm
This parameter sets the backlash compensation amount of each axis.

112	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF X AXIS
113	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Y AXIS
114	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Z AXIS
115	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF THE 4TH AXIS

Range： 1 ~ 50
Effective： Effective After Reboot
Access level： Machine Maker
Default： 20
Unit： Nul
to set total section of X-axis pitch error compensation. The multiple product of this parameter setting value and parameter 1018(1019, 1020, 1021) setting value should be the total length of X-axis ball screw pitch error compensation. Now the max compensation section is 50 sections for each axis.

117 **BACKLASH COMPENSATION FUNCTION BIT**

Range： 0 ~ 15
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

BIT0: for X axis, 1 means to enable X-axis backlash compensation function; 0 means not to enable.
BIT1：for Y axis, 1 means to enable Y axis backlash compensation function; 0 means not to enable.
BIT2：for Z axis, 1 means to enable Z axis backlash compensation function; 0 means not to enable.
BIT3：for 4th axis, 1 means to enable 4th axis backlash compensation function; 0 means not to enable.

118 **DIRECTION OF PITCH ERROR COMPENSATION BIT**

Range： 0 ~ 15
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

BIT0：for setting X axis, 1 means pitch error compensation starts from –ive direction X axis returns to the reference point; 0 means pitch error compensation starts toward +ive direction.
BIT1：for setting Y axis, 1 means pitch error compensation starts from –ive direction Y axis returns to the reference point; 0 means pitch error compensation starts toward +ive direction.
BIT2：for setting Z axis, 1 means pitch error compensation starts from –ive direction Z axis returns to the reference point; 0 means pitch error compensation starts toward +ive direction.
BIT3：for setting 4th axis, 1 means pitch error compensation starts from –ive direction 4th axis returns to the reference point; 0 means pitch error compensation starts toward +ive direction.

119 **PITCH ERROR COMPENSATION FUNCTION BIT**

Range： 0 ~ 15
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

BIT0：for X axis, 1 means to enable X axis pitch error compensation function; 0 means not to enable.
BIT1：for Y axis, 1 means to enable Y axis pitch error compensation function; 0 means not to enable.
BIT2：for Z axis, 1 means to enable Z-axis pitch error compensation function; 0 means not to enable.
BIT3：for 4th axis, 1 means to enable 4th axis pitch error compensation function; 0 means not to enable.

300	PITCH ERROR COMPENSATION OF 001 SESSION OF X AXIS μm
349	PITCH ERROR COMPENSATION OF 050 SESSION OF X AXIS μm

Range： -20000 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm
Assume the pitch error of X axis is M (μm), set this parameter to M, and Pr.0038 to 16.

450	PITCH ERROR COMPENSATION OF 001 SESSION OF Y AXIS μm
499	PITCH ERROR COMPENSATION OF 050 SESSION OF Y AXIS μm

Range： -20000 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm
Assume the pitch error of Y axis is M (μm), set this parameter to M, and Pr.0038 to 16.

600	PITCH ERROR COMPENSATION OF 001 SESSION OF Z AXIS μm
649	PITCH ERROR COMPENSATION OF 050 SESSION OF Z AXIS μm

Range： -20000 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm
Assume the pitch error of Z axis is M (μm), set this parameter to M, and Pr.0038 to 16.

750	PITCH ERROR COMPENSATION OF 001 SESSION OF THE 4TH AXIS μm
799	PITCH ERROR COMPENSATION OF 050 SESSION OF THE 4TH AXIS μm

Range： -20000 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm
Assume the pitch error of the 4^{th} axis is M (μm), set this parameter to M, and Pr.0038 to 16.

811	BALL BAR COMPENSATION G CODE 0)G2 G3 1) ALL

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

When this parameter is set to 0, the spike compensation amount set by the ball- bar test is only applicable to G02/03 Arc Interpolation; set to 1, the default spike compensation amount will be added to all Motion G codes whenever some servo axis makes a counter motion.

812	REVERSAL SPIKE COMPENSATION: +X
818	REVERSAL SPIKE COMPENSATION: +Y
828	REVERSAL SPIKE COMPENSATION: +Z

Range： 0 ~ 200
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

This parameter sets the spike value of each corresponding axis in the ball-bar test. When set to 0, this function is disabled.

813	DURATION OF REVERSAL SPIKE COMPENSATION: +X
819	DURATION OF REVERSAL SPIKE COMPENSATION: +Y
829	DURATION OF REVERSAL SPIKE COMPENSATION: +Z

Range： 0 ~ 200
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

Please confirm the actual dwell cycle duration of the controller before setting these parameters. These parameters set the spike duration of each corresponding axial positive direction in the ball-bar test. When set to 0, this function is disabled.

814	REVERSAL SPIKE LAG COMPENSATION: +X
820	REVERSAL SPIKE LAG COMPENSATION: +Y
830	REVERSAL SPIKE LAG COMPENSATION: +Z

Range： 0 ~ 200
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

Please confirm the actual dwell cycle duration of the controller before setting these parameters. These parameters set the spike lag duration of each corresponding axial positive direction in the ball-bar test.

815	**REVERSAL SPIKE COMPENSATION: －X**
825	**REVERSAL SPIKE COMPENSATION: －Y**
831	**REVERSAL SPIKE COMPENSATION: －Z**

Range： 0 ~ 200
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

Please confirm the actual dwell cycle duration of the controller before setting these parameters. These parameters set the spike value of each corresponding axial negative direction in the ball-bar test. When set to 0, this function is disabled.

816	**DURATION OF REVERSAL SPIKE COMPENSATION: －X**
826	**DURATION OF REVERSAL SPIKE COMPENSATION: －Y**
832	**DURATION OF REVERSAL SPIKE COMPENSATION: －Z**

Range： 0 ~ 200
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

Please confirm the actual dwell cycle duration of the controller before setting this parameter. These parameters set the spike duration of the negative direction of each corresponding axis in the ball-bar test. When set to 0, this function is disabled.

817	**REVERSAL SPIKE LAG COMPENSATION: －X**
827	**REVERSAL SPIKE LAG COMPENSATION: －Y**
833	**REVERSAL SPIKE LAG COMPENSATION: －Z**

Range： 0 ~ 200
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

Please confirm the actual dwell cycle duration of the controller before setting these parameters. These parameters set the spike duration of each corresponding axial negative direction in the ball-bar test. When set to 0, this function is disabled.

840	ENABLE AXIS X TDC FUNCTION
851	ENABLE AXIS Y TDC FUNCTION
856	ENABLE AXIS Z TDC FUNCTION
861	ENABLE AXIS 4TH TDC FUNCTION

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul
Set to 0: disable X-axis TDC function
Set to 1: enable X-axis TDC function

841	X TDC MAX COMP. IN TIME C.S
852	Y TDC MAX COMP. IN TIME C.S
857	Z TDC MAX COMP. IN TIME C.S
862	4TH TDC MAX COMP. IN TIME C.S.

Range： 0 ~ 18000
Effective： Effective After Reboot
Access level： Machine Maker
Default： 60
Unit： sec
When machining starts, NC compensates the amount set by this parameter whenever the interval time set by parameter No, 0843, 0854, 0859, & 0864 is due. When machining stops, NC returns to the original amount set by this parameter whenever the interval time set by parameter No, 0844、0855、0860 & 0865 is due.

842	X TOTAL COMP VALUE IN TDC μm
853	Y TOTAL COMP VALUE IN TDC μm
858	Z TOTAL COMP VALUE IN TDC μm
863	4TH TOTAL COMP VALUE IN TDC μm

Range： -1000 ~ 1000
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： μm
To set each axis total comp. value in TDC

843	X TDC MAX COMP. IN TIME STOP
854	Y TDC MAX COMP. IN TIME STOP
859	Z TDC MAX COMP. IN TIME STOP
864	4TH TDC MAX COMP. IN TIME STOP

Range： 0 ~ 18000
Effective： Effective After Reboot
Access level： Machine Maker
Default： 60
Unit： sec
To set each axis TDC max comp. in time stop

1018	SESSION INTERVAL OF PITCH ERROR COMPENSATION: X AXIS μm
1019	SESSION INTERVAL OF PITCH ERROR COMPENSATION: Y AXIS μm
1020	SESSION INTERVAL OF PITCH ERROR COMPENSATION: Z AXIS μm
1021	SESSION INTERVAL OF PITCH ERROR COMPENSATION: THE 4TH AXIS μm

Range： 0 ~ 99999999
Effective： Effective After Reboot
Access level： Machine Maker
Default： 30000
Unit： μm

Assume the session interval of X axis's pitch error compensation for X axis is 10000 μm, set this parameter to 10000.

1046	START POSITION OF PITCH ERROR: X AXIS μm
1047	START POSITION OF PITCH ERROR: Y AXIS μm
1048	START POSITION OF PITCH ERROR: Z AXIS μm
1049	START POSITION OF PITCH ERROR: THE 4TH AXIS μm

Range： -99999999 ~ 99999999
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： μm

Assume the pitch error's start position of some axis is 0 μm (mechanical coordinates), set this parameter to 0.

5.7 Zero Return Parameter

About home/zero return procedure, please refer to the description at back to this chapter.

19 SOLUTIONS WHEN HOME IS ON DOG

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

0：Before executing HOME return again, the system should send a warning message to notify users to remove the corresponding axis away from DOG. The warning messages for each axis is as below:

X axis：“MOT4014 X AXIS ON HOME DOG”
Y axis：“MOT4015 Y AXIS ON HOME DOG”
Z axis：“MOT4016 Z AXIS ON HOME DOG”“
The 4th axis: “MOT4017 4th AXIS ON HOME DOG”

1：Before executing HOME return, NC should remove the servo axis (towards the opposite direction of HOME reference) until the axis leaves DOG.

20 DEFAULT SETTING OF HOME RETURN BIT

Range： 0 ~ 15
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

After turning on the machine, check if each axis is preset to having returned to its reference point.

Bit 0：X axis
Bit 1：Y axis
Bit 2：Z axis
Bit 3：The 4th axis
Bit 4：The 5th axis
Bit 5：The 6th axis

30	**OFFSET AMOUNT OF HOME RETURN: X AXIS μm**
31	**OFFSET AMOUNT OF HOME RETURN: Y AXIS μm**
32	**OFFSET AMOUNT OF HOME RETURN: Z AXIS μm**
33	**OFFSET AMOUNT OF HOME RETURN: THE 4TH AXIS μm**

Range： -32768 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

Assume the offset amount of N (μm) is to be made to the mechanical reference point of X (Y, Z, the 4th) axis, set this parameter to N. To set different offset amount will change a zero point's position. However, this set value will not change the display of HOME coordinates after HOME return is executed. When this parameter's set value is a positive number, the mechanical reference point of X (Y, Z, the 4th) axis will travel in the direction away from DOG. When the set value is negative, the mechanical reference point of X (Y, Z, the 4th) axis will travel in the direction towards DOG.

34	**IDLE DURATION FOR X AXIS TO SEARCH FOR ZERO POINT 10ms**
35	**IDLE DURATION FOR Y AXIS TO SEARCH FOR ZERO POINT 10ms**
36	**IDLE DURATION FOR Z AXIS TO SEARCH FOR ZERO POINT 10ms**
37	**IDLE DURATION FOR THE 4TH AXIS TO SEARCH FOR ZERO POINT 10ms**

Range： 100 ~ 2000
Effective： Effective After RESET
Access level： Machine Maker
Default： 100
Unit： 10 ms

The dwell time set by these parameters are applied in the following three conditions:

a. To set the dwell time of decelerating stop when some axis travels toward the reference point in 1st speed and meets DOG.
b. To set the dwell time of decelerating stop when some axis travels away from DOG in 2nd speed and finds the motor INDEX.
c. To set the dwell time of decelerating stop when some axis finds and returns to the motor INDEX.

48	HOME SEARCH METHOD BIT

Range： 0 ~ 15
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

BIT 0： Setting 0 to indicate X axis re-searching HOME point method is re-searching DOG+ Index. 1 to indicate X axis re-searching HOME point method is force setting.
BIT 1： Setting 0 to indicate Y axis re-searching HOME point method is re-searching DOG+ Index. 1 to indicate Y axis re-searching HOME point method is force setting.
BIT 2： Setting 0 to indicate Z axis re-searching HOME point method is re-searching DOG+ Index. 1 to indicate Z axis re-searching HOME point method is force setting.
BIT 3： Setting 0 to indicate the 4th axis re-searching HOME point method is re-searching DOG+ Index. 1 to indicate the 4th axis re-searching HOME point method is force setting.

64	HOME DOG SENSOR IS 0)NC 1)NO

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

This parameter is only effective when DOG signal is connected to LOCAL INPUTS (HS1 ~ HS4 on the transit card) (Pr.0175 is set to 0); if DOG signal is connected REMOTE INPUTS, PLC must convert DOG into C031 ~ C035 to notify NC.

76 **SET ABSOLUTE COORD. AFTER HOME RETURN 0)NO 1)YES**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： Nul

Please refer to Pr. 1014 ~ Pr.1017 for the set values of absolute coordinates. After each servo axis returns to the zero point, the display value of the absolute coordinates is decided by the following three values:

a. The set values of Pr.1014 ~ Pr.1017;
b. The set values of 00 coordinate system, G54 ~G59 coordinates;
c. The set values of G52 local coordinate system.

$$\text{Set values of Pr.1014 ~ Pr.1017} - \begin{pmatrix} \text{00 coordinate system's set value} \\ + \text{G54 ~ G59coordinates' set value} \\ + \text{G52local coordinates' set value} \end{pmatrix}$$

In addition,

a. This parameter sets whether Pr.1014 ~ Pr.1017's set values are effective;
b. The set values of 00 coordinate system and G54 ~ G59 coordinate system are always effective;
c. Pr.0133 sets whether the set values of G52 local coordinate system are effective.

77 **G00 1)DISABLED 0) 1)EFFECTIVE**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

	Pr.0077 = 1, G00 before HOME return is effective.	Pr.0077 = 0, G00 before HOME return is disabled.
MEM、MDI AUTO modes	G00 functions normally, the feed rate of each axis is set by Pr.1000 ~ Pr.1003.	Convert G00 to G01 automatically, the feed rate is set by F code (or Pr.0149).
JOG、RAPID MANUAL modes	In JOG mode, feed rates of each axis is set by Pr.1100~ Pr.1103. In Rapid mode, the feed rate is set by Pr.1000 ~ Pr.1003.	Action in RAPID mode is the same as JOG mode. The feed rate is set by Pr.1100 ~ Pr.1103.

79	X AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG
80	Y AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG
81	Z AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG
82	THE 4TH AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG

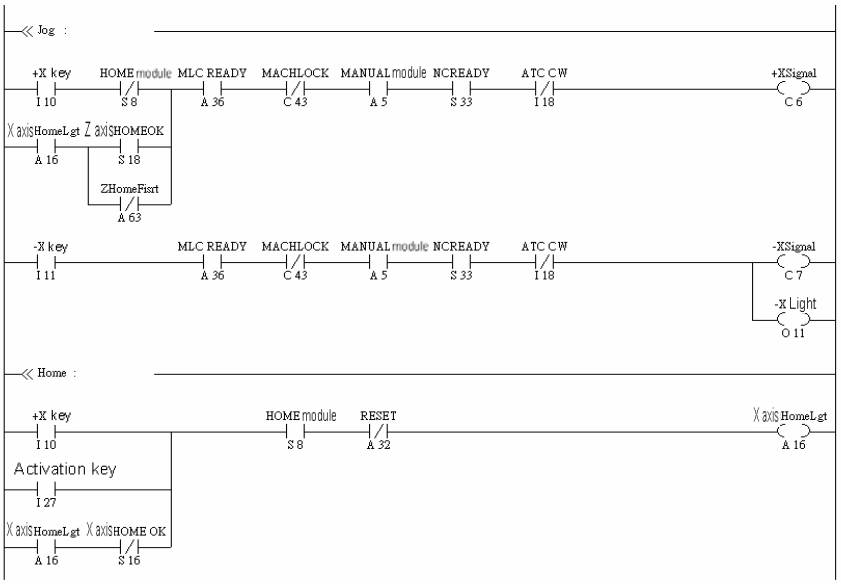
Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： Nul

0：Zero point is after DOG: when each axis meets DOG, it continues to search for the zero point in the same direction.
1：Zero point is ahead DOG: when each axis meets DOG, it continues to search for the zero point in the opposite direction.

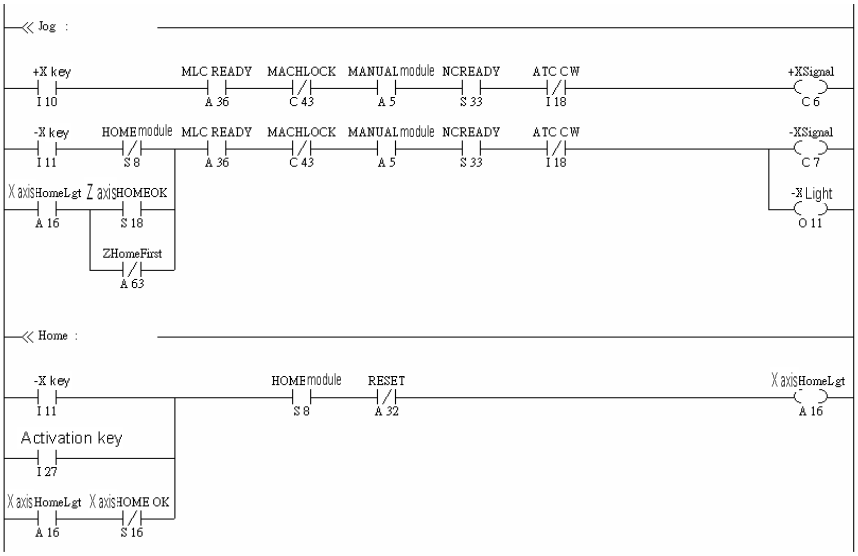
120	DIRECTION OF HOME RETURN FOR EACH AXIS BIT

Range： 0 ~ 15
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

Except for setting this parameter to choose the direction of HOME return, PLC should also make the corresponding modification according to this parameter's setting. The default zero point in the controller's PLC version is set to be in the positive direction. Due to safety concern, in case the keys <+> or <-> could be pressed by mistake, no matter which key is pressed, only the signal of the positive direction <+> will be sent out (Take X axis for example, this signal is C06). Therefore, when some zero point is in the negative direction of the servo axis, not only this parameter's corresponding BIT should be set to 1, the corresponding HOME return procedure in PLC must also be amended at the same time.
Take the example of X axis, the PLC of HOME return is as below：



If X axis returns to HOME in the negative direction, besides setting Bit 0 of this parameter to 1, PLC should be modified as below：



175 **HOME DOG I POINT 0)LOCAL 1)REMOTE**

Range： 0 ~ 1

Effective： Effective After Reboot

Access level： Machine Maker

Default： 0

Unit： Nul

0：DOG signal is connected to LOCAL INPUTS (HS1 ~ HS4 of the transit card), they type of DOG must be set (Pr.0064);

1：DOG signal is connected to REMOTE INPUTS, PLC must convert DOG into the corresponding C Bits (C031 ~ C034, please refer to their setting descriptions).

204 **ZERO POINT RECORDED BY NC BIT**

Range： 0 ~ 15
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

BIT 0：0 means when X axis is in Home point mode, the system must research Home point when executing return Home process.
1 means when X axis is in Home point mode, the system uses NC record's Home point when executing return Home process.

BIT 1：0 means when Y axis is in Home point mode, the system must research Home point when executing return Home process.
1 means when Y axis is in Home point mode, the system uses NC record's Home point when executing return Home process.

BIT 2：0 means when Y axis is in Home point mode, the system must research Home point when executing return Home process.
1 means when Y axis is in Home point mode, the system uses NC record's Home point when executing return Home process.

BIT 3：0 means when 4th axis is in Home point mode, the system must research Home point when executing return Home process.
1 means when 4th axis is in Home point mode, the system uses NC record's Home point when executing return Home process.

293 **REFERENCE OF SERVO AXIS'S ZERO POINT**

Range： 0 ~ 63
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

Bit 0：Set to 0, X axis uses DOG as the mechanical reference point; set to 1, X axis uses the motor INDEX signal as the mechanical reference point.

Bit 1：Set to 0, Y axis uses DOG as the mechanical reference point; set to 1, Y axis uses the motor INDEX signal as the mechanical reference point.

Bit 2：Set to 0, Z axis uses DOG as the mechanical reference point; set to 1, Z axis uses the motor INDEX signal as the mechanical reference point.

For a linear axis, please set the mechanical reference point as DOG (set the corresponding BIT of this parameter to 0); for a rotary axis, given motor teeth/screw ball's teeth is an integer, use the index of the motor encoder as the mechanical reference (set the relative BIT of this parameter to 1). For a rotary axis, and motor teeth/screw ball's teeth is not an integer, it is not recommended to use INDEX of the motor enoder as the mechanical reference point, as doing so will produce multiple mechanical reference points.

834	READING DURATION OF ABSOLUTE ENCODER

Range： 0 ~ 10
Effective： Effective After RESET
Access level： Machine Maker
Default： 5
Unit： s

This parameter sets the duration limit for the absolute encoder to send feedback to NC.

1014	ABSOLUTE COORDINATES OF X AXIS AFTER RETURNING TO HOME POINT μm
1015	ABSOLUTE COORDINATES OF Y AXIS AFTER RETURNING TO HOME POINT μm
1016	ABSOLUTE COORDINATES OF Z AXIS AFTER RETURNING TO HOME POINT μm
1017	ABSOLUTE COORDINATES OF THE 4TH AXIS AFTER RETURNING TO HOME POINT μm

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

Assume the expected absolute coordinates of X axis after returning to the zero point is 300μm, set this parameter to 300. This parameter's set value only changes the display value of X axis's coordinates after returning to the zero point, which will not affect the actual machine position of X axis after returning to the zero point. This parameter is only effective when Pr.0076 is set to 1.

1022	THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm
1023	THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm
1024	THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm
1025	THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

This parameter sets the corresponding offset amount of each axis's 2^{nd} zero point to its 1^{st} zero point. Assume the corresponding offset amount is 2000μm, set this parameter 2000.

1026	THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm
1027	THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm
1028	THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm
1029	THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

This parameter sets the corresponding offset amount of each axis's 3rd zero point to its 1st zero point. Assume the corresponding offset amount is 2000μm, set this parameter 2000.

1030	THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm
1031	THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm
1032	THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm
1033	THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm

This parameter sets the corresponding offset amount of each axis's 4th zero point to its 1st zero point. Assume the corresponding offset amount is 2000μm, set this parameter 2000.

1104	HOME RETURN AT THE 1ST SPEED: X AXIS μm/min
1105	HOME RETURN AT THE 1ST SPEED: Y AXIS μm/min
1106	HOME RETURN AT THE 1ST SPEED: Z AXIS μm/min
1107	HOME RETURN AT THE 1ST SPEED: THE 4TH AXIS μm/min

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 2000000
Unit： μm/min

During HOME return, each axis travels to its zero point at the speed set by this parameter (Pr.0120). If DOG is met, each axis searches for the motor's zero point according to the 1st speed set by Pr.1108 ~ Pr.1111, Pr.1140, and Pr.1141.

1108	**HOME RETURN AT THE 2ND SPEED: X AXIS μm/min**
1109	**HOME RETURN AT THE 2ND SPEED: Y AXIS μm/min**
1110	**HOME RETURN AT THE 2ND SPEED: Z AXIS μm/min**
1111	**HOME RETURN AT THE 2ND SPEED: THE 4TH AXIS μm/min**

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 200000
Unit： μm/min

During HOME return, each axis travels to its zero point at the speed set by Pr.1104 ~ 1107, 1138, & 1139 (Set by Pr.0120). If DOG is met, each axis searches for the motor's zero point at the 2nd speed set by this parameter.

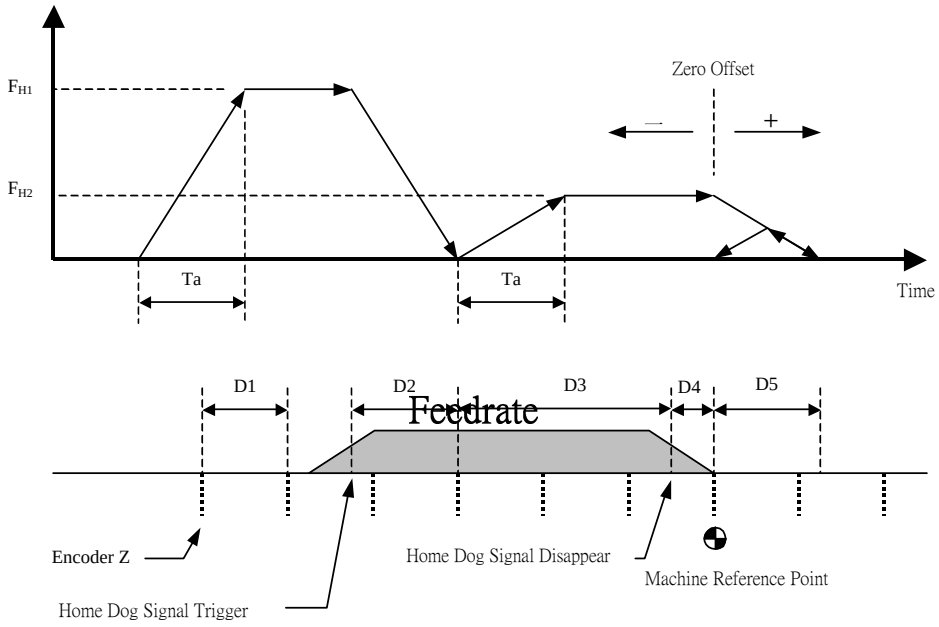
1118	**INDEX PROTECTION**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

When the distance between the 1st index and limit switch is less than 1/5 or more than 4/5 revolution of the encoder, grid protection function will activate so the next index mark will be used to make the distance between the 1st index and limit switch over 1/2 revolution of the encoder if the distance in-between is less than 1/2 revolution. This function ensures that the zero point is always the original one.

Zero Return Procedure Description

■ **When Reference Point is Behind DOG**



1. D1is the distance between two Z phase signals that are close together of servo motor ECNODER.
2. D2 is the distance between the HOME DOG input points to the servo axis by using the 1st gear speed decelerating stop. The calculating formula is as following:

   $$D2 \fallingdotseq \text{servo lag + deceleration distance} \fallingdotseq \frac{F_{H1}}{K_p} + \frac{F_{H1} \cdot T_a}{2}$$

   K_p is the servo position loop gain （sec^{-1}）, , T_a is the servo axis G00 acc/decelerating time.

   If the length between the Home DOG input point and the disappear point is smaller than D2, then warning message (MOT 0027 Home DOG length is too short) will occur.
3. D3 is the traveling distance at the time when servo motor starts from complete stop and accelerates to 2nd gear speed to when Home DOG singnal disappears. In order to catch the Z phase signal under the condition of the same speed, the distance of D3 must be long enough in order for the servo motor to be able to reach the 2nd gear speed. Calculating formula is as following:

   $D3 \geqq \frac{F_{H2} \cdot T_a}{2}$, T_a is servo axis G00 acc/deceleration time.

   So, the length of the Home DOG must be at least (D2 + D3) long.

4. D4 is the time interval from the disappear point of Home DOG to the next Z phase signal of servo motor ECNODER. In order to prevent any confusion that is caused by the electric and the machine delay, D4 must be approximately one-half of D1, which means the disappear point of Home DOG must be approximately at the mid-point of the two Z phase signals that are close to the servo motor. If the motor rotates one time but not able to find the Z phase signal after the Home Dog signal is disappear, then the aralm message (MOT0045 not able to find the Zl light of motor) will occur. Please check whether there is motor connection error.
5. D5 is the traveling distance from the 1st Z phase signal of servo motor ENCODER after getting away DOG to servo axis in 2nd gear decelerating stop. The calculating formual is as following:

   D5 ≒ servo lag + deceleration distance ≒ $\frac{F_{H2}}{K_p} + \frac{F_{H2} \cdot T_a}{2}$

   K_p is the servo position loop gain （sec^{-1}），, T_a is the servo axis G00 acc/decelerating time.

   The distance between the machine reference point of servo axis and the traveling limit must be at least greater than D5. Or it will mistakenly cause travel limitation during zero return.

   Recommanding to set the offset amount of the servo axis reference point (parameters 0030 ~ 0033) greater than D5 in order to prevent any reverse direciton moving of servo axis.

【Example】Assumed a servo axis home return in 1st gear speed is 10m/min, the 2nd gear speed is 200mm/min, G00 acc/decelerating time is 150ms, position loop gain is 100sec-1. Under the condition that the reference point is behind DOG, the calculating formula of the shortest needed length of DOG is as following:

$$D2 \fallingdotseq \frac{10000/60}{100} + \frac{10000/60 \cdot 0.15}{2} \fallingdotseq 14.17mm$$

$$D3 \fallingdotseq \frac{200/60 \cdot 0.15}{2} \fallingdotseq 0.25mm$$

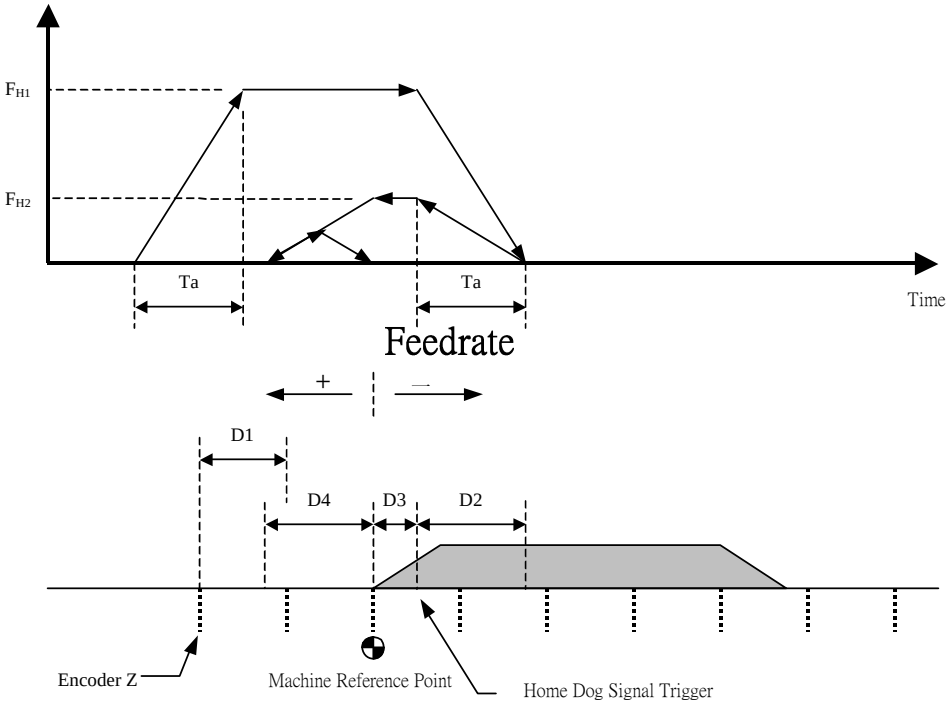
So, the shortest needed length of DOG is（D2 + D3） ≒ 14.42mm

Also,

$$D5 \fallingdotseq \frac{200/60}{100} + \frac{200/60 \cdot 0.15}{2} \fallingdotseq 0.28mm$$

If the setting vaule for the offset amount of this axis reference point is larger than 0.28mm, it will be able to prevent this axis to do the reverse direction moving at the last step of the home return procedure.

■ **When Reference Point is Ahead DOG**



D1is the distance between two Z phase signals that are close tegether of servo motor ECNODER.

D2 is the distance between the HOME DOG input points to the servo axis by using the 1st gear speed decelerating stop. The calculating formula is as following:

$$D2 \fallingdotseq \text{servo lag + deceleration distance} \fallingdotseq \frac{F_{H1}}{K_p} + \frac{F_{H1} \cdot T_a}{2}$$

K_p is the servo position loop gain （sec^{-1}）, , T_a is the servo axis G00 acc/decelerating time.

Zero Offset

If the length between the Home DOG input point and the disappear point is smaller than D2, then warning message (MOT 0027 Home DOG length is too short) will occur.

6. D2 is the traveling distance at the time when servo motor starts from complete stop and accelerates to 2nd gear speed to when Home DOG singnal disappears General speaking, the 2nd gear speed is smaller than the 1st gear speed, so the length of D2 must be long enough for the servo motor to accelerate to the 2nd gear speed, which means catching the servo motor Z phase signals in the same speed.

7. D3 is the time interval from the disappear point of Home DOG to the next Z phase signal of servo motor ECNODER. In order to prevent any confusion that is caused by the electric and the machine delay, D4 must be approximately one-half of D1, which means the disappear point of Home DOG must be approximately at the mid-point of the two Z phase signals that are close to the servo motor. If the motor rotates one time but not able to find the Z phase signal after the Home Dog signal is disappear, then the aralm message (MOT0045 not able to find the Zl light of motor) will occur. Please check whether there is motor connection error.
8. D4 is the traveling distance from the 1st Z phase signal of servo motor ENCODER after getting away DOG to servo axis in 2nd gear decelerating stop. The calculating formual is as following:

   D5 ≒ servo lag + deceleration distance ≒ $\frac{F_{H2}}{K_p} + \frac{F_{H2} \cdot T_a}{2}$

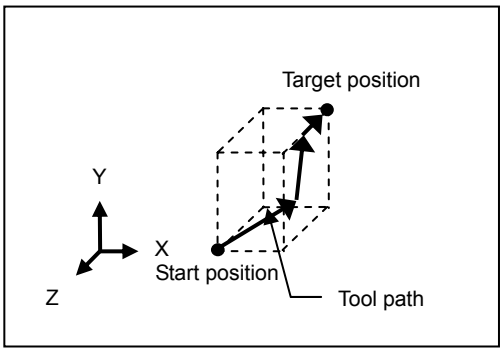
   K_p is the servo position loop gain （sec^{-1}），, T_a is the servo axis G00 acc/decelerating time. Recommanding to set the setting value for the offset amount of the servo axis reference point that is greater than D4 in order to prevent the servo axis to do the reverse direction moving.

5.8 Operation Parameter

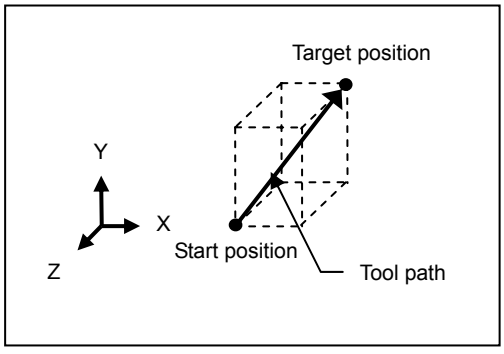
41	SYNCHRONIC MOTION OF G00 COMMAND 0)NO 1)YES

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

0：Each axis motions at the G00 speed set for each axis respectively, no synchronic motion with G00;
1：Each axis motions synchronically with G00 command, and it is effective for the following commands:
G00 commands in MEM or MDI mode;
Commands equal to G00 in MEM or MDI mode, ex. G27 ~ G30, G53;
G00 & G53 command of PMC axis function



Pr.0041 = 0



Pr.0041 = 1

43 **FLAG OF EXACT CHECK**

Range： 0 ~ 31
Effective： Effective After RESET
Access level： User
Default： 16
Unit： Nul

Bit0：1 means X axis straight-line cutting (G01) of exact stop checking function is canceled.
Bit1：1 means Y axis straight-line cutting (G01) of exact stop checking function is canceled.
Bit2：1 means Z axis straight-line cutting (G01) of exact stop checking function is canceled.
Bit3：1 means 4th axis straight-line cutting (G01) of exact stop checking function is canceled.
Bit4：1 means starting rapid traverse (G00) of exact stop checking function is canceled.

For straight-line cutting command (G01), if want to enable the exact stop checking function, not only needs to set this parameter corresponding bit but also needs to order G09 command (exact stop command, works for a single block), or G61 command (exact stop mode, permanently effective, so must use G64 command to cancel.)
Once activating the exact stop checking function of G01 command, NC system will wait until each enabled servo axis enters into the checking windows range (parameters 0006 ~ 0009) after completed interpolation of any one of G01 command, then it will execute the next single block.
For the RAPID TRAVERSE command, G00, only need to set BIT 4 of this parameter to 1 in order to active the exact stop checking function. Under the condition that the exact stop function can be enable, NC system will wait until the actual position of each servo axis already enters into the checking windows range (parameters 0800 ~ 0803) after the interpolation is completed, then it will execute the next signal block. But if the former single block and the latter single block of a certain rapidly orientation command are both rapid traverse commands, then this rapid traverse command will NOT execute the exact stop checking.

63 **SET RELATIVE COORDINATES ACCORDING TO ABSOLUTE COORIDNATES 0)NO 1)YES**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

The effective range of this parameter's set value is as below:
a. Display value of initial coordinates;
b. Display value of coordinates after HOME return is finished;
c. G54 ~ G59 commands (Coordinate system selection);
d. G92 command (Set coordinate values).

71 **PATH CHECK G22 ADOPTS 0)OUTSIDE 1)INSIDE**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

0：The path check set by G22 is in the outside forbidden area, and tools can only travel inside the assigned check range. If there is any command that tries to motion some tool to the area outside the assigned check range, the system alarm will be triggered.
1：The path check set by G22 is in the inside forbidden area, and tools can only travel outside the assigned check range. If there is any command that tries to motion some tool to the area inside the assigned check range, the system alarm will be triggered.
Please refer to the description of the warning messages MOT 4058、9009 ~ 9014 for the relative system alarms.

73 **ACCELERATION/DECELERATION OF G31 0)NO 1)YES**

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

0：No, after G31 Skip signal is detected, do not decelerate or stop.
1：Yes, after G31 Skip signal is detected, decelerate according to the acceleration/deceleration duration set by Pr.0014.

74 **EXECUTE SINGLE BLOCK OF MACRO**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

0：MACRO commands (not NC commands) will not be executed by single block.
1：MACRO commands (not NC commands) will be executed by single block.

83 **G00 IS 0)DISABLED 1)EFFECTIVE IN DRY RUN**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

In DRY RUN mode, the motion of RAPID TRAVERSE

	Pr.0083			
	0		1	
	Pr.0041		Pr.0041	
	0	1	0	1
RAPID mode	（1）			
G00 or commands equal to G00 in MEM, MDI mode	（2）	（3）	（1）	（4）
G00, G53 commands of PMC axis function	C23 is OFF：（1）	C23 is OFF：（3）	（1）	（4）
	C23 is ON：（1）	C23 is ON：（4）		

（1） Each axis travels at G00 speed set respectively for each axis;
（2） Each axis travels at JOG speed set respectively for each axis;
（3） Each axis travels no faster than JOG speed set respectively for each axis;
（4） Each axis travels no faster than G00 speed set respectively for each axis.

89 **SET M CODE COMMAND OF PART COUNT BY USER**

Range： 1 ~ 99
Effective： Effective After RESET
Access level： User
Default： 99
Unit： Nul

In addition to M02 & M30, users can also set M code commands for part count by using this parameter. Please refer to Programming Manual for the detail list of M code commands.
When the program meets this M code, the part count number on POS page will accumulate, and machining time will automatically turn to zero. If the accumulated part count number exceeds the preset maximum part count number, NC will send S134 to notify PLC to take the corresponding action.

94 **EDIBILITY OF 09XXX 0)NO 1)YES**

Range： 0 ~ 1
Effective： Instant Activity
Access level： Machine Maker
Default： 0
Unit： Nul
Set the edibility of files No. O9000~O9999, etc.

122 **NAME THE 4TH AXIS (ABCUVW)**

Range： 0 ~ 5
Effective： Effective After Reboot
Access level： Machine Maker
Default： 2
Unit： Nul
Set to 0, the 4th axis is referred as A.
Set to 1, the 4th axis is referred as B.
Set to 2, the 4th axis is referred as C.
Set to 3, the 4th axis is referred as U.
Set to 4, the 4th axis is referred as V.
Set to 5, the 4th axis is referred as W.

123 **UNIT SYSTEM 0)G21 METRIC 1)G20 IMPERIAL**

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul
This parameter sets the default unit system after the system starts. Users can switch between the two unit systems by G20(imperial) & G21(metric).

124 **INITIAL MOTION COMMAND 0)G00 1)G01**

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： User
Default： 1
Unit： Nul
This parameter sets the default motion commands after NC starts. In MEM or MDI mode, users execute the commands below for the first time:

G91 X100. Y100. Z100.;
When this parameter is set to 0, the command above is the same as:

G91 G00 X100. Y100. Z100.;
When this parameter is set to 0, the command above is the same as:

G91 G01 X100. Y100. Z100.;

125 OFFSET NUMBER POSITION TYPE

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

1：Using the first two digits of T code as tool compensation code.
0：Using the last two digits of T code as tool compensation code.

126 ENABLE T0 OFFSET CANCEL

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

When user commands T0, this parameter sets whether to cancel tool Compensation.
When this parameter is 1, T01 command can be used as 「Cancel Tool Compensation Command」.

127 DIGITS OF T CODE

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

When this parameter is 0, T code key-in format is Taabb, which indicates aa as tool number and bb as compensation number.
When this parameter is 1, T code key-in format is Taa, which indicates aa as both tool number and compensation number.

128 T4 CODE ASSIGNE TYPE

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： Nul

When T code format is set as 4 digits and the T code key-in format is 2 digits,Txx:
Para. # 0128 =0, Txx is T0.
Para. # 0128 =1,Txx is Txx which means tool number and compensation number is the same.

130	UNIT OF INPUT VALUE

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

Examples: In metric system, if this parameter is set to 0, and the commands as below are set in MDI mode：
G90 G00 X100. F1000.;
X axis travels at the rate of 1mm/min to the position at 0.1mm.
G90 G00 X100. F1000.;
X axis travels at the rate of 1000mm/min to the position at 100mm.

If this parameter is set to 1：
G90 G00 X100. F1000.;
X axis travels at the rate of 1000mm/min to the position at 100mm.
G90 G00 X100. F1000.;
X axis travels at the rate of 1000mm/min to the position at 100mm.

131	CUTTER COMPENSATION TYPE 0)A 1)B

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

0：Use type A cutter compensation.
1：Use type B cutter compensation.
Please refer to Programming Manual for the description of types.

132	D/R MEASUREMENT FOR X
201	D/R MEASUREMENT FOR Y

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

This parameter sets the command key-in coordinate is diameter or radius mode.

135	DEFAULT COORDINATES 0)ABSOLUTE G90 1)INCREMENTAL G91

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul

The system’s default coordinate type is:
0：Absolute coordinates (G90)
1：Incremental coordinates (G91)

140	GLOBAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

There are 500 GLOBAL MACROs in total, and all layers share these global variables. Among these MACROs, the default value of @1 ~ @400 is VACANT. This parameter sets whether @1 ~ @400 turns back to VACANT after RESET. The values of @401 ~ @500 will remain the same after RESET is pressed and also remain in the system after power off. @0 is always set to VACANT.

141	LOCAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

There are 33 MACROs in total; within each layer of a program has its own 33 local variables separately. As long as some layer of a program is finished, its local MACRO variables will be deleted. However, as pressing RESET will enable the system to go back to the main program's layer, users must use this parameter to set if to delete the local MACRO variables in the main program's layer. If the system restarts, then all the local variables will be deleted no matter in which layer they are. #0 is always set to VACANT.

145	DEFAULT PLANE 0)XY 1)ZX 2)YZ

Range： 0 ~ 2
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

0: Default plane is XY (G17).
0: Default plane is ZX (G18).
0: Default plane is YZ (G19).

146	M CODE FOR MACRO O9001
147	M CODE FOR MACRO O9002
148	M CODE FOR MACRO O9003

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

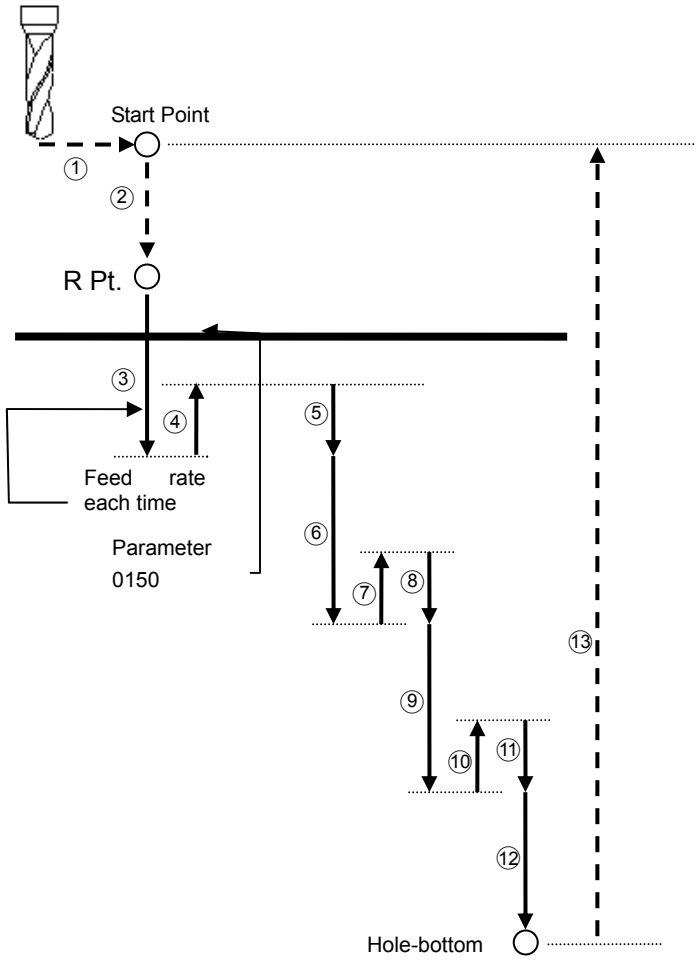
When NC executes some M code set by these parameters in a part program, NC will call and execute MACRO programs O0001 ~ O9003. If the parameter is set to 0, this function is disabled. Among the MACRO programs called by G, M, or T codes, all M codes set by the parameter are regarded as general M codes, which can not call a MACRO program.
Please refer to Programming Manual for the detail of M code list.

149 **DEFAULT FEED RATE**

Range： 0 ~ 32767
Effective： Effective After Reboot
Access level： User
Default： 1000
Unit： mm/min
This parameter sets the default feed rate in MEM or MDI mode.

150 **TOOL ESCAPE AMOUNT IN DRILLING CYCLE**

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： User
Default： 200
Unit： μm
This parameter sets the return distance of Z axis in G73 Peak command. The return distance is used to clean the chips. The motion diagram of Peak command is as below:



151	DIAMETER/RADIUS COMPENSATION

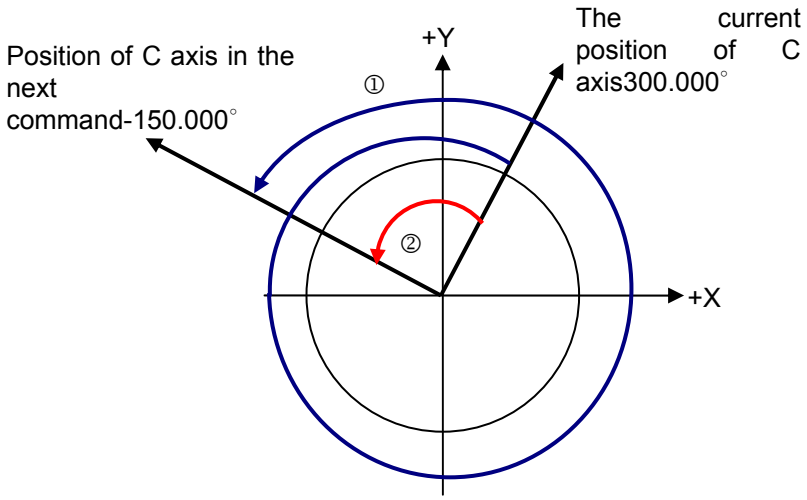
Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： Nul

This parameter sets the tool radius compensation value key-in coordinate is diameter or radius mode.

152	ROTARY PATH OF THE 4TH AXIS

Range： 0 ~ 3
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

The following diagram shows the two paths of C axis to travel from 300.000 to -150.000° by or not by taking the shortest path. In path ①, C axis adopts the normal linear axis method to make the motion, and the coordinate after the motion is finished is shown as -150.000. In path②, C axis travels by taking the shortest path, and the coordinate after the motion is finished is shown as 210.000.



153	G CODE TYPE 0)B 1)A 2)C

Range： 0 ~ 2
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

This parameter assign A, B, or C Type for G Code.

154	DISABLE G71/G72 PROFILE CHK

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul
This parameter set enable shape checking or not when executing G71/G72.

155	UNIT OF INITIAL FEED RATE 0)MM/REV 1)MM/MIN

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul
This parameter sets the default unit system of cutting feed rate in MEM or MDI mode; however, this parameter is invalid for G00 command.
0：Adopt G95 mode, in metric system mm/rev is applied; in imperial system, inch/rev is applied. In this case, cutting commands (G01/G02/G03) are only effective when cooperating with the rotation of spindle.
1：Adopt G94 mode, in metric system the unit mm/min is applied; in imperial system, inch/min is applied.

161	M CODE FOR MACRO O9004
162	M CODE FOR MACRO O9005
163	M CODE FOR MACRO O9006
164	M CODE FOR MACRO O9007
165	M CODE FOR MACRO O9008
166	G CODE FOR MACRO O9010
167	G CODE FOR MACRO O9011
168	G CODE FOR MACRO O9012
169	T CODE CALLS O9020

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul
When NC executes the M code set by this parameter, NC will call and execute MACRO program O9004 (O9005 ~ O9008, O9010 ~ O9012, O9020); users can write the content of that MACRO by themselves by copying the file to the MACRO program table assigned by the system (the preset table is C:\“system table”\MACRO). The set value of this parameter is not applicable to M codes for general purposes. Please refer to Programming Manual for M code list in detai.

176	LOCAL PORT NO FOR G31 P1
242	LOCAL PORT NO FOR G31 P2
243	LOCAL PORT NO FOR G31 P3
244	LOCAL PORT NO FOR G31 P4

Range： 0 ~ 4
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

1：The signal G31 SKIP is connected to the first LOCAL INPUT point (HS1 on a transit card)
2：The signal G31 SKIP is connected to the second LOCAL INPUT point (HS2 on a transit card)
Because the single block stop function of G31 SKIP needs LOCAL INPUTs to latch the values of the absolute position recoder for each axis, therefore only the first or second LOCAL INPUT can be applied.

177	G31 SIGNAL SOURCE TYPE 0)NC 1)NO
245	CONTACT TYPE OF G31 P2
246	CONTACT TYPE OF G31 P3
247	CONTACT TYPE OF G31 P4

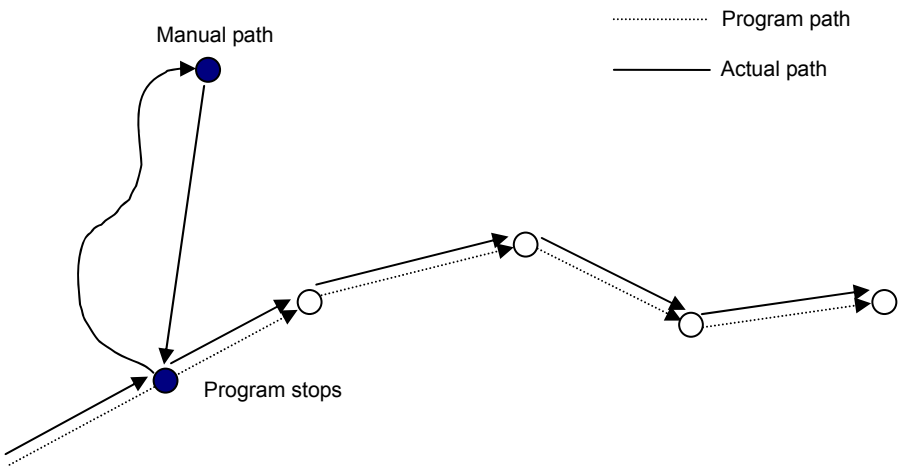
Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： Nul

0：The signal G31SKIP is normal close (NC). When this SKIP signal turns from 1 to 0, the G31 block will stop at once and the next block will be executed.
1：The signal G31SKIP is normal open (NO). When this SKIP signal turns from 0 to 1, the G31 block will stop at once and the next block will be executed.

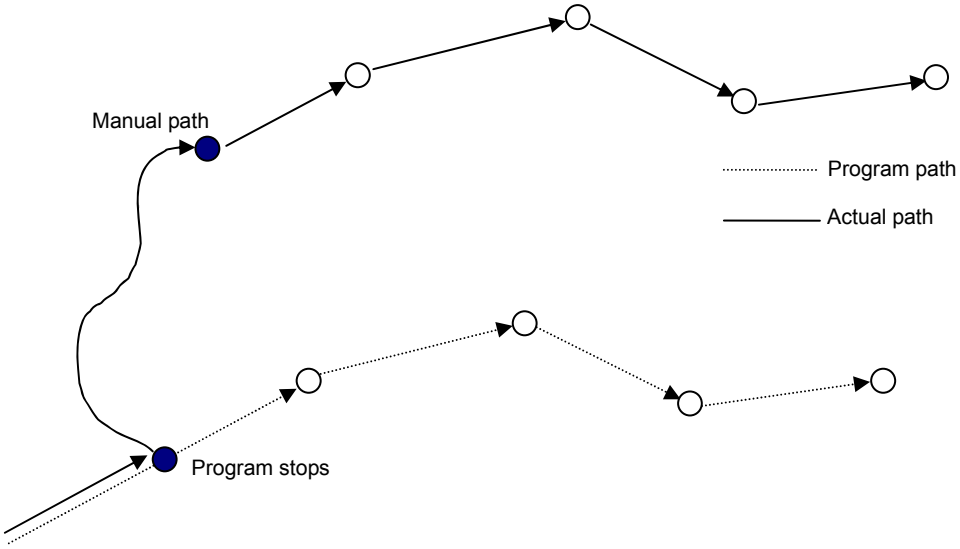
180	MANUAL RETURN

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

In the middle of executing a part program in MEM or MDI mode, if switching to MANUAL modes such as JOG, MPG, or RAPID, etc., the system will enter FEED HOLD status. If moving the machine manually away from its last position in MEM or MDI mode, there are two options to return to MEM or MDI mode and resume the unfinished program:
1. Manual Return: Resume the unfinished program by moving the machine to its last position in MEM or MDI mode.
2. Resume the unfinished program from the current position; however, there will be a shift amount for the following positions.



Enable Manual Return



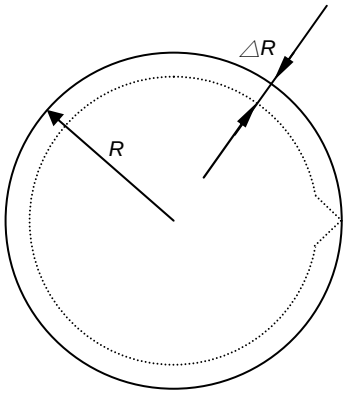
Disable Manual Return

Manual Return function can be set either by this parameter or by C004.
When C004 is ON, Manual Return function is enabled.
When C004 is OFF, Manual Return function is disabled.
If Pr.0180 is set to 1, Manual Return function will be enabled no matter C004 is ON or OFF; if Pr.0180 is set to 0, use C004 to set if to enable this function.

187	AUTO ARC FEED RATE CLAMP 0)NO 1)YES

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul
0：No
1：Yes

In acceleration/deceleration after interpolation law, there will be an offset amount ΔR between Arc command and the actual path.



The formula is ： $\Delta R = (\frac{1}{2K_p^2 R} + \frac{T^2}{24R})V^2$ is the offset caused by servo lag.

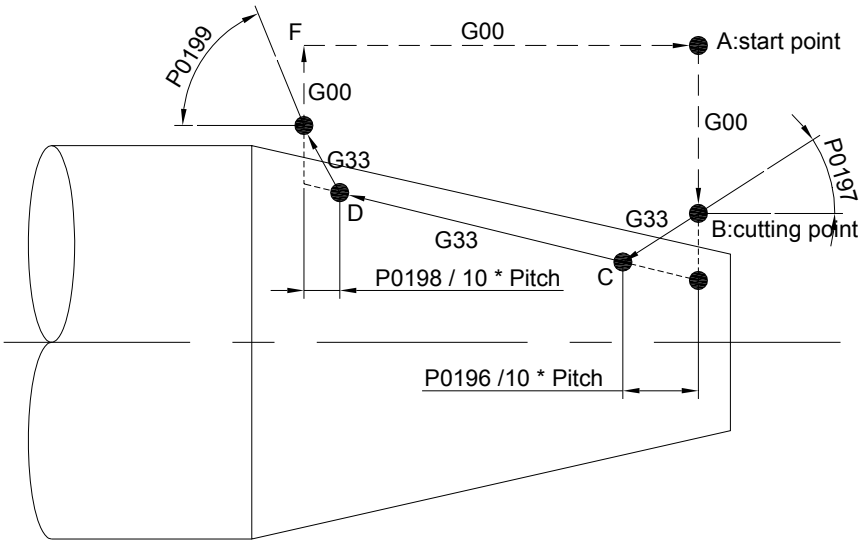
$\frac{T^2}{24R}$ is the offset caused by command lag (If pre-acceleration/deceleration is adopted, then $\frac{T^2}{24R}$ is not calculated). K_p is position loop gain; T is the constant number of acceleration/deceleration time; R is arch radius; and V is the assigned feed rate. This formula is only applicable when the responding rate of speed loop is 3 ~ 10 times faster than (that of) position loop.

When ARC FEED RATE AUTO CLAMP function is enabled, the system will adjust the actual feed rate based on the assigned maximum tolerance of path error (Pr.0809).
Please also refer to the relative parameters: Pr.0188 & Pr.0809.

196	G78(G92) CUT DOWN CHAMFER LEN.
197	G78(G92) CUT DOWN CHAMFER ANGLE
198	G78(G92) CUT UP CHAMFER LENGTH
199	G78(G92) CUT UP CHAMFER ANGLE

Range： 0 ~ 85
Effective： Effective After RESET
Access level： User
Default： 45
Unit： Nul

As shown in the drawing below, Pr.0196 & Pr.0197 set the cutting angle and the length to be preserved. Pr. 0198 & Pr. 0199 set the lifting length and angle of the tool when thread cutting is finished.



200	FEEDRATE DISPLAY 0)COMMAND 1)ACTUAL FEEDBACK

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

0：Show the command value of feed rate on HMI.
1：The system calculates feed back values by using each axis's motor encoder (or the linear scale) and shows the value on HMI.

202	OPERATION LANGUAGE 0)ENGLISH 1)TRADITIONAL CHINESE 2)SIMPLIFIED CHINESE

Range： 0 ~ 2
Effective： Effective After Reboot
Access level： User
Default： 1
Unit： Nul
0：English
1：Traditional Chinese
2：Simplified Chinese

203	PROGRAM RESET SWITCH MEM MODE

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul
Move cursor to file head or not when mode changed to MDI mode

205	TOOL COMPENSATION 0)ABSOLUTE 1) RELATIVE INPUT

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul
This parameter sets whether the tool compensation value set on OFFSET page is an absolute or a relative value.

211	STOP PRE-INTERPRETATION OF M CODE
212	STOP PRE-INTERPRETATION OF M CODE
213	STOP PRE-INTERPRETATION OF M CODE
214	STOP PRE-INTERPRETATION OF M CODE
215	STOP PRE-INTERPRETATION OF M CODE
216	STOP PRE-INTERPRETATION OF M CODE
217	STOP PRE-INTERPRETATION OF M CODE
218	STOP PRE-INTERPRETATION OF M CODE
219	STOP PRE-INTERPRETATION OF M CODE
220	STOP PRE-INTERPRETATION OF M CODE

Range： 0 ~ 299
Effective： Effective After RESET
Access level： User
Default： 209
Unit： Nul
If some M code must wait for external signals, it must be registered here to prevent any false action caused by pre-interpretation of part programs.

221 **DIGITAL FILTER FREQUENCY (KHZ)**

Range： 0 ~ 6666
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

Please refer to the chart below for the valid ranges of digital filter frequency. If the frequency is set between two ranges, NC will use the closest value as the filter frequency. For example, Pr.0221 is set as 250 KHz while the actual filter frequency is 256 KHz.

Filter Freq. (KHz)	Filter Freq. (KHz)	Filter Freq. (KHz)	Filter Freq. (KHz)	Filter Freq. (KHz)	Filter Freq. (KHz)
6667	256	131	81	53	28
3333	247	128	80	52	27
2222	238	126	79	51	26
1667	230	123	78	50	
1333	222	121	77	49	
1111	215	119	76	48	
952	208	117	75	47	
833	202	115	74	46	
741	196	113	73	45	
667	190	111	72	44	
606	185	109	71	43	
556	180	108	67	42	
513	175	106	66	41	
476	171	104	63	40	
444	167	101	65	39	
417	163	100	64	38	
392	159	98	63	37	
370	155	95	62	36	
351	152	94	61	35	
333	148	93	60	34	
317	145	90	59	33	
303	142	88	58	32	
290	139	85	57	31	
278	136	83	56	30	
267	133	82	54	29	

231	HIDE INFORMATION OF X AXIS
232	HIDE INFORMATION OF Y AXIS
233	HIDE INFORMATION OF Z AXIS
234	HIDE INFORMATION OF THE 4TH AXIS

Range： 0 ~ 3
Effective： Instant Activity
Access level： Machine Maker
Default： 0
Unit： Nul

The corresponding HMI information of X (Y, Z, the 4th, the 5th, the 6th) axis is:
0：Shown
1：Hidden
2：Set by C181(C182、C183、C184、C185、C186). OFF: Shown；ON: Hidden.

238	REL/ABS GEOM VALUE

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

The preset mode of geometry compensation input.
0: Absolute input mode.
1: Incremental input mode.

239	MAX WEAR VALUE TO INPUT

Range： 1 ~ 10000
Effective： Instant Activity
Access level： User
Default： 1000
Unit： LU

The maximum value of wear compensation for each input:
- Wear compensation input is in “absolute mode”：The deviation between the input value and the present value cannot be larger than the value set by Pr.0239.
- Wear compensation input is in “incremental mode”：The input value cannot be larger than the value set by Pr.0239.

249	DISPLAY ABNORMALITY OF RAMDISK 0)OFF 1)ON

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

0：When there is any abnormality of RAMDISK, do not show warning messages.
1：When there is any abnormality of RAMDISK, show warning messages.

351 **UNIT OF CUTTING OVERRIDE FEED RATE**

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul
0：Cutting override feed rate = R016 register value* 10%；
1：Cutting override feed rate = R016 register value* 1%。

352 **UNIT OF JOG OVERRIDE**

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul
0：JOG override = R017 register value* 10%；
1：JOG override = R017 register value* 1%。

353 **UNIT OF RAPID TRAVERSDE OVERRIDE**

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul
0：RAPID TRAVERSE override are F0, 25%, 50%, & 100%, respectively,
1：RAPID TRAVERSE override = R018 register value* 1%.

360 **SET OPERATION SCREEN COLOR (0~3)**

Range： 0 ~ 3
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul
0：Screen color setting is not applied.
1：Screen color setting is white words over a black background
2：Screen color setting is black words over a white background
3：Screen color setting is customized by users.

361	SET THE NUMBER FOR BLACK (0~16)
362	SET THE NUMBER FOR BLUE (0~16)
363	SET THE NUMBER FOR GREEN (0~16)
364	SET THE NUMBER FOR CYAN (0~16)
365	SET THE NUMBER FOR RED (0~16)
366	SET THE NUMBER FOR PURPLE (0~16)
367	SET THE NUMBER FOR BROWN (0~16)
368	SET THE NUMBER FOR WHITE (0~16)
369	SET THE NUMBER FOR GRAY (0~16)
370	SET THE NUMBER FOR LIGHT BLUE (0~16)
371	SET THE NUMBER FOR LIGHT GREEN (0~16)
372	SET THE NUMBER FOR LIGHT CYAN (0~16)
373	SET THE NUMBER FOR LIGHT RED (0~16)
374	SET THE NUMBER FOR LIGHT PURPLE (0~16)
375	SET THE NUMBER FOR BLACK COLOR (0~16)
376	SET THE NUMBER FOR BRIGHT WHITE COLOR (0~16)
377	SET THE NUMBER FOR CURSOR (0~16)
378	SET THE NUMBER FOR HIGHLIGHT (0~16)
379	SET THE NUMBER FOR UPPER FRAME (0~16)
380	SET THE NUMBER FOR LOWER FRAME (0~16)

Range： 0 ~ 16
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul

Only effective when Pr.0360 is set to 3.
0：Not applied.
1~16：Applied and change to the selected color.

394	SCREENSAVER WAIT TIME

Range： 0 ~ 9999
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul

1. When this parameter is set to 0, the screensaver is not applied.
2. When this parameter is not 0, the screensaver activates automatically after the system is not operated for a specified amount of time (time length set by the parameter). If screensaver has not activated and some key is pressed, wait time will be counted from the last keystroke. If screensaver already activates, pressing any key will immediately terminate it, and wait time will be counted from zero.

680	**Enable Angular Axis Control**
681	**Enable Return along AngularAxis**
682	**Inclination Angle for AAC**
683	**Axis Number of Slanted Axis**
684	**Axis Number of Cartesian Axis**

Range： 0 ~ 3
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

When the included angle of the angular axis and vertical axis is not 90 degree, angular axis control function controls the motion distance of each axis according to the angular angle. The part program is written by presuming the included angle of the angular axis and vertical axis is perpendicular, but the actual motion distance is controlled based on the angular angle.

806	**MAXIMUM OFFSET TOLERANCE OF CORNER μm**

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： User
Default： 50
Unit： μm

This parameter influences the precision of machining. The smaller the set value is, the more the semblance is closer to the part program, nevertheless, the time required for machining is relatively longer. Also, because of some factors such as the fabrication of the machine, friction, etc., it is possible that the machine position could not reach the preset checking range, and hence the system could not finish the execution of the block in the part program. The recommended minimum value of this parameter is around 10 μm.

808	**ENABLE CORNNER ACC CONTROL**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

It the corner deceleration function is enabled, the system will accelerate/decelerate the corner between tool paths automatically to make path offset remain within the preset tolerance.

809 **SPIKE OFFSET TOLERANCE μm**

Range： 1 ~ 32767
Effective： Effective After RESET
Access level： User
Default： 30
Unit： μm

This parameter influences the precision of spike. The smaller the set value is, the better the spike effect is, nevertheless, the time required for machining is relatively longer. Please set this parameter according to the offset range acceptable for the setting of arc sizes in actual practice. The recommended minimum set value of this parameter is around 10 μm.

866 **LOCAL PORT NO FOR MEASURE**

Range： 1 ~ 2
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： n/A

1: Local Input No. 0 is used as the input point of measuring signal
2: Local Input No. 1 is used as the input point of measuring signal.

867 **CONTACT TYPE OF MEASURE 0)NC 1)NO**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： n/A

0: The type of tool measuring signal is “Normal Close”, meaning, the tool measuring signal is active at high level.
1: The type of tool measuring signal is “Normal Open”, meaning, the tool measuring signal is active at low level.

868 **TOOL OFFSET NO FOR MEASURE**

Range： 0 ~ 30
Effective： Effective After RESET
Access level： User
Default： 0
Unit： n/A

0: The geometry compensation number of manual measurement is set by the register R12 of MLC.
Numbers other than 0: The geometry compensation number of manual measurement is set by this parameter

869 **ENABLE MEASURE ACCELERATION**

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： n/A

When a measuring signal is input, acceleration/deceleration function is:
0: Not applied.
1: Applied.

870 **ENABLE CUTTING START SIGNAL**

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： n/A

When NC executes a part program in MEM mode,
1: The part program must wait until the cutting permission signal is ON.
0: No need to wait for the cutting permission signal.

871 **WAITING TIME BEFORE CHECK CFSS**

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 1000
Unit： ms

When Pr.0870 is set to 1, the cutting permission signal will not be checked until the specified wait time as set by this parameter is due.

872 **G78(G92) CUT DOWN FEED RATIO**

Range： 1 ~ 10
Effective： Effective After RESET
Access level： Machine Maker
Default： 2
Unit： n/A

When thread cutting cycle G78 (Type A is G92) is executed, this parameter sets whether the cutting speed is accelerated.
1: The cutting speed is the same as the set F___.
2: The cutting speed is doubled of F____, and so on.

873	G78(G92) CUT UP FEED RATIO

Range： 1 ~ 10
Effective： Effective After RESET
Access level： Machine Maker
Default： 2
Unit： n/A

When thread cutting cycle G78 (Type A is G92) is executed, this parameter sets if the tool's lifting speed is accelerated.
1: The tool's lifting speed is the same as the set F___.
2: The tool's lifting speed is doubled of F____, and so on.

899	APPLY CE REGULATIONS 0)NO 1)YES

Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

0：CE regulations are not applied.
1：CE regulations are applied.

1006	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +X μm
1008	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Y μm
1010	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Z μm
1012	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +THE 4TH μm

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 99999999
Unit： μm

This parameter sets the travel limit value of the 1st soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999μm will be applied. If this parameter's set value is smaller than the negative X-axis software travel limit, the system alarm "MOT 4005, SET FIRST SOFELIMIT ERROR" will be triggered. The positive 1st and 2nd soft travel limit for each axis can be switched from each other by using the corresponding C Bit. When these parameters are enabled, if some axis is about to exceed the travel limit, the system alarm "MOT 9001 X AXIS OVER SOFTLIMIT (+)" or "MOT 4058 OVER SOFTLIMIT" will be triggered. Please refer to the description of the warning messages.

1007	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - X μm
1009	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Y μm
1011	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Z μm
1013	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - THE 4TH AXIS μm

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： -99999999
Unit： μm

This parameter sets the travel limit value of the 1st soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999μm will be applied. If this parameter's set value is smaller than the positive X-axis software travel limit), the system alarm "MOT 4005, SET FIRST SOFELIMIT ERROR" will be triggered. The positive 1st and 2nd soft travel limit for each axis can be switched from each other by using the corresponding C Bit. When these parameters are enabled, if some axis is about to exceed the travel limit, the system alarm "MOT 9002/4/6 X/Y/Z AXIS OVER SOFTLIMIT (+)" or "MOT 4058 OVER SOFTLIMIT" will be triggered. Please refer to the description of the warning messages.

1034	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +X μm
1036	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Y μm
1038	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Z μm
1040	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +4TH AXIS μm

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 99999999
Unit： μm

This parameter sets the travel limit value of the 1st soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999μm will be applied. If this parameter's set value is smaller than Pr.1007 (negative X-axis software travel limit), the system alarm "MOT 4005, SET FIRST SOFELIMIT ERROR" will be triggered. The positive 1st and 2nd soft travel limit for each axis can be switched from each other by using the corresponding C Bit. When these parameters are enabled, if some axis is about to exceed the travel limit, the system alarm "MOT 9001 X AXIS OVER SOFTLIMIT (+)" or "MOT 4058 OVER SOFTLIMIT" will be triggered. Please refer to the description of the warning messages.

1035	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -X μm
1037	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Y μm
1039	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Z μm
1041	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -4TH AXIS μm

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： -99999999
Unit： μm

This parameter sets the travel limit value of the 1st soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999 μm will be applied. If this parameter's set value is smaller than Pr.1007 (negative X-axis software travel limit), the system alarm "MOT 4005, SET FIRST SOFELIMIT ERROR" will be triggered. The positive 1st and 2nd soft travel limit for each axis can be switched from each other by using the corresponding C Bit. When these parameters are enabled, if some axis is about to exceed the travel limit, the system alarm "MOT 9001 X AXIS OVER SOFTLIMIT (+)" or "MOT 4058 OVER SOFTLIMIT" will be triggered. Please refer to the description of the warning messages.

1043	G83 Drilling 0)High 1)Normal

Range： 0 ~ 1
Effective： Instant Activity
Access level： User
Default： 0
Unit： Nul

When this parameter is set to 0, high speed peak drilling is referred; when set to 1, peak drilling is referred.

1044	G87 Drilling 0)High 1)Normal

Range： 0 ~ 1
Effective： Instant Activity
Access level： User
Default： 0
Unit： Nul

When this parameter is set to 0, high speed peak drilling is referred; when set to 1, peak drilling is referred.

1045	P2 Pause Time (ms)

Range： 0 ~ 99999
Effective： Instant Activity
Access level： User
Default： 1000
Unit： Nul

The second dwell time setting; meaning, when the tool returns to R point or start point, this parameter can set the tool' s dwell time.

1081	MRCCD μm
1082	MRCDT μm

Range： 0 ~ 99999999
Effective： Effective After RESET
Access level： User
Default： 1000
Unit： μm

Parameter #1081 assigns cutting depth of composite cutting cycle G71 and G72.
Parameter #1082 assigns tool escape amount of composite cutting cycle G71 and G72.
Parameter #1081 and #1082 assign U and R of G71 and G72 commands when they are not commanded by user.

1083	PESCX μm
1084	PESCZ μm

Range： 0 ~ 99999999
Effective： Effective After RESET
Access level： User
Default： 1000
Unit： μm

Parameter # 1083 assigns X axis direction escape amount of composite cutting cycle G73.
Parameter # 1084 assigns Z axis direction escape amount of composite cutting cycle G73.
Parameters # 1083 and 1084 assign U and W of G73 command when they are not commanded by user yet.

1085	PATIM μm

Range： 0 ~ 99999999
Effective： Effective After RESET
Access level： User
Default： 5
Unit： Nul

This parameter assigns division number of composite cutting cycle G73.

1086	GROOVE μm

Range： 0 ~ 99999999
Effective： Effective After RESET
Access level： User
Default： 1000
Unit： μm

This parameter assigns the value of composite cutting cycle G74 and return value of G75.

1087 **THRPT**

Range： 101 ~ 9999
Effective： Effective After RESET
Access level： User
Default： 101
Unit： Nul

To set the default value of fine repetitive time (mm) and chamfer angle tool escape length (rr, min.) while executing G76. This setting value should be 4 digits. The first two digits mean working repetitive time (mm) and the last two digits means chamfer tool escape angle (rr).

1088 **THANG**

Range： 0 ~ 90
Effective： Effective After RESET
Access level： User
Default： 60
Unit： μm

Tool noise angle (aa) default value while executing G76.

1089 **THCLM μm**

Range： 0 ~ 99999999
Effective： Effective After RESET
Access level： User
Default： 50
Unit： μm

This parameter assigns the minimum cutting depth default value of composite cutting cycle G76.

1090 **THDFN μm**

Range： 0 ~ 99999999
Effective： Effective After RESET
Access level： User
Default： 50
Unit： μm

This parameter value assigns the allow amount of composite cutting cycle G76. Please notice that this parameter can set the R value of G76 command when it is not commanding yet.

1158 **SHOW F2~F12 FOR FUN. KEY**

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul

Because inconvenience could occur when operators use commercial PC keyboard to operate controller, F2~F12 characters are shown on the function keys on the screen for users' convenience during operation.

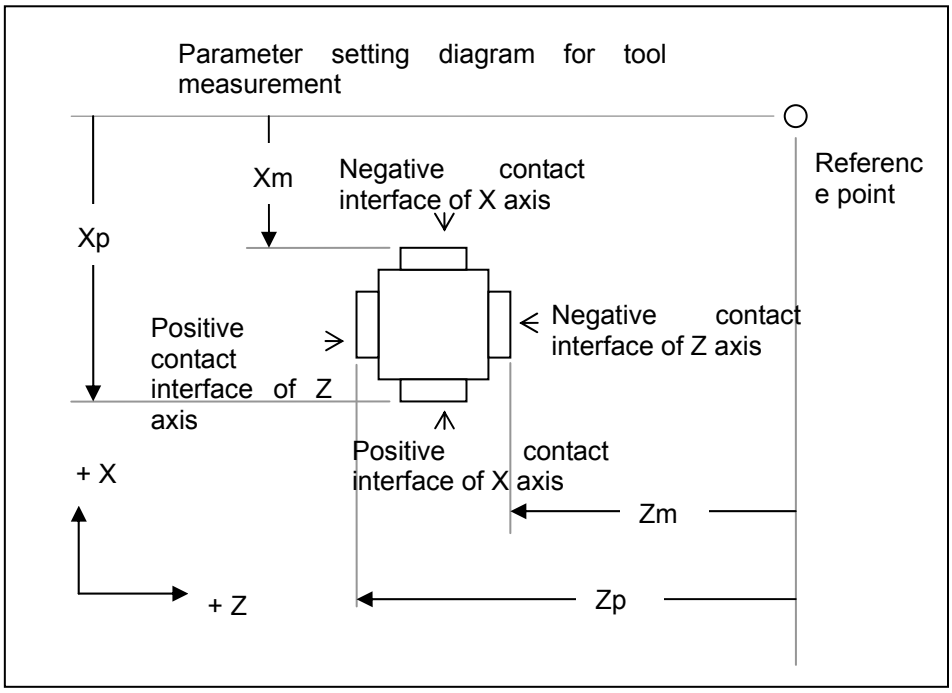
1159	PROGRAM READING OVERTIME

Range： 0 ~ 30000
Effective： Instant Activity
Access level： User
Default： 30
Unit： sec

During machining, if file-reading of the controller takes too long time, an alarm dialog box will appear to notify users about the abnormal situation, it will also remind users to reset the system to ensure efficiency of the controller and the machine.

1160	DISTANCE OF CONTACT X+
1161	DISTANCE OF CONTACT X-
1162	DISTANCE OF CONTACT Z+
1163	DISTANCE OF CONTACT Z-

Range： -99999999 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： μm



Para. # 1160: Distance from machine reference point to Face X+. And also, distance from machine reference point to X+ Touch Sensor face, such as Figure Xp.

Para. # 1161: Distance from machine reference point to Face X-. And also, distance from machine reference point to X- Touch Sensor face, such as Figure Xm.

Para. # 1162：Distance from machine reference point to Face Z+. And also, distance from machine reference point to Z+ Touch Sensor face, such as Figure Zp.

Para. # 1163：Distance from machine reference point to Face Z-. And also, distance from machine reference point to Z- Touch Sensor face, such as Figure Zm.

6 SYSTEM ALARM （Alarm）and WARNING（Warning）

When the system alarm message (ALARM) occurs, operation will stop. User must check the whole machine according to the alarm message. If able to solve problems, then only need to click RESET again to clear the condition. (However, if need to change parameter, then must exit the system software and then re-enter for the system to work.)

Three types of alarm message which are MOT (MOTION) ALARM, OP
(OPERATION) ALARM or INT (INTERPREATATION) ALARM. Definitions of the above alarm message are as following：

6.1 OP OPERATION ALARM

OP 1001：X SERVO ALARM
OP 1002：Y SERVO ALARM
OP 1003：Z SERVO ALARM
OP 1004：4TH SERVO ALARM
OP 1100：5TH SERVO ALARM
OP 1101：6TH SERVO ALARM

(1) Alarm message from SERVO driver.
(2) Please check ERROR message from the SERVO driver to know the cause.
(3) Please re-booting.

OP 1013：DETACH/ATTACH X-AXIS AS MOVING
OP 1014：DETACH/ATTACH Y-AXIS AS MOVING
OP 1015：DETACH/ATTACH Z-AXIS AS MOVING
OP 1016：DETACH/ATTACH 4TH-AXIS AS MOVING
OP 1024：DETACH/ATTACH 5TH-AXIS AS MOVING
OP 1025：DETACH/ATTACH 6TH-AXIS AS MOVING

(1) Move is not allowed when switching.

OP 1017：LNC SYSTEM EXPIRED

(1) Please contact with distributor or machine makers.

OP 1018：DESIRED MACRO VARIABLES NOT EXIST.

(1) Check Macro variables.

OP 1019：DESIRED MACRO VARIABLES OVER RANGE

(1) Check Macro variable value.

OP 1020：OVER MLC TRAVEL LIMIT

(1) Check each axis hardware travel limit.

OP 1021：GEAR SIGNAL ERROR

(1) Check if gear is correct.

OP 1027：HSP LONG, NEED TO CONTACT WITH SYSTEM PROVIDER.

(1) Please contact with distributor or machine makers

OP 1029：X AXIS OVER MLC TRAVEL LIMIT （+）

OP 1030：X AXIS OVER MLC TRAVEL LIMIT （-）

OP 1031：Y AXIS OVER MLC TRAVEL LIMIT （+）

OP 1032：Y AXIS OVER MLC TRAVEL LIMIT （-）

OP 1033：Z AXIS OVER MLC TRAVEL LIMIT （+）

OP 1034：Z AXIS OVER MLC TRAVEL LIMIT （-）

OP 1035：4TH AXIS OVER MLC TRAVEL LIMIT （+）

OP 1036：4TH AXIS OVER MLC TRAVEL LIMIT （-）

OP 1037：5TH AXIS OVER MLC TRAVEL LIMIT （+）

OP 1038：5TH AXIS OVER MLC TRAVEL LIMIT （-）

OP 1039：6TH AXIS OVER MLC TRAVEL LIMIT （+）

OP 1040：6TH AXIS OVER MLC TRAVEL LIMIT （-）

(1) Press rest to reboot system

OP 6001：X AXIS OVER MLC TRAVEL LIMIT （+）

OP 6002：X AXIS OVER MLC TRAVEL LIMIT （-）

OP 6003：Y AXIS OVER MLC TRAVEL LIMIT （+）

OP 6004：Y AXIS OVER MLC TRAVEL LIMIT （-）

OP 6005：Z AXIS OVER MLC TRAVEL LIMIT （+）

OP 6006：Z AXIS OVER MLC TRAVEL LIMIT （-）

OP 6007：4TH AXIS OVER MLC TRAVEL LIMIT （+）

OP 6008：4TH AXIS OVER MLC TRAVEL LIMIT （-）

OP 6009：5TH AXIS OVER MLC TRAVEL LIMIT （+）

OP 6010：5TH AXIS OVER MLC TRAVEL LIMIT （-）

OP 6011：6TH AXIS OVER MLC TRAVEL LIMIT （+）

OP 6012：6TH AXIS OVER MLC TRAVEL LIMIT （-）

(1) Check each axis hardware travel limit.

6.2 INT INTERPRETATION ALARM

INT 3001：NO SUCH TOKEN

(1) Part program enter data has invalid symbols or characters.

(2) Modify program error.

(3) Press RESET to clear the wrong warning message.

INT 3002：GRAMMAR ERROR

(1) Part program enter data has invalid symbols or characters.

(2) Modify program error.

(3) Press RESET to clear the wrong warning message.

INT 3003：OUT OF NODE MEMORY

(1) MACRO grammar has too complicate showing program such as too many brackets.

(2) Simplify complexity degree or make it to be 2 blocks.

(3) Press RESET to clear the wrong warning message.

INT 3004：EXECUTE NODE ERROR

(1) System executes mathematics calculation that is not allow to execute

(2) Press RESET to clear the wrong warning message.

INT 3005：FUNCTION ERROR

(1) System executes invalid function that is not allow to execute.（Won't happen under normal system condition.）

(2) System error, please contact the supplier.

INT 3006：DIVIDED BY 0

(1) MACRO is divided by 0.

(2) Modify numerator of the division. Must NOT be 0.

(3) Press RESET to clear the wrong warning message.

INT 3007：VARIABLE OVER RANGE

(1) One/some of local variables, common variables and global variables are out of range.

(2) Modify variable numbers that are out of their number range.

(3) Press RESET to clear the wrong warning message.

INT 3008：MACRO DOMAIN ERROR

(1) MACRO function domain error. If square (SQRT) argument is negative or ATAN arguments are two zeros.

(2) Modify domain.

(3) Press RESET to clear the wrong warning message.

INT 3010：NOT ALLOWABLE DECIMAL POINT

(1) NC address has not allowable decimal point.

(2) Modify decimal point in NC address.

INT 3011：WORD DATA OVER RANGE

(1) NC address word data is out of range.

(2) Modify word data in NC address.

(3) Press RESET to clear wrong warning message.

INT 3012：MACRO ILLEGAL MACRO PARAMATER INPUT（G、L、N、O、P）

(1) Illegal arguments（G，L，N，O，P）in MACRO program.

(2) Correcting these illegal arguments.

(3) Press RESET to clear wrong warning message.

INT 3013：PART PROGRAM HAS GRAMMER ERROR.

(1) Input data has grammar error.

(2) Part program error.

(3) Press RESET to clear wrong warning message.

INT 3050：TOOL DIAMETER IS 0

(1) Modify tool diameter setting.

INT 3051：ILLEGAL RPM GIVEN

(1) Part program command has rotation speed command over maximum setting.

(2) Modify error in part program.

INT 3052：ILLEGAL FEEDRATE GIVEN

(1) Part program command has feed rate command over maximum setting.

(2) Modify error in part program.

INT 3053：（D）EACH CUT DOWN DEPTH IS 0

INT 3054：（H）TOTAL DEPTH IS 0

INT 3055：ESCAPE LOWER START POINT.Z

INT 3056：（W）EACH CUT WIDTH IS 0

INT 3060：HOLES TOO DENSITY

INT 3061：HOLES COUNT MUST>=2

INT 3062：R MUST > Z

INT 3070：WRONG DATA：R=0

INT 3071：WRONG DATA：2R<=PHI

INT 3072：WRONG DATA：V>PHI

INT 3073：WRONG DATA：Q=0

INT 3074：WRONG DATA：V>=Q

INT 3075：WRONG DATA：（PHI+2Q）>=2R

INT 3076：WRONG DATA：I（J）=0

INT 3077：WRONG DATA：I（J）-2R<=0

INT 3078：WRONG DATA：2Q+PHI>=I（J）

INT 3079：WRONG DATA：2V+PHI>I（J）

INT 3080：DISTANCE OF TWO CENTER IS 0

INT 3081：WRONG DATA：2（R-V）<PHI

INT 3082：WRONG DATA：2（R-V）<=PHI

INT 3083：WRONG DATA：2V+PHI>=I（J）

INT 3084：WRONG DATA：0.414*PHI+I<=2C

INT 3085：WRONG DATA：0.414*PHI+J<=2C

INT 3090：T COMMAND ERROR

INT 3100：ILLEGAL G CODE

(1) Illegal G code in part program.
(2) Delete illegal G code.
(3) Press RESET to clear wrong warning message.

INT 3101：PFM INITIAL ERROR

INT 3102：TRANS INITIAL ERROR

INT 3103：TABLE INITIAL ERROR

INT 3104：POST INITIAL ERROR

INT 3110：FETCH ERROR

INT 3111：LACK OF FILENAME（P ADDRESS IS NOT ENTERED）

(1) Lock of filenames in part program. (P address is not entered.）
(2) Increase number of filenames.
(3) Press RESET to clear wrong warning message.

INT 3112：ILLEGAL FILENAME

(1) Illegal filename in part program.
(2) Modify file name.
(3) Press RESET to clear wrong warning message.

INT 3113：FILE NOT EXIST

(1) File not found in the system.

(2) Making/modifying the executing file.

(3) Press RESET to clear wrong warning message.

INT 3114：END OF FILE

(1) There is no M02 or M30 error in part program.

(2) Modify error in part program.

INT 3120：POST ERROR

INT 3121：LACK OF SUB RETURN（M99）

(1) No returning to the part program command in the sub-program.

(2) Add returning back to the part program command in the sub-program.

(3) Press RESET to clear wrong warning message.

INT 3122：PROGRAM OVERFLOW（8）

(1) Total numbers of calling Sub-program or MACRO is over the total level limit.（i.e., 8）

(2) Decrease numbers of calling program level.

(3) Press RESET to clear wrong warning message.

INT 3123：MACRO OVERFLOW（4）

(1) Total numbers of calling MACRO is over the total level limit. (i.e., 4).

(2) Decrease numbers of calling program level.

(3) Press RESET to clear wrong warning message.

INT 3124：MACRO UNDERFLOW（G67）

INT 3125：WITHOUT LABEL

(1) NO such LABEL .

(2) Please check LABEL name.

(3) Press RESET to clear wrong message error.

INT 3126：BLOCK NOT FOUND

(1) The designated BLOCK is not found.

(2) Check whether or not the designated BLOCK is exist in part program.

(3) Press RESET to clear wrong warning message.

INT 3127：ILLEGAL LABEL

INT 3128：FEEDRATE OUT OF RANGE, CHECK G94/G95

(1) Check G94 and G95 are used correctly.

(2) Check whether or not the FEEDRAT F value is too big.

(3) Press RESET to clear the error and adjust G94, G95 and F value.

INT 3129：SINGLE BLOCK ONLY 1 SET OF SYSTEM M CODE(Ex. M00, M01, M02, M30, M98)

(1) Check if this single block using system M code or customized M code at the same time.

INT 3130：COORDINATE ERROR

INT 3131：UNKNOWN PLANE

INT 3132：USE G02/G03, ILLEGAL RADIUS

(1) Using G02, G03 arch cutting command, the final coordinate is NOT on the arch.

(2) Check the position of center point, direction and final point’s coordinate value.

(3) Press RESET to clear error.

INT 3133：CALL MACRO ACCEPT ONLY 1 M CODE

(1) Check if this single block call Macro whether to use multiple sets of M code.

INT 3134：IN SINGLE BLOCK, M CODE (USER) CAN NOT BE OVER 3

(1) Check if this single block use more than 4.

INT 3140：SEND TABLE1 ERROR

INT 3141：NO FREE VARIABLES

INT 3150：INSUFFICIENT DATA

(1) Not enough executing G code data.（Lack of G10’ s P，R，Z）

(2) Supply the needed data.

(3) Press RESET to clear wrong warning message.

INT 3151：IP MAINTAIN ERROR

INT 3152：CAN CYCLE EXECUTE G27，G28，G29，G30

(1) Executing G27，G28，G29，G30 in the CANNED CYCLE.

(2) Cancel the above G codes in CANNED CYCLE before executing.

(3) Press RESET to clear wrong warning message.

INT 3153：NO SUCH R POINT

(1) Wrong reference point number in G30.

(2) Modify the entered reference point number.

(3) Press RESET to clear wrong warning message.

INT 3154：ILLEGAL IN CC

(1) Executing illegal motion in CANNED CYCLE.

(2) Please cancel any illegal motion in CANNED CYCLE before executing.

(3) Press RESET to clear wrong warning message.

INT 3156：ILLEGAL G31 IN COMPENSATION

INT 3157：G10 P CODE OUT OF RANGE

INT 3158：G10 L/E CODE OUT OF RANGE

INT 3160：INCORRECT READ SEQUENCE

(1) Check whether or not there is incorrect sub-program or jump sequence from the part program.

(2) Press RESET to clear wrong warning message and modify part program.

INT 3161：DNC RS232 LOSS DATA PACKGE

INT 3162：DNC RS232 PROGRAM BUFFER OVERFLOW

(1) Program buffer overflow while DNC RS232 is transmitting program.

(2) Check whether or not the connecting line is disconnect or fall.

(3) Press RESET to clear wrong warning message or reboot.

INT 3163：G05, R RANGE IS 1-10

INT 3164：PATH FOLLOW AND FOLLOW AXIS HAS CONFLICT IN MOVEMENT

INT 3165：G54,P IS OVER RANGE

INT 3166：G10 COMMAND HAS ILLEGAL

INT 3167：G05 P/L COMMAND NEED TO SHOW TOGETHER

INT 3173：IN DO, N VALUE SHOULD OVER 0 OR SMALLER THEN 4

INT 3174：WHILE DO RANGE OVERLAP

INT 3175：LOOP FROM OUTSIDE TO GO IN WHILE DO

INT 3176：DO-END HAS NO 1:1

INT 3200：GOTO LINE IS THE SAME WITH CURRENT ONE

INT 3201：COMP UNIT VECTOR 0

(1) Compensation unit vector is 0.

(2) System error, please contact supplier.

(3) Press RESET to clear wrong warning message

INT 3202：COMP START UP ARC

(1) Compensating start-up is arch.

(2) Please start compensating according to G00/G01.

(3) Press RESET to clear wrong warning message.

INT 3203：COMP CANCEL ARC

(1) Compensating cancel is arch.

(2) Please cancel compensation according to G00/G01.

(3) Press RESET to clear wrong warning message.

INT 3205：COMP VECTOR LENGTH 0

(1) DETERMINE values is 0.

(2) Check part program.

(3) System error, please contact supplier.

INT 3206：COMP INTERFERENCE

(1) Over cutting interference occurs.

(2) Decrease compensation radius or modify part program pathway.

(3) Press RESET to clear wrong message error.

INT 3301：THIS AXIS IS ONE OF THE SIMULTANEOUS AXIS, CAN NOT GIVE MOVE COMMAND TO IT

INT 3303：CHANING AXIS COMMAND CAN NOT BE REPEAT WHEN CHANGING

INT 3999：ALARM NUMBER IS OVER

6.3 MOT MOTION RELATED ALARM

MOT 4001：X AXIS ERROR COUNTER OVERFLOW

MOT 4002：Y AXIS ERROR COUNTER OVERFLOW

MOT 4003：Z AXIS ERROR COUNTER OVERFLOW

MOT 4004：4TH AXIS ERROR COUNTER OVERFLOW

MOT 4202：5TH AXIS ERROR COUNTER OVERFLOW

MOT 4203：6TH AXIS ERROR COUNTER OVERFLOW

(1) Motion board servo axis ERROR COUNTER overflow（16-BIT）

(2) Check or not the commanding speed is too fast.

(3) Check whether or not servo motor is working normally.

(4) Check whether or not the machine is running normally.

(5) Check whether or not the board is normal.

MOT 4005：SET FIRST SOFT LIMIT ERROR

(1) Error setting of 1st soft limit parameter (i.e., +ive soft limit is smaller than –ive soft limit) Please check parameter numbers 1006~1013、1142~1145.

(2) Clicking RESET to set new parameter.

(3) After changing the parameter, please reboot.

MOT 4006：X AXIS SERVO LAG OVERFLOW MORE THAN PR.0002

MOT 4007：Y AXIS SERVO LAG OVERFLOW MORE THAN PR.0003

MOT 4008：Z AXIS SERVO LAG OVERFLOW MORE THAN PR.0004

MOT 4009：4TH AXIS SERVO LAG OVERFLOW MORE THAN PR.0005

MOT 4204：5TH AXIS SERVO LAG OVERFLOW MORE THAN PR.0250

MOT 4205：6TH AXIS SERVO LAG OVERFLOW MORE THAN PR.0251

(1) Servo axis servo lag over parameter 0002 ~ 0005、0250、0251setting value.

(2) Check whether the setting speed is too fast or the parameter 0002 ~ 0005、0250、0251 setting value is too small.

(3) Clicking RESET to continue operating.

(4) If reset parameter, must reboot.

MOT 4012：SINGLE BLOCK COMMAND ERROR

MOT 4014：X AXIS ON HOME DOG

MOT 4015：Y AXIS ON HOME DOG

MOT 4016：Z AXIS ON HOME DOG

MOT 4017：4TH AXIS ON HOME DOG

MOT 4206：5TH AXIS ON HOME DOG

MOT 4207：6TH AXIS ON HOME DOG

(1) Servo axis is on HOME DOG

(2) Press RESET, use JOG to move out from HOME DOG to go ZRN.

MOT 4018：NO RETURN HOME

(1) Not return to the reference point after rebooting.

(2) Clicking RESET and return to the reference point first.

MOT 4023：SET SECOND SOFT LIMIT ERROR

(1) Maximum parameter value of the 2nd soft limit is smaller than the smallest value.

(2) Checking parameters 1034~1041、1146~1149.

(3) Reset parameter and then reboot.

MOT 4025：G10 P RANGE ERROR

(1) P value is over range.

(2) Please check the part program.

MOT 4026：X AXIS ENCODER WIRING ERROR

MOT 4087：Y AXIS ENCODER WIRING ERROR

MOT 4096：Z AXIS ENCODER WIRING ERROR

MOT 4097：4TH AXIS ENCODER WIRING ERROR

MOT 4098：5TH AXIS ENCODER WIRING ERROR

MOT 4099：6TH AXIS ENCODER WIRING ERROR

(1) ENCODER brake or 5V power error.

(2) Check wiring or connector.

MOT 4027：HOME DOG LENGTH TOO SHORT

(1) Return HOME, the DOG is too short or speed too fast.

(2) Enlarge DOG or slow return HOME speed.

MOT 4035：CMR SETTING WRONG

(1) DMR setting error.

(2) Check Pr.0068 ~ 0070，0072，0100 ~ 0107，0270 ~ 0275，1112 ~ 1115，1119~1120

(3) Re-setting parameter and re-booting.

MOT 4037：SET DMR ERROR

(1) DMR setting error.

(2) Checking whether or not the setting value is over setting parameter 0053 ~ 0057、0258~0259 range.

(3) Re-setting parameter and re-booting.

MOT 4039：HOME LOW SPEED ERROR

(1) 2nd home speed setting error.

(2) Checking whether or not the setting value is over setting parameter 1108~1111、1140~1141 range.

(3) Re-setting parameter and re-booting.

MOT 4040：X CMP NO. ERROR

MOT 4041：Y CMP NO. ERROR

MOT 4042：Z CMP NO. ERROR

MOT 4043：4TH CMP NO. ERROR

MOT 4136：5TH CMP NO. ERROR

MOT 4137：6TH CMP NO. ERROR

(1) Pitch compensation section setting error.

(2) Checking Parameter# 0112~0115、0280~0281range.

(3) Re-setting parameter and re-booting.

MOT 4044：CMP INTERVAL ERROR

(1) Pitch compensation section setting error.

(2) Checking Parameter # 1018~1021range.

(3) Re-setting parameter and re-booting.

MOT 4045：NO INDEX INTERRUPT

(1) Reference point index disconnect signal error or HOME DOG too short.

(2) Check motor card interpolation setting or check home sensor.

MOT 4046：RETURN HOME FAILURE

(1) Checking whether nor not machine lock or other machine problems.

(2) Press RESET to clear the condition.

MOT 4047：I/O COMMUNICATION ERROR

(1) Check I/O board.

(2) Check all connectors on I/O board.

MOT 4048：SPINDLE ORITENTATION SIGNAL NOT RELEASE

Assumed executing machine adjustment and orientation. If initially, the spindle is positioned on the sensor, the spindle will move away automatically. After the orientation signal is off, user will be able to execute machine adjustment or orientation. However, if the spindle already rotates one cycle but the orientation signal has not been released, then this alarm message will occur.

(1) Checking whether or not there is connection problem on the spindle orientation sensor.

(2) Checking whether or not the spindle orientation sensor signal and type setting is correct (Parameter # 184).

(3) Checking whether or not the spindle orientation sensor is broken.

MOT 4049：SPINDLE ORITENTATION FLAUT

When executing spindle orientation, the spindle is NOT able to reach the correct orientation point.

(1) Please go to DGNOS page. If the data system NO. 10 is changing, but the spindle is not rotating. Then, it means the spindle motor ENCDER signal has external distribution that makes the system misunderstood.

(2) Please check whether or not the setting orientation rate is too high by parameter 0021 that makes spindle motor has missing step in the Pulse Mode.

MOT 4050：SPINDLE ORITENTATION SIGNAL NOT FOUND

Assumed the spindle has rotated one time already but it hasn’t found the orientation position sensor while executing machine adjustment or while orientation program is running. The following alarm messages will occur.

(1) Checking whether or not there is connection problem on the spindle orientation sensor

(2) Checking whether or not the spindle orientation sensor signal and type setting is correct (Parameter # 0184).

(3) Checking whether or not the spindle orientation sensor is broken.

MOT 4051：NO SPINDLE SPEED DEFINE

Run tuning or orientation, if SP still can't not find sensor after a circle, system will send alarm.

(1) SP speed is not defined or blank.

(2) Key in S_ before tapping command.

MOT 4052：LAG IS OVER WHEN TAPPING

(1) Check if the rigid tapping tuning is done.

(2) Check if Pr.1078 too small.

MOT 4053：SP SPEED WILL OVER WHEN TAPPING

(1) Check if SP speed is over for this gear to receive.

(2) Check if Pr.1060 too big, recommend value is 100.

MOT 4054：RAGID TAPPING AXIS SPEED WILL BE OVER

While tapping, Z axis speed will be over than Pr. 1004 setting.

(1) Check if rigid tapping return ACC Pr.1060 is too big. If ACC is on when returning,（P1060 is bigger then 100）, then cutting axis will be ACC, recommend value 100.

MOT 4055：SP SERVO LAG OVER PR.1075

(1) Check Ladder.

(2) Check if SP rotate when tapping, if not, check SP drives.

(3) Check SP Encoder wiring.

(4) Check if Pr.1075 too small.

MOT 4057：SPINDLE SPEED CAN'T ARRIVE

MOT 4058：OVER SOFTLIMIT

MOT 4059：SP ERROR COUNTER OVER

MOT 4062：X AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

MOT 4065：Y AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

MOT 4068：Z AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

MOT 4071：4TH AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

MOT 4084：5TH AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

MOT 4081：6TH AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

After servo axis re-finds home, NC will ask servo absolute encoder to do returning zero. After completing, NC re-read encoder data to make sure it has return zero. But if the data is over the Pr.1098 setting, Alarm. (MITSUBISHI servo motor-when you want to re-read absolute encoder, you need to servo off, wait around 20ms and servo on, during this time, NC will follow 4th encoder to update coordinate. Later's comparison also use update coordinate.)

(1) Check if Pr.1098 is correct or not.

(2) Check if 4th axis absolute encoder completes the action of returning zero.

MOT 4063：X AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

MOT 4066：Y AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

MOT 4069：Z AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

MOT 4072：4TH AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

MOT 4079：5TH AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

MOT 4082：6TH AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

When NC is doing servo axis absolute encoder reading, if it didn't finish the reading action under Pr. 0834 setting time, Alarm.

(1) Check if servo drives set to be absolute encoder.

(2) Check hardware cable connections.

(3) Check if servo axis Ladder correct (MITSUBISHI servo motor-when you want to re-read absolute encoder, you need to servo off, wait around 20ms and servo on. Check if CS bit is correct.)

(4) Check if Pr.0834 setting time is enough to complete absolute encoder reading action.

MOT 4064：X AXIS ABSOLUTE ENCODER CHECK SMM ERROR

MOT 4067：Y AXIS ABSOLUTE ENCODER CHECK SMM ERROR

MOT 4070：Z AXIS ABSOLUTE ENCODER CHECK SMM ERROR

MOT 4073：4th AXIS ABSOLUTE ENCODER CHECK SMM ERROR

MOT 4080：5th AXIS ABSOLUTE ENCODER CHECK SMM ERROR

MOT 4083：6th AXIS ABSOLUTE ENCODER CHECK SMM ERROR

Servo axis reading-absolute encoder has CHECK SMM error.

(1) Check hardware cable connections.

(2) Please check whether or not servo axis ladder has error.

MOT 4090：X AXIS SERVO LAG TOO BIG, CHECK WIRING OR PR. 416

MOT 4091：Y AXIS SERVO LAG TOO BIG, CHECK WIRING OR PR. 417

MOT 4092：Z AXIS SERVO LAG TOO BIG, CHECK WIRING OR PR. 418

MOT 4093：4TH AXIS SERVO LAG TOO BIG, CHECK WIRING OR PR. 419

MOT 4094：5TH AXIS SERVO LAG TOO BIG, CHECK WIRING OR PR. 420

MOT 4095：6TH AXIS SERVO LAG TOO BIG, CHECK WIRING OR PR. 421

MOT 4100：COM REPEAT CHECK PR.1810 AND 1811

MOT 4104：X AXIS PMC/INT OUTPUT ERROR

MOT 4105：Y AXIS PMC/INT OUTPUT ERROR

MOT 4106：Z AXIS PMC/INT OUTPUT ERROR

MOT 4107：4TH AXIS PMC/INT OUTPUT ERROR

MOT 4108：5TH AXIS PMC/INT OUTPUT ERROR

MOT 4109：6TH AXIS PMC/INT OUTPUT ERROR

MOT 4121：X AXIS COMMANDED UNDER DETACHED

MOT 4122：Y AXIS COMMANDED UNDER DETACHED

MOT 4123：Z AXIS COMMANDED UNDER DETACHED

MOT 4124：4th AXIS COMMANDED UNDER DETACHED

MOT 4127：5th AXIS COMMANDED UNDER DETACHED

MOT 4128：6th AXIS COMMANDED UNDER DETACHED

MOT 4126：RESTART PROCEDURE CAN NOT GIVE MOVE COMMAND

MOT 4129：LIMIT AND INDEX HAS CERTAIN SAFE DISTANCE, USE GRID TO PROTECT

MOT 4130：X AXIS MULTI-HOME LINEAR SCALE HOME PITCH ERROR
MOT 4131：Y AXIS MULTI-HOME LINEAR SCALE HOME PITCH ERROR
MOT 4132：Z AXIS MULTI-HOME LINEAR SCALE HOME PITCH ERROR
MOT 4133：4TH AXIS MULTI-HOME LINEAR SCALE HOME PITCH ERROR
MOT 4134：5TH AXIS MULTI-HOME LINEAR SCALE HOME PITCH ERROR
MOT 4135：6TH AXIS MULTI-HOME LINEAR SCALE HOME PITCH ERROR

MOT 4138：FOLLOW SP NAME ERROR

MOT 4139：ANALOG VOLTAGE CHECKING CARD DO NOT EXIST

MOT 4140：ANALOG VOLTAGE CHECKING MAX AND MIN SETTING ERROR

MOT 4141：EXECUTE RETURN HOME WHEN AT PREPARE COMPLETE

MOT 4142：STOP INT M CODE, M CODE REPEAT, CHECK PR.211~220

MOT 4143：X AXIS ABS ENCODER COMMUNICATION ERROR
MOT 4144：Y AXIS ABS ENCODER COMMUNICATION ERROR
MOT 4145：Z AXIS ABS ENCODER COMMUNICATION ERROR
MOT 4146：4TH AXIS ABS ENCODER COMMUNICATION ERROR
MOT 4147：5TH AXIS ABS ENCODER COMMUNICATION ERROR
MOT 4148：6TH AXIS ABS ENCODER COMMUNICATION ERROR

MOT 4149：X AXIS ABS ENCODER CAN NOT USE ROTATION AXIS, CHECK PR.845
MOT 4150：Y AXIS ABS ENCODER CAN NOT USE ROTATION AXIS, CHECK PR.846
MOT 4151：Z AXIS ABS ENCODER CAN NOT USE ROTATION AXIS, CHECK PR.847
MOT 4152：4TH AXIS ABS ENCODER CAN NOT USE ROTATION AXIS, CHECK PR.66
MOT 4153：5TH AXIS ABS ENCODER CAN NOT USE ROTATION AXIS, CHECK PR.260
MOT 4154：6TH AXIS ABS ENCODER CAN NOT USE ROTATION AXIS, CHECK PR.261

MOT 4155：PMC G00 ACC/DEC(PR.398)ERROR

MOT 4156：PMC G01 ACC/DEC (PR.399) ERROR

MOT 4157：PMC G00 POSITION CHECK RANGE(PR.1831~1836)ERROR

MOT 4158：PMC G01 POSITION CHECK RANGE (PR.1837~1842) ERROR

MOT 4159：1 SOFTWARE PROHIBIT ERROR

(1) Check Pr.1900 ~ 1911.

MOT 4160：2 SOFTWARE PROHIBIT ERROR

(1) Check Pr.1912 ~ 1923.

MOT 4161：I/OCARD COMMUNICATION ERROR (RIO2)

MOT 4162：OUT OF X AXIS HOME DOG, CHECK PR.1890 OR DOG SIGNAL

MOT 4163：OUT OF Y AXIS HOME DOG, CHECK PR.1891 OR DOG SIGNAL

MOT 4164：OUT OF Z AXIS HOME DOG, CHECK PR.1892 OR DOG SIGNAL

MOT 4165：OUT OF C AXIS HOME DOG, CHECK PR.1893 OR DOG SIGNAL

MOT 4166：OUT OF 5TH AXIS HOME DOG, CHECK PR.1894 OR DOG SIGNAL

MOT 4167：OUT OF 6TH AXIS HOME DOG, CHECK PR.1895 OR DOG SIGNAL

MOT 4168：TWO SETS OF INNER M CODER CAN NOT EXIT TOGETHER

MOT 4169：X AXIS 2ND FEEDBACK EXAM WRONG, CHECK IF MACHINE INTERFERENCE OR PR.1954 TOO SMALL

MOT 4170：Y AXIS 2ND FEEDBACK EXAM WRONG, CHECK IF MACHINE INTERFERENCE OR PR.1955 TOO SMALL

MOT 4171：Z AXIS 2ND FEEDBACK EXAM WRONG, CHECK IF MACHINE INTERFERENCE OR PR.1956 TOO SMALL

MOT 4172：4TH AXIS 2ND FEEDBACK EXAM WRONG, CHECK IF MACHINE INTERFERENCE OR PR.1957 TOO SMALL

MOT 4173：5TH AXIS 2ND FEEDBACK EXAM WRONG, CHECK IF MACHINE INTERFERENCE OR PR.1958 TOO SMALL

MOT 4174：6TH AXIS 2ND FEEDBACK EXAM WRONG, CHECK IF MACHINE INTERFERENCE OR PR.1959 TOO SMALL

(1) Check if feedback signal was interfered.

(2) Check if have machine interference

(3) Reset corresponding 2nd encoder feedback exam tolerance Pr.1954~1959 value, and press reset to continue.

(4) Enlarge Pr.1954~1959, press reset, clear alarm, press ZRN to make value to be 0.

(5) Press reboot to make value to be 0.

MOT 4175：X AXIS AND MAIN AXIS LAG, CHECK CHECK IF MACHINE INTERFERENCE OR PR.1960 TOO SMALL

MOT 4176：Y AXIS AND MAIN AXIS LAG, CHECK CHECK IF MACHINE INTERFERENCE OR PR.1961 TOO SMALL

MOT 4177：Z AXIS AND MAIN AXIS LAG, CHECK CHECK IF MACHINE INTERFERENCE OR PR.1962 TOO SMALL

MOT 4178：4TH AXIS AND MAIN AXIS LAG, CHECK CHECK IF MACHINE INTERFERENCE OR PR.1963 TOO SMALL

MOT 4179：5TH AXIS AND MAIN AXIS LAG, CHECK CHECK IF MACHINE INTERFERENCE OR PR.1964 TOO SMALL

MOT 4180：6TH AXIS AND MAIN AXIS LAG, CHECK CHECK IF MACHINE INTERFERENCE OR PR.1965 TOO SMALL

(1) Reboot system.

(2) Make Pr.1960~1965 bigger, press reset

(3) Check if have machine interference.

MOT 4208：SERVO AXIS NO. REPEAT

MOT 4209：2ND FEEDBACK EXAM IMPUT PORT REPEAT, CHECK PR.1924~1929

(1) Check if Pr.1924~1929 setting repeats. if so, modify and reboot to clear alarm. If only using reset to clear this alarm, this input port will be invalid.

MOT 4950：SYSTEM ALARM

MOT 9001：X AXIS OVER SOFTLIMIT（+）
MOT 9002：X AXIS OVER SOFTLIMIT（-）
MOT 9003：Y AXIS OVER SOFTLIMIT（+）
MOT 9004：Y AXIS OVER SOFTLIMIT（-）
MOT 9005：Z AXIS OVER SOFTLIMIT（+）
MOT 9006：Z AXIS OVER SOFTLIMIT（-）
MOT 9007：4TH AXIS OVER SOFTLIMIT（+）
MOT 9008：4TH AXIS OVER SOFTLIMIT（-）
MOT 9019：5TH AXIS OVER SOFTLIMIT（+）
MOT 9016：5TH AXIS OVER SOFTLIMIT（-）
MOT 9017：6TH AXIS OVER SOFTLIMIT（+）
MOT 9018：6TH AXIS OVER SOFTLIMIT（-）

(1) Check Pr,1006 ~ 1013、1142~1145 and see if need to be adjusted, or servo axes move backward and out of travel limit.
(2) Press RESET and return HOME.

MOT 9009：X AXIS OVER G22 SOFTLIMIT （+）
MOT 9010：X AXIS OVER G22 SOFTLIMIT （-）
MOT 9011：Y AXIS OVER G22 SOFTLIMIT （+）
MOT 9012：Y AXIS OVER G22 SOFTLIMIT （-）
MOT 9013：Z AXIS OVER G22 SOFTLIMIT （+）
MOT 9014：Z AXIS OVER G22 SOFTLIMIT （-）

(1) Check G22 each axis travel limit and see if need to be adjusted, or modify program command location.

MOT 9015：OVER CUTTING FEED START SIGNAL WAITTING

7 Machine Adustment

7.1 Lathe Rigid Tapping Command

Description：

- **G94（G95）**

Mode	Thread Pitch Calculation	F_ Unit
G94	F_ / S_	mm/min
G95	F_	mm/rev

- **G98、G99**

G98：Returning back to the initial height.

G99：Returning back to R point

G84（G74）X_Y_Z_R_P_F_K_：

G84：Right helical.

G74：Left helical.

X_Y_：Tapping position.

Z_：Tapping's lowest point (hole bottom).

R_：Tapping's starting point.

P_：Tapping's stop time.

F_：Tapping's Z axis feed speed（G94）or pitch（G95）.

K_：Repeating tapping numbers.

Example：

G94（G95）; //Set Feedrate unit

M29 S_; // To enable rigid tapping mode and to command spindle to the desired rotational speed.

G98（G99）G84（G74）X_Y_Z_R_P_F_K_;

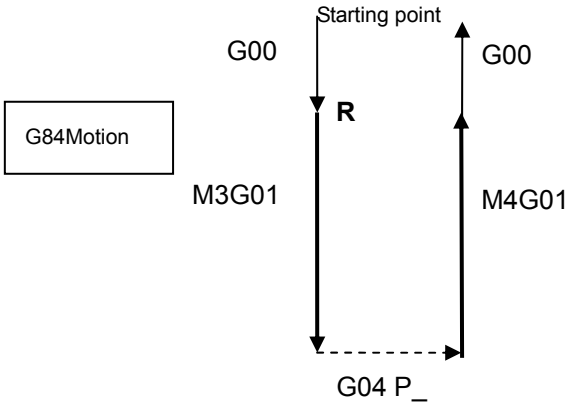
G80; // or Group 0 commands（G00、G01、G02、G03）, disable rigid mode.

- **Returning acceleration function**

Setting parameter 1060, which will be able to accelerate the Z axis returning speed under rigid tapping and to decrease working time.

- **Override**

  Under rigid tapping, Feed Override and Spindle Speed Override will be disabled.



- **MLC Rigid Tapping C BIT**

C BIT	SYMBOL	Description
C125	RT START	When C125 is ON, it will inform NC to start rigid tapping mode. MLC needs to wait until NC S128 = ON and then to disable C125.
C124	RT STOP	Disable rigid tapping mode. Under normal situation, rigid tapping mode will be disabled automatically after reading G80 or Group 1's G code. If there is special need, please set bit to ON and then rigid tapping will be disabled automatically.
S128	RT STATE	Rigid Tapping Mode Status When NC enters into the rigid tapping mode, S128 remains ON until it exits rigid tapping mode. If user press RESET under rigid tapping, NC will set S128 OFF.

Notice： When user press RESET, please disable rigid tapping mode in order to prevent any unpredicted ituation.

- **Rigid Tapping System Information**

Rigid Tapping System Information #	Description
#21	Max error in rigid tapping travel
#22	Estimate value of rigid tapping 1st speed compensation value
#23	Estimate value of rigid tapping 1st acceleration speed compensation value
#24	Estimate value of rigid tapping 2nd speed compensation value
#25	Estimate value of rigid tapping 2nd acceleration compensation value
#26	Rigid tapping spindle following error

- **Rigid Tapping Machine Adjustment Procedure**

1. Please increase the maximum allowable following error of Z axis direction (Para. # 1058 is approximately set to 3000). Also increase the maximum servo error of the spindle (Para. # 1075 is approximately set to encoder size per rotation of the spindle*10) in order to prevent warning when doing machine adjustment.
2. Confirm Spindle Rotational Direction（Para. # 1071）
   Executing the following program：
   M29S500
   G91G84R-10Z-50F500
   M28
   M30
   Check whether or not the spindle rotational direction is the same direction as M3 direction under non-rigid tapping mode. If not the same, please set Para. # 1071 to 1.
3. Acc/Deceleration Time Adjustment
   To adjust acc/deceleration time (parameter 1059) and execute the following program:
   M29S2500 ; rotational speed setting is the maximum rigid tapping speed.
   G91G84R-10Z-50F2500
   M28
   M30
   During executing, must make the spindle drive device's current lower than the saturation value, and make the spindle to turn smoothly.
   Please pay attention to whether or not the needed maximum rotational speed can be reached at the upper enter frequency limit of the spindle. Using Toshiba as an example, adjust Para. # 373, 425, 426, 427, and 428.
   If the spindle rotational speed is not smooth in high rotational speed, please refer to Para. # 371.

4. Speed Compensation

a.Please set parameters 1064、1065、1073、1074 to zero and reboot the system after modifying.

b.Executing the following program in dry run one time (no need to put on any material)

M29S2500

G91G84R-10Z-50 F2500 P1000

M28

M30

To observe system data #22, and to enter this value into speed compensation parameter 1064. This value should be between 100~8000. After entering system data #24 into parameter 1073（S22 → P1064，S24→P1073）, reboot the system.

c.Executing the above part program again. If there is any shaking, please adding parameter 1066 from 0 to 20 in order to decrease shaking. This value shouldn't be as too big as possible, or the following error will increase. Recommending value is between 3~5.

5. Acceleration Speed Compensation

a.Executing Step 4 program one more time, enter system data # 23 and #25 separately into acceleration speed compensation parameter 1065 and 1074 and then reboot the system. This value should be between 100~8000.

b.If shaking occurs, please adding parameter 1070 from 0 to 20 in order to decrease shaking. Recommending value is 10~15.

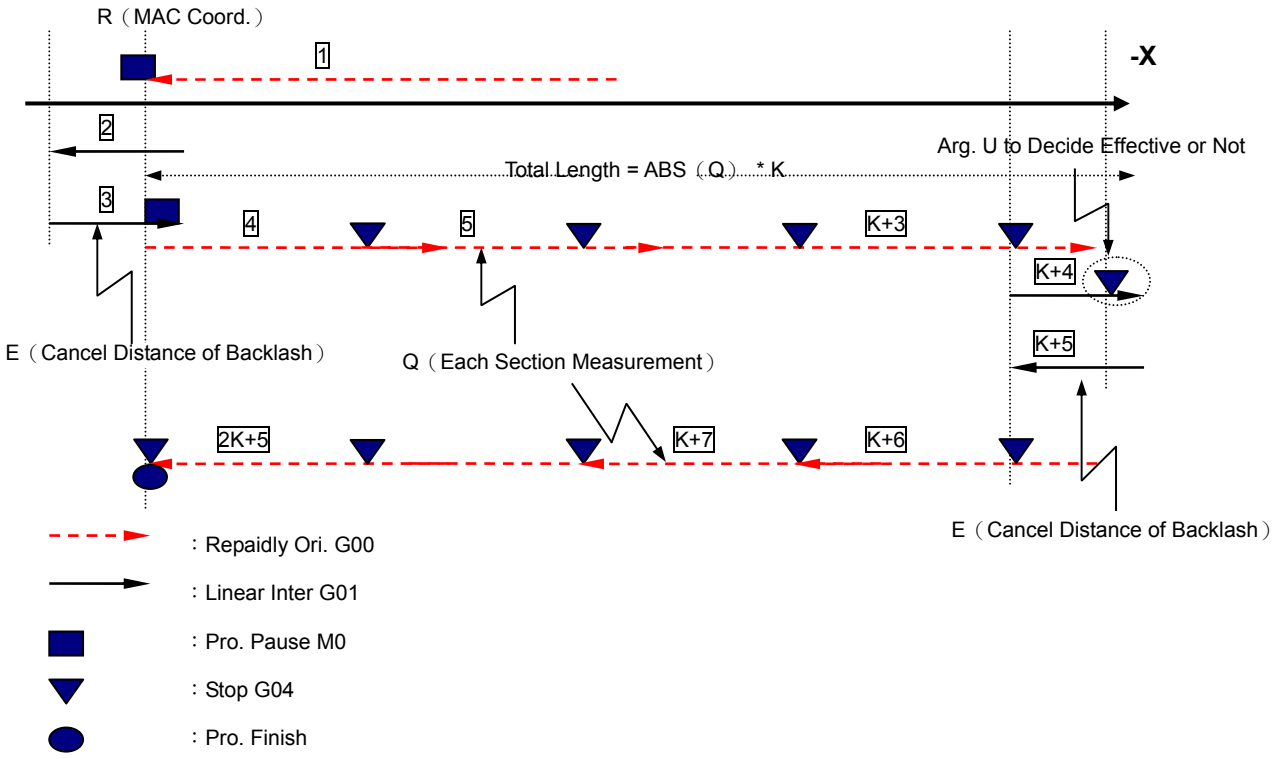
c.After completed, please observe system data #21. This is the biggest error of Z axis direction during tapping.

6. Servo Error Amount Checking

a.Reset Para. # 1058 as the allowable error amount and it must be larger than system data #21. Recommend setting this value as 5 – 10 times larger than system parameter 21. During rigid tapping, when the error is over this setting value, tapping will stop.

b.Using the same principle to set Para. # 1075 as the allowable error amount for the spindle servo. Recommend to set this value as 5-10 times larger than the system parameter #26. During rigid tapping, when the error is over this setting value, tapping will stop.

7.2 Laser Compensation Procedure



Program Argument Description

1. A：Axis direction, 1 means X axis, 2 means Y axis and 3 means Z axis
2. E：E：Delete backlash moving distance. If it is a positive value, at beginning of measuring, the program should move ABS（E）distance toward this axis positive direction. Then moving ABS（E）distance toward negative direction (Step 2 and Step 3 from the above Diagram). After measuring forward direction, first moving ABS（E）distance toward negative direction and then moving ABS（E）distance toward positive direction (Steps K+4 and K+5 from the above diagram). If it is a negative value, then using the opposite method. If it is a negative direction compensation, then this argument must be set as positive.

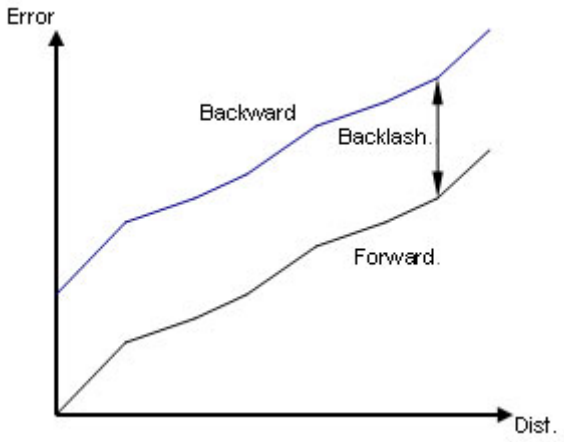
   To delete backlash motion is to execute G01 and the feedrate is constant to 800mm/min. In order to catch the first point of Backward direction (which equals to the last point of the Forward direction, final point of Step K+3 or the starting point of Step K+6), so the setting value of this argument should be bigger than the setting value of Laser measuring software (such as RENISHAW, HP and etc). If not, Step K+4 and Step K+5 should stop for a while.
3. K：Measure section, this argument value must be the same as the total section setting value of the pitch error compensation (Parameters 0112 – 0115) for the corresponding axis direction in NC system.

4. Q：Each section's measuring length. If it is positive direction compensation, please set setting value as positive value. If it is negative direction, please set setting value as negative value. This argument value must be the same as each pitch error compensation distance's setting value for the corresponding axis in NC system. (Parameters 1018 – 1021, NC system parameter values are positive permanently. Parameter 0118 will set the compensation direction.)
5. R：Measure starting coordinate (machine coordinate), this argument value must be the same as the starting position's setting value of pitch error compensation (Parameters 1046 – 1049) for the corresponding axis direction in NC system.
6. T：For each section's pause time, unit is sec.
7. U：When the setting is 1, after executing K+4 Step, pause argument

   T will continue moving toward the reverse direction at the desired time. When the setting is 0, pause argument T will continue moving toward the reverse direction immediately after executing K+4 Step. Please refer to Argument E for a description.

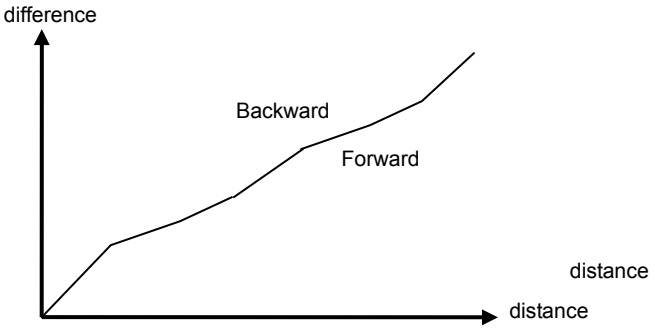
Executing Steps

1. Check NC parameter 0038 (Backlash and pitch error compensation unit) setting value is correct or not.
2. Correct O0000 content and modify each argument's (E, K, Q, R) corresponding NC parameter setting value.
3. Disable backlash or pitch error compensation function (Parameters 0117 and 0119); reboot system.
4. Executing reference point procedure.
5. After resetting laser measure software (such as RENISHAW、HP and est.), executing O0000 program and measuring the error amount of each section's compensation length. The measure result is as below：



6. Putting the measured backlash（From the upper diagram, the vertical difference between two lines）into NC parameter（Parameters 0044 ~ 0047）, and enable the backlash function（Parameter 0117）; reboot the system.

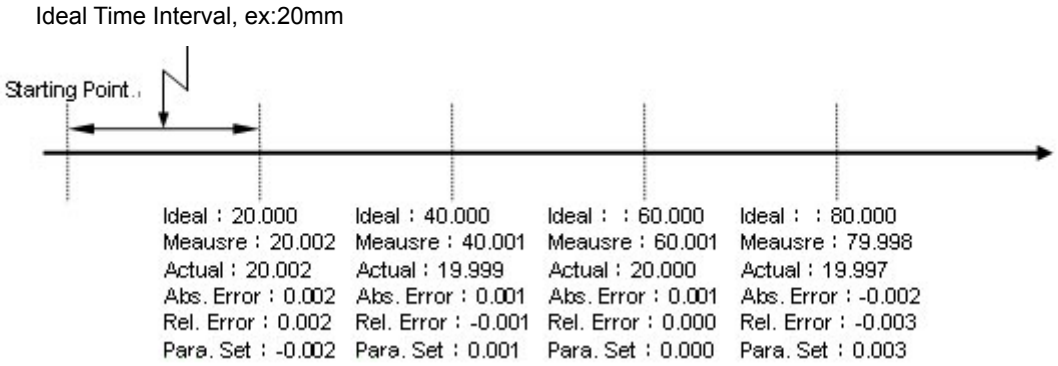
7. After looking for the reference point, re-executing Step 5 and the measure result should be as following：



8. Setting pitch error compensation values（NC Parameters 0300 ~ 0349、0450 ~ 0499、0600 ~ 0649 and 0750 ~ 0799）. Assumed the LNC system pitch error compensation value uses the relative value setting. If the laser measure software (such as RENISHAW, HP, and est.) able to execute exchanging, there will be no problem. But, if can only use the absolute value to indicate, the exchanging method is as following:：

   The N^{th} section relative error = the N^{th} section absolute error – the $(N-1)^{th}$ section absolute error；

   The N^{th} section compensation setting value = -ive N^{th} section relative error.

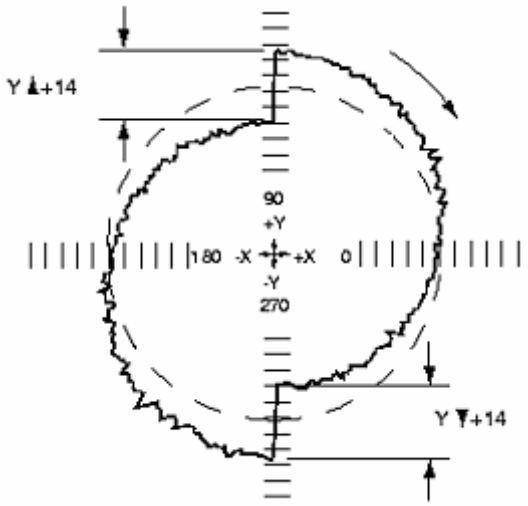


After rebooting the system, re-executing Step 7 until the compensation effect is within the acceptable range.

7.3 Double Ball Bar Measure – Backlash or Circular Spike

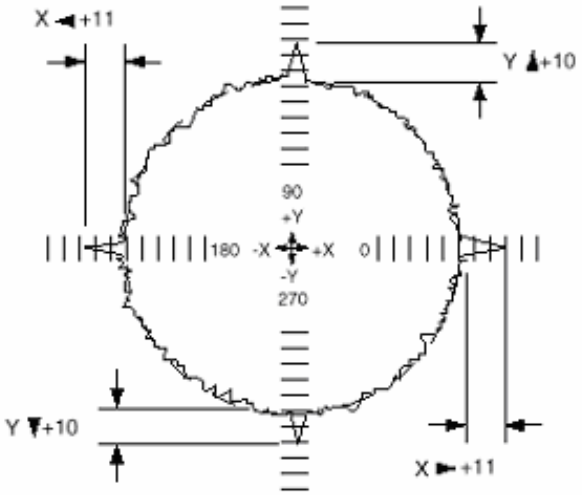
- Backlash

  Using DOUBLE BALL BAR to measure backlash, the result analyzing diagram is as following (only the Y axis part, which is called Positive Backlash). Able to see the Y axis backlash is 14um from the diagram. So please set this value (i.e., 14um) into Para. # 0045 and set BIT1 of Para. # 0117 to 1 in order to enable Y axis backlash compensation functions.



- Reversal Spikes

  Using DOUBLE BALL BAR to executing canned cycle testing, the result analyzing diagram is as below. In the diagram, the sticking out path in the direction changing area of each axis is called the circular spikes phenomenon.



Using +ive X axis direction as an example, each related parameter setting for circular spikes compensation value is as following：

1. Parameter 0812：+ X Axis Direction of Reversal Spikes Value

   Unit：um

   Description: This parameter is to set the circular compensation value of +ive X axis direction. Using the above diagram as an example. The +ive X axis direction circular spike is 11. So based on the principle, the parameter setting value is 11. However, since the present LNC series controller is using PULSE COMMAND control mode (spike compensation is added to CURRENT LOOP value), there will be some delay between the actual corresponding of servo motor and the commanding value. Based on past experience, the circular compensation value should be set as 8-9 times of the actual value. So according to the result from the above diagram, the recommend setting value for this parameter is 90. If this parameter setting value is 0, it means not to enable the + X axis spike compensation function.

2. Parameter 0813: Reversal Spikes Time Interval of +ive X Axis Direction

   Unit：disconnecting time interval

   486IPC is 10.6ms

   586IPC is 3.6ms

   Description: To use this parameter to set the maintaining time of +ive X axis direction spike compensation. The corresponding +ive X axis spike maintaining time (spindle width) is displayed on the result analyzing diagram. The measure software will provide each measured Sampling Rate. Using RENISHAW as an example,【Sample: 7.81 per sec information will be displayed on the left side of analysis diagram. This means the time interval for two closing points is $\frac{1}{7.81} = 128ms$. Need at least 3 points (during time $2 \times 128 = 256ms$) if want the analysis diagram to display multiple-angle sharp. Under this requirement, the parameter setting value is $\frac{256}{3.6} = 71$（586IPC）. If this parameter setting value is zero, this means not to enable the +ive X axis spike compensation function.

3. Parameter 0814: Reversal Spikes Delay Time of +ive X axis

   Unit：discounting time interval

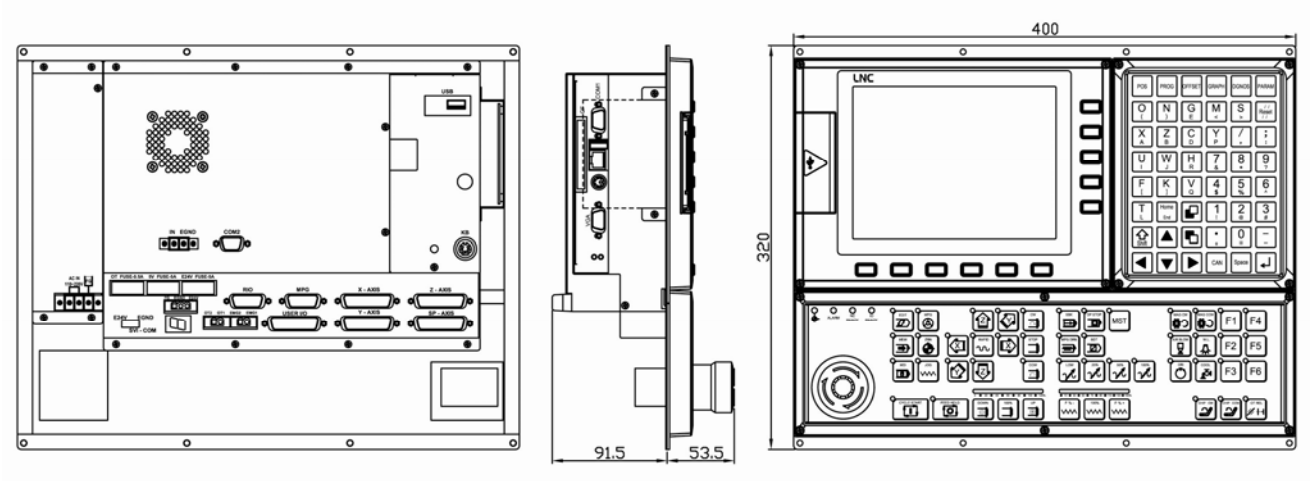
   486IPC is 10.6ms

   586IPC is 3.6ms

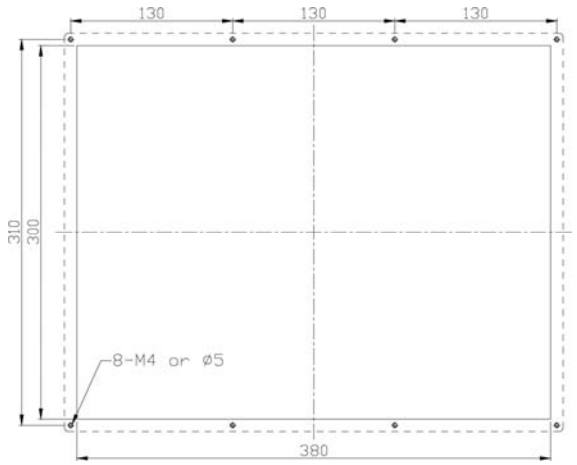
   Description: Assumed the circular spike occurring point of +ive X axis is not in the direction changing center (on the X axis), but it occurs after direction changing. Then, need to set this parameter. Please refer to the description of parameter 0813 for the calculating method of this setting value.

8 Dimension

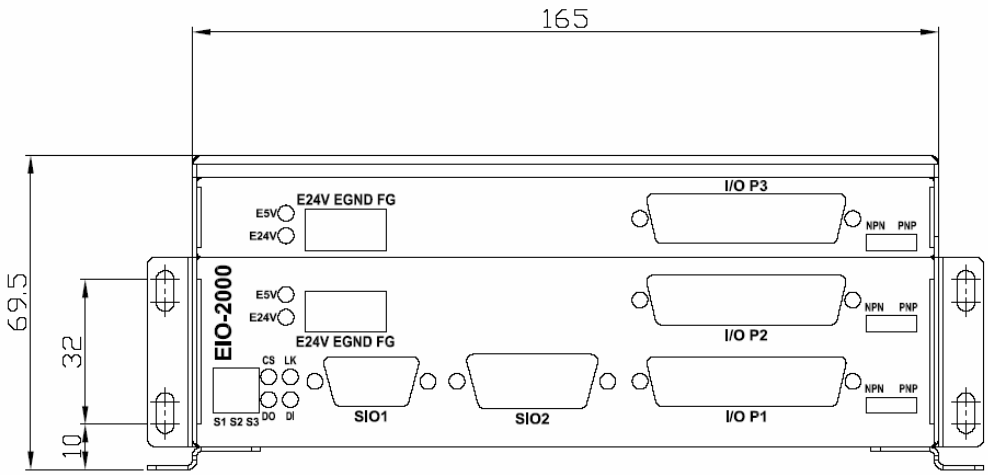
8.1 Dimension



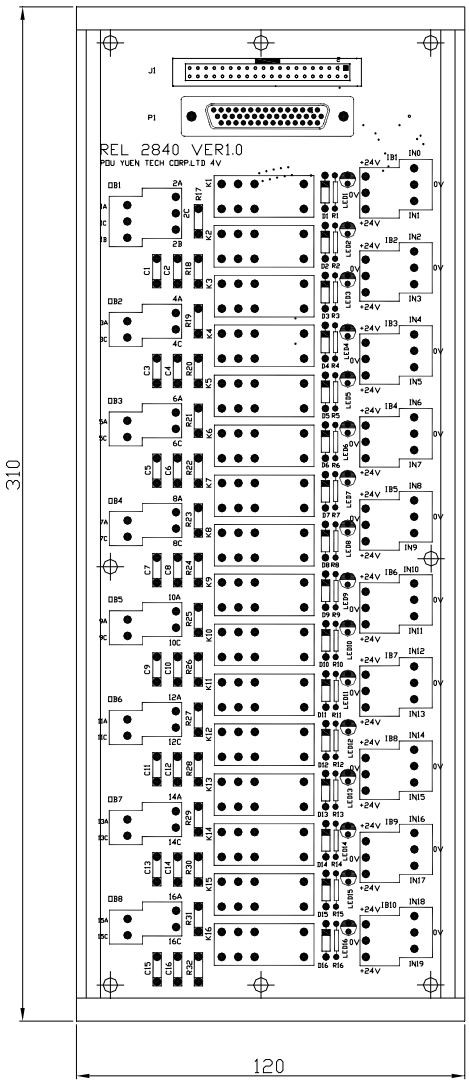
8.2 Chassis dimension



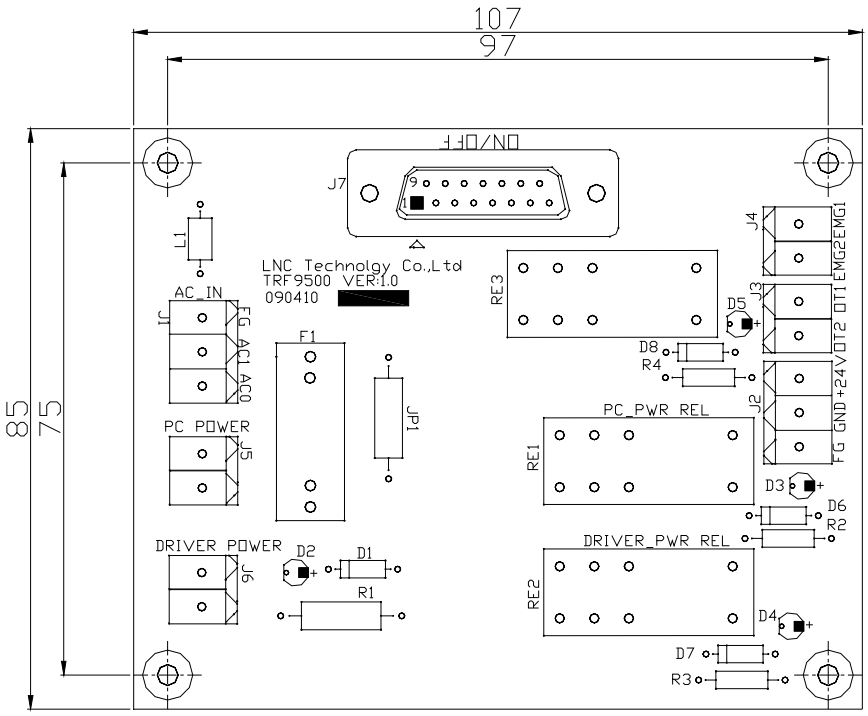
8.3 EIO2000


165
69.5
32
10
E24V EGND FG
E5V
E24V
I/O P3
NPN PNP
EIO-2000
E5V
E24V
E24V EGND FG
I/O P2
NPN PNP
CS LK
S1 S2 S3
DO DI
SIO1
SIO2
I/O P1
NPN PNP

8.4 REL2840



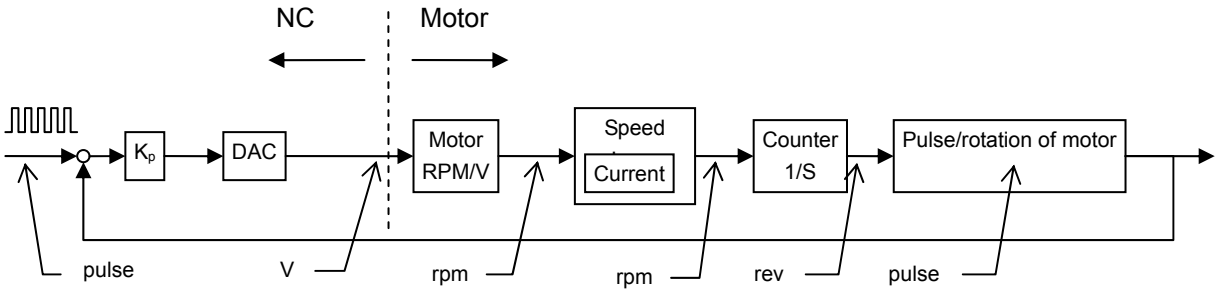
8.5 TRF-9500 Dimension



9 APPENDIX A PARAMETER ADJUSTMENT EXAMPLE

A1 Parameter Adjustment of V Command Control Method

Using X axis as an example, the following is the diagram of CONTROL BLOCK DIAGRAM when motor ENCODER has the position feedback signal



1. K_p：position gain on PCC1620 motion control card, P control.
2. PCC1620 motion control board DAC specification：

   16-bit，output ±10V → DAC analogy degree = $\frac{10}{2^{16-1}-1} = \frac{10}{32767}$

3. Motor incremental gain = 1V, the corresponding motor rotational speed rpm, is decided by motor specification（motor driver also needs to be set）.
4. The speed of motor driver and the responding speed of the current feedback is much faster than the speed of position feedback, so it is able to set it as 1.
5. Total pulse per rotation of Motor = total Encoder output pulse per rotation of motor * multiple feedback factor.

Example：X axis selects motor 2000rpm/10V, the total encoder output pulse per rotation of motor is 2500; for machine structure, gear ratio is 4; pitch is 10mm. Under V command control method, if users hope the system feedback loop gain is 30 for this axis, then how to set the related parameters?

Answer：Parameter #0001：30（system feedback loop gain）.

Parameter # 0054：4（X axis multiple feedback factor）.

Parameter #1112：2500（total encoder output pulse per rotation of X axis motor）.

Parameter # 0108：200（X axis motor loop gain）.

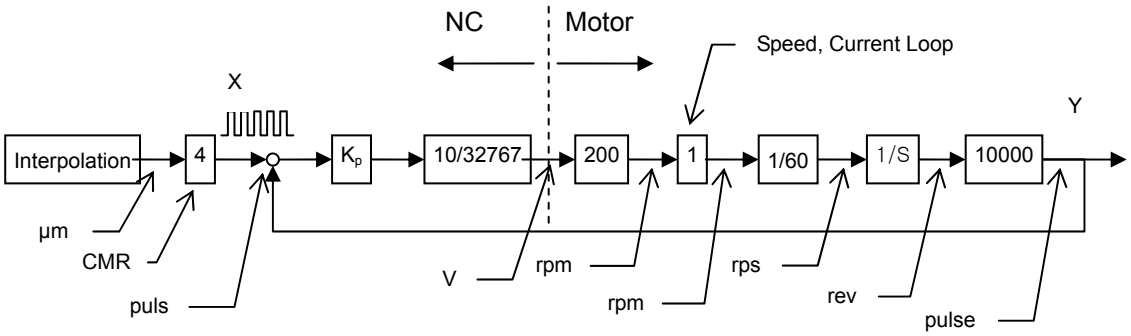
Parameter #0156：3（X axis control commanding mode）.

Parameter #0068：1（denominator of X axis motor）.

Parameter #0100：4（numerator of X axis ball screw）.

Parameter #0104：10000（pitch of X axis ball screw）.

So the control loop at this time is as below:



Relationship between Position Control Feedback Output and Input:

$$Y = \frac{K_p \cdot 10/32767 \cdot 200 \cdot 1/60 \cdot \frac{1}{S} \cdot 10000}{1 + K_p \cdot 10/32767 \cdot 200 \cdot 1/60 \cdot \frac{1}{S} \cdot 10000} X = \frac{10.17284 K_p}{S + 10.17284 K_p} X \quad ,$$

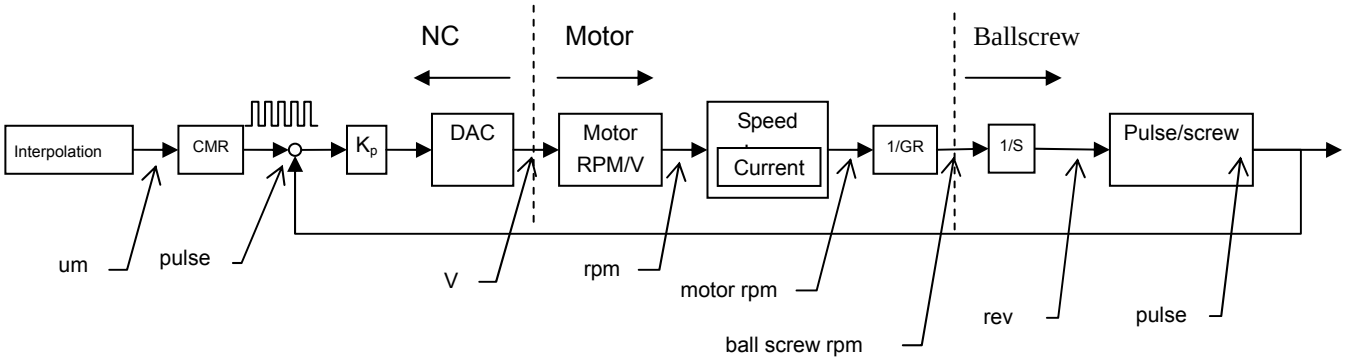
At this time, the position feedback loop gain is $10.17284K_p$. Since the user requires the desired position loop gain is 30, so the K_p value needs to be set as $\frac{30}{10.17284} = 2.949^{i}$ on motion control board.

Testing Method：

$e = \frac{F}{K}$，e is the following error under stable condition（X axis reaches equal speed），please check system data # 000, unit is the smallest unit of the system; F is the feedrate; K is the position feedback loop gain. In this example, when K is 30 and under the condition that feedrate is 2000mm/min, following error should be $e = \frac{2000000 / 60}{30} = 1111$ when X axis is in equal speed. When X axis is already in equal speed and the value of system data #000 is 1111 (or close to this number, sometimes there will be some difference due to moving forward one space), it means the parameter setting is correct.

A2 Parameter Adjustment when Encoder is installed besides Ball Screw

1. Connecting ball screw encoder feedback signal to NC, using it as position control.
2. Connecting motor encoder feedback signal to motor driver, using it as speed (velocity) and voltage control.



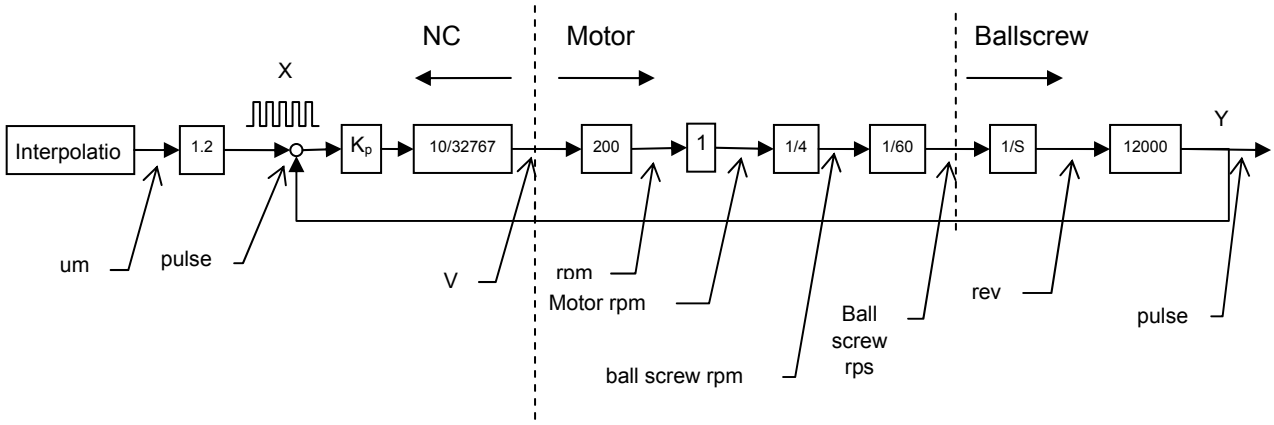
3. Since the position feedback signal is returning back from ball screw at this time, must set gear ratio to 1 even there is gear ratio is between motor and ball screw. Putting the gear ratio factor into the position control feedback.
4. Assumed the initial parameter # 1112 is to set the encoder total output pulse value per rotation of motor. At this time, changing it to as the encoder total output pulse value per rotation of ball screw.

Example：X axis selects 2000rpm/10V motor，encoder total output pulse value per rotation of motor is 2500; for machine structure, gear ratio is 4, pitch is 10mm, Please to install an additional 3000pulses/rev encoder on the ball screw side and also to connect the feedback signal to NC for position control. Under the condition that V command control method and the system loop gain is 30, how to set the related parameters?

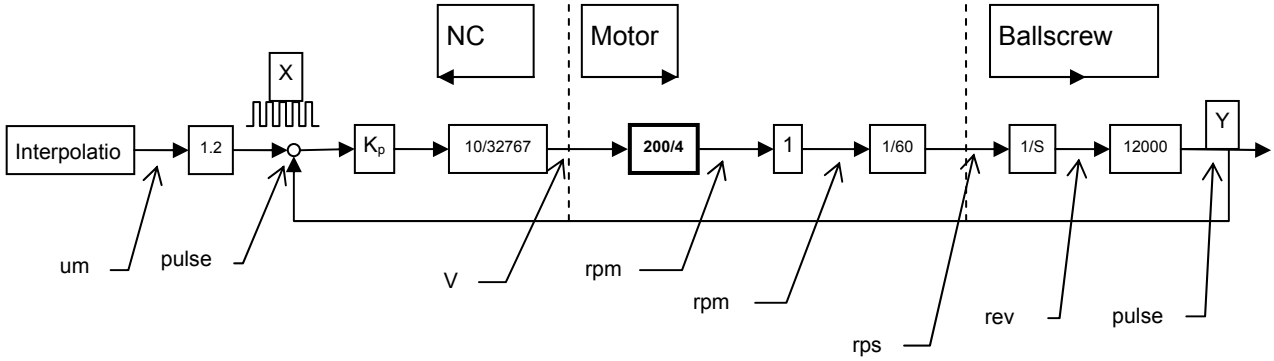
Answer：Parameter #0001：30（system feedback loop gain）.
Parameter #0054：4（X axis multiple feedback factor）.
Parameter #1112：3000（encoder total output pulse value per rotation of X axis ball screw）.
Parameter #0108：????（X axis motor loop gain）→explain later.
Parameter #0156：3（X axis control commanding mode）.
Parameter #0068：1（denominator of X axis motor）.
Parameter #0100：1（numerator of X axis ball screw）.
Parameter #0104：10000（Pitch of X axis ball screw）.

$CMR = \frac{3000 * 4}{10000} = 1.2\, pulses / um$，which means 1um on X axis is correspond to 1.2 pulses that is the encoder total output signal of ball screw.

Control Loop is as below：



But, since there is no extra parameters for GR factor setting in position feedback, modification is as following:



Input and Output Relationship：

$$Y = \frac{K_p \cdot 10/32767 \cdot 200 \cdot 1/4 \cdot 1/60 \cdot 1/S \cdot 12000}{1 + K_p \cdot 10/32767 \cdot 200 \cdot 1/4 \cdot 1/60 \cdot 1/S \cdot 12000} X$$

$$= \frac{K_p \cdot 10/32767 \cdot 200/4 \cdot 1/60 \cdot 1/S \cdot 12000}{1 + K_p \cdot 10/32767 \cdot 200/4 \cdot 1/60 \cdot 1/S \cdot 12000} X = \frac{3.05185 K_p}{S + 3.05185 K_p} X$$

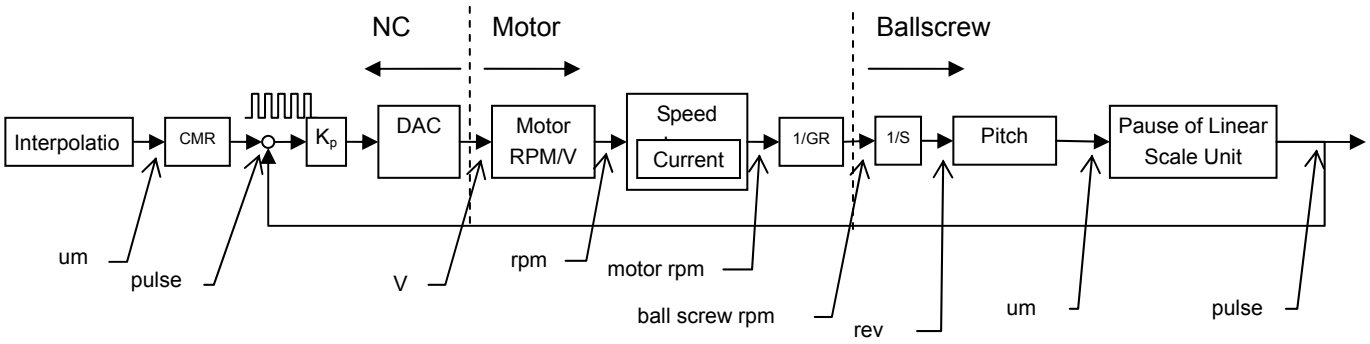
So, in this application example, parameter #0108 setting value is 200/4=50 and the K_p setting value is $\frac{30}{3.05185} = 9.83$ on PCC1620 motion control board.

Weakness: under the present structure, when the motor actual loop gain cannot be completely divided by gear wheel ratio, please enter the closest integrate value. Also, there is a little bit difference between the whole position loop gain values and Parameter #0001 value. But, the position control has no problem at all.

Strength: able to clear backlash error.

A3 Parameter Adjustment when using Linear Scale Control Method

1. Connecting linear scale feedback signal to NC, using it as position control.
2. Connecting motor encoder feedback signal to motor driver, using it as velocity (speed) and voltage control.



3. Since the position feedback signal is returning back from table at this time, must set the gear ratio to 1 even there is gear ratio between motor and ball screw. Putting the gear ratio factor into the position control loop.

Example：X axis selects 2000rpm/10V motor, the total encoder output pulse value per rotation of motor is 2500; for the machine structure, gear ratio is 4, pitch is 10mm. Also, please install an addition linear scale: every 20um will output one A/B pulse set, every 50mm will output one Z phase pulse and also sending the feedback signal to NC. Under the condition of V command control method and the system loop gain value is 30, how to set the related parameters?

Answer：Parameter #0001：30（system loop gain）.

Parameter #0054：4（X axis multiple feedback factor）.

Parameter #1112：????（total encoder output pulse value per rotation of X axis motor）.→explain later.

Parameter #0108：????（X axis motor loop gain）.→explain later.

Parameter #0156：3（X axis control commanding mode）.

Parameter #0068：1（denominator of X axis motor）.

Parameter #0100：1（numerator of X axis ball screw）.

Parameter #0104：????（X axis pitch）.→explain later.

（Parameter #1112 * Parameter #0054）the initial definition is the total encoder output pulse value per rotation of X axis motor. This value is used as the distance between each index in zero return procedure. So after changing to linear scale, Parameter #1112 also needs to change to the pulse value that is sent out by linear scale. In this example, every

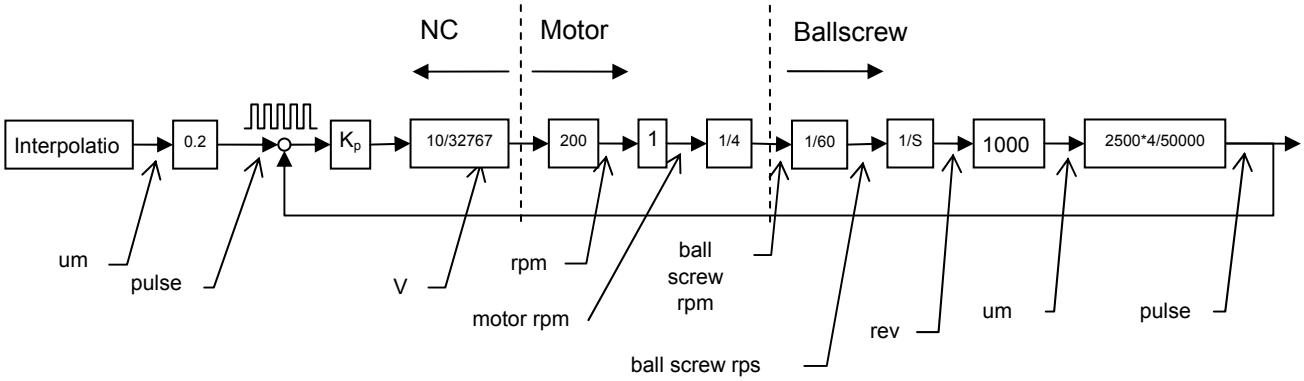
50 mm linear scale will produce one Z phase pulse, every 20 um will produce one A/B pulse set, so the pulse value that is produced by linear scale between each index is 50 * 1000 / 20 = 2500 → the setting value of Parameter #1112 is 2500.

For linear scale, every 20 um will produce one A/B pulse set. This means every 5um will produce one pulse after 4 ratio so the CMR = 1 / 5 = 0.2. But for NC,

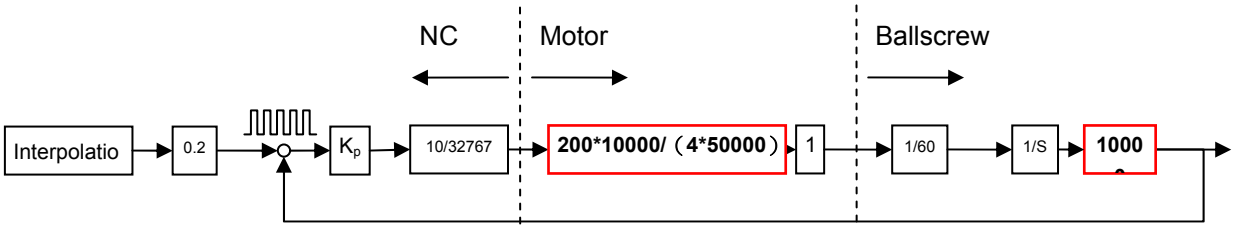
$$CMR = \frac{P0058 \times P0054}{P0104} \times \frac{P100}{P68}$$

Since Parameter #1112 is to set the pulse value, which is produced by linear scale, between each index, Parameter #0104 must set the distance between each linear scale index in order to make the CMR in NC the same as that in linear scale. In this example, Parameter #0104 must be set as 50000.

Control loop is as below：



Since there is no extra parameter for pitch and numerator of X axis ball screw setting, the control loop is modified as following:



Output and Input Relationship:

$$Y = \frac{K_p \cdot 10/32767 \cdot 200 \cdot 1/4 \cdot 1/60 \cdot 1/S \cdot 10000 \cdot 10000/50000}{1 + K_p \cdot 10/32767 \cdot 200 \cdot 1/4 \cdot 1/60 \cdot 1/S \cdot 10000 \cdot 10000/50000} X$$

$$= \frac{K_p \cdot 10/32767 \cdot (200 \cdot 10000)/(4 \cdot 50000) \cdot 1/60 \cdot 1/S \cdot 10000}{1 + K_p \cdot 10/32767 \cdot (200 \cdot 10000)/(4 \cdot 500000) \cdot 1/60 \cdot 1/S \cdot 10000} X = \frac{0.50864}{S + 0.50864 K_p} X$$

So, in this application case, the setting value of Parameter 0108 is 200*10000/（4*50000）=10. The K_p setting value is $\frac{30}{0.50864} = 58.9808$ on PCC1620 Motion Control Board.

Weakness: Under current structure, when Parameter 0108 cannot be an integrate number, please enter the closest integrate number. At this time, there will be some difference between the whole position loop gain and parameter 0001, but the position control will not have any problem.

Strength: able to clear backlash error and pitch error.

10 Appendix B：Servo Connection Example

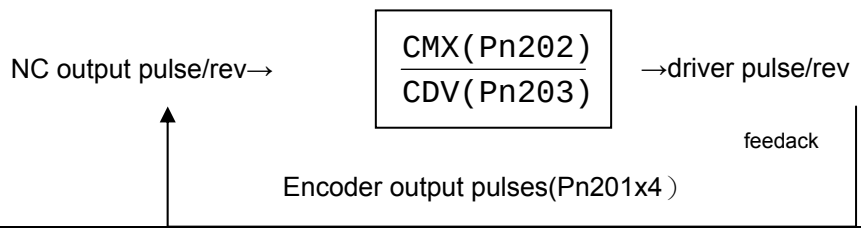
B1 Yaskawa Servo Connection Example

YASKAWA Servo Motor Machine Adjustment Description

Parameter	Description	Value	Note
Pn000	Control Mode Select: 0:speed control 1:position control	1	_ _1_
Pn100	Speed circuit gain	Depend on motor type	
Pn101	Speed Loop Integral Time Constant	Depend on motor type	
Pn102	Position Loop Gain	Depend on motor type	
Pn200	Pulse Type	4	_ _ _4
Pn201	PG Dividing Ratio	Depend on motor type	
Pn202	Electronic Gear Ratio (Numerator)	Depend on motor type	
Pn203	Electronic Gear Ratio (Denominator)	Depend on motor type	

_ ：means has no this setting.

YASKAWA Σ-II Series electron gear ratio formula



Model example

SGMPH-01 A A A 2 S

SGMPH-01 A A A G 1 2 B

Code	ENCODER pulse per rotate(pulse/rev）	
A	13-BIT	2048
1 or B	16-BIT	16384
2 or C	17-BIT	32768

Ex: using motor that Code=A, PITCH=5MM, (1μ=1pulse）:

5MM<PITCH>=5000μ=5000pulse
Because Pn201<motor ENCODER PULES per rotate>X4<NC multiple>=5000 pulse
So Pn201=1250
NC parameter<<0058、0060>>：to set X-Axis and Z-Axis ENCODER(P/Rev.)=1250。

$$\frac{Pn203}{Pn203}=\frac{2048_{\langle 13\text{-BIT}\rangle}X4_{\langle x4\ multiplier\rangle}}{1250_{\langle NC\ Para.:\ X\text{-}Axis/Z\text{-}Zxis\ ENCODER(P/Rev.)\rangle}X4_{\langle x4\ multiplier\rangle}}=\xrightarrow{reduce}\frac{1024}{625}$$

Servo motor parameter:
Pn201：1250　　Pn202：1024　　Pn203：625

Ex: using motor that Code=1 or B, PITCH=10MM，(1μ=1pulse）:

10MM<PITCH>=10000μ=10000pulse
Because Pn201< motor ENCODER PULES per rotate >X4< NC multiple >=10000 pulse
So Pn201=2500
NC parameter <<0058、0060>>：X-Axis and Z-Axis ENCODER(P/Rev.)=2500

$$\frac{Pn203}{Pn203}=\frac{16384_{\langle 16\text{-BIT}\rangle}X4_{\langle x4\ multiplier\rangle}}{2500_{\langle NC\ Para.:\ X\text{-}Axis/Z\text{-}Zxis\ ENCODER(P/Rev.)\rangle}X4_{\langle x4\ multiplier\rangle}}=\xrightarrow{reduce}\frac{4096}{625}$$

Servo motor parameter: X-Axis and Z-Axis ENCODER(P/Rev.)=2500
Pn201：2500　　Pn202：4096　　Pn203：625

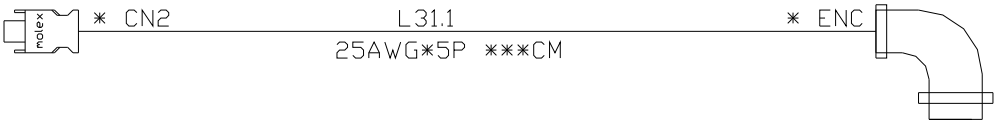
Ex：using Code=2 or C type motor, PITCH=10MM，(1μ=1pulse）:

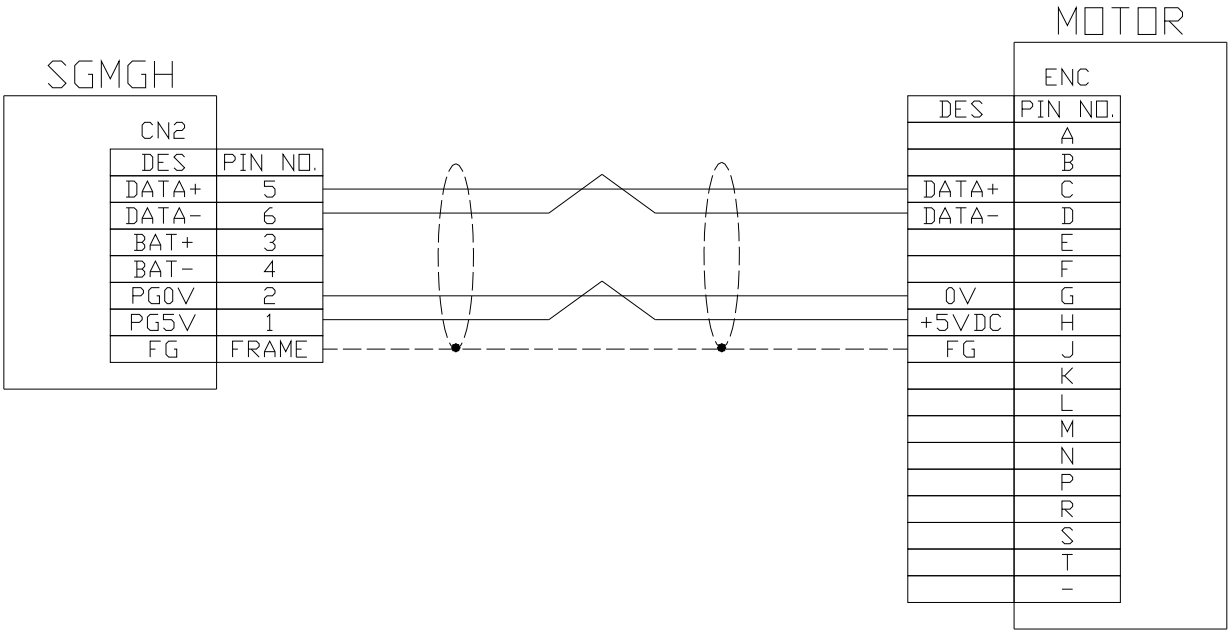
10MM<PITCH>=10000μ=10000pulse
Pn201 < motor ENCODER P/Rev. > X4 <NC multiple>=10000 pulse
So Pn201=2500
NC para. : <<0058、0060>> : X-Axis and Z-Axis ENCODER(P/Rev.)=2500

$$\frac{Pn203}{Pn203}=\frac{32768_{\langle 17\text{-BIT}\rangle}X4_{\langle x4\ multiplier\rangle}}{2500_{\langle NC\ Para.:\ X\text{-}Axis/Z\text{-}Zxis\ ENCODER(P/Rev.)\rangle}X4_{(x4\ multiplier)}}=\xrightarrow{約分後}\frac{8192}{625}$$

Servo motor parameters:
Pn201：2500　　Pn202：8192　　Pn203：625

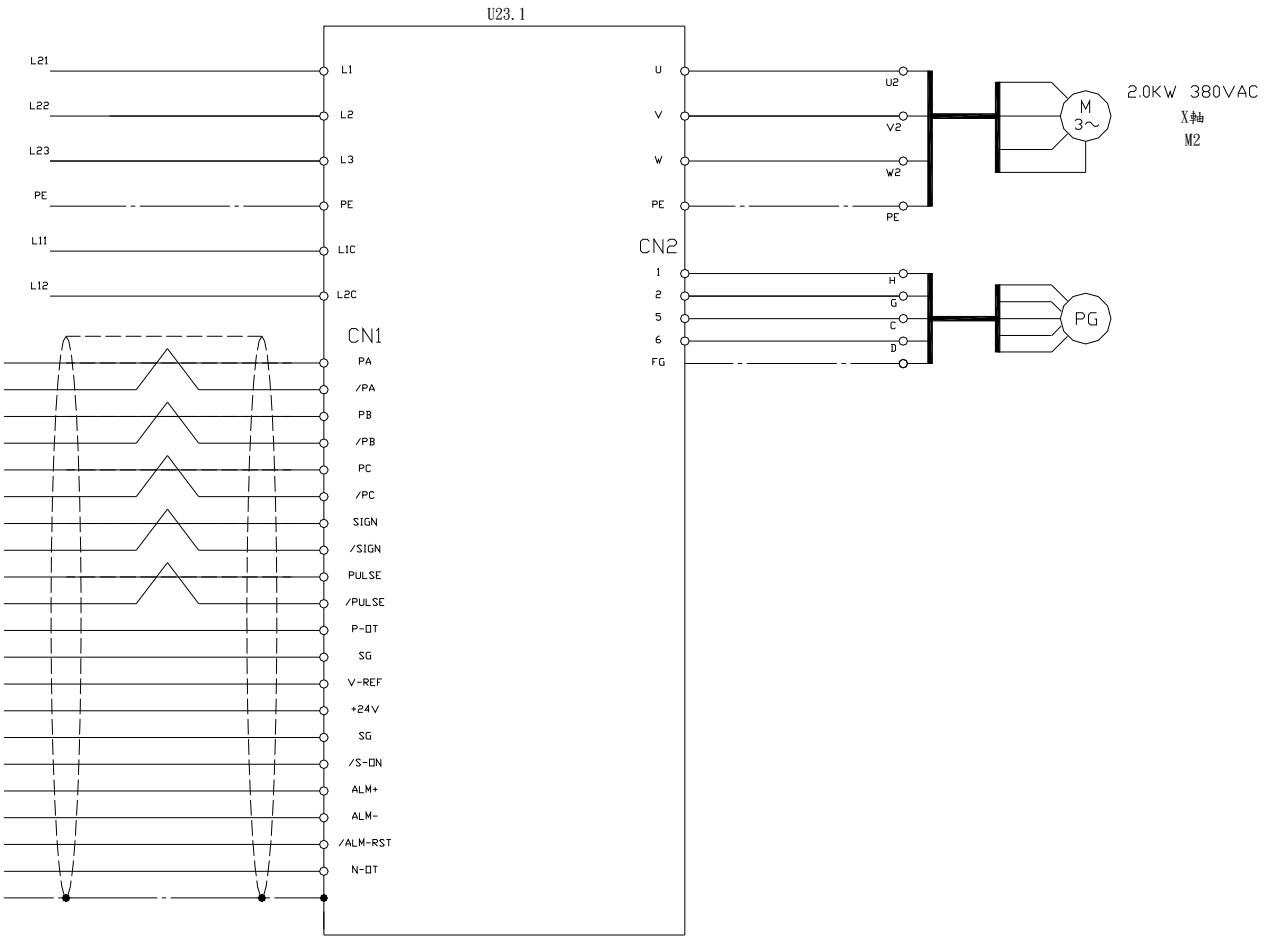
- **ENCODERW Wiring Figure**



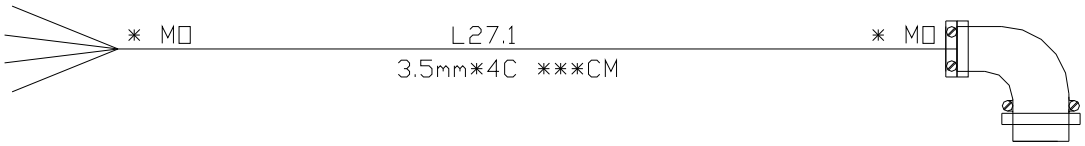


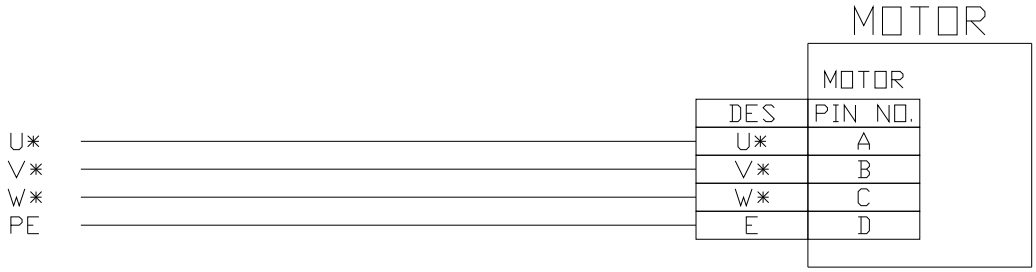
ENCODER Wiring Diagram

- **YASKAWA Wiring Figure**

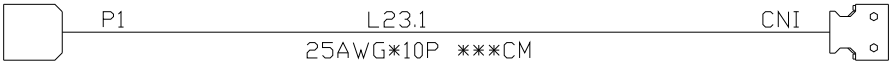


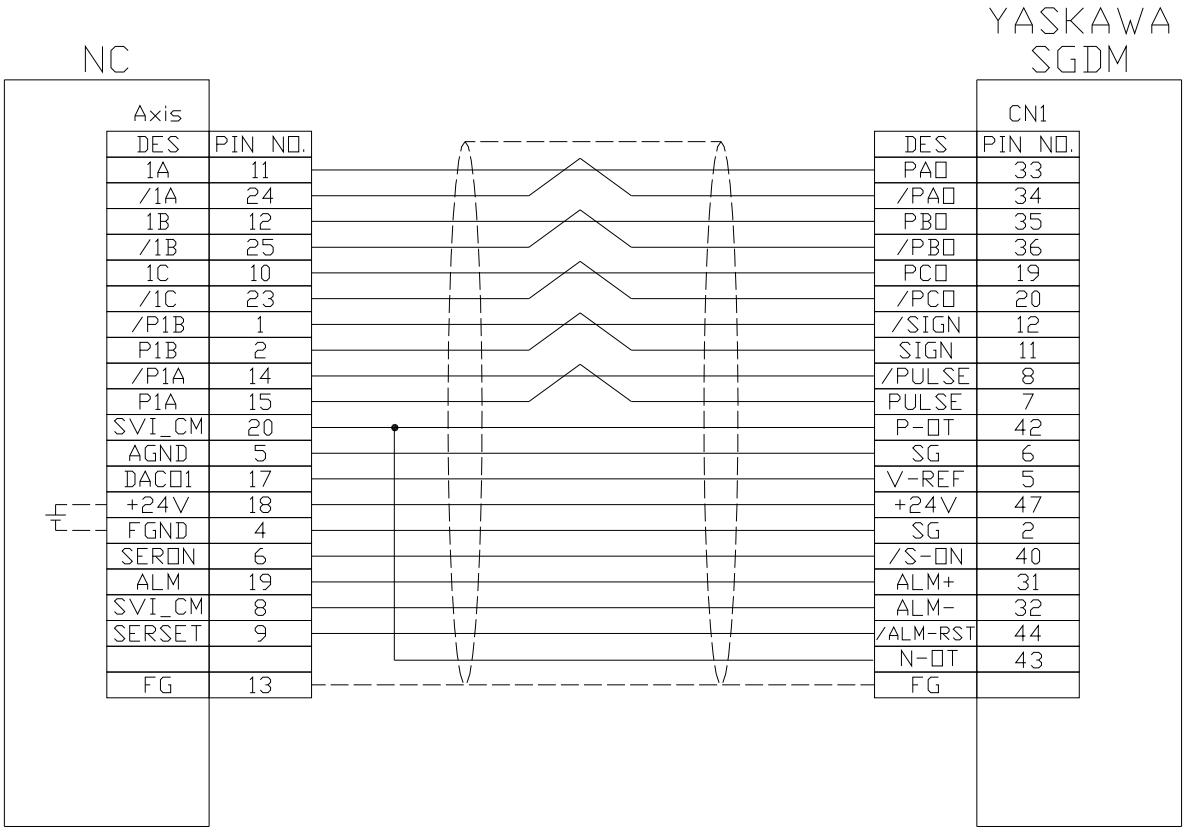
- **YASKAWA Motor POWER Figure**





- **NC→YASKAWA Driver Wiring Figure**





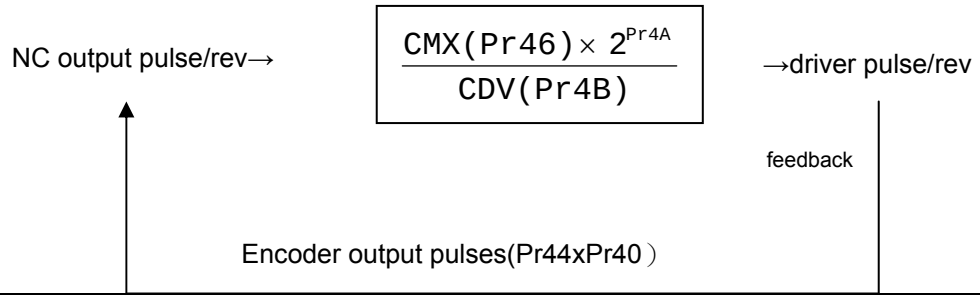
B2 Panasonic Servo Connection Example

Panasonic Servo Motor Adjust Parameters

A TYPE			
Para.	Description	Value	Note
Pr 02 *	To set control mode Control mode:0: position 1: speed	0	
Pr10	Position Loop Gain	According to motor type	
Pr11	Speed Loop Gain	According to motor type	
Pr12	Loop Integral Time Constant	According to motor type	
Pr40 *	Control pulse multiple	4(default)	Use if resolution been changed
Pr44 *	Number of output pulse per rotation	2500(default)	Use if resolution been changed
Pr46	electronic gear ratio numerator	10000(default)	Use if resolution been changed
Pr4A	electronic gear ratio numerator×2^n	0(default)	Use if resolution been changed
Pr4B	electronic gear ratio denominator	10000(default)	Use if resolution been changed

D TYPE			
Para.	Description	Value	Note
Pr 02 *	To set control mode Control mode:0: position 1: speed	0	
Pr03	Speed Loop Gain	According to motor type	
Pr04	Loop Integral Time Constant	According to motor type	
Pr20	Position Loop Gain	According to motor type	

Panasonic electron gear ratio formula



NC pulse output must equal to driver feedback pulse(ENR) formula:

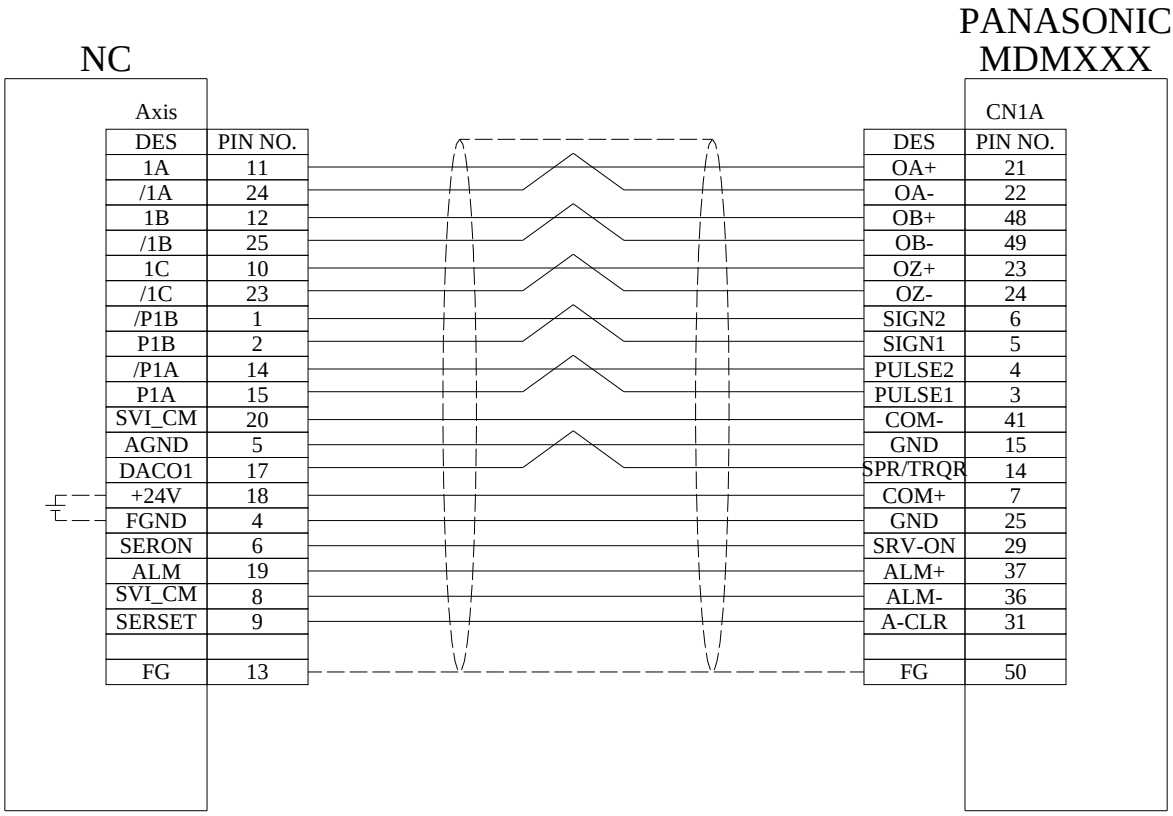
$$Pr\,44 \times Pr\,40 \times \frac{Pr\,46 \times 2^{Pr\,4A}}{Pr\,4B}$$

Pr40=4(default）
Pr44=2500(default）
Pr46=10000(default）
Pr4A=0(default）
Pr4B=10000(default）

Ex: if want resolution of motor up to 10000pulse/rev

$$2500\langle Pr\,44\rangle \times 4(Pr\,40) \times \frac{10000(Pr\,46) \times 2^{0(Pr\,4A)}}{10000(Pr\,4B)} = 10000\,pulse/rev$$

- **NC→PANASONIC Driver Wiring Figure**



DES	PIN NO.		DES	PIN NO.
1A	11		OA+	21
/1A	24		OA-	22
1B	12		OB+	48
/1B	25		OB-	49
1C	10		OZ+	23
/1C	23		OZ-	24
/P1B	1		SIGN2	6
P1B	2		SIGN1	5
/P1A	14		PULSE2	4
P1A	15		PULSE1	3
SVI_CM	20		COM-	41
AGND	5		GND	15
DACO1	17		SPR/TRQR	14
+24V	18		COM+	7
FGND	4		GND	25
SERON	6		SRV-ON	29
ALM	19		ALM+	37
SVI_CM	8		ALM-	36
SERSET	9		A-CLR	31
FG	13		FG	50

B3 Mitsubishi Servo Example

Mitsubishi Servo Motor Adjust Parameter

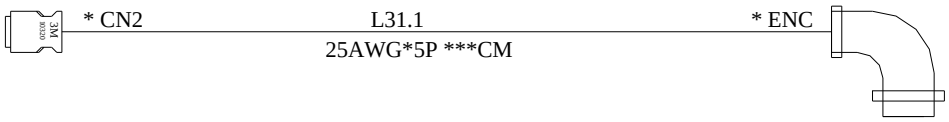
classification	Para. #	Symbol	Name and function	Default	Setting value	Unit	Control mode
Basic parameter	19	*BLK	Parameter write function setting:	0000	000E		P.S.T
	0	*STY	Control mode selection: 0：position control 2：speed control Please refer to 5-5	0000	0000		P.S.T
	2	ATU	Auto-tuning: Please refer to 5-6	0105	0405		P.S
	3	CMX	electronic gear ratio numerator	1	8192		P
	4	CDV	electronic gear ratio denominator	1	625		P
	21	*OP	Function 3（command pulse selection）	0000	0012		P
Extended parameter 1	25	VCM	Max. Feedback Speed of Analogy Speed： Setting Analogy Speed Command（VC）. Key-in the feedback speed of maximum voltage（10V）. The setting value is 0 as the constant rotational speed.	0	3000	Rpm/min	S.T
	27	*ENC	Checking Output PLUSE： Output PLUSE = Analogy Degree/REV of Servo Motor Please also refer to Section 5-15.	4000	10000	Pulse/rev	P.S.T
	29	VCO	Analogy Speed Command OFFSET： Setting Voltage OFFSET value of Analogy Speed Command（VC）.	According to servo driver		Millivolt	
	37	VG2	Speed Incremental 2 Adjusting effort is more obvious than that of Speed Incremental 1.	817	1000	Rad/s	

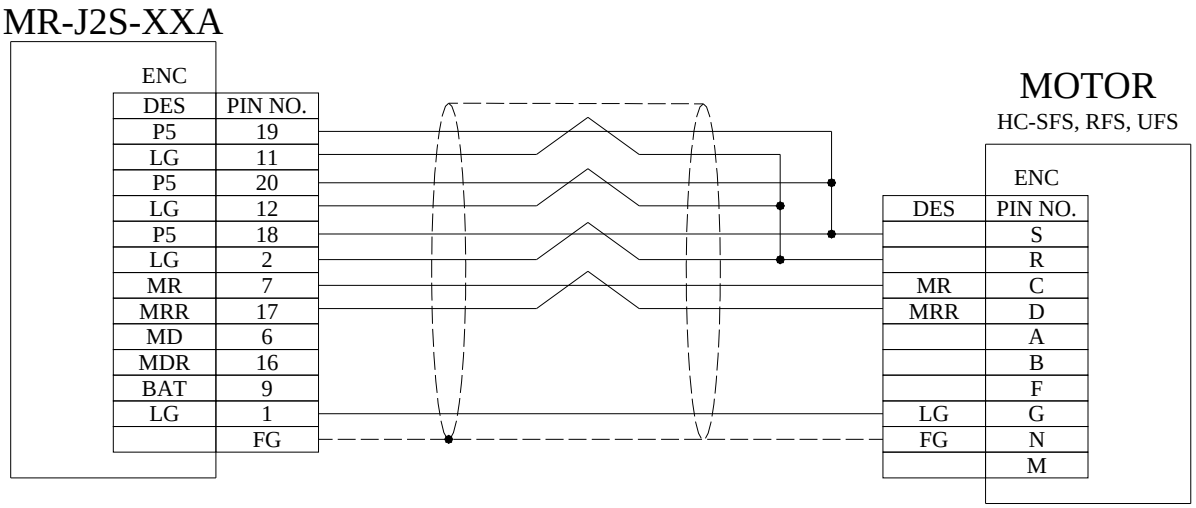
Mitsubishi electron gear ratio formula

Ex: Setting ENCODER output value（NO.27）to

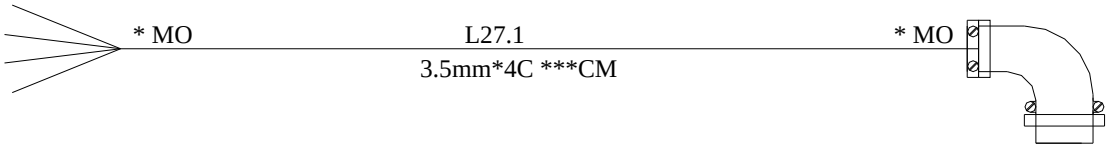
10000: $\frac{CMX\langle\text{Command pulse numerator}\rangle}{CDV\langle\text{Command pulse denominator}\rangle}=\frac{131072X4}{10000X4}=\xrightarrow{\text{Reduction}}\frac{8192}{625}=\frac{\text{parameter3}}{\text{parameter4}}$

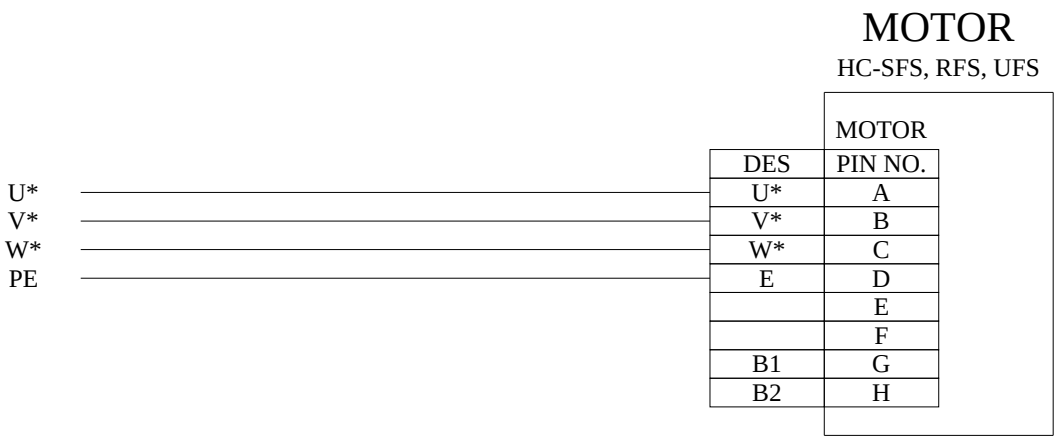
- **Mitsubishi ENCODER Wiring Diagram**



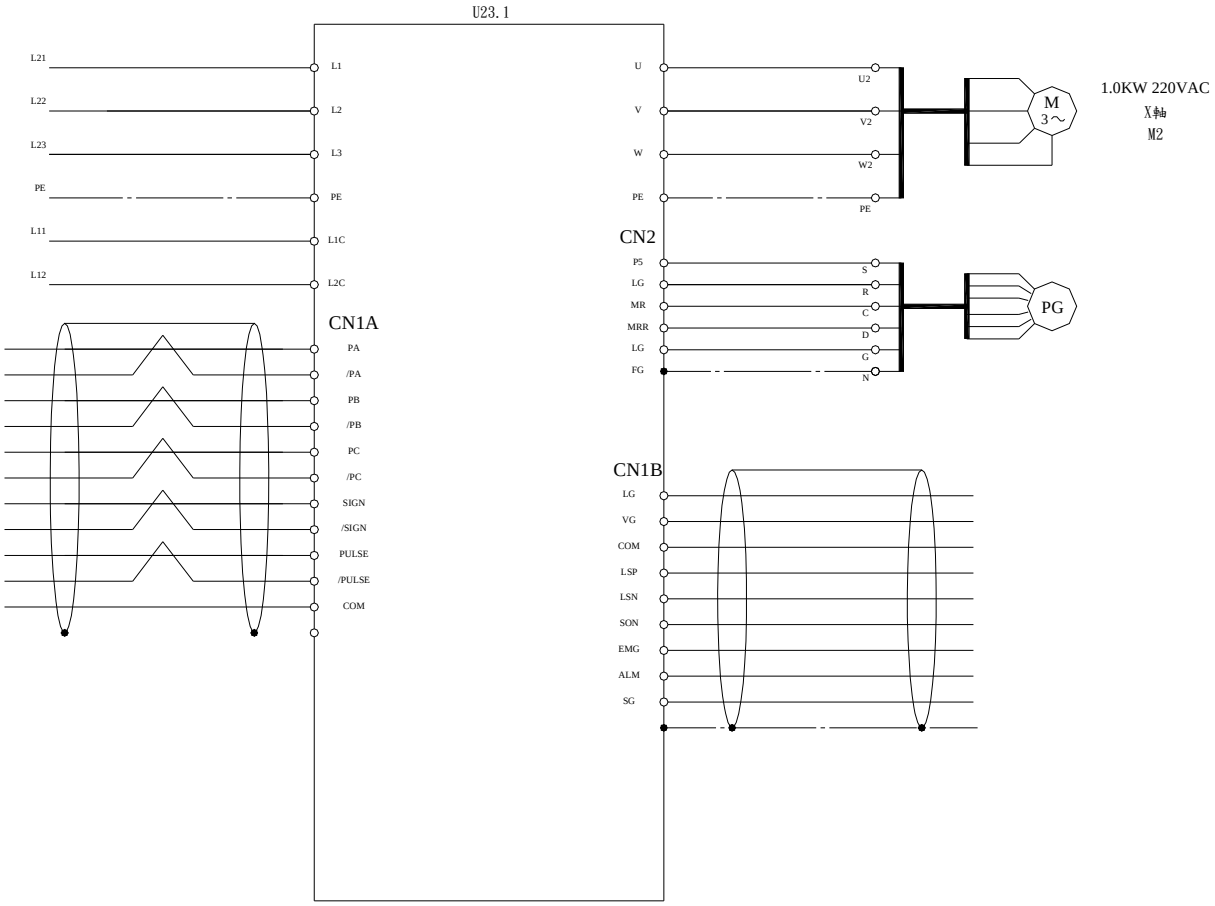


- **Mitsubishi Motor Power Wiring Figure**

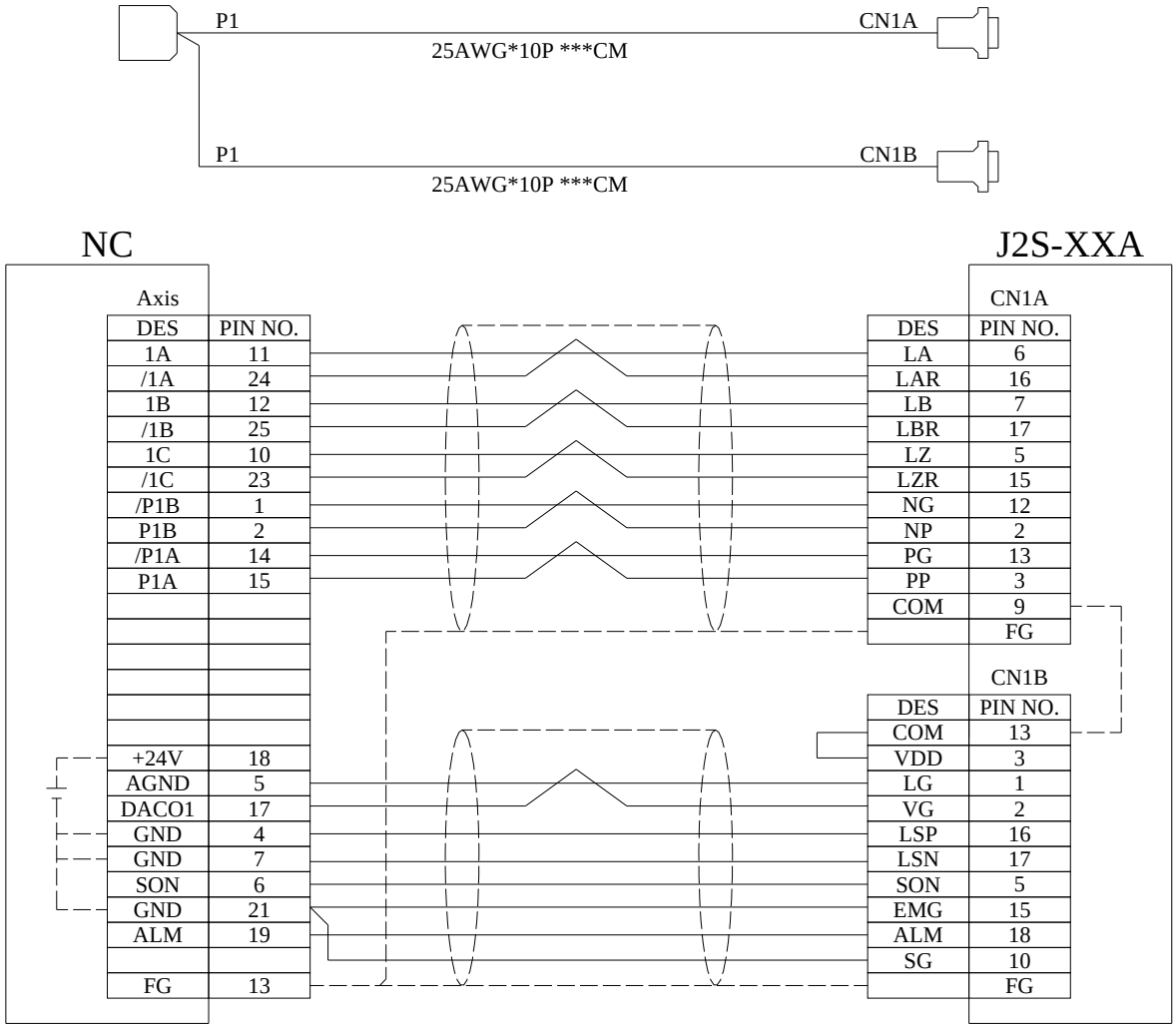




- **Mitsubishi System Wiring Figure**



- **NC→ Mitsubishi Driver Wiring Figure**



B4 TOSHIBA converter

Starting & AUTO – TUNING Steps:

Please Follow the below Parameter Adjustment Steps after Power ON:

1.Para. vL：Base frequency #1（25 ~ 400 ）

(Normal setting value is 60）.

2.Para. F306：Voltage of base frequency（output voltage adjustment）

(Normal setting value is 0 ~ 600V）.

3.Para.F411：Nμmber of poles of motor（2、4、6、8、10、12、14、16、18）

(Normal setting value is 4）.

4.Para.F412：Rated capacity of motor(0.1 ~ 280kw）

Setting value is according to Output ratio on motor brand.

5.Para.F413：Motor type（ 0 ~ 4）

(Normal setting value is 4）.

6.Executing auto-tuning.

Para.F400：To set auto-tuning selection as 2（auto-tuning enabled）

7.When auto-tunning is finish, inverter will auto-save the new parameter after testing.

Para.F401 ~ F410 auto-setting value.

8.Finish Steps 1~7 and doing CW/CCW testing.

Para.Fr（Forward/Reverse selection） 0：Forward 1：Reverse

（This parameter is effective on OP operation method. ）

9.To set Para.cnod（operation command mode selection）to 1.

When **AUTO –** TUNING is finish and basic motor parameter data is key-in, executing parameter adjustment immediately.

There are 24 basic parameters. F100 ~ F800 are extension parameters.

Bais Parameter Setting:

Parameter	Function	Setting Range	Setting Value
AU1	Automatic acceleration / deceleration	0：disabled（manual setting） 1：enabled（automatic setting）	0
This parameter controls ACC/DECELERATION Speed AU1=1： Auto acc/deceleration speed adjustment. But, user must set a constant value for the acceleration/deceleration parameter. This parameter will do 1/8 ~ 8 time auto-adjusting setting according to the acc/deceleration value. AU1=0：This function is disable which means that acc/deceleration is controlled by this parameter value. Figure 1 and Figure 2 are automatically time changing figure when overloading size changes. The below two figures show that this parameter can control the actual rotational speed in order to prevent any unusual sound.			

Acc/Deceleration Time when Small Overloading

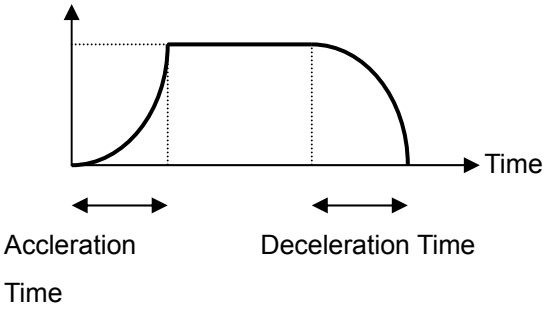


Figure 1

Acc/Deceleration Time when Large Overloading

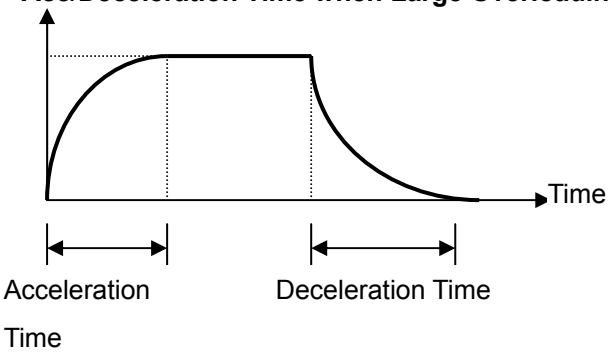


Figure 2

Parameter	Function	Setting Range	Setting Value
AU2	Automatic V/f mode setting	0：（0 is always displayed）	1
		1：Automatic torque boost + auto-tuning	
		2：Vector control（speed control） + auto-tuning	
		3：Automatic energy-saving + auto-tuning	

When this parameter is finished setting, number will all be zero on the screen. Please do NOT worry whether or not the setting is finish.

1：Automatic torque boost + auto-tuning

The load current is observed in all speed range and the inverter's output voltage is adjusted automatically so that the motor can always produce torque large enough for stable operation.

This parameter is finished setting, PE（motor control mode select） parameter will be set to 2 automtaically（automatic torque boost）. Also 400（auto tuning） parameter will be set to 2 automatically（automatic torque execution）.

2：Vector control（speed control）+ auto-tuning

The motor reach its full potential and produce large torque even at low speeds. Also, you can minimize motor speed fluctuations caused by load fluctuations for more accurate operation.

This mode of control is best suited to conveyor and crane/hoist application as operated in speed control mode

This parameter is finished setting, PE（motor control mode select）parameter will be set to 3 automatically（vector control）Also 400（auto tuning） parameter will be set to 2 automatically（automatic torque execution）.

3：Automatic energy-saving + auto-tuning

The inverter passes a current commensurate with the load to save energy.

This parameter is finished setting, PE（motor control mode select）parameter will be set to 5 automatically（vector control）. Also 400（auto tuning） parameter will be set to 2 automatically（automatic torque execution）.

The correspoindng parameter value after AU1 is set.

AU2		Parameters set automatically		
		PE		F400
0	0 is always display	--	----------	---------
1	Automatic torque boost + auto-tuning	2	Automatic torque boost	Executed 2 first（returns to 0 after execution）
2	Vector control（speed） + auto-tuning	3	Sensor-less vector control (speed control）	Executed 2 first（returns to 0 after execution）
3	Automatic energy-saving + auto-tuning	5	Automatic energy-saving + sensor-less auto-tuning	Executed 2 first（returns to 0 after execution）

3

Parameter	Function	Setting Range	Setting
CNOD	Operation command mode selection	0:Terminal input enable	0
		1:Operating panel input enabled	
		2:Communication common serial option enabled	
		3:Communication RS485 option enabled	
		4:Communic add-on option enabled	

0:Terminal input enable Start and stop is exercised by means of external signals. 1:Operating panel input enabled Start and stop is exercised by pressing the RUN or STOP key on the control panel. 2:Communication common serial option enabled Start and stop is exercised from RS232C device fitted as standard. 3:Communication RS485 option enabled Start and stop is exercised from RS485 communication device fitted as standard. 4:Communic add-on option enabled Start and stop is exercised from add-on module communication option.

Parameter	Function	Setting Range	Setting
FNOD	Speed setting mode selection	1:VI（ voltage input ） / II（ current input ） VI：0 to 10Vdc II:4 to 20mAdc 2:RR（ Potentiometer / voltage input ） RR：0 to 10Vdc 3:RX（ voltage input ） RX：0 to +/－10Vdc 4:RX2（ voltage input ） RX2：0 to +/－10Vdc 5:Operating panel input enabled Frequencies are set by pressing the control panel key. 6:Binary / BCD input speed command are entered from 12/16 bit binary input or BCD 7:Communication common serial option（RS232C） 8:Standard communication RS485 9:Communication add-on module option enabled speed command are entered from network communication 10:Up-down frequency by means of up-down frequency signals from the terminal 11:Pulse input	2

Parameter	Function	Setting Range	Setting Value
FNSL	FM Terminal meter selection	0 ~ 31	0
FN	FM Terminal meter adjustment	-----	---
This parameter is not used this time. So, please ignore it.			

Parameter	Function	Setting Range	Setting Value
typ	Standard setting mode selection	1:50Hz standard setting 2:60Hz standard setting 3:Factory default setting 4:Trip history clear 5:Comulative operation time clear 6:Type information clear 7:User setting storage 8:Reset to saved parameters (7）	

Parameter	Function	Setting Range	Setting Value
Fr	Forward / reverse run selection	0：Forward run 1：Reverse run	0
This parameter is effective when CNOD is 1. In hardware wiring of F-CC: Forward running. R-CC Wiring: Reverse running. Please also refer to parameter F105.			

Parameter	Function	Setting Range	Setting Value
ACC	Acceleration time 1	0.1（Note） ~ 6000 seconds	Recommending Value = 15
DEC	Deceleration time 1	0.1（Note） ~ 6000 seconds	Recommending Value = 15
（Note） If the setting time is very small, it can be set by Para. F508. The range is 0.01 ~ 10 sec. The ACC time is the frequency value of Output Speed Commanding, which is the time of frequency from 0 adding up to FH setting value. The DEC time is the frequency value of Output Speed Commanding, which is the time of frequency from FH decreasing down to 0 setting value. If two parameters are to set AU1 as 0, then it is manual adjustment parameter. Please refer to Figure 3 as a constant acceleration/deceleration frequency changes example.			

Acc/Deceleration are Constant No Matter Any Change

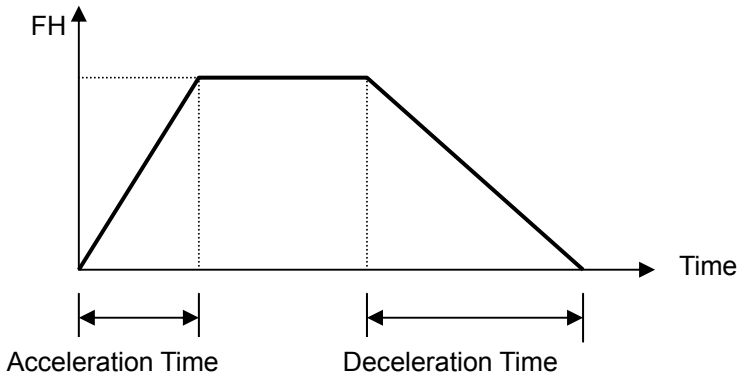


Figure 三

FH	Maximμm frequency	30 ~400 Hz	333
Max. outuput frequency to control acc/deceleration time condition.			

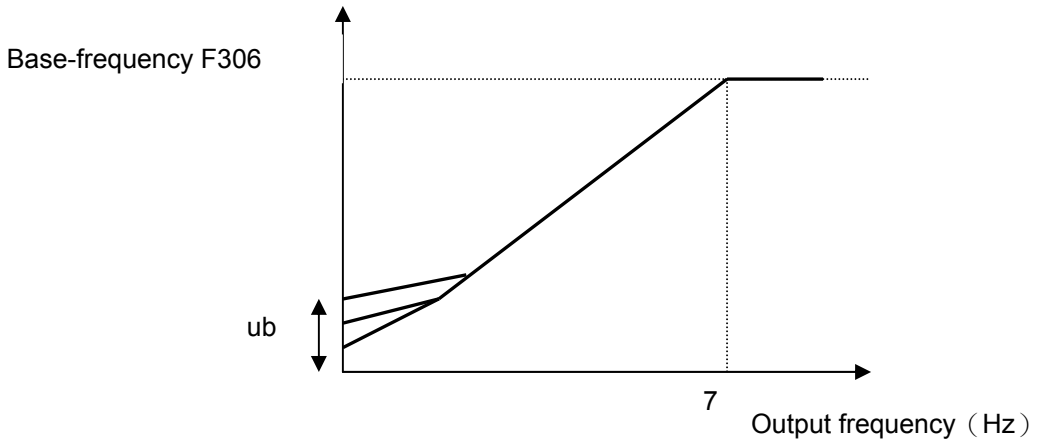
Parameter	Function	Setting Range	Setting Value
UL	Upper limit frequency	LL ~ FH	333

Parameter	Function	Setting Range	Setting Value
LL	Lower limit frequency	0 ~ UL	3

Parameter	Function	Setting Range	Setting Value
uL	Base frequency	25 ~ 400	60
uL parameter is used in constant torque control area. Please refer to parameter F306 (Base frequency voltage）.			

Parameter	Function	Setting Range	Setting Value
Pt	Motor control mode selection	0: Constant torque characteristic(motor control） 1: Square reduction torque characteristic (motor and so on.） 2: Automatic torque boost (V/F control automatically）. Must used as AU2 = 2 and F400 = 1. 3: Sensor-less vector control. Must used as AU2 = 4 and F400 = 2. 4: Automtic torque boost + automatic energy-saving Must used as AU2 = 4 and F400 = 2. 5: Sensor-less vector control + automatic energy-saving. Must used as AU2 = 4 and F400 = 2. 6:V-f 5-point setting 7: Sensorless vector control（torque/speed switching） 8: PG feedback vector control（torque/speed switching） 9: PG feedback vector control（torque/position switching）	9

Parameter	Function	Setting Range	Setting Value
ub	Manual torque boost 1	0 ~ 30%	Depends on capacity
When torque produced in low speed range is not large enough, it can be boosted up by increasing the torque boost rate with this parameter This parameter can be used with: PE=0（V/f constant） PE=1（square reduction） PE=6（V/f 5-point setting） （Note）This value must not be too high. Everytime's incremental can not be over2% of setting value, or over current will occur.			



Parameter	Function	Setting Range				Note
OLN	O	Electronic thermal protective characteristic selection				N/A
		Set Value		Overload protection	Overload stall	
		0	Standard motor	O	×	
		1		O	O	
		2		×	×	
		3		×	O	
		4	VF motor (special motor)	O	×	
		5		O	O	
		6		×	×	
		7		×	O	

Parameter	Function	Setting Range	Setting Value
Sr1 ~Sr7	Preset-speed operation frequencies	0 ~ 30%	Depends on capacity

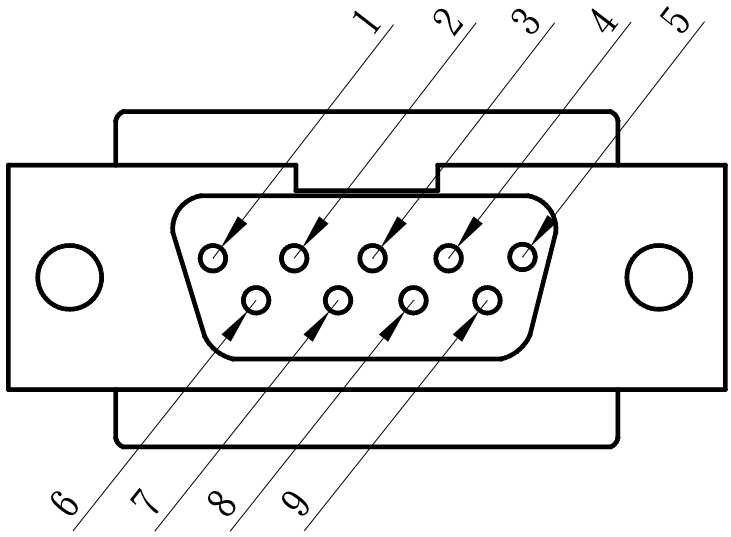
This parameter can set 15 kinds of default speed. The first seven sections are set in S1 ~ S7 and the last eight sections are set in F287~F294. The requirements, such as acc/deceleration, direction and so on) can be modified in F380 ~ F394. Also, when doing multiple-speed testing, CNOD and FNOD must be modified in order for this function to be effective. Please refer E28 ~E30 for a detailed description.
Please notice that this value is a frequency multiplier value, not actual rotational speed.

	Preset-speed															Note
Terminal	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
S1 - CC	O	--	O	--	O	--	O	--	O	--	O	--	O	--	O	
S2 - CC	--	O	O	--	--	O	O	--	--	O	O	--	--	O	O	
S3 - CC	--	--	--	O	O	O	O	--	--	--	--	O	O	O	O	
S4 - CC	--	--	--	--	--	--	--	O	O	O	O	O	O	O	O	

Appendix C RS232 Connection Description

For remote transmittion connector standard, it means the remote transmittion connector and the external setting signal connection standard. RS-232C is the very easy transmittion standard. If not using hard-part flow control, only needs 3 signal cables in order to accomplish the double transmittion jobs.

The electronic feature of RS232 belongs to the in-balance transmittion method. So the transmittion distance is a little bit short, approximate 15m, due to the anti-interference function is weak. According to the RS-232C standard, connector circuit must be the physical D type connector. D type connector has 25 cords (short name is DB25). But, it can be 9 cords (short name is DB9). Most of PC use DB9, like the diagram show below:



PIN	Abb.	Meaning
Pin1	CD	Carrier Detect
Pin2	RXD	Receive
Pin3	TXD	Transmit
Pin4	DTR	Data Terminal Ready
Pin5	GND	Ground
Pin6	DSR	Data Set Ready
Pin7	RTS	Request To Send
Pin8	CTS	Clear To Send
Pin9	RI	Ring Indicator

Transmitting Cable Production

There are two types of Pin for a normal type remote port. One is 9 Pin and the other one is 25 Pin. Usually the NC side has 9Pin male port. But, the PC side has either 9Pin or 25Pin. male port.

The method to connect NC and PC is to do the transmitting via jumper cable. If users equipment is 9Pin, then please use the 9Pin connector. Actually, 9Pin is very useful for other controller system application. Sometimes, 3Pin can have the same control function. So the simplest 3Pin is to use the 2nd, the 3rd and the 5th pins to receive and transmit：

NC COM1（9pin JACK） to PC COM1（9pin JACK）	NC PC ---------- pin2（RD） --- pin3（TD） pin3（TD） --- pin2（RD） pin5（SG） --- pin5（SG）
NC COM1（9pin JACK） to PC COM2（25pin JACK）	NC PC ---------- pin2（RD） --- pin3（TD） pin3（TD） --- pin2（RD） pin5（SG） --- pin7（SG）

Appendix D Internet Setting Description

Network Connection Settings for the Controller

This controller can obtain the resource of a remote disk in Microsoft Network by “Internet Connection Sharing.” Below are the steps to be made at the controller side & PC side, respectively, to install and to make relative settings to enable network connection sharing function.

1. At the controller side:
2. Install network software at the controller side. To install, boot the system with an OS floppy disk and select the installation option 3 “INSTALL NETWORK UTILITIES.” (This step can be skipped if there is already a NET directory in the path of “C:\NET.”)
3. Modify network configuration of the controller. There are two ways to make the modifications:

   Method 1： by DOS or by the operating interface of LNC software.

   I. Modify the file “C：\config.sys” of the controller

      Modify

      REM device=C：\NET\ifshlp.sys

      Into

      device=C：\NET\ifshlp.sys

   II. Edit “C:\Net\2net.bat.” Modify this line according to your needs:

      C：\NET\net△use△N：△\\PCNET\share△12345△YES

      Below are the definitions for each field in the line.

      A. △represents a blank character.
      B. PCNET” is the computer name in the Network, and “share” is the folder name shared by the computer.
      C. ”N” is the (virtual) disk of N: which is mapping to the sharing resource “\\PCNET\ share“ in the network. (Please do not use “D:” which is used for different purposes; using “D:” will cause errors.)
      D. “12345” indicates the password to log on PC. Passwords may or may not be required.

      for different operating systems.

      - Window98：For this system, instead of adding a new account, users can connect some network disk by sharing a folder with each other. Therefore, users must log on with the same password as set by PC for “folder-sharing” function.
      - Window2000 與 WindowXP：The two systems have higher security levels for access permissions, so users of different identifications are required to enter different passwords as set by PC. If no password is set at PC side, network connection would fail unless PC permission is open for guest access (the setup of guest access is

described in the later chapter).

E. For OS versions Ver.2.5 or versions earlier than Ver.2.5, some disk codes that are no longer applicable can still be shown. If this occurs when the controller is on-line, add the line C:\NET\net stop /yes before the line C:\NET\ net initialize.

III. Verify if the settings are correct for the controller's file C：\NET\SYSTEM.INI and also for other relative settings in Network Neighborhood. Some programs might need to be modified as below (Please DO NOT change the settings that are not mentioned here)：

[network]

：

computername=LNCDOS

：

username=LNCDOS

：

workgroup=WORKGROUP

：

logondomain=WORKGROUP

：

”computername=” is the controller name in the Network. Each controller should have its own unique name that is different from other disks in the Network. The default computer name is LNCDOS. Therefore, if there is more than one controller in a domain, this default name must be modified.

”username=” is the controller name to log on PC. Except for Window98, all other operating systems require PC side to add a new user with the same name at the same time unless access permission is open to guests. The default user name is LNCDOS. Since a user can use the same name to log on repeatedly, there is no need to modify this name even if there is more than one controller in a domain.

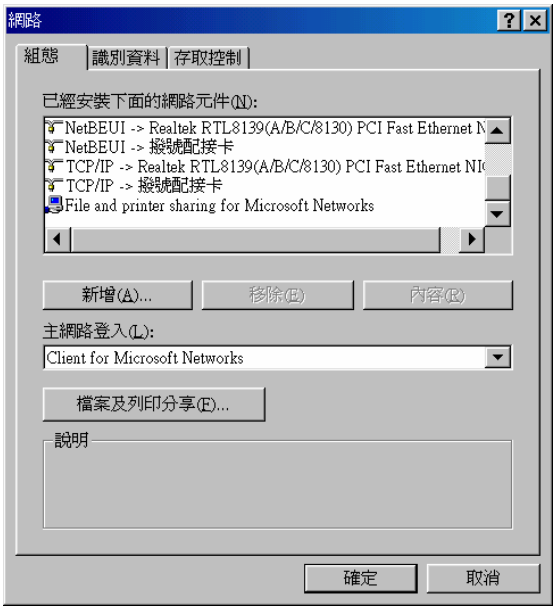
”workgroup=” is the work group name of the controller when logging on the internet. Please set this value according to the Network which the controller belongs to. By default, it is set as “WORKGROUP.”

”logondomain=” is the domain name of the controller when logging on the internet. Please set this value according to the domain that the controller belongs to. The setting method is basically the same as that of “WORKGROUP.”

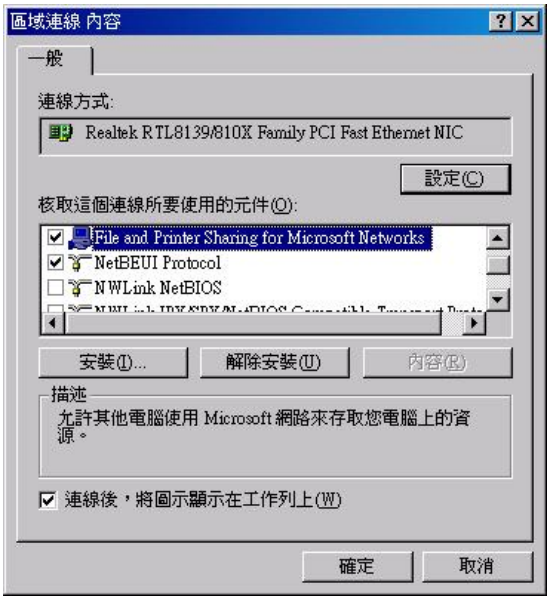
- **The system setting steps for Internet**

1.Make sure the Internet card, cables, relating protocol are ready for set up. Make sure [NetBEUIcommunication protocol] is in the Internet setting status and [File and printer sharing for Microsoft Networks] serice also.

□ WINDOWS 98 page steps：[start].[setting].[control platform].[Internet]as below



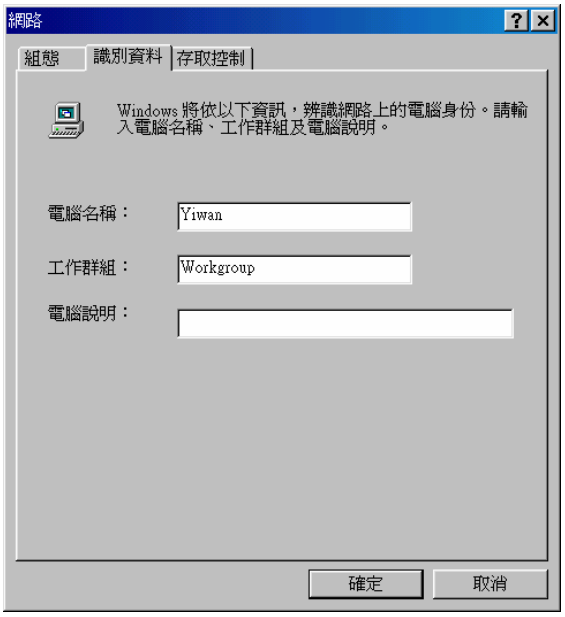
□ WINDOWS NT page process：[start].[setting].[control platform].[Internet and dial up].[local Internet].<contents> as below



Note：As above Figure, Nwlink NetBIOS can't be used, otherwise the connection will fail.

2.Check the Internet [Identity] setting page's [Computer name] and [Working group] is correct. Here welist this computer as Yiwan, group is Workgroup （C：In the \net\system.ini workgroup and log on domain should be the same with here. C: the system name and computer name should be the same under \net\2net.bat）

□ WINDOWS 98 page process：[start].[setting].[control platform].[Internet] as below

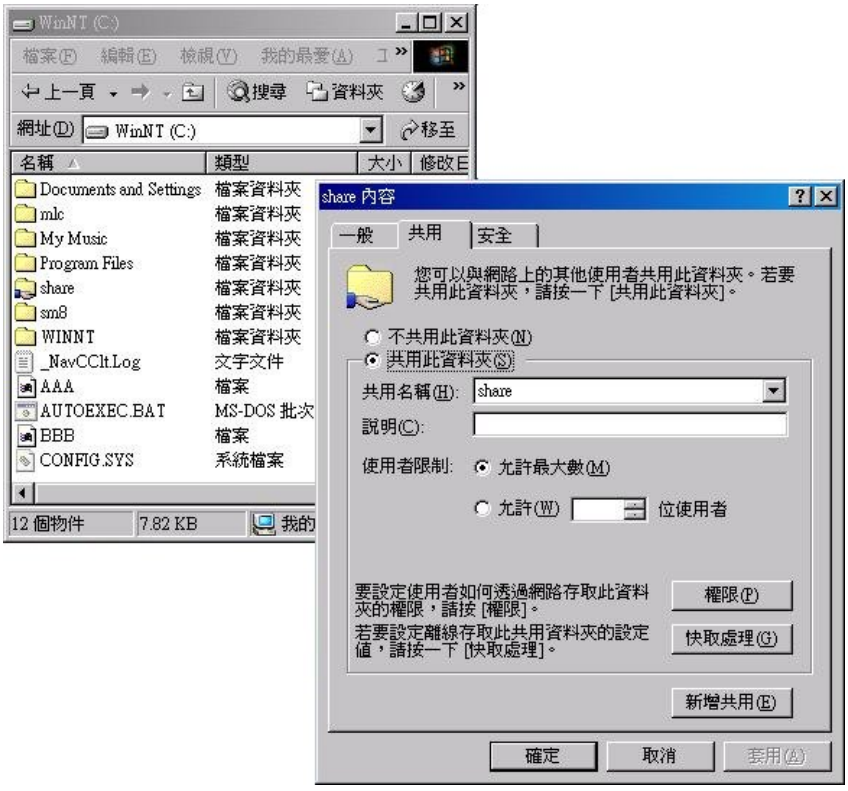


□ WINDOWS NT page process：[start].[setting].[control platform]. <content>（Internet Indentity）<content>

3.After sharing one category in the system, confirm the setting of [share file name] is the same. At here, the name is YIWANST.

□ WINDOWS 98 page process： [File management].[Directory].[Share] as below

□ WINDOWS NT page process： [File management].[Directory].[Share] as below

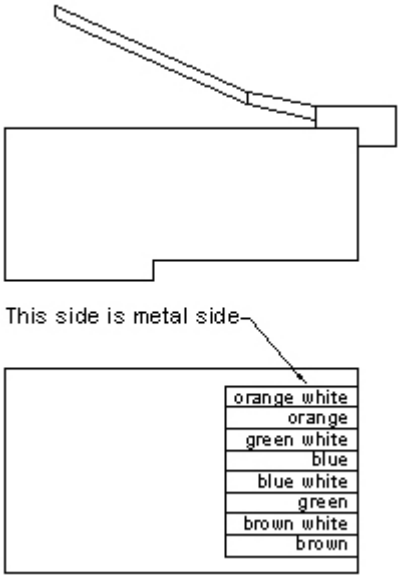


- **Internet cable making**

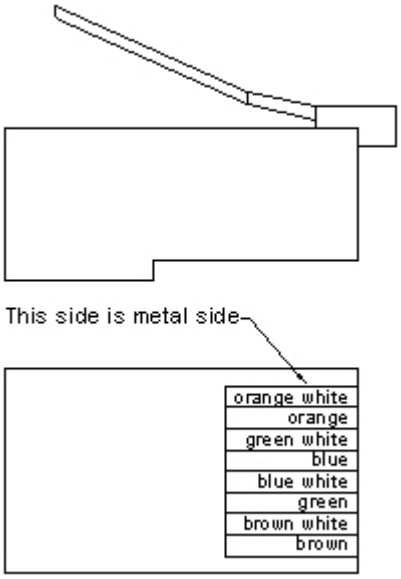
Use HUB to connect with controller：

Ethernet connection

PC side



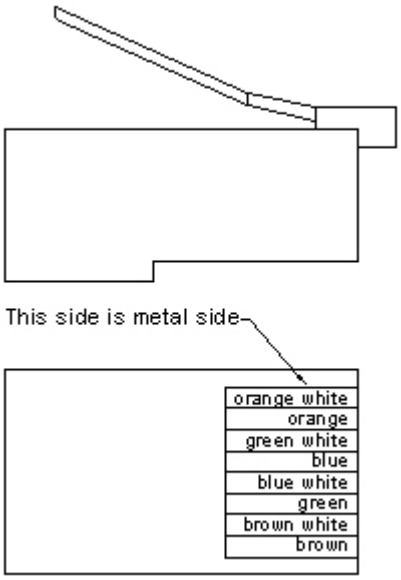
Controller side



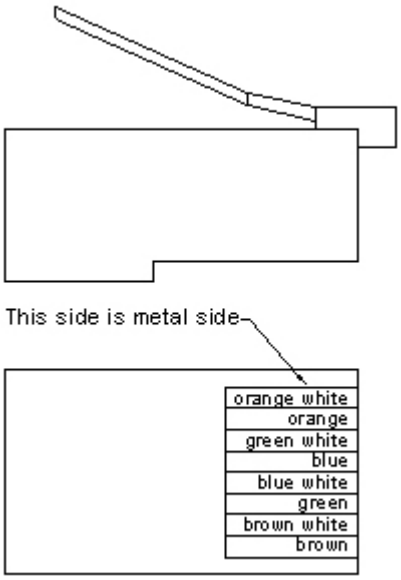
Use PC to connect with controller：

One to one type connection

PC side



Controller side



- **The way to prevent sudden shut-down while idling**

While using internet disk or internet computer to share files, some users will have sudden shut-down problem while idling, the reasons can be as below：

a. At the OS：If user use Windows 2000 or Windows XP, then the system's setting will shut down idling interent connection (which has no saving actions) within 15 minutes. Therefore sometimes users may face the problem that controller can not connect to PC side.

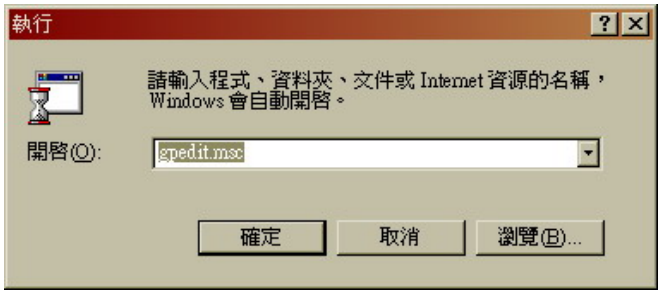
b. Internet card：PC side will shut down automatically the internet card power(which has no saving actions). This kind of situations will happen on Notebook.

Below is the setting way of anti-auto shut down connection.

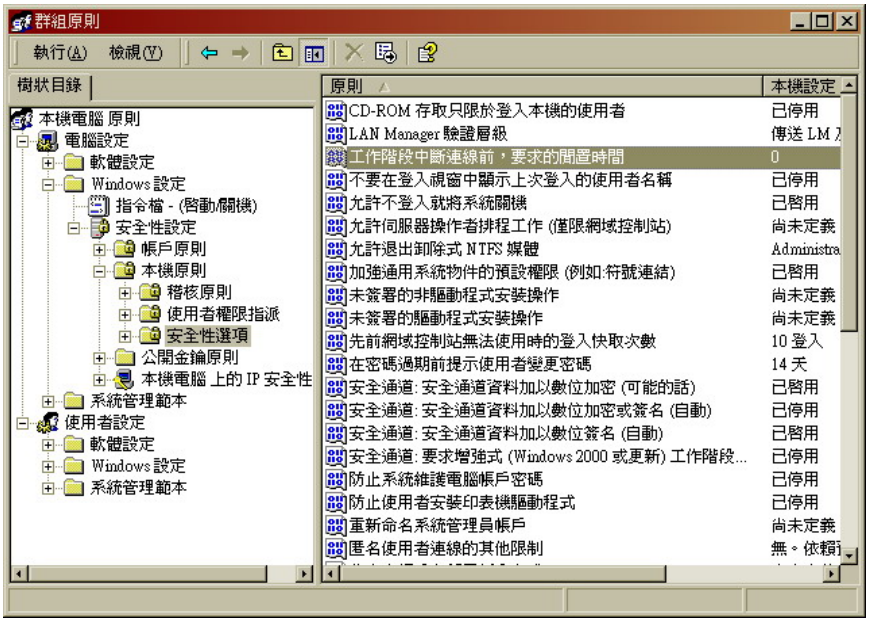
a. OS：

- Windows 2000 system：

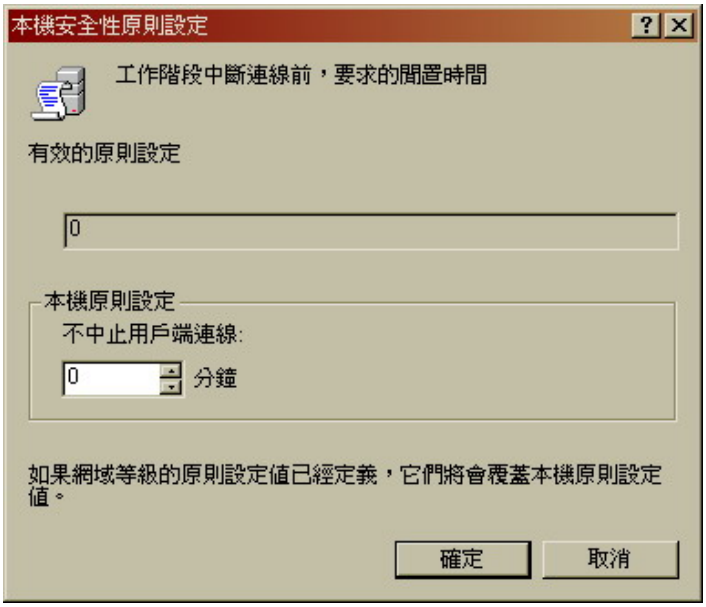
1. [Start]->[execute], input Gpedit.msc to open【group principles】setting.



2. Set「computer setting\Windows setting\safety setting\machine principle\safety selections」-「Microsoft internet server：before stoping working, the demanding delay time」

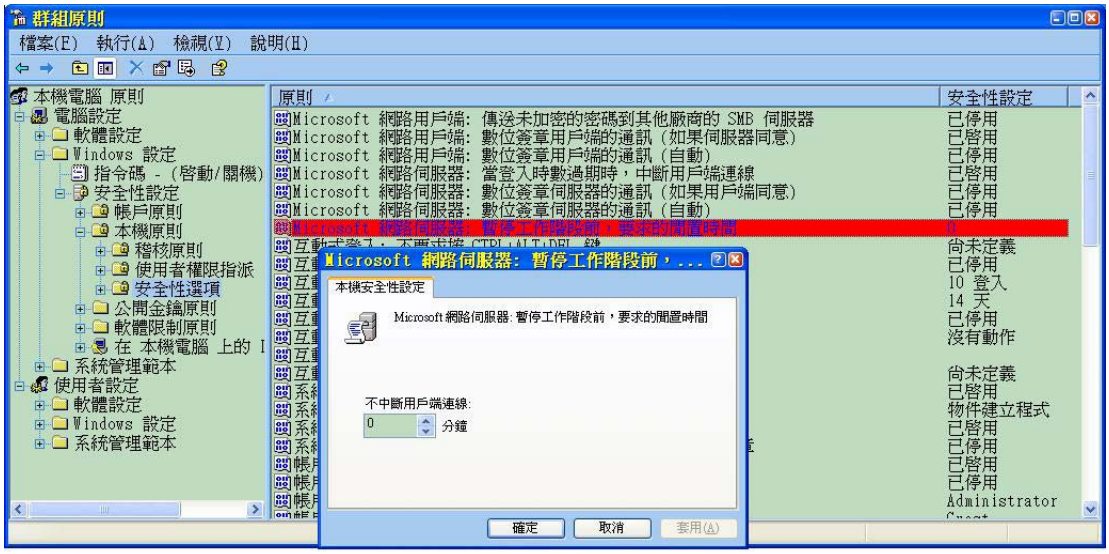


3. Click twice to show dialog, and input 0, means you will not stop user side connection. Re-boot to let the setting valid. As below figure.



■ Windows XP system：

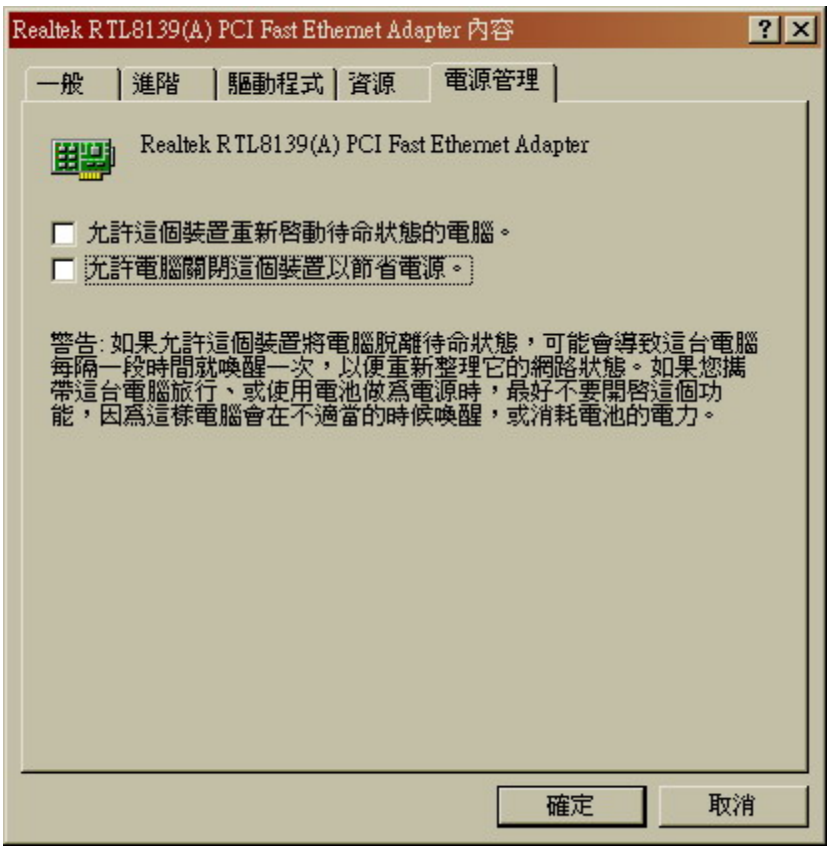
1. [Start]->[execute], input Gpedit.msc to open【group principles】setting.
2. Set「computer setting\Windows setting\safety setting\machine principle\safety selections」-「Microsoft internet server：before stoping working, the demanding delay time」
3. Click twice to show dialog, and input 0, means you will not stop user side connection. Re-boot to let the setting valid. As below figure.



b. Internet card：

■ Windows 2000 system：

1. 「Internet 」->Click right button「content」->「local connection」->click right button「content」->「connection method」>「setting」button->「power management」page, cancel this button「allow computer to close this device to save energy」As below figure：

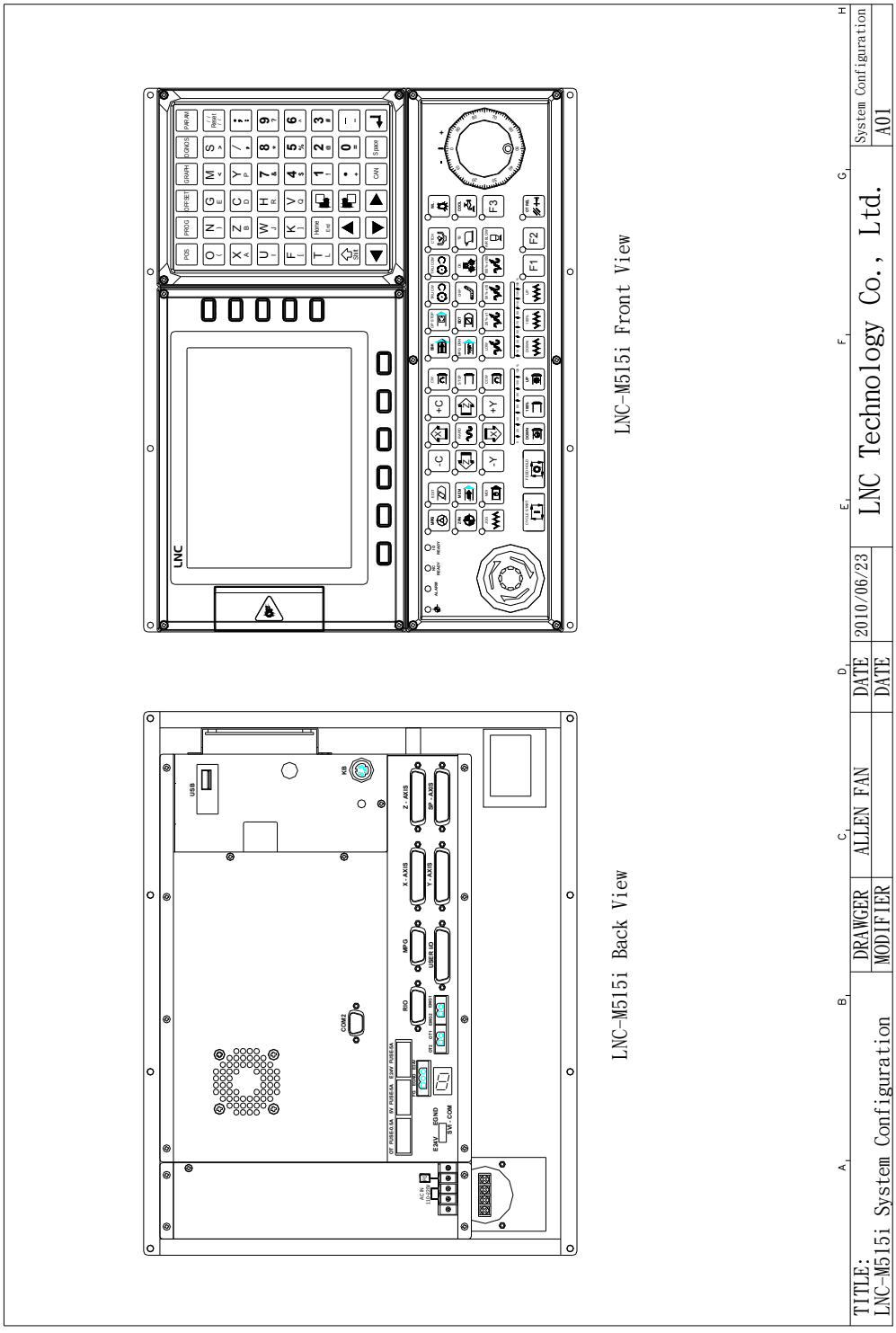


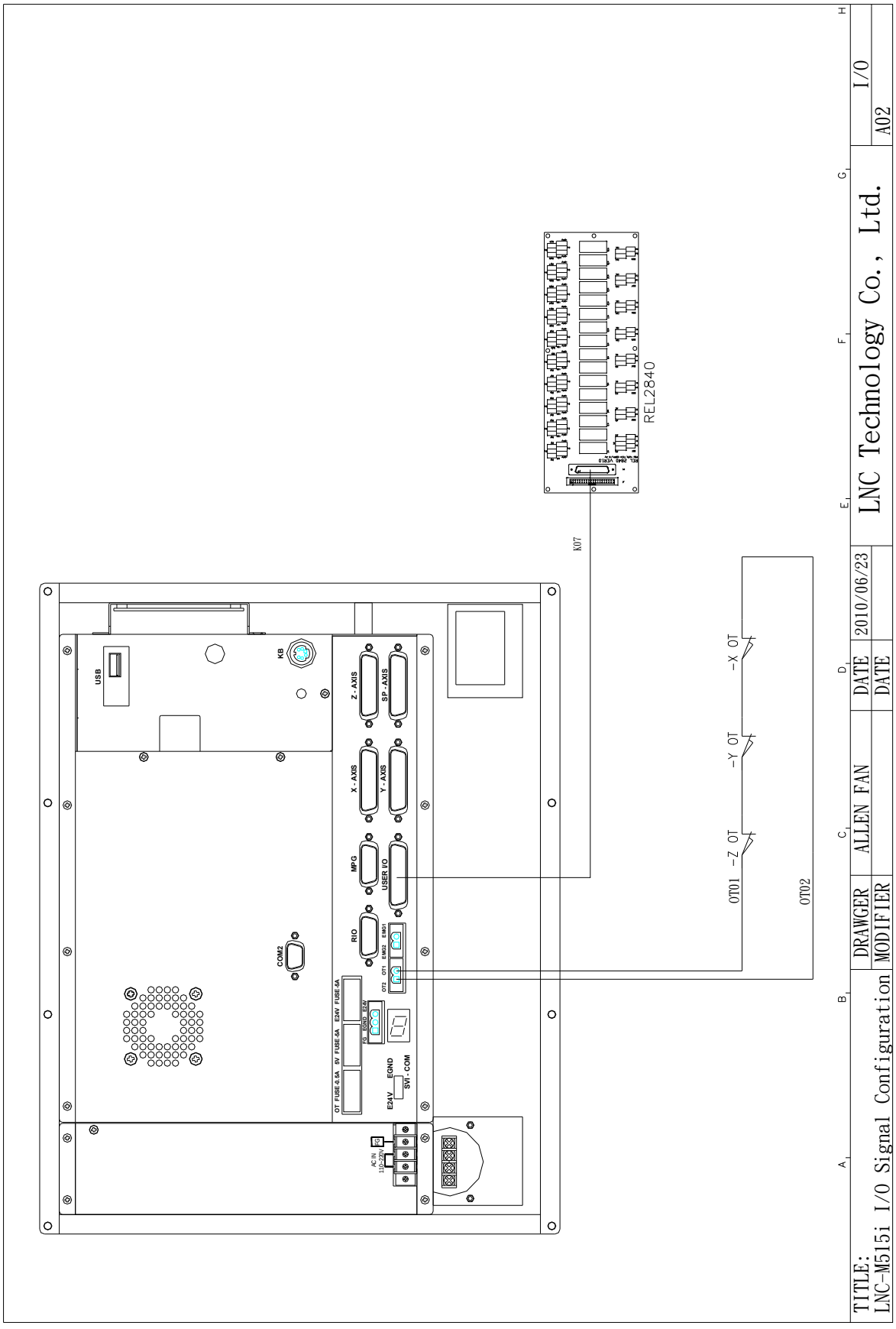
- Windows XP system：

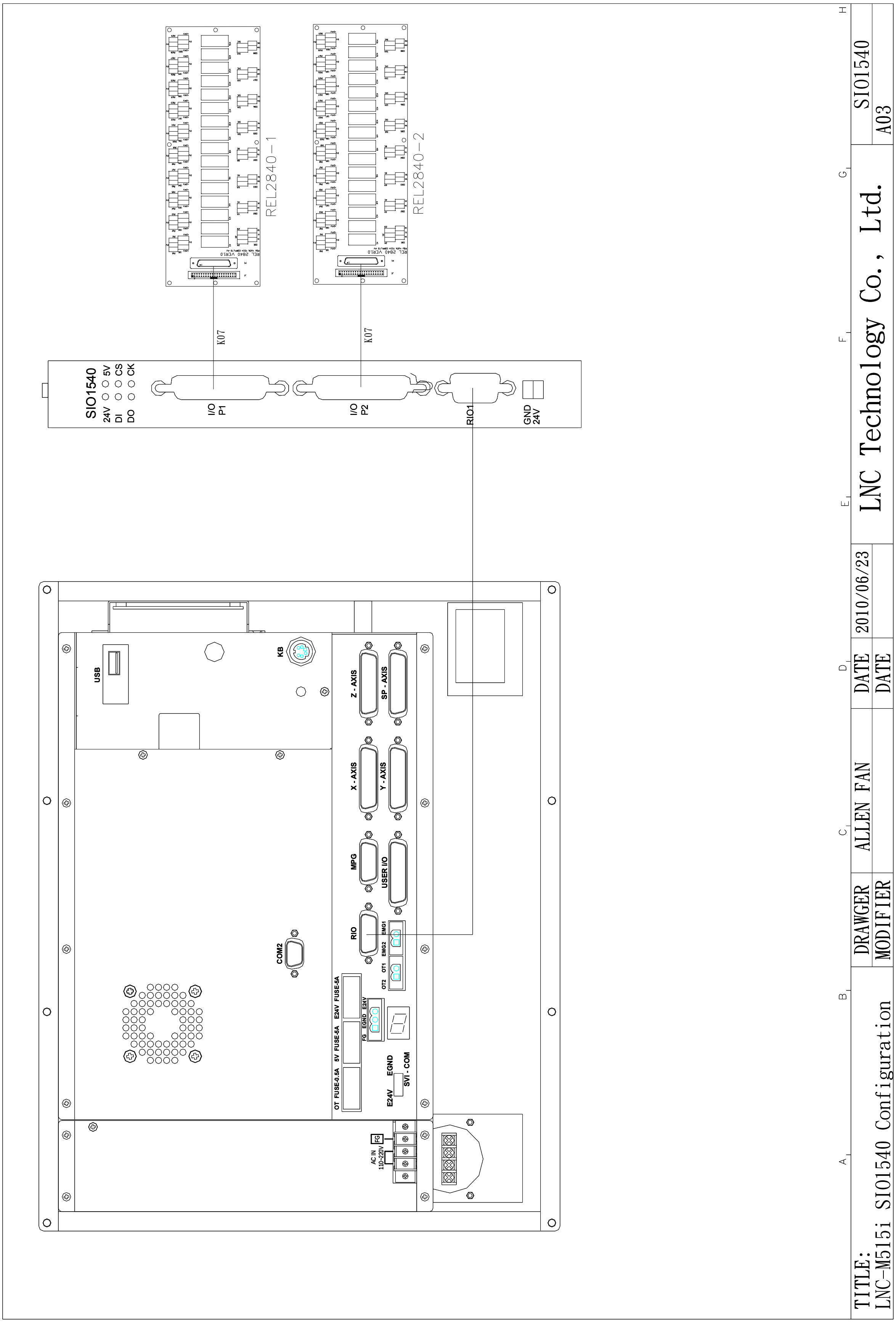
1. 「Internet 」->Click right button「content」->「local connection」->click right button「content」->「connection method」>「setting」button->「power management」page, cancel this button「allow computer to close this device to save energy」As below figure：

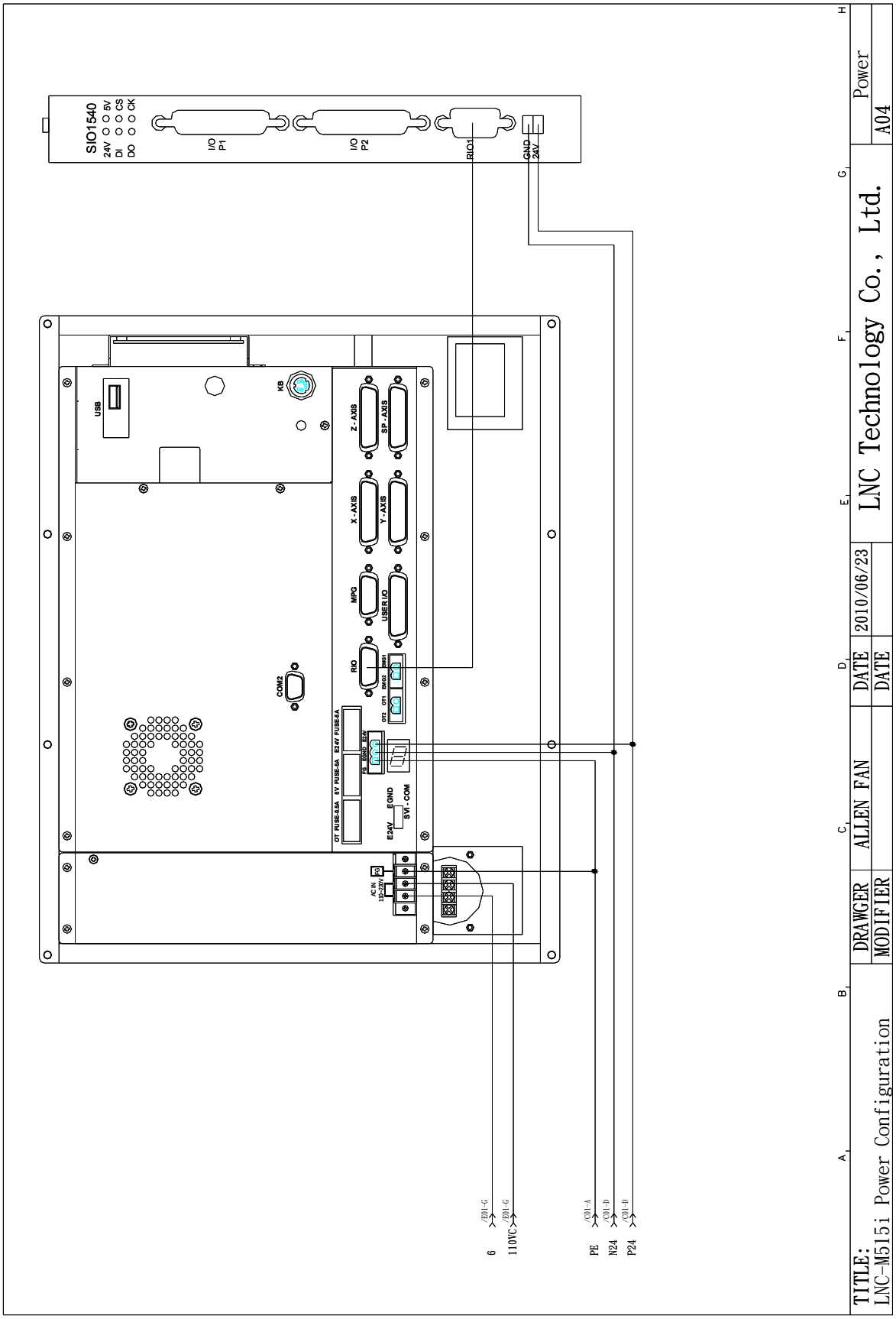
Appendix E WIRING DIAGRAM

A-Sytem Configuration

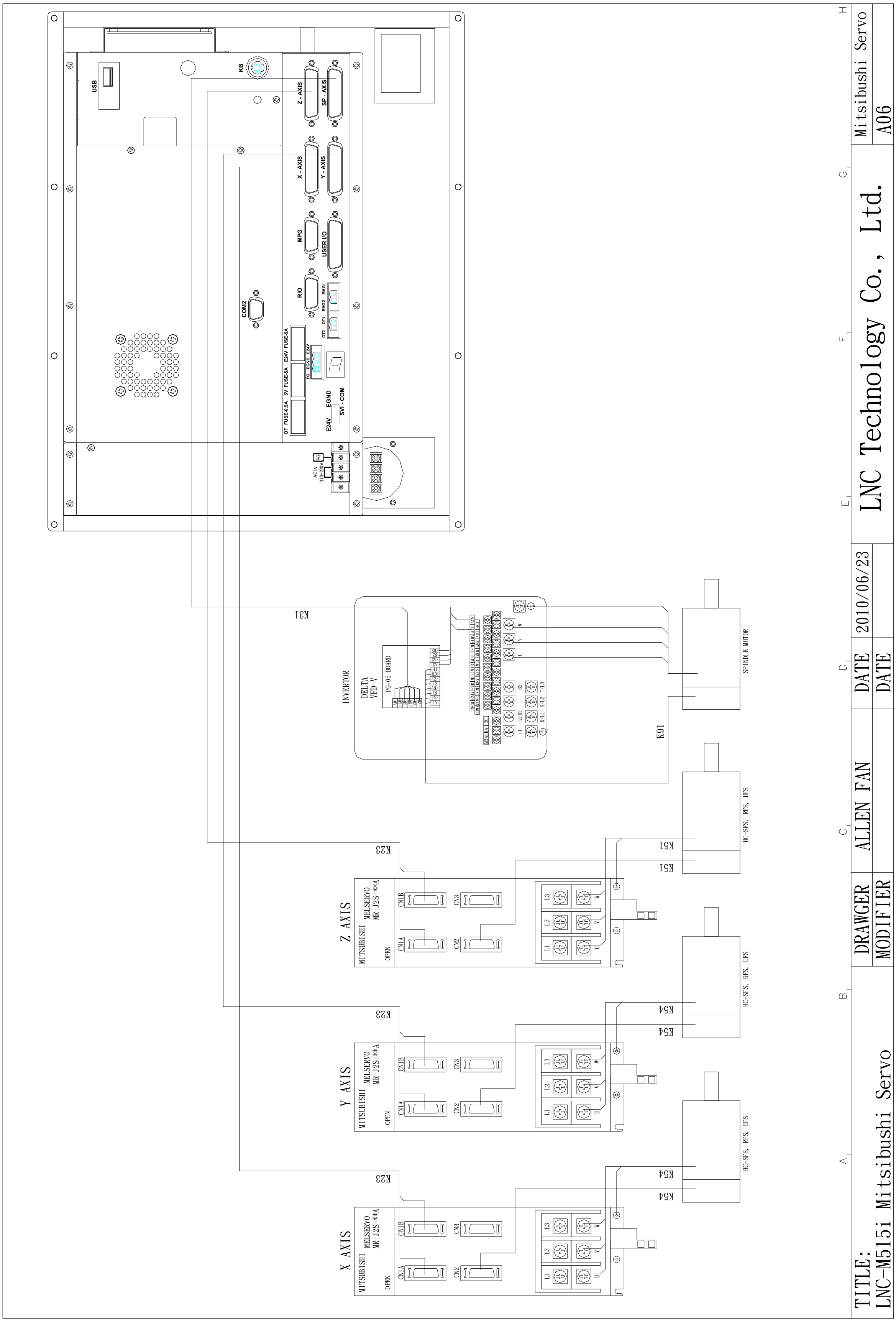


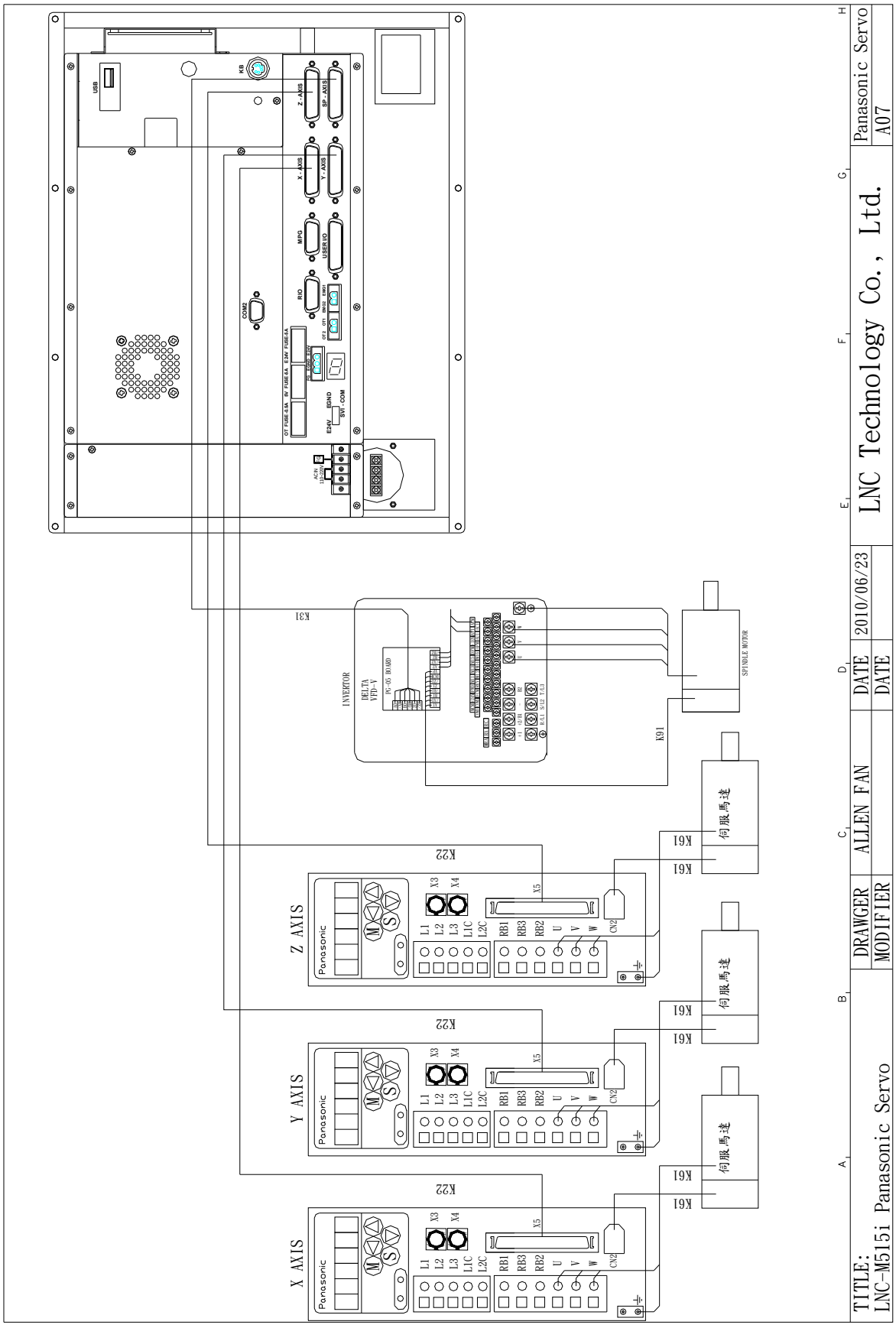

LNC Technology Co., Ltd.
TITLE:
LNC-M515i I/O Signal Configuration
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
I/O
A02
REL2840
K07
OT01
OT02
-Z OT
-Y OT
-X OT
USB
KB
COM2
Z - AXIS
SP - AXIS
X - AXIS
Y - AXIS
MPG
USER I/O
RIO
E24V
EGND
5V1 COM
AC IN

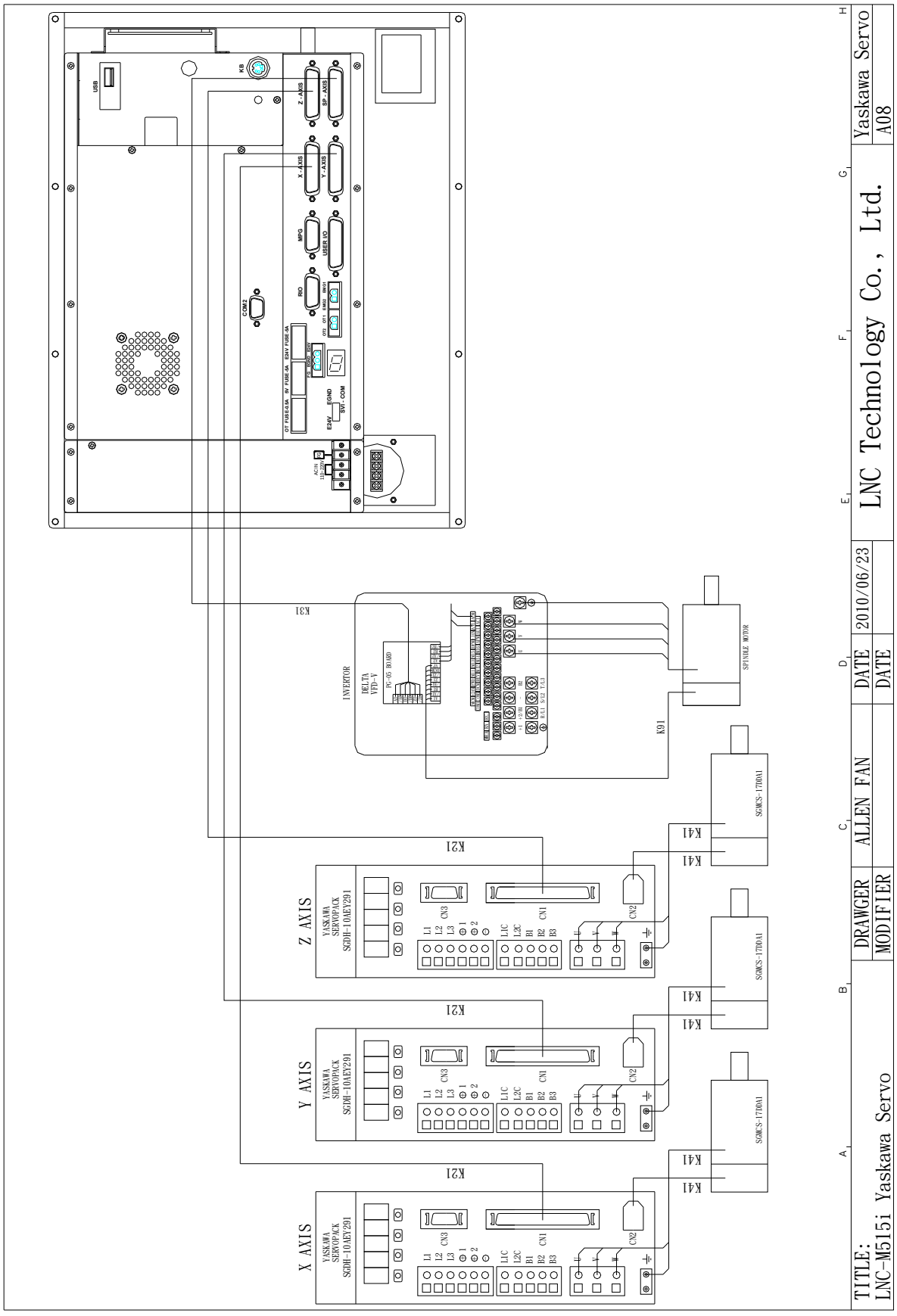

REL2840-1
REL2840-2
K07
K07
SIO1540
24V
DI
DO
5V
CS
CK
I/O P1
I/O P2
RIO1
GND 24V
USB
KB
Z - AXIS
SP - AXIS
X - AXIS
Y - AXIS
MPG
USER I/O
RIO
EMG1
EMG2
OT1
OT2
COM2
FG EGND E24V
OT FUSE-0.5A
5V FUSE-5A
E24V FUSE-5A
E24V
EGND
SVI - COM
AC IN 110~220V
TITLE:
LNC-M515i SIO1540 Configuration
DRAWGER
ALLEN FAN
MODIFIER
DATE
2010/06/23
DATE
LNC Technology Co., Ltd.
SIO1540
A03


SIO1540
24V
DI
DO
5V
CS
CK
I/O P1
I/O P2
RIO1
GND 24V
USB
KB
Z-AXIS
SP-AXIS
X-AXIS
Y-AXIS
MPG
USER I/O
RIO
COM2
OT FUSE-0.5A
5V FUSE-5A
E24V FUSE-5A
E24V
EGND
5V/.COM
AC IN 110-220V
6
110VAC
PE
N24
P24
TITLE:
LNC-M515i Power Configuration
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
LNC Technology Co., Ltd.
Power
A04

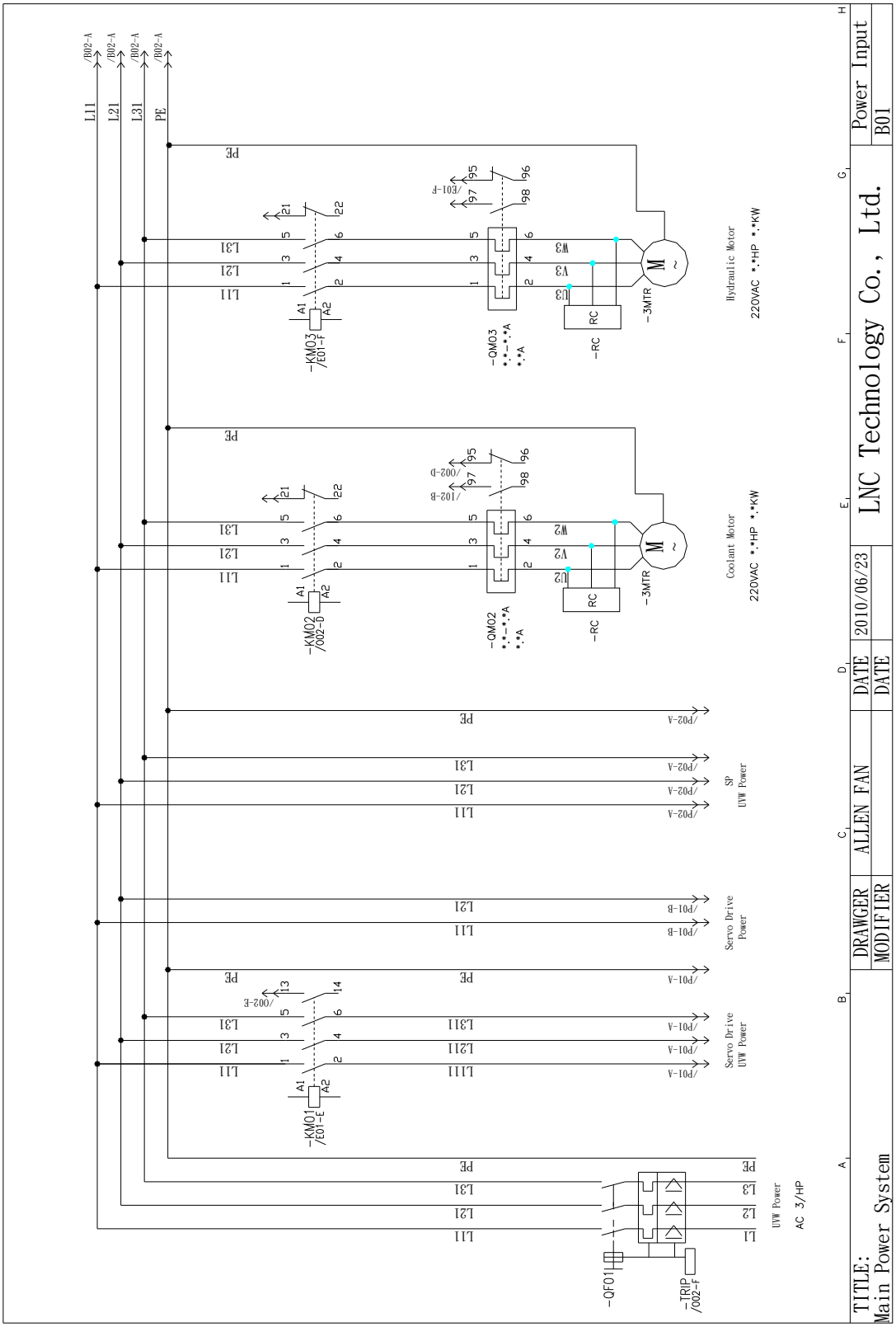

MPG
LNC Technology Co., Ltd.
TITLE:
LNC-M515i MPG Configuration
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
MPG
A05

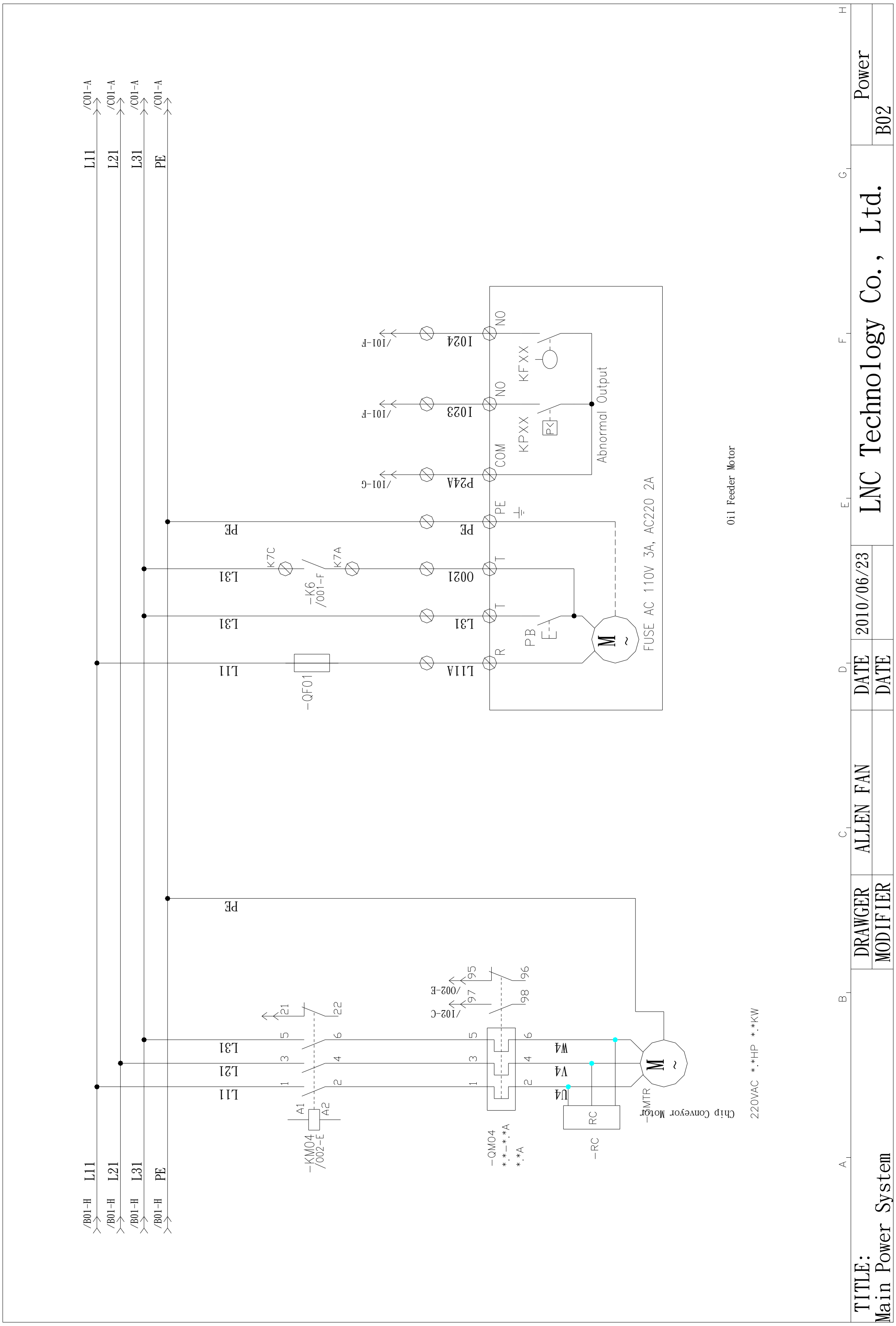

USB
KB
Z-AXIS
SP-AXIS
X-AXIS
Y-AXIS
MPG
USER I/O
RIO
COM2
K31
INVERTOR
DELTA
VFD-V
PG-05 BOARD
SPINDLE MOTOR
K91
Z AXIS
Y AXIS
X AXIS
MITSUBISHI MELSERVO
MR-J2S-**A
K23
K51
K54
HC-SFS, RFS, UFS
TITLE:
LNC-M515i Mitsubishi Servo
DRAWGER
ALLEN FAN
MODIFIER
DATE
2010/06/23
DATE
LNC Technology Co., Ltd.
Mitsubishi Servo
A06


TITLE:
LNC-M515i Panasonic Servo
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
LNC Technology Co., Ltd.
Panasonic Servo
A07
INVERTOR
DELTA
VFD-V
PC-05 BOARD
SPINDLE MOTOR
K31
K91
K61
K22
Z AXIS
Y AXIS
X AXIS
Panasonic
伺服馬達
L1
L2
L3
L1C
L2C
RB1
RB3
RB2
U
V
W
CN2
X3
X4
X5

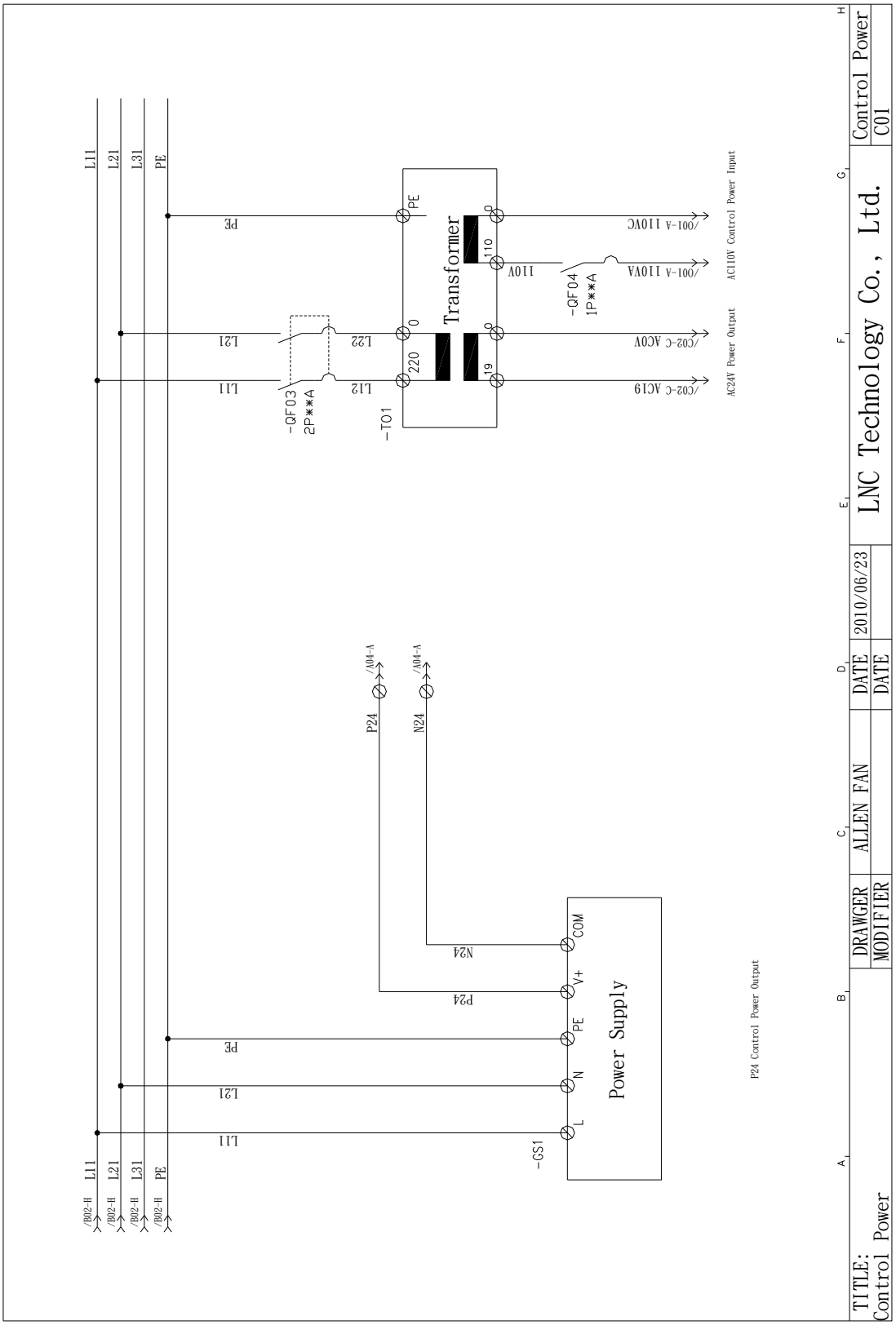

LNC Technology Co., Ltd.
TITLE:
LNC-M515i Yaskawa Servo
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
Yaskawa Servo
A08
Z AXIS
Y AXIS
X AXIS
YASKAWA
SERVOPACK
SGDH-10AE1291
SGMCS-17D0A1
K21
K41
K91
INVERTOR
DELTA
VFD-V
SPINDLE MOTOR

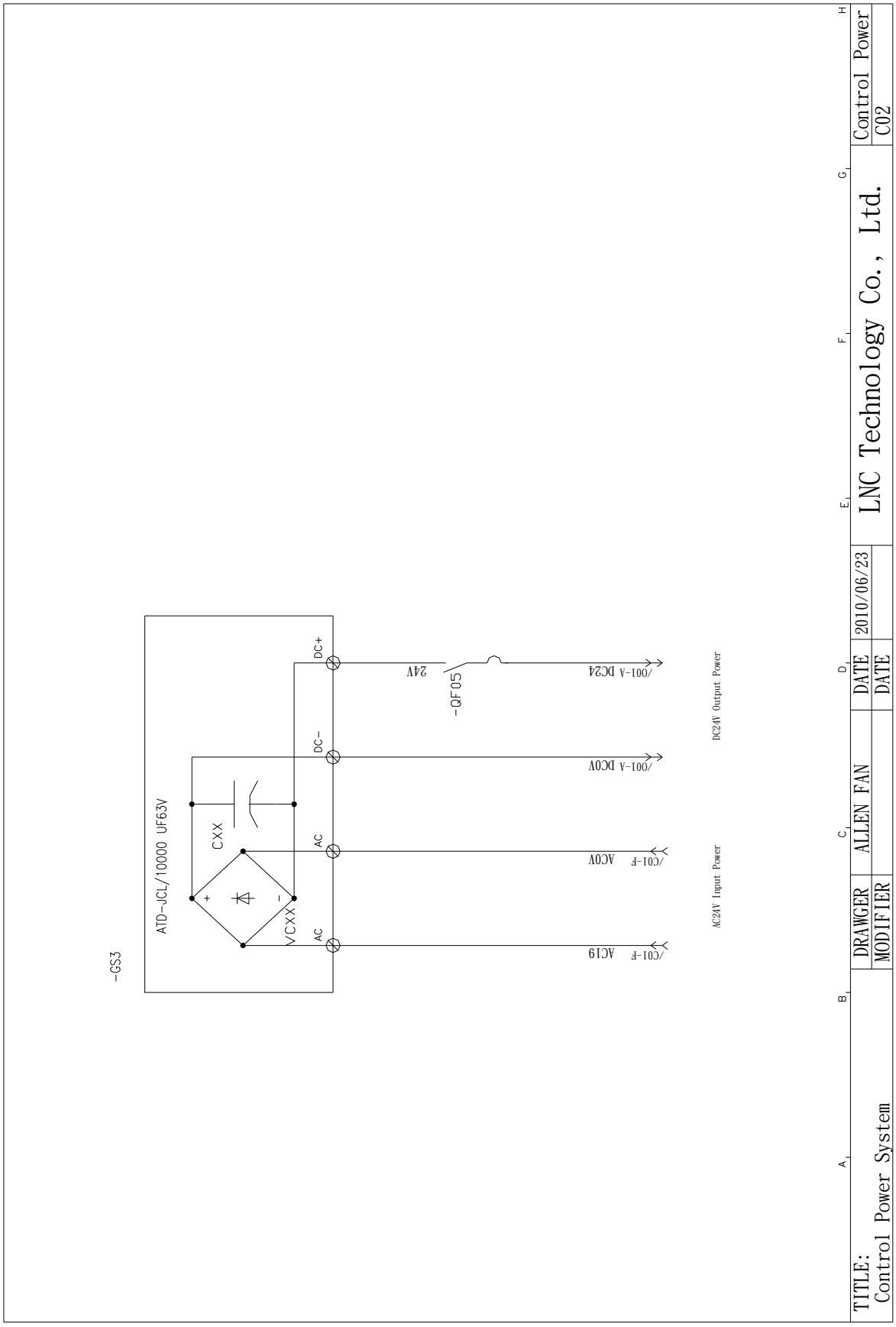
B-Main Power


Power Input
B01
LNC Technology Co., Ltd.
DATE
2010/06/23
ALLEN FAN
DRAWGER
MODIFIER
TITLE:
Main Power System
Hydraulic Motor
220VAC *.*HP *.*KW
Coolant Motor
220VAC *.*HP *.*KW
Servo Drive UVW Power
Servo Drive Power
SP UVW Power
UVW Power
AC 3/HP
-3MTR
-RC
-QM03
-QM02
-KM03 /E01-F
-KM02 /002-D
-KM01 /E01-E
-QF01
-TRIP /002-F

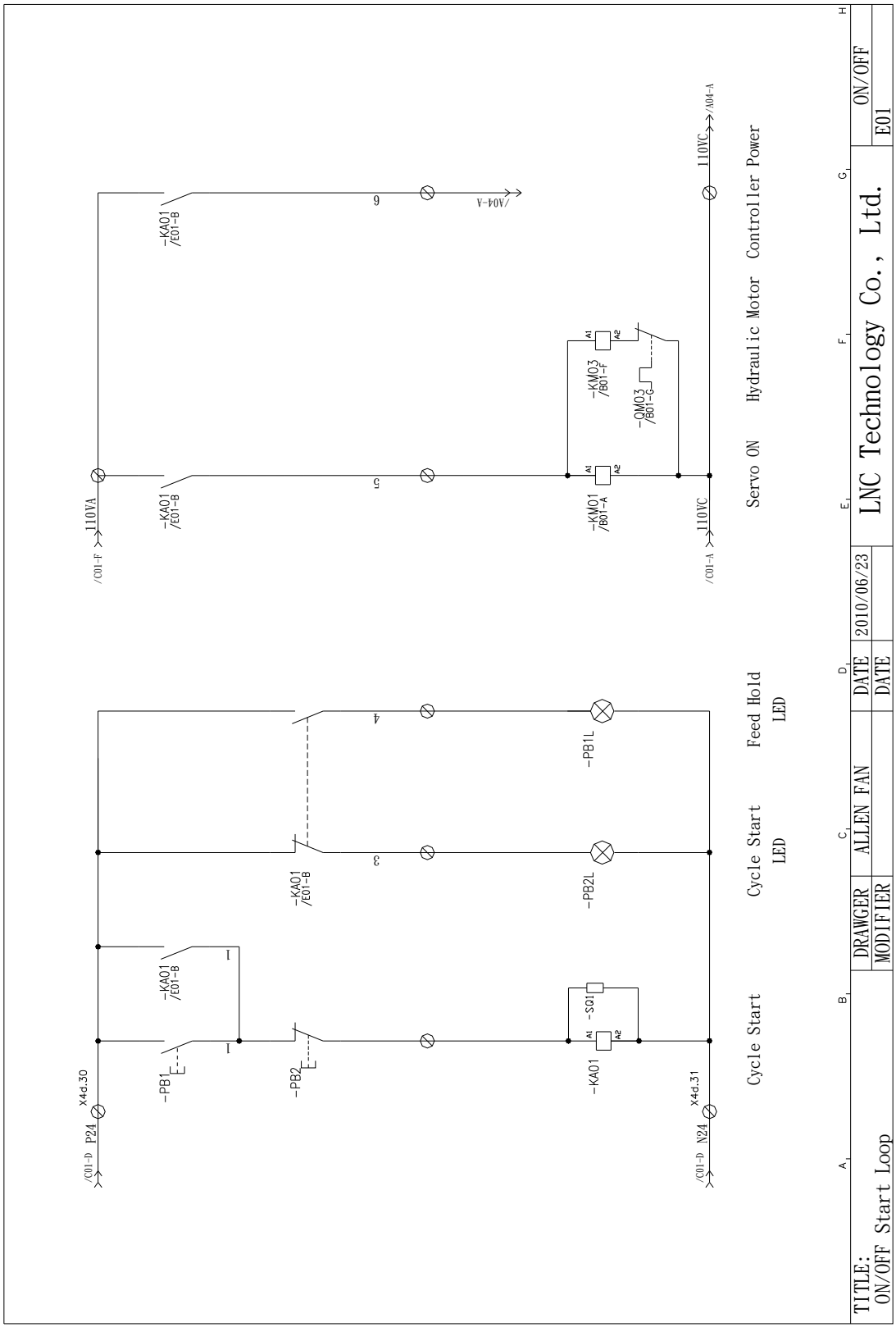

Oil Feeder Motor
FUSE AC 110V 3A, AC220 2A
Abnormal Output
Chip Conveyor Motor
220VAC *.*HP *.*KW
TITLE:
Main Power System
DRAWGER
ALLEN FAN
MODIFIER
DATE
2010/06/23
DATE
LNC Technology Co., Ltd.
Power
B02

C-Control Loop

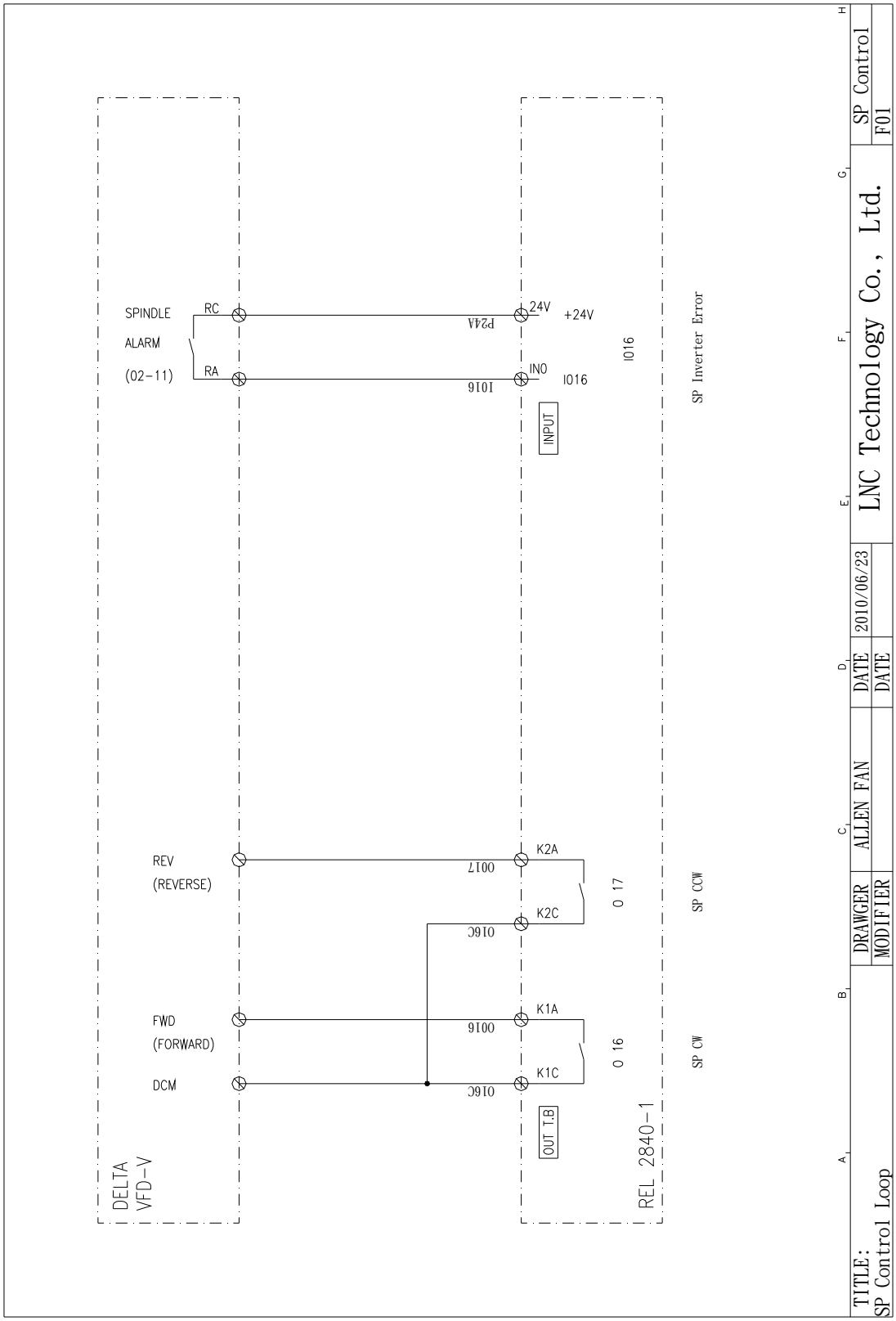



-GS3
ATD-JCL/10000 UF63V
CXX
VCXX
DC+
DC-
AC
AC
24V
-QF05
/C01-A DC24
/C01-A DC0V
/C01-F AC0V
/C01-F AC19
DC24V Output Power
AC24V Input Power
TITLE:
Control Power System
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
LNC Technology Co., Ltd.
Control Power
C02

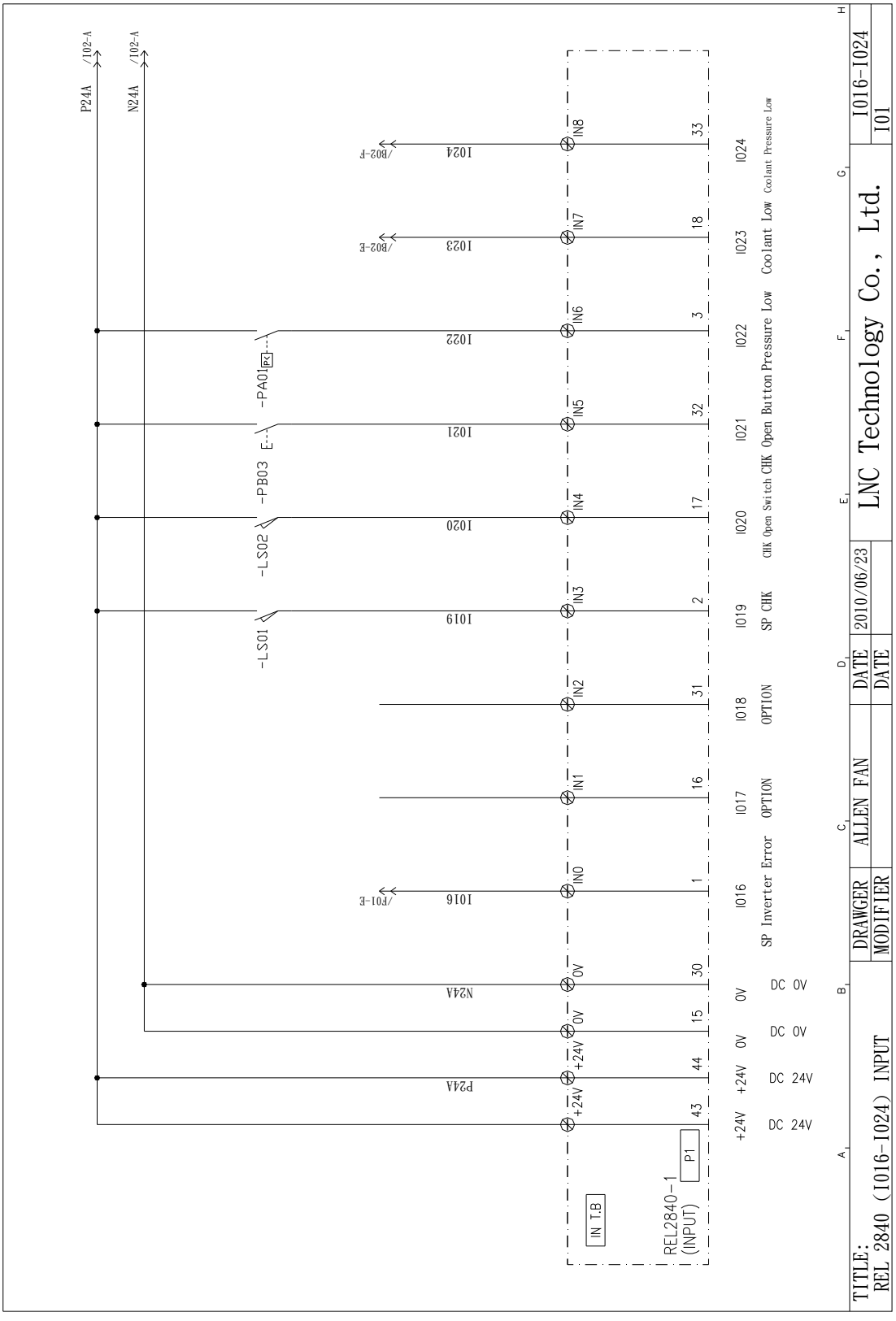
E-ONOFF

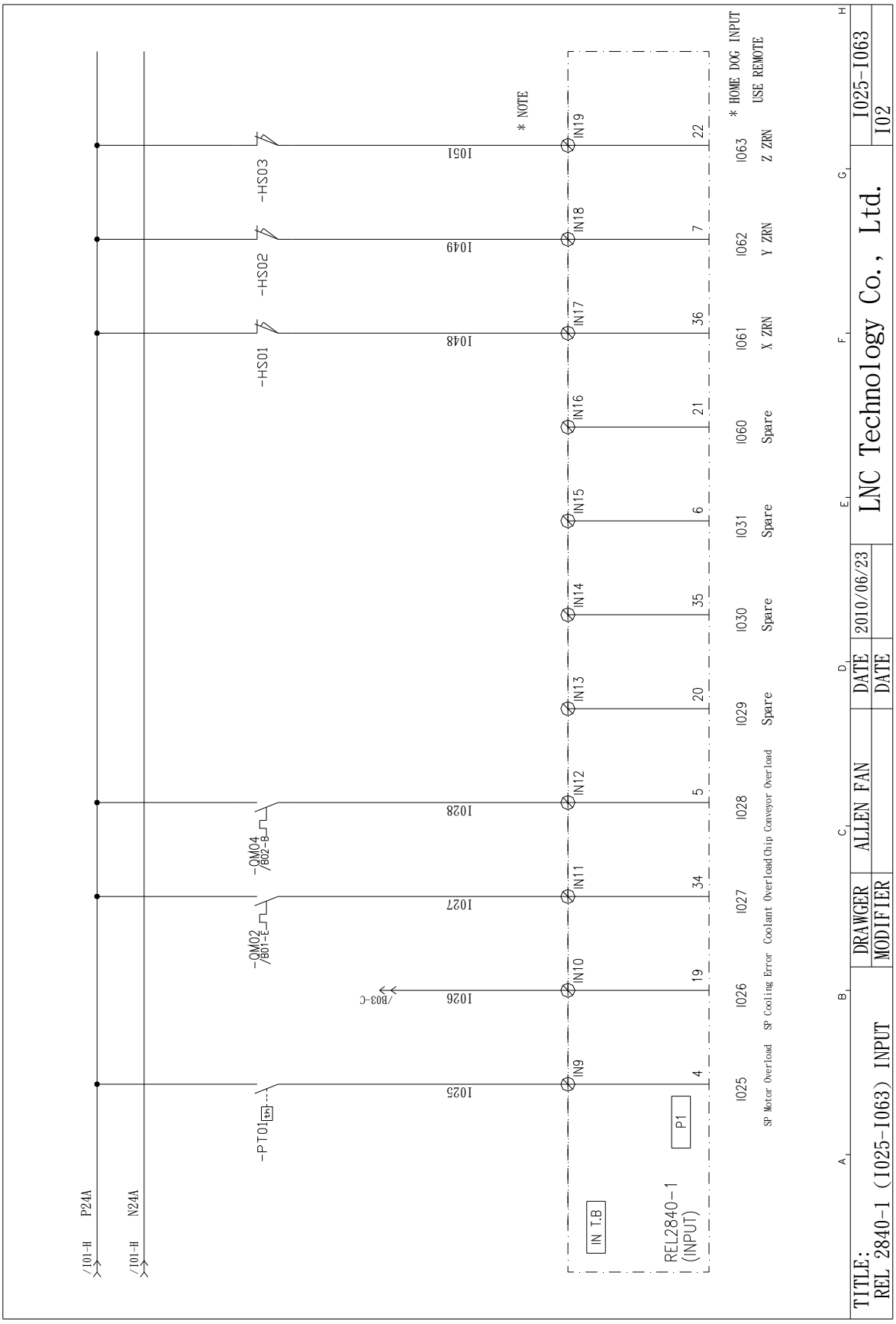

TITLE:
ON/OFF Start Loop
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
LNC Technology Co., Ltd.
ON/OFF
E01
Cycle Start LED
Feed Hold LED
Servo ON
Hydraulic Motor Controller Power
Cycle Start
/C01-D P24
X4d.30
/C01-D N24
X4d.31
/C01-F 110VA
/C01-A 110VC
110VC >> /A04-A
/A04-A
-PB1
-PB2
-KA01 /E01-B
-SQ1
-PB1L
-PB2L
-KMO1 /B01-A
-KMO3 /B01-F
-QMO3 /B01-G

F- Spindle Interface

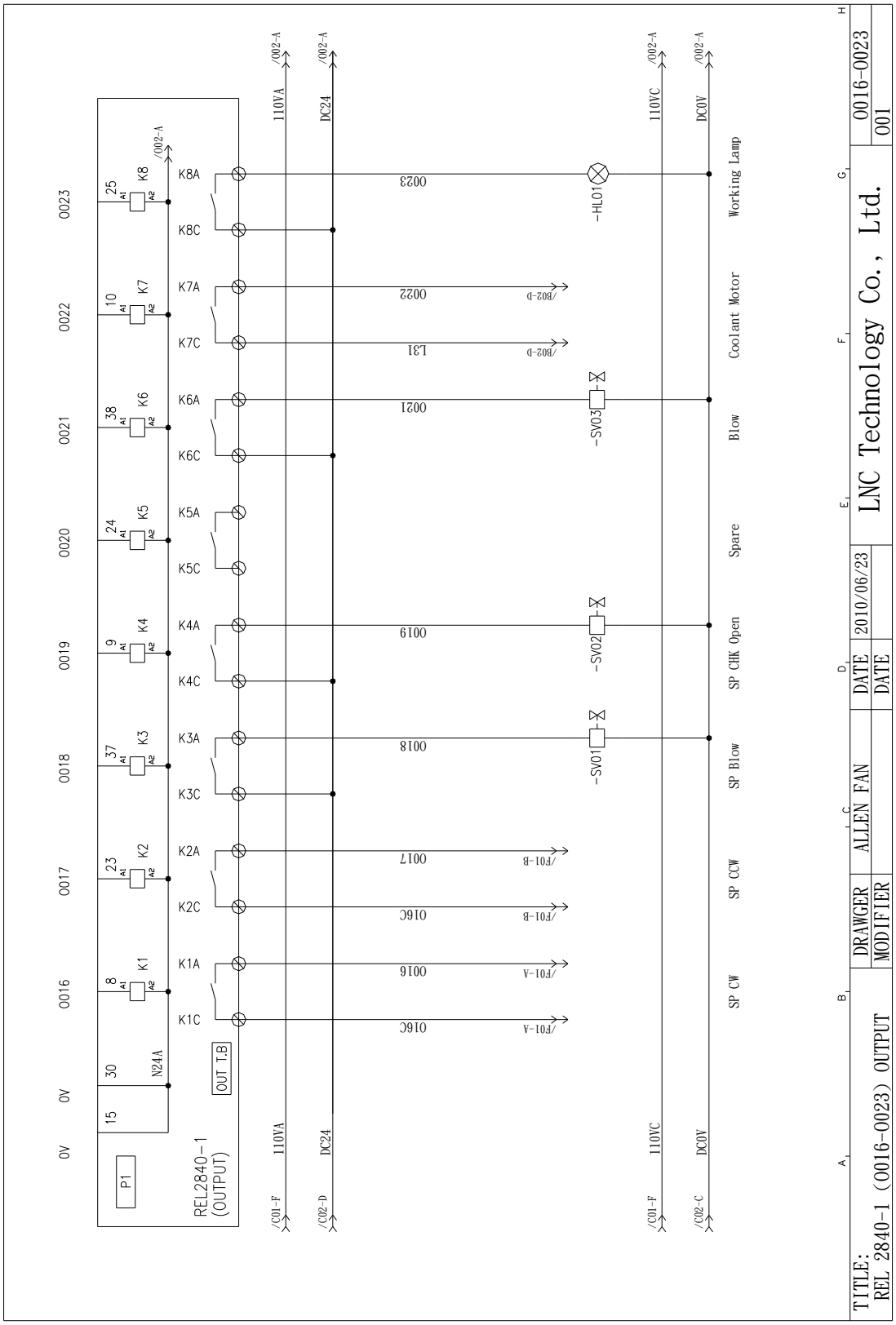


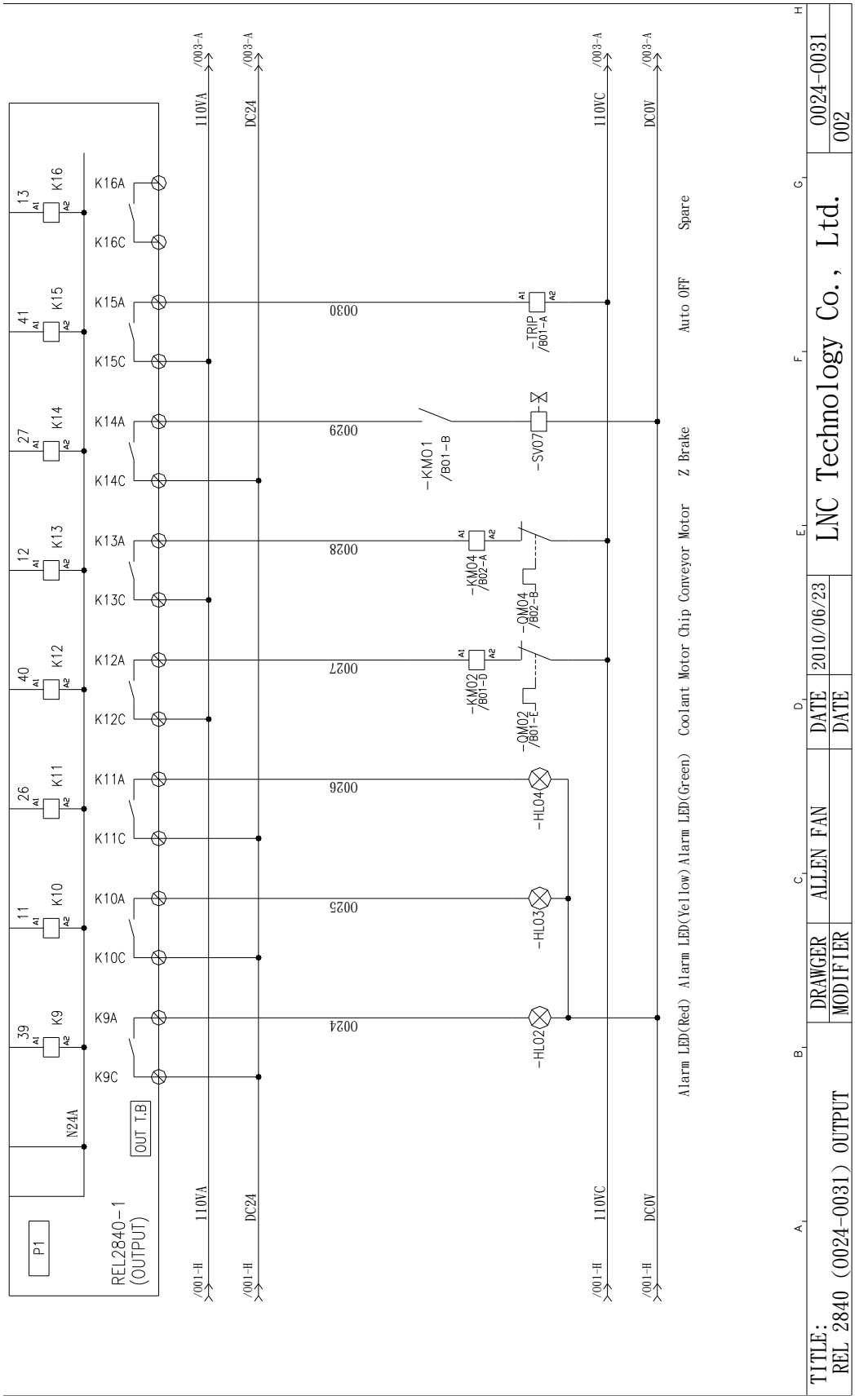
I-INPUT Wiring



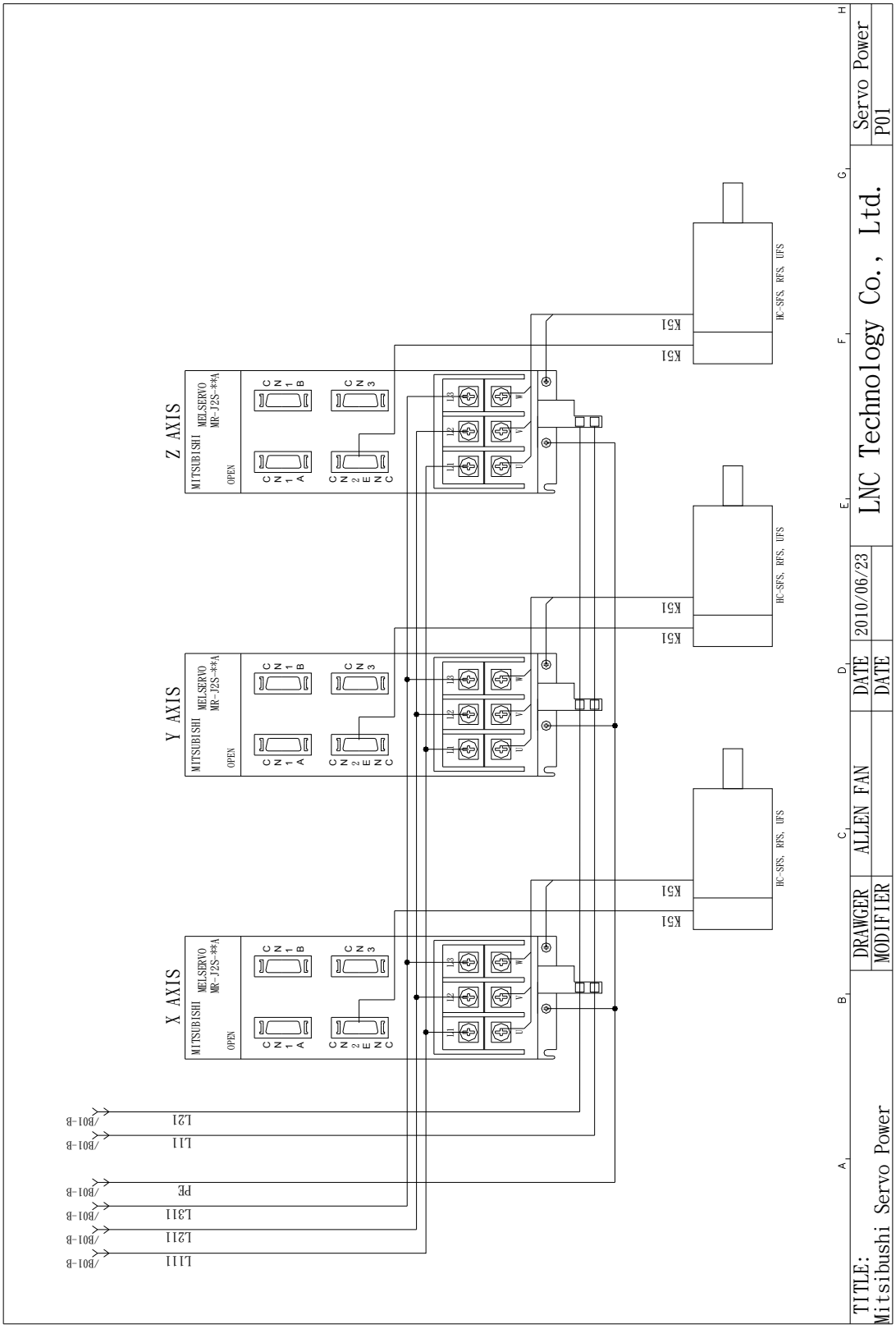

TITLE:
REL 2840-1 (I025-I063) INPUT
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
LNC Technology Co., Ltd.
I025-I063
I02
REL2840-1
(INPUT)
IN T.B
P1
-PT01
-QM02
-QM04
-HS01
-HS02
-HS03
* NOTE
* HOME DOG INPUT
USE REMOTE
Z ZRN
Y ZRN
X ZRN
Spare
Spare
Spare
Spare
Chip Conveyor Overload
Coolant Overload
SP Cooling Error
SP Motor Overload
I025
I026
I027
I028
I029
I030
I031
I060
I061
I062
I063
I025
I026
I027
I028
I051
I049
I048
IN9
IN10
IN11
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
4
19
34
5
20
35
6
21
36
7
22
/I01-H P24A
/I01-H N24A
/B03-C

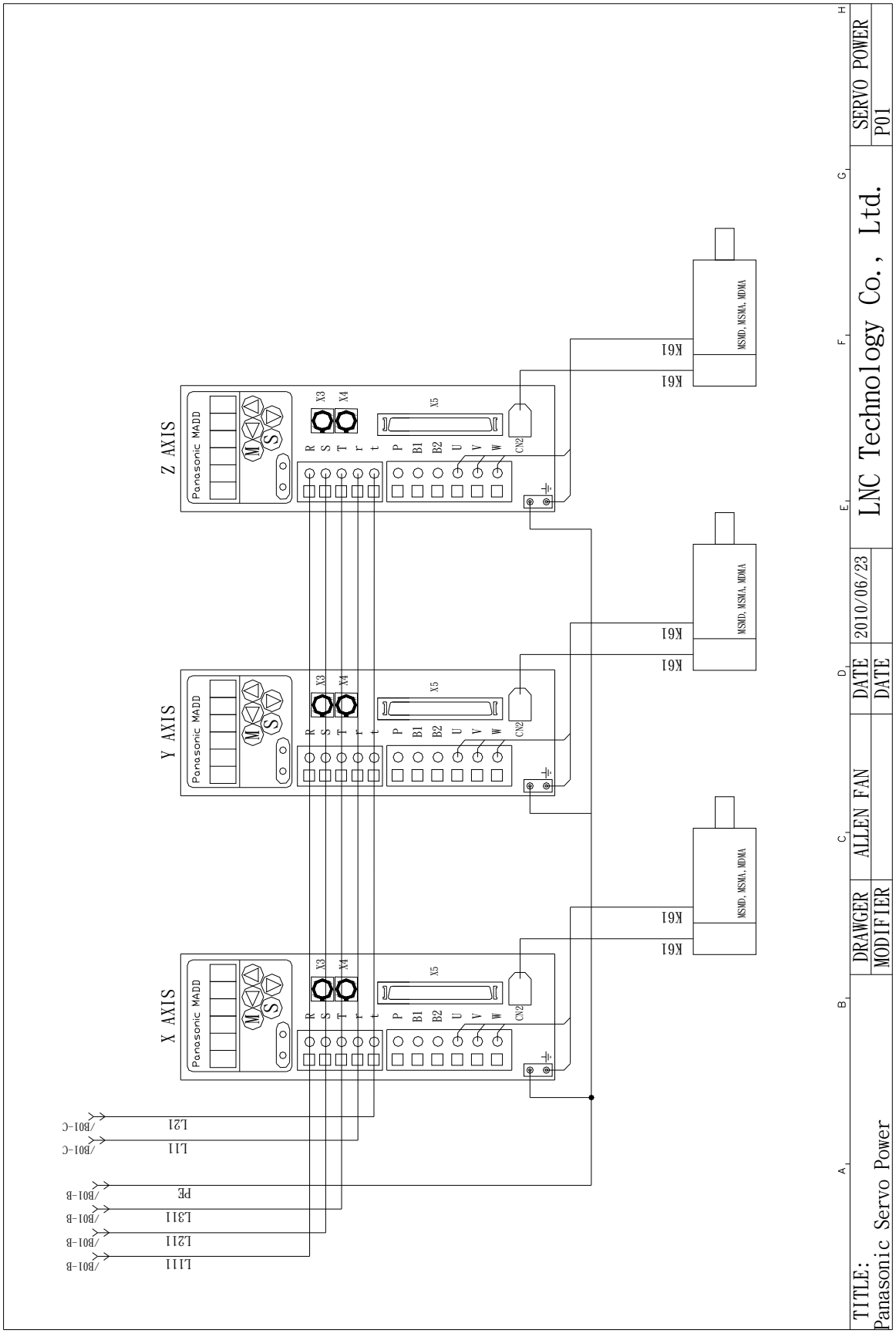
O-OUTPUT Wiring

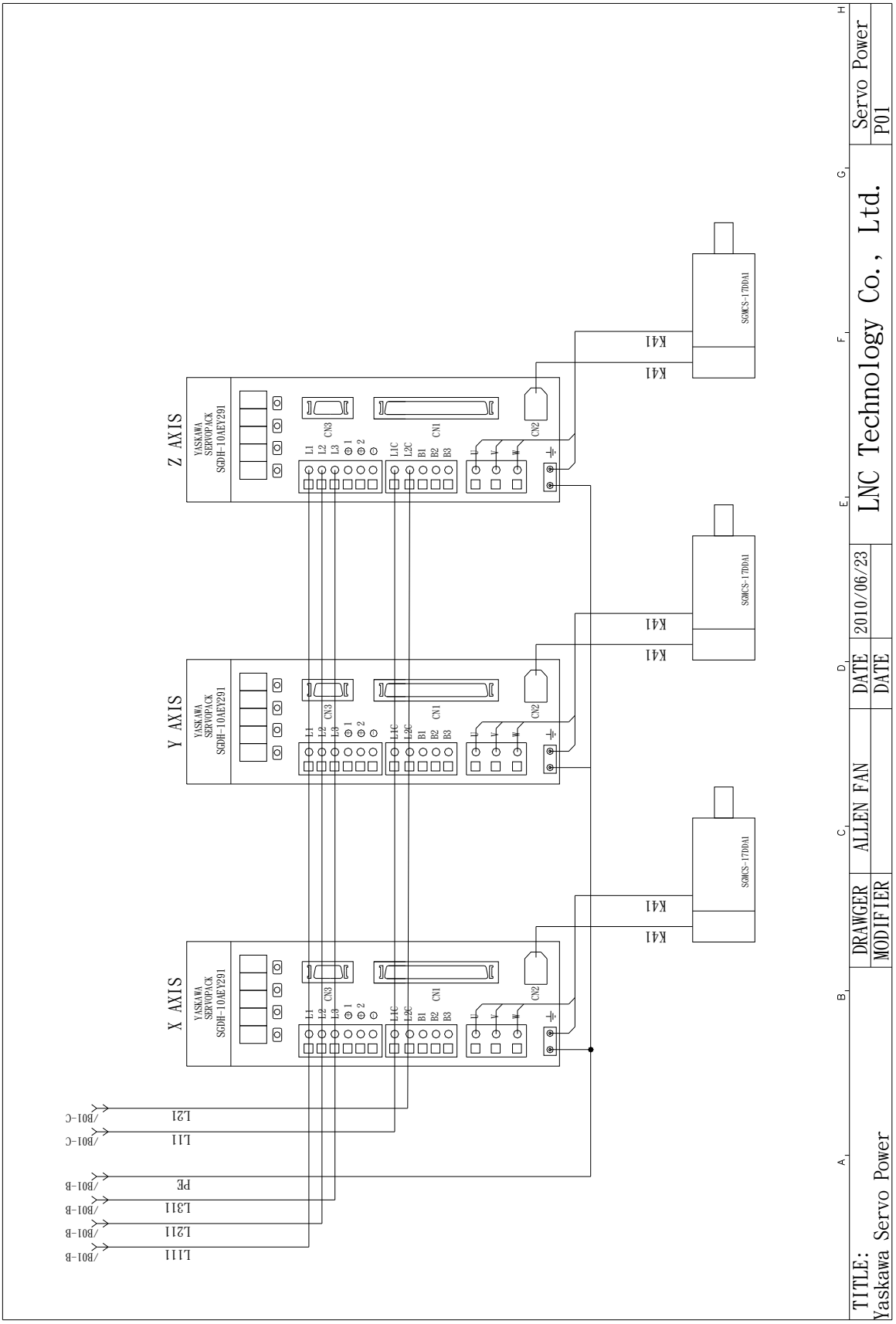


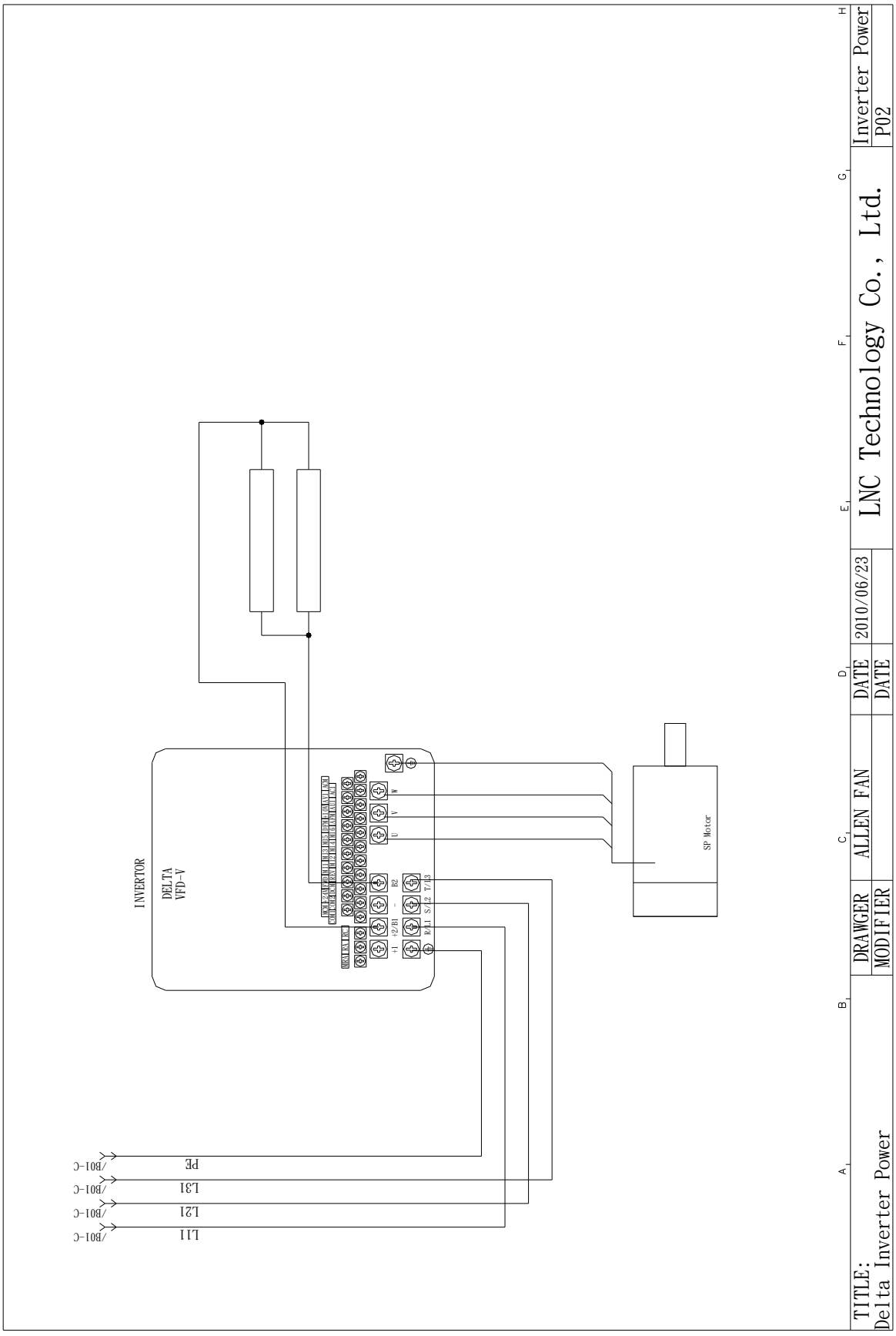

REL2840-1
(OUTPUT)
P1
N24A
OUT T.B
110VA
DC24
110VC
DC0V
/001-H
/003-A
K16A
K16C
K15A
K15C
K14A
K14C
K13A
K13C
K12A
K12C
K11A
K11C
K10A
K10C
K9A
K9C
K16
K15
K14
K13
K12
K11
K10
K9
13
41
27
12
40
26
11
39
0030
0029
0028
0027
0026
0025
0024
-KM01
/B01-B
-TRIP
/B01-A
-SV07
-KM04
/B02-A
-QM04
/B02-B
-KM02
/B01-D
-QM02
/B01-E
-HL04
-HL03
-HL02
Alarm LED(Red) Alarm LED(Yellow) Alarm LED(Green) Coolant Motor Chip Conveyor Motor Z Brake Auto OFF Spare
TITLE:
REL 2840 (0024-0031) OUTPUT
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
LNC Technology Co., Ltd.
0024-0031
002

P- Servo Main Power




Z AXIS
Y AXIS
X AXIS
Panasonic MADD
X3
X4
X5
CN2
R
S
T
r
t
P
B1
B2
U
V
W
K61
MSMD, MSMA, MDMA
L111
L211
L311
PE
L11
L21
/B01-B
/B01-C
TITLE:
Panasonic Servo Power
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
LNC Technology Co., Ltd.
SERVO POWER
P01


Z AXIS
Y AXIS
X AXIS
YASKAWA
SERVOPACK
SGDH-10AEY291
CN1
CN2
CN3
SGMCS-17D0A1
K41
L21
L11
PE
L311
L211
L111
/B01-C
/B01-B
TITLE:
Yaskawa Servo Power
DRAWGER
MODIFIER
ALLEN FAN
DATE
2010/06/23
LNC Technology Co., Ltd.
Servo Power
P01


INVERTOR
DELTA
VFD-V
SP Motor
PE
L31
L21
L11
TITLE:
Delta Inverter Power
DRAWGER
MODIFIER
ALLEN FAN
DATE
DATE
2010/06/23
LNC Technology Co., Ltd.
Inverter Power
P02

T-IO List

INPUT	DESCRIPTION	Remarke
I016	SP Inverter Error	REL
I017	OPTION	REL
I018	OPTION	REL
I019	SP CHK Close	REL
I020	SP CHK Open	REL
I021	SP CHK Open Button	REL
I022	Pressure Low	REL
I023	Coolant Unit Pressure Low	REL
I024	Coolant Pressure Low	REL
I025	SP Motor Overheat	REL
I026	SP Cooling Error	REL
I027	Coolant Overload	REL
I028	Chip Conveyor Overload	REL
I029	USER I/O IN13	REL
I030	USER I/O IN14	REL
I031	USER I/O IN15	REL
I060	USER I/O IN16	REL
I061	X ZRN	REL
I062	Y ZRN	REL
I063	Z ZRN	REL

INPUT	DESCRIPTION	Remarke

TITLE: LNC M515i Input Signal

DRAWGER	ALLEN FAN	DATE 2010/06/23
MODIFIER		DATE

LNC Technology Co., Ltd.

515i SERIES T01

OUTPUT	DESCRIPTION	Remarke
0016	SP CW	REL
0017	SP CCW	REL
0018	SP Blow	REL
0019	SP CHK Open	REL
0020	REL2840-K5	REL
0021	Blow	REL
0022	Coolant Motor	REL
0023	Working Lamp	REL
0024	Alarm LED Red	REL
0025	Alarm LED Yellow	REL
0026	Alarm LED Green	REL
0027	Coolant Motor	REL
0028	Chip Conveyor Motor	REL
0029	Z Brake	REL
0030	Auto OFF	REL
0031	REL2840-K16	REL

OUTPUT	DESCRIPTION	Remarke
0032		
0033		
0034		
0035		
0036		
0037		
0038		
0039		
0040		
0041		
0042		
0043		
0044		
0045		
0046		
0047		
0048		
0049		
0050		
0051		
0052		
0053		
0054		
0055		
0056		
0057		
0058		
0059		
0060		
0061		

TITLE: LNC M515i Output	DRAWGER	ALLEN FAN	DATE	2010/06/23	LNC Technology Co., Ltd.	M515i SERIES	
	MODIFIER		DATE			T02	

INPUT	DESCRIPTION	Remarke
I320	EDIT	OP
I321	MPG	OP
I322	-C AXIS	OP
I323	-X AXIS	OP
I324	+C AXIS	OP
I325	CW	OP
I326	SBK	OP
I327	OP STOP	OP
I328	MEM	OP
I329	ZRN	OP
I330	+Z AXIS	OP
I331	RAPID	OP
I332	-Z AXIS	OP
I333	STOP	OP
I334	MPG DRN	OP
I335	BDT	OP
I336	MDI	OP
I337	JOG	OP
I338	-Y AXIS	OP
I339	+X AXIS	OP
I340	+Y AXIS	OP
I341	CCW	OP
I342	LOW	OP
I343	25%/MPG*100	OP
I344	EMG-STOP	OP
I345	CYCLE START	OP
I346	FEED HOLD	OP
I347	SP Speed DOWN	OP
I348	SP Speed 100%	OP
I349	SP Speed UP	OP
I350	Feedrate F%-	OP
I351	Feedrate 100%	OP

INPUT	DESCRIPTION	Remarke
I352	TUR CW	REL
I353	TUR CCW	OP
I354	CTCH	OP
I355	F1	OP
I356	CHIP	OP
I357	CK	OP
I358	TB	OP
I359	F2	OP
I360	50%MPG*10	OP
I361	100%MPG*100	OP
I362	AIR BLOW	OP
I363	F3	OP
I364	Feedrate F%+	OP
I365	W.L	OP
I366	COOL	OP
I367		
I368		
I369		
I370		
I371		
I372		
I373		
I374		
I375		

TITLE:	DRAWGER	ALLEN FAN	DATE	2010/06/23	LNC Technology Co., Ltd.	OP
LNC M515i OP INPUT	MODIFIER		DATE			T03

OUTPUT	DESCRIPTION	Remarke
0320	SP Speed OR 70% LED	OP
0321	SP Speed OR 60% LED	OP
0322	SP Speed OR 50% LED	OP
0323	SP Speed OR 40% LED	OP
0324	SP Speed OR 30% LED	OP
0325	SP Speed OR 20% LED	OP
0326	SP Speed OR 10% LED	OP
0327	SP Speed OR 0% LED	OP
0328	Feedrate OR 150% LED	OP
0329	Feedrate OR 140% LED	OP
0330	Feedrate OR 130% LED	OP
0331	Feedrate OR 120% LED	OP
0332	Feedrate OR 110% LED	OP
0333	Feedrate OR 100% LED	OP
0334	Feedrate OR 90% LED	OP
0335	Feedrate OR 80% LED	OP
0336	Feedrate OR 70% LED	OP
0337	Feedrate OR 60% LED	OP
0338	Feedrate OR 50% LED	OP
0339	Feedrate OR 40% LED	OP
0340	Feedrate OR 30% LED	OP
0341	Feedrate OR 20% LED	OP
0342	Feedrate OR 10% LED	OP
0343	Feedrate OR 0% LED	OP
0344	F3 LED	OP
0345	AIR BLOW LED	OP
0346	100%/MPG*100 LED	OP
0347	50%/MPG*10 LED	OP
0348	25%/MPG*1 LED	OP
0349	W.L LED	OP
0350	COOL LED	OP
0351	OT REL LED	OP

OUTPUT	DESCRIPTION	Remarke
0352	F2 LED	OP
0353	TB LED	OP
0354	CK LED	OP
0355	CHIP LED	OP
0356	BDT LED	OP
0357	MPG DRN LED	OP
0358	STOP LED	OP
0359	-Z LED	OP
0360	F1 LED	OP
0361	CTCH LED	OP
0362	TUR CCW LED	OP
0363	TUR CW LED	OP
0364	OP STOP LED	OP
0366	CW LED	OP
0367	+C LED	OP
0368	MDI LED	OP
0369	MEM LED	OP
0373	ZRN LED	OP
0374	+Z LED	OP
0375	RAPID LED	OP
0377	JOG LED	OP
0378	-Y LED	OP
0379	+X LED	OP
0380	+Y LED	OP
0381	CCW LED	OP
0382	LOW LED	OP
0383	CYCLE START LED	OP
0386	FEED HOLD LED	OP
0387	SP Speed OR 120% LED	OP
0388	SP Speed OR 110% LED	OP
0389	SP Speed OR 100% LED	OP
0390	SP Speed OR 90% LED	OP

TITLE: LNC M515i OP OUTPUT

DRAWGER	ALLEN FAN	DATE
MODIFIER		DATE

2010/06/23

LNC Technology Co., Ltd.

OP

T04

OUTPUT	DESCRIPTION	Remarke
O391	SP SPEED OR 80% LED	OP
O392	HOME LED	OP
O393	ALARM LED	OP
O394	NC READY LED	OP
O395	IO READY LED	OP
O396	EDIT LED	OP
O397	MPG LED	OP
O398	-C LED	OP
O399	-X LED	OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP
		OP

TITLE: LNC T515i OP OUTPUT SIGNAL	DRAWGER	ALLEN FAN	DATE	2010/06/23	LNC Technology Co., Ltd.	OP
	MODIFIER		DATE			T05