

LNC-M515i

Maintenance Manual

2011/1 Ver. : V04.00.001(4408210086)

Leading Numerical Controller



LNC Technology Co., Ltd.

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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 which 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 :

- Prepare a formatted CF card
- Set the boot sequence of IPC to A: first
- Insert [O.S UTILITY] disk to A
- RESET and boot with A: (CTRL+ALT+DEL or RESET)
- Run this option
- 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 continue.

- **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 reconstruction. 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 incomplete preparation, press EMG-STOP and press system update, below picture will be shown on the screen, users can choose each item to continue :

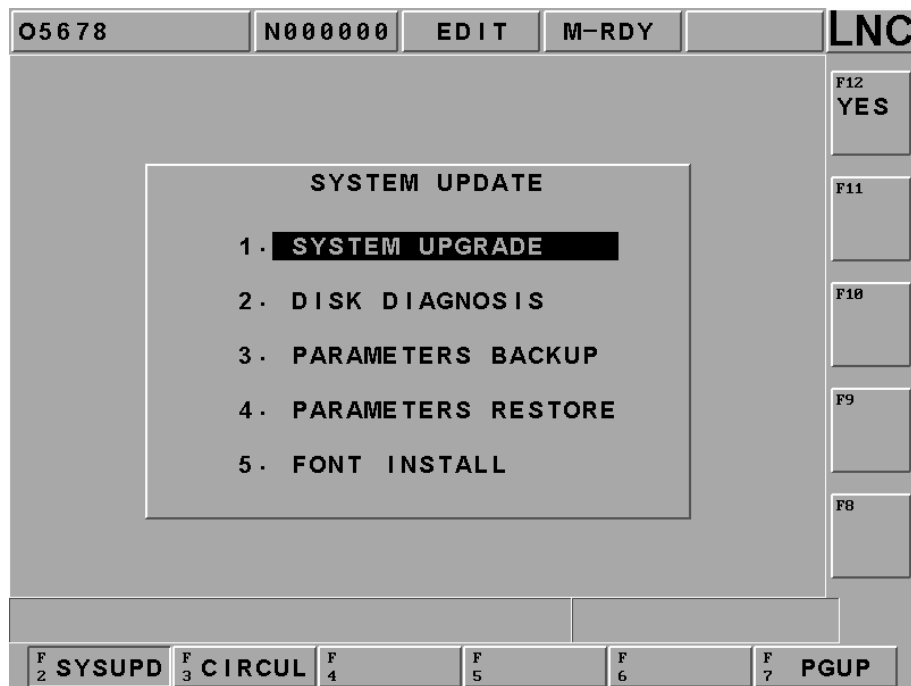
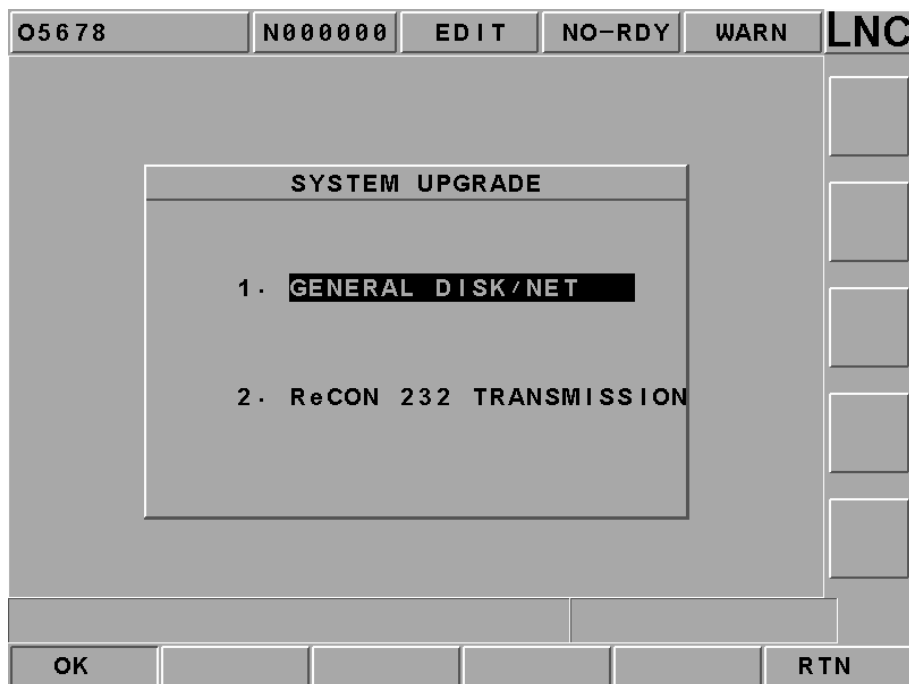


Figure 2.2-1 System Update Main Page

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 :

|                                                                                                                                                                                                                                                                                                                                                                                                                                            |         |      |        |  |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|--------|--|------------|
| O5678                                                                                                                                                                                                                                                                                                                                                                                                                                      | N000000 | EDIT | NO-RDY |  | <b>LNC</b> |
| <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <p style="text-align: center;"><b>SOURCE DIR CHOOSE</b></p> <p>DIR NAME : <span style="border: 1px solid black; padding: 2px;">01\V3\14000\</span></p> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>[ -A- ]</p> <p>[ -B- ]</p> <p>[ -C- ]</p> <p>[ -N- ]</p> <p>[ . . ]</p> <p>[ . ]</p> <p>[ MACHINE ]</p> </div> </div> |         |      |        |  |            |
| <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <span>OK</span> <span>CANCEL</span> </div>                                                                                                                                                                                                                                                                                                                   |         |      |        |  |            |

- 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 :

|                                                                                                                                                                                                                                                                                                       |         |      |        |      |            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|--------|------|------------|
| O5678                                                                                                                                                                                                                                                                                                 | N000000 | EDIT | NO-RDY | WARN | <b>LNC</b> |
| <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <p style="text-align: center;"><b>SYSTEM UPGRADE</b></p> <hr/> <p style="text-align: center;"><b>SYSTEM UPGRADE</b></p> <p style="text-align: center; margin-top: 20px;">Confirm restore from target?</p> </div> |         |      |        |      |            |
| <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <span>OK</span> <span>CANCEL</span> </div>                                                                                                                                                                              |         |      |        |      |            |

- 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)<br>If new installation, current LNCM515i backup. |
| C : \LNCM515i.B2      | Backup of LNCM515i directory (recently edition)                                             |
| C : \LNCM515\EXE      | System files                                                                                |
| C : \LNCM515\RESOURCE | Environment relative data files<br>(refer to DIR.DOC)                                       |
| C : \LNCM515\MACHINE  | LADDER and system files                                                                     |
| C : \LNCM515\MACRO    | Canned cycle macro for Standard Lathe<br>(user's NC files should not be here)               |
| C : \LNCM515\NCFILES  | User's NC files<br>(file name must be O0000~O8999)                                          |
| C : \LNCM515\CAMP RJ  | CAM project files<br>(extended file name is *.DAT)                                          |

### 3 Hardware Maintenance

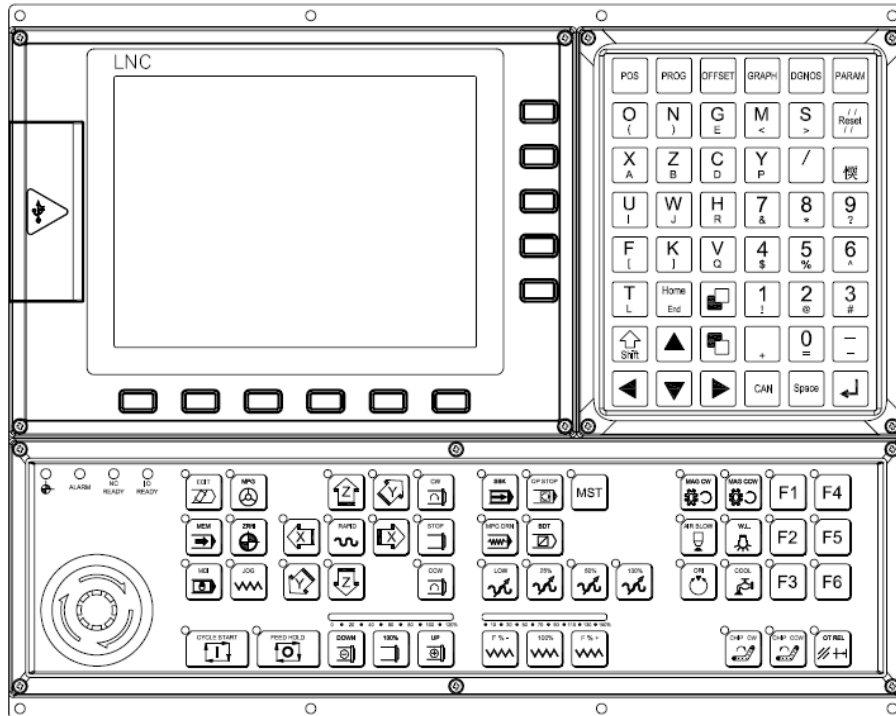
#### 3.1 Product Display

| LNC-M515i       | SPEC                                              |
|-----------------|---------------------------------------------------|
| Monitor         | 8" TFT LCD                                        |
| SDRAM           | 128M bytes or above                               |
| System CF Card  | 1G or above                                       |
| PC Motherboard  | Industrial PC board                               |
| Data Interface  | USB or CF Card                                    |
| Remote I/O      | 128 Input/128 Output                              |
| USER I/O        | 20 Input/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                |

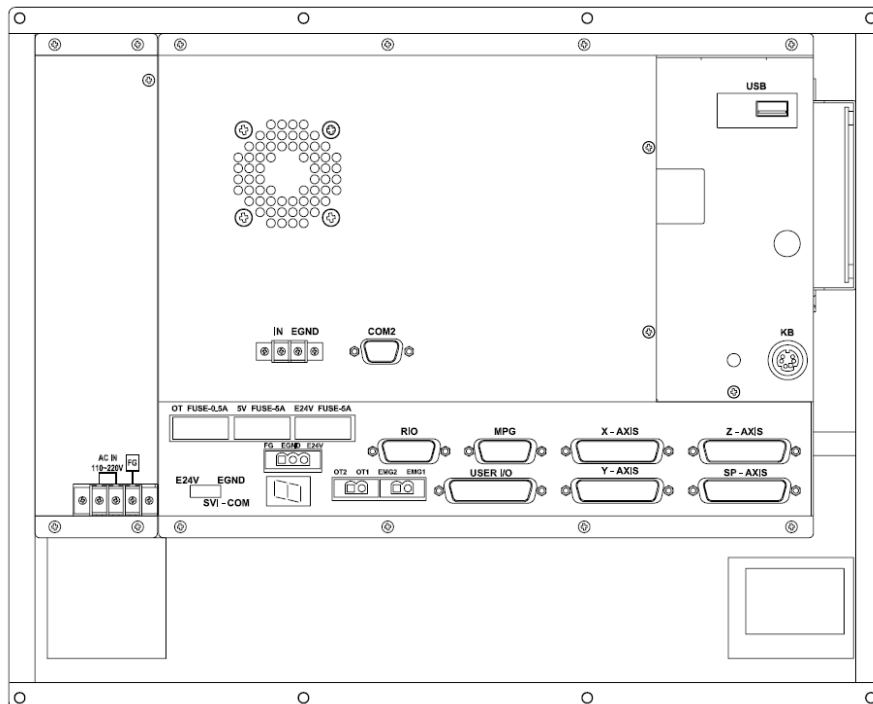
#### LNC-515i System Power Demand

| Power Category      | Specification          | Usage           | NOTE |
|---------------------|------------------------|-----------------|------|
| System Power        | AC 110V/230V 50Hz/60Hz | For System      |      |
| External Power(24V) | DC24V/ (4A UP)         | For external IO |      |

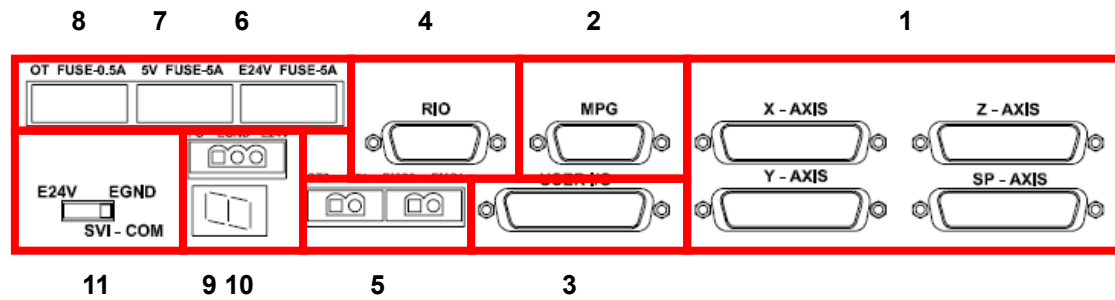
### 3.2 Port and interface



Controller Front View

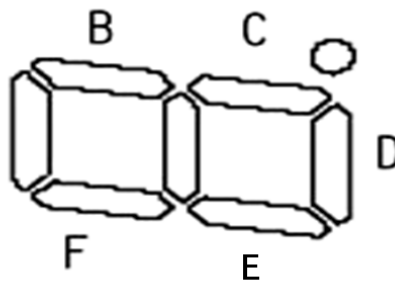


Controller Back View



12

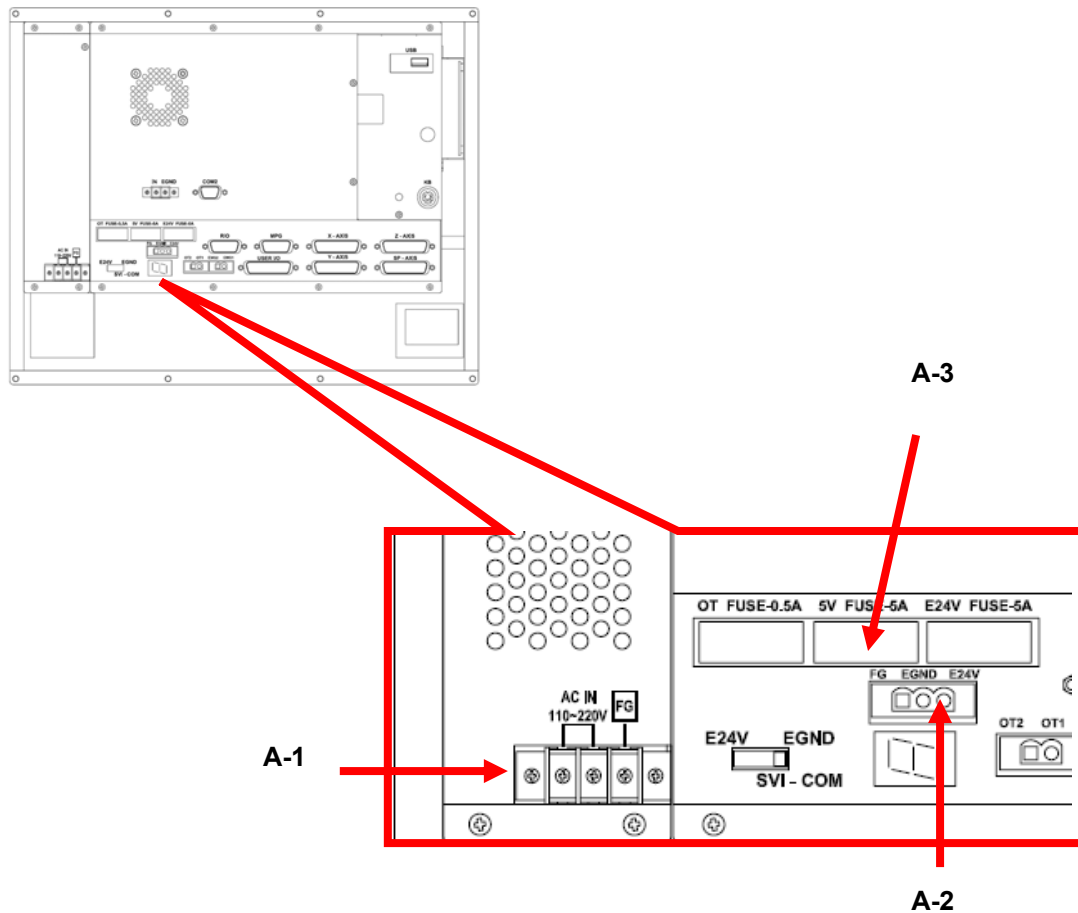
| Mark | Icon Code          | Function           | Connection Format    | Note                 |
|------|--------------------|--------------------|----------------------|----------------------|
| 1    | X、Y、Z、SP AXIS      | Axis servo control | D-SUB 25 PIN(Jack )  |                      |
| 2    | MPG                | MPG PIN            | D-SUB 15 PIN(Jack )  | Command and IN       |
| 3    | USER I/O           | 20IN/16OUT         | HD_D-SUB PIN(Plug )  | 44 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.

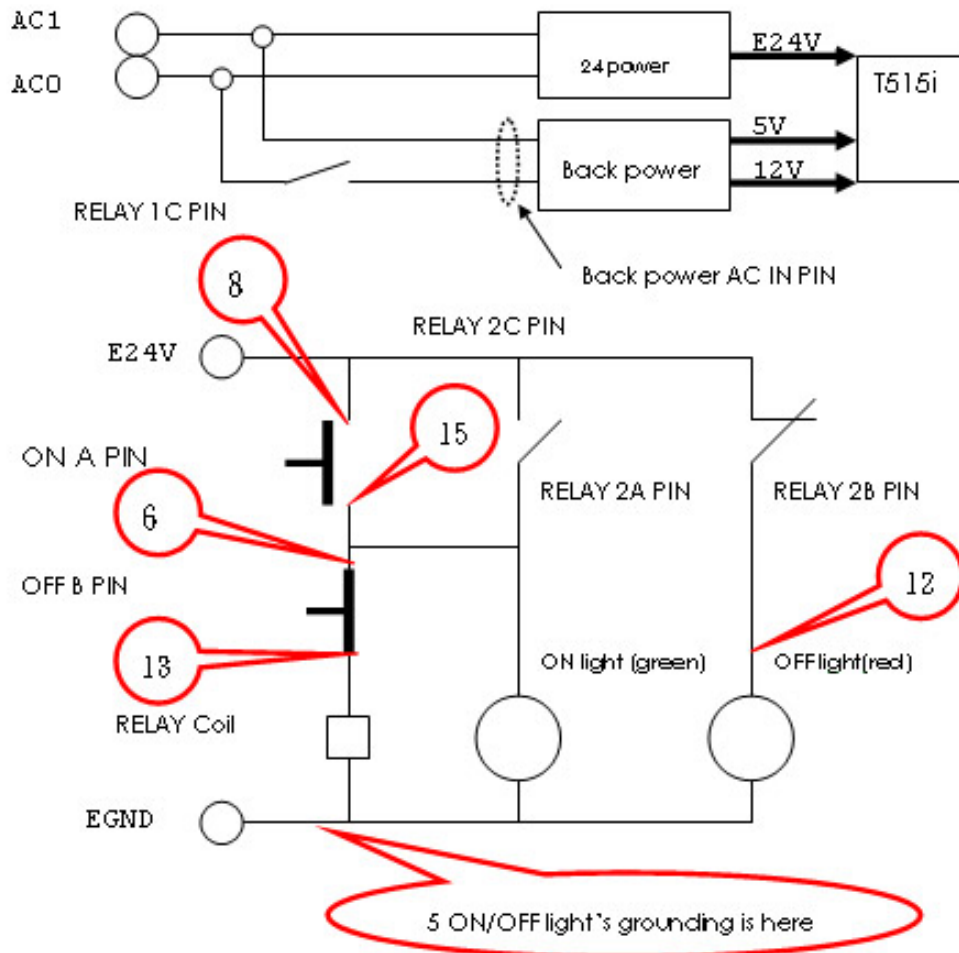
◎Connection : Connection as below :



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 :

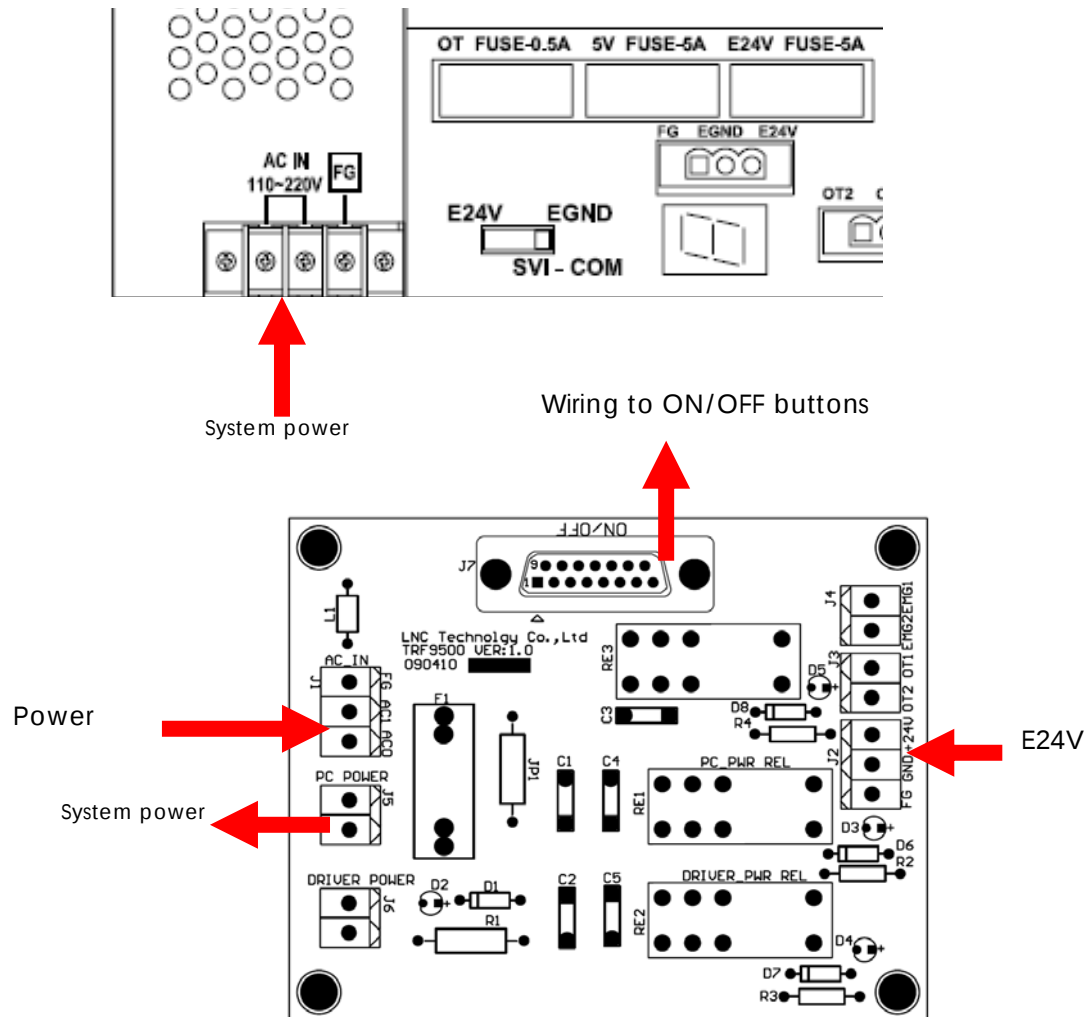


Note : 1.The numbers in this graph is to show TRF9500 ON/OFF Connector PIN.

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          |

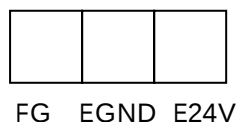


- **AC power cable : we recommend you use PVC cables and the cable diameter is 0.75 mm<sup>2</sup> or above material (better within 5m).**
- **Before sending electricity, please make sure the wiring is correct. ( please do not connect AC power to FG, otherwise the controller will be burned out.)**

#### 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.

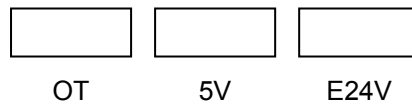


- **We recommend you to use the power supply of LNC (E24V/5.8A 、 E5V/3A). With using this model, LNC have passed the CE test. We can not guarantee your needs without using this model.**
- **When using this power supply, please make sure the installation location will not be too far( DC output may have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

### A-3 : FUSE

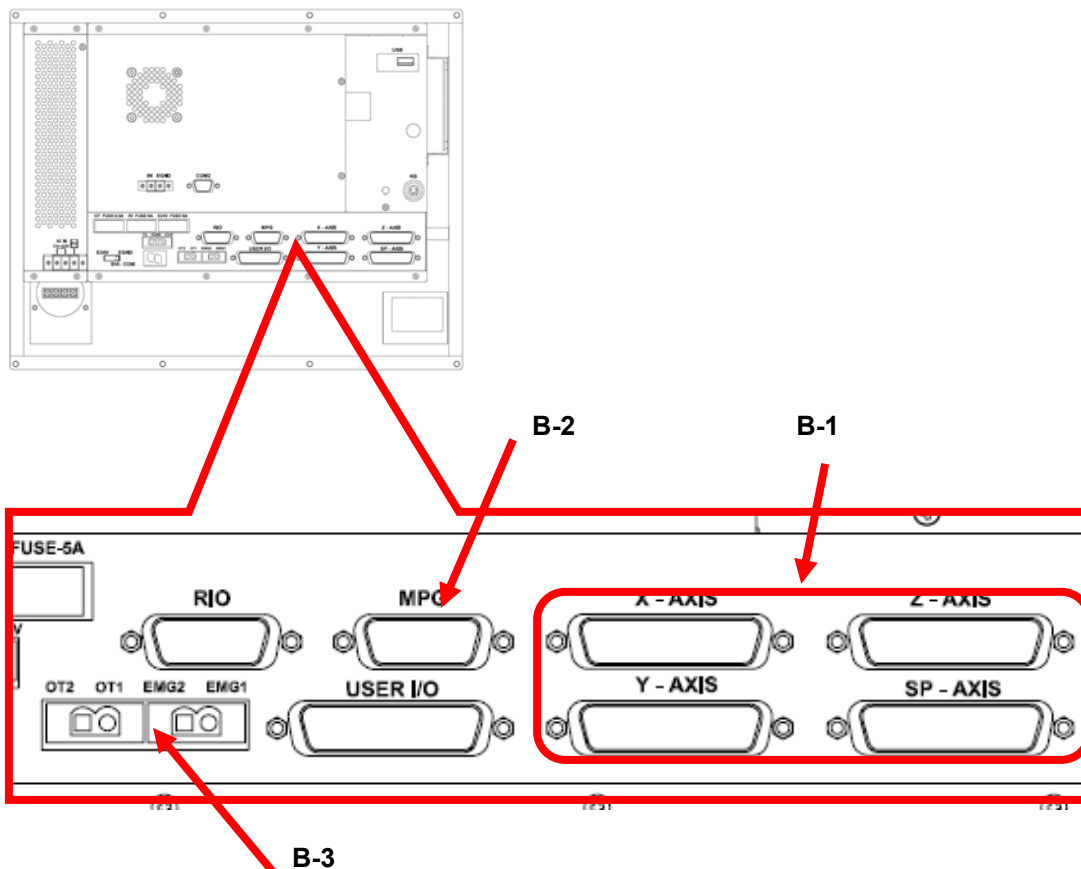
◎Description : Fuse is the circuit protection. When controller has strange situation, please check if fuse is OK.

◎Position Description : Relating position is as below :



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

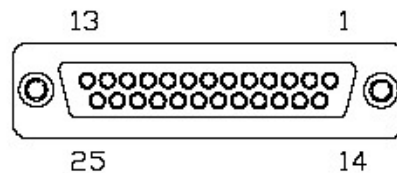
### B 、 Motion Control :



#### 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  $\pm 10V$ .

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

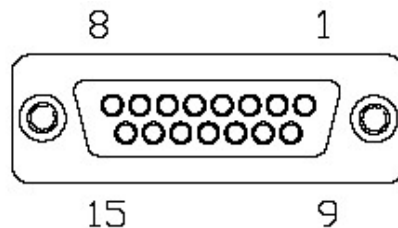


- When making the connection cables of control pin and back-end driver, please use better shielding cover and cables (A.W.G24 UP) And make sure the connection of shielding cables to reduce the chance of noise interference. LNC offers standard cables for selection.
- Please don't bind signal control cables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

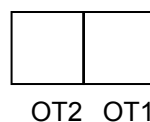
(2) This pin offer 6 sets of 5V input for axis direction and ratio selection to use.

### 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



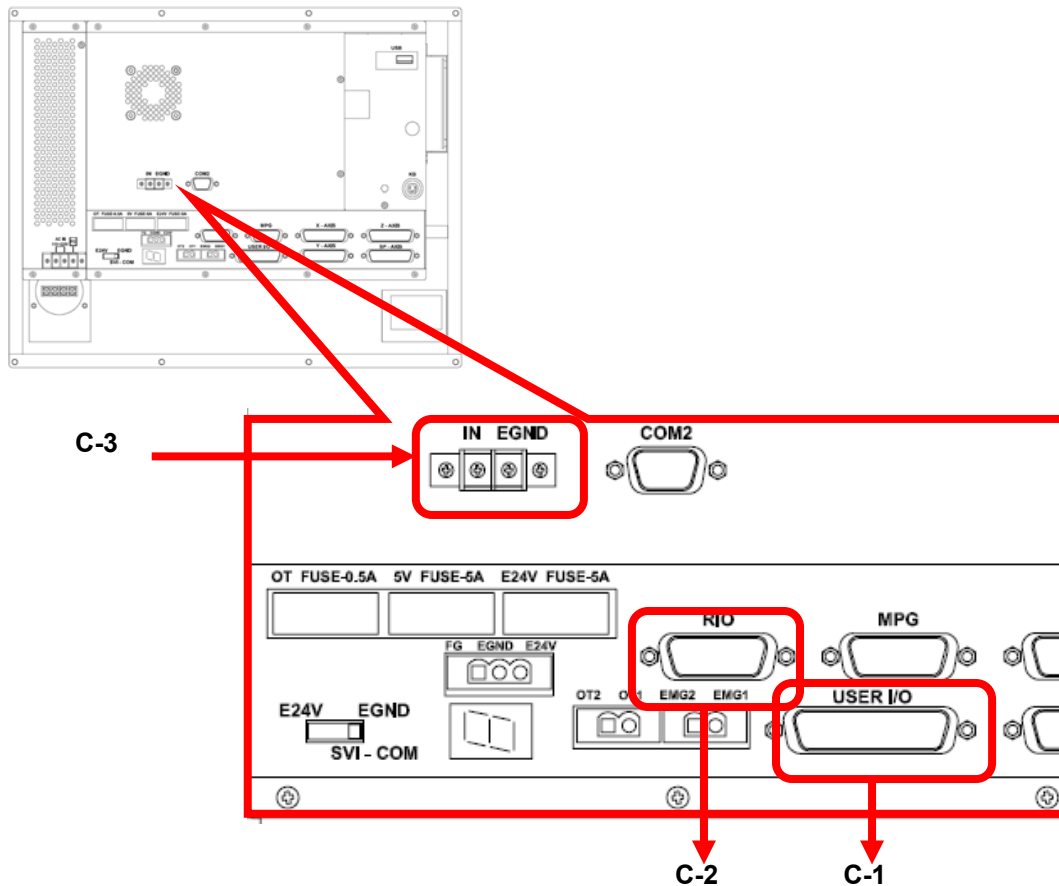
EMG2 EMG1

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.

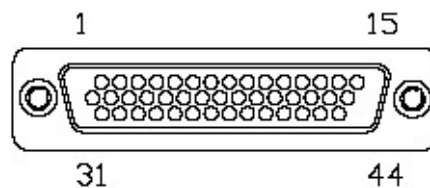
## C 、 IO Control :



### C-1 : USER IO Connector

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

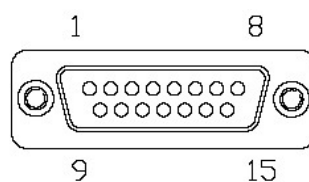
◎Connector Description : Adopts HD\_SUB 44PIN(Plug), please refer to annex 2 for definition :



### 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.



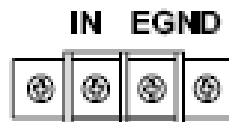


- When making the connection cables of control pin and back-end driver, please use better shielding cover and cables (A.W.G24 UP) And make sure the connection of shielding cables to reduce the chance of noise interference. LNC offers standard cables for selection
- (1・9) ; (2・10) ; (3・11) ; (4・12) require 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

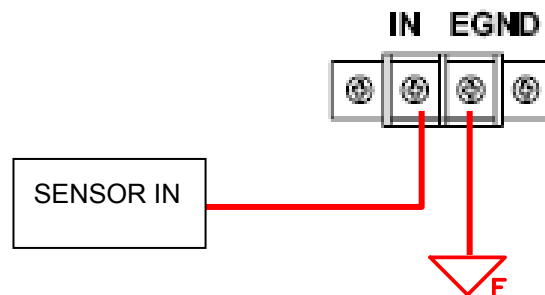
◎Description : C-3 offers 1 IN for tool measuring.

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

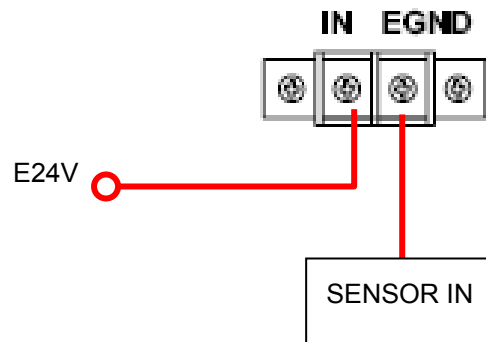


Quick IN Connector wiring :

1.When the sensor is PNP (HIGH motion)



2. When the sensor is NPN (LOW motion)

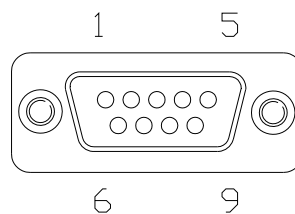


- IN is 24V standard.

#### 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/ <b>422TX</b> -/485- | 2   | RXD2/ <b>422TX</b> + /485+ |
| 3   | TXD2/ <b>422RX</b> +      | 4   | DTR2/ <b>422RX</b> -       |
| 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           |                 |                |

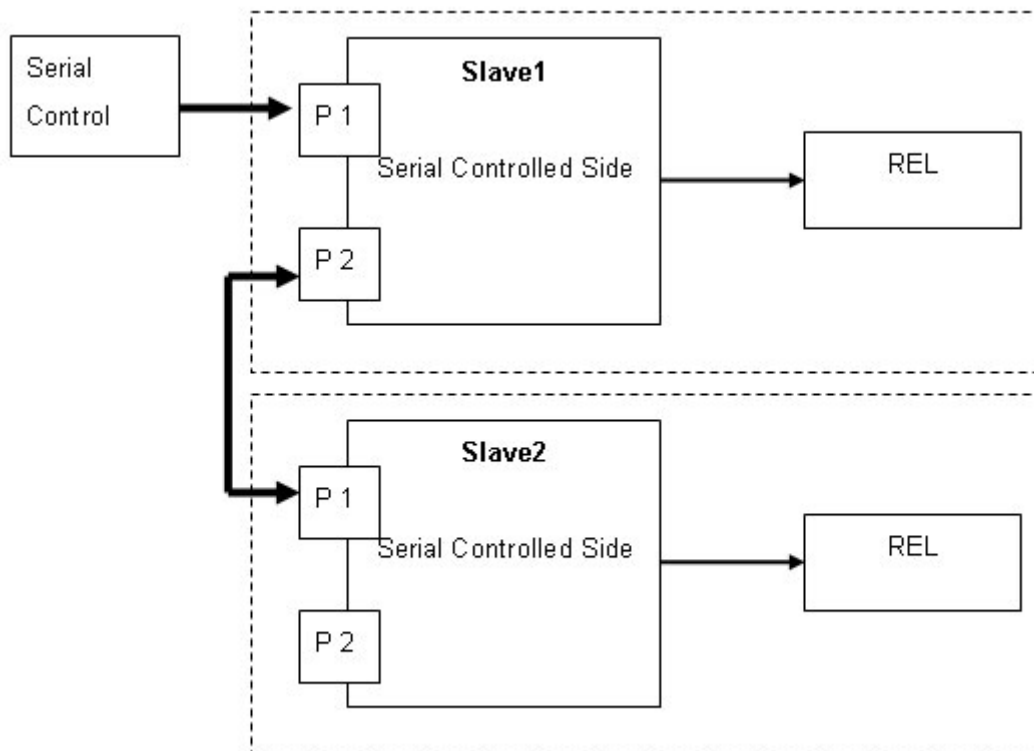
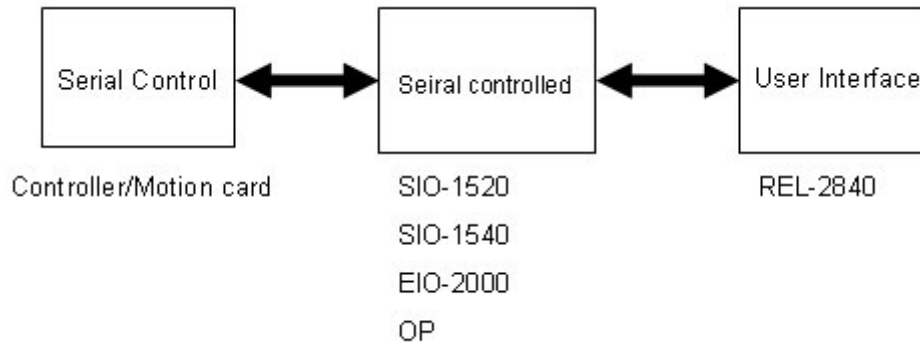
| I Point Name  | I Point Number | O Point Name          | O Point Number |
|---------------|----------------|-----------------------|----------------|
| Feedrate 100% | I383           |                       |                |
| Feedrate F%+  | I366           |                       |                |
| 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%)<br>LED  | O328           |
|              |                | Feedrate OR(80%)<br>LED  | O351           |
|              |                | Feedrate OR(90%)<br>LED  | O350           |
|              |                | Feedrate OR(100%)<br>LED | O349           |
|              |                | Feedrate OR(110%)<br>LED | O348           |
|              |                | Feedrate OR(120%)<br>LED | O347           |
|              |                | Feedrate OR(130%)<br>LED | O346           |
|              |                | Feedrate OR(140%)<br>LED | O345           |
|              |                | Feedrate OR(150%)<br>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

$$1(\text{control port}) \times 2(\text{EIO-2000-2}) \times 60 \text{ IN} = 120 \text{ IN}$$

$$1(\text{control port}) \times 2(\text{EIO-2000-2}) \times 48 \text{ OUT} = 96 \text{ OUT}$$

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

$$1(\text{control port}) \times 2(\text{SIO-1540}) \times 40 \text{ IN} = 80 \text{ IN}$$

$$1(\text{control port}) \times 2(\text{SIO-1540}) \times 32 \text{ OUT} = 64 \text{ OUT}$$

And so on.....

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

## I/O card specification

- 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.

### 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)

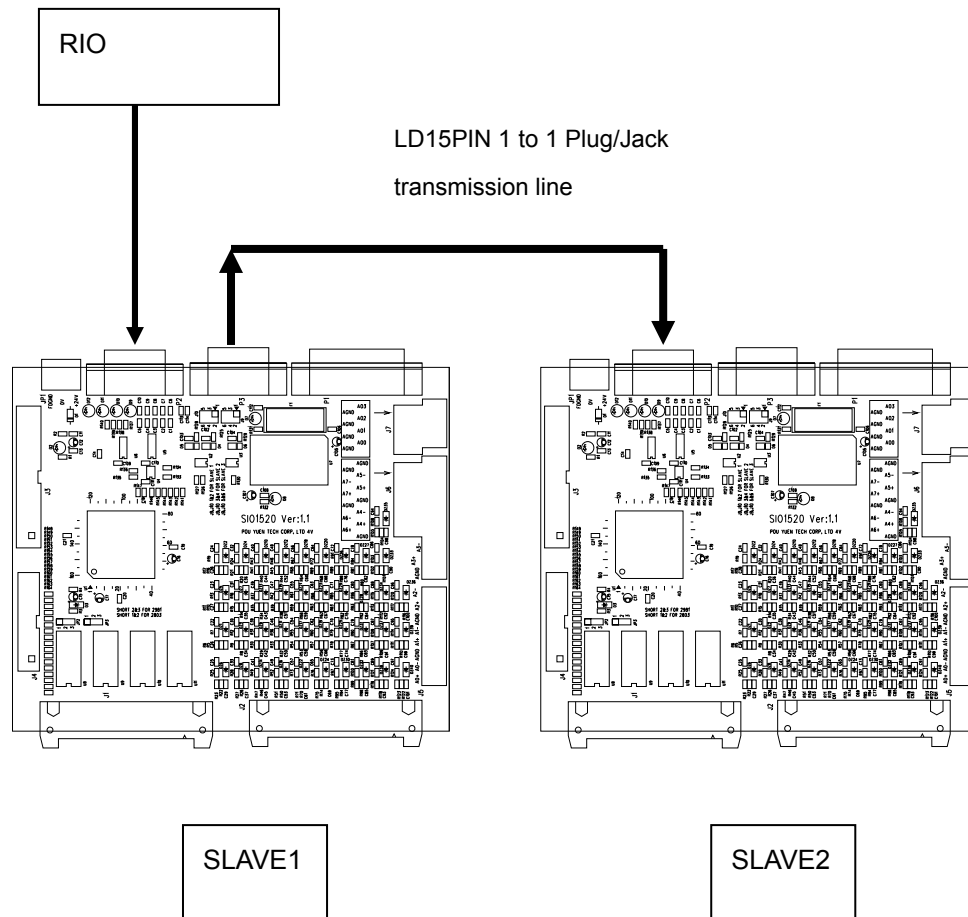
◎Rated Capacity : E24V±0.5V (3A UP)

### 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.

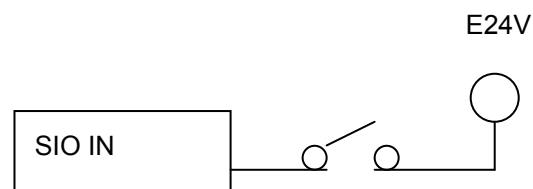
◎Serial expansion example : Serial connection for 2 SIO-1520 cards :



### D 、 E : IO port

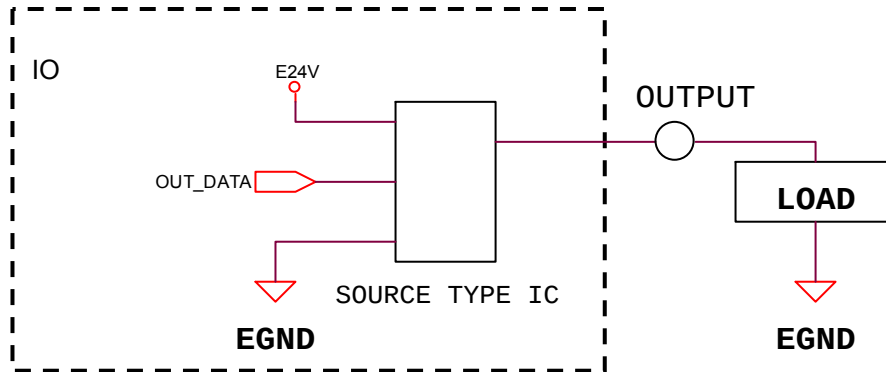
◎Description : D head contains 32 sets of 24V OUT, and E head contains 40 sets of IN.

◎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 than 60 mA, when doing load selection. Otherwise it may have damage to components.  $E24V/60\text{ mA}=400\Omega$  ← 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.

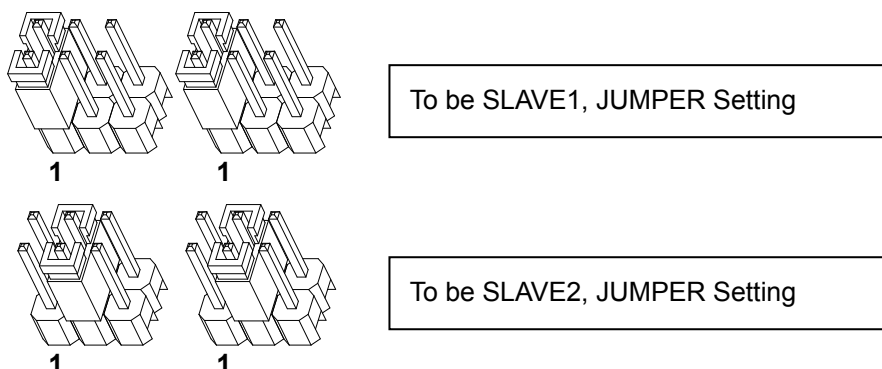
#### F、G : Spare IO Connector

◎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 :



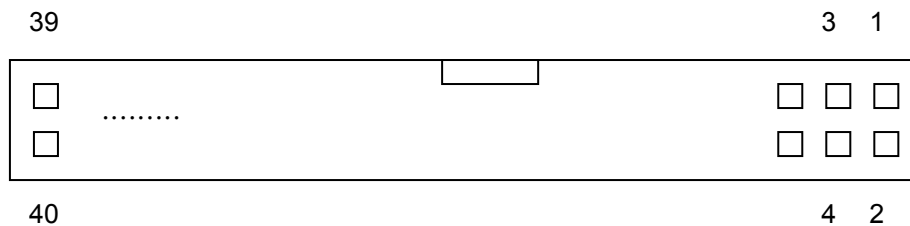
## I : Communication/Power Indicator Light

### ◎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)

39

3 1

|                                |                                                                            |
|--------------------------------|----------------------------------------------------------------------------|
| <input type="checkbox"/> ..... | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| <input type="checkbox"/>       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |

REL

4 2

| 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       |

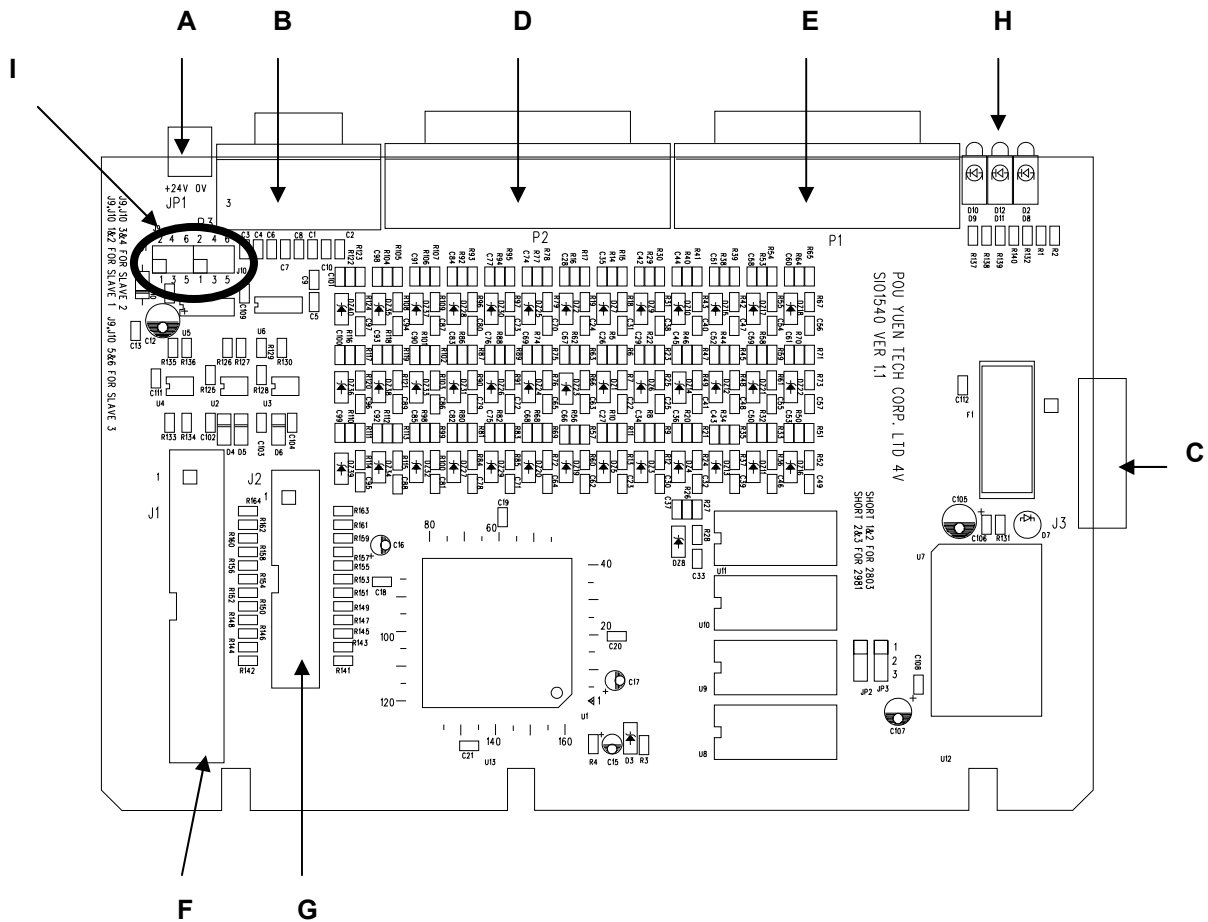
### 3.7 I/O SIO 1540

#### 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 :

| <b>Power</b>        |                         |                      |                          |
|---------------------|-------------------------|----------------------|--------------------------|
| Picture             | Type                    | Function             | Usage                    |
| A                   | 3PIN 3.81mm head        | DC(24V) POWER INPUT  | To POWER                 |
| <b>Light</b>        |                         |                      |                          |
| 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             |
| <b>IO Connector</b> |                         |                      |                          |
| 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                   |
| <b>Setting</b>      |                         |                      |                          |
| 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 output power, if this pin has problem, O point output will be error. (Has no effect to IN point).

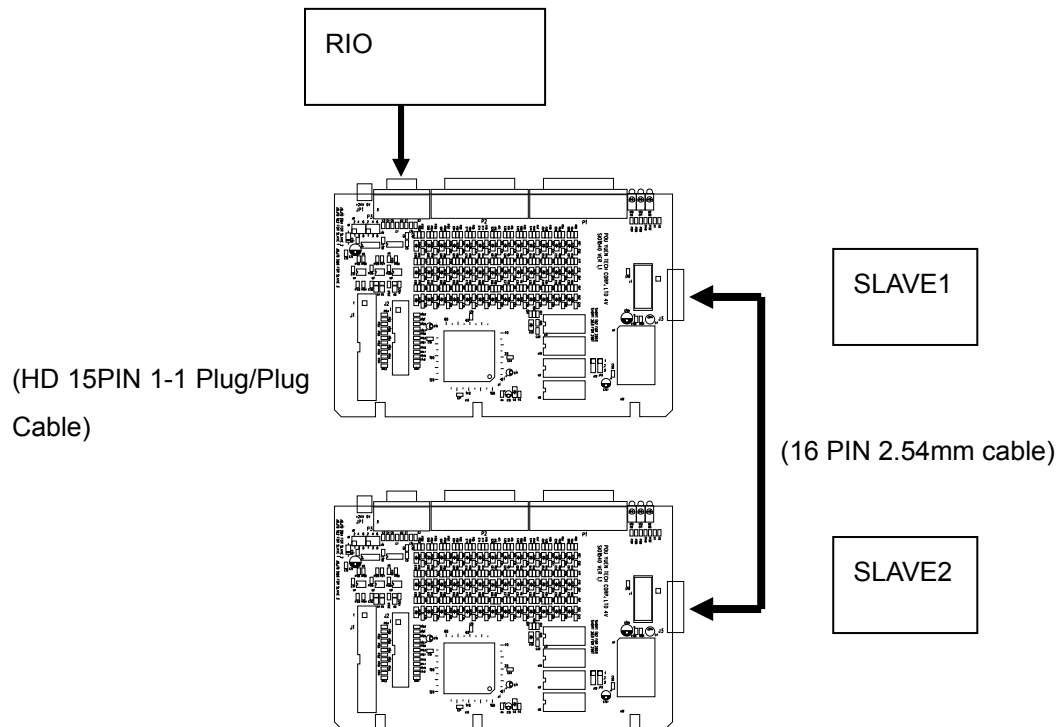
◎Rated Capacity : E24V±0.5V (3A UP)

### B 、 C : Serial 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 parallel signal, is for serial expansion to use.

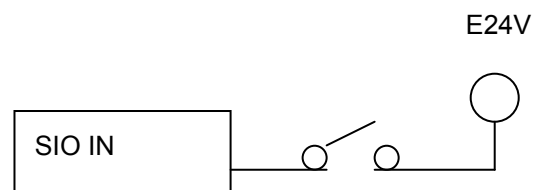
◎Serial expansion example : Serial connection for 2 SIO-1540 cards.



### D 、 E : IO Port

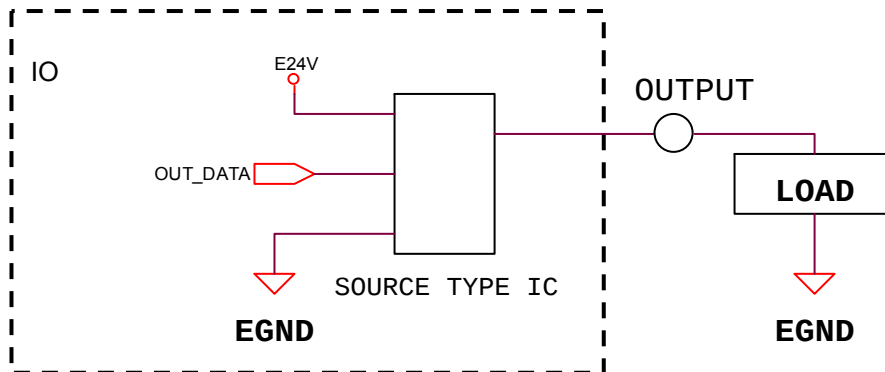
◎Description : 1.D 、 E head connects to REL to do IO controller. Each port can control 20IN/16OUT to coordinate with REL board.

◎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 than 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

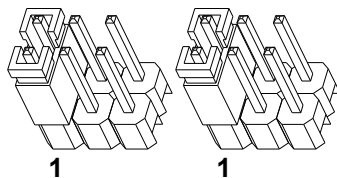
◎Description :

- (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.

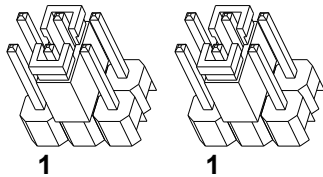
I : SLAVE JUMPER

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

◎Setting Sample :



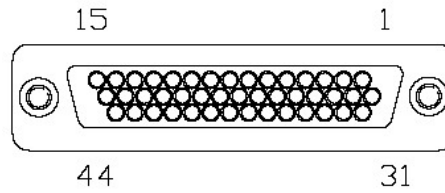
To be SLAVE1 · JUMPER Setting



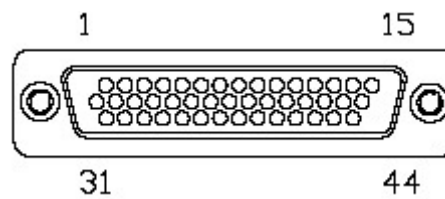
To be SLAVE2 · JUMPER Setting

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



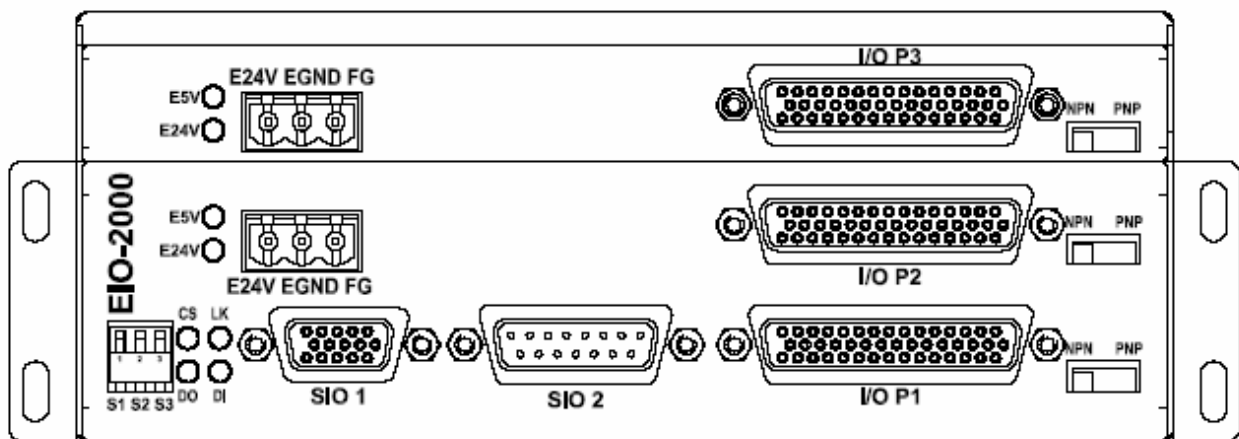
### 3.8 I/O EIO2000 Definition

#### Specification

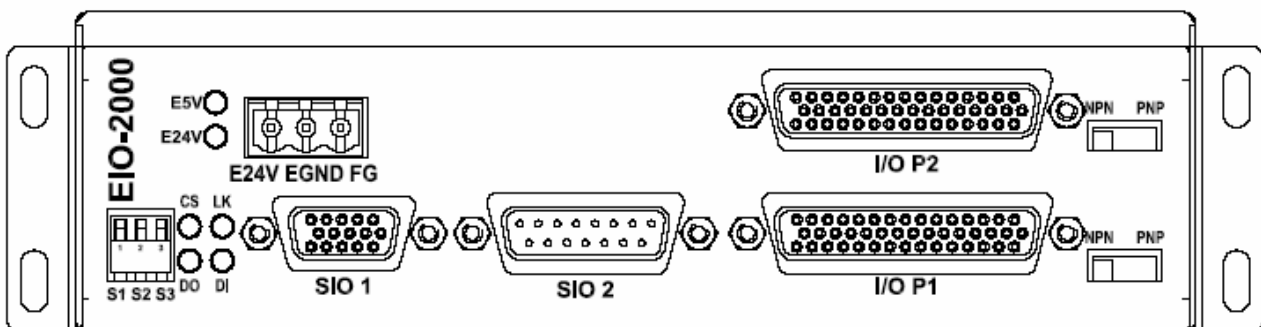
- 1.Type(1)- 40 IN / 32 OUT ; Type(2)- 60 IN / 48 OUT
- 2.Every serial port can connect with 2 sets of EIO-2000 ; Max to be 120 IN / 96 OUT.
- 3.NPN and PNP mode setting.
- 4.SLAVE number setting (1~3).

#### Hardware :

## EIO-2000(60in 48out)



## EIO-2000(40in 32out)



### Connector Light Description

| Power           |                   |                      |                                 |
|-----------------|-------------------|----------------------|---------------------------------|
| Picture         | Component         | Function             | Description                     |
| E24V EGND<br>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.

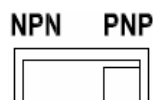
### Setting and light description

(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.

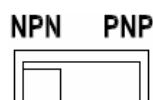
(1)PNP mode : (default)

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.





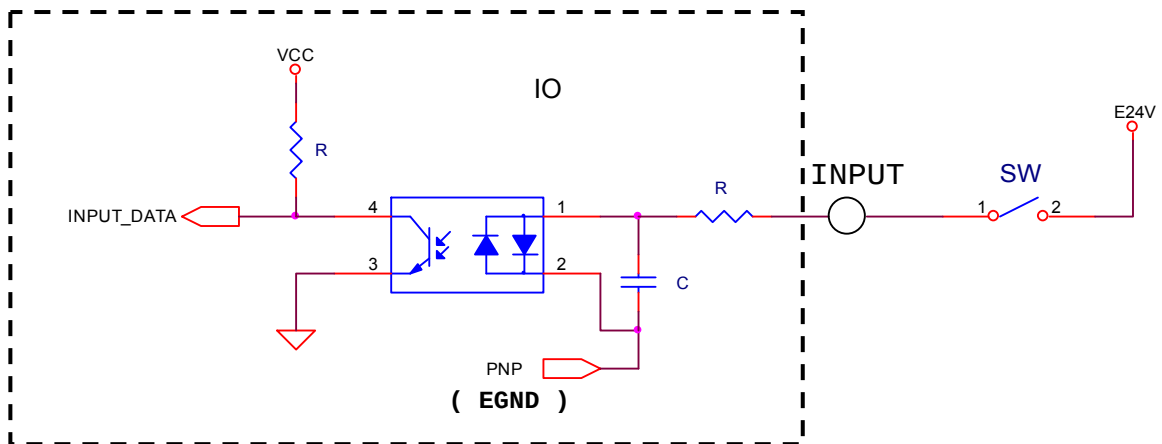
- Component power should be the same with E24V and EGND, otherwise the IN will be invalid.
- Please switch off E24V power and do mode switching, make sure not to do switching while electricity ON.

(B) IO Port (P1、P2、P3) :

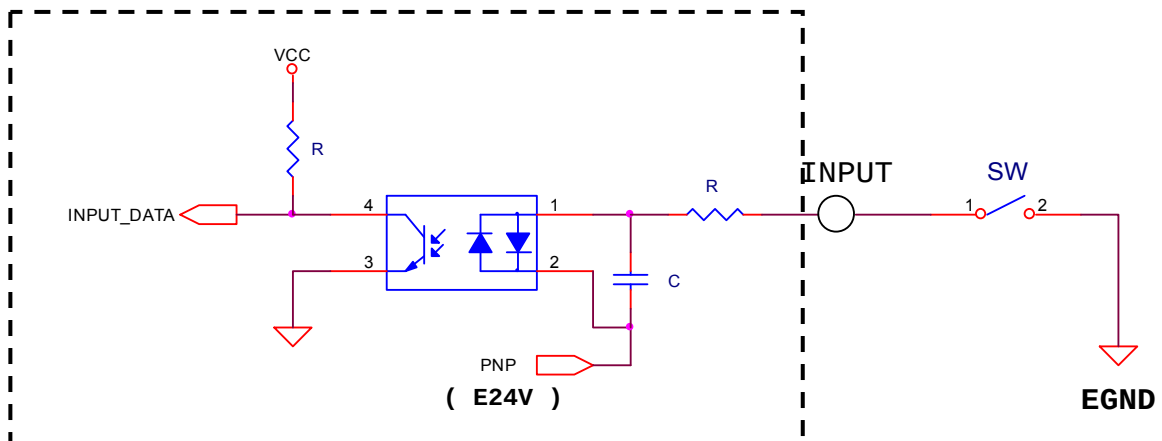
This Pin is to REL board to do IO control. Every port can control 20IN/16OUT with REL board.

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

PNP :

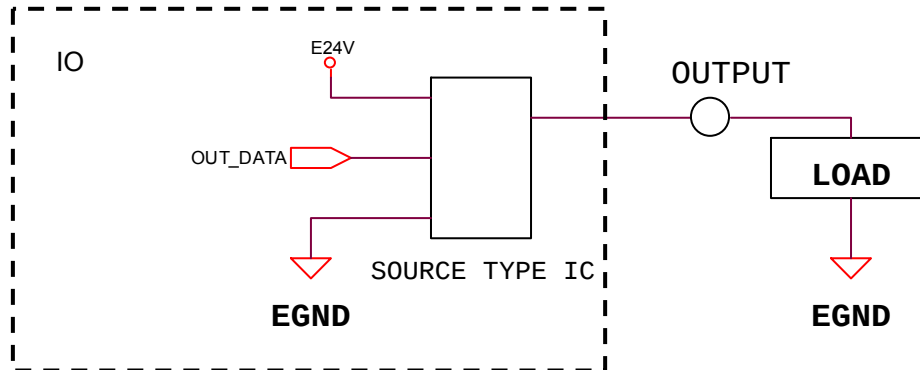


NPN :



## (2) OUT Usage

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



## Notice :



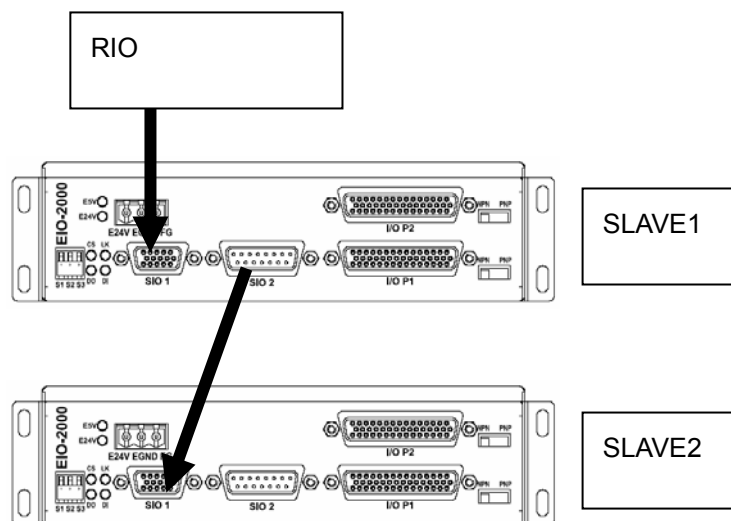
- Please do not make the current more than 60 mA, when doing load selection. Otherwise it may have damage to components.  $E24V/60\text{ mA}=400\Omega \leftarrow$  Load resistance can not be less than this value.
- When O point grounds, if shortcircuit happens, IC will burn out instantly, please pay 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)



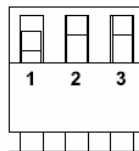


- Serial connection cable is one on one cables, please make sure the shielding of wire, refer to annex 1.

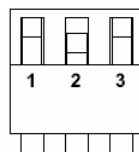
(D) SLAVE Switch :

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.**

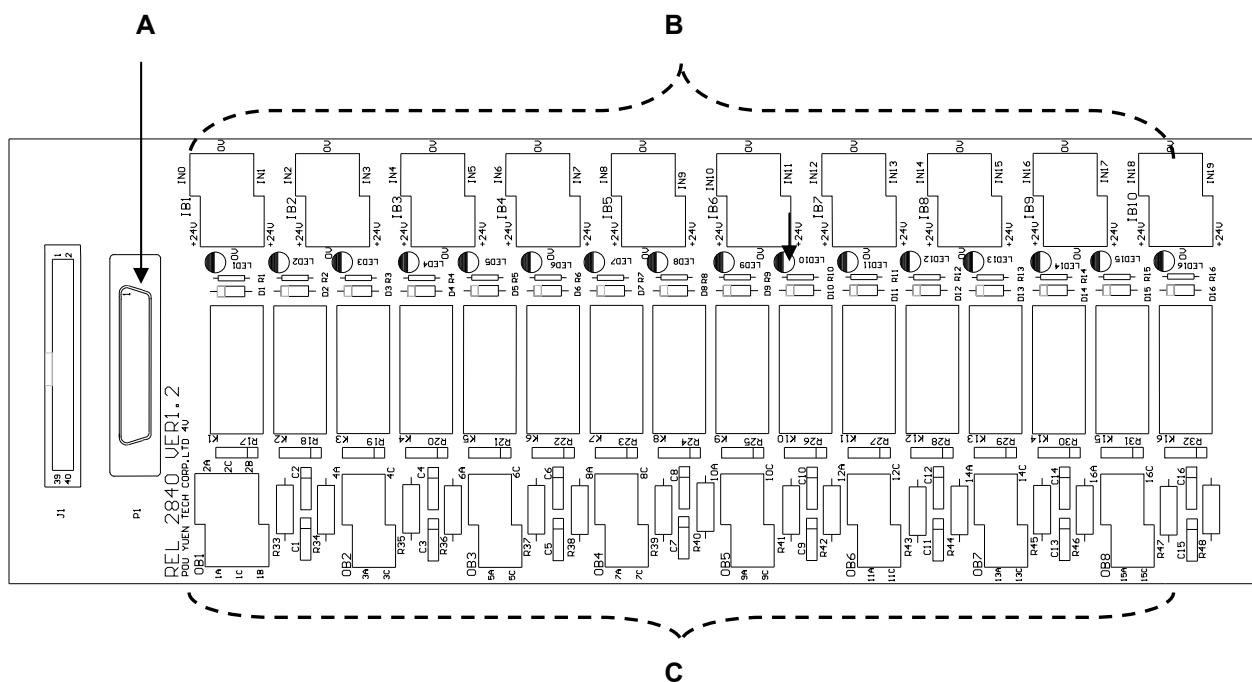
### 3.9 REL 2840 definition

#### 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

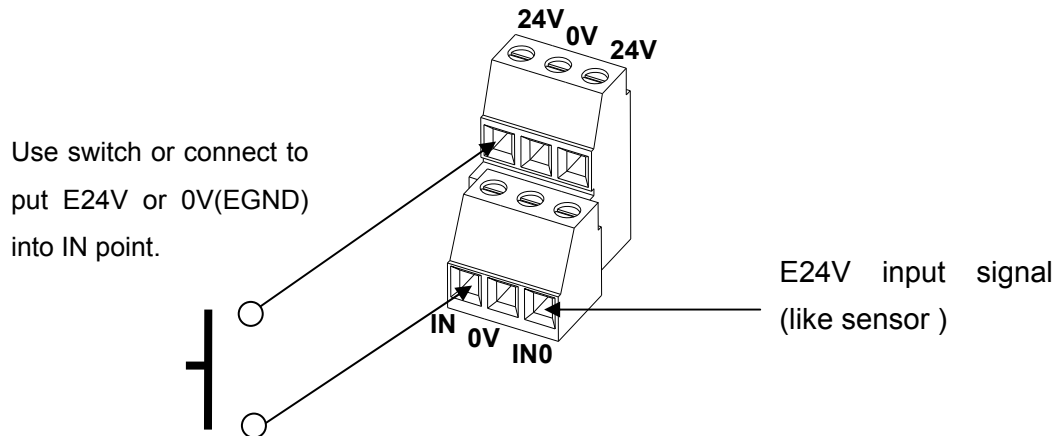
◎Description：This connector is 20 IN/16 OUT IO control connector to connect 與 with SIO and EIO.

##### 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：

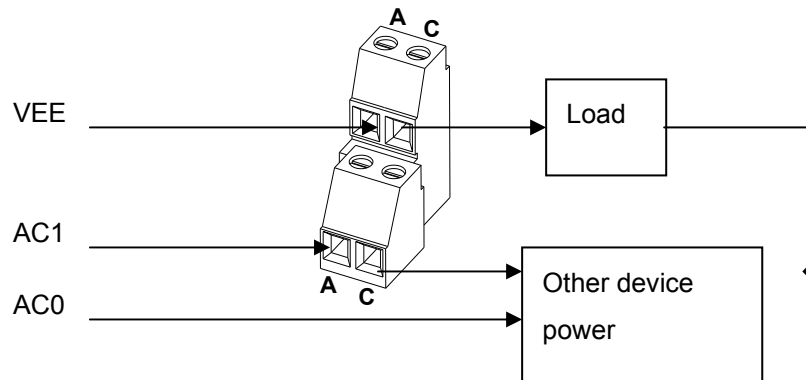


- When using NPN IN, please make sure the SIO and EIO support NPN mode.
- Please follow direction to do wiring, not make E24V and EGND at short circuit situation.

### C : OUT Connector

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

◎OUT Connector usage sample :



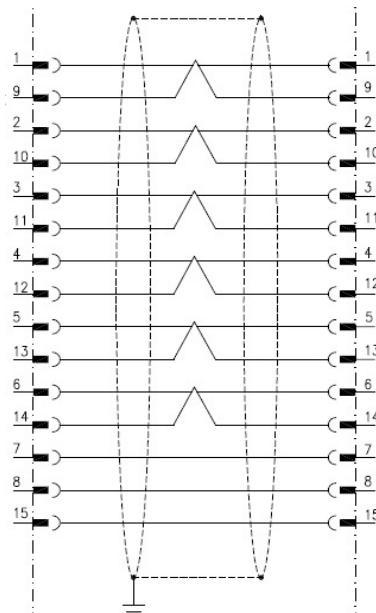
### Annex 1 :

SIO serial communication cable information:

\*Cable is one on one.

\*Use pair twisted cables

\*The metal shield must be connected.



## Annex 2 :

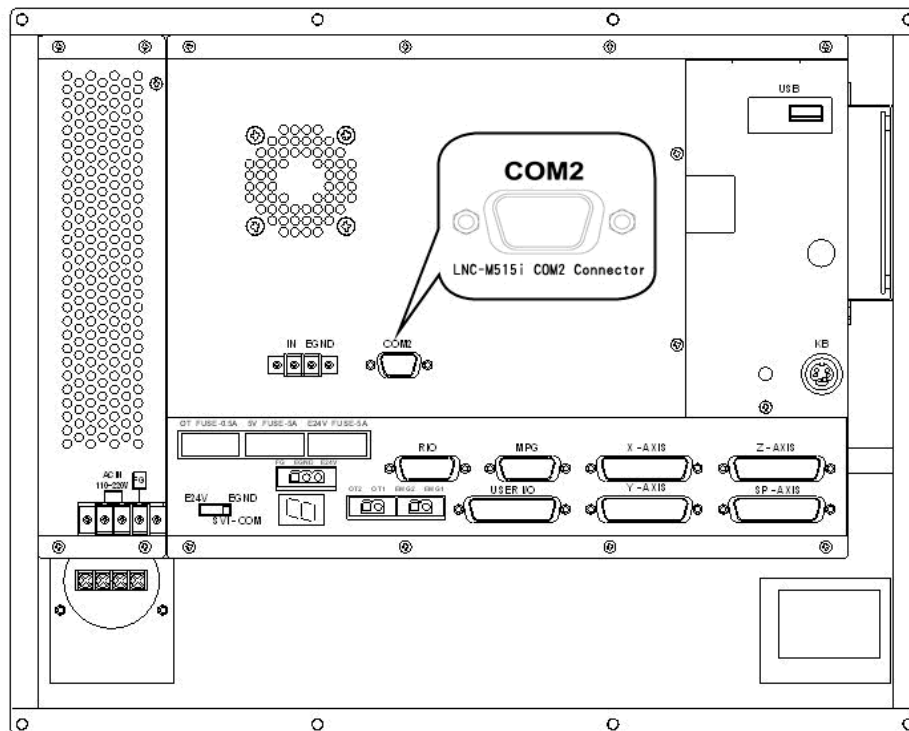
| HD_SUB 44PIN(1) definition 『USER IO(plug)/SIO1540(Jack)/EIO2000(Jack)』 |            |     |            |     |            |
|------------------------------------------------------------------------|------------|-----|------------|-----|------------|
| PIN                                                                    | 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       | -   | -          |

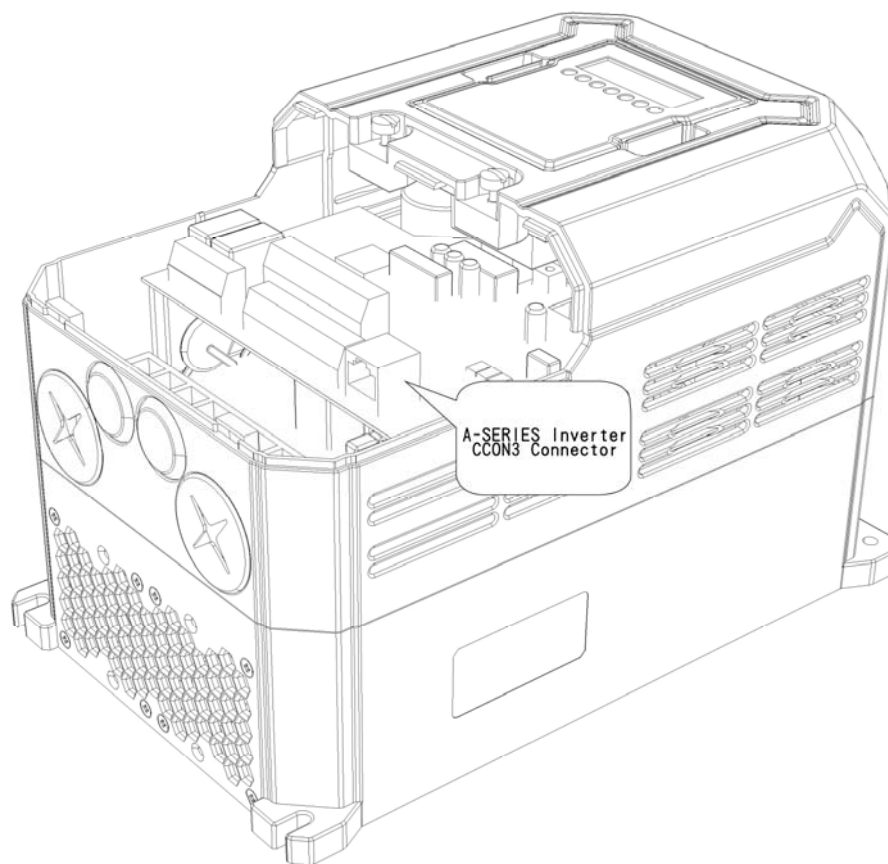
### 3.10 LNC-M515i + A-SERIES Inverter communication wiring description :

#### 1.LNC-M515i port :



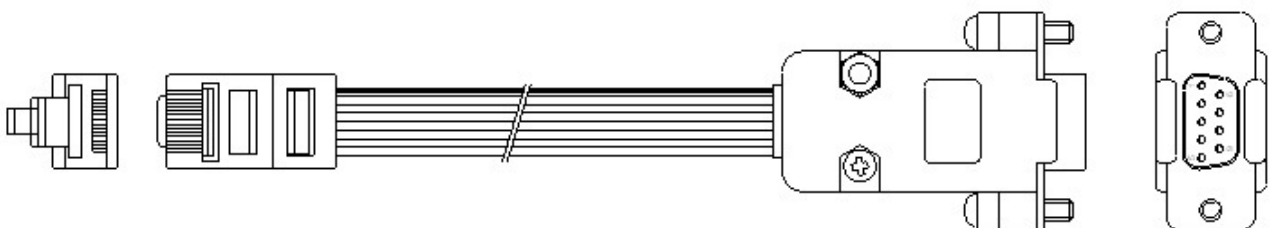
Use LNC-M515i COM2 Port

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   |

| <b>BIT #</b> | <b>SYMBOL</b> | <b>DESCRIPTION</b>                                   | <b>PAGE</b> |
|--------------|---------------|------------------------------------------------------|-------------|
| 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-Constant 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 Measurement Touching Signal:+X     | 69   |

| <b>BIT #</b> | <b>SYMBOL</b> | <b>DESCRIPTION</b>                                                  | <b>PAGE</b> |
|--------------|---------------|---------------------------------------------------------------------|-------------|
| 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   | AFLI   | 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<br>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<br>INCREMENTAL JOG OVERRIDE 2: x10, 3: x100, 4 : x1000, OTHERS: x1      | 95   |
| 015   | SPDOV   | ROTATION SPEED OVERRIDE OF THE SPINDLE<br>0 ~ 12 REPRESENT 0% ~ 120%, RESPECTIVELY; OTHERS: SET VALUE × 0.01 | 96   |
| 016   | FEEDOV  | CUTTING OVERRIDE<br>0 ~ 20 REPRESENT 0% ~ 200%, RESPECTIVELY; OTHERS: SET VALUE × 0.001                      | 96   |
| 017   | JGOV    | JOG OVERRIDE<br>0 ~ 20 REPRESENT 0% ~ 200%, RESPECTIVELY; OTHERS: SET VALUE × 0.001                          | 97   |
| 018   | RTOV    | RAPID TRAVERSE OVERRIDE<br>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   | PM CZMM | MOTION COMMAND OF PMC AXIS: Z AXIS, mm part                                                                  | 98   |
| 029   | PM CZUM | 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   |

## MLC Maintenance -- C , S BITS & Register

| <b>BIT #</b> | <b>SYMBOL</b> | <b>DESCRIPTION</b>             | <b>PAGE</b> |
|--------------|---------------|--------------------------------|-------------|
| 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.

|                  |                                        |
|------------------|----------------------------------------|
| <b>C Bit 006</b> | <b>SELECT AXIS &amp; DIRECTION: +X</b> |
| <b>C Bit 007</b> | <b>SELECT AXIS &amp; DIRECTION: -X</b> |
| <b>C Bit 008</b> | <b>SELECT AXIS &amp; DIRECTION: +Y</b> |
| <b>C Bit 009</b> | <b>SELECT AXIS &amp; DIRECTION: -Y</b> |
| <b>C Bit 010</b> | <b>SELECT AXIS &amp; DIRECTION: +Z</b> |
| <b>C Bit 011</b> | <b>SELECT AXIS &amp; DIRECTION: -Z</b> |
| <b>C Bit 012</b> | <b>+4 Axis Direction</b>               |
| <b>C Bit 013</b> | <b>-4 Axis Direction</b>               |

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.

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

(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 triggered, NC will auto-calculate the tool geometry OFFSET amount.

Touch Sensor

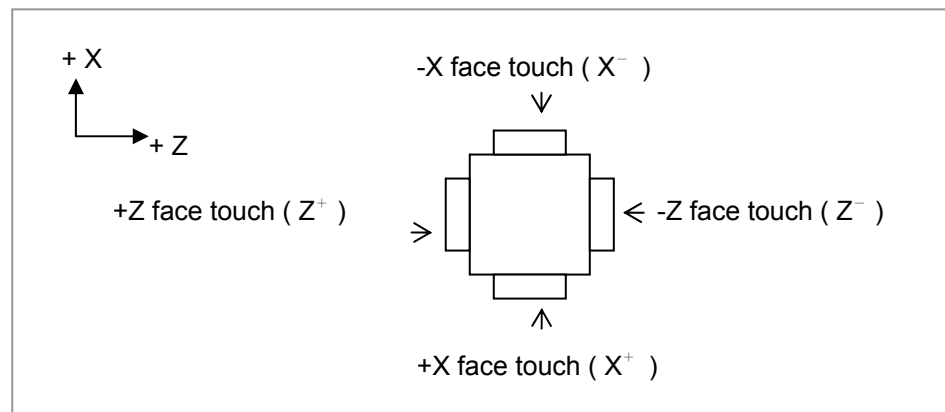
Every axis will provide +/- ive directions touching face. Please refer to the below diagram and description:

$X^+$  : 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)



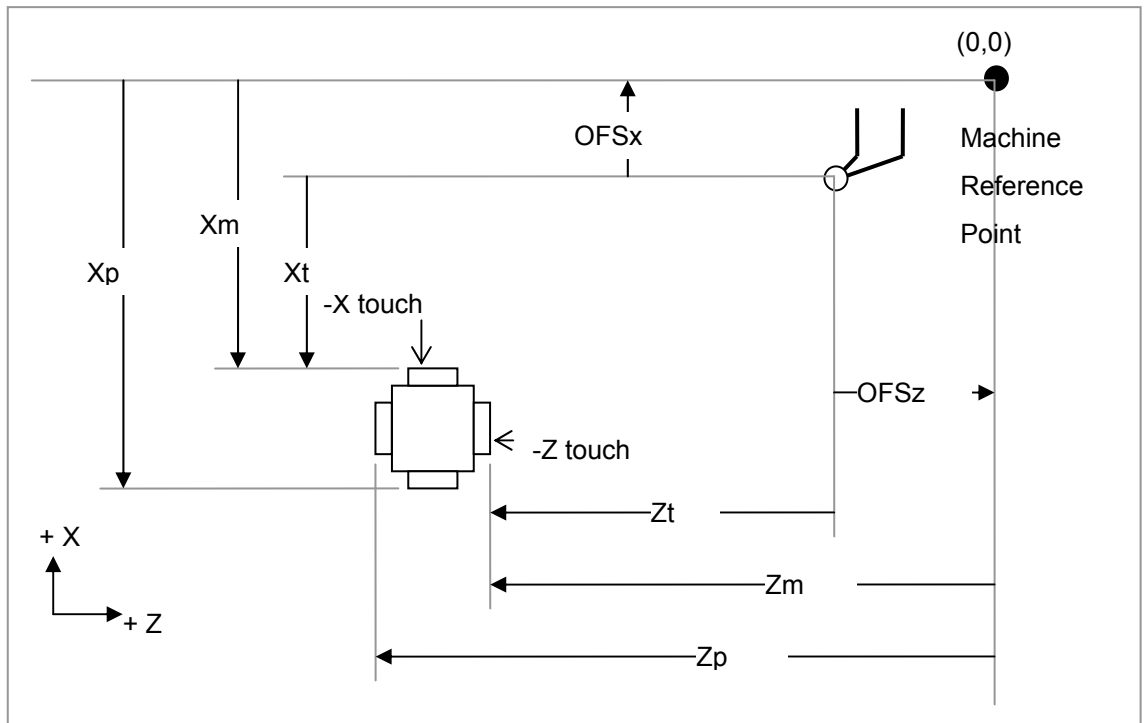
R Register 012 : Offset number of manual tool geometry measurement.

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.

|                  |                                 |
|------------------|---------------------------------|
| <b>C Bit 031</b> | <b>HOME DOG: X AXIS</b>         |
| <b>C Bit 032</b> | <b>HOME DOG: Y AXIS</b>         |
| <b>C Bit 033</b> | <b>HOME DOG: Z AXIS</b>         |
| <b>C Bit 034</b> | <b>4th Axis Home DOG Signal</b> |

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.

|                  |                       |
|------------------|-----------------------|
| <b>C Bit 036</b> | <b>EMERGENCY STOP</b> |
|------------------|-----------------------|

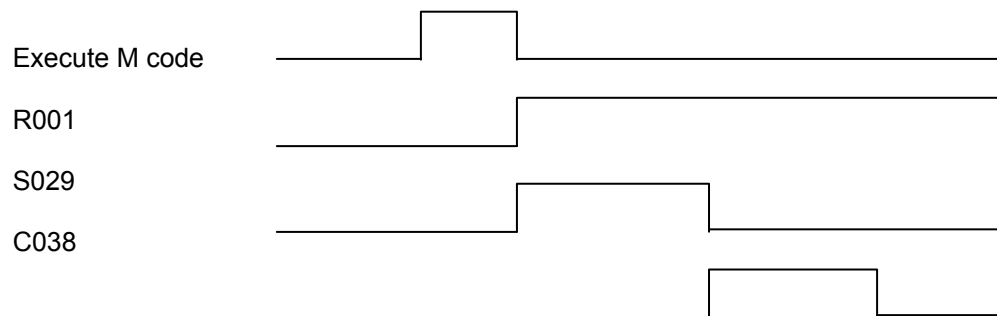
When C036 is ON, the system is reset, all motions stop, and the system status becomes NOT READY.

|                  |                       |
|------------------|-----------------------|
| <b>C Bit 037</b> | <b>EXTERNAL RESET</b> |
|------------------|-----------------------|

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

|                  |                            |
|------------------|----------------------------|
| <b>C Bit 038</b> | <b>M, S, T CODE FINISH</b> |
|------------------|----------------------------|

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:



- When executing M77, 77 is filled into R001.
- 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.
- This timing chart is not applicable to M00, M01, M02, M30, M98, & M99.

|                  |                     |
|------------------|---------------------|
| <b>C Bit 040</b> | <b>SINGLE BLOCK</b> |
|------------------|---------------------|

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.

|                  |                            |
|------------------|----------------------------|
| <b>C Bit 041</b> | <b>OPTIONAL BLOCK SKIP</b> |
|------------------|----------------------------|

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**

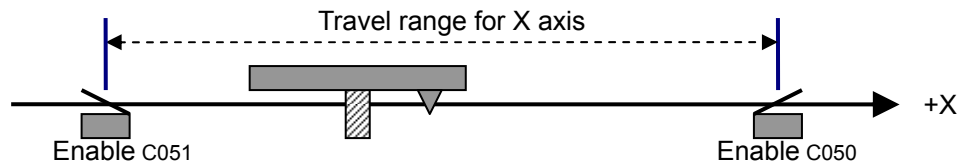
When C049 is ON, the command for the corresponding axis will not be executed.

For example: When the 4<sup>th</sup> axis is set to be ignored and a block "G01 X10 Z10 C10" is executed, the command of "C10" will be neglected.

|                  |                             |
|------------------|-----------------------------|
| <b>C Bit 050</b> | <b>AXIS OVER TRAVEL: +X</b> |
| <b>C Bit 051</b> | <b>AXIS OVER TRAVEL: -X</b> |
| <b>C Bit 052</b> | <b>AXIS OVER TRAVEL: +Y</b> |
| <b>C Bit 053</b> | <b>AXIS OVER TRAVEL: -Y</b> |
| <b>C Bit 054</b> | <b>AXIS OVER TRAVEL: +Z</b> |
| <b>C Bit 055</b> | <b>AXIS OVER TRAVEL: -Z</b> |
| <b>C Bit 056</b> | <b>+4th Axis OT</b>         |
| <b>C Bit 057</b> | <b>-4th Axis OT</b>         |

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 4 <sup>th</sup> axis's positive direction |
| 57    | PLC travel limit of the 4 <sup>th</sup> 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 4 <sup>th</sup> 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 |

|                  |                               |
|------------------|-------------------------------|
| <b>C Bit 059</b> | <b>AXIS INTERLOCK: X AXIS</b> |
| <b>C Bit 060</b> | <b>AXIS INTERLOCK: Y AXIS</b> |
| <b>C Bit 061</b> | <b>AXIS INTERLOCK: Z AXIS</b> |
| <b>C Bit 062</b> | <b>4th Axis Interlock</b>     |

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

|                  |                                                             |
|------------------|-------------------------------------------------------------|
| <b>C Bit 066</b> | <b>HANDLE INTERRUPT: X AXIS</b>                             |
| <b>C Bit 067</b> | <b>HANDLE INTERRUPT: Y AXIS</b>                             |
| <b>C Bit 068</b> | <b>HANDLE INTERRUPT: Z AXIS</b>                             |
| <b>C Bit 069</b> | <b>4th Axis: Select Axis Direction Signal of Handle INT</b> |

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.

|                  |                              |
|------------------|------------------------------|
| <b>C Bit 072</b> | <b>1st Spindle JOG</b>       |
| <b>C Bit 073</b> | <b>2nd Spindle JOG</b>       |
| <b>C Bit 074</b> | <b>3rd Spindle JOG</b>       |
|                  | 1 <sup>st</sup> spindle JOG. |

|                  |                             |
|------------------|-----------------------------|
| <b>C Bit 075</b> | <b>SERVO ALARM: X AXIS</b>  |
| <b>C Bit 076</b> | <b>SERVO ALARM: Y AXIS</b>  |
| <b>C Bit 077</b> | <b>SERVO ALARM: Z AXIS</b>  |
| <b>C Bit 078</b> | <b>4th Axis Servo Alarm</b> |

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

|                  |                        |
|------------------|------------------------|
| <b>C Bit 080</b> | <b>3rd Spindle CW</b>  |
| <b>C Bit 081</b> | <b>3rd Spindle CCW</b> |
| <b>C Bit 082</b> | <b>1st Spindle CW</b>  |
| <b>C Bit 083</b> | <b>1st Spindle CCW</b> |
| <b>C Bit 087</b> | <b>2nd Spindle CW</b>  |
| <b>C Bit 088</b> | <b>2nd Spindle CCW</b> |

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.

|                  |                            |
|------------------|----------------------------|
| <b>C Bit 085</b> | <b>Spindle Orientation</b> |
|------------------|----------------------------|

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.

|                  |                              |
|------------------|------------------------------|
| <b>C Bit 089</b> | <b>ENABLE MIRROR: X AXIS</b> |
| <b>C Bit 090</b> | <b>ENABLE MIRROR: Y AXIS</b> |
| <b>C Bit 091</b> | <b>ENABLE MIRROR: Z AXIS</b> |
| <b>C Bit 092</b> | <b>4th Axis Servo Alarm</b>  |

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

|                  |                                                 |
|------------------|-------------------------------------------------|
| <b>C Bit 095</b> | <b>Select Semi-Constant Position of Spindle</b> |
|------------------|-------------------------------------------------|

Lathe semi-constant M code.

|                  |                            |
|------------------|----------------------------|
| <b>C Bit 097</b> | <b>1st Spindle Gear #1</b> |
| <b>C Bit 098</b> | <b>1st Spindle Gear #2</b> |
| <b>C Bit 099</b> | <b>1st Spindle Gear #3</b> |
| <b>C Bit 116</b> | <b>2nd Spindle Gear #1</b> |
| <b>C Bit 117</b> | <b>2nd Spindle Gear #2</b> |
| <b>C Bit 118</b> | <b>2nd Spindle Gear #3</b> |
| <b>C Bit 121</b> | <b>3rd Spindle Gear #1</b> |
| <b>C Bit 122</b> | <b>3rd Spindle Gear #2</b> |
| <b>C Bit 123</b> | <b>3rd Spindle Gear #3</b> |

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 4<sup>th</sup> 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 |
|-------------------------|------|------------------|------------------|--------------------|
| 1 <sup>st</sup> 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           |
| 2 <sup>nd</sup> 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           |
| 3 <sup>rd</sup> 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           |

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

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 2<sup>nd</sup> zero point is prohibited. When some program path in the area below the 2<sup>nd</sup> 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.

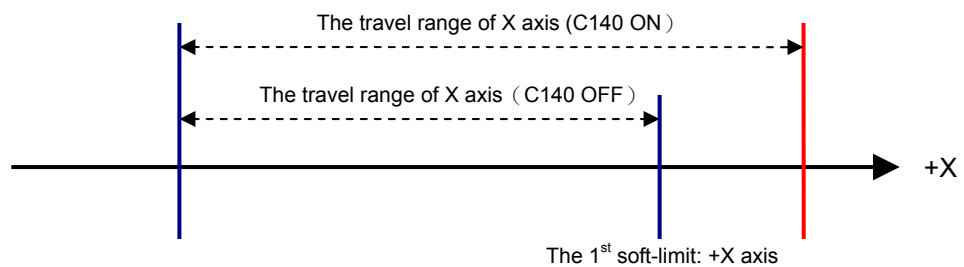
|                  |                                            |
|------------------|--------------------------------------------|
| <b>C Bit 140</b> | <b>THE 2ND SOFT-LIMIT: +X</b>              |
| <b>C Bit 141</b> | <b>THE 2ND SOFT-LIMIT: -X</b>              |
| <b>C Bit 142</b> | <b>THE 2ND SOFT-LIMIT: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

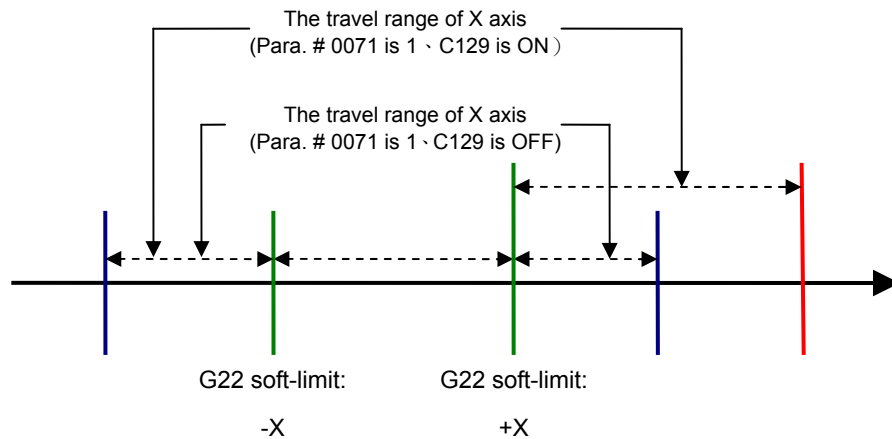
The 1<sup>st</sup> soft-limit : Set by Pr.1006 ~ Pr.1013. The values set by these parameters will be enabled only after Home return is executed. The default value of the positive axial soft-limit is 99999.999mm, and the negative default value is -99999.999mm.

The 2<sup>nd</sup> 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 1<sup>st</sup> and 2<sup>nd</sup> 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 1 <sup>st</sup> soft-limit;<br>ON, adopt the 2 <sup>nd</sup> soft-limit. |
| Soft-limit: -X axis                   | C141: OFF, adopt the 1 <sup>st</sup> soft-limit;<br>ON, adopt the 2 <sup>nd</sup> soft-limit. |
| Soft-limit: +Y axis                   | C142: OFF, adopt the 1 <sup>st</sup> soft-limit;<br>ON, adopt the 2 <sup>nd</sup> soft-limit. |
| Soft-limit: -Y axis                   | C143: OFF, adopt the 1 <sup>st</sup> soft-limit;<br>ON, adopt the 2 <sup>nd</sup> soft-limit. |
| Soft-limit: +Z axis                   | C144: OFF, adopt the 1 <sup>st</sup> soft-limit;<br>ON, adopt the 2 <sup>nd</sup> soft-limit. |
| Soft-limit: -Z axis                   | C145: OFF, adopt the 1 <sup>st</sup> soft-limit;<br>ON, adopt the 2 <sup>nd</sup> soft-limit. |
| Soft-limit: +The 4 <sup>th</sup> axis | C146: OFF, adopt the 1 <sup>st</sup> soft-limit;<br>ON, adopt the 2 <sup>nd</sup> soft-limit. |
| Soft-limit: -The 4 <sup>th</sup> axis | C147: OFF, adopt the 1 <sup>st</sup> soft-limit;<br>ON, adopt the 2 <sup>nd</sup> 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.

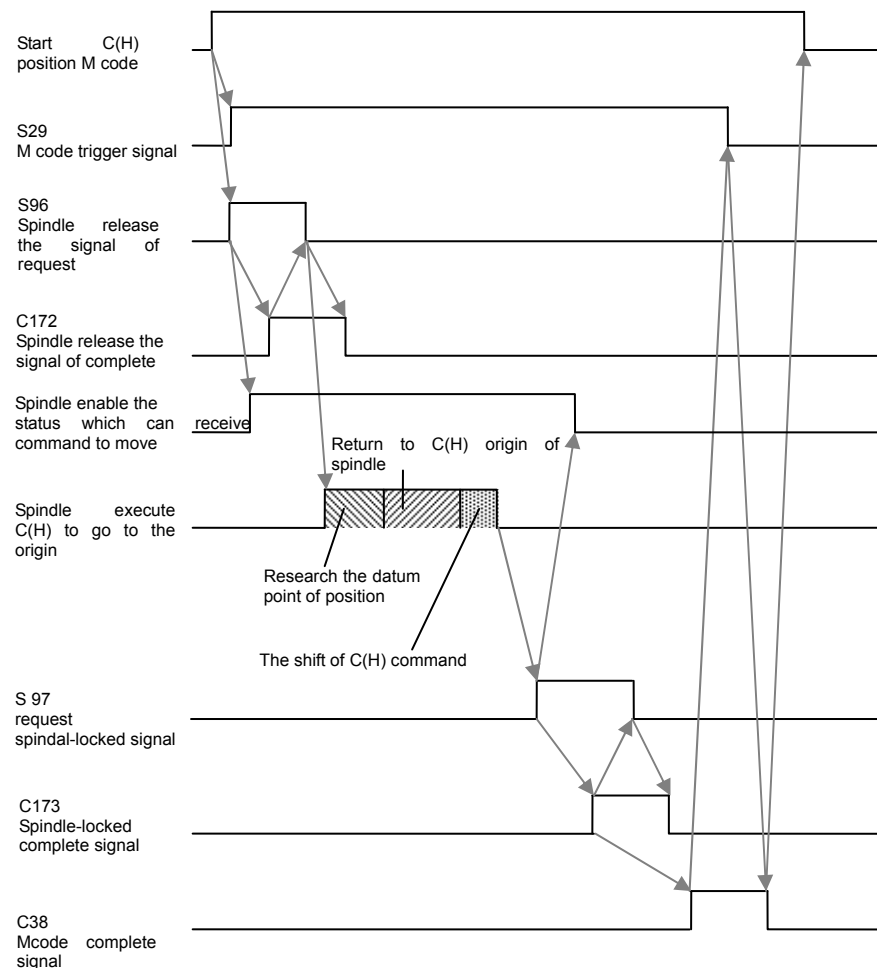


figure of ordinal process about spindle C(H) position mode to enter M code

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

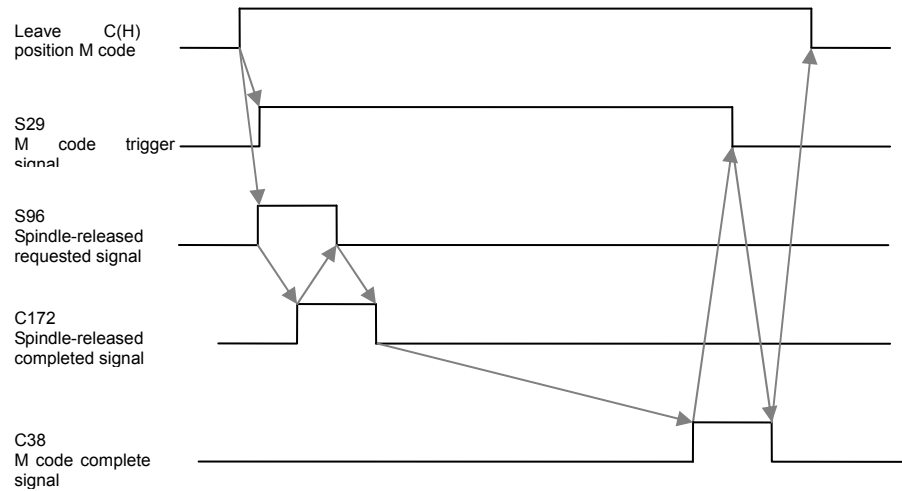


figure of ordinal process about spindle C(H) position mode to leave M code

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

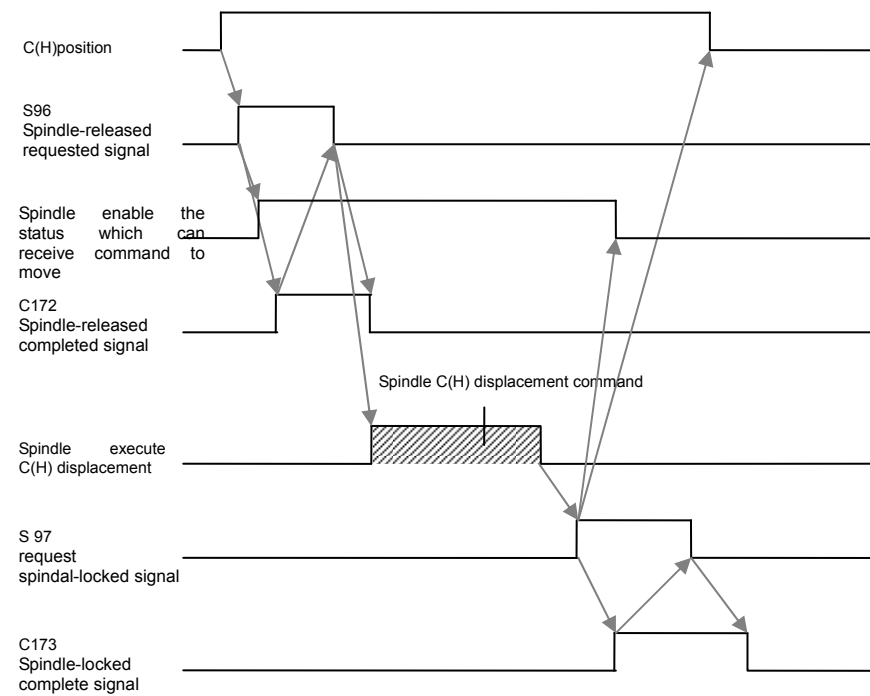


figure of ordinal process about spindle C(H)

|                  |                                                     |
|------------------|-----------------------------------------------------|
| <b>C Bit 201</b> | <b>Absolute encoder Reset Ready Signal:X Axis</b>   |
| <b>C Bit 202</b> | <b>Absolute encoder Reset Ready Signal:Y Axis</b>   |
| <b>C Bit 203</b> | <b>Absolute encoder Reset Ready Signal:Z Axis</b>   |
| <b>C Bit 204</b> | <b>Absolute encoder Reset Ready Signal:4th Axis</b> |

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

|                  |                                                    |
|------------------|----------------------------------------------------|
| <b>C Bit 207</b> | <b>Absolute Encoder Data Ready Signal:X Axis</b>   |
| <b>C Bit 208</b> | <b>Absolute Encoder Data Ready Signal:Y Axis</b>   |
| <b>C Bit 209</b> | <b>Absolute Encoder Data Ready Signal:Z Axis</b>   |
| <b>C Bit 210</b> | <b>Absolute Encoder Data Ready Signal:4th Axis</b> |

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

|                  |                                                                  |
|------------------|------------------------------------------------------------------|
| <b>C Bit 213</b> | <b>Absolute Encoder Data Bit 0Transmitting Signal : X Axis</b>   |
| <b>C Bit 214</b> | <b>Absolute Encoder Data Bit 0Transmitting Signal : Y Axis</b>   |
| <b>C Bit 215</b> | <b>Absolute Encoder Data Bit 0Transmitting Signal : Z Axis</b>   |
| <b>C Bit 216</b> | <b>Absolute Encoder Data Bit 0Transmitting Signal : 4th Axis</b> |

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.

|                  |                                                  |
|------------------|--------------------------------------------------|
| <b>C Bit 219</b> | <b>Absolute Encoder Bit 1 Transmit: X Axis</b>   |
| <b>C Bit 220</b> | <b>Absolute Encoder Bit 1 Transmit: Y Axis</b>   |
| <b>C Bit 221</b> | <b>Absolute Encoder Bit 1 Transmit: Z Axis</b>   |
| <b>C Bit 222</b> | <b>Absolute Encoder Bit 1 Transmit: 4th Axis</b> |

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 2<sup>nd</sup> spindle to rigid tap, PLC uses C125 to notify NC entering rigid tap mode, and ON C230 to notify NC to choose encoder of 2<sup>nd</sup> spindle to be the source of loop signal at the same time ◦ 1<sup>st</sup> spindle is the default to be the source of loop signal ◦ C230choose 2<sup>nd</sup> spindle encoder to be the source of loop signal  
C231choose 3<sup>rd</sup> spindle encoder to be the source of loop signal

| C230 | C231 | effect                         |
|------|------|--------------------------------|
| OFF  | OFF  | Choose 1 <sup>st</sup> spindle |
| ON   | OFF  | Choose 2 <sup>nd</sup> spindle |
| ON   | ON   |                                |
| OFF  | ON   | Choose 3 <sup>rd</sup> 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<sup>nd</sup> (or 3<sup>rd</sup>, 4<sup>th</sup>) HOME return and stops at the 2<sup>nd</sup> (or 3<sup>rd</sup>, 4<sup>th</sup>) 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**

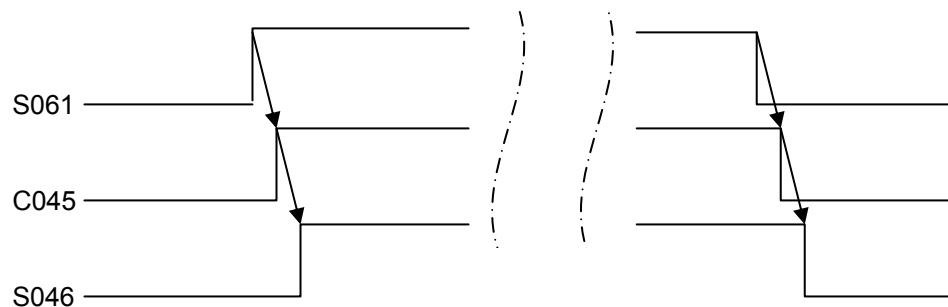
S047 refers to the status of Auxiliary Function Lock (AFL).

**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.

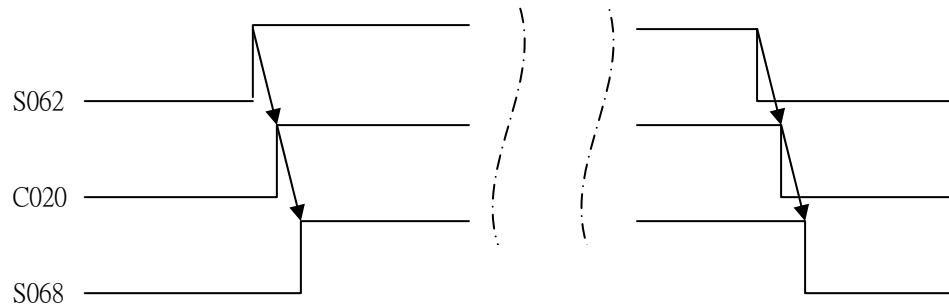
**S Bit 061 SOFT PANEL KEY: Z-AXIS NEGLECT**

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

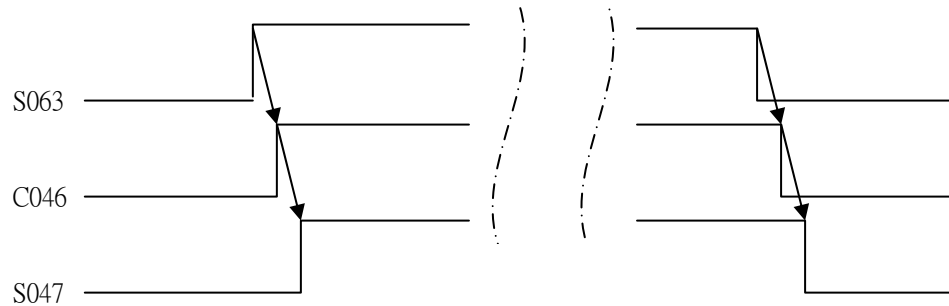


**S Bit 062**
**SOFT KEY: MPG DRY RUN**

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**

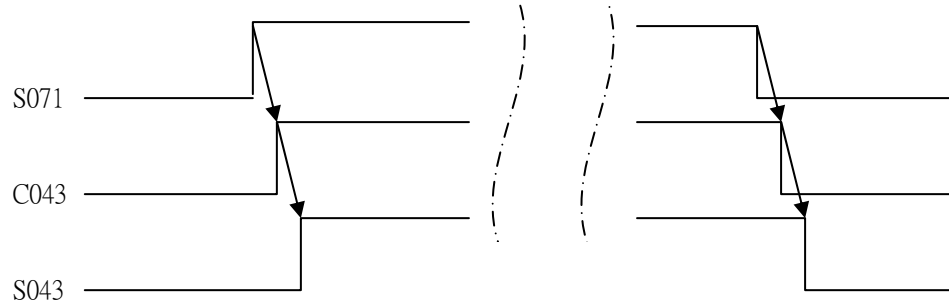
S068 indicates the corresponding status of MPG DRY RUN (MPGDRN).

**S Bit 069**
**T CODE STROBE**

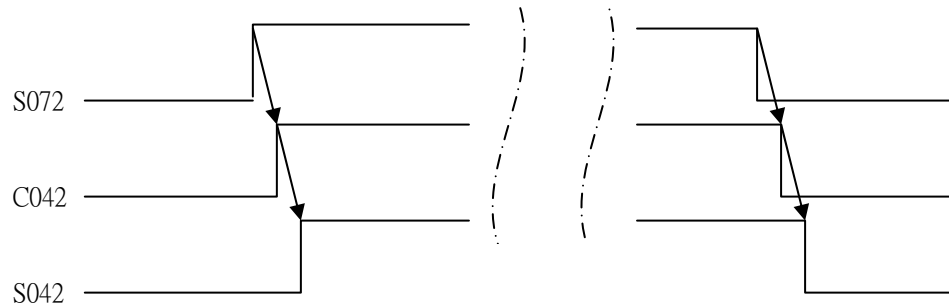
When T code is executed in the system, S069 is ON to notify LADDER to process T code until PLC responds with FIN signal.

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

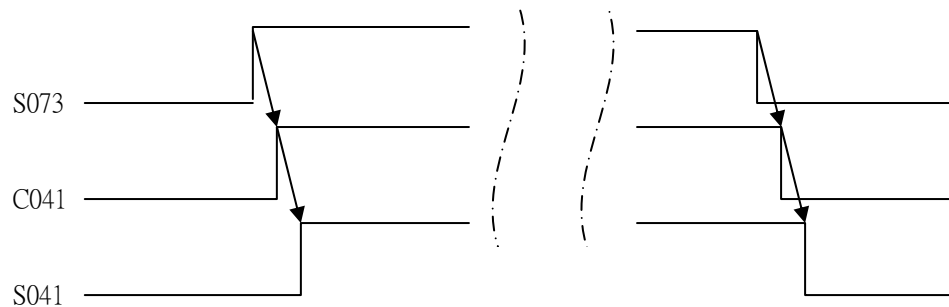
S071 notifies LADDER about the ON/OFF status of MACHINE LOCK key on the soft panel. The timing chart is as below:


**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:

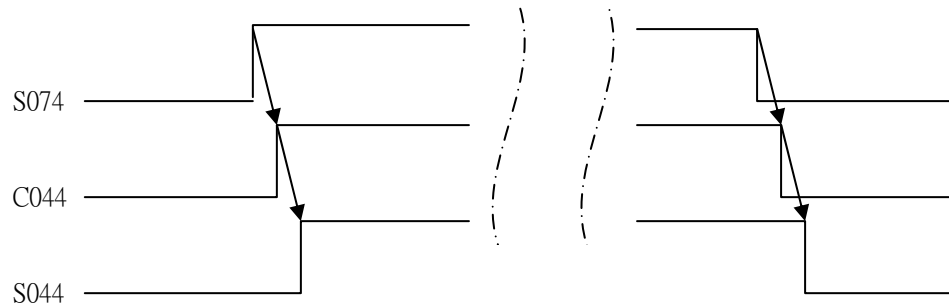

**S Bit 073**
**SOFT KEY: OPTIONAL BLOCK SKIP**

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.

|                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| <b>S Bit 052</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>2nd Spindle Zero Speed Arrival</b>           |
| <b>S Bit 057</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>3rd Spindle Zero Speed Arrival</b>           |
| <b>S Bit 092</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>THE 1ST SPINDLE REACHES ZERO SPEED</b>       |
| <p>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.</p> <p>The 1<sup>st</sup> spindle: Pr. 1063.</p> <p>The 2<sup>nd</sup> spindle: Pr. 0299.</p> <p>The 3<sup>rd</sup> spindle: Pr. 0882.</p>                                                                                                                                                  |                                                 |
| <b>S Bit 094</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Spindle Command Format is Pulse signal</b>   |
| <p>The signal will sent out when the form of control command of spindle is Pulse mode.</p>                                                                                                                                                                                                                                                                                                                                                  |                                                 |
| <b>S Bit 095</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Spindle Semi-Constant Positioning Finish</b> |
| <p>After spindle complete to rotate the semi-constant positioning angle, NC send out semi-constant positioning finish signal S95.</p>                                                                                                                                                                                                                                                                                                       |                                                 |
| <b>S Bit 096</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Request Signal of 1st Spindle Release</b>    |
| <b>S Bit 097</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Request Signal of 1st Spindle Lock</b>       |
| <p>S96 、 S97 are used to position CH :</p> <p>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</p> <p>S96 : the signal to request releasing 1<sup>st</sup> spindle</p> <p>S97 : the signal to request locking 1<sup>st</sup> spindle</p> |                                                 |
| <b>S Bit 100</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$320</b>                     |
| <b>S Bit 101</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$321</b>                     |
| <b>S Bit 102</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$322</b>                     |
| <b>S Bit 103</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$323</b>                     |
| <b>S Bit 104</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$324</b>                     |
| <b>S Bit 105</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$325</b>                     |
| <b>S Bit 106</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$326</b>                     |
| <b>S Bit 107</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$327</b>                     |
| <b>S Bit 108</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$328</b>                     |
| <b>S Bit 109</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$329</b>                     |
| <b>S Bit 110</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$330</b>                     |
| <b>S Bit 111</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$331</b>                     |
| <b>S Bit 112</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$332</b>                     |
| <b>S Bit 113</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$333</b>                     |
| <b>S Bit 114</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$334</b>                     |
| <b>S Bit 115</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MACRO Variable \$335</b>                     |
| <p>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.</p>                                                                                                                                                                               |                                                 |

**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 (Workpiece 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 |                      |   |

|                  |                                                     |
|------------------|-----------------------------------------------------|
| <b>S Bit 154</b> | <b>MOTION DIRECTION OF SERVO AXIS: X AXIS</b>       |
| <b>S Bit 155</b> | <b>MOTION DIRECTION OF SERVO AXIS: Y AXIS</b>       |
| <b>S Bit 156</b> | <b>MOTION DIRECTION OF SERVO AXIS: Z AXIS</b>       |
| <b>S Bit 157</b> | <b>MOTION DIRECTION OF SERVO AXIS: THE 4TH AXIS</b> |

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.

|                  |                                                                    |
|------------------|--------------------------------------------------------------------|
| <b>S Bit 201</b> | <b>Enter into Absolute Encoder Data Transmitting Mode:X Axis</b>   |
| <b>S Bit 202</b> | <b>Enter into Absolute Encoder Data Transmitting Mode:Y Axis</b>   |
| <b>S Bit 203</b> | <b>Enter into Absolute Encoder Data Transmitting Mode:Z Axis</b>   |
| <b>S Bit 204</b> | <b>Enter into Absolute Encoder Data Transmitting Mode:4th Axis</b> |

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

|                  |                                                    |
|------------------|----------------------------------------------------|
| <b>S Bit 207</b> | <b>Absolute Encoder Data Transmitting:X Axis</b>   |
| <b>S Bit 208</b> | <b>Absolute Encoder Data Transmitting:Y Axis</b>   |
| <b>S Bit 209</b> | <b>Absolute Encoder Data Transmitting:Z Axis</b>   |
| <b>S Bit 210</b> | <b>Absolute Encoder Data Transmitting:4th Axis</b> |

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

|                  |                                        |
|------------------|----------------------------------------|
| <b>S Bit 213</b> | <b>Absolute Encoder Reset:X Axis</b>   |
| <b>S Bit 214</b> | <b>Absolute Encoder Reset:Y Axis</b>   |
| <b>S Bit 215</b> | <b>Absolute Encoder Reset:Z Axis</b>   |
| <b>S Bit 216</b> | <b>Absolute Encoder Reset:4th Axis</b> |

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

|                  |                             |
|------------------|-----------------------------|
| <b>S Bit 079</b> | <b>PLC WINDOW COMPLETED</b> |
|------------------|-----------------------------|

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

#### 4.6 Register Description

|                  |                                                                                                           |
|------------------|-----------------------------------------------------------------------------------------------------------|
| <b>R Bit 012</b> | <b>Manual Tool Geometry Measuring Number</b><br>No Description                                            |
| <b>R Bit 001</b> | <b>M CODE</b><br>R001 sends out M code value when M code is being executed.<br>Range: 00 ~ 99.            |
| <b>R Bit 002</b> | <b>S CODE</b><br>R002 sends out S code value when S code is being executed.<br>Range: 0000 ~ 9999.        |
| <b>R Bit 003</b> | <b>T CODE</b><br>R001 sends out T code value when T code is being executed.<br>Range: 0000 ~ 9999.        |
| <b>R Bit 004</b> | <b>ACTUAL ROTATION SPEED OF THE SPINDLE</b><br>R004 indicates the actual rotation speed of the spindle.   |
| <b>R Bit 005</b> | <b>2nd spindle rotational speed command</b><br>The command of 2 <sup>nd</sup> spindle's rotational speed. |
| <b>R Bit 006</b> | <b>2nd Spindle Actual Speed</b><br>Actually rotational speed of 2 <sup>nd</sup> spindle.                  |
| <b>R Bit 007</b> | <b>3rd spindle rotational speed command</b><br>The command of 3 <sup>rd</sup> spindle's rotational speed. |
| <b>R Bit 008</b> | <b>3rd Spindle Actual Speed</b><br>Actually rotational speed of 3 <sup>rd</sup> 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 Rotating Mode Override**

R Bit 020

**3rd Spindle Rotating 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 4<sup>th</sup> axis

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

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 &  $\mu$ m, 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.

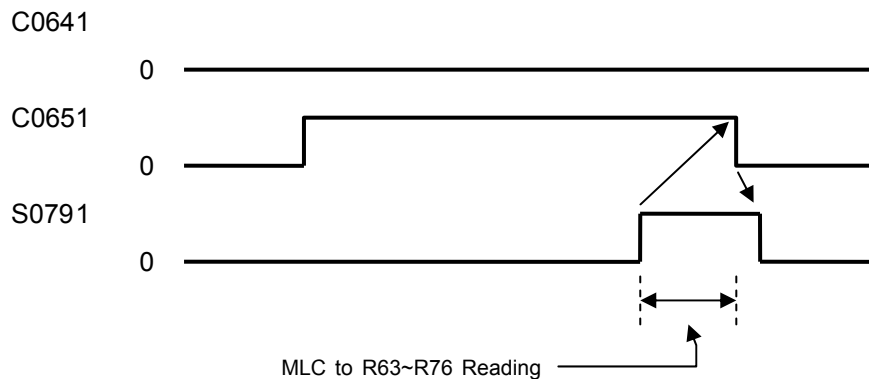
#### 4.7 PLC Window Function

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<br>1 : read absolute coordinate value ;<br>2 : read machine coordinate value ;<br>3 : read & write macro global variables ;<br>4 : read parameter value ;                                                                                                                                                                                                                     | 1 : read only ;<br>2 : read only ;<br>3 : read & write ;<br>4 : read only ;                                                                      |
| 61         | Sub-Item Code 1 (different depends on R60)<br>R60 : 3, means the starting numbers of macro global variables(1 ~ 500) that are read and wrote<br>R60 : 4, the starting parameter #s that are read                                                                                                                                                                                        |                                                                                                                                                  |
| 62         | Sub-Item Code 2 (different depends on R60 and R61)<br>R60 : 3 , means the desired read/write macro global variables' numbers (starting from the number that is designated by R61) , maximum 8.<br>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         | <b>Read/Write Value (different depends on R60~R62)</b><br>R60 : 1 , means X axis absolute coordinate mm part ;<br>R60 : 2 , means X axis machine coordinate mm part ;<br>R60 : 3 , means the present value of the 1 <sup>st</sup> macro global variable that is designated by R61 and R62.<br>R60 : 4 , means the value of 1 <sup>st</sup> parameter that is designated by R61 and R62. | Please refer to Attention.                                                                                                                       |
| 64         | <b>Read/Write Value (different depends on R60~R62)</b><br>R60 : 1 , means X axis absolute coordinate um part ;<br>R60 : 2 , means X axis machine coordinate um part ;<br>R60 : 3 , means the present value of the 1 <sup>st</sup> macro global variable that is designated by R61 and R62.<br>R60 : 4 , means the value of 1 <sup>st</sup> parameter that is designated by R61 and R62. | Please refer to Attention.                                                                                                                       |
| 65         | <b>Read/Write Value (different depends on R60~R62)</b><br>R60 : 1 , means Y axis absolute coordinate mm part ;<br>R60 : 2 , means Y axis machine coordinate mm part ;<br>R60 : 3 , means the present value of the 1 <sup>st</sup> macro global variable that is designated by R61 and R62.<br>R60 : 4 , means the value of 1 <sup>st</sup> 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)<br>R60 : 1 , means Y axis absolute coordinate um part ;<br>R60 : 2 , means Y axis machine coordinate um part ;<br>R60 : 3 , means the present value of the1st macro global variable that is designated by R61 and R62.<br>R60 : 4 , means the value of 1st parameter that is designated by R61 and R62.                                    | Please refer to Attention. |
| 67         | <b>Read/Write Value (different depends on R60~R62)</b><br>R60 : 1 , means Z axis absolute coordinate mm part ;<br>R60 : 2 , means Z axis machine coordinate mm part ;<br>R60 : 3 , means the present value of the1 <sup>st</sup> macro global variable that is designated by R61 and R62.<br>R60 : 4 , means the value of 1 <sup>st</sup> parameter that is designated by R61 and R62.     | Please refer to Attention. |
| 68         | <b>Read/Write Value (different depends on R60~R62)</b><br>R60 : 1 , means Z axis absolute coordinate um part ;<br>R60 : 2 , means Z axis machine coordinate um part ;<br>R60 : 3 , means the present value of the1 <sup>st</sup> macro global variable that is designated by R61 and R62.<br>R60 : 4 , means the value of 1 <sup>st</sup> parameter that is designated by R61 and R62.     | Please refer to Attention. |
| 69         | Read/Write Value (different depends on R60~R62)<br>R60 : 1 , means 4th axis absolute coordinate mm part ;<br>R60 : 2 , means 4th axis machine coordinate mm part ;<br>R60 : 3 , means the present value of the1st macro global variable that is designated by R61 and R62.<br>R60 : 4 , means the value of 1st parameter that is designated by R61 and R62.                                | Please refer to Attention. |
| 70         | <b>Read/Write Value (different depends on R60~R62)</b><br>R60 : 1 , means 4th axis absolute coordinate um part ;<br>R60 : 2 , means 4th axis machine coordinate um part ;<br>R60 : 3 , means the present value of the1 <sup>st</sup> macro global variable that is designated by R61 and R62.<br>R60 : 4 , means the value of 1 <sup>st</sup> 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 LNCMILLMACHINE, 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

```

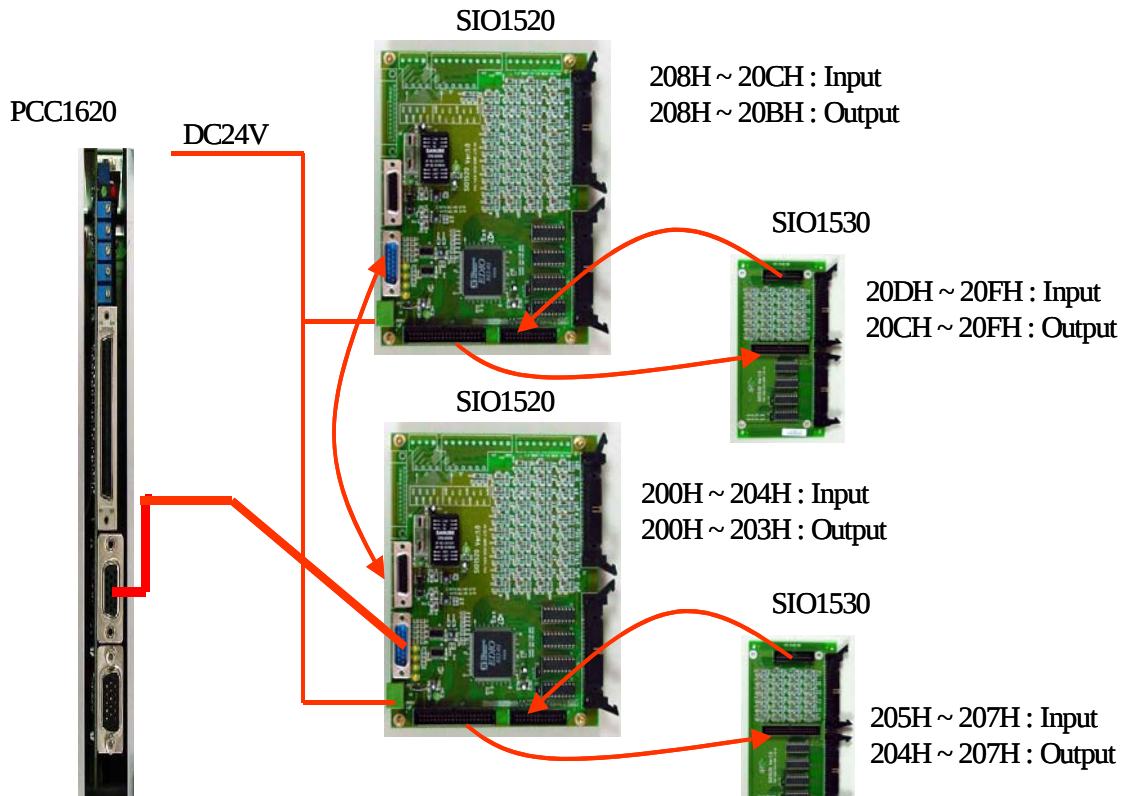
One of I 0 1 0x200,

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 1, 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, $\mu\text{m}$                 | R         | Machine Maker | 124  |
| 3  | Servo      | MAX. SERVO LAG OF Y AXIS, $\mu\text{m}$                 | R         | Machine Maker | 124  |
| 4  | Servo      | MAX. SERVO LAG OF Z AXIS, $\mu\text{m}$                 | R         | Machine Maker | 124  |
| 5  | Servo      | MAX. SERVO LAG OF THE 4TH AXIS, $\mu\text{m}$           | R         | Machine Maker | 124  |
| 6  | Servo      | IN-POSITION CHECK WINDOW OF X AXIS, $\mu\text{m}$       | R         | Machine Maker | 124  |
| 7  | Servo      | IN-POSITION CHECK WINDOW OF Y AXIS, $\mu\text{m}$       | R         | Machine Maker | 124  |
| 8  | Servo      | IN-POSITION CHECK WINDOW OF Z AXIS, $\mu\text{m}$       | R         | Machine Maker | 124  |
| 9  | Servo      | IN-POSITION CHECK WINDOW OF THE 4TH AXIS, $\mu\text{m}$ | 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 $\mu\text{m}$      | R         | Machine Maker | 167  |

| No | Group        | Description                                                           | Effective | Level         | Page |
|----|--------------|-----------------------------------------------------------------------|-----------|---------------|------|
| 31 | Zero Point   | OFFSET AMOUNT OF HOME RETURN: Y AXIS $\mu\text{m}$                    | R         | Machine Maker | 167  |
| 32 | Zero Point   | OFFSET AMOUNT OF HOME RETURN: Z AXIS $\mu\text{m}$                    | R         | Machine Maker | 167  |
| 33 | Zero Point   | OFFSET AMOUNT OF HOME RETURN: THE 4TH AXIS $\mu\text{m}$              | 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) $\mu\text{m}$                  | ⊙         | 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 $\mu\text{m}$                  | R         | Machine Maker | 159  |
| 45 | Compensation | BACKLASH COMPENSATION AMOUNT OF Y AXIS $\mu\text{m}$                  | R         | Machine Maker | 159  |
| 46 | Compensation | BACKLASH COMPENSATION AMOUNT OF Z AXIS $\mu\text{m}$                  | R         | Machine Maker | 159  |
| 47 | Compensation | BACKLASH COMPENSATION AMOUNT OF THE 4TH AXIS $\mu\text{m}$            | 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  |

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| 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  |

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| 201 | Operation  | D/R MEASUREMENT FOR Y                                                      | ⊙         | Machine Maker | 187  |
| 202 | Operation  | OPERATION LANGUAGE 0)ENGLISH<br>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)<br>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<br>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<br>0)OFF 1)ON                               | ⊙         | Machine Maker | 198  |
| 293 | Zero Point | REFERENCE OF SERVO AXIS'S ZERO<br>POINT                                    | ⊙         | Machine Maker | 172  |
| 294 | Spindle    | CORRESPONDING TO 2ND SPINDLE                                               | ⊙         | Machine Maker | 141  |

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| 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 $\mu\text{m}$ | R         | Machine Maker | 161  |
| 349 | Compensation | PITCH ERROR COMPENSATION OF 050 SESSION OF X AXIS $\mu\text{m}$ | 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 TRAVERSE 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  |

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| 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 $\mu\text{m}$ | R         | Machine Maker | 161  |
| 499 | Compensation | PITCH ERROR COMPENSATION OF 050 SESSION OF Y AXIS $\mu\text{m}$ | R         | Machine Maker | 161  |
| 600 | Compensation | PITCH ERROR COMPENSATION OF 001 SESSION OF Z AXIS $\mu\text{m}$ | R         | Machine Maker | 161  |
| 649 | Compensation | PITCH ERROR COMPENSATION OF 050 SESSION OF Z AXIS $\mu\text{m}$ | 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  |

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| 750 | Compensation | PITCH ERROR COMPENSATION OF 001<br>SESSION OF THE 4TH AXIS $\mu\text{m}$ | R         | Machine<br>Maker | 161  |
| 799 | Compensation | PITCH ERROR COMPENSATION OF 050<br>SESSION OF THE 4TH AXIS $\mu\text{m}$ | R         | Machine<br>Maker | 161  |
| 800 | Servo        | G00'S IN-POSITION CHECK WINDOW OF<br>X AXIS, $\mu\text{m}$               | R         | Machine<br>Maker | 133  |
| 801 | Servo        | G00'S IN-POSITION CHECK WINDOW OF<br>Y AXIS, $\mu\text{m}$               | R         | Machine<br>Maker | 133  |
| 802 | Servo        | G00'S IN-POSITION CHECK WINDOW OF<br>Z AXIS, $\mu\text{m}$               | R         | Machine<br>Maker | 133  |
| 803 | Servo        | G00'S IN-POSITION CHECK WINDOW OF<br>THE 4TH AXIS, $\mu\text{m}$         | R         | Machine<br>Maker | 133  |
| 806 | Operation    | MAXIMUM OFFSET TOLERANCE OF<br>CORNER $\mu\text{m}$                      | R         | User             | 201  |
| 808 | Operation    | ENABLE CORNNER ACC CONTROL                                               | R         | User             | 201  |
| 809 | Operation    | SPIKE OFFSET TOLERANCE $\mu\text{m}$                                     | R         | User             | 202  |
| 811 | Compensation | BALL BAR COMPENSATION G CODE 0)G2<br>G3 1) ALL                           | R         | Machine<br>Maker | 162  |
| 812 | Compensation | REVERSAL SPIKE COMPENSATION: +X                                          | R         | Machine<br>Maker | 162  |
| 813 | Compensation | DURATION OF REVERSAL SPIKE<br>COMPENSATION: +X                           | R         | Machine<br>Maker | 162  |
| 814 | Compensation | REVERSAL SPIKE LAG COMPENSATION:<br>+X                                   | R         | Machine<br>Maker | 162  |
| 815 | Compensation | REVERSAL SPIKE COMPENSATION: -X                                          | R         | Machine<br>Maker | 163  |
| 816 | Compensation | DURATION OF REVERSAL SPIKE<br>COMPENSATION: -X                           | R         | Machine<br>Maker | 163  |
| 817 | Compensation | REVERSAL SPIKE LAG COMPENSATION:<br>-X                                   | R         | Machine<br>Maker | 163  |
| 818 | Compensation | REVERSAL SPIKE COMPENSATION: +Y                                          | R         | Machine<br>Maker | 162  |
| 819 | Compensation | DURATION OF REVERSAL SPIKE<br>COMPENSATION: +Y                           | R         | Machine<br>Maker | 162  |
| 820 | Compensation | REVERSAL SPIKE LAG COMPENSATION:<br>+Y                                   | R         | Machine<br>Maker | 162  |
| 825 | Compensation | REVERSAL SPIKE COMPENSATION: -Y                                          | R         | Machine<br>Maker | 163  |
| 826 | Compensation | DURATION OF REVERSAL SPIKE<br>COMPENSATION: -Y                           | R         | Machine<br>Maker | 163  |
| 827 | Compensation | REVERSAL SPIKE LAG COMPENSATION:<br>-Y                                   | R         | Machine<br>Maker | 163  |
| 828 | Compensation | REVERSAL SPIKE COMPENSATION: +Z                                          | R         | Machine<br>Maker | 162  |
| 829 | Compensation | DURATION OF REVERSAL SPIKE<br>COMPENSATION: +Z                           | R         | Machine<br>Maker | 162  |
| 830 | Compensation | REVERSAL SPIKE LAG COMPENSATION:<br>+Z                                   | R         | Machine<br>Maker | 162  |
| 831 | Compensation | REVERSAL SPIKE COMPENSATION: -Z                                          | R         | Machine<br>Maker | 163  |
| 832 | Compensation | DURATION OF REVERSAL SPIKE<br>COMPENSATION: -Z                           | R         | Machine<br>Maker | 163  |
| 833 | Compensation | REVERSAL SPIKE LAG COMPENSATION:<br>-Z                                   | R         | Machine<br>Maker | 163  |

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| 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  |

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| 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, $\mu\text{m}/\text{min}$ | R         | Machine Maker | 133  |

| No   | Group        | Description                                                                                          | Effective | Level         | Page |
|------|--------------|------------------------------------------------------------------------------------------------------|-----------|---------------|------|
| 1001 | Servo        | G00 MAX. SPEED OF Y AXIS IN RAPID TRAVERSE, $\mu\text{m}/\text{min}$                                 | R         | Machine Maker | 133  |
| 1002 | Servo        | G00 MAX. SPEED OF Z AXIS IN RAPID TRAVERSE, $\mu\text{m}/\text{min}$                                 | R         | Machine Maker | 133  |
| 1003 | Servo        | G00 MAX. SPEED OF THE 4TH AXIS IN RAPID TRAVERSE, $\mu\text{m}/\text{min}$                           | R         | Machine Maker | 133  |
| 1004 | Servo        | G01 MAX. SPEED OF LINEAR CUTTING, $\mu\text{m}/\text{min}$                                           | R         | Machine Maker | 134  |
| 1006 | Operation    | SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +X $\mu\text{m}$                                            | R         | Machine Maker | 204  |
| 1007 | Operation    | SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - X $\mu\text{m}$                                           | R         | Machine Maker | 205  |
| 1008 | Operation    | SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Y $\mu\text{m}$                                            | R         | Machine Maker | 204  |
| 1009 | Operation    | SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Y $\mu\text{m}$                                           | R         | Machine Maker | 205  |
| 1010 | Operation    | SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Z $\mu\text{m}$                                            | R         | Machine Maker | 204  |
| 1011 | Operation    | SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Z $\mu\text{m}$                                           | R         | Machine Maker | 205  |
| 1012 | Operation    | SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +THE 4TH $\mu\text{m}$                                      | R         | Machine Maker | 204  |
| 1013 | Operation    | SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - THE 4TH AXIS $\mu\text{m}$                                | R         | Machine Maker | 205  |
| 1014 | Zero Point   | ABSOLUTE COORDINATES OF X AXIS AFTER RETURNING TO HOME POINT $\mu\text{m}$                           | R         | Machine Maker | 173  |
| 1015 | Zero Point   | ABSOLUTE COORDINATES OF Y AXIS AFTER RETURNING TO HOME POINT $\mu\text{m}$                           | R         | Machine Maker | 173  |
| 1016 | Zero Point   | ABSOLUTE COORDINATES OF Z AXIS AFTER RETURNING TO HOME POINT $\mu\text{m}$                           | R         | Machine Maker | 173  |
| 1017 | Zero Point   | ABSOLUTE COORDINATES OF THE 4TH AXIS AFTER RETURNING TO HOME POINT $\mu\text{m}$                     | R         | Machine Maker | 173  |
| 1018 | Compensation | SESSION INTERVAL OF PITCH ERROR COMPENSATION: X AXIS $\mu\text{m}$                                   | ⊙         | Machine Maker | 165  |
| 1019 | Compensation | SESSION INTERVAL OF PITCH ERROR COMPENSATION: Y AXIS $\mu\text{m}$                                   | ⊙         | Machine Maker | 165  |
| 1020 | Compensation | SESSION INTERVAL OF PITCH ERROR COMPENSATION: Z AXIS $\mu\text{m}$                                   | ⊙         | Machine Maker | 165  |
| 1021 | Compensation | SESSION INTERVAL OF PITCH ERROR COMPENSATION: THE 4TH AXIS $\mu\text{m}$                             | ⊙         | Machine Maker | 165  |
| 1022 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       | R         | Machine Maker | 173  |
| 1023 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       | R         | Machine Maker | 173  |
| 1024 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       | R         | Machine Maker | 173  |
| 1025 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$ | 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 $\mu\text{m}$       | R         | Machine Maker | 174  |
| 1027 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       | R         | Machine Maker | 174  |
| 1028 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       | R         | Machine Maker | 174  |
| 1029 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$ | R         | Machine Maker | 174  |
| 1030 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       | R         | Machine Maker | 174  |
| 1031 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       | R         | Machine Maker | 174  |
| 1032 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       | R         | Machine Maker | 174  |
| 1033 | Zero Point   | THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$ | R         | Machine Maker | 174  |
| 1034 | Operation    | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +X $\mu\text{m}$                                            | R         | Machine Maker | 205  |
| 1035 | Operation    | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -X $\mu\text{m}$                                            | R         | Machine Maker | 206  |
| 1036 | Operation    | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Y $\mu\text{m}$                                            | R         | Machine Maker | 205  |
| 1037 | Operation    | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Y $\mu\text{m}$                                            | R         | Machine Maker | 206  |
| 1038 | Operation    | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Z $\mu\text{m}$                                            | R         | Machine Maker | 205  |
| 1039 | Operation    | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Z $\mu\text{m}$                                            | R         | Machine Maker | 206  |
| 1040 | Operation    | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +4TH AXIS $\mu\text{m}$                                     | R         | Machine Maker | 205  |
| 1041 | Operation    | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -4TH AXIS $\mu\text{m}$                                     | 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 $\mu\text{m}$                                                  | ⊙         | Machine Maker | 165  |
| 1047 | Compensation | START POSITION OF PITCH ERROR: Y AXIS $\mu\text{m}$                                                  | ⊙         | Machine Maker | 165  |
| 1048 | Compensation | START POSITION OF PITCH ERROR: Z AXIS $\mu\text{m}$                                                  | ⊙         | Machine Maker | 165  |
| 1049 | Compensation | START POSITION OF PITCH ERROR: THE 4TH AXIS $\mu\text{m}$                                            | ⊙         | 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 ANGLE 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 $\mu$ s                                                                        | ⊙         | 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 $\mu$ m                                                                              | R         | User          | 207  |
| 1082 | Operation  | MRCDT $\mu$ m                                                                              | R         | User          | 207  |
| 1083 | Operation  | PESCX $\mu$ m                                                                              | R         | User          | 207  |
| 1084 | Operation  | PESCZ $\mu$ m                                                                              | R         | User          | 207  |
| 1085 | Operation  | PATIM $\mu$ m                                                                              | R         | User          | 207  |
| 1086 | Operation  | GROOVE $\mu$ m                                                                             | R         | User          | 207  |
| 1087 | Operation  | THRPT                                                                                      | R         | User          | 208  |
| 1088 | Operation  | THANG                                                                                      | R         | User          | 208  |
| 1089 | Operation  | THCLM $\mu$ m                                                                              | R         | User          | 208  |
| 1090 | Operation  | THDFN $\mu$ m                                                                              | R         | User          | 208  |
| 1095 | Spindle    | HOME OF SPD. C(H) POSITION                                                                 | R         | Machine Maker | 156  |
| 1100 | Servo      | JOG SPEED FOR X AXIS $\mu$ m/min                                                           | R         | Machine Maker | 136  |
| 1101 | Servo      | JOG SPEED FOR Y AXIS $\mu$ m/min                                                           | R         | Machine Maker | 136  |
| 1102 | Servo      | JOG SPEED FOR Z AXIS $\mu$ m/min                                                           | R         | Machine Maker | 136  |
| 1103 | Servo      | JOG SPEED FOR THE 4TH AXIS $\mu$ m/min                                                     | R         | Machine Maker | 136  |
| 1104 | Zero Point | HOME RETURN AT THE 1ST SPEED: X AXIS $\mu$ m/min                                           | R         | Machine Maker | 174  |
| 1105 | Zero Point | HOME RETURN AT THE 1ST SPEED: Y AXIS $\mu$ m/min                                           | R         | Machine Maker | 174  |

| No   | Group      | Description                                                         | Effective | Level         | Page |
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| 1106 | Zero Point | HOME RETURN AT THE 1ST SPEED: Z AXIS $\mu\text{m}/\text{min}$       | R         | Machine Maker | 174  |
| 1107 | Zero Point | HOME RETURN AT THE 1ST SPEED: THE 4TH AXIS $\mu\text{m}/\text{min}$ | R         | Machine Maker | 174  |
| 1108 | Zero Point | HOME RETURN AT THE 2ND SPEED: X AXIS $\mu\text{m}/\text{min}$       | R         | Machine Maker | 175  |
| 1109 | Zero Point | HOME RETURN AT THE 2ND SPEED: Y AXIS $\mu\text{m}/\text{min}$       | R         | Machine Maker | 175  |
| 1110 | Zero Point | HOME RETURN AT THE 2ND SPEED: Z AXIS $\mu\text{m}/\text{min}$       | R         | Machine Maker | 175  |
| 1111 | Zero Point | HOME RETURN AT THE 2ND SPEED: THE 4TH AXIS $\mu\text{m}/\text{min}$ | 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                                                                                                                                                                                                                                                          | <b>SYSTEM LOOP GAINS FOR V CMD</b> |
| Range :                                                                                                                                                                                                                                                    | 1 ~ 20000                          |
| Effective :                                                                                                                                                                                                                                                | Effective After Reboot             |
| Access level :                                                                                                                                                                                                                                             | Machine Maker                      |
| Default :                                                                                                                                                                                                                                                  | 30                                 |
| Unit :                                                                                                                                                                                                                                                     | 1/sec                              |
| <p>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.</p> |                                    |
| <p>lag = F/Kp</p>                                                                                                                                                                                                                                          |                                    |
| <p>F is the feedrate, Kp is the position Loop incremental value.</p>                                                                                                                                                                                       |                                    |
| <p>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.</p>                           |                                    |
| <p>Example:</p>                                                                                                                                                                                                                                            |                                    |
| <p>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:</p>                                                                                  |                                    |

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

Please notice that the following error amount of X axis must not over 3334  $\mu$  m 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 | <b>MAX. SERVO LAG OF X AXIS, <math>\mu\text{m}</math></b>       |
| 3 | <b>MAX. SERVO LAG OF Y AXIS, <math>\mu\text{m}</math></b>       |
| 4 | <b>MAX. SERVO LAG OF Z AXIS, <math>\mu\text{m}</math></b>       |
| 5 | <b>MAX. SERVO LAG OF THE 4TH AXIS, <math>\mu\text{m}</math></b> |

Range : 1 ~ 30000

Effective : Effective After RESET

Access level : Machine Maker

Default : 30000

Unit :  $\mu\text{m}$

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:

$$\text{lag} = F/Kp$$

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:

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

When the machine functions normally, the servo lag amount of X axis should not exceed  $3334\mu\text{m}$  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 | <b>IN-POSITION CHECK WINDOW OF X AXIS, <math>\mu\text{m}</math></b>       |
| 7 | <b>IN-POSITION CHECK WINDOW OF Y AXIS, <math>\mu\text{m}</math></b>       |
| 8 | <b>IN-POSITION CHECK WINDOW OF Z AXIS, <math>\mu\text{m}</math></b>       |
| 9 | <b>IN-POSITION CHECK WINDOW OF THE 4TH AXIS, <math>\mu\text{m}</math></b> |

Range : 1 ~ 20000

Effective : Effective After RESET

Access level : Machine Maker

Default : 50

Unit :  $\mu\text{m}$

This parameter sets the in-position check window of each axis in the Exact Stop mode. When some axis's

$|\text{command position} - \text{actual position}| \leq$  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.

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>10</b> | <b>G00'S ACCEL./DECEL. TIME OF X AXIS, ms</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>11</b> | <b>G00'S ACCEL./DECEL. TIME OF Y AXIS, ms</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>12</b> | <b>G00'S ACCEL./DECEL. TIME OF Z AXIS, ms</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>13</b> | <b>G00'S ACCEL./DECEL. TIME OF THE 4TH AXIS, ms</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|           | Range : 3 ~ 1500<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 230<br>Unit : ms<br><p>This parameter sets each axis's acceleration &amp; 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.</p> <p>For 486IPC version (IPO is 5ms), the maximum value of this parameter is 2000.</p> <p>For 586IPC version (IPO is 3ms), the maximum value of this parameter is 1500.</p> <p>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.</p>                   |
| <b>14</b> | <b>G01 ACCEL./DECEL. TIME</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|           | Range : 3 ~ 1500<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 100<br>Unit : ms<br><p>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.</p> <p>If the set value exceeds the above limit, the alarm "MOT 4030 SET PAR 14 ERROR" will be triggered.</p>                                                                                                                               |
| <b>18</b> | <b>THREAD CUTTING ACC/DEC TIME</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|           | Range : 1 ~ 1000<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 50<br>Unit : ms<br><p>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.</p> <p>In 486IPC (IPO is 5ms) , max. value of this parameter is 1000.</p> <p>In 586IPC (IPO is 3ms) , max. value of this parameter is 1000.</p> <p>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.</p> |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>If the lead of X (Y, Z, the 4 <sup>th</sup> ) axis is connected to the N <sup>th</sup> 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<br>Effective : Effective After RESET<br>Access level : User<br>Default : 10<br>Unit : %<br>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<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 4<br>Unit : Nul<br>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.<br>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. |

|             |                                    |
|-------------|------------------------------------|
| <b>1112</b> | <b>ENCODER.X PULSES/ROTATION</b>   |
| <b>1113</b> | <b>ENCODER.Y PULSES/ROTATION</b>   |
| <b>1114</b> | <b>ENCODER.Z PULSES/ROTATION</b>   |
| <b>1115</b> | <b>ENCODER.4TH PULSES/ROTATION</b> |

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.

|           |                                 |
|-----------|---------------------------------|
| <b>65</b> | <b>ABSOLUTE ENCODER BIT 0-3</b> |
|-----------|---------------------------------|

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.

|           |                                                     |
|-----------|-----------------------------------------------------|
| <b>66</b> | <b>SET THE 4TH AXIS AS A 0)ROTARY 1)LINEAR AXIS</b> |
|-----------|-----------------------------------------------------|

Range : 0 ~ 1  
 Effective : Effective After Reboot  
 Access level : Machine Maker  
 Default : 0  
 Unit : Nul  
 0: Rotary axis;  
 1: Linear axis.  
 If the 4<sup>th</sup> ~ 6<sup>th</sup> 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  | <b>MAX FOLLOWING ERROR X100</b><br>Range : 0 ~ 15<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>BIT0 : when set as 1, the maximum following error of X-axis (parameter # 0002) is magnified 100 times.<br>BIT1 : when set as 1, the maximum following error of Y-axis (parameter # 0003) is magnified 100 times.<br>BIT2 : when set as 1, the maximum following error of Z-axis (parameter # 0004) is magnified 100 times.<br>BIT3 : when set as 1, the maximum following error of 4 <sup>TH</sup> -axis (parameter # 0005) is magnified 100 times. |
| 108 | <b>RPM TO VOLTAGE RATIO FOR X AXIS RPM/1V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 109 | <b>RPM TO VOLTAGE RATIO FOR Y AXIS RPM/1V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 110 | <b>RPM TO VOLTAGE RATIO FOR Z AXIS RPM/1V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 111 | <b>RPM TO VOLTAGE RATIO FOR THE 4TH AXIS RPM/1V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|     | Range : 1 ~ 20000<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 200<br>Unit : RPM/1V<br>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.<br>This parameter is only effective when the control mode of each axis is V Command.                                                                                                                                                   |

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>116</b> | <b>MOVING DIR OF EACH AXIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|            | Range : 0 ~ 31<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><br>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.<br>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.<br>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.<br>BIT3 : when set as 1, the 4 <sup>TH</sup> -axis should move in reverse direction against previous movement. When set as 0, there is no reverse movement.<br>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.<br><b>Description:</b> 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. |

|            |                                                                                                                                                                                  |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>156</b> | <b>COMMAND TYPE OF X AXIS 0)AB 1)CW 2)PD 3)V</b>                                                                                                                                 |
| <b>157</b> | <b>COMMAND TYPE OF Y AXIS 0)AB 1)CW 2)PD 3)V</b>                                                                                                                                 |
| <b>158</b> | <b>COMMAND TYPE OF Z AXIS 0)AB 1)CW 2)PD 3)V</b>                                                                                                                                 |
| <b>159</b> | <b>COMMAND TYPE OF THE 4TH AXIS 0)AB 1)CW 2)PD 3)V</b>                                                                                                                           |
|            | Range : 0 ~ 3<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><br>0 : A/B PHASE ;<br>1 : CW/CCW ;<br>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

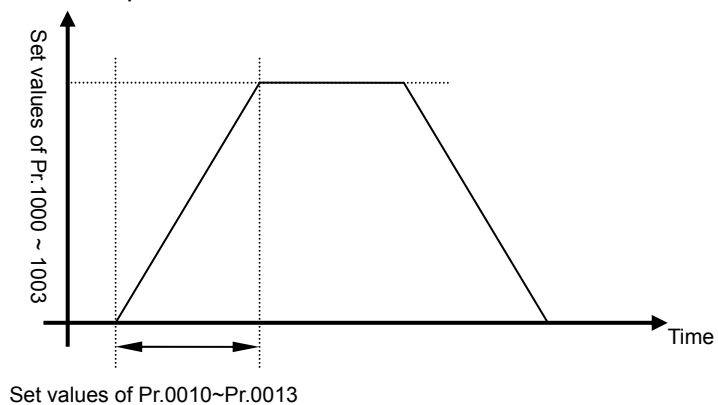
Default : 1

Unit : Nul

0 : Linear acceleration/deceleration

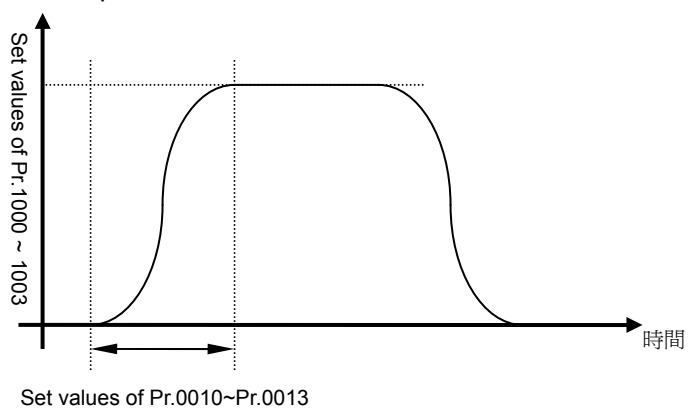
1 : S-curve acceleration/deceleration

Servo motion speed



Linear accel./decel. type

Servo motion speed



S curve accel./decel. type

173

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

Range : 0 ~ 1

Effective : Effective After Reboot

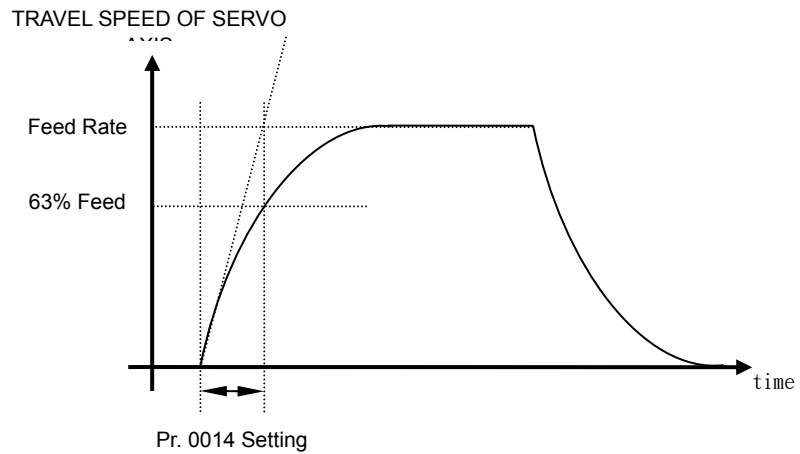
Access level : Machine Maker

Default : 1

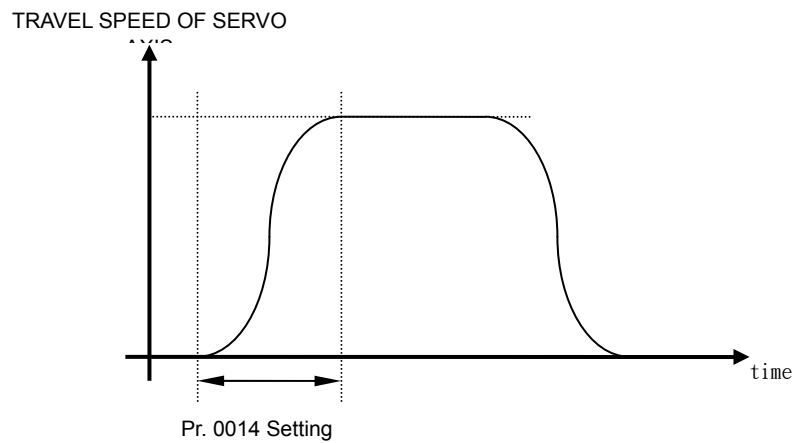
Unit : Nul

0 : Exponential 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 4<sup>TH</sup>-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  $\pm 1$ , 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 as 1.

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.

|            |                                             |
|------------|---------------------------------------------|
| <b>191</b> | <b>ENCORDER SIGNAL TYPE OF X AXIS</b>       |
| <b>192</b> | <b>ENCORDER SIGNAL TYPE OF Y AXIS</b>       |
| <b>193</b> | <b>ENCORDER SIGNAL TYPE OF Z AXIS</b>       |
| <b>194</b> | <b>ENCORDER SIGNAL TYPE OF THE 4TH AXIS</b> |

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.

|            |                                                                                 |
|------------|---------------------------------------------------------------------------------|
| <b>800</b> | <b>G00'S IN-POSITION CHECK WINDOW OF X AXIS, <math>\mu\text{m}</math></b>       |
| <b>801</b> | <b>G00'S IN-POSITION CHECK WINDOW OF Y AXIS, <math>\mu\text{m}</math></b>       |
| <b>802</b> | <b>G00'S IN-POSITION CHECK WINDOW OF Z AXIS, <math>\mu\text{m}</math></b>       |
| <b>803</b> | <b>G00'S IN-POSITION CHECK WINDOW OF THE 4TH AXIS, <math>\mu\text{m}</math></b> |

Range : 1 ~ 20000  
 Effective : Effective After RESET  
 Access level : Machine Maker  
 Default : 1000  
 Unit :  $\mu\text{m}$

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  
 $|\text{command position} - \text{actual position}| \leq \text{this parameter's set value}$ ,  
 this means that this axis has already completed rapid positioning and stopped.

|             |                                                                                              |
|-------------|----------------------------------------------------------------------------------------------|
| <b>1000</b> | <b>G00 MAX. SPEED OF X AXIS IN RAPID TRAVERSE, <math>\mu\text{m}/\text{min}</math></b>       |
| <b>1001</b> | <b>G00 MAX. SPEED OF Y AXIS IN RAPID TRAVERSE, <math>\mu\text{m}/\text{min}</math></b>       |
| <b>1002</b> | <b>G00 MAX. SPEED OF Z AXIS IN RAPID TRAVERSE, <math>\mu\text{m}/\text{min}</math></b>       |
| <b>1003</b> | <b>G00 MAX. SPEED OF THE 4TH AXIS IN RAPID TRAVERSE, <math>\mu\text{m}/\text{min}</math></b> |

Range : 1 ~ 99999999  
 Effective : Effective After RESET  
 Access level : Machine Maker  
 Default : 5000000  
 Unit :  $\mu\text{m}/\text{min}$

This parameter sets the max. motion speed of each axis during rapid traverse.

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1004</b> | <b>G01 MAX. SPEED OF LINEAR CUTTING, <math>\mu\text{m}/\text{min}</math></b><br>Range : 1 ~ 99999999<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 2000000<br>Unit : $\mu\text{m}/\text{min}$<br>This parameter sets the following values:<br>1. The max. feed rate of the linear cutting command G01;<br>2. The max. feed rate of the curve cutting command G02/03;<br>3. The feed rate of the cutting commands G01/02/03 in DRY RUN mode.<br>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. |
| <b>1042</b> | <b>G31 PRESET FEED RATE</b><br>Range : 1 ~ 99999999<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 2000<br>Unit : $\mu\text{m}/\text{min}$<br>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.                                                                                                                                                                                                                                                         |
| <b>1061</b> | <b>MAX. SPEED OF LATHE TAPPING</b><br>Range : 1 ~ 99999999<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 10000000<br>Unit : $\mu\text{m}$<br>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  $\mu s$**

Range : 1 ~ 50

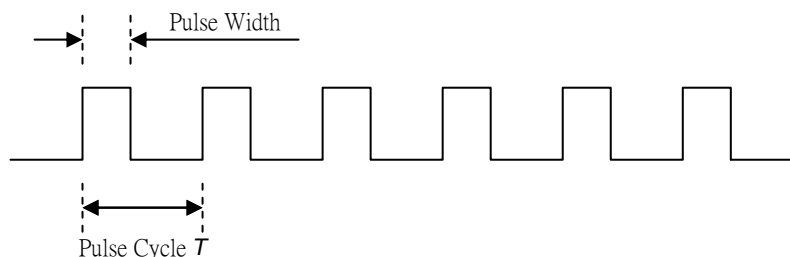
Effective : Effective After Reboot

Access level : Machine Maker

Default : 20

Unit :  $\mu s$

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) :

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

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:

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

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.

## Parameters

---

|      |                                                     |
|------|-----------------------------------------------------|
| 1100 | JOG SPEED FOR X AXIS $\mu\text{m}/\text{min}$       |
| 1101 | JOG SPEED FOR Y AXIS $\mu\text{m}/\text{min}$       |
| 1102 | JOG SPEED FOR Z AXIS $\mu\text{m}/\text{min}$       |
| 1103 | JOG SPEED FOR THE 4TH AXIS $\mu\text{m}/\text{min}$ |

Range : 1 ~ 99999999

Effective : Effective After RESET

Access level : Machine Maker

Default : 2000000

Unit :  $\mu\text{m}/\text{min}$

This parameter sets the moving speed of each axis in JOG mode.

### 5.3 MACHINE PARAMETER

|           |                                                                                     |
|-----------|-------------------------------------------------------------------------------------|
| <b>62</b> | <b>UNIT OF Pr.0104 ~ Pr.0107 0) METRIC 1) IMPERIAL</b>                              |
|           | 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. |

|           |                                                                                                                       |
|-----------|-----------------------------------------------------------------------------------------------------------------------|
| <b>68</b> | <b>TOOTH NUMBER OF X AXIS MOTOR (DENOMINATOR IN GEAR RATIO)</b>                                                       |
| <b>69</b> | <b>TOOTH NUMBER OF Y AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)</b>                                                     |
| <b>70</b> | <b>TOOTH NUMBER OF Z AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)</b>                                                     |
| <b>72</b> | <b>TOOTH NUMBER OF THE 4TH AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)</b>                                               |
|           | 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 :  $\mu\text{m}$

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 4<sup>th</sup> 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:

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

**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  $0.0001^\circ$  , 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

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>16</b>  | <b>ACC/DEC TIME OF 1ST SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>885</b> | <b>ACC/DEC TIME OF 2ND SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>888</b> | <b>ACCEL./DECEL. TIME PER KILO-REV.OF THE 3RD SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |
|            | Range : 0 ~ 10000<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 500<br>Unit : Nul<br><p>When the command output format of the spindle is in pulse format or <math>\pm 10V</math>, this parameter sets the acceleration/deceleration time of the spindle's speed.</p>                                                                                                                                                                   |
| <b>21</b>  | <b>RPM OF THE 1ST SPINDLE'S ORIENTATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|            | Range : 1 ~ 20000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 100<br>Unit : RPM<br><p>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.</p> |
| <b>29</b>  | <b>THE CORRESPONDING SERVO AXIS NUMBER OF THE 1ST SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>294</b> | <b>CORRESPONDING TO 2ND SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>295</b> | <b>CORRESPONDING TO 3RD SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|            | Range : 0 ~ 6<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><p>If the spindle's wiring is connected to the N<sup>th</sup> axis of the transit card, set this parameter to N; if there is no spindle, set to 0.</p>                                                                                                                                                                                                  |

|     |                                                            |
|-----|------------------------------------------------------------|
| 49  | <b>MOTOR'S TOOTH NUMBER OF THE 1ST SPINDLE IN 1ST GEAR</b> |
| 664 | <b>MOTOR'S TOOTH NUMBER OF THE 2ND SPINDLE IN 1ST GEAR</b> |
| 672 | <b>MOTOR'S TOOTH NUMBER OF THE 3RD SPINDLE IN 1ST GEAR</b> |

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 1<sup>st</sup> gear, which equals to setting the denominator in gear ratio of some spindle in 1<sup>st</sup> gear. When some spindle is in 1<sup>st</sup> 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 an acceleration relationship between motor and spindle. Please refer to the following formula for the setting method :

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

|     |                                                   |
|-----|---------------------------------------------------|
| 50  | <b>THE 1ST SPINDLE'S TEETH NUMBER IN 1ST GEAR</b> |
| 665 | <b>THE 2ND SPINDLE'S TEETH NUMBER IN 1ST GEAR</b> |
| 673 | <b>THE 3RD SPINDLE'S TEETH NUMBER IN 1ST GEAR</b> |

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 1<sup>st</sup> gear, which equals to setting the numerator in gear ratio of some spindle in 1<sup>st</sup> gear. When some spindle is in 1<sup>st</sup> 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 :

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

|            |                                                            |
|------------|------------------------------------------------------------|
| <b>51</b>  | <b>TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 2ND GEAR</b> |
| <b>666</b> | <b>TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 2ND GEAR</b> |
| <b>674</b> | <b>TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 2ND GEAR</b> |

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 2<sup>nd</sup> gear, which equals to setting the denominator in gear ratio of some spindle in 2<sup>nd</sup> gear. When some spindle is in 2<sup>nd</sup> 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 :

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

|            |                                                    |
|------------|----------------------------------------------------|
| <b>52</b>  | <b>TOOTH NUMBER OF THE 1ST SPINDLE IN 2ND GEAR</b> |
| <b>667</b> | <b>TOOTH NUMBER OF THE 2ND SPINDLE IN 2ND GEAR</b> |
| <b>675</b> | <b>TOOTH NUMBER OF THE 3RD SPINDLE IN 2ND GEAR</b> |

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 2<sup>nd</sup> gear, which equals to setting the numerator in gear ratio of some spindle in 2<sup>nd</sup> gear. When some spindle is in 2<sup>nd</sup> 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 :

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

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>57</b>  | <b>FEEDBACK RATE OF THE 1ST SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>890</b> | <b>FEEDBACK RATE OF THE 2ND SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>894</b> | <b>FEEDBACK RATE OF THE 3RD SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|            | Range : 1 ~ 4<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 1<br>Unit : Nul<br><p>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.</p> <p>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.</p> |
| <b>61</b>  | <b>1ST SPINDLE ENCODER PPR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>889</b> | <b>PPR OF THE 2ND SPINDLE'S ENCODER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>893</b> | <b>PPR OF THE 3RD SPINDLE'S ENCODER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|            | Range : 1 ~ 32767<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 1024<br>Unit : pulse<br><p>Assuming pulse/rev. of some motor encoder is 2500, then set this parameter to 2500.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>84</b>  | <b>THE 1ST SPINDLE ORIENTATION 0)SENSOR 1)ENCODER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|            | Range : 0 ~ 1<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><p>0 : Use a positioning sensor as the reference for spindle orientation.<br/> 1 : Use an encoder index as the reference for spindle orientation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|            |                                                     |
|------------|-----------------------------------------------------|
| <b>90</b>  | <b>THE 1ST SPINDLE DISPLAYS 0)COMMAND 1) SENSOR</b> |
| <b>897</b> | <b>THE 2ND SPINDLE DISPLAYS 0)COMMAND 1) SENSOR</b> |
| <b>898</b> | <b>THE 3RD SPINDLE DISPLAYS 0)COMMAND 1) SENSOR</b> |

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.

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

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.

|            |                                       |
|------------|---------------------------------------|
| <b>95</b>  | <b>MIN. SPEED OF THE 1ST SPINDLE</b>  |
| <b>96</b>  | <b>MAX SPEED OF 1ST SPINDLE</b>       |
| <b>876</b> | <b>MAX SPEED OF 2ND SPINDLE</b>       |
| <b>877</b> | <b>MIN. RPM OF THE 2nd SPINDLE</b>    |
| <b>878</b> | <b>INITIAL RPM OF THE 3RD SPINDLE</b> |
| <b>879</b> | <b>MAX. RPM OF THE 3RD SPINDLE</b>    |
| <b>880</b> | <b>MIN. RPM OF THE 3RD SPINDLE</b>    |

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  $\pm 10V$ , 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 3<sup>rd</sup> gear, which equals to setting the denominator in gear ratio of some spindle in 3<sup>rd</sup> gear. When some spindle is in 3<sup>rd</sup> 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 :

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

|            |                                                    |
|------------|----------------------------------------------------|
| <b>179</b> | <b>TOOTH NUMBER OF THE 1ST SPINDLE IN 3RD GEAR</b> |
| <b>669</b> | <b>TOOTH NUMBER OF THE 2ND SPINDLE IN 3RD GEAR</b> |
| <b>677</b> | <b>TOOTH NUMBER OF THE 3RD SPINDLE IN 3RD GEAR</b> |

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 3<sup>rd</sup> gear, which equals to setting the numerator in gear ratio of some spindle in 3<sup>rd</sup> gear. When some spindle is in 3<sup>rd</sup> 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 :

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

|            |                                                            |
|------------|------------------------------------------------------------|
| <b>181</b> | <b>TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 4TH GEAR</b> |
| <b>670</b> | <b>TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 4TH GEAR</b> |
| <b>678</b> | <b>TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 4TH GEAR</b> |

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 4<sup>TH</sup> gear, which equals to setting the denominator in gear ratio of some spindle in 4<sup>TH</sup> gear. When some spindle is in 4<sup>TH</sup> 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 4<sup>th</sup> gear, which equals to setting the numerator in gear ratio of some spindle in 4<sup>th</sup> gear. When some spindle is in 4<sup>th</sup> 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 | <b>POSITION COMMAND TYPE</b>                                                                                                                                                                                                                                                                                                                                                                                             |
|     | Range : 0 ~ 3<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>0 : A/B PHASE<br>1 : CW/CCW<br>2 : PULSE/DIRECTION<br>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 | <b>SIGNAL TYPE OF THE 1ST SPINDLE'S ENCODER</b>                                                                                                                                                                                                                                                                                                                                                                          |
| 891 | <b>SIGNAL TYPE OF THE 2ND SPINDLE'S ENCODER</b>                                                                                                                                                                                                                                                                                                                                                                          |
| 895 | <b>SIGNAL TYPE OF THE 3RD SPINDLE'S ENCODER</b>                                                                                                                                                                                                                                                                                                                                                                          |
|     | Range : 0 ~ 3<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>This parameter sets the feedback signal type of the encoder.<br>0 : A/B PHASE<br>1 : CW/CCW<br>2 : Pulse/Dir<br>3 : No feedback.                                                                                                                                                                     |
| 222 | <b>ACC/DEC TIME OF SPD. CH POS.</b>                                                                                                                                                                                                                                                                                                                                                                                      |
|     | Range : 1 ~ 32767<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 100<br>Unit : Nul<br>Acc/Deceleration time for spindle to execute C(H) positioning.                                                                                                                                                                                                                                 |
| 240 | <b>CLOSE LOOP GAIN OF THE 1ST SPINDLE'S ORIENTATION</b>                                                                                                                                                                                                                                                                                                                                                                  |
|     | Range : 0 ~ 20000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 30<br>Unit : 1/S<br>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.                                                                                                                                              |

|            |                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>354</b> | <b>OVERRIDE UNIT OF THE 1ST SPINDLE'S RPM</b>                                                                                                                                                                                                                                                                                                                                                                             |
| <b>355</b> | <b>OVERRIDE UNIT OF THE 2ND SPINDLE'S RPM</b>                                                                                                                                                                                                                                                                                                                                                                             |
| <b>356</b> | <b>OVERRIDE UNIT OF THE 3RD SPINDLE'S RPM</b>                                                                                                                                                                                                                                                                                                                                                                             |
|            | Range : 0 ~ 1<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>Set to 0 : The 1 <sup>st</sup> (2 <sup>nd</sup> & 3 <sup>rd</sup> ) spindle's rotation override speed = R015 (R019 ÷ R020) register value * 10% ;<br>Set to 1 : The 1 <sup>st</sup> (2 <sup>nd</sup> & 3 <sup>rd</sup> ) spindle's rotation override speed = R015 (R019 ÷ R020) register value * 1% . |
| <b>663</b> | <b>1ST SPD ORIENT ACC/DEC TIME</b>                                                                                                                                                                                                                                                                                                                                                                                        |
|            | Range : 0 ~ 32767<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 100<br>Unit : ms<br>This parameter sets the acceleration/deceleration of the spindle during orientation (including spindle adjustment).                                                                                                                                                                              |
| <b>835</b> | <b>SPD. CH POS. ENABLE M CODE</b>                                                                                                                                                                                                                                                                                                                                                                                         |
|            | Range : 0 ~ 32767<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>When the system executes this M code, the spindle enters C(H) positioning mode.                                                                                                                                                                                                                   |
| <b>836</b> | <b>SPD. CH POS. RELEASE M CODE</b>                                                                                                                                                                                                                                                                                                                                                                                        |
|            | Range : 0 ~ 32767<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>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 ( $\alpha$ ) (parameter No. 0837), the numbers (n) (Pr.0838) of semi-fixing positioning M code, and the basic angle ( $\beta$ ) (Pr.1062).

Relationship of M code & positioning angle

| M code           | Angle shift amount | The shift value of basic angle $\beta = 30^\circ$ |
|------------------|--------------------|---------------------------------------------------|
| $M \alpha$       | $\beta$            | $30^\circ$                                        |
| $M (\alpha + 1)$ | $2\beta$           | $60^\circ$                                        |
| $M (\alpha + 2)$ | $3\beta$           | $90^\circ$                                        |
| $M (\alpha + 3)$ | $4\beta$           | $120^\circ$                                       |
| :                | :                  | :                                                 |
| $M (\alpha + n)$ | $(n + 1)\beta$     |                                                   |

|     |                                                 |
|-----|-------------------------------------------------|
| 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.

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>298</b>  | <b>RPM REACHES SET RANGE OF THE 2ND SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>881</b>  | <b>RPM REACHES SET RANGE OF THE 3RD SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>1054</b> | <b>RPM REACHES SET RANGE OF THE 1ST SPINDLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|             | Range : 1 ~ 20000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 50<br>Unit : RPM<br><p>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</p> $  \text{Spindle's actual RPM} - \text{Spindle's command RPM}   < \text{this parameter's set value}$ <p>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.</p> |
| <b>1056</b> | <b>SPD ORIENTATION OFFSET ANGLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|             | Range : -360000 ~ 360000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 30000<br>Unit : 0.001degree<br><p>During spindle orientation, this parameter sets the offset amount between the orientation stop point and the reference zero point.<br/> For the unit of offset amount, please set to pulse or 0.0001 degree by Pr.0248.</p>                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>1059</b> | <b>ACCEL./DECCEL. TIME PER KILO-REV. OF THE 1ST SPINDLE DURING RIGID TAPPING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>1164</b> | <b>SPD2 RIGTAP ACC/DEC TIME</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>1165</b> | <b>SPD3 RIGTAP ACC/DEC TIME</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|             | Range : 0 ~ 32767<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : ms<br><p>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.</p>                                                                                                                                                                                                                                                                                                                                                                              |

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1062 | <b>BASIC ANGLE OF SPD POS.</b><br>Range : -360000 ~ 360000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 30000<br>Unit : 0.001°<br>This parameter sets the Spindle semi-constant position basic angle shifting amount ( $\beta$ ). 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  | <b>THE 2ND SPINDLE REACHES ZERO SPEED RPM</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 882  | <b>THE 3RD SPINDLE REACHES ZERO SPEED RPM</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 1063 | <b>THE 1ST SPINDLE REACHES ZERO SPEED RPM</b><br>Range : 1 ~ 20000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 10<br>Unit : RPM<br>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 | <b>COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1166 | <b>SPD2 RIGTAP VELOCITY COMP.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1167 | <b>SPD3 RIGTAP VELOCITY COMP.</b><br>Range : 0 ~ 100000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>After rigid tapping adjustment is finished, enter the value shown by system info No.023 on DGNOS page to this parameter.                                                                                                                                                                                                                              |
| 1065 | <b>COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S ACCELERATION DURING RIGID TAPPING</b>                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1168 | <b>SPD2 RIGTAP ACCELERATED COMP.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 1169 | <b>SPD3 RIGTAP ACCELERATED COMP.</b><br>Range : 0 ~ 100000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>After the adjustment of rigid tapping is finished, enter the value shown by system info No.022 on DGNOS page to this parameter.                                                                                                                                                                                                                    |

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <b>1066</b> | <b>COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>1170</b> | <b>SPD2 RIGTAP VEL. FILTER FACTOR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>1171</b> | <b>SPD3 RIGTAP VEL. FILTER FACTOR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|             | Range : 0 ~ 20<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><p>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 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.</p> |
| <b>1069</b> | <b>SPD1 RIGTAP SPD STOP CHECK</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>1174</b> | <b>SPD2 RIGTAP SPD STOP CHECK</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>1175</b> | <b>SPD3 RIGTAP SPD STOP CHECK</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|             | Range : 0 ~ 200<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 20<br>Unit : Pulse<br><p>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 tapping. On the other hand, if the setting value is too big, tapping error may increase.</p>   |
| <b>1070</b> | <b>COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S ACCELERATION SPEED DURING RIGID TAPPING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>1172</b> | <b>SPD2 RIGTAP ACC. FILTER FACTOR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>1173</b> | <b>SPD3 RIGTAP ACC. FILTER FACTOR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|             | Range : 0 ~ 20<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><p>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.</p>  |

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1075 | <b>TOLERANCE OF THE 1ST SPINDLE IN CONTROL MODE</b>                                                                                                                                                                                                                                                                                                                                                                                               |
|      | Range : 0 ~ 100000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 4096<br>Unit : Pulse<br><p>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.</p> |
| 1076 | <b>SPD1 RIGTAP DEC TIME/1000 RPM</b>                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1176 | <b>SPD2 RIGTAP DEC TIME/1000 RPM</b>                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1177 | <b>SPD3 RIGTAP DEC TIME/1000 RPM</b>                                                                                                                                                                                                                                                                                                                                                                                                              |
|      | Range : 0 ~ 100000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 1000<br>Unit : ms<br><p>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.</p>                                                                                                                                                      |
| 1095 | <b>HOME OF SPD. C(H) POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                 |
|      | Range : -99999999 ~ 99999999<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : 0.001degree<br><p>The zero point of the spindle's C(H) positioning (the corresponding shift angle to the index point).</p>                                                                                                                                                                                             |
| 1117 | <b>SPEED OF SPD. CH POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                  |
|      | Range : 1 ~ 99999999<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 36000<br>Unit : Nul<br><p>The speed when the spindle executes C(H) positioning</p>                                                                                                                                                                                                                                                         |

|             |                                   |
|-------------|-----------------------------------|
| <b>1121</b> | <b>JOG RPM OF THE 1ST SPINDLE</b> |
| <b>1122</b> | <b>JOG SPEED OF 2ND SPINDLE</b>   |
| <b>1123</b> | <b>JOG SPEED OF 3RD SPINDLE</b>   |

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

|           |                                                                                                                          |
|-----------|--------------------------------------------------------------------------------------------------------------------------|
| <b>15</b> | <b>CORRESPONDING MECHANICAL AXIS OF MPG SIMULATED AXIS</b>                                                               |
|           | 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). |
| <b>28</b> | <b>MPG CONNECTION PORT OF X AXIS</b>                                                                                     |
| <b>75</b> | <b>MPG CONNECTION PORT OF THE 4TH AXIS</b>                                                                               |
| <b>87</b> | <b>MPG CONNECTION PORT OF Y AXIS</b>                                                                                     |
| <b>88</b> | <b>MPG CONNECTION PORT OF Z AXIS</b>                                                                                     |
|           | 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.

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>38</b>  | <b>BACKLASH COMPENSATION UNIT 0)PULSE 16)μm</b><br>Range : 0 ~ 16<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 16<br>Unit : Nul<br>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).                                                                                                                                    |
| <b>44</b>  | <b>BACKLASH COMPENSATION AMOUNT OF X AXIS μm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>45</b>  | <b>BACKLASH COMPENSATION AMOUNT OF Y AXIS μm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>46</b>  | <b>BACKLASH COMPENSATION AMOUNT OF Z AXIS μm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>47</b>  | <b>BACKLASH COMPENSATION AMOUNT OF THE 4TH AXIS μm</b><br>Range : 0 ~ 32767<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : μm<br>This parameter sets the backlash compensation amount of each axis.                                                                                                                                                                                                                                                         |
| <b>112</b> | <b>TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF X AXIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>113</b> | <b>TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Y AXIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>114</b> | <b>TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Z AXIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>115</b> | <b>TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF THE 4TH AXIS</b><br>Range : 1 ~ 50<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 20<br>Unit : Nul<br>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. |

|            |                                           |
|------------|-------------------------------------------|
| <b>117</b> | <b>BACKLASH COMPENSATION FUNCTION BIT</b> |
|------------|-------------------------------------------|

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 4<sup>th</sup> axis, 1 means to enable 4th axis backlash compensation function; 0 means not to enable.

|            |                                                  |
|------------|--------------------------------------------------|
| <b>118</b> | <b>DIRECTION OF PITCH ERROR COMPENSATION BIT</b> |
|------------|--------------------------------------------------|

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 4<sup>th</sup> axis, 1 means pitch error compensation starts from -ive direction 4<sup>th</sup> axis returns to the reference point; 0 means pitch error compensation starts toward +ive direction.

|            |                                              |
|------------|----------------------------------------------|
| <b>119</b> | <b>PITCH ERROR COMPENSATION FUNCTION BIT</b> |
|------------|----------------------------------------------|

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 4<sup>th</sup> axis, 1 means to enable 4<sup>th</sup> axis pitch error compensation function; 0 means not to enable.

|            |                                                                                                                                                                                                                                                              |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>300</b> | <b>PITCH ERROR COMPENSATION OF 001 SESSION OF X AXIS <math>\mu\text{m}</math></b>                                                                                                                                                                            |
| <b>349</b> | <b>PITCH ERROR COMPENSATION OF 050 SESSION OF X AXIS <math>\mu\text{m}</math></b>                                                                                                                                                                            |
|            | Range : -20000 ~ 20000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>Assume the pitch error of X axis is M ( $\mu\text{m}$ ), set this parameter to M, and Pr.0038 to 16.                   |
| <b>450</b> | <b>PITCH ERROR COMPENSATION OF 001 SESSION OF Y AXIS <math>\mu\text{m}</math></b>                                                                                                                                                                            |
| <b>499</b> | <b>PITCH ERROR COMPENSATION OF 050 SESSION OF Y AXIS <math>\mu\text{m}</math></b>                                                                                                                                                                            |
|            | Range : -20000 ~ 20000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>Assume the pitch error of Y axis is M ( $\mu\text{m}$ ), set this parameter to M, and Pr.0038 to 16.                   |
| <b>600</b> | <b>PITCH ERROR COMPENSATION OF 001 SESSION OF Z AXIS <math>\mu\text{m}</math></b>                                                                                                                                                                            |
| <b>649</b> | <b>PITCH ERROR COMPENSATION OF 050 SESSION OF Z AXIS <math>\mu\text{m}</math></b>                                                                                                                                                                            |
|            | Range : -20000 ~ 20000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>Assume the pitch error of Z axis is M ( $\mu\text{m}$ ), set this parameter to M, and Pr.0038 to 16.                   |
| <b>750</b> | <b>PITCH ERROR COMPENSATION OF 001 SESSION OF THE 4TH AXIS <math>\mu\text{m}</math></b>                                                                                                                                                                      |
| <b>799</b> | <b>PITCH ERROR COMPENSATION OF 050 SESSION OF THE 4TH AXIS <math>\mu\text{m}</math></b>                                                                                                                                                                      |
|            | Range : -20000 ~ 20000<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>Assume the pitch error of the 4 <sup>th</sup> axis is M ( $\mu\text{m}$ ), set this parameter to M, and Pr.0038 to 16. |

|            |                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>811</b> | <b>BALL BAR COMPENSATION G CODE 0)G2 G3 1) ALL</b>                                                                                                                                                                                                                                                                                                                                                         |
|            | Range : 0 ~ 1<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>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. |
| <b>812</b> | <b>REVERSAL SPIKE COMPENSATION: +X</b>                                                                                                                                                                                                                                                                                                                                                                     |
| <b>818</b> | <b>REVERSAL SPIKE COMPENSATION: +Y</b>                                                                                                                                                                                                                                                                                                                                                                     |
| <b>828</b> | <b>REVERSAL SPIKE COMPENSATION: +Z</b>                                                                                                                                                                                                                                                                                                                                                                     |
|            | Range : 0 ~ 200<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>This parameter sets the spike value of each corresponding axis in the ball-bar test. When set to 0, this function is disabled.                                                                                                                                              |
| <b>813</b> | <b>DURATION OF REVERSAL SPIKE COMPENSATION: +X</b>                                                                                                                                                                                                                                                                                                                                                         |
| <b>819</b> | <b>DURATION OF REVERSAL SPIKE COMPENSATION: +Y</b>                                                                                                                                                                                                                                                                                                                                                         |
| <b>829</b> | <b>DURATION OF REVERSAL SPIKE COMPENSATION: +Z</b>                                                                                                                                                                                                                                                                                                                                                         |
|            | Range : 0 ~ 200<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>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.                    |
| <b>814</b> | <b>REVERSAL SPIKE LAG COMPENSATION: +X</b>                                                                                                                                                                                                                                                                                                                                                                 |
| <b>820</b> | <b>REVERSAL SPIKE LAG COMPENSATION: +Y</b>                                                                                                                                                                                                                                                                                                                                                                 |
| <b>830</b> | <b>REVERSAL SPIKE LAG COMPENSATION: +Z</b>                                                                                                                                                                                                                                                                                                                                                                 |
|            | Range : 0 ~ 200<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>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.                                                          |

|            |                                                                                                                                                                                                                                                                                                                                                                                             |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>815</b> | <b>REVERSAL SPIKE COMPENSATION: –X</b>                                                                                                                                                                                                                                                                                                                                                      |
| <b>825</b> | <b>REVERSAL SPIKE COMPENSATION: –Y</b>                                                                                                                                                                                                                                                                                                                                                      |
| <b>831</b> | <b>REVERSAL SPIKE COMPENSATION: –Z</b>                                                                                                                                                                                                                                                                                                                                                      |
|            | Range : 0 ~ 200<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>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.        |
| <b>816</b> | <b>DURATION OF REVERSAL SPIKE COMPENSATION: –X</b>                                                                                                                                                                                                                                                                                                                                          |
| <b>826</b> | <b>DURATION OF REVERSAL SPIKE COMPENSATION: –Y</b>                                                                                                                                                                                                                                                                                                                                          |
| <b>832</b> | <b>DURATION OF REVERSAL SPIKE COMPENSATION: –Z</b>                                                                                                                                                                                                                                                                                                                                          |
|            | Range : 0 ~ 200<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>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. |
| <b>817</b> | <b>REVERSAL SPIKE LAG COMPENSATION: –X</b>                                                                                                                                                                                                                                                                                                                                                  |
| <b>827</b> | <b>REVERSAL SPIKE LAG COMPENSATION: –Y</b>                                                                                                                                                                                                                                                                                                                                                  |
| <b>833</b> | <b>REVERSAL SPIKE LAG COMPENSATION: –Z</b>                                                                                                                                                                                                                                                                                                                                                  |
|            | Range : 0 ~ 200<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>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 $\mu$ m   |
| 853 | Y TOTAL COMP VALUE IN TDC $\mu$ m   |
| 858 | Z TOTAL COMP VALUE IN TDC $\mu$ m   |
| 863 | 4TH TOTAL COMP VALUE IN TDC $\mu$ m |

Range : -1000 ~ 1000  
 Effective : Effective After Reboot  
 Access level : Machine Maker  
 Default : 0  
 Unit :  $\mu$ m  
 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

|             |                                                                                            |
|-------------|--------------------------------------------------------------------------------------------|
| <b>1018</b> | <b>SESSION INTERVAL OF PITCH ERROR COMPENSATION: X AXIS <math>\mu\text{m}</math></b>       |
| <b>1019</b> | <b>SESSION INTERVAL OF PITCH ERROR COMPENSATION: Y AXIS <math>\mu\text{m}</math></b>       |
| <b>1020</b> | <b>SESSION INTERVAL OF PITCH ERROR COMPENSATION: Z AXIS <math>\mu\text{m}</math></b>       |
| <b>1021</b> | <b>SESSION INTERVAL OF PITCH ERROR COMPENSATION: THE 4TH AXIS <math>\mu\text{m}</math></b> |

Range : 0 ~ 99999999

Effective : Effective After Reboot

Access level : Machine Maker

Default : 30000

Unit :  $\mu\text{m}$

Assume the session interval of X axis's pitch error compensation for X axis is 10000  $\mu\text{m}$ , set this parameter to 10000.

|             |                                                                             |
|-------------|-----------------------------------------------------------------------------|
| <b>1046</b> | <b>START POSITION OF PITCH ERROR: X AXIS <math>\mu\text{m}</math></b>       |
| <b>1047</b> | <b>START POSITION OF PITCH ERROR: Y AXIS <math>\mu\text{m}</math></b>       |
| <b>1048</b> | <b>START POSITION OF PITCH ERROR: Z AXIS <math>\mu\text{m}</math></b>       |
| <b>1049</b> | <b>START POSITION OF PITCH ERROR: THE 4TH AXIS <math>\mu\text{m}</math></b> |

Range : -99999999 ~ 99999999

Effective : Effective After Reboot

Access level : Machine Maker

Default : 0

Unit :  $\mu\text{m}$

Assume the pitch error's start position of some axis is 0  $\mu\text{m}$  (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.

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>19</b> | <b>SOLUTIONS WHEN HOME IS ON DOG</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|           | Range : 0 ~ 1<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><br>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:<br>X axis : "MOT4014 X AXIS ON HOME DOG"<br>Y axis : "MOT4015 Y AXIS ON HOME DOG"<br>Z axis : "MOT4016 Z AXIS ON HOME DOG"<br>The 4 <sup>th</sup> axis: "MOT4017 4 <sup>th</sup> AXIS ON HOME DOG"<br>1 : Before executing HOME return, NC should remove the servo axis (towards the opposite direction of HOME reference) until the axis leaves DOG. |
| <b>20</b> | <b>DEFAULT SETTING OF HOME RETURN BIT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|           | Range : 0 ~ 15<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><br>After turning on the machine, check if each axis is preset to having returned to its reference point.<br>Bit 0 : X axis<br>Bit 1 : Y axis<br>Bit 2 : Z axis<br>Bit 3 : The 4 <sup>th</sup> axis<br>Bit 4 : The 5 <sup>th</sup> axis<br>Bit 5 : The 6 <sup>th</sup> axis                                                                                                                                                                                                                                                                              |

|           |                                                                            |
|-----------|----------------------------------------------------------------------------|
| <b>30</b> | <b>OFFSET AMOUNT OF HOME RETURN: X AXIS <math>\mu\text{m}</math></b>       |
| <b>31</b> | <b>OFFSET AMOUNT OF HOME RETURN: Y AXIS <math>\mu\text{m}</math></b>       |
| <b>32</b> | <b>OFFSET AMOUNT OF HOME RETURN: Z AXIS <math>\mu\text{m}</math></b>       |
| <b>33</b> | <b>OFFSET AMOUNT OF HOME RETURN: THE 4TH AXIS <math>\mu\text{m}</math></b> |

Range : -32768 ~ 32767

Effective : Effective After RESET

Access level : Machine Maker

Default : 0

Unit :  $\mu\text{m}$

Assume the offset amount of N ( $\mu\text{m}$ ) is to be made to the mechanical reference point of X (Y, Z, the 4<sup>th</sup>) 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 4<sup>th</sup>) axis will travel in the direction away from DOG. When the set value is negative, the mechanical reference point of X (Y, Z, the 4<sup>th</sup>) axis will travel in the direction towards DOG.

|           |                                                                     |
|-----------|---------------------------------------------------------------------|
| <b>34</b> | <b>IDLE DURATION FOR X AXIS TO SEARCH FOR ZERO POINT 10ms</b>       |
| <b>35</b> | <b>IDLE DURATION FOR Y AXIS TO SEARCH FOR ZERO POINT 10ms</b>       |
| <b>36</b> | <b>IDLE DURATION FOR Z AXIS TO SEARCH FOR ZERO POINT 10ms</b>       |
| <b>37</b> | <b>IDLE DURATION FOR THE 4TH AXIS TO SEARCH FOR ZERO POINT 10ms</b> |

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:

- To set the dwell time of decelerating stop when some axis travels toward the reference point in 1<sup>st</sup> speed and meets DOG.
- To set the dwell time of decelerating stop when some axis travels away from DOG in 2<sup>nd</sup> speed and finds the motor INDEX.
- 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 4<sup>th</sup> axis re-searching HOME point method is re-searching DOG+ Index. 1 to indicate the 4<sup>th</sup> 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:

- The set values of Pr.1014 ~ Pr.1017;
- The set values of 00 coordinate system, G54 ~G59 coordinates;
- 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,

- This parameter sets whether Pr.1014 ~ Pr.1017's set values are effective;
- The set values of 00 coordinate system and G54 ~ G59 coordinate system are always effective;
- 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<br>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<br>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

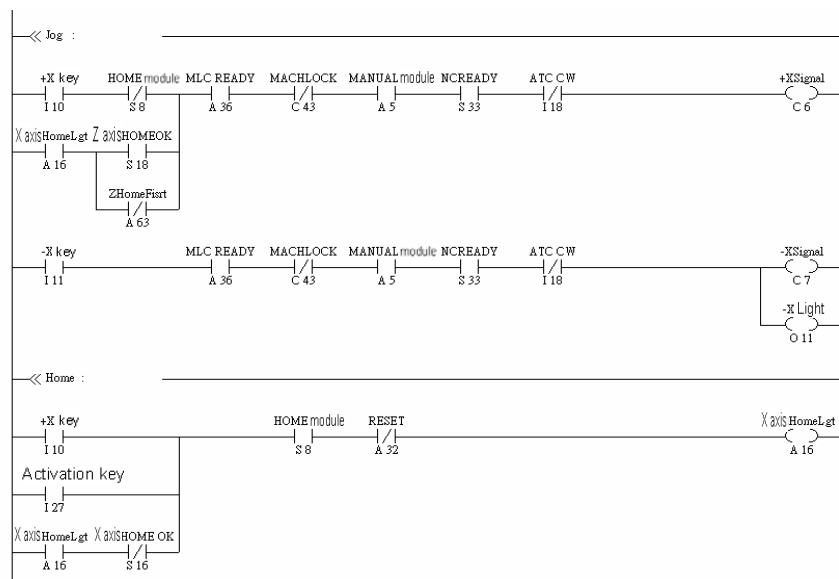
Access level : Machine Maker

Default : 0

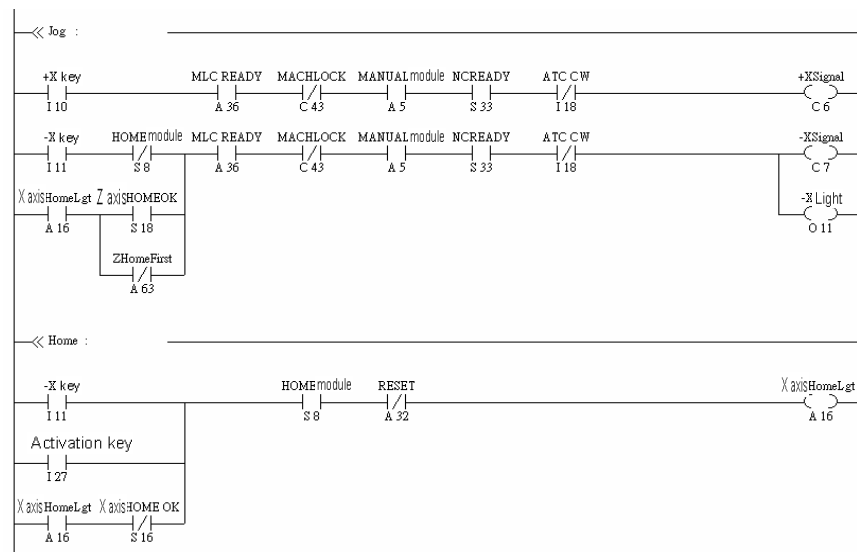
Unit : Nul

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 encoder as the mechanical reference point, as doing so will produce multiple mechanical reference points.

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>834</b>  | <b>READING DURATION OF ABSOLUTE ENCODER</b><br>Range : 0 ~ 10<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 5<br>Unit : s<br>This parameter sets the duration limit for the absolute encoder to send feedback to NC.                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>1014</b> | <b>ABSOLUTE COORDINATES OF X AXIS AFTER RETURNING TO HOME POINT <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>1015</b> | <b>ABSOLUTE COORDINATES OF Y AXIS AFTER RETURNING TO HOME POINT <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>1016</b> | <b>ABSOLUTE COORDINATES OF Z AXIS AFTER RETURNING TO HOME POINT <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>1017</b> | <b>ABSOLUTE COORDINATES OF THE 4TH AXIS AFTER RETURNING TO HOME POINT <math>\mu\text{m}</math></b><br>Range : -99999999 ~ 99999999<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>Assume the expected absolute coordinates of X axis after returning to the zero point is 300 $\mu\text{m}$ , 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. |
| <b>1022</b> | <b>THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>1023</b> | <b>THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>1024</b> | <b>THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>1025</b> | <b>THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT <math>\mu\text{m}</math></b><br>Range : -99999999 ~ 99999999<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : $\mu\text{m}$<br>This parameter sets the corresponding offset amount of each axis's 2 <sup>nd</sup> zero point to its 1 <sup>st</sup> zero point. Assume the corresponding offset amount is 2000 $\mu\text{m}$ , set this parameter 2000.                                                                                                                                                                          |

|      |                                                                                                      |
|------|------------------------------------------------------------------------------------------------------|
| 1026 | THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       |
| 1027 | THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       |
| 1028 | THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       |
| 1029 | THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$ |

Range : -99999999 ~ 99999999

Effective : Effective After RESET

Access level : Machine Maker

Default : 0

Unit :  $\mu\text{m}$

This parameter sets the corresponding offset amount of each axis's 3<sup>rd</sup> zero point to its 1<sup>st</sup> zero point. Assume the corresponding offset amount is 2000 $\mu\text{m}$ , set this parameter 2000.

|      |                                                                                                      |
|------|------------------------------------------------------------------------------------------------------|
| 1030 | THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       |
| 1031 | THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       |
| 1032 | THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$       |
| 1033 | THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT $\mu\text{m}$ |

Range : -99999999 ~ 99999999

Effective : Effective After RESET

Access level : Machine Maker

Default : 0

Unit :  $\mu\text{m}$

This parameter sets the corresponding offset amount of each axis's 4<sup>th</sup> zero point to its 1<sup>st</sup> zero point. Assume the corresponding offset amount is 2000 $\mu\text{m}$ , set this parameter 2000.

|      |                                                                     |
|------|---------------------------------------------------------------------|
| 1104 | HOME RETURN AT THE 1ST SPEED: X AXIS $\mu\text{m}/\text{min}$       |
| 1105 | HOME RETURN AT THE 1ST SPEED: Y AXIS $\mu\text{m}/\text{min}$       |
| 1106 | HOME RETURN AT THE 1ST SPEED: Z AXIS $\mu\text{m}/\text{min}$       |
| 1107 | HOME RETURN AT THE 1ST SPEED: THE 4TH AXIS $\mu\text{m}/\text{min}$ |

Range : 1 ~ 99999999

Effective : Effective After RESET

Access level : Machine Maker

Default : 2000000

Unit :  $\mu\text{m}/\text{min}$

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 1<sup>st</sup> speed set by Pr.1108 ~ Pr.1111, Pr.1140, and Pr.1141.

|             |                                                                                       |
|-------------|---------------------------------------------------------------------------------------|
| <b>1108</b> | <b>HOME RETURN AT THE 2ND SPEED: X AXIS <math>\mu\text{m}/\text{min}</math></b>       |
| <b>1109</b> | <b>HOME RETURN AT THE 2ND SPEED: Y AXIS <math>\mu\text{m}/\text{min}</math></b>       |
| <b>1110</b> | <b>HOME RETURN AT THE 2ND SPEED: Z AXIS <math>\mu\text{m}/\text{min}</math></b>       |
| <b>1111</b> | <b>HOME RETURN AT THE 2ND SPEED: THE 4TH AXIS <math>\mu\text{m}/\text{min}</math></b> |

Range : 1 ~ 99999999

Effective : Effective After RESET

Access level : Machine Maker

Default : 200000

Unit :  $\mu\text{m}/\text{min}$

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 2<sup>nd</sup> speed set by this parameter.

|             |                         |
|-------------|-------------------------|
| <b>1118</b> | <b>INDEX PROTECTION</b> |
|-------------|-------------------------|

Range : 0 ~ 1

Effective : Effective After RESET

Access level : User

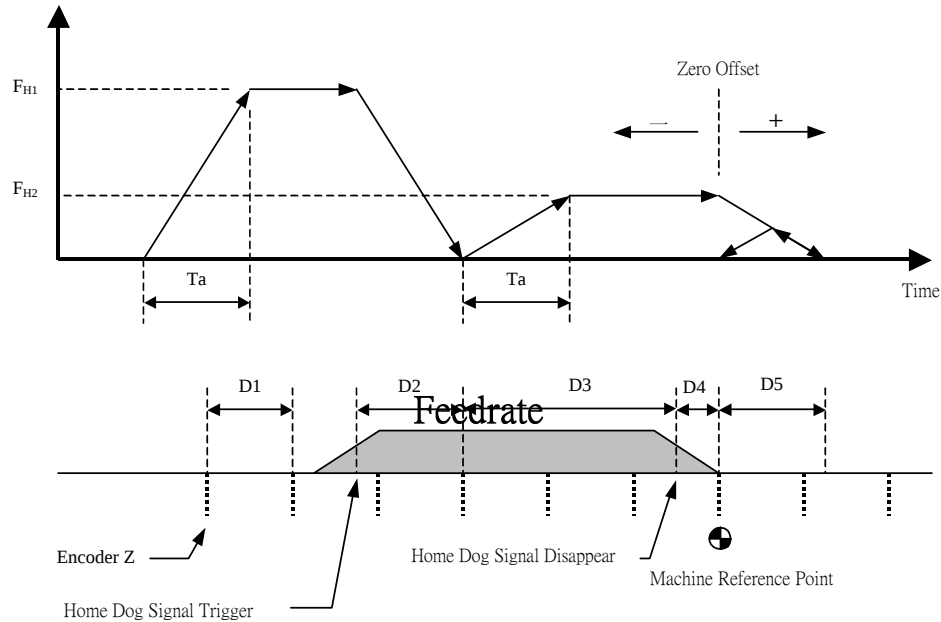
Default : 0

Unit : Nul

When the distance between the 1<sup>st</sup> 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 1<sup>st</sup> 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. D1 is 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 1<sup>st</sup> gear speed decelerating stop. The calculating formula is as following:

$$D2 \cong \text{servo lag} + \text{deceleration distance} \cong \frac{F_{H1}}{K_p} + \frac{F_{H1} \cdot T_a}{2}$$

$K_p$  is the servo position loop gain ( $\text{sec}^{-1}$ ),  $T_a$  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 2<sup>nd</sup> gear speed to when Home DOG signal 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 2<sup>nd</sup> gear speed. Calculating formula is as following:

$$D3 \cong \frac{F_{H2} \cdot T_a}{2}, \quad T_a \text{ is servo axis G00 acc/deceleration time.}$$

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 alarm message (MOT0045 not able to find the ZI light of motor) will occur. Please check whether there is motor connection error.
5. D5 is the traveling distance from the 1<sup>st</sup> Z phase signal of servo motor ENCODER after getting away DOG to servo axis in 2<sup>nd</sup> gear decelerating stop. The calculating formual is as following:

$$D5 \doteq \text{servo lag} + \text{deceleration distance} \doteq \frac{F_{H2}}{K_p} + \frac{F_{H2} \cdot T_a}{2}$$

$K_p$  is the servo position loop gain ( $\text{sec}^{-1}$ ),  $T_a$  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.

Recommending to set the offset amount of the servo axis reference point (parameters 0030 ~ 0033) greater than D5 in order to prevent any reverse directon moving of servo axis.

【Example】Assumed a servo axis home return in 1<sup>st</sup> gear speed is 10m/min, the 2<sup>nd</sup> gear speed is 200mm/min, G00 acc/decelerating time is 150ms, position loop gain is 100sec<sup>-1</sup>. Under the condition that the reference point is behind DOG, the calculating formula of the shortest needed length of DOG is as following:

$$D2 \doteq \frac{10000/60}{100} + \frac{10000/60 \cdot 0.15}{2} \doteq 14.17\text{mm}$$

$$D3 \doteq \frac{200/60 \cdot 0.15}{2} \doteq 0.25\text{mm}$$

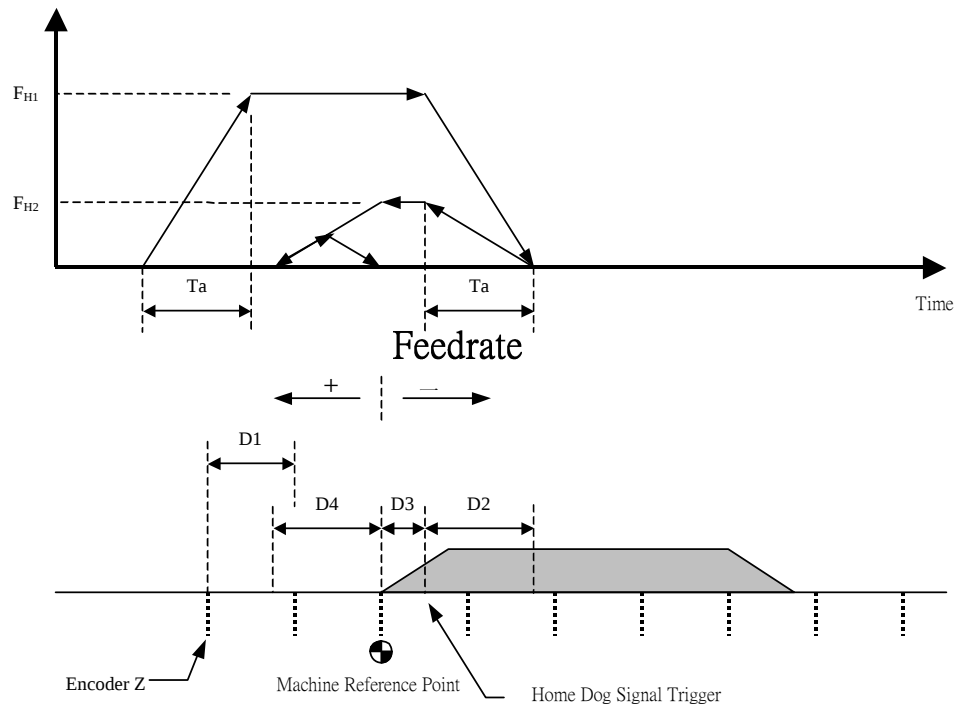
So, the shortest needed length of DOG is (D2 + D3)  $\doteq$  14.42mm

Also,

$$D5 \doteq \frac{200/60}{100} + \frac{200/60 \cdot 0.15}{2} \doteq 0.28\text{mm}$$

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



D1 is the distance between two Z phase signals that are close together of servo motor ECNODER.

D2 is the distance between the HOME DOG input points to the servo axis by using the 1<sup>st</sup> gear speed decelerating stop. The calculating formula is as following:

$$D2 \doteq \text{servo lag} + \text{deceleration distance} \doteq \frac{F_{H1}}{K_p} + \frac{F_{H1} \cdot T_a}{2}$$

$K_p$  is the servo position loop gain ( $\text{sec}^{-1}$ ),  $T_a$  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 2<sup>nd</sup> gear speed to when Home DOG signal disappears. General speaking, the 2<sup>nd</sup> gear speed is smaller than the 1<sup>st</sup> gear speed, so the length of D2 must be long enough for the servo motor to accelerate to the 2<sup>nd</sup> 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 alarm message (MOT0045 not able to find the ZI light of motor) will occur. Please check whether there is motor connection error.
8. D4 is the traveling distance from the 1<sup>st</sup> Z phase signal of servo motor ENCODER after getting away DOG to servo axis in 2<sup>nd</sup> gear decelerating stop. The calculating formual is as following:

$$D5 \doteq \text{servo lag} + \text{deceleration distance} \doteq \frac{F_{H2}}{K_p} + \frac{F_{H2} \cdot T_a}{2}$$

$K_p$  is the servo position loop gain ( $\text{sec}^{-1}$ ),  $T_a$  is the servo axis G00 acc/decelerating time.

Recommending 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

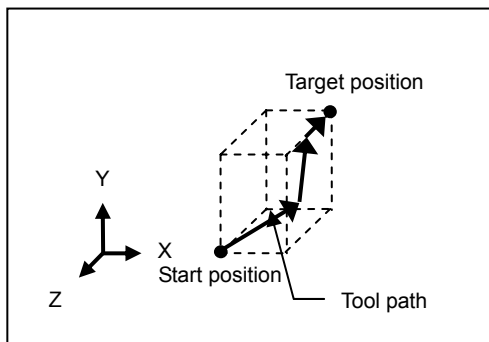
0 : Each axis motions at the G00 speed set for each axis respectively, no synchronic motion with G00;

1 : Each axis motions synchronically with G00 command, and it is effective for the following commands:

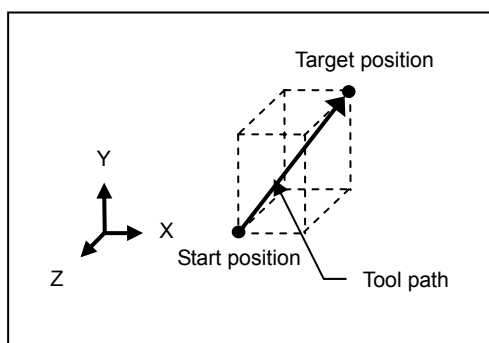
G00 commands in MEM or MDI mode;

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:

- Display value of initial coordinates;
- Display value of coordinates after HOME return is finished;
- G54 ~ G59 commands (Coordinate system selection);
- 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 :<br>(1) | C23 is OFF :<br>(3) | (1)     | (4) |
|                                               | C23 is ON :<br>(1)  | C23 is ON :<br>(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.

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>94</b>  | <b>EDIBILITY OF 09XXX 0)NO 1)YES</b><br>Range : 0 ~ 1<br>Effective : Instant Activity<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>Set the edibility of files No. 09000~09999, etc.                                                                                                                                                                                                                                                                                                                                          |
| <b>122</b> | <b>NAME THE 4TH AXIS (ABCUVW)</b><br>Range : 0 ~ 5<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 2<br>Unit : Nul<br>Set to 0, the 4 <sup>th</sup> axis is referred as A.<br>Set to 1, the 4 <sup>th</sup> axis is referred as B.<br>Set to 2, the 4 <sup>th</sup> axis is referred as C.<br>Set to 3, the 4 <sup>th</sup> axis is referred as U.<br>Set to 4, the 4 <sup>th</sup> axis is referred as V.<br>Set to 5, the 4 <sup>th</sup> axis is referred as W.                                           |
| <b>123</b> | <b>UNIT SYSTEM 0)G21 METRIC 1)G20 IMPERIAL</b><br>Range : 0 ~ 1<br>Effective : Effective After Reboot<br>Access level : User<br>Default : 0<br>Unit : Nul<br>This parameter sets the default unit system after the system starts. Users can switch between the two unit systems by G20(imperial) & G21(metric).                                                                                                                                                                                                                                 |
| <b>124</b> | <b>INITIAL MOTION COMMAND 0)G00 1)G01</b><br>Range : 0 ~ 1<br>Effective : Effective After Reboot<br>Access level : User<br>Default : 1<br>Unit : Nul<br>This parameter sets the default motion commands after NC starts. In MEM or MDI mode, users execute the commands below for the first time:<br><br>G91 X100. Y100. Z100.;<br>When this parameter is set to 0, the command above is the same as:<br><br>G91 G00 X100. Y100. Z100.;<br>When this parameter is set to 0, the command above is the same as:<br><br>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.

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>130</b>               | <b>UNIT OF INPUT VALUE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                          | <p>Range : 0 ~ 1</p> <p>Effective : Effective After RESET</p> <p>Access level : User</p> <p>Default : 1</p> <p>Unit : Nul</p> <p>Examples: In metric system, if this parameter is set to 0, and the commands as below are set in MDI mode :</p> <p>G90 G00 X100. F1000.;</p> <p>X axis travels at the rate of 1mm/min to the position at 0.1mm.</p> <p>G90 G00 X100. F1000.;</p> <p>X axis travels at the rate of 1000mm/min to the position at 100mm.</p> <p>If this parameter is set to 1 :</p> <p>G90 G00 X100. F1000.;</p> <p>X axis travels at the rate of 1000mm/min to the position at 100mm.</p> <p>G90 G00 X100. F1000.;</p> <p>X axis travels at the rate of 1000mm/min to the position at 100mm.</p> |
| <b>131</b>               | <b>CUTTER COMPENSATION TYPE 0)A 1)B</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                          | <p>Range : 0 ~ 1</p> <p>Effective : Effective After RESET</p> <p>Access level : Machine Maker</p> <p>Default : 0</p> <p>Unit : Nul</p> <p>0 : Use type A cutter compensation.</p> <p>1 : Use type B cutter compensation.</p> <p>Please refer to Programming Manual for the description of types.</p>                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>132</b><br><b>201</b> | <b>D/R MEASUREMENT FOR X</b><br><b>D/R MEASUREMENT FOR Y</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                          | <p>Range : 0 ~ 1</p> <p>Effective : Effective After Reboot</p> <p>Access level : Machine Maker</p> <p>Default : 0</p> <p>Unit : Nul</p> <p>This parameter sets the command key-in coordinate is diameter or radius mode.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>135</b>               | <b>DEFAULT COORDINATES 0)ABSOLUTE G90 1)INCREMENTAL G91</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                          | <p>Range : 0 ~ 1</p> <p>Effective : Effective After Reboot</p> <p>Access level : User</p> <p>Default : 0</p> <p>Unit : Nul</p> <p>The system's default coordinate type is:</p> <p>0 : Absolute coordinates (G90)</p> <p>1 : Incremental coordinates (G91)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>140</b> | <b>GLOBAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED</b><br>Range : 0 ~ 1<br>Effective : Effective After RESET<br>Access level : User<br>Default : 1<br>Unit : Nul<br><p>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.</p>                                                                                                                                                                |
| <b>141</b> | <b>LOCAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED</b><br>Range : 0 ~ 1<br>Effective : Effective After RESET<br>Access level : User<br>Default : 0<br>Unit : Nul<br><p>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.</p> |
| <b>145</b> | <b>DEFAULT PLANE 0)XY 1)ZX 2)YZ</b><br>Range : 0 ~ 2<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><p>0: Default plane is XY (G17).<br/> 0: Default plane is ZX (G18).<br/> 0: Default plane is YZ (G19).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>146</b> | <b>M CODE FOR MACRO O9001</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>147</b> | <b>M CODE FOR MACRO O9002</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>148</b> | <b>M CODE FOR MACRO O9003</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|            | Range : 0 ~ 32767<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br><p>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.<br/> Please refer to Programming Manual for the detail of M code list.</p>                                                                                                                                                                |

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

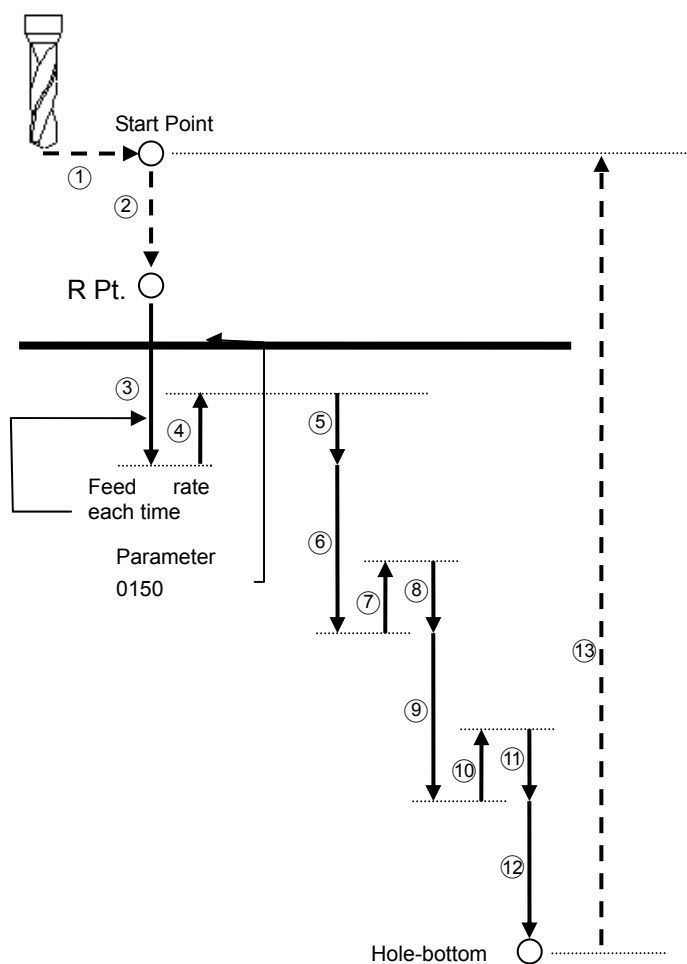
Effective : Effective After RESET

Access level : User

Default : 200

Unit :  $\mu\text{m}$

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

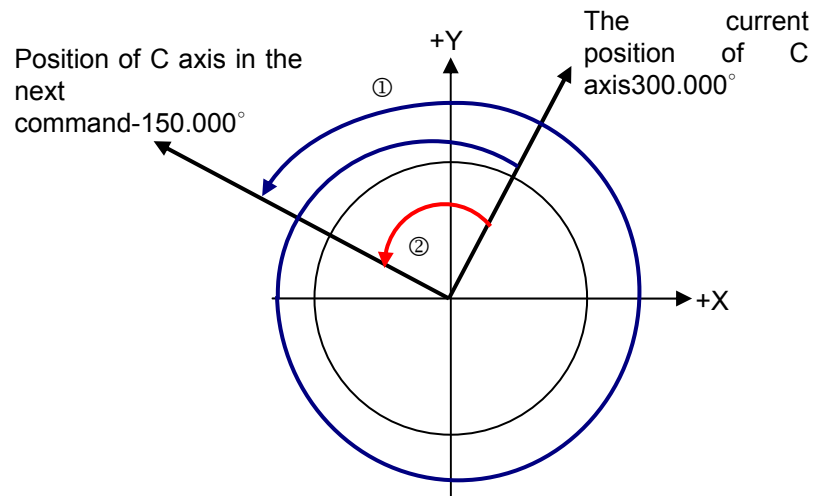
Effective : Effective After RESET

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

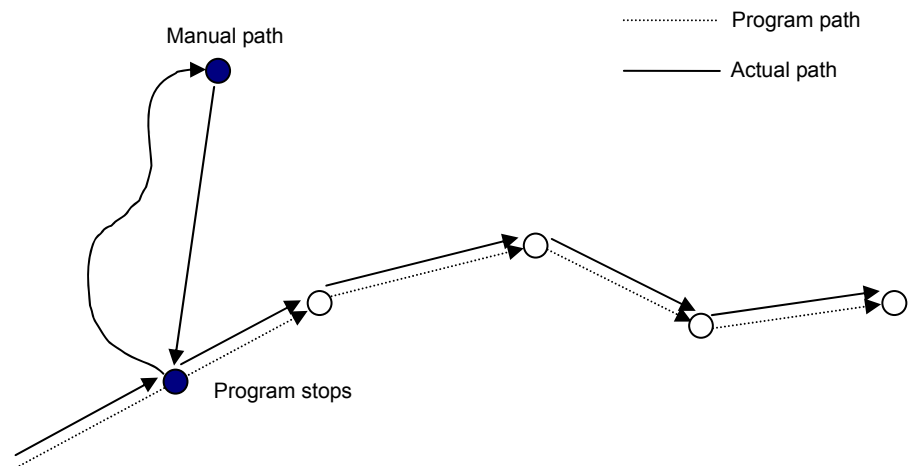
Default : 0

Unit : Nul

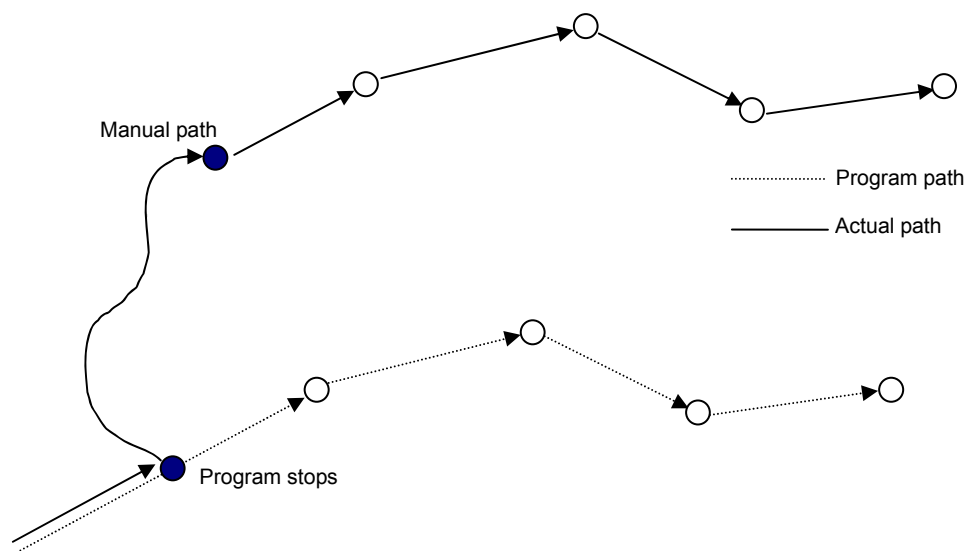
This parameter assign A, B, or C Type for G Code.

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>154</b> | <b>DISABLE G71/G72 PROFILE CHK</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|            | 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.                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>155</b> | <b>UNIT OF INITIAL FEED RATE 0)MM/REV 1)MM/MIN</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |
|            | 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.                                                                                                                                                                                                                                                                                                                                                            |
| <b>161</b> | <b>M CODE FOR MACRO O9004</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>162</b> | <b>M CODE FOR MACRO O9005</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>163</b> | <b>M CODE FOR MACRO O9006</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>164</b> | <b>M CODE FOR MACRO O9007</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>165</b> | <b>M CODE FOR MACRO O9008</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>166</b> | <b>G CODE FOR MACRO O9010</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>167</b> | <b>G CODE FOR MACRO O9011</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>168</b> | <b>G CODE FOR MACRO O9012</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>169</b> | <b>T CODE CALLS O9020</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|            | 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 detail. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 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<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>1 : The signal G31 SKIP is connected to the first LOCAL INPUT point (HS1 on a transit card)<br>2 : The signal G31 SKIP is connected to the second LOCAL INPUT point (HS2 on a transit card)<br>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<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 1<br>Unit : Nul<br>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.<br>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<br>Effective : Effective After RESET<br>Access level : User<br>Default : 1<br>Unit : Nul<br>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:<br>1. Manual Return: Resume the unfinished program by moving the machine to its last position in MEM or MDI mode.<br>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

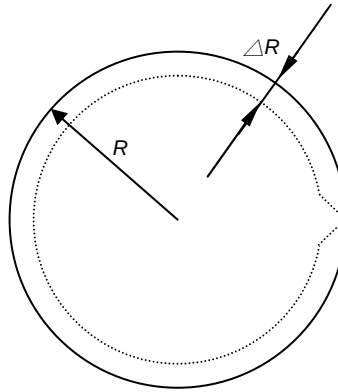
Manual Return function can be set either by this parameter or by C004.  
When C004 is ON, Manual Return function is enabled.  
When C004 is OFF, Manual Return function is disabled.  
If Pr.0180 is set to 1, Manual Return function will be enabled no matter C004 is ON or OFF; if Pr.0180 is set to 0, use 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  $\Delta R$  between Arc command and the actual path.



The formula is :  $\Delta R = \left( \frac{1}{2K_p^2 R} + \frac{T^2}{24R} \right) V^2$  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

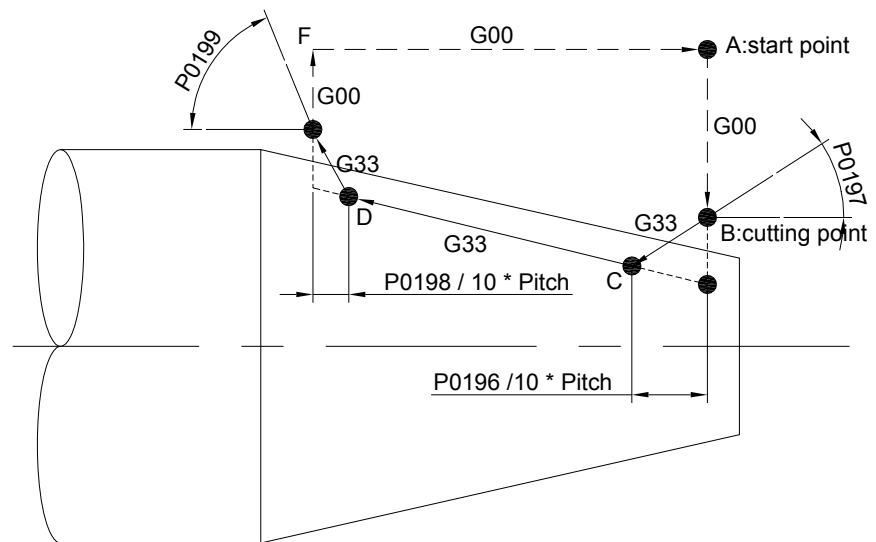
Effective : Effective After RESET

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 | <b>OPERATION LANGUAGE 0)ENGLISH 1)TRADITIONAL CHINESE 2)SIMPLIFIED CHINESE</b>                                                                                                                                                                                     |
|     | Range : 0 ~ 2<br>Effective : Effective After Reboot<br>Access level : User<br>Default : 1<br>Unit : Nul<br>0 : English<br>1 : Traditional Chinese<br>2 : Simplified Chinese                                                                                        |
| 203 | <b>PROGRAM RESET SWITCH MEM MODE</b>                                                                                                                                                                                                                               |
|     | Range : 0 ~ 1<br>Effective : Effective After RESET<br>Access level : User<br>Default : 0<br>Unit : Nul<br>Move cursor to file head or not when mode changed to MDI mode                                                                                            |
| 205 | <b>TOOL COMPENSATION 0)ABSOLUTE 1) RELATIVE INPUT</b>                                                                                                                                                                                                              |
|     | Range : 0 ~ 1<br>Effective : Effective After RESET<br>Access level : User<br>Default : 1<br>Unit : Nul<br>This parameter sets whether the tool compensation value set on OFFSET page is an absolute or a relative value.                                           |
| 211 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
| 212 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
| 213 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
| 214 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
| 215 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
| 216 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
| 217 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
| 218 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
| 219 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
| 220 | <b>STOP PRE-INTERPRETATION OF M CODE</b>                                                                                                                                                                                                                           |
|     | Range : 0 ~ 299<br>Effective : Effective After RESET<br>Access level : User<br>Default : 209<br>Unit : Nul<br>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 | <b>HIDE INFORMATION OF X AXIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 232 | <b>HIDE INFORMATION OF Y AXIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 233 | <b>HIDE INFORMATION OF Z AXIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 234 | <b>HIDE INFORMATION OF THE 4TH AXIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|     | Range : 0 ~ 3<br>Effective : Instant Activity<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>The corresponding HMI information of X (Y, Z, the 4 <sup>th</sup> , the 5 <sup>th</sup> , the 6 <sup>th</sup> ) axis is:<br>0 : Shown<br>1 : Hidden<br>2 : Set by C181(C182、C183、C184、C185、C186). OFF: Shown ; ON: Hidden.                                                                                                                                                                        |
| 238 | <b>REL/ABS GEOM VALUE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|     | Range : 0 ~ 1<br>Effective : Effective After RESET<br>Access level : User<br>Default : 0<br>Unit : Nul<br>The preset mode of geometry compensation input.<br>0: Absolute input mode.<br>1: Incremental input mode.                                                                                                                                                                                                                                                                                              |
| 239 | <b>MAX WEAR VALUE TO INPUT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|     | Range : 1 ~ 10000<br>Effective : Instant Activity<br>Access level : User<br>Default : 1000<br>Unit : LU<br>The maximum value of wear compensation for each input: <ul style="list-style-type: none"> <li>● 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.</li> <li>● Wear compensation input is in “incremental mode” : The input value cannot be larger than the value set by Pr.0239.</li> </ul> |
| 249 | <b>DISPLAY ABNORMALITY OF RAMDISK 0)OFF 1)ON</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|     | Range : 0 ~ 1<br>Effective : Effective After Reboot<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>0 : When there is any abnormality of RAMDISK, do not show warning messages.<br>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 TRAVERSE 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 | <b>SCREENSAVER WAIT TIME</b> |
|-----|------------------------------|

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.

|            |                                        |
|------------|----------------------------------------|
| <b>680</b> | <b>Enable Angular Axis Control</b>     |
| <b>681</b> | <b>Enable Return along AngularAxis</b> |
| <b>682</b> | <b>Inclination Angle for AAC</b>       |
| <b>683</b> | <b>Axis Number of Slanted Axis</b>     |
| <b>684</b> | <b>Axis Number of Cartesian Axis</b>   |

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.

|            |                                                                    |
|------------|--------------------------------------------------------------------|
| <b>806</b> | <b>MAXIMUM OFFSET TOLERANCE OF CORNER <math>\mu\text{m}</math></b> |
|------------|--------------------------------------------------------------------|

Range : 0 ~ 32767

Effective : Effective After RESET

Access level : User

Default : 50

Unit :  $\mu\text{m}$

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  $\mu\text{m}$ .

|            |                                  |
|------------|----------------------------------|
| <b>808</b> | <b>ENABLE CORNER ACC CONTROL</b> |
|------------|----------------------------------|

Range : 0 ~ 1

Effective : Effective After RESET

Access level : User

Default : 1

Unit : Nul

If 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  $\mu\text{m}$** 

Range : 1 ~ 32767

Effective : Effective After RESET

Access level : User

Default : 30

Unit :  $\mu\text{m}$ 

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  $\mu\text{m}$ .

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

|            |                                    |
|------------|------------------------------------|
| <b>869</b> | <b>ENABLE MEASURE ACCELERATION</b> |
|------------|------------------------------------|

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.

|            |                                    |
|------------|------------------------------------|
| <b>870</b> | <b>ENABLE CUTTING START SIGNAL</b> |
|------------|------------------------------------|

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.

|            |                                       |
|------------|---------------------------------------|
| <b>871</b> | <b>WAITING TIME BEFORE CHECK CFSS</b> |
|------------|---------------------------------------|

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.

|            |                                     |
|------------|-------------------------------------|
| <b>872</b> | <b>G78(G92) CUT DOWN FEED RATIO</b> |
|------------|-------------------------------------|

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.

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>873</b>  | <b>G78(G92) CUT UP FEED RATIO</b><br>Range : 1 ~ 10<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 2<br>Unit : n/A<br>When thread cutting cycle G78 (Type A is G92) is executed, this parameter sets if the tool's lifting speed is accelerated.<br>1: The tool's lifting speed is the same as the set F____.<br>2: The tool's lifting speed is doubled of F____, and so on.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>899</b>  | <b>APPLY CE REGULATIONS 0)NO 1)YES</b><br>Range : 0 ~ 1<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 0<br>Unit : Nul<br>0 : CE regulations are not applied.<br>1 : CE regulations are applied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>1006</b> | <b>SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +X <math>\mu</math>m</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>1008</b> | <b>SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Y <math>\mu</math>m</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>1010</b> | <b>SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Z <math>\mu</math>m</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>1012</b> | <b>SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +THE 4TH <math>\mu</math>m</b><br>Range : -99999999 ~ 99999999<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : 99999999<br>Unit : $\mu$ m<br>This parameter sets the travel limit value of the 1 <sup>st</sup> soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999 $\mu$ m 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 1 <sup>st</sup> and 2 <sup>nd</sup> 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. |

|             |                                                                                  |
|-------------|----------------------------------------------------------------------------------|
| <b>1007</b> | <b>SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - X <math>\mu</math>m</b>            |
| <b>1009</b> | <b>SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Y <math>\mu</math>m</b>            |
| <b>1011</b> | <b>SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Z <math>\mu</math>m</b>            |
| <b>1013</b> | <b>SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - THE 4TH AXIS <math>\mu</math>m</b> |

Range : -99999999 ~ 99999999

Effective : Effective After RESET

Access level : Machine Maker

Default : -99999999

Unit :  $\mu$ m

This parameter sets the travel limit value of the 1<sup>st</sup> soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999  $\mu$ m 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 1<sup>st</sup> and 2<sup>nd</sup> 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.

|             |                                                                             |
|-------------|-----------------------------------------------------------------------------|
| <b>1034</b> | <b>SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +X <math>\mu</math>m</b>        |
| <b>1036</b> | <b>SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Y <math>\mu</math>m</b>        |
| <b>1038</b> | <b>SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Z <math>\mu</math>m</b>        |
| <b>1040</b> | <b>SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +4TH AXIS <math>\mu</math>m</b> |

Range : -99999999 ~ 99999999

Effective : Effective After RESET

Access level : Machine Maker

Default : 99999999

Unit :  $\mu$ m

This parameter sets the travel limit value of the 1<sup>st</sup> soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999  $\mu$ m 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 1<sup>st</sup> and 2<sup>nd</sup> 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 $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1037 | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Y $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1039 | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Z $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1041 | SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -4TH AXIS $\mu$ m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|      | Range : -99999999 ~ 99999999<br>Effective : Effective After RESET<br>Access level : Machine Maker<br>Default : -99999999<br>Unit : $\mu$ m<br><p>This parameter sets the travel limit value of the 1<sup>st</sup> soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999 <math>\mu</math>m 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 1<sup>st</sup> and 2<sup>nd</sup> 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.</p> |
| 1043 | <b>G83 Drilling 0)High 1)Normal</b><br>Range : 0 ~ 1<br>Effective : Instant Activity<br>Access level : User<br>Default : 0<br>Unit : Nul<br><p>When this parameter is set to 0, high speed peak drilling is referred; when set to 1, peak drilling is referred.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1044 | <b>G87 Drilling 0)High 1)Normal</b><br>Range : 0 ~ 1<br>Effective : Instant Activity<br>Access level : User<br>Default : 0<br>Unit : Nul<br><p>When this parameter is set to 0, high speed peak drilling is referred; when set to 1, peak drilling is referred.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1045 | <b>P2 Pause Time (ms)</b><br>Range : 0 ~ 99999<br>Effective : Instant Activity<br>Access level : User<br>Default : 1000<br>Unit : Nul<br><p>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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

|             |                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1081</b> | <b>MRCCD <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>1082</b> | <b>MRCDT <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                 |
|             | Range : 0 ~ 99999999<br>Effective : Effective After RESET<br>Access level : User<br>Default : 1000<br>Unit : $\mu\text{m}$<br>Parameter #1081 assigns cutting depth of composite cutting cycle G71 and G72.<br>Parameter #1082 assigns tool escape amount of composite cutting cycle G71 and G72.<br>Parameter #1081 and #1082 assign U and R of G71 and G72 commands when they are not commanded by user.            |
| <b>1083</b> | <b>PESCX <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>1084</b> | <b>PES CZ <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                |
|             | Range : 0 ~ 99999999<br>Effective : Effective After RESET<br>Access level : User<br>Default : 1000<br>Unit : $\mu\text{m}$<br>Parameter # 1083 assigns X axis direction escape amount of composite cutting cycle G73.<br>Parameter # 1084 assigns Z axis direction escape amount of composite cutting cycle G73.<br>Parameters # 1083 and 1084 assign U and W of G73 command when they are not commanded by user yet. |
| <b>1085</b> | <b>PATIM <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                 |
|             | Range : 0 ~ 99999999<br>Effective : Effective After RESET<br>Access level : User<br>Default : 5<br>Unit : Nul<br>This parameter assigns division number of composite cutting cycle G73.                                                                                                                                                                                                                               |
| <b>1086</b> | <b>GROOVE <math>\mu\text{m}</math></b>                                                                                                                                                                                                                                                                                                                                                                                |
|             | Range : 0 ~ 99999999<br>Effective : Effective After RESET<br>Access level : User<br>Default : 1000<br>Unit : $\mu\text{m}$<br>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 :  $\mu$ m

Tool noise angle (aa) default value while executing G76.

1089

**THCLM  $\mu$ m**

Range : 0 ~ 99999999

Effective : Effective After RESET

Access level : User

Default : 50

Unit :  $\mu$ m

This parameter assigns the minimum cutting depth default value of composite cutting cycle G76.

1090

**THDFN  $\mu$ m**

Range : 0 ~ 99999999

Effective : Effective After RESET

Access level : User

Default : 50

Unit :  $\mu$ m

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

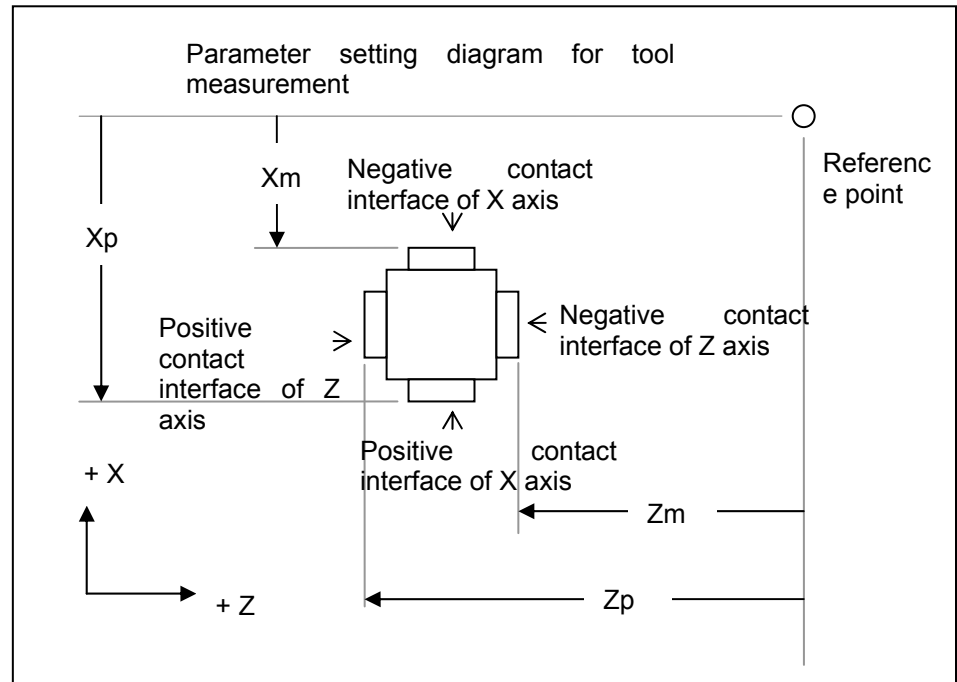
Default : 30

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 :  $\mu\text{m}$



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 (INTERPRETATION) 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 : 4<sup>TH</sup> SERVO ALARM**

**OP 1100 : 5<sup>TH</sup> SERVO ALARM**

**OP 1101 : 6<sup>TH</sup> 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

**SYSTEM ALARM (Alarm) and WARNING (Warning)**

---

- 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 $\geq$ 2

INT 3062 : R MUST  $> Z$

INT 3070 : WRONG DATA :  $R=0$

INT 3071 : WRONG DATA :  $2R\leq\Phi$

INT 3072 : WRONG DATA :  $V>\Phi$

INT 3073 : WRONG DATA :  $Q=0$

INT 3074 : WRONG DATA :  $V\geq Q$

INT 3075 : WRONG DATA :  $(\Phi+2Q) \geq 2R$

INT 3076 : WRONG DATA :  $I(J) = 0$

INT 3077 : WRONG DATA :  $I(J) - 2R \leq 0$

INT 3078 : WRONG DATA :  $2Q+\Phi \geq I(J)$

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 :  $2 (R-V) \leq PHI$**

**INT 3083 : WRONG DATA :  $2V+PHI \geq I (J)$**

**INT 3084 : WRONG DATA :  $0.414*PHI+I \leq 2C$**

**INT 3085 : WRONG DATA :  $0.414*PHI+J \leq 2C$**

**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) Lack 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 、 0251 setting 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 or 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 ORIENTATION 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 ORIENTATION 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 ORIENTATION 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 INPUT 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 Adjustment

### 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\_ ;

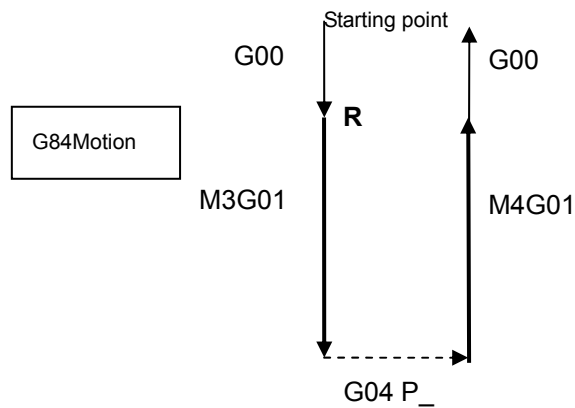
G80 ;                      // or Group 0 commands (G00、G01、G02、G03) , disable rigid mode.

- **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.<br>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<br>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 situation.

- **Rigid Tapping System Information**

| Rigid Tapping System Information # | Description                                                                           |
|------------------------------------|---------------------------------------------------------------------------------------|
| #21                                | Max error in rigid tapping travel                                                     |
| #22                                | Estimate value of rigid tapping 1 <sup>st</sup> speed compensation value              |
| #23                                | Estimate value of rigid tapping 1 <sup>st</sup> acceleration speed compensation value |
| #24                                | Estimate value of rigid tapping 2 <sup>nd</sup> speed compensation value              |
| #25                                | Estimate value of rigid tapping 2 <sup>nd</sup> 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.

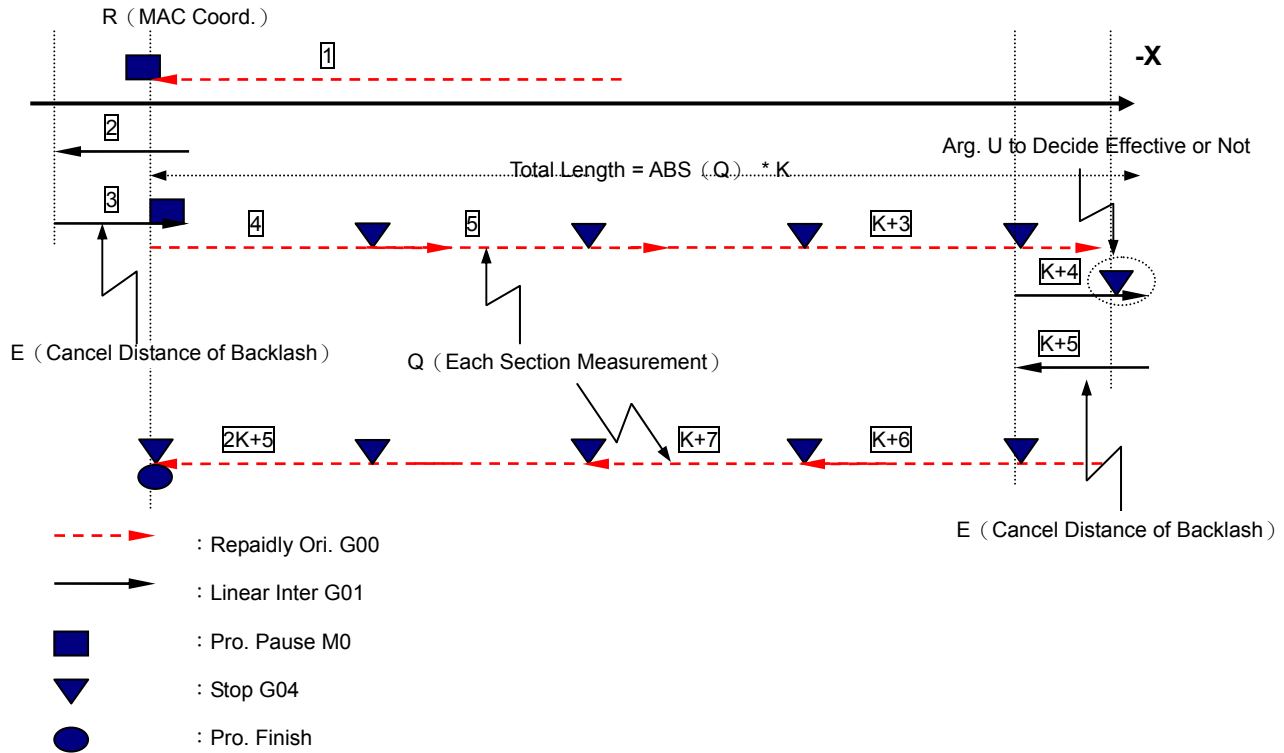
c. After completed, please observe system data #21. This is the biggest error of Z axis direction during tapping.

#### 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



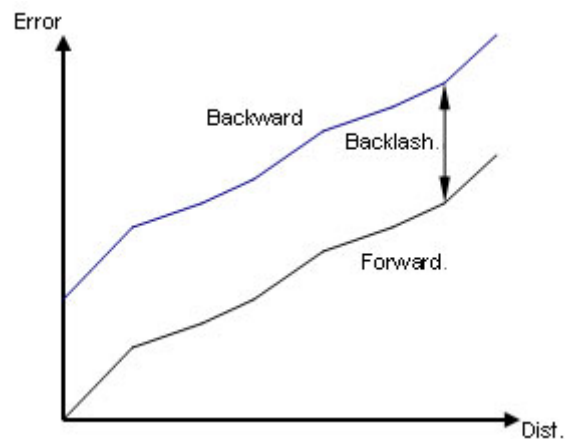
### Program Argument Description

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  $\text{ABS}(E)$  distance toward this axis positive direction. Then moving  $\text{ABS}(E)$  distance toward negative direction (Step 2 and Step 3 from the above Diagram). After measuring forward direction, first moving  $\text{ABS}(E)$  distance toward negative direction and then moving  $\text{ABS}(E)$  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.

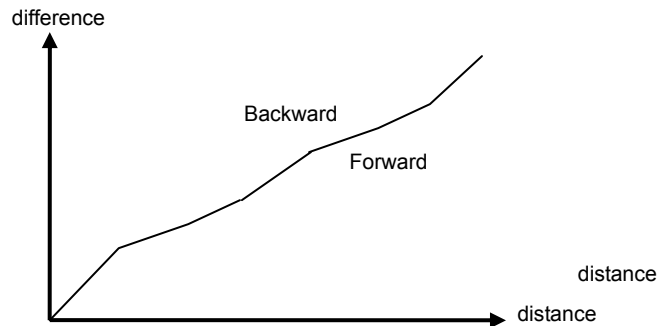
### Executing Steps

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 :

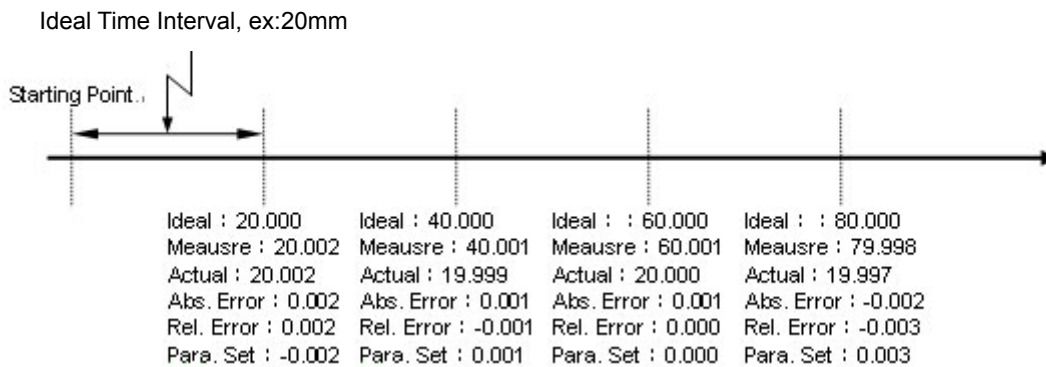


8. Setting pitch error compensation values( NC Parameters 0300 ~ 0349·0450 ~ 0499·0600 ~ 0649 and 0750 ~ 0799 ).

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  $N^{\text{th}}$  section relative error = the  $N^{\text{th}}$  section absolute error – the  $(N-1)^{\text{th}}$  section absolute error ;

The  $N^{\text{th}}$  section compensation setting value = -ive  $N^{\text{th}}$  section relative error.



After rebooting the system, re-executing Step 7 until the compensation effect is within the acceptable range.



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

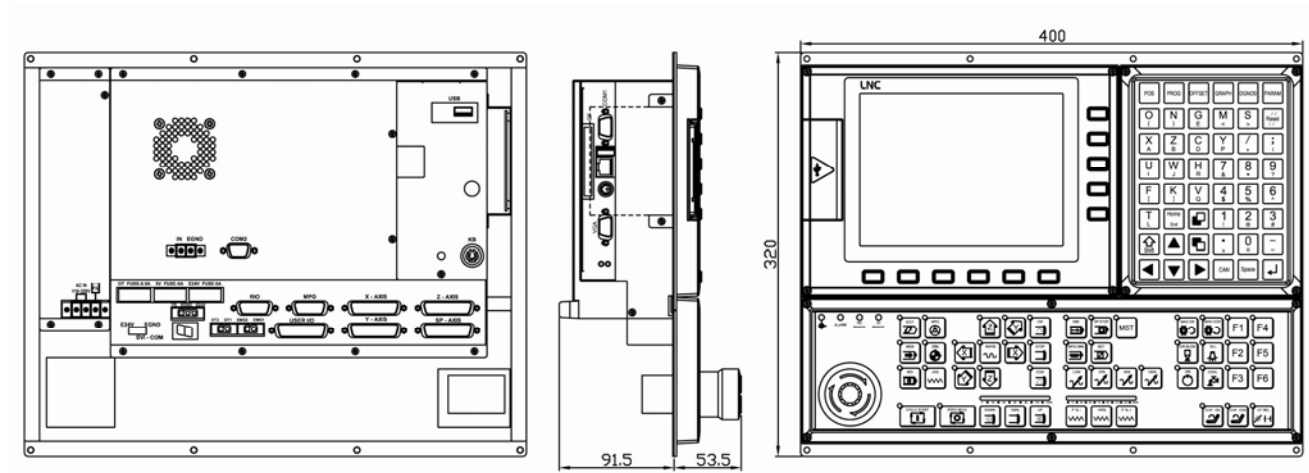
486IPC is 10.6ms

586IPC is 3.6ms

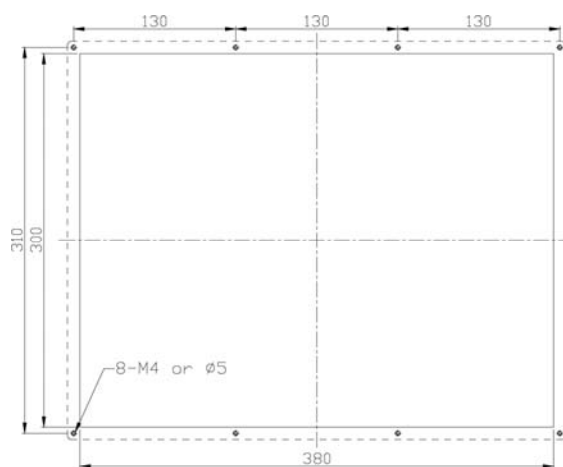
Description: Assumed the circular spike occurring point of +ive X axis is not in the direction changing center (on the X axis), but it occurs after direction changing. Then, need to set this parameter. Please refer to the description of parameter 0813 for the calculating method of this setting value.

## 8 Dimension

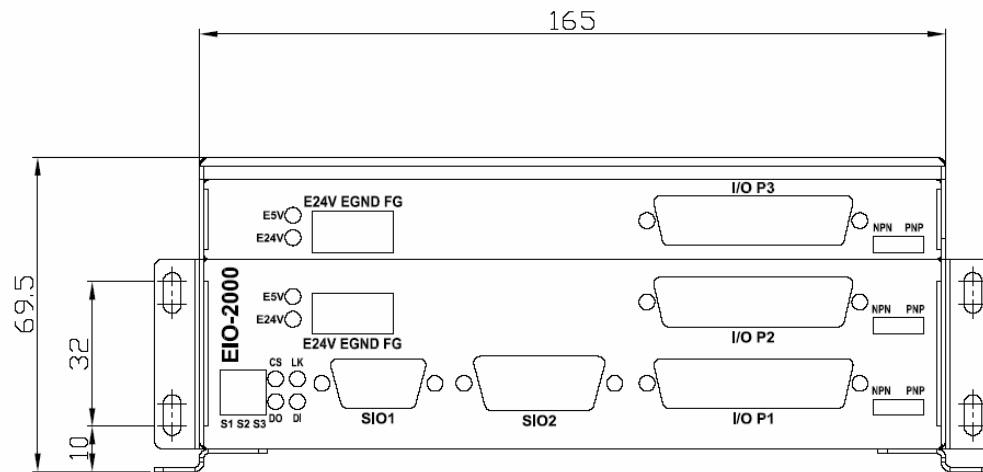
## 8.1 Dimension



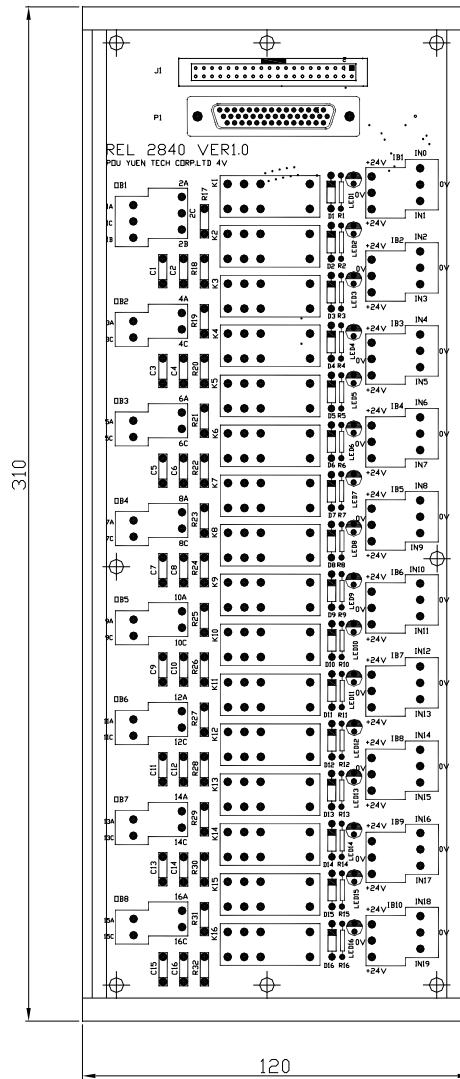
## 8.2 Chassis dimension



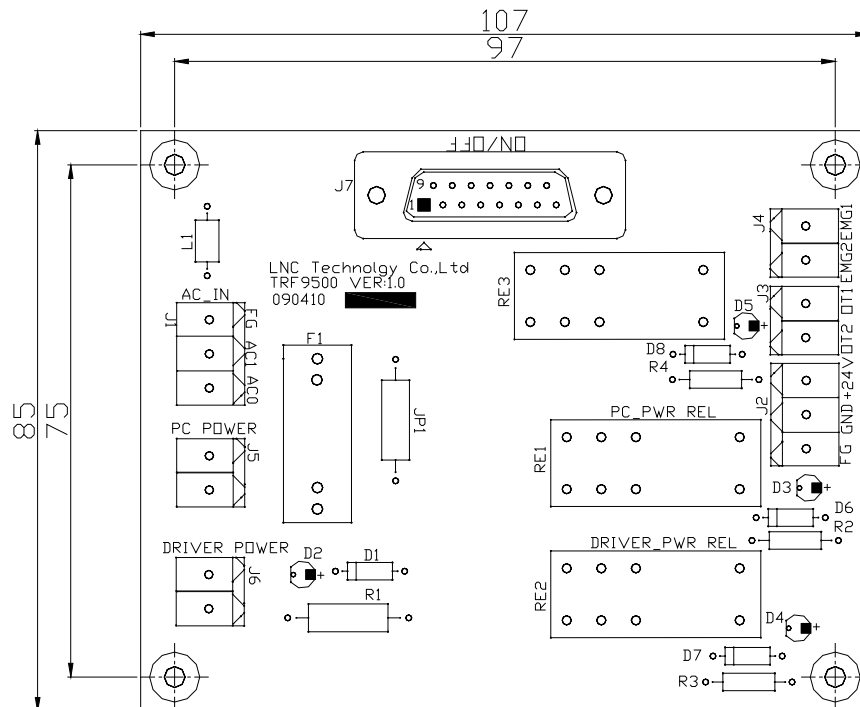
### 8.3 EIO2000



## 8.4 REL2840



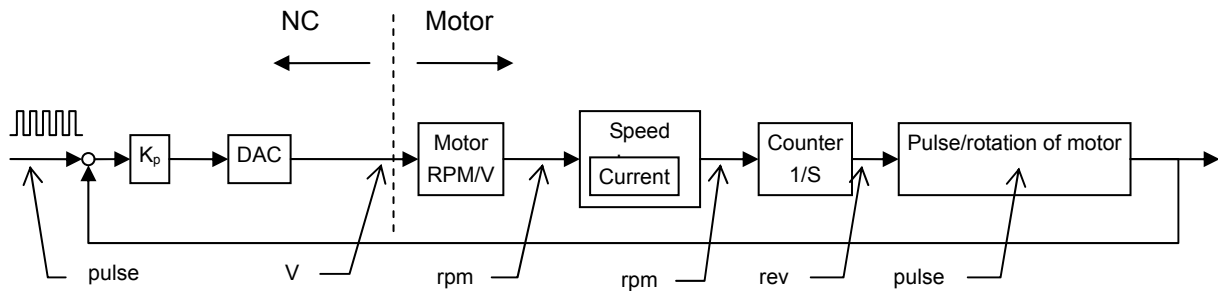
## 8.5 TRF-9500 Dimension



## 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 :

$$16\text{-bit, output } \pm 10\text{V} \rightarrow \text{DAC analogy degree} = \frac{10}{2^{16-1} - 1} = \frac{10}{32767}$$

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 ) .

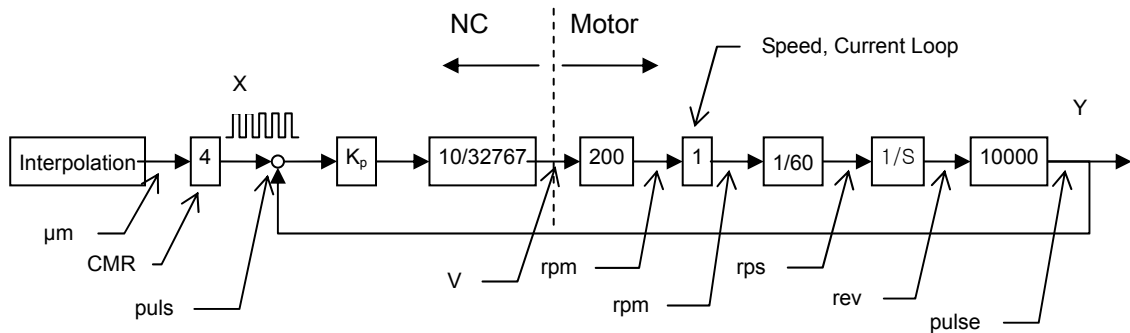
Parameter #0156 : 3 ( X axis control commanding mode ) .

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:

$$Y = \frac{K_p \cdot \frac{10}{32767} \cdot 200 \cdot \frac{1}{60} \cdot \frac{1}{S} \cdot 10000}{1 + K_p \cdot \frac{10}{32767} \cdot 200 \cdot \frac{1}{60} \cdot \frac{1}{S} \cdot 10000} X = \frac{10.17284 K_p}{S + 10.17284 K_p} X ,$$

At this time, the position feedback loop gain is  $10.17284 K_p$ . 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 :**

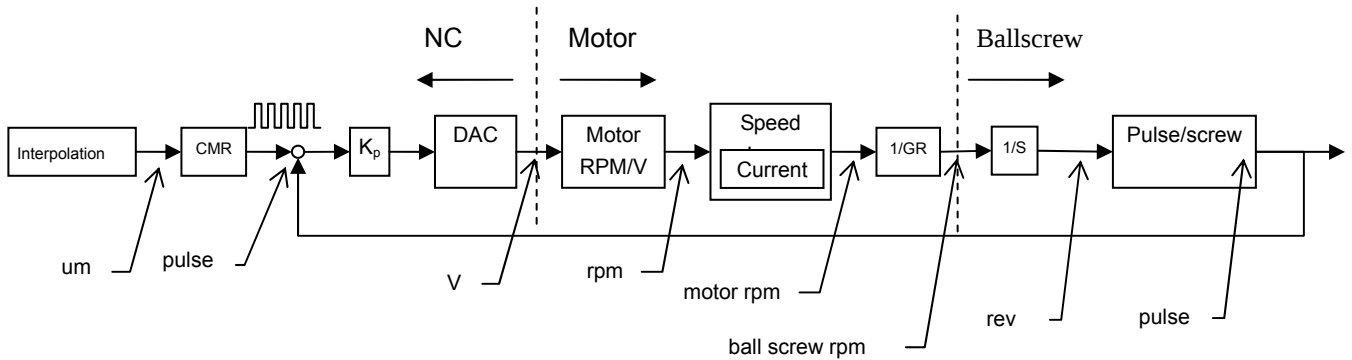
$e = \frac{F}{K}$ , e is the following error under stable condition (X axis reaches equal speed), please check system data # 000, unit is the smallest unit of the system; F is the feedrate; K is the position feedback loop gain. In this example, when K is 30 and under the condition that feedrate is 2000mm/min, following error should be

$$e = \frac{2000000}{30} \times \frac{1}{60} = 1111 \text{ when X axis is in equal speed. When X axis is already in equal speed and the}$$

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 ) .

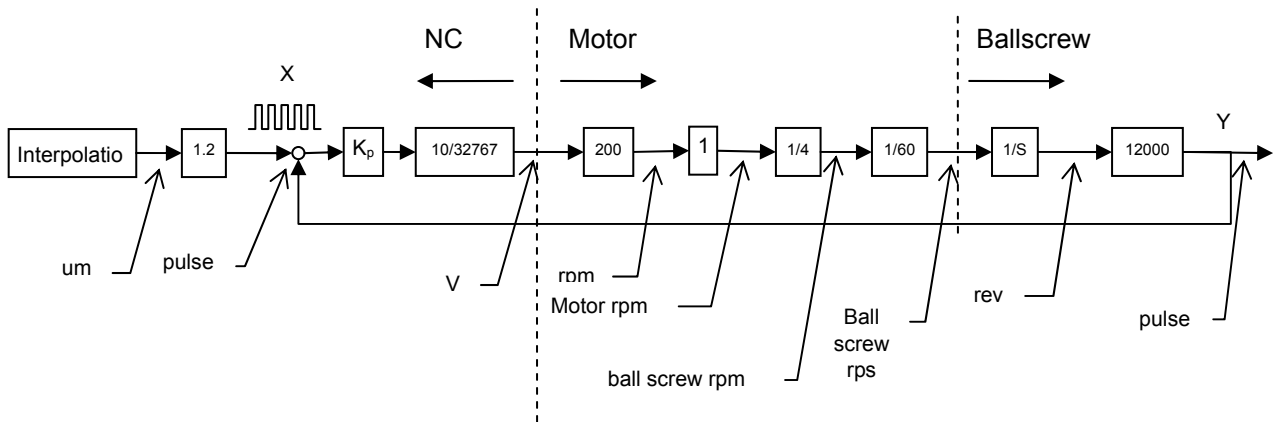
Parameter #0100 : 1 ( numerator of X axis ball screw ) .

Parameter #0104 : 10000 ( Pitch of X axis ball screw ) .

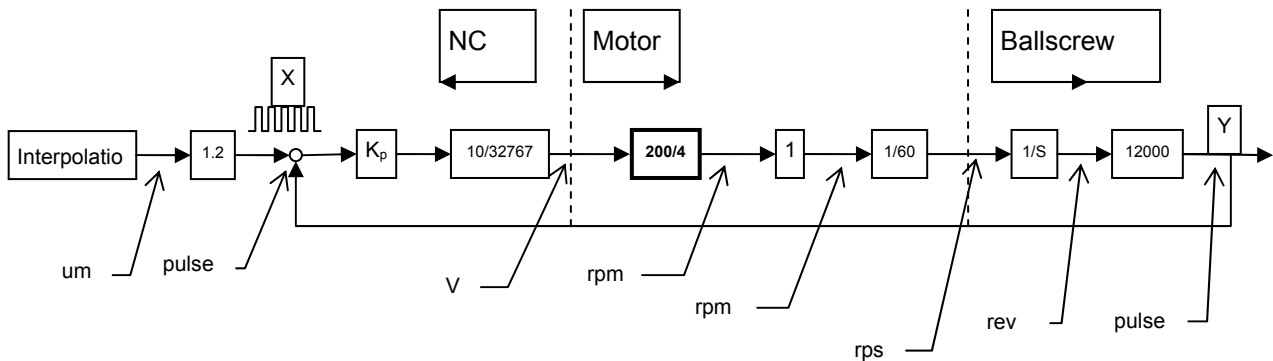
$$CMR = \frac{3000 * 4}{10000} = 1.2 \text{ pulses/um} , \text{ which means } 1\text{um on X axis is correspond to } 1.2 \text{ pulses that is the}$$

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 :

$$Y = \frac{K_p \cdot 10/32767 \cdot 200 \cdot 1/4 \cdot 1/60 \cdot 1/S \cdot 12000}{1 + K_p \cdot 10/32767 \cdot 200 \cdot 1/4 \cdot 1/60 \cdot 1/S \cdot 12000} X$$

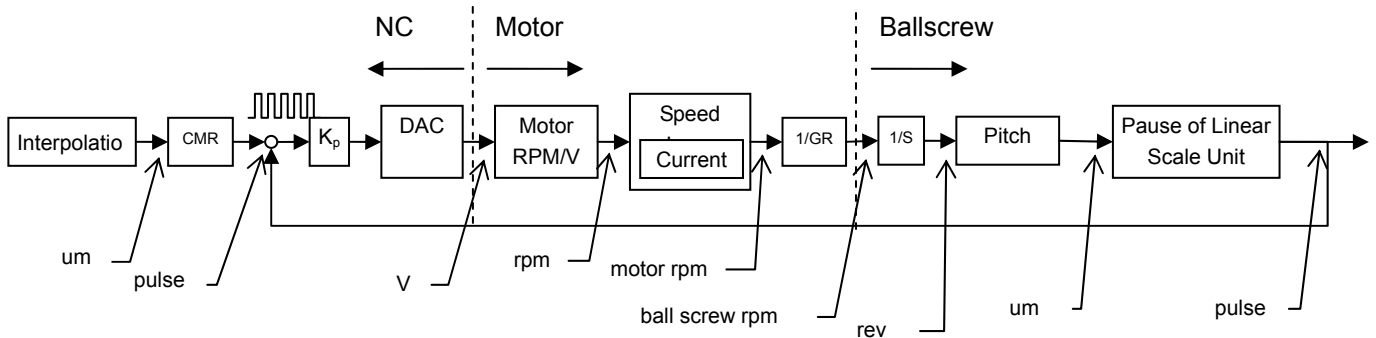
$$= \frac{K_p \cdot 10/32767 \cdot 200/4 \cdot 1/60 \cdot 1/S \cdot 12000}{1 + K_p \cdot 10/32767 \cdot 200/4 \cdot 1/60 \cdot 1/S \cdot 12000} X = \frac{3.05185K_p}{S + 3.05185K_p} X$$

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  $50 * 1000 / 20 = 2500 \rightarrow$  the setting value of Parameter #1112 is 2500.

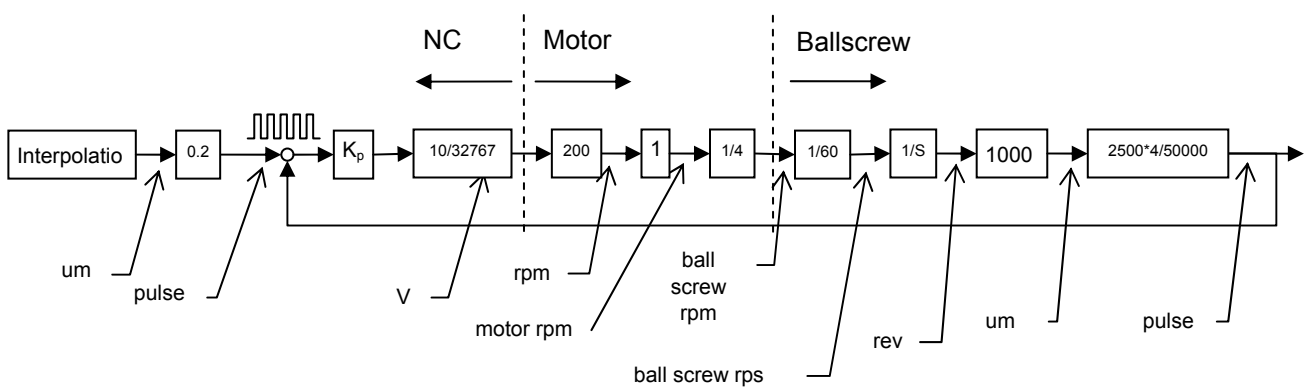
## APPENDIX A PARAMETER ADJUSTMENT EXAMPLE

For linear scale, every 20  $\mu\text{m}$  will produce one A/B pulse set. This means every 5 $\mu\text{m}$  will produce one pulse after 4 ratio so the CMR =  $1 / 5 = 0.2$ . But for NC,

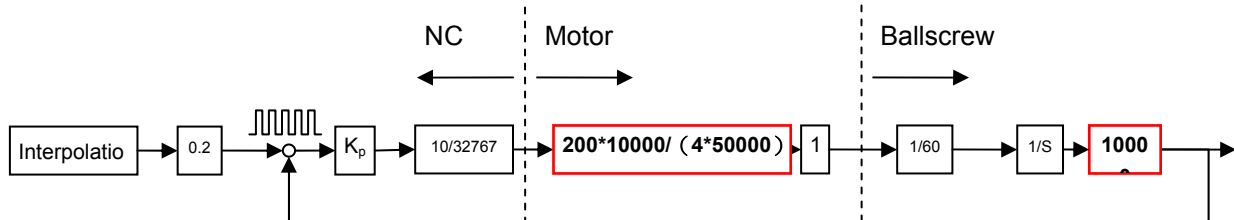
$$CMR = \frac{P0058 \times P0054}{P0104} \times \frac{P100}{P68}$$

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:

$$Y = \frac{K_p \cdot 10/32767 \cdot 200 \cdot 1/4 \cdot 1/60 \cdot 1/S \cdot 10000 \cdot 10000/50000}{1 + K_p \cdot 10/32767 \cdot 200 \cdot 1/4 \cdot 1/60 \cdot 1/S \cdot 10000 \cdot 10000/50000} X$$

$$= \frac{K_p \cdot 10/32767 \cdot (200 \cdot 10000) / (4 \cdot 50000) \cdot 1/60 \cdot 1/S \cdot 10000}{1 + K_p \cdot 10/32767 \cdot (200 \cdot 10000) / (4 \cdot 50000) \cdot 1/60 \cdot 1/S \cdot 10000} X = \frac{0.50864}{S + 0.50864 K_p} X$$

So, in this application case, the setting value of Parameter 0108 is  $200 \times 10000 / (4 \times 50000) = 10$ . The  $K_p$

setting value is  $\frac{30}{0.50864} = 58.9808$  on PCC1620 Motion Control Board.

## APPENDIX A PARAMETER ADJUSTMENT EXAMPLE

---

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

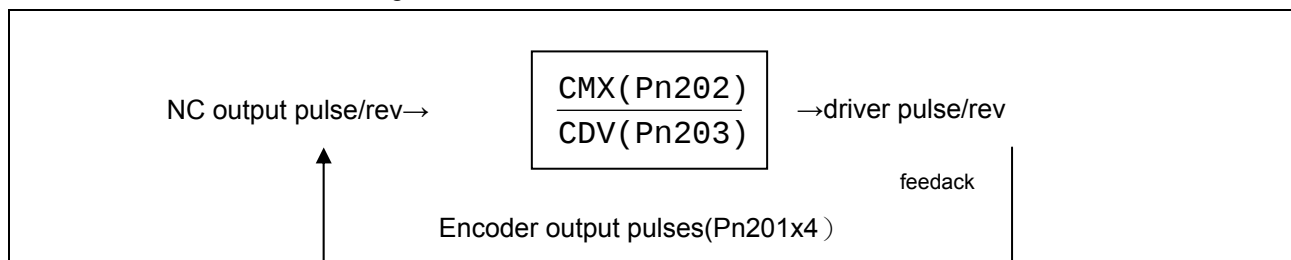
YASKAWA Servo Motor Machine Adjustment Description

| Parameter | Description                                                   | Value                | Note  |
|-----------|---------------------------------------------------------------|----------------------|-------|
| Pn000     | Control Mode Select:<br>0:speed control<br>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.

## Appendix B : Servo Connection Example

YASKAWA Σ-II Series electron gear ratio formula



Model example

SGMPH-01 A **A** A 2 SSGMPH-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&lt;PITCH&gt;=5000μ=5000pulse

Because Pn201&lt;motor ENCODER PULES per rotate&gt;X4&lt;NC multiple&gt;=5000 pulse

So Pn201=1250

NC parameter &lt;&lt;0058、0060&gt;&gt; : to set X-Axis and Z-Axis ENCODER(P/Rev.)=1250。

$$\frac{\text{Pn203}}{\text{Pn203}} = \frac{2048_{(13\text{-BIT})} \times 4_{(x4 \text{ multiplier})}}{1250_{(NC \text{ Para.: X-Axis/Z-Zxis ENCODER(P/Rev.)})} \times 4_{(x4 \text{ multiplier})}} = \text{reduce} \rightarrow \frac{1024}{625}$$

Servo motor parameter:

Pn201 : 1250      Pn202 : 1024      Pn203 : 625

Ex: using motor that Code=1 or B, PITCH=10MM、(1μ=1pulse) :

10MM&lt;PITCH&gt;=10000μ=10000pulse

Because Pn201&lt; motor ENCODER PULES per rotate &gt;X4&lt; NC multiple &gt;=10000 pulse

So Pn201=2500

NC parameter &lt;&lt;0058、0060&gt;&gt; : X-Axis and Z-Axis ENCODER(P/Rev.)=2500

$$\frac{\text{Pn203}}{\text{Pn203}} = \frac{16384_{(16\text{-BIT})} \times 4_{(x4 \text{ multiplier})}}{2500_{(NC \text{ Para.: X-Axis/Z-Zxis ENCODER(P/Rev.)})} \times 4_{(x4 \text{ multiplier})}} = \text{reduce} \rightarrow \frac{4096}{625}$$

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&lt;PITCH&gt;=10000μ=10000pulse

Pn201 &lt; motor ENCODER P/Rev. &gt; X4 &lt;NC multiple&gt;=10000 pulse

So Pn201=2500

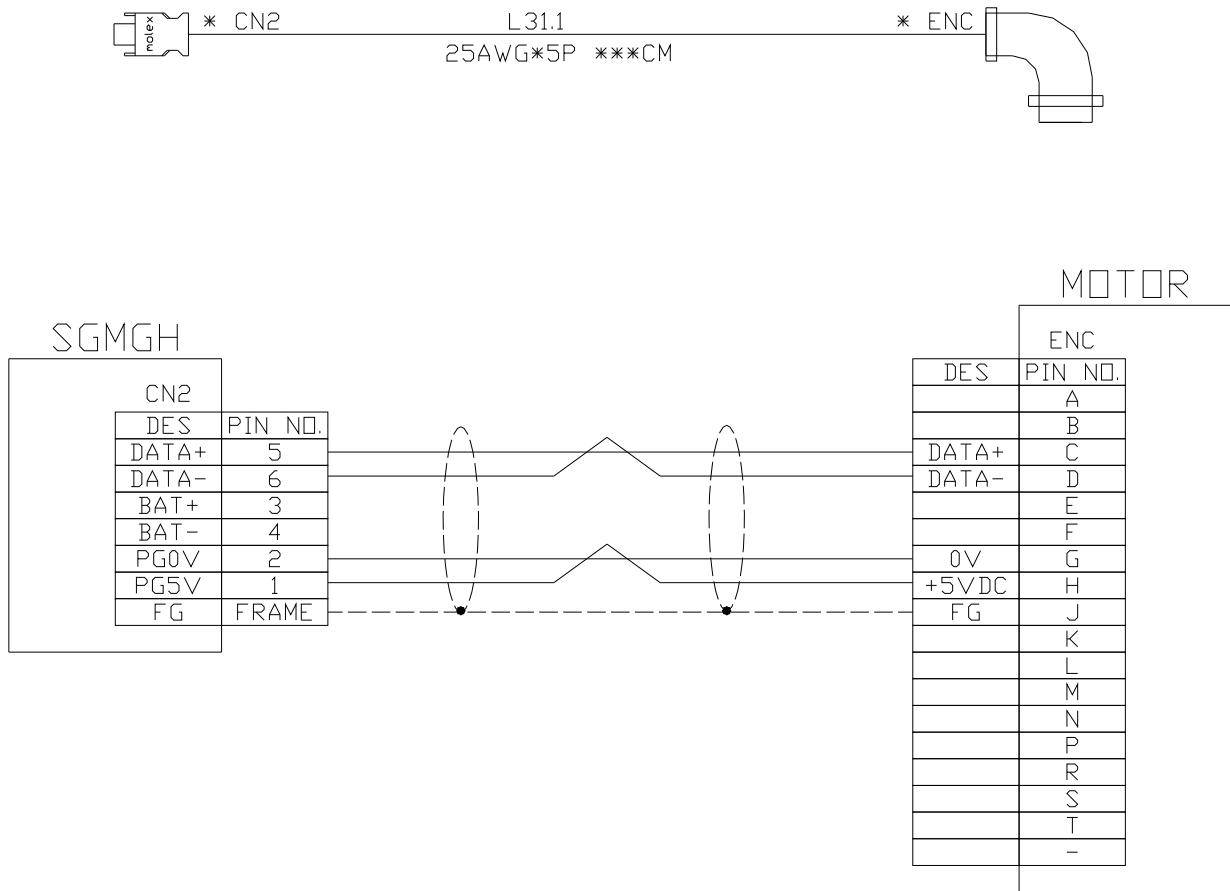
NC para. : &lt;&lt;0058、0060&gt;&gt; : X-Axis and Z-Axis ENCODER(P/Rev.)=2500

$$\frac{\text{Pn203}}{\text{Pn203}} = \frac{32768_{(17\text{-BIT})} \times 4_{(x4 \text{ multiplier})}}{2500_{(NC \text{ Para.: X-Axis/Z-Zxis ENCODER(P/Rev.)})} \times 4_{(x4 \text{ multiplier})}} = \text{約分後} \rightarrow \frac{8192}{625}$$

Servo motor parameters:

Pn201 : 2500      Pn202 : 8192      Pn203 : 625

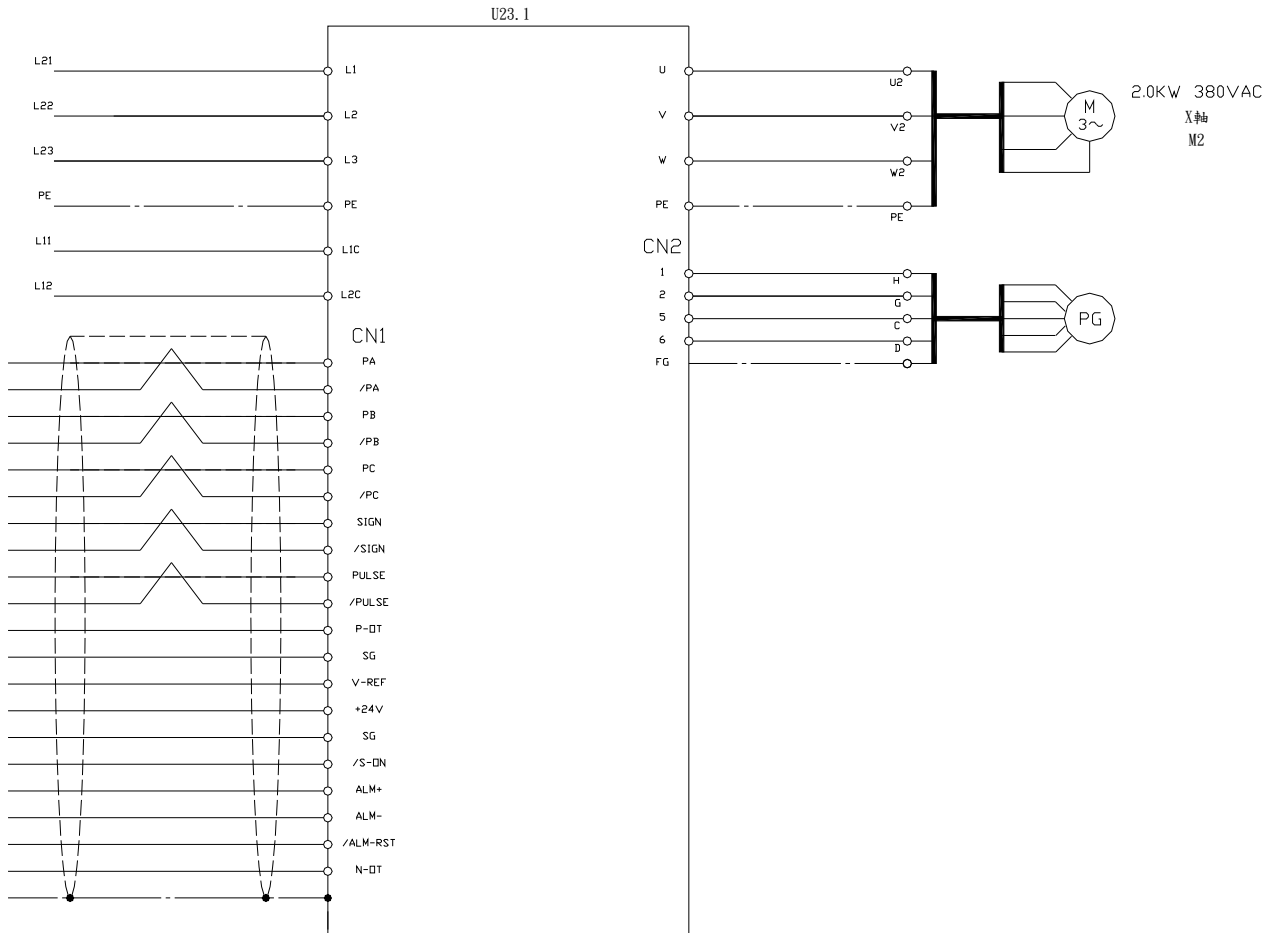
## ENCODERW Wiring Figure



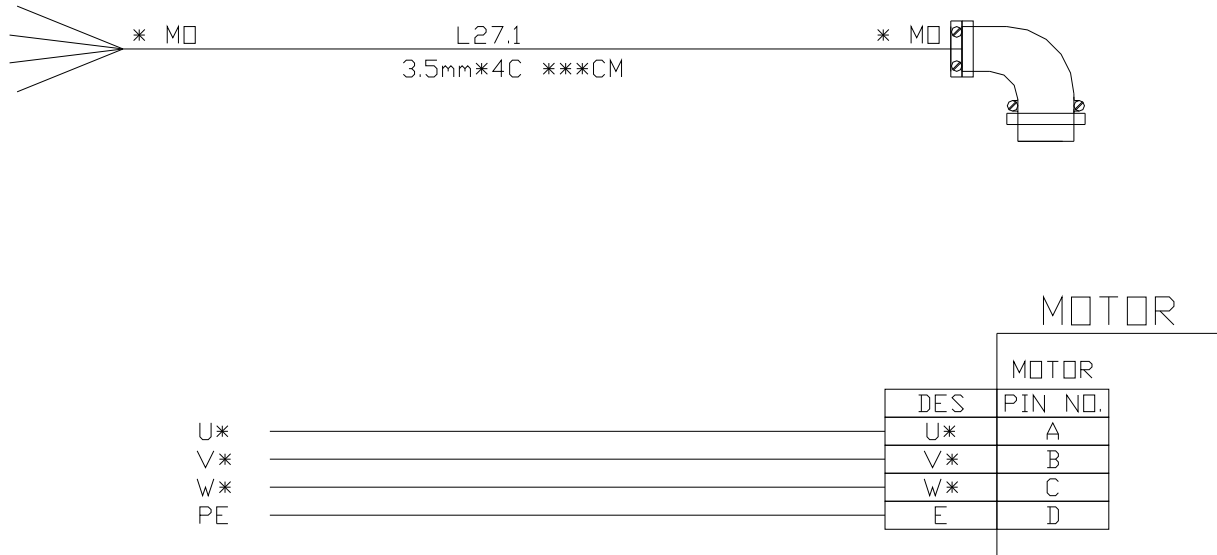
ENCODER Wiring Diagram

## Appendix B : Servo Connection Example

### ● YASKAWA Wiring Figure

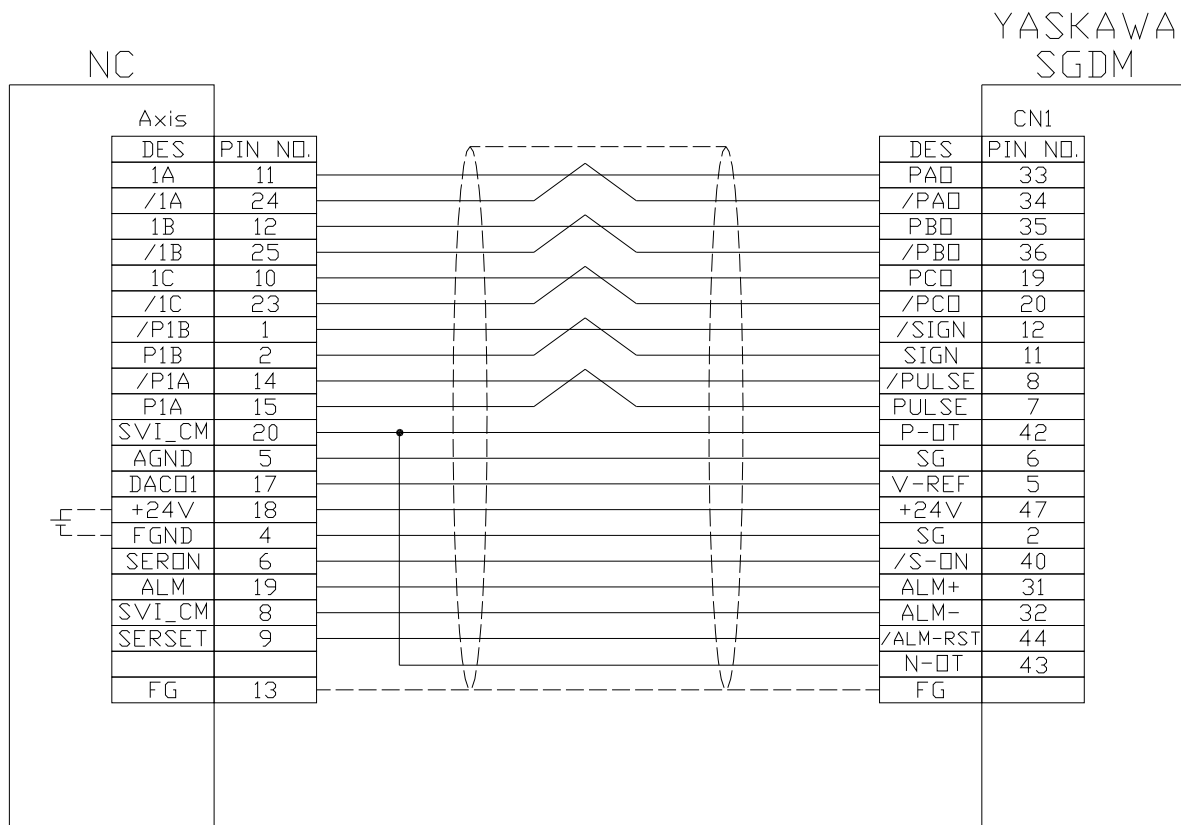
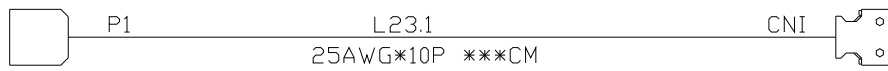


## ● YASKAWA Motor POWER Figure



## Appendix B : Servo Connection Example

### ● NC→YASKAWA Driver Wiring Figure



## Appendix B : Servo Connection Example

### B2 Panasonic Servo Connection Example

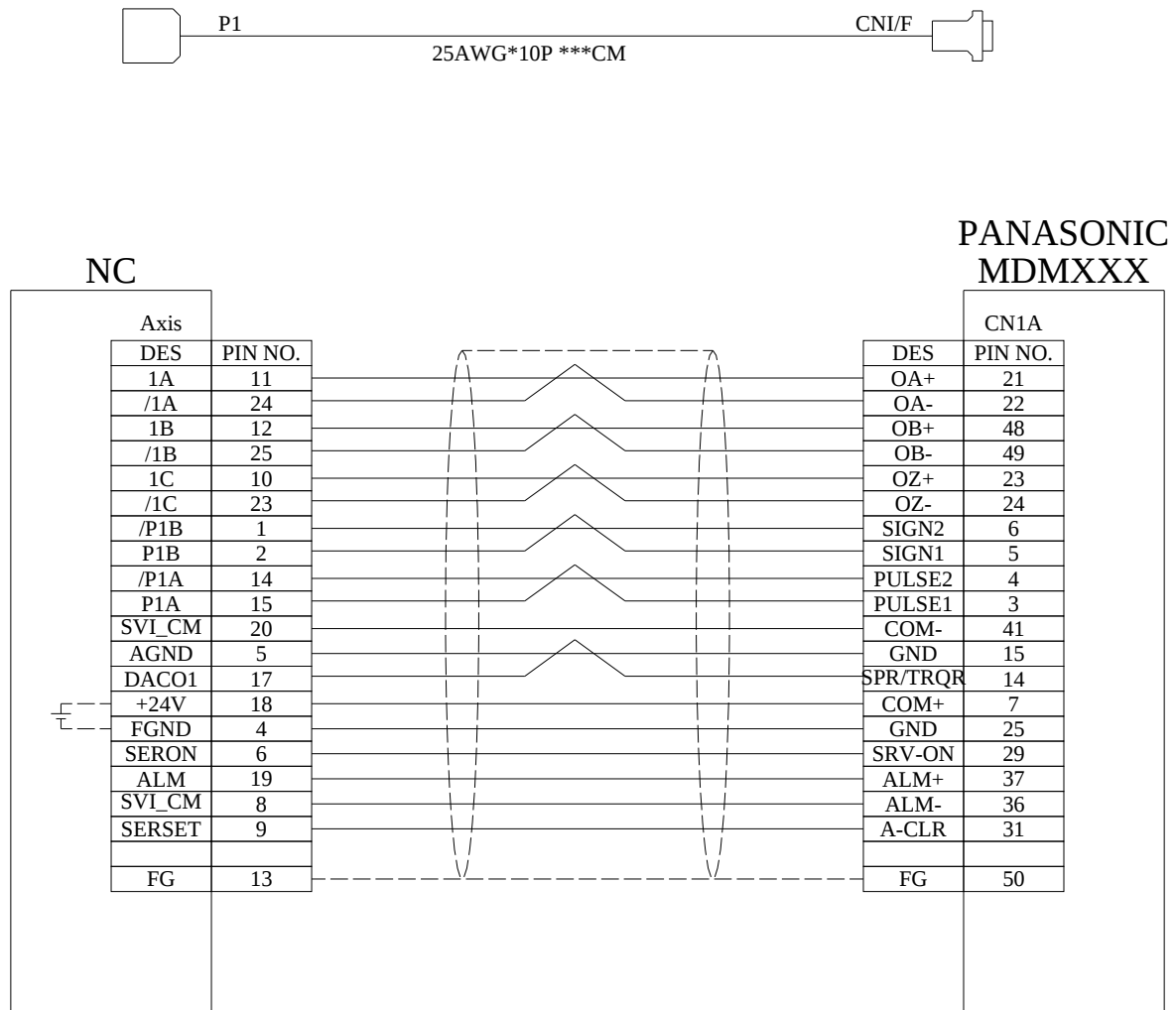
#### Panasonic Servo Motor Adjust Parameters

| A TYPE  |                                                             |                         |                                |
|---------|-------------------------------------------------------------|-------------------------|--------------------------------|
| Para.   | Description                                                 | Value                   | Note                           |
| Pr 02 * | To set control mode<br>Control mode:0: position<br>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 $\times 2^n$                | 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<br>Control mode:0: position<br>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

|                                                                                                                                         |                                                                                                                                                           |                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <p>NC output pulse/rev→</p> <p>↑</p>                                                                                                    | <div style="border: 1px solid black; padding: 10px; text-align: center;"> <math display="block">\frac{CMX(Pr46) \times 2^{Pr4A}}{CDV(Pr4B)}</math> </div> | <p>→driver pulse/rev</p> <p>feedback</p> |
| Encoder output pulses(Pr44xPr40 )                                                                                                       |                                                                                                                                                           |                                          |
| 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 )<br>Pr44=2500(default )<br>Pr46=10000(default )<br>Pr4A=0(default )<br>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



### B3 Mitsubishi Servo Example

Mitsubishi Servo Motor Adjust Parameter

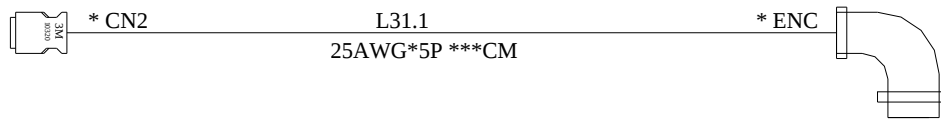
| classification       | Para. # | Symbol | Name and function                                                                                                                                                                               | Default                   | Setting value | Unit      | Control mode |
|----------------------|---------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------|-----------|--------------|
| Basic parameter      | 19      | *BLK   | Parameter write function setting:                                                                                                                                                               | 0000                      | 000E          |           | P.S.T        |
|                      | 0       | *STY   | Control mode selection:<br>0 : position control<br>2 : speed control<br>Please refer to 5-5                                                                                                     | 0000                      | 0000          |           | P.S.T        |
|                      | 2       | ATU    | Auto-tuning:<br>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 :<br>Setting Analogy Speed Command (VC) . Key-in the feedback speed of maximum voltage (10V) .<br>The setting value is 0 as the constant rotational speed. | 0                         | 3000          | Rpm/min   | S.T          |
|                      | 27      | *ENC   | Checking Output PLUSE :<br>Output PLUSE = Analogy Degree/REV of Servo Motor<br>Please also refer to Section 5-15.                                                                               | 4000                      | 10000         | Pulse/rev | P.S.T        |
|                      | 29      | VCO    | Analogy Speed Command OFFSET :<br>Setting Voltage OFFSET value of Analogy Speed Command (VC) .                                                                                                  | According to servo driver |               | Millivolt |              |
|                      | 37      | VG2    | Speed Incremental 2<br>Adjusting effort is more obvious than that of Speed Incremental 1.                                                                                                       | 817                       | 1000          | Rad/s     |              |

Mitsubishi electron gear ratio formula

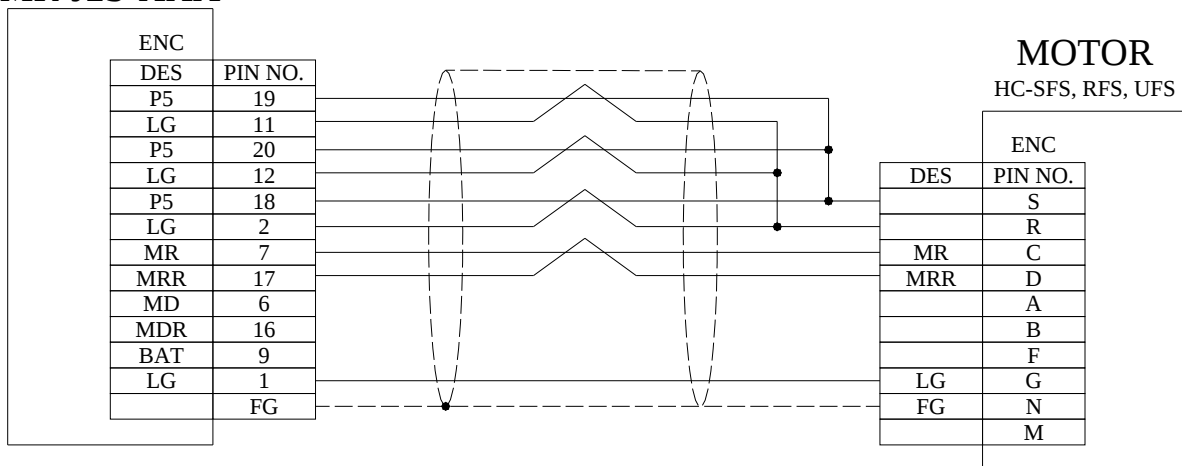
Ex: Setting ENCODER output value (NO.27) to

$$10000: \frac{CMX \langle \text{Command pulse numerator} \rangle}{CDV \langle \text{Command pulse denominator} \rangle} = \frac{131072 \times 4}{10000 \times 4} \xrightarrow{\text{Reduction}} \frac{8192}{625} = \frac{\text{parameter3}}{\text{parameter4}}$$

## ● Mitsubishi ENCODER Wiring Diagram

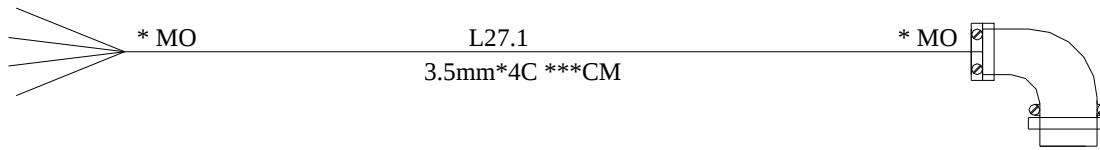


## MR-J2S-XXA



## Appendix B : Servo Connection Example

### ● Mitsubishi Motor Power Wiring Figure

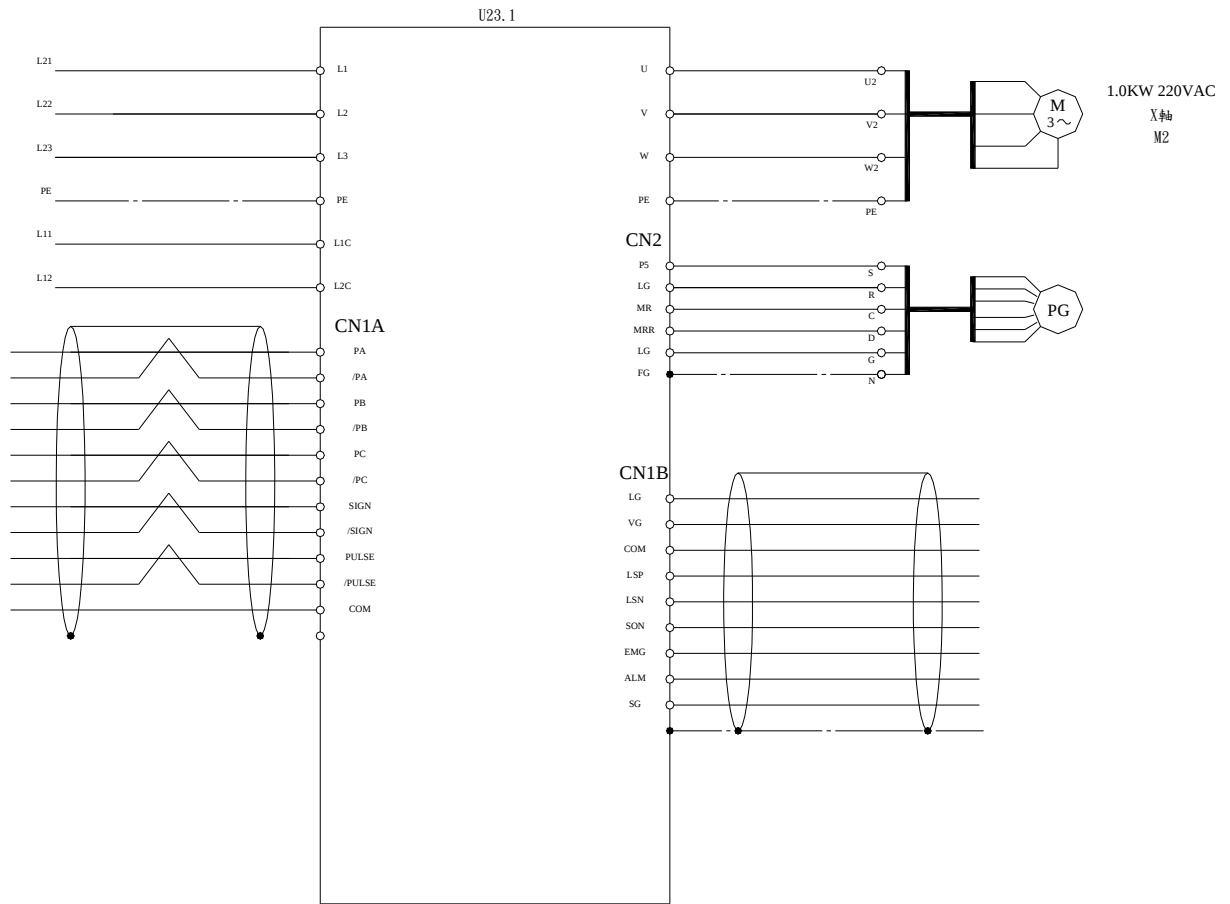


### MOTOR

HC-SFS, RFS, UFS

|    |       | MOTOR |         |
|----|-------|-------|---------|
|    |       | DES   | PIN NO. |
| U* | _____ | U*    | A       |
| V* | _____ | V*    | B       |
| W* | _____ | W*    | C       |
| PE | _____ | E     | D       |
|    |       |       | E       |
|    |       |       | F       |
|    |       | B1    | G       |
|    |       | B2    | H       |

## ● Mitsubishi System 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 : Number 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-tuning 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 )<br>1 : enabled ( automatic setting ) | 0             |

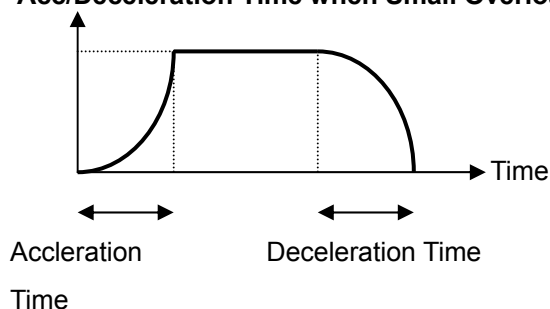
This parameter controls ACC/DECELERATION Speed

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.

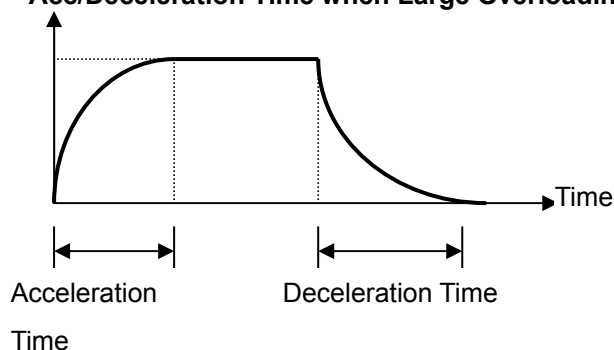
Figure 1 and Figure 2 are automatically time changing figure when overloading size changes. The below two figures show that this parameter can control the actual rotational speed in order to prevent any unusual sound.

**Acc/Deceleration Time when Small Overloading**



**Figure 1**

**Acc/Deceleration Time when Large Overloading**



**Figure 2**

## Appendix B : Servo Connection Example

| Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Function                   | Setting Range                                                                                                                                                                | Setting Value |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| AU2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Automatic V/f mode setting | 0 : ( 0 is always displayed )<br>1 : Automatic torque boost + auto-tuning<br>2 : Vector control ( speed control ) + auto-tuning<br>3 : Automatic energy-saving + auto-tuning | 1             |
| <p>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.</p> <p>1 : Automatic torque boost + auto-tuning<br/>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 automatically ( automatic torque boost ) . Also 400 ( auto tuning ) parameter will be set to 2 automatically ( automatic torque execution ) .</p> <p>2 : Vector control ( speed control ) + auto-tuning<br/>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<br/>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 ) .</p> <p>3 : Automatic energy-saving + auto-tuning<br/>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 ) .</p> |                            |                                                                                                                                                                              |               |

The corresponding 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<br>1:Operating panel input enabled<br>2:Communication common serial option enabled<br>3:Communication RS485 option enabled<br>4:Communic add-on option enabled | 0       |

## Appendix B : Servo Connection Example

|                                                                                   |
|-----------------------------------------------------------------------------------|
| 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 )<br>VI : 0 to 10Vdc   II:4 to 20mAdc<br>2:RR ( Potentiometer / voltage input )<br>RR : 0 to 10Vdc<br>3:RX ( voltage input )<br>RX : 0 to +/– 10Vdc<br>4:RX2 ( voltage input )<br>RX2 : 0 to +/– 10Vdc<br>5:Operating panel input enabled<br>Frequencies are set by pressing the control panel key.<br>6:Binary / BCD input<br>speed command are entered from 12/16 bit binary input or BCD<br>7:Communication common serial option ( RS232C )<br>8:Standard communication RS485<br>9:Communication add-on module option enabled<br>speed command are entered from network communication<br>10:Up-down frequency<br>by means of up-down frequency signals from the terminal<br>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<br>2:60Hz standard setting<br>3:Factory default setting<br>4:Trip history clear<br>5:Comulative operation time clear<br>6:Type information clear<br>7>User setting storage<br>8:Reset to saved parameters ( 7 ) |               |

## Appendix B : Servo Connection Example

| 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

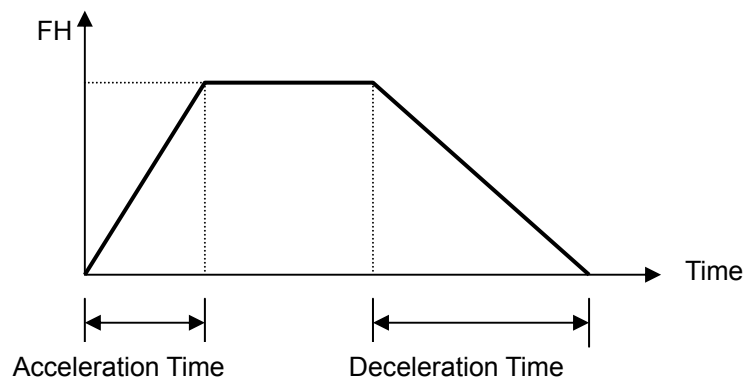


Figure 三

|    |                   |            |     |
|----|-------------------|------------|-----|
| FH | Maximum frequency | 30 ~400 Hz | 333 |
|----|-------------------|------------|-----|

Max. output 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            |

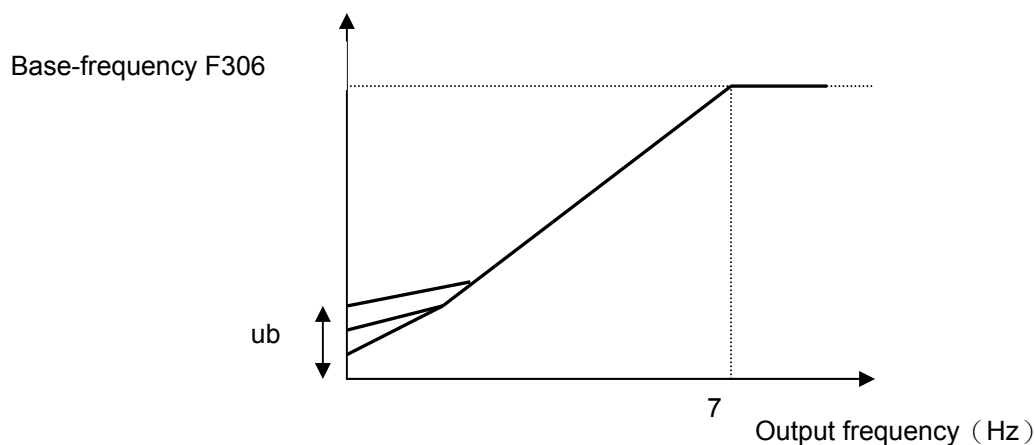
uL parameter is used in constant torque control area. Please refer to parameter F306 (Base frequency voltage) .

## Appendix B : Servo Connection Example

| Parameter | Function                     | Setting Range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Setting Value |
|-----------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Pt        | Motor control mode selection | 0: Constant torque characteristic(motor control )<br>1: Square reduction torque characteristic (motor and so on. )<br>2: Automatic torque boost (V/F control automatically) .<br>Must used as AU2 = 2 and F400 = 1.<br>3: Sensor-less vector control. Must used as AU2 = 4 and F400 = 2.<br>4: Automtic torque boost + automatic energy-saving<br>Must used as AU2 = 4 and F400 = 2.<br>5: Sensor-less vector control + automatic energy-saving. Must used as AU2 = 4 and F400 = 2.<br>6:V-f 5-point setting<br>7: Sensorless vector control ( torque/speed switching )<br>8: PG feedback vector control ( torque/speed switching )<br>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.



## Appendix B : Servo Connection Example

| Parameter | Function | Setting Range                                          |                              |                     | Note |
|-----------|----------|--------------------------------------------------------|------------------------------|---------------------|------|
| OLN       | O        | Electronic thermal protective characteristic selection |                              |                     | N/A  |
|           |          | Set Value                                              |                              | Overload protection |      |
|           |          | 0                                                      | Standard motor               | O                   |      |
|           |          | 1                                                      |                              | O                   |      |
|           |          | 2                                                      |                              | x                   |      |
|           |          | 3                                                      |                              | x                   |      |
|           |          | 4                                                      | VF motor<br>(special motor ) | O                   |      |
|           |          | 5                                                      |                              | O                   |      |
|           |          | 6                                                      |                              | x                   |      |
|           |          | 7                                                      |                              | x                   |      |

| Parameter | Function                           | Setting Range | Setting Value       |
|-----------|------------------------------------|---------------|---------------------|
| Sr1 ~Sr7  | Preset-speed operation frequencies | 0 ~ 30%       | Depends on capacity |

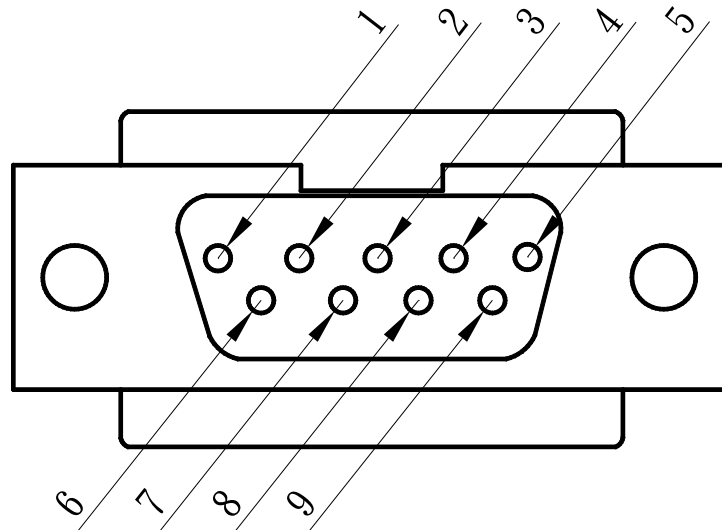
This parameter can set 15 kinds of default speed. The first seven sections are set in S1 ~ S7 and the last eight sections are set in F287~F294. The requirements, such as acc/deceleration, direction and so on) can be modified in F380 ~ F394. Also, when doing multiple-speed testing, CNOD and FNOD must 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.

| Terminal | Preset-speed |    |    |    |    |    |    |    |    |    |    |    |    |    |    | Note |
|----------|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|
|          | 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 transmission connector standard, it means the remote transmission connector and the external setting signal connection standard. RS-232C is the very easy transmission standard. If not using hard-part flow control, only needs 3 signal cables in order to accomplish the double transmission jobs.

The electronic feature of RS232 belongs to the in-balance transmission method. So the transmission 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 2<sup>nd</sup>, the 3<sup>rd</sup> and the 5<sup>th</sup> pins to receive and transmit :

NC COM1 ( 9pin JACK )  
to  
PC COM1 ( 9pin JACK )

NC COM1 ( 9pin JACK )  
to  
PC COM2 ( 25pin JACK )

| NC          | PC              |
|-------------|-----------------|
| pin2 ( RD ) | --- pin3 ( TD ) |
| pin3 ( TD ) | --- pin2 ( RD ) |
| pin5 ( SG ) | --- pin5 ( SG ) |

| 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:\Net2net.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.

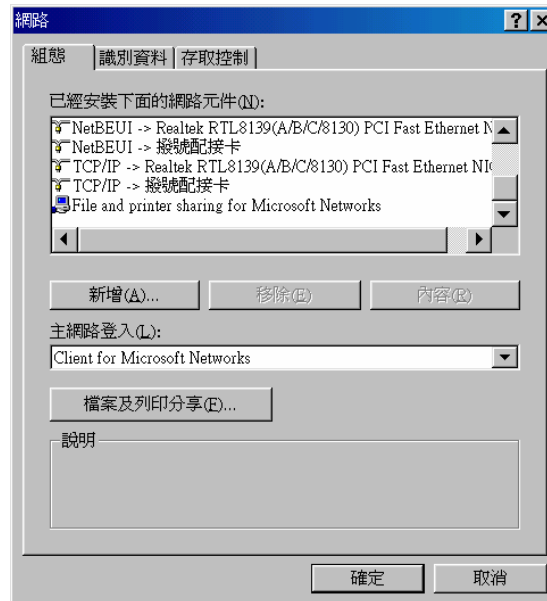
"workgroup=" is the work group name of the controller when logging on the internet. Please set this value according to the Network which the controller belongs to. By default, it is set as "WORKGROUP."

"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."

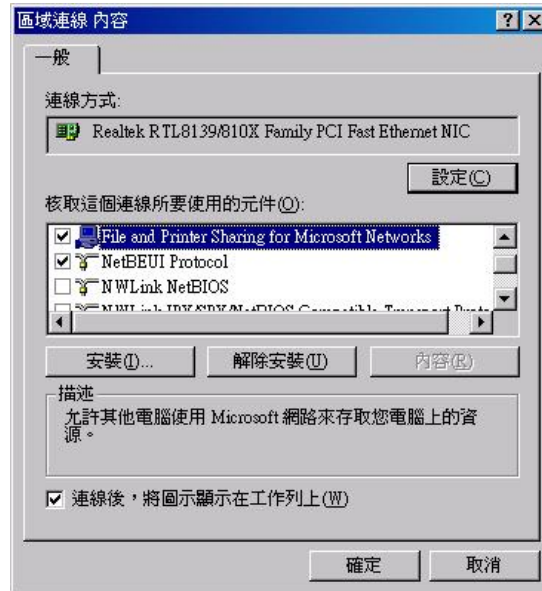
- The system setting steps for Internet

1. Make sure the Internet card, cables, relating protocol are ready for set up. Make sure [NetBEUI communication protocol] is in the Internet setting status and [File and printer sharing for Microsoft Networks] service also.

- WINDOWS 98 page steps : [start].[setting].[control platform].[Internet] as below



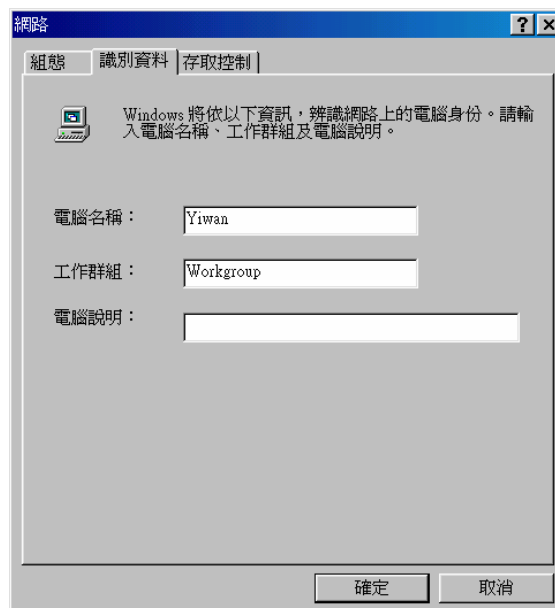
- WINDOWS NT page process : [start].[setting].[control platform].[Internet and dial up].[local Internet].<contents> as below



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 we list 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 Identity )  
<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

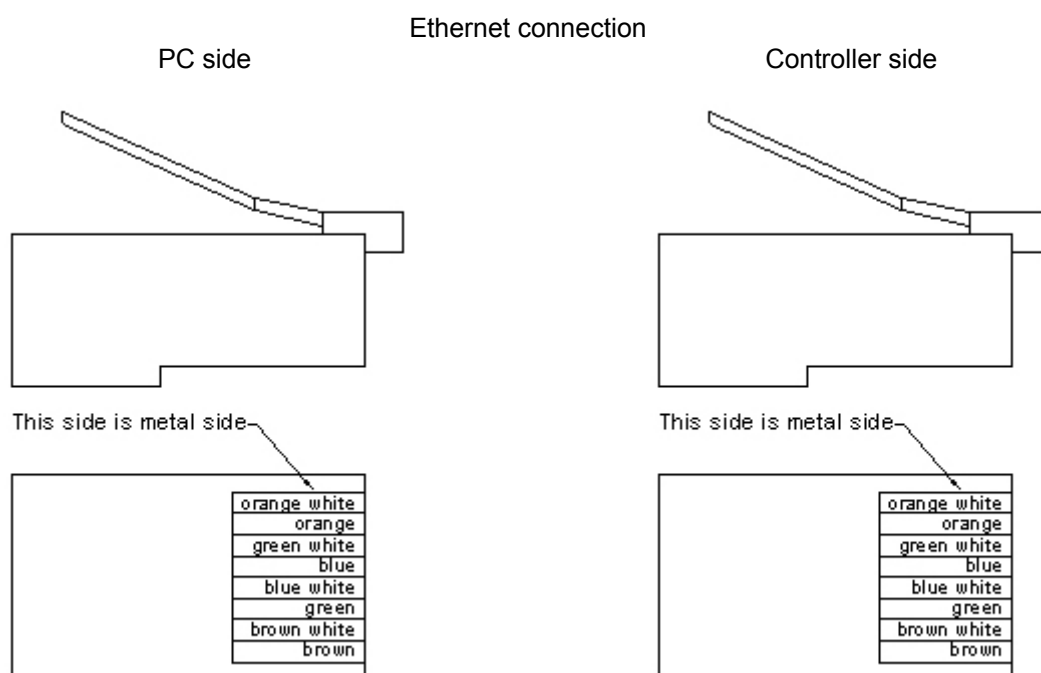


- WINDOWS NT page process : [File management].[Directory].[Share] as below

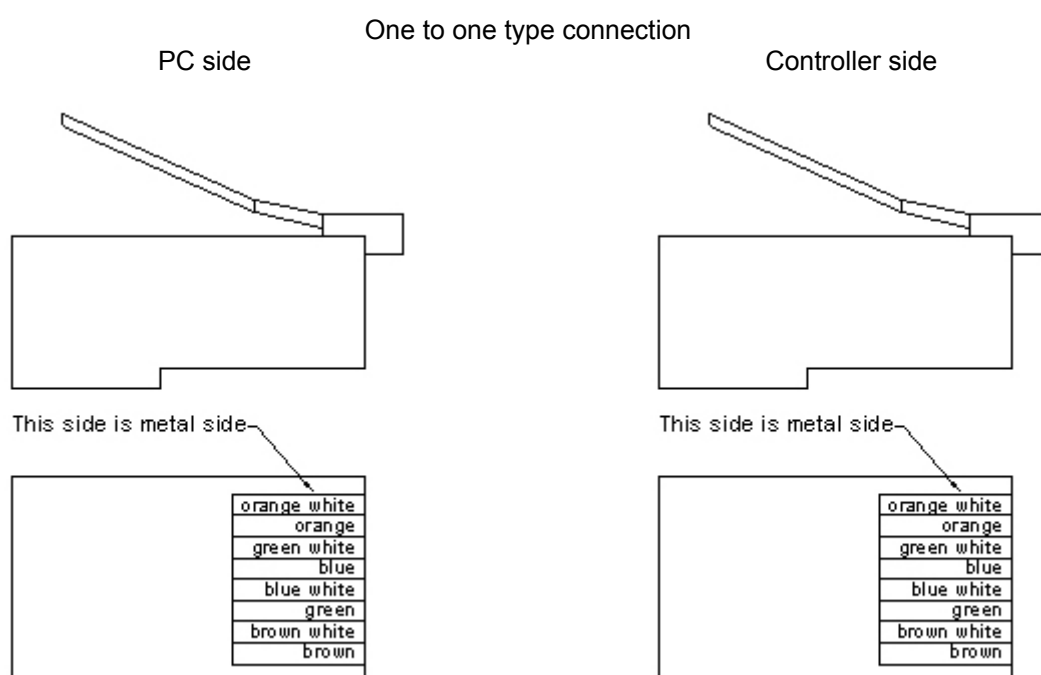


## ● Internet cable making

Use HUB to connect with controller :



Use PC to connect with controller :



### ● 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 :

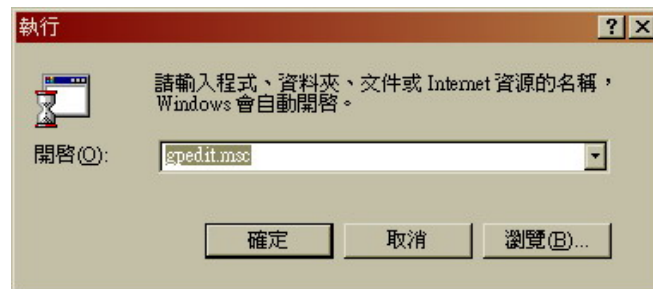
- At the OS : If user use Windows 2000 or Windows XP, then the system's setting will shut down idling interent connection (which has no saving actions) within 15 minutes. Therefore sometimes users may face the problem that controller can not connect to PC side.
- Internet card : PC side will shut down 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.

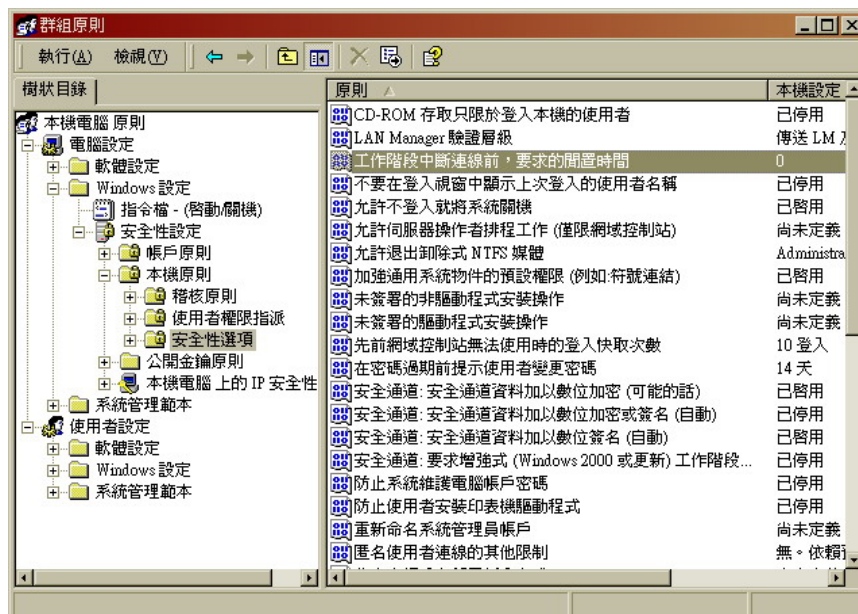
#### a. OS :

##### ■ Windows 2000 system :

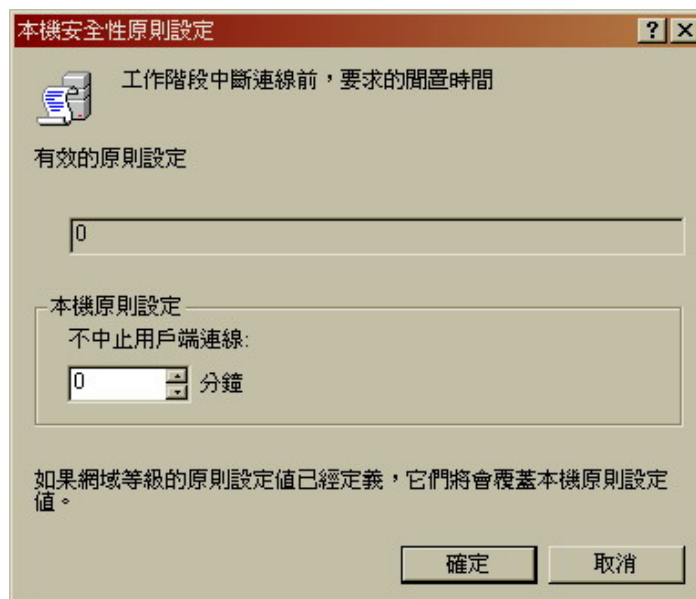
- [Start]->[execute], input Gpedit.msc to open 【group principles】 setting.



- Set 「computer setting\Windows setting\safety setting\machine principle\safety selections」 - 「Microsoft internet server : before stoping working, the demanding delay time」

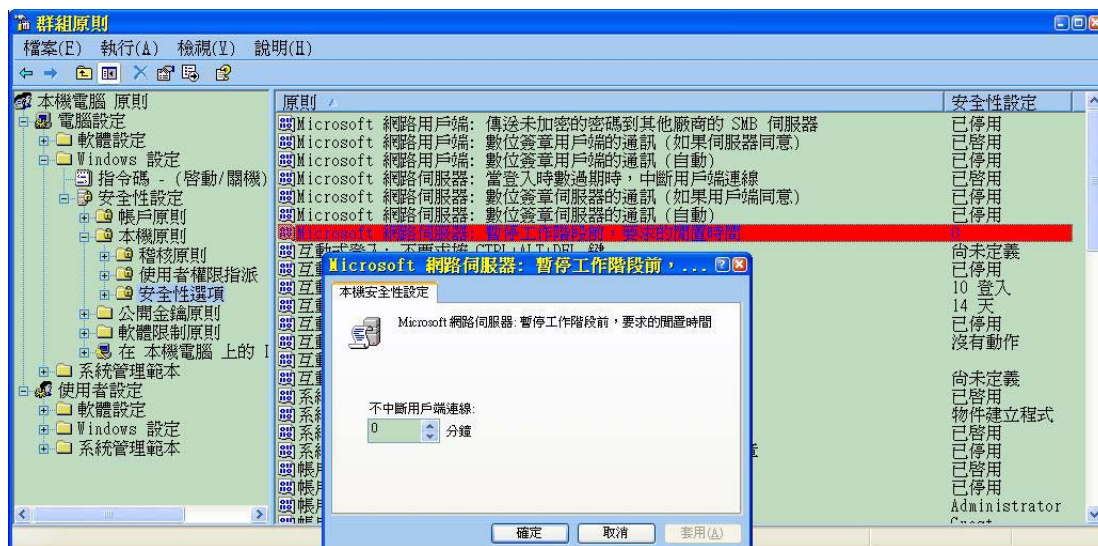


- Click twice to show dialog, and input 0, means you will not stop user side connection. Re-boot to let the setting valid. As below figure.



■ Windows XP system :

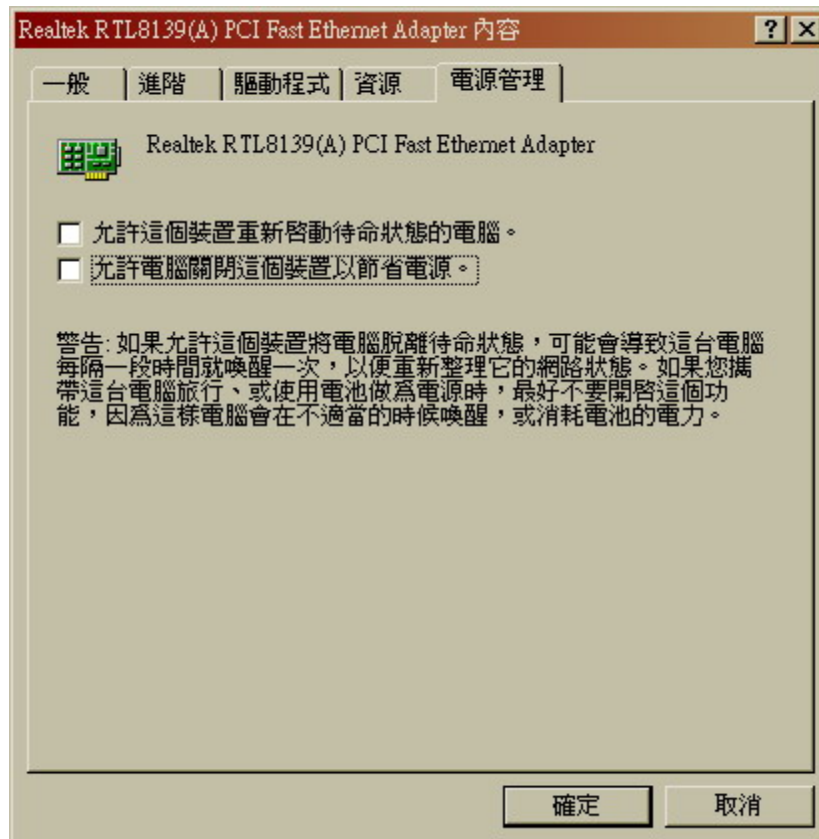
1. [Start]->[execute], input Gpedit.msc to open 【group principles】 setting.
2. Set 「computer setting\Windows setting\safety setting\machine principle\safety selections」 - 「Microsoft internet server : before stoping working, the demanding delay time」
3. Click twice to show dialog, and input 0, means you will not stop user side connection.  
Re-boot to let the setting valid. As below figure.



## b. Internet card :

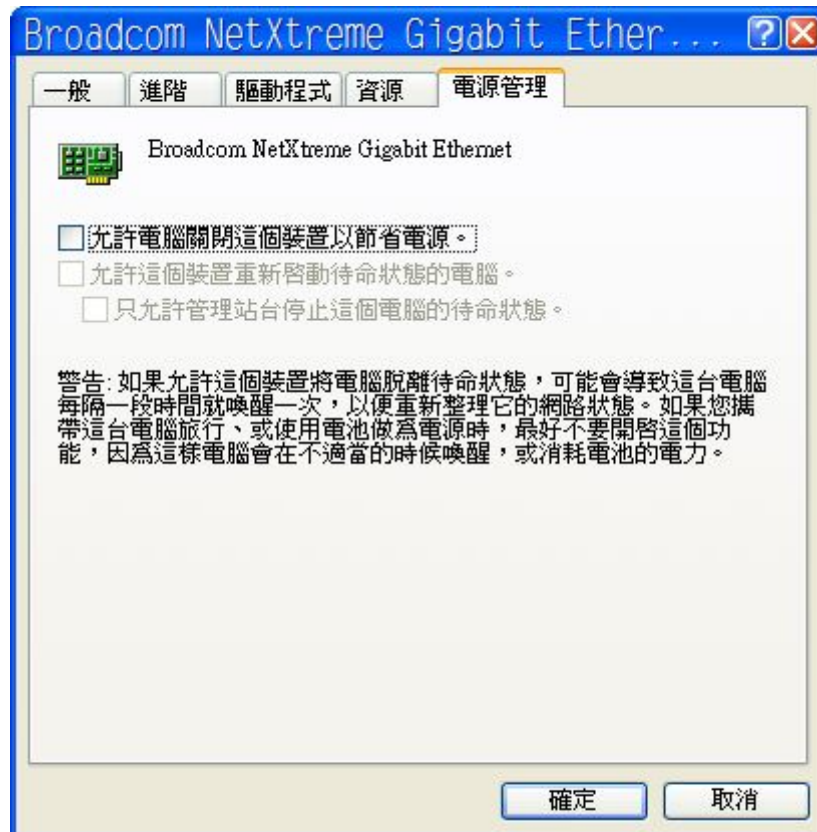
## ■ Windows 2000 system :

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 :



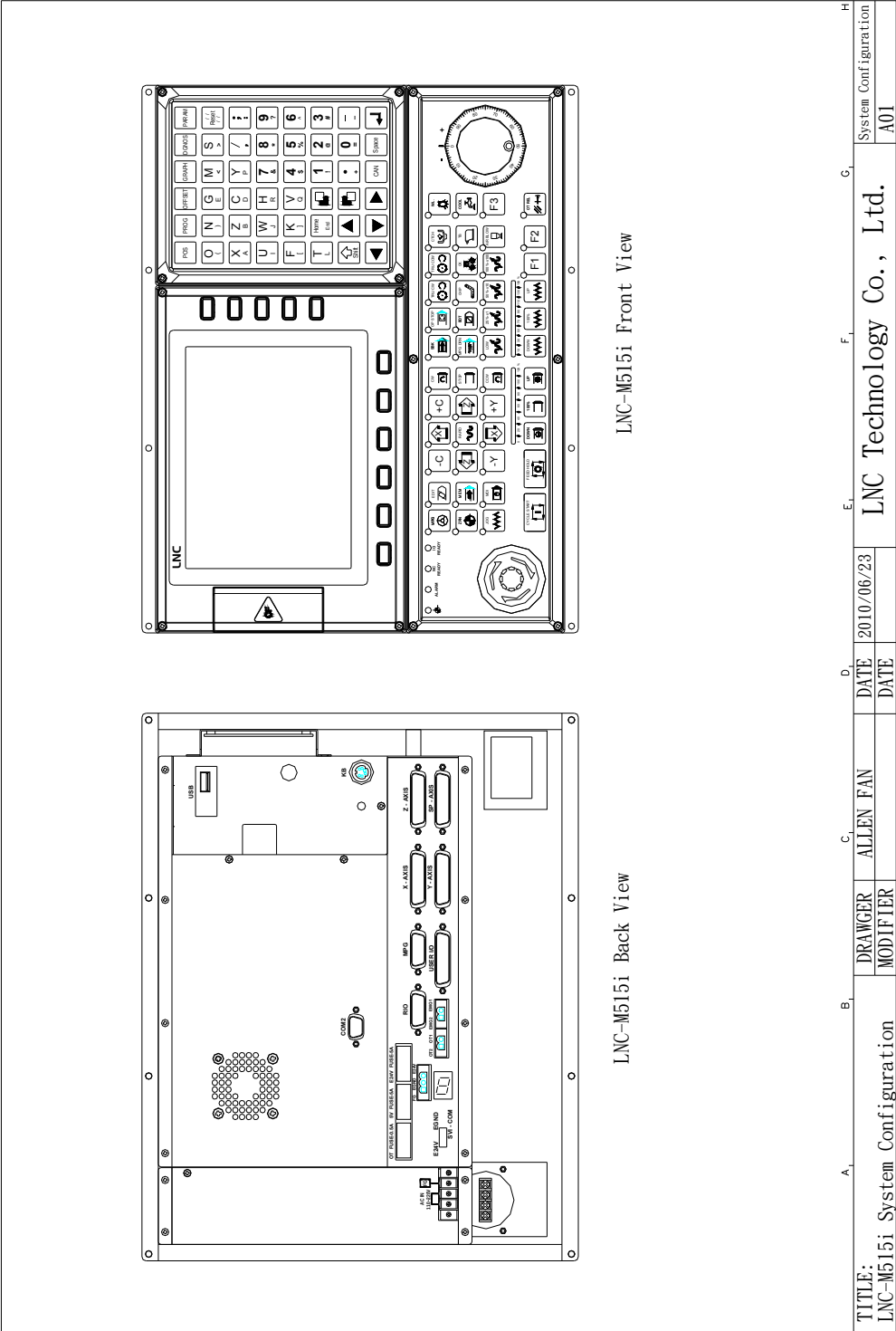
## ■ Windows XP system :

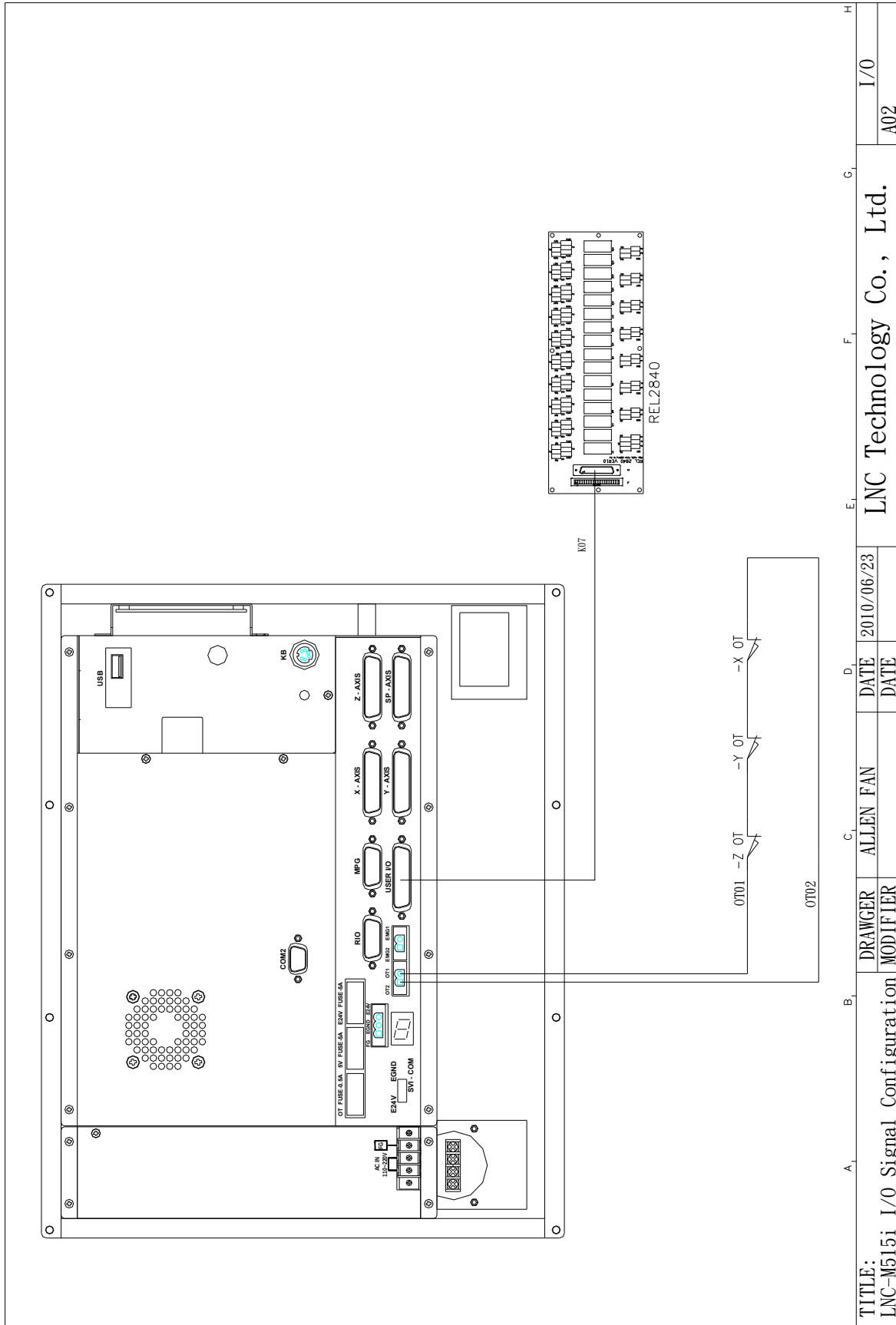
1. 「Internet」->Click right button「content」->「local connection」->click right button「content」->「connection method」>「setting」button->「power management」page, cancel this button「allow computer to close this device to save energy」As below figure :

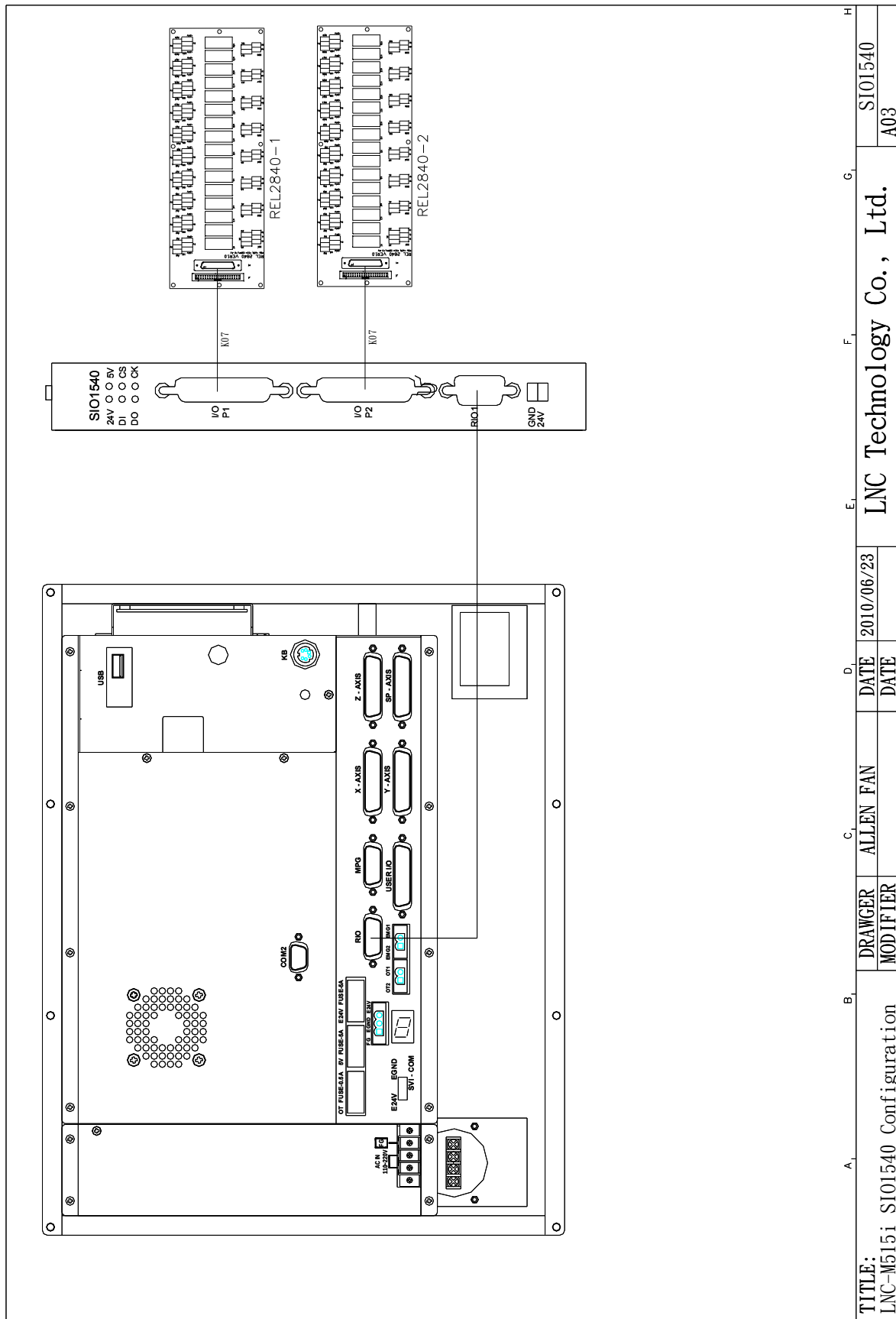


Appendix E WIRING DIAGRAM

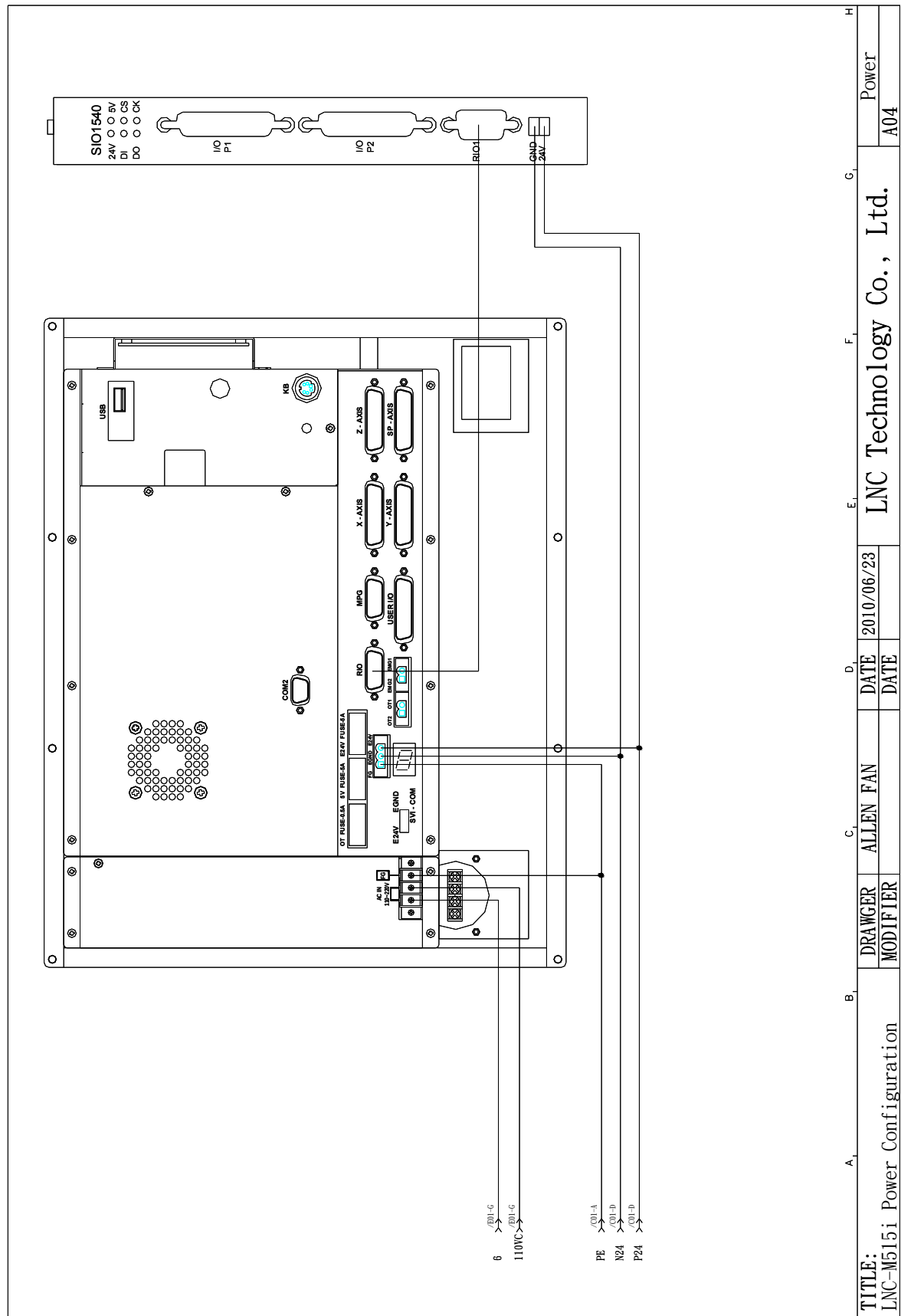
A-Sytem Configuration



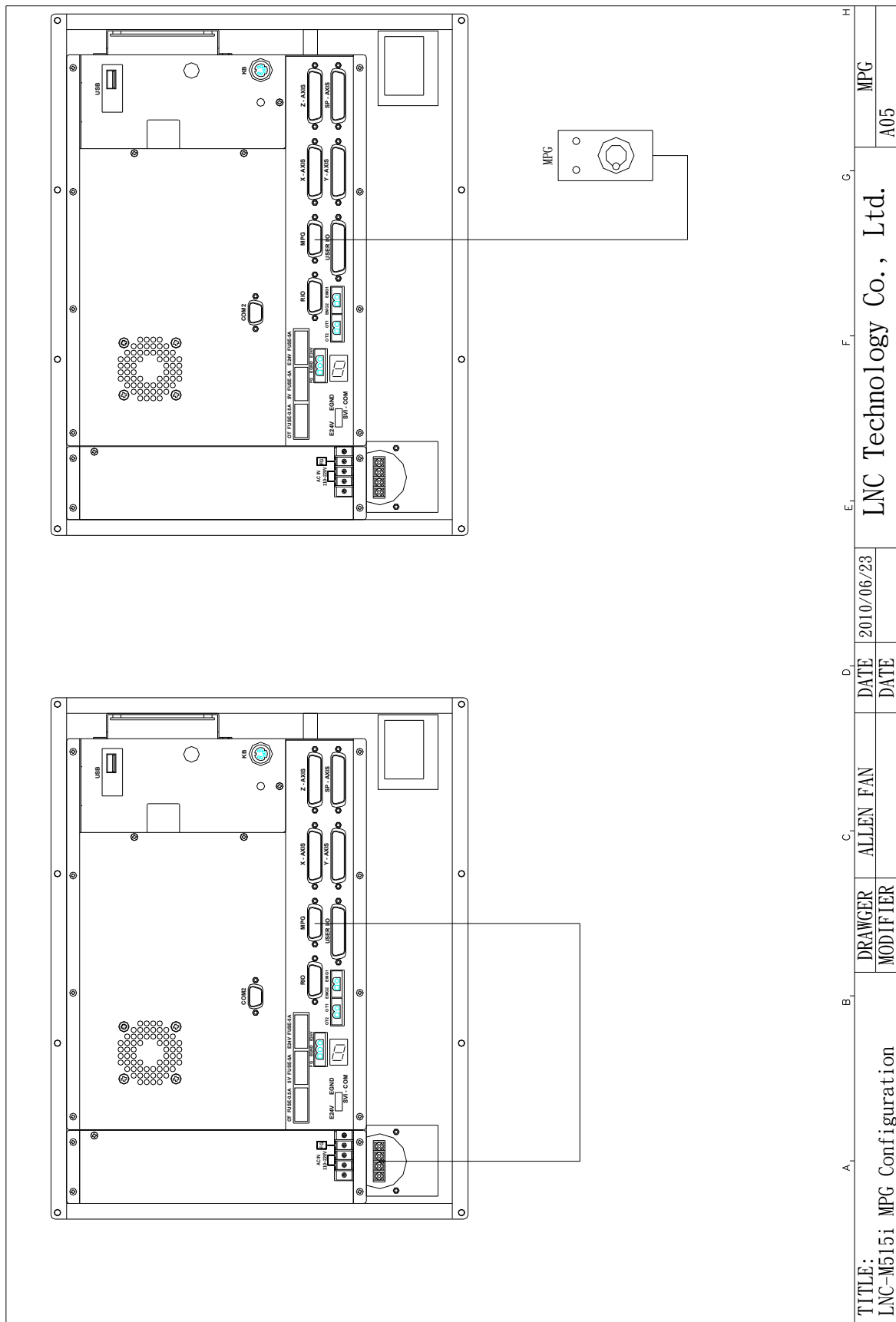


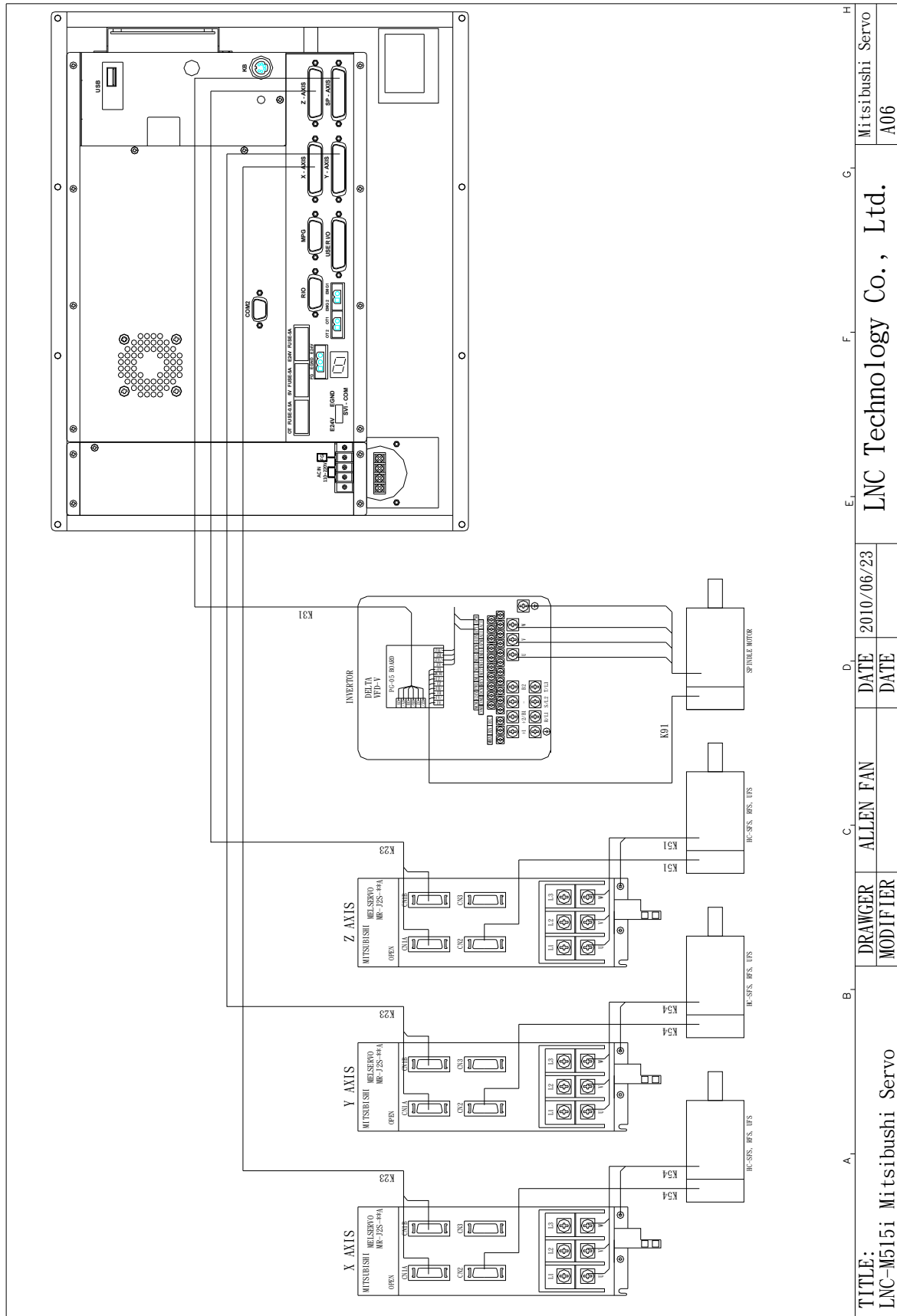


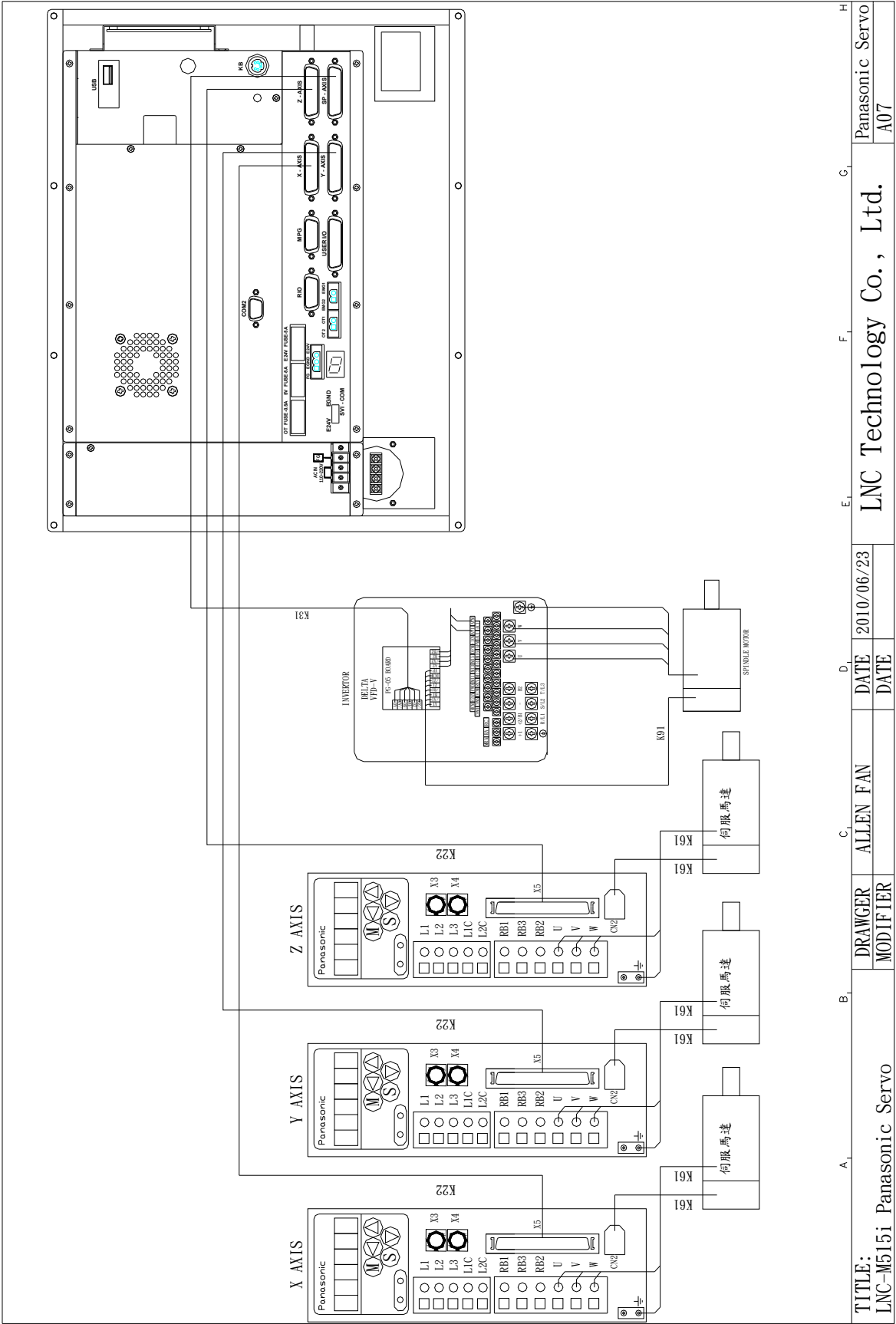
## Appendix E WIRING DIAGRAM



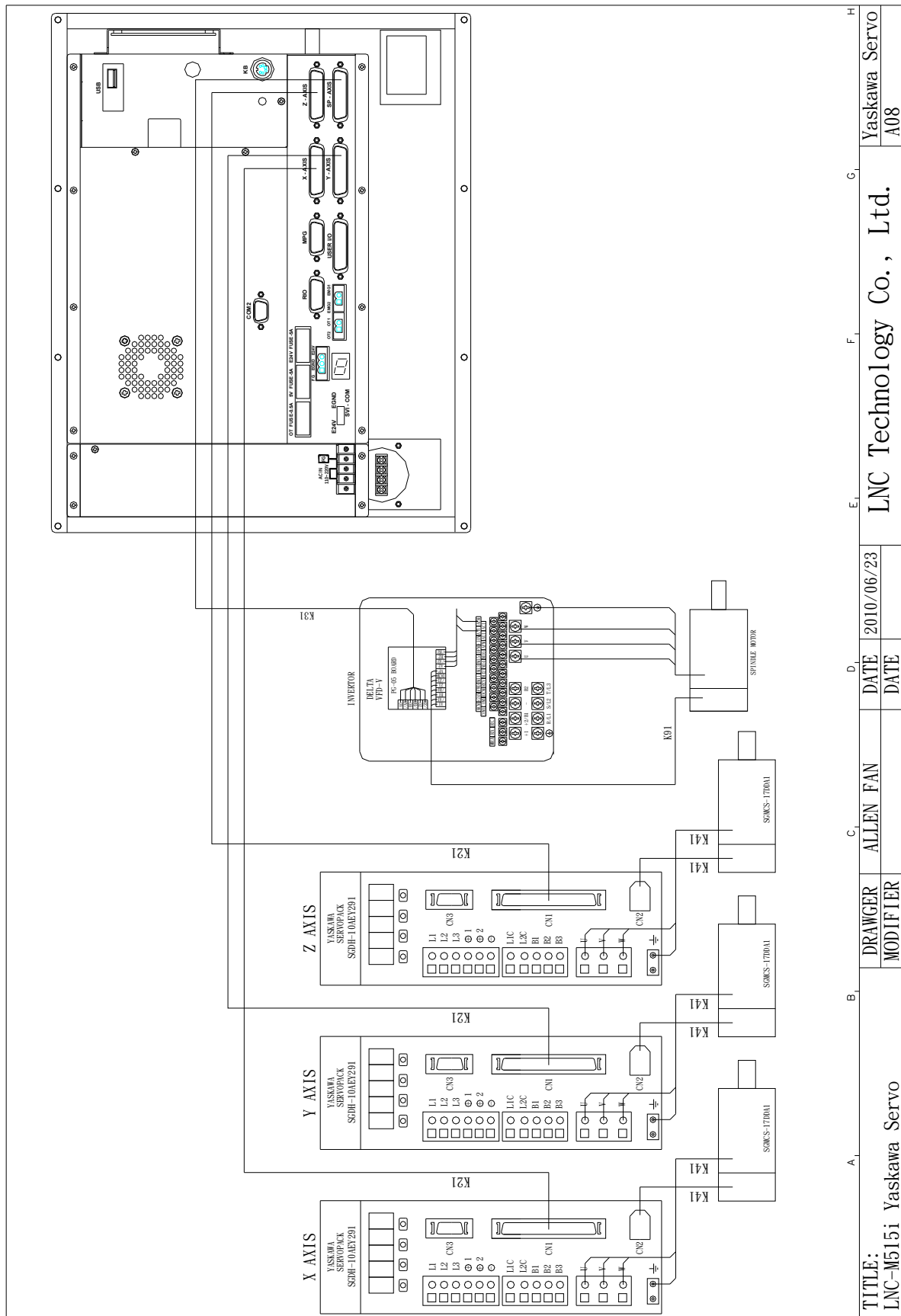
## Appendix E WIRING DIAGRAM



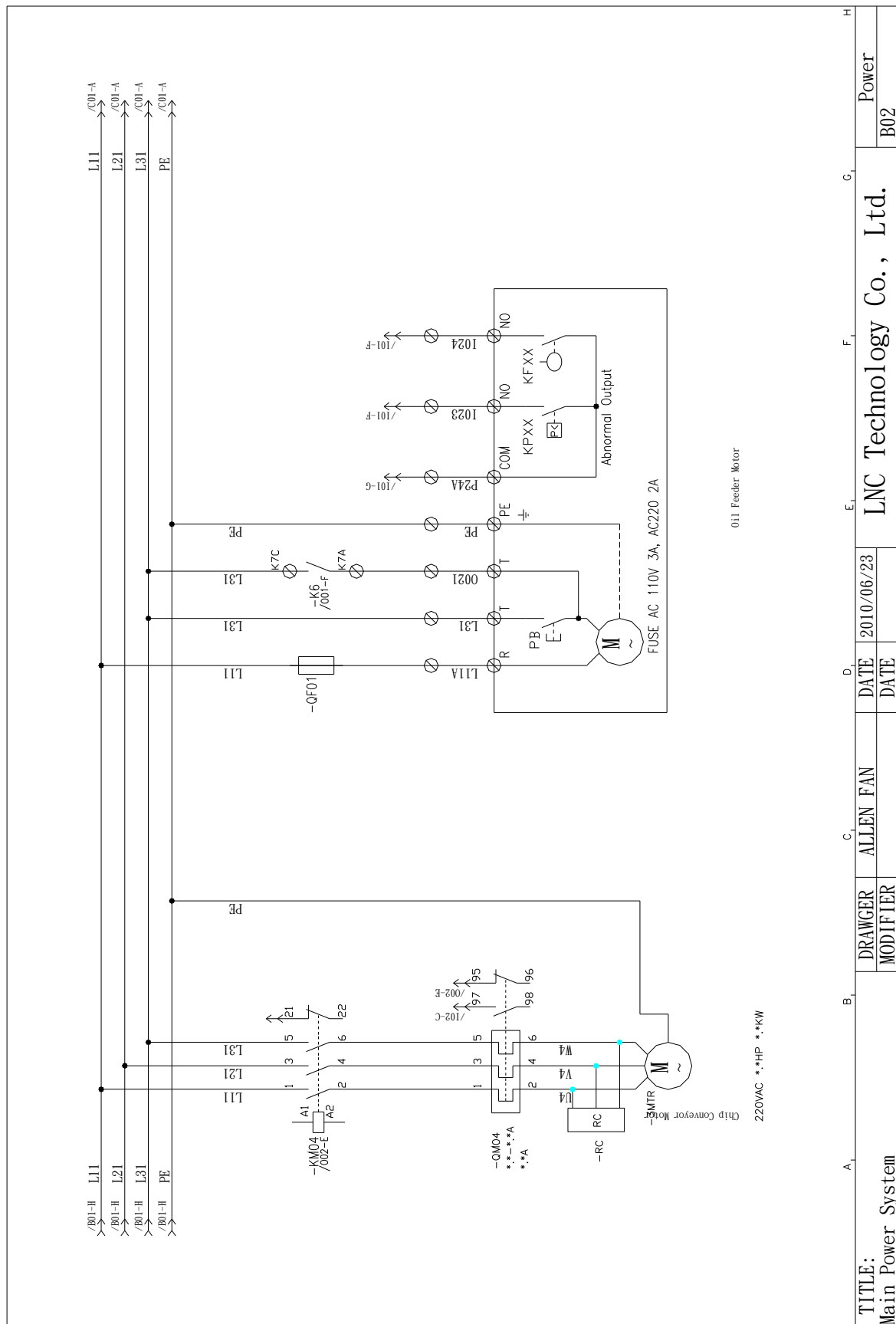




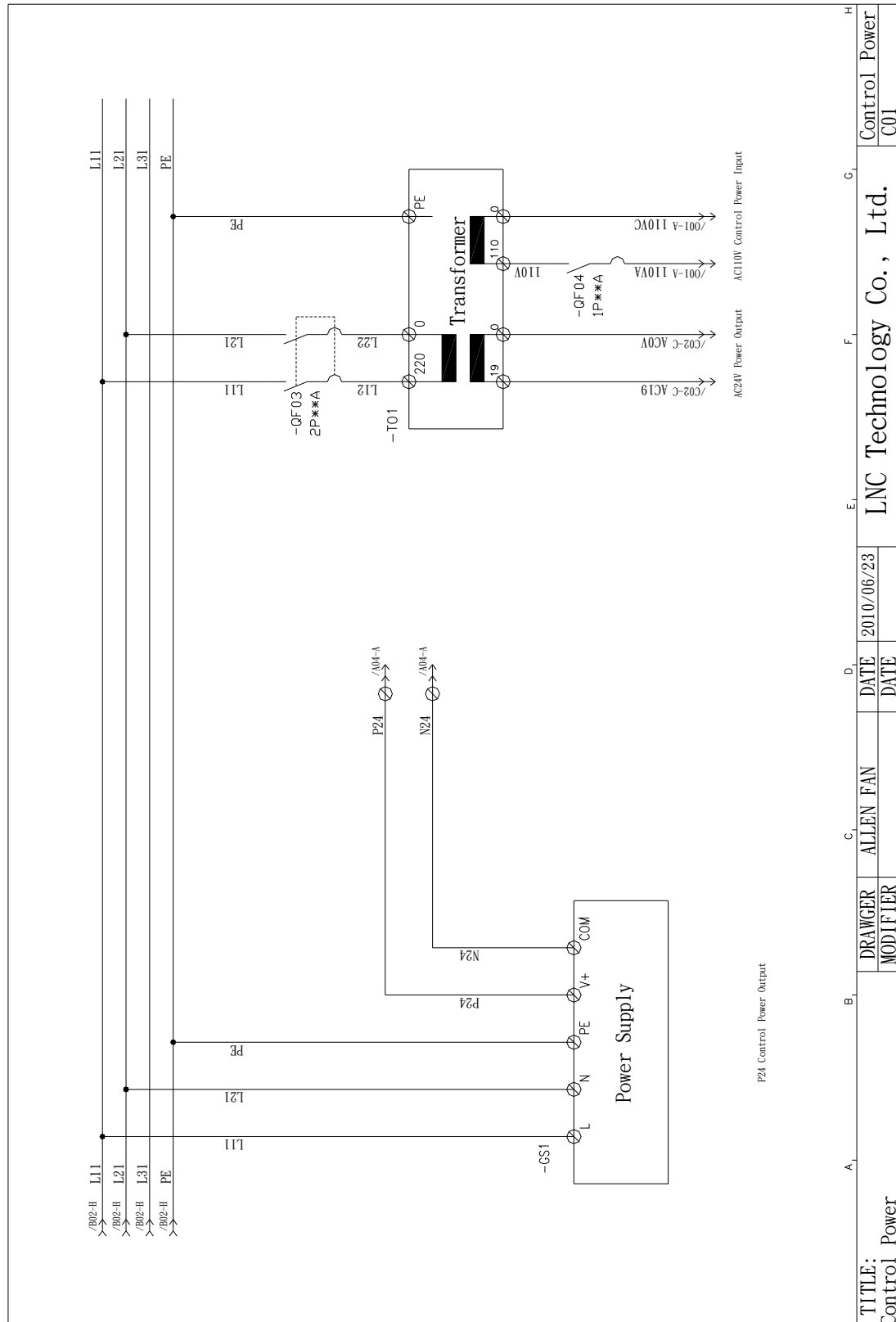
|                                     |                    |           |              |            |                          |  |  |                        |
|-------------------------------------|--------------------|-----------|--------------|------------|--------------------------|--|--|------------------------|
| TITLE:<br>LNC-M515i Panasonic Servo | DRAWER<br>MODIFIER | ALLEN FAN | DATE<br>DATE | 2010/06/23 | LNC Technology Co., Ltd. |  |  | Panasonic Servo<br>A07 |
|                                     |                    |           |              |            |                          |  |  |                        |

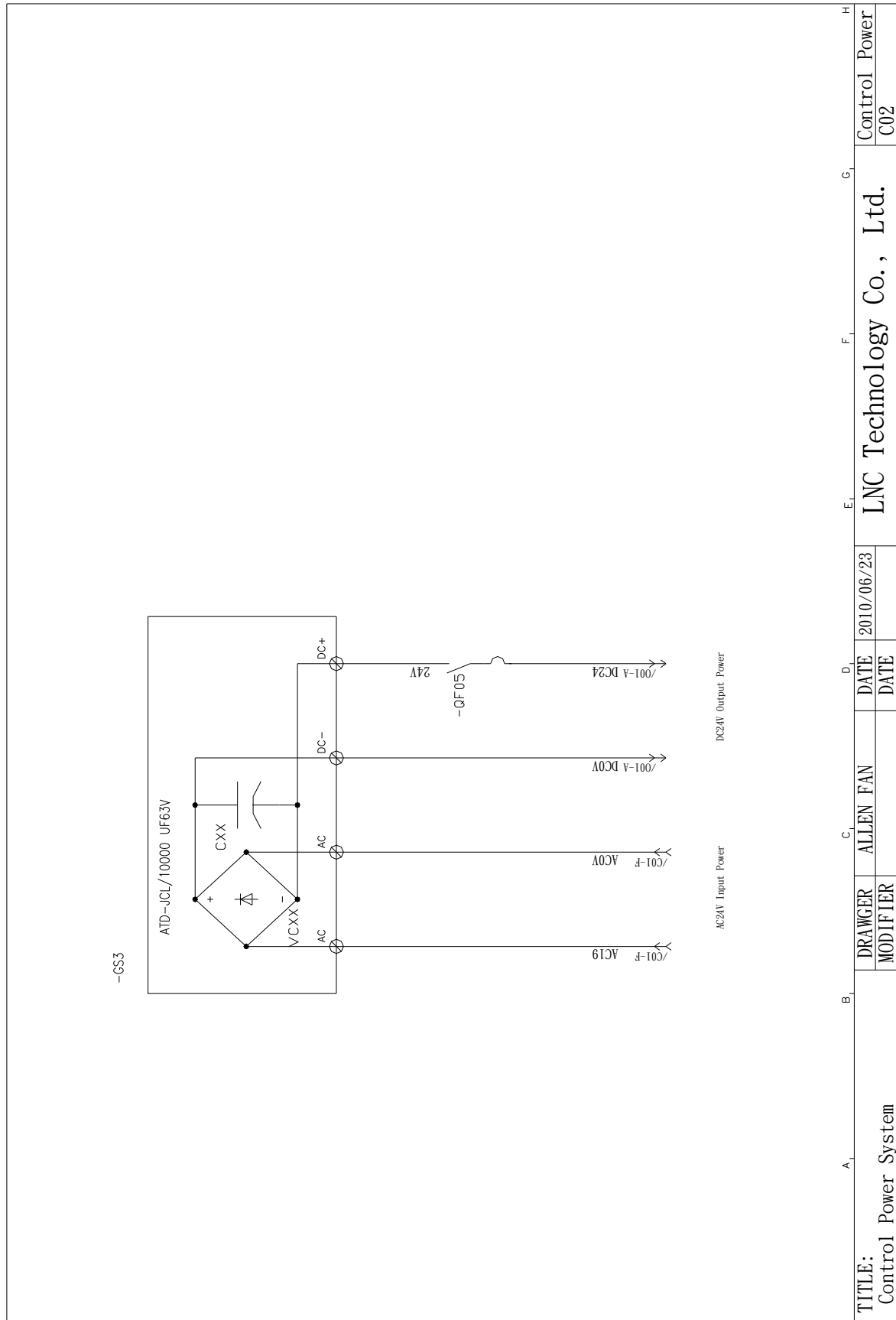




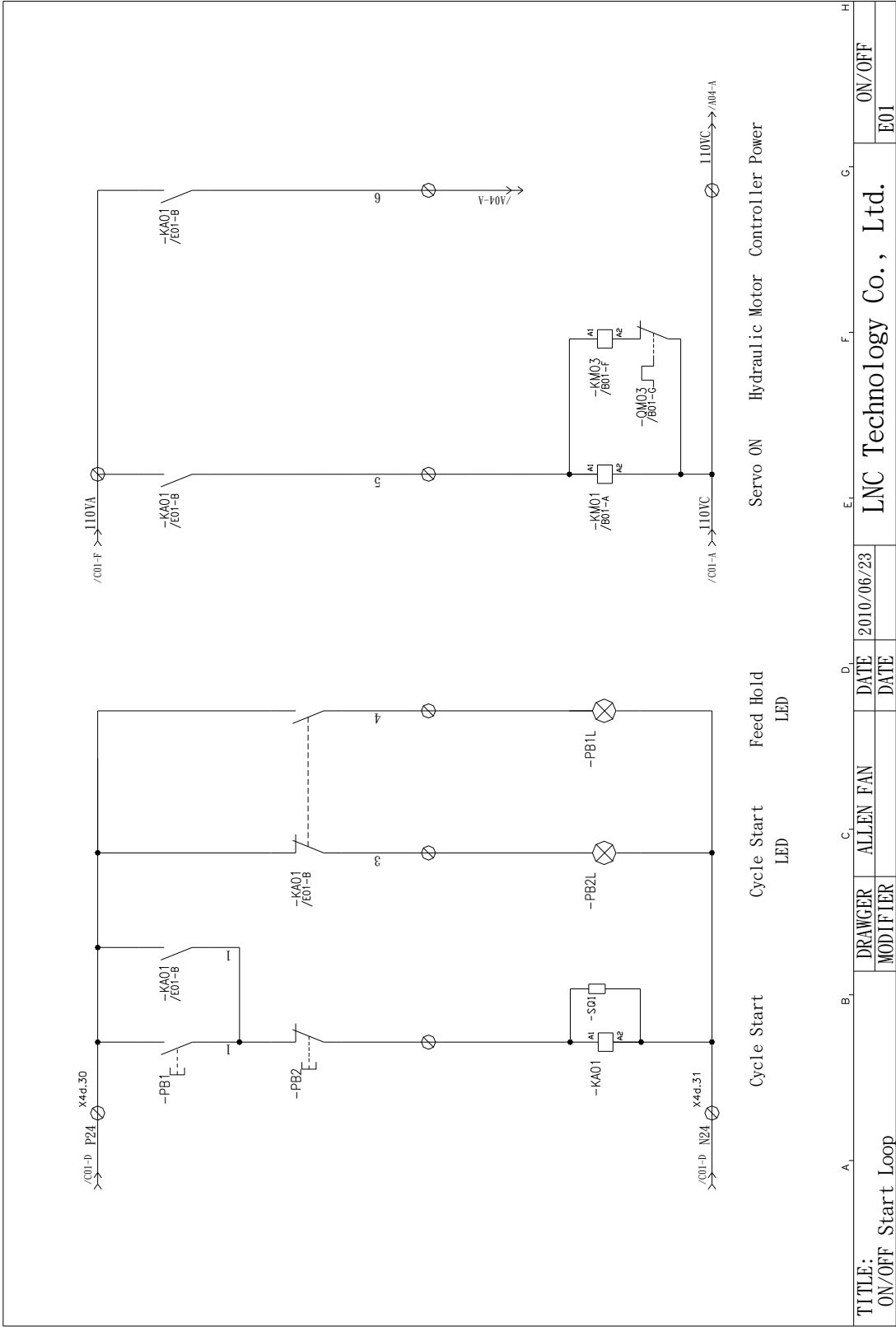


## C-Control Loop



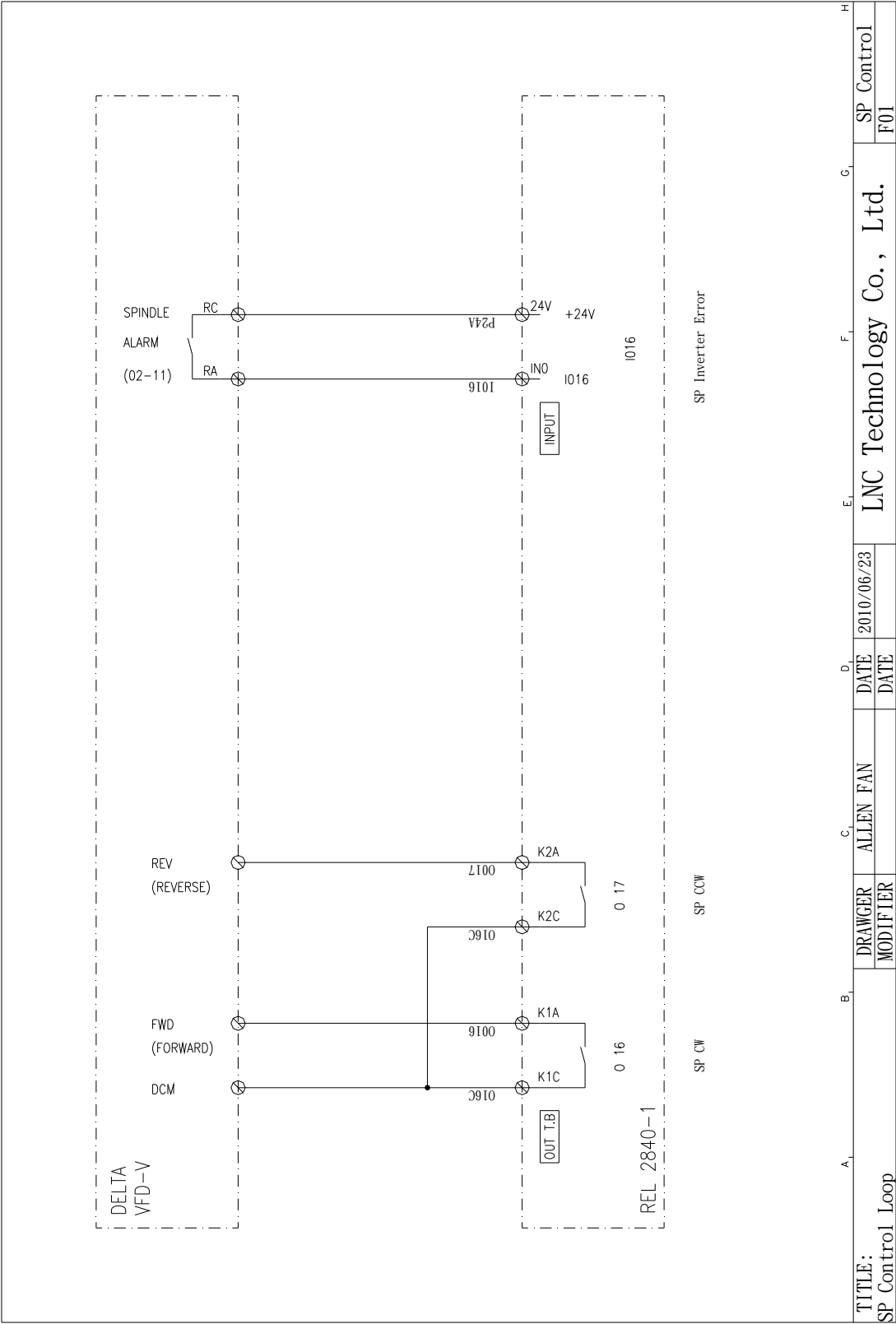


E-ONOFF

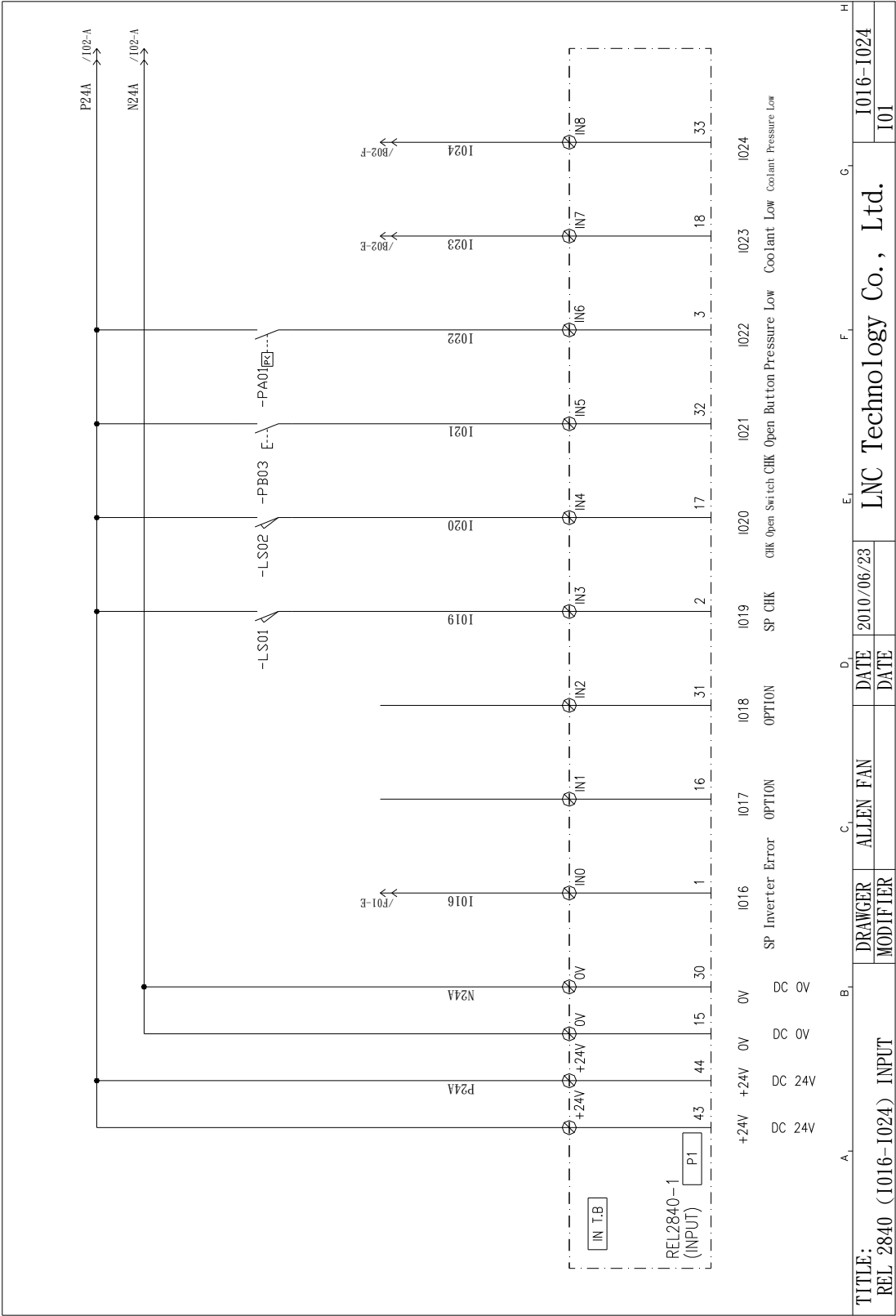


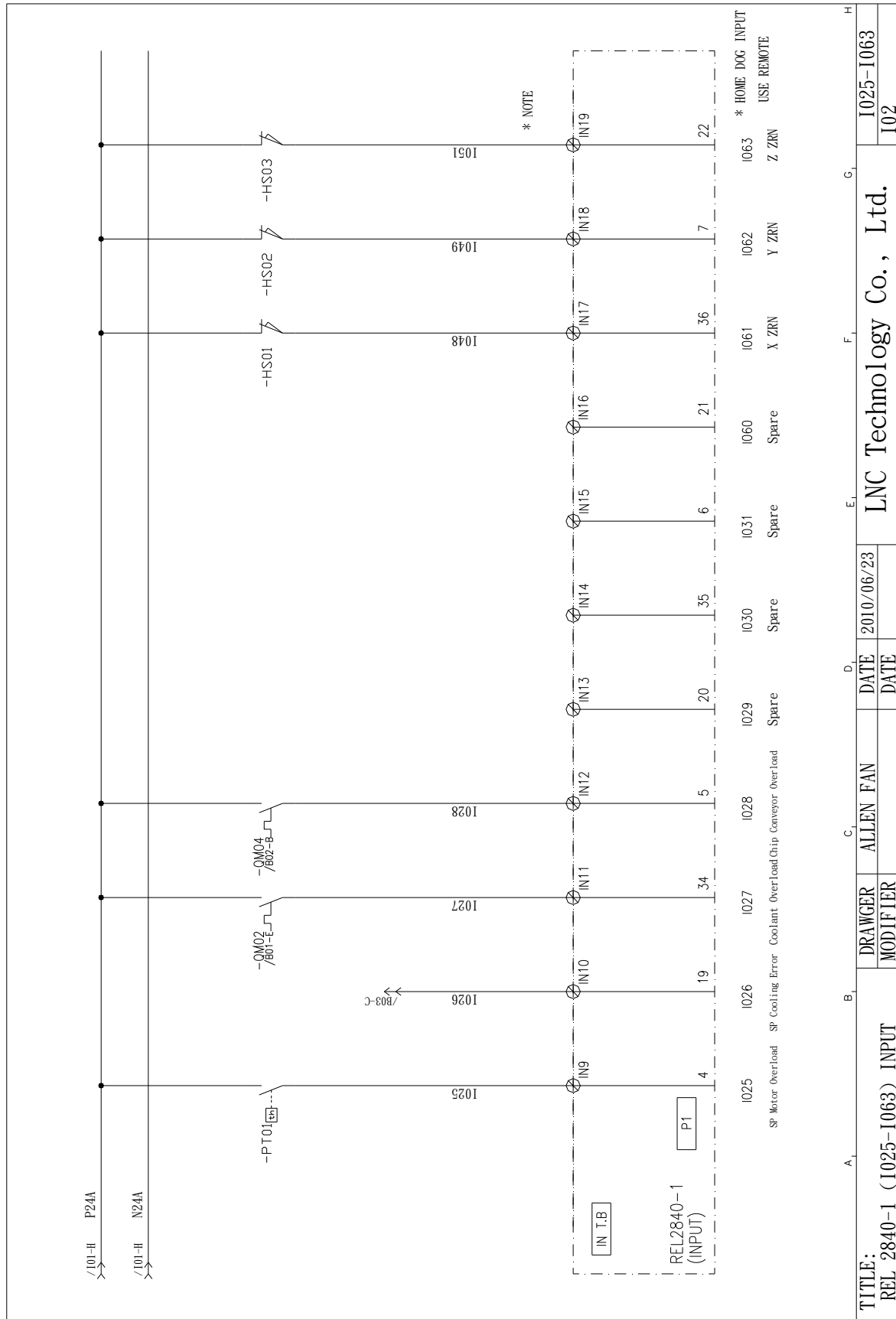


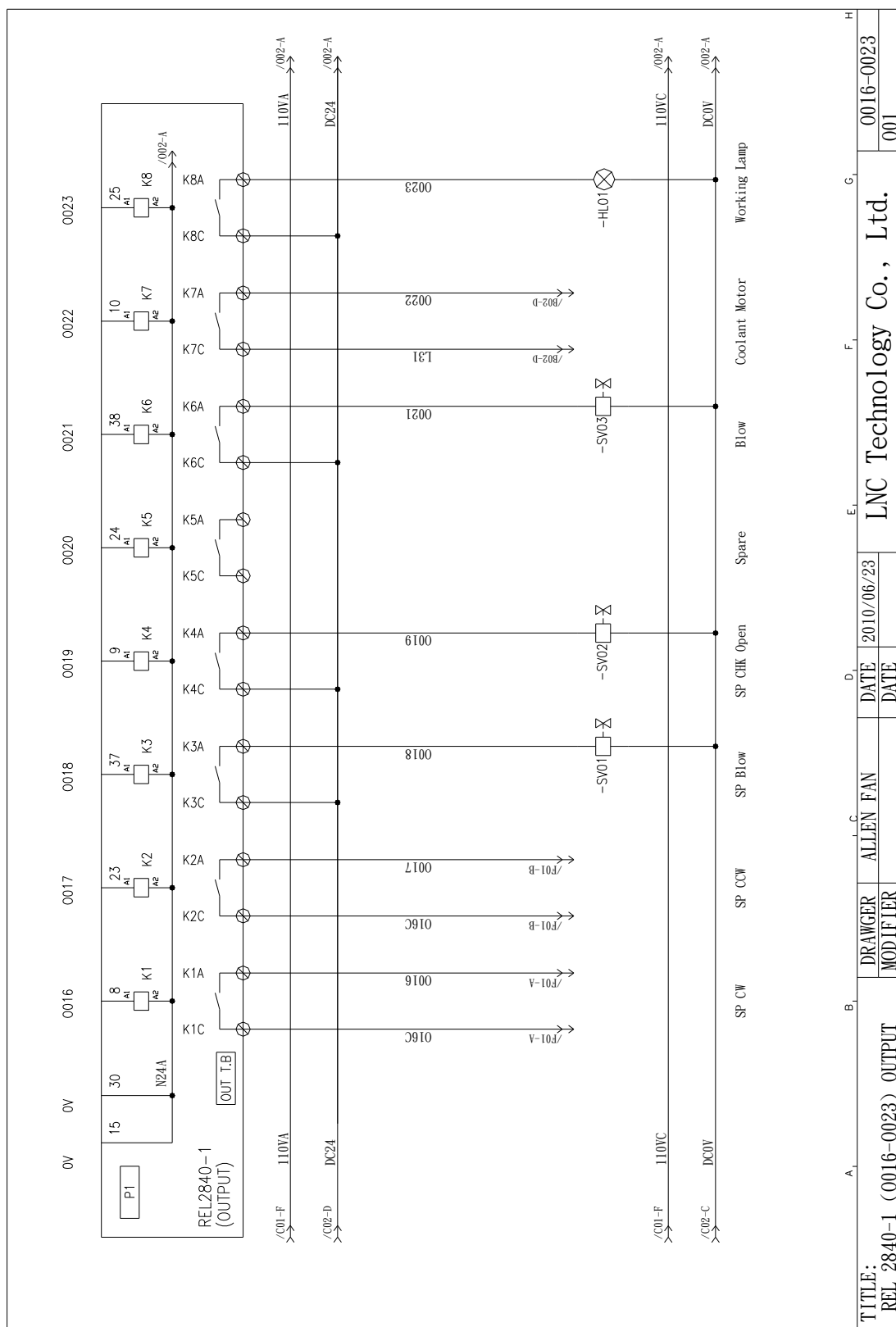
F- Spindle Interface

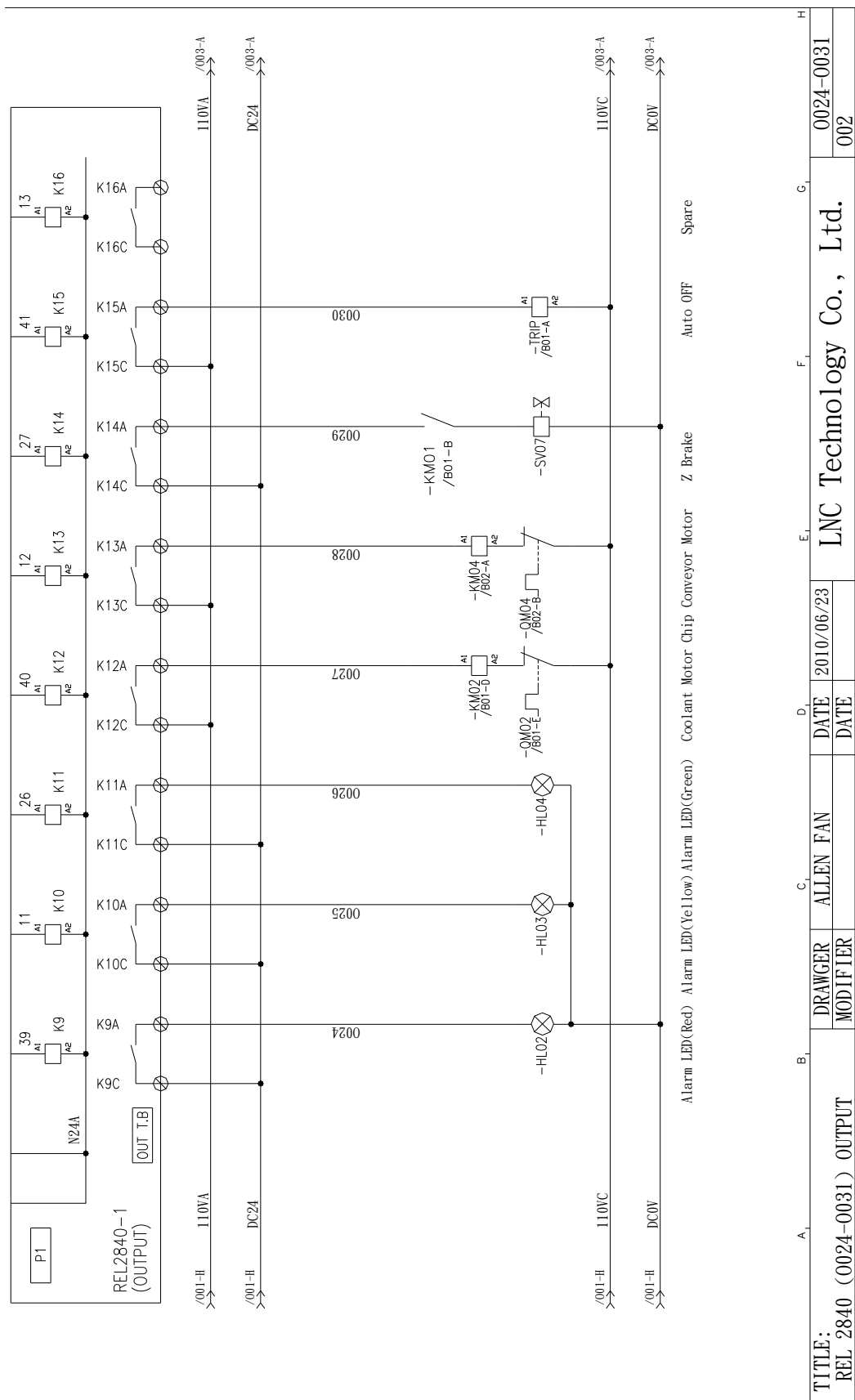


I-INPUT Wiring

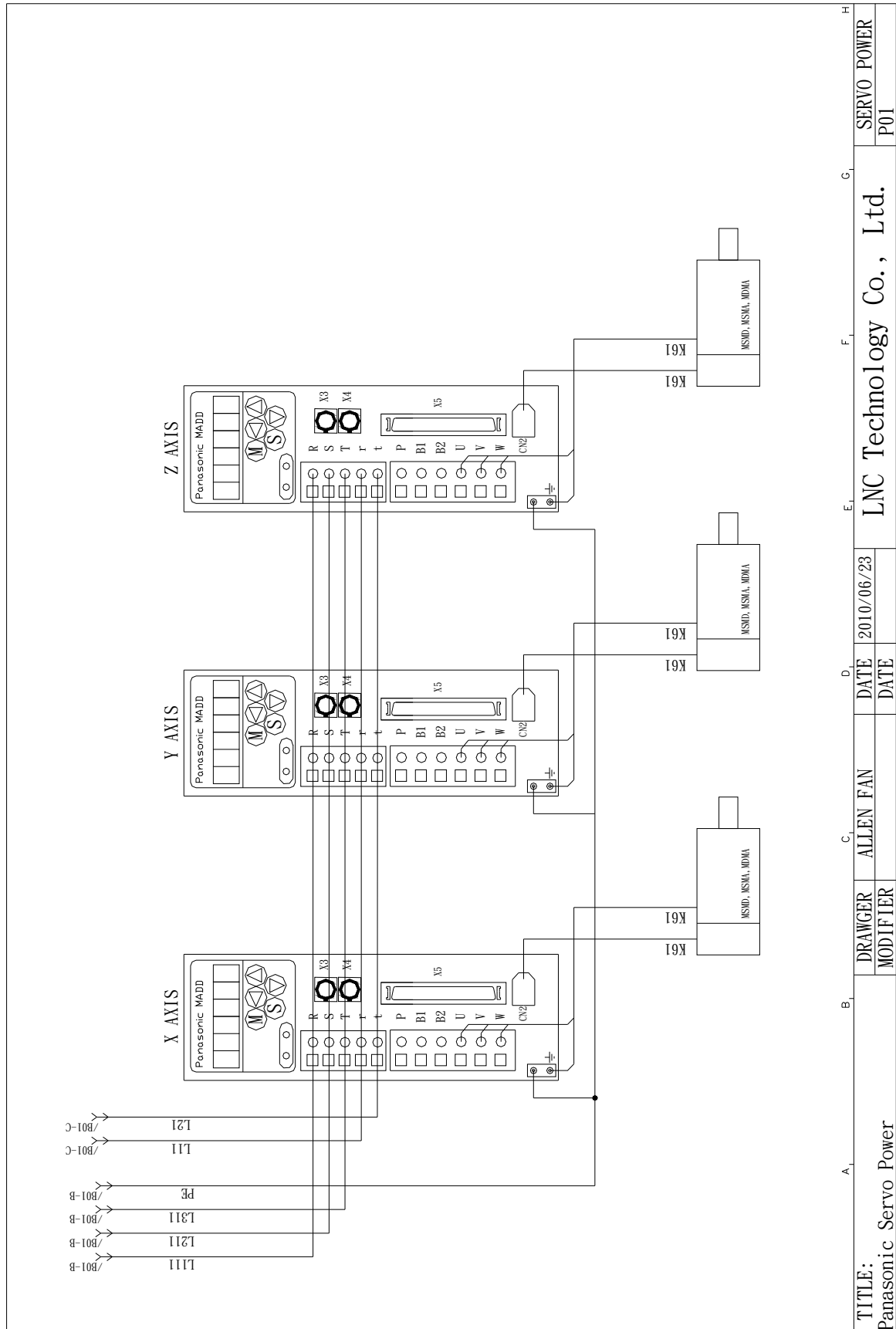


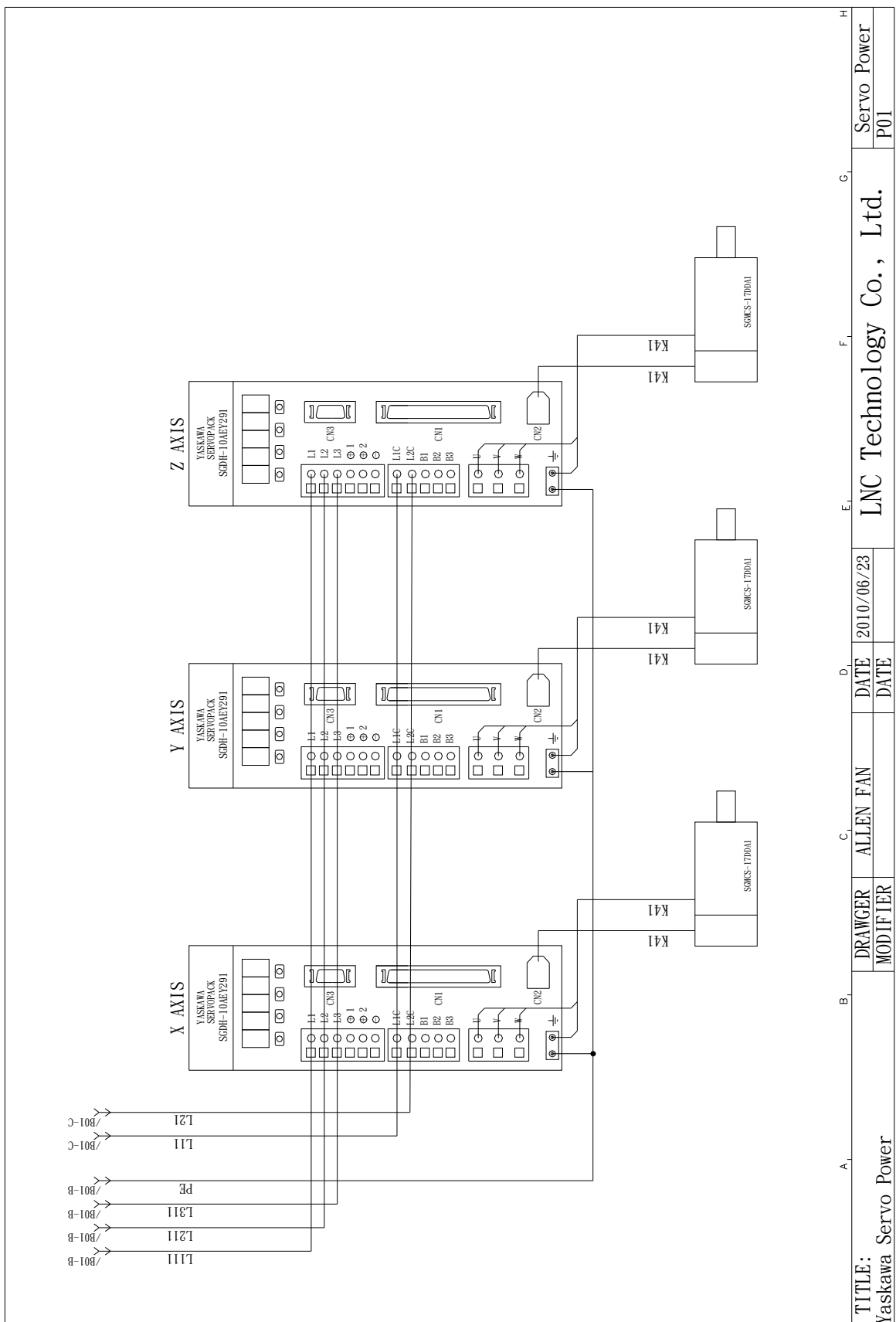


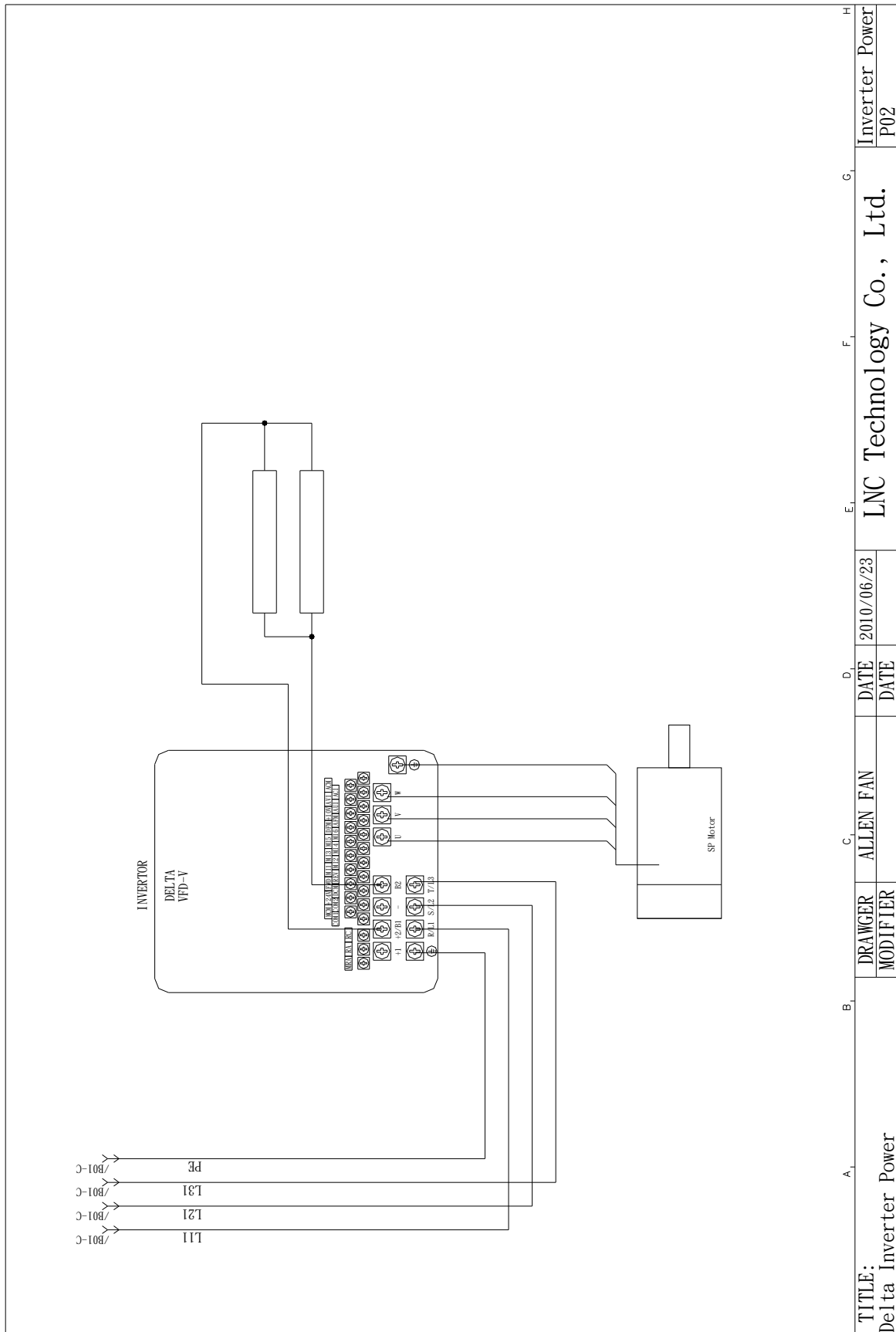












## T-10 List

[illegible]

| A <sub>1</sub>   |                     | B <sub>1</sub> |        | C <sub>1</sub> |        | D <sub>1</sub> |  | E <sub>1</sub> |  | F <sub>1</sub>           |  | G <sub>1</sub> |  | H <sub>1</sub> |  |
|------------------|---------------------|----------------|--------|----------------|--------|----------------|--|----------------|--|--------------------------|--|----------------|--|----------------|--|
| TITLE:           |                     | DRAWER         |        | ALLEN FAN      |        | DATE           |  | 2010/06/23     |  | LNC Technology Co., Ltd. |  | M515i SERIES   |  | T02            |  |
| LNC M515i Output |                     | MODIFIER       |        |                |        | DATE           |  |                |  |                          |  |                |  |                |  |
| OUTPUT           | DESCRIPTION         | Remark         | OUTPUT | DESCRIPTION    | Remark |                |  |                |  |                          |  |                |  |                |  |
| 0016             | SP CW               | REL            | 0032   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0017             | SP CCW              | REL            | 0033   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0018             | SP Blow             | REL            | 0034   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0019             | SP CHK Open         | REL            | 0035   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0020             | REL2840-K5          | REL            | 0036   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0021             | Blow                | REL            | 0037   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0022             | Coolant Motor       | REL            | 0038   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0023             | Working Lamp        | REL            | 0039   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0024             | Alarm LED Red       | REL            | 0040   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0025             | Alarm LED Yellow    | REL            | 0041   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0026             | Alarm LED Green     | REL            | 0042   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0027             | Coolant Motor       | REL            | 0043   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0028             | Chip Conveyor Motor | REL            | 0044   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0029             | Z Brake             | REL            | 0045   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0030             | Auto OFF            | REL            | 0046   |                |        |                |  |                |  |                          |  |                |  |                |  |
| 0031             | REL2840-K16         | REL            | 0047   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0048   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0049   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0050   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0051   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0052   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0053   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0054   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0055   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0056   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0057   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0058   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0059   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0060   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                | 0061   |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                |        |                |        |                |  |                |  |                          |  |                |  |                |  |
|                  |                     |                |        |                |        |                |  |                |  |                          |  |                |  |                |  |

[illegible]

|                    |                |                |                |                |                |                          |                |
|--------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|----------------|
| A <sub>1</sub>     | B <sub>1</sub> | C <sub>1</sub> | D <sub>1</sub> | E <sub>1</sub> | F <sub>1</sub> | G <sub>1</sub>           | H <sub>1</sub> |
| TITLE:             |                | DRAWER         | ALLEN FAN      | DATE           | 2010/06/23     | LNC Technology Co., Ltd. |                |
| LNC M515i OP INPUT |                | MODIFIER       |                | DATE           |                | OP                       |                |
|                    |                |                |                |                |                | T03                      |                |

| TITLE:<br>LNC M515i OP OUTPUT |                  |             | DRAWER<br>MODIFIER |    |    | DATE    |    |    | DATE   |                      |    | LNC Technology Co., Ltd. |    |    | T04     |    |    |
|-------------------------------|------------------|-------------|--------------------|----|----|---------|----|----|--------|----------------------|----|--------------------------|----|----|---------|----|----|
| OUTPUT                        |                  |             | DESCRIPTION        |    |    | REMARKS |    |    | OUTPUT |                      |    | DESCRIPTION              |    |    | REMARKS |    |    |
| 0320                          | SP Speed         | OR 70% LED  | OP                 | OP | OP | OP      | OP | OP | 0352   | F2 LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0321                          | SP Speed         | OR 60% LED  | OP                 | OP | OP | OP      | OP | OP | 0353   | TB LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0322                          | SP Speed         | OR 50% LED  | OP                 | OP | OP | OP      | OP | OP | 0354   | CK LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0323                          | SP Speed         | OR 40% LED  | OP                 | OP | OP | OP      | OP | OP | 0355   | CHIP LED             | OP | OP                       | OP | OP | OP      | OP | OP |
| 0324                          | SP Speed         | OR 30% LED  | OP                 | OP | OP | OP      | OP | OP | 0356   | BDT LED              | OP | OP                       | OP | OP | OP      | OP | OP |
| 0325                          | SP Speed         | OR 20% LED  | OP                 | OP | OP | OP      | OP | OP | 0357   | MPG DRN LED          | OP | OP                       | OP | OP | OP      | OP | OP |
| 0326                          | SP Speed         | OR 10% LED  | OP                 | OP | OP | OP      | OP | OP | 0358   | STOP LED             | OP | OP                       | OP | OP | OP      | OP | OP |
| 0327                          | SP Speed         | OR 0% LED   | OP                 | OP | OP | OP      | OP | OP | 0359   | -Z LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0328                          | Feedrate         | OR 150% LED | OP                 | OP | OP | OP      | OP | OP | 0360   | F1 LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0329                          | Feedrate         | OR 140% LED | OP                 | OP | OP | OP      | OP | OP | 0361   | CTCH LED             | OP | OP                       | OP | OP | OP      | OP | OP |
| 0330                          | Feedrate         | OR 130% LED | OP                 | OP | OP | OP      | OP | OP | 0362   | TUR CCW LED          | OP | OP                       | OP | OP | OP      | OP | OP |
| 0331                          | Feedrate         | OR 120% LED | OP                 | OP | OP | OP      | OP | OP | 0363   | TUR CW LED           | OP | OP                       | OP | OP | OP      | OP | OP |
| 0332                          | Feedrate         | OR 110% LED | OP                 | OP | OP | OP      | OP | OP | 0364   | OP STOP LED          | OP | OP                       | OP | OP | OP      | OP | OP |
| 0333                          | Feedrate         | OR 100% LED | OP                 | OP | OP | OP      | OP | OP | 0366   | CW LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0334                          | Feedrate         | OR 90% LED  | OP                 | OP | OP | OP      | OP | OP | 0367   | +C LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0335                          | Feedrate         | OR 80% LED  | OP                 | OP | OP | OP      | OP | OP | 0368   | MDI LED              | OP | OP                       | OP | OP | OP      | OP | OP |
| 0336                          | Feedrate         | OR 70% LED  | OP                 | OP | OP | OP      | OP | OP | 0369   | MEM LED              | OP | OP                       | OP | OP | OP      | OP | OP |
| 0337                          | Feedrate         | OR 60% LED  | OP                 | OP | OP | OP      | OP | OP | 0373   | ZRN LED              | OP | OP                       | OP | OP | OP      | OP | OP |
| 0338                          | Feedrate         | OR 50% LED  | OP                 | OP | OP | OP      | OP | OP | 0374   | +Z LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0339                          | Feedrate         | OR 40% LED  | OP                 | OP | OP | OP      | OP | OP | 0375   | RAPID LED            | OP | OP                       | OP | OP | OP      | OP | OP |
| 0340                          | Feedrate         | OR 30% LED  | OP                 | OP | OP | OP      | OP | OP | 0377   | JOG LED              | OP | OP                       | OP | OP | OP      | OP | OP |
| 0341                          | Feedrate         | OR 20% LED  | OP                 | OP | OP | OP      | OP | OP | 0378   | -Y LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0342                          | Feedrate         | OR 10% LED  | OP                 | OP | OP | OP      | OP | OP | 0379   | +X LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0343                          | Feedrate         | OR 0% LED   | OP                 | OP | OP | OP      | OP | OP | 0380   | +Y LED               | OP | OP                       | OP | OP | OP      | OP | OP |
| 0344                          | F3 LED           |             | OP                 | OP | OP | OP      | OP | OP | 0381   | CCW LED              | OP | OP                       | OP | OP | OP      | OP | OP |
| 0345                          | AIR BLOW LED     |             | OP                 | OP | OP | OP      | OP | OP | 0382   | LOW LED              | OP | OP                       | OP | OP | OP      | OP | OP |
| 0346                          | 100%/MPG*100 LED |             | OP                 | OP | OP | OP      | OP | OP | 0383   | CYCLE START LED      | OP | OP                       | OP | OP | OP      | OP | OP |
| 0347                          | 50%/MPG*10 LED   |             | OP                 | OP | OP | OP      | OP | OP | 0386   | FEED HOLD LED        | OP | OP                       | OP | OP | OP      | OP | OP |
| 0348                          | 25%/MPG*1 LED    |             | OP                 | OP | OP | OP      | OP | OP | 0387   | SP Speed OR 120% LED | OP | OP                       | OP | OP | OP      | OP | OP |
| 0349                          | W. L LED         |             | OP                 | OP | OP | OP      | OP | OP | 0388   | SP Speed OR 110% LED | OP | OP                       | OP | OP | OP      | OP | OP |
| 0350                          | COOL LED         |             | OP                 | OP | OP | OP      | OP | OP | 0389   | SP Speed OR 100% LED | OP | OP                       | OP | OP | OP      | OP | OP |
| 0351                          | OT REL LED       |             | OP                 | OP | OP | OP      | OP | OP | 0390   | SP Speed OR 90% LED  | OP | OP                       | OP | OP | OP      | OP | OP |

[illegible]

