LNC-M650

Maintenance Manual

2011/05 Ver：V04.00.000(4408210118)

Leading Numerical Controller

LNC Technology Co., Ltd.

Table of Contents

1 SPECIFICATION

LNC-M650 Series is a standard DOS-Based controller and also an integrated and economical 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.

- This controller did not have 5 axes shape control and cutting function, only suitable for industrial machines.
- This controller did not have 5 axes TCP tool tip compensation functions.
- This controller did not have rotation axes speed planning function.
- This controller did not have 5 axes machining center interference anti-collision check function.

The following introduces the functional and structure specification of LNC-M650 series controller.

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**

1.2 LNC-M650 Controller

LNC-M650 Controller is based on the standard industrial PC which is suitable in normal tool machines, industrial machines and automation systems. It has excellent maintenance, high performance motion control functions and a lot I/O points support which all can be used in all kinds of industries. Moreover, PC open system and modularized design will make system function easier to upgrade and to maintain.

1.2.1 Specifications Table of LNC-M650

Specification	Constructing and Putting
PC	Industrial PC
Show interfaces	VGA interface
Transmit interfaces	Ethernet , RS232
Store interfaces	IDE , FDD
Offer the power to export	5V , 12V
Deposit and withdraw the storing device dynamically (SDRAM)	Above 64M
Store on the device	Above card 64M of CF
Qualify for the next round of competitions in the way	The front and qualifying for the next round of competitions partly
Servo system	Offer a position return circuit / the speed return circuit control
Main shaft system	Offer Pulse control / DA to export
Remote I/O (bunch arranges I/O)	256 inputting /256 exporting
The direct materials transmitting (DNC)	RS232 19200 Baud Rate
The biggest control axle counting	6Pulse or 6Vcmd (Ver2.1)
The axle of the main shaft is counted	An axle
Working temperature	0~55°C
Input power	AC110/220V 50/60HZ

2 Software Maintenance

2.1 LNC-M650 Installation Description

This system has six installation diskettes, wich are [O.S UTILITY], [LNC_M650 INSTALL DISK], Text Font Disk and also three anti-virus program diskettes.

2.1.1 [O.S UTILITY]

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

```
            O.S Utility ver 2.10
1.QUICK MAKE AN BOOTABLE H.D(C)
2.INSTALL MLC UTILITIES
3.INSTALL NETWORK UTILITIES
4.VIRUS SCAN
P.Fdisk H.D       C.Chkdsk
F.Format H.D      N.NDD
R.Reboot          S.SYS
Press 'Q' to Exit

        Choise an Option[1234PFRCNSQ]?
```

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

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

  1. Prepare a formatted CF card.
  2. Set the boot sequence of IPC to A: first
  3. Insert [O.S UTILITY] disk to A:
  4. RESET and boot with A:
  5. Run this option
  6. 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).

- **INSTALL NETWORK UTILITIES**

  This is install network utilities to your IPC(OS required).

- **VIRUS SCAN**

  To scan if the system has virus(OS and scan program required).
- **Fdisk H.D**

  CF card disc separated.
- **Chkdsk**

  CF card disc checking.
- **Format H.D**

  CF card disc formatted.
- **NDD**

  CF card disc scan.
- **Reboot**

  System reboots.
- **SYS**

  CF card turn on setting.
- **QUIT**

  To quit installation.

2.1.2 [LNC_M650 INSTALL DISK]

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

```
=====================================
WELCOME TO INSTALL LNC-M650 SERIES
=====================================
Current Version:
   Not install

Installing Version:
   M650_VER_03.10.003

Are you sure to install?[Y,N]
```

When this screen is shown, you can see the number of Current Version and Installing Version. Please confirm the version number is correct before installment. Press 「Y」 to install the software and when installment is completed, the following screen will be shown. Press any key to reboot the computer and enter LNC system.

```
Wonderful ! Fully install finish!!
Press any key to continue . . .
```

If want to quit install program, press 「N」 to quit and reboot the computer.

- **Font**

Execute G.BAT of install disk and word fonts will be installed automatically.
Please confirm that LNC softeware has been installed before install word font.

```
24x24 Font 2.4B of Serial
Install on First Disk[C:\LNCM650]
Make sure for INSTALL C:\LNCM650[Y,N]Y
Please wait,file preparing ...
Please wait,file installing ...
C:\LNCM650\:Finish !!
Press any key to continue . . .
```

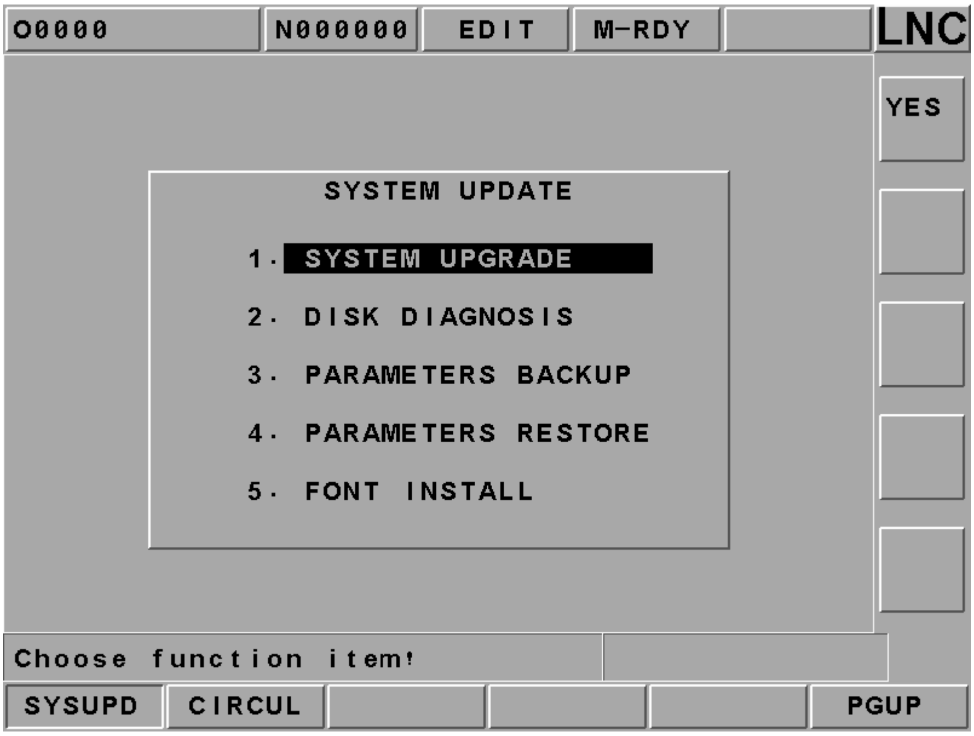
The following screen will be shown when any key is pressed. Then press any key to reboot the computer automatically and enter the system. If the font is installed by floppy disc, please remove the floppy disc first, otherwise, it might cause problem and not able to reboot the computer.

```
Font Installed !!
Reboot and Restart system !!
After reboot, please eject floppy!!
Press any key to continue . . .
```

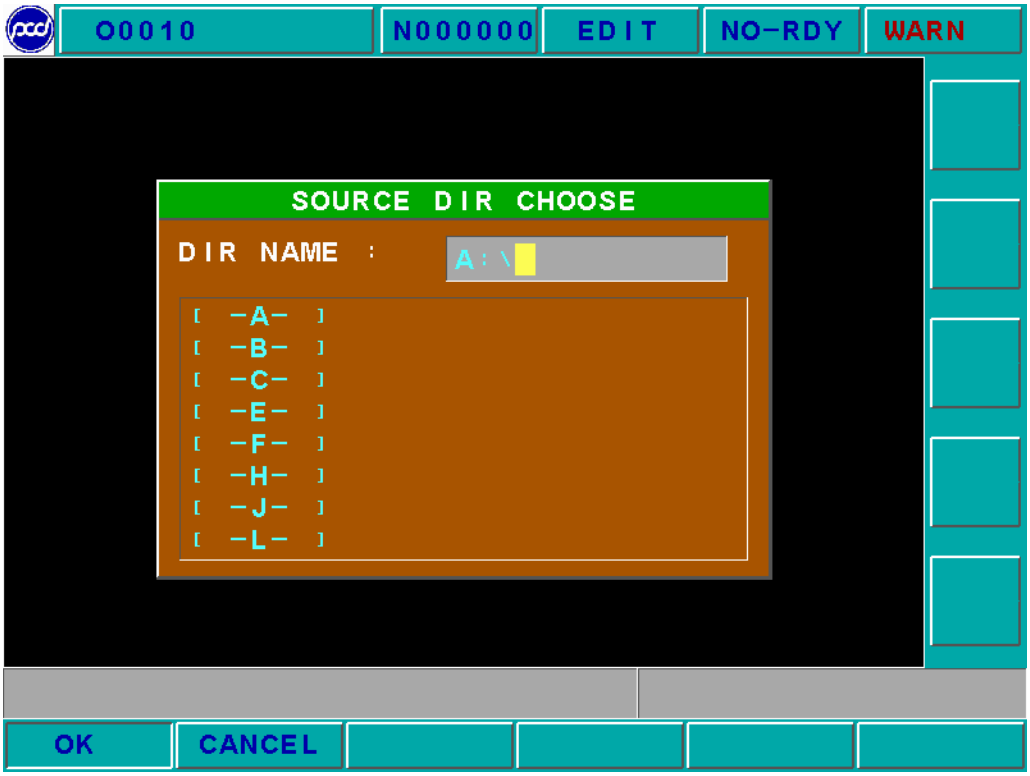
2.2 System update

Please prepare for update source disk before start update, here is the steps:

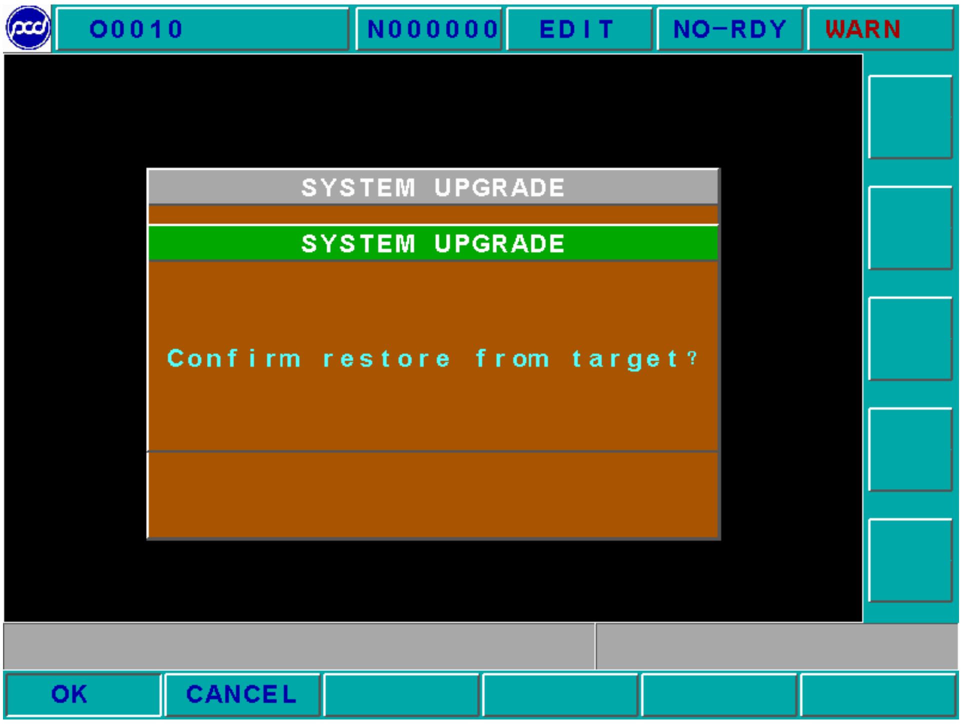
1. Enter LNC system.
2. Enter DGNOS function.
3. Push EMG-STOP.
4. Get into update screen and choose “1.update”, show as below:



5. Press the conform button, then it will show up the dialog room for users to choose the installation route.If the route of installation is the floopy. Please input A：1（Prsetting route is floopy）,then push the conform button.Or, using the divection key to move the cursor to the source path selection column and pressing （ok）.Please ensure the cursor stops at the key-in column and press （ok）in order to process the next step.Please below figure as an example：



6. System up grade conform, then push conform：



7. After quiting LNC system, then enter the same screen, as first time installation, and choose intall for update. All of the operation show on the screen please follow up the previous cheapter.

2.3 System Direction Description

Users will find the following files in the system hardware after running LNC-M650 series installation program.

2.3.1 [OS.UTILTIY] Results

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

2.3.2 [LNC_M650 INSTALL DISK] Results

Name	Files
C：\LNCMILL.BAK	Backup of LNC-M650 directory (last edition) If it's a wholenew installment, then it'll be the backup of current version of LNC-M650.
C：\LNCMILL.B2	Backup of LNC-M650 directory (recently edition)
C：\LNCMILL\EXE	System files
C：\LNCMILL\RESOURCE	Environment relative data files（refer to DIR.DOC）
C：\LNCMILL\MACHINE	LADDER and system files
C：\LNCMILL\MACRO	Canned cycle macro for Standard miller（user's NC files should not be here）
C：\LNCMILL\NCFILES	User's NC files（file name must be O0000~O8999）
C：\LNCMILL\CAMPRJ	CAM project files（extended file name is *.DAT）

3 Hardware Maintenance

3.1 Power supply

This system uses these power supplies:

Supply target	Brand	type	Input voltage	Output voltage
LCD module	Skynet Electronic Co.,Ltd	SNP-PA57	AC 110/230V 60/50HZ	DC 12V/4.2A
output	MEAN WELL Enterprises Co.,Ltd	ADS-15524	AC 110/230V 60/50HZ	DC 24V/5.8A DC 5V/3A

3.2 LNC-M650 Controller

3.2.1 Standard

1. Case with 8 slots (including 5V/12V power supply)
2. Slave I/O (40 Input / 32 Output)
3. SCSI 68 Pin Cable

3.2.2 Cabinet Equipment

1. Standard Operation Panel
2. Standard Transit Board
3. Relay Board (20 Input / 16 Output)

3.2.3 Optional

1. Extension Slave I/O Board (24 Input / 32 Output)
2. Slave I/O (40 Input / 32 Output)
3. CD – ROM
4. Floppy Disk

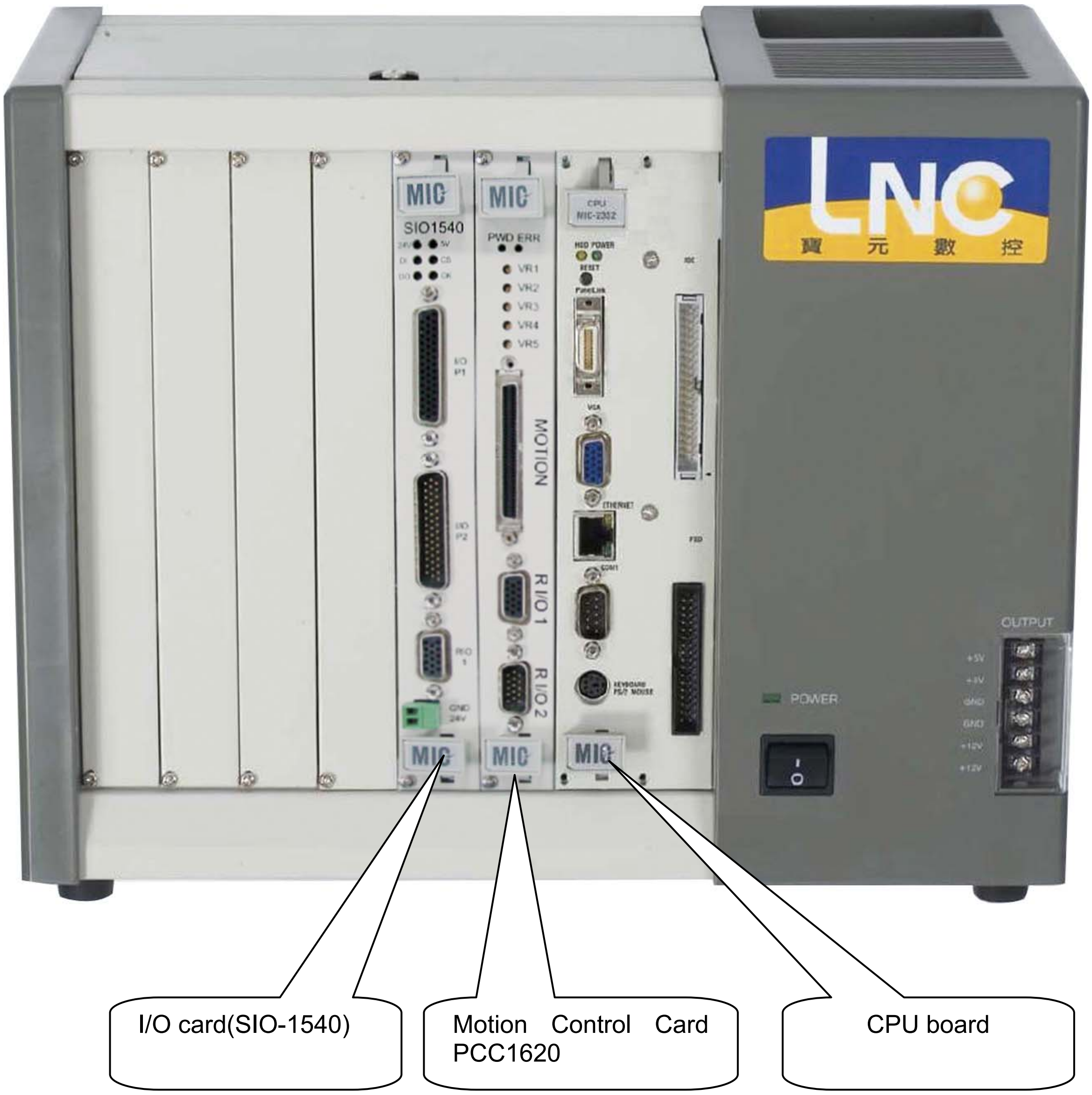
3.2.4 PCC1620 Motion Control Card Hardware Specification

1. 6 axes Pulse / 6 Vcmd control
2. Spindle control panel Pulse / Vcmd (Encoder Feedback)
3. Analogy output provides 6 Channel (±15 Bits)
4. I/O highest supports to 256 Input / 256 Output (use serial I/O transmit)
5. Provide 4 axes Home Sensor
6. Provide 1 axis MPG +/- 31 Bits Counter
7. Provide 6 axes disconnect checking (Version 2.0 above)

3.2.5 I/O Card Specfication

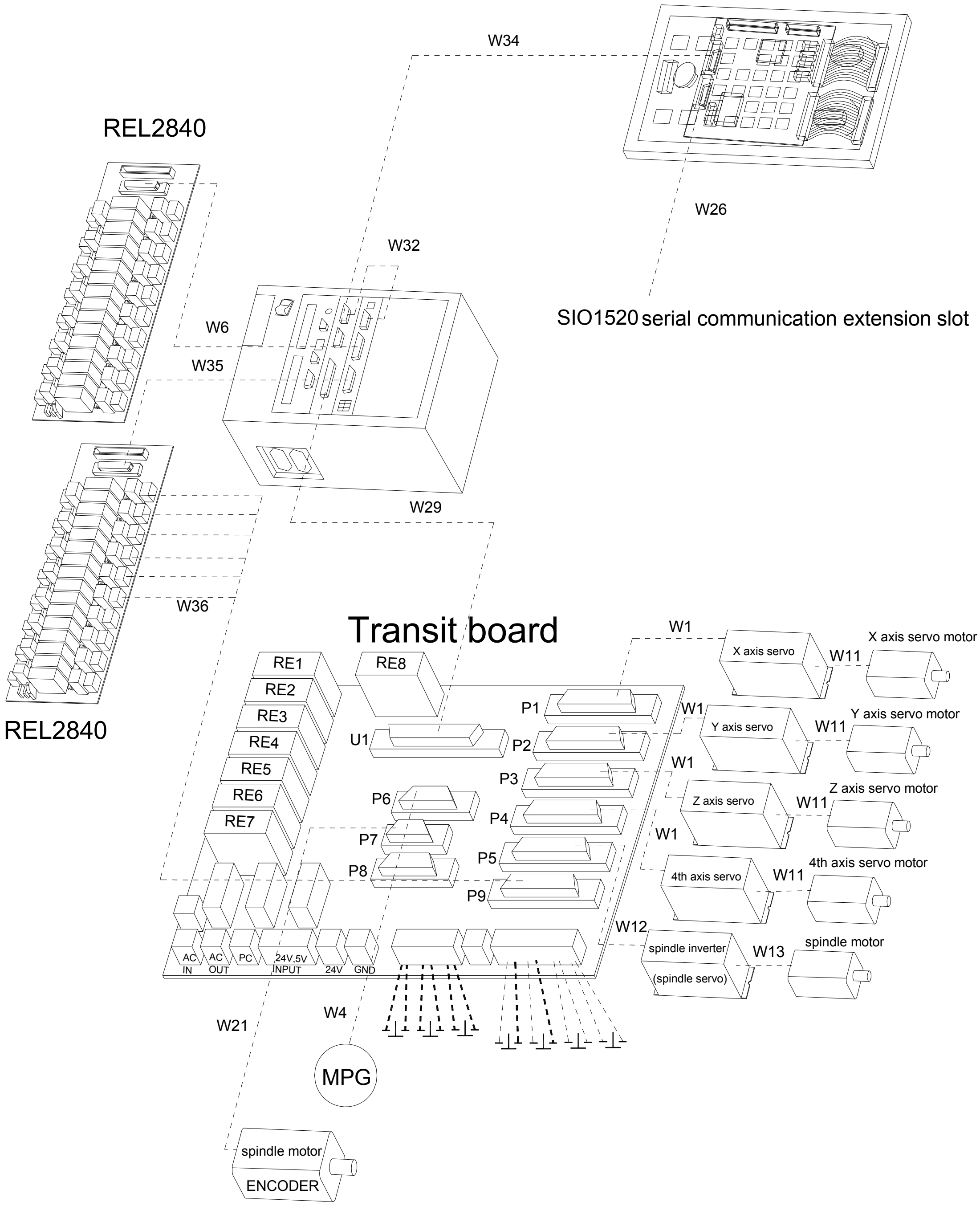
1. Provide total I/O point is 256 Input / 256 Output
2. Use CRC error checking function
3. Transmitting method is Master / Slave
4. Transmitting distance is able to reach 50 M

3.2.6 Controller Appearance



Main machine board and motion control board are as above, power supply AC110 /230 V 60/50Hz are able to be used .

3.2.7 System Wiring Diagram



Peripheral Connection Chart 2 of Standard Controller

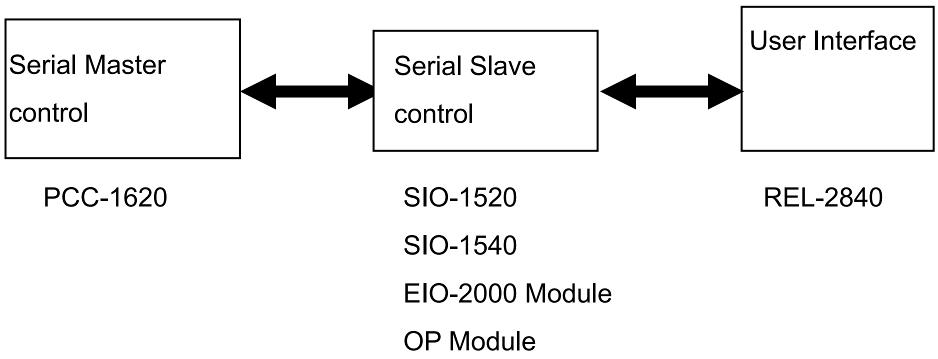
3.3 Hardware Module

LNC-M650 applies PC-Based structure. The interface card which fits in with ISABus electric specification all can be used in this controller. Bellow is the instruction of each module.

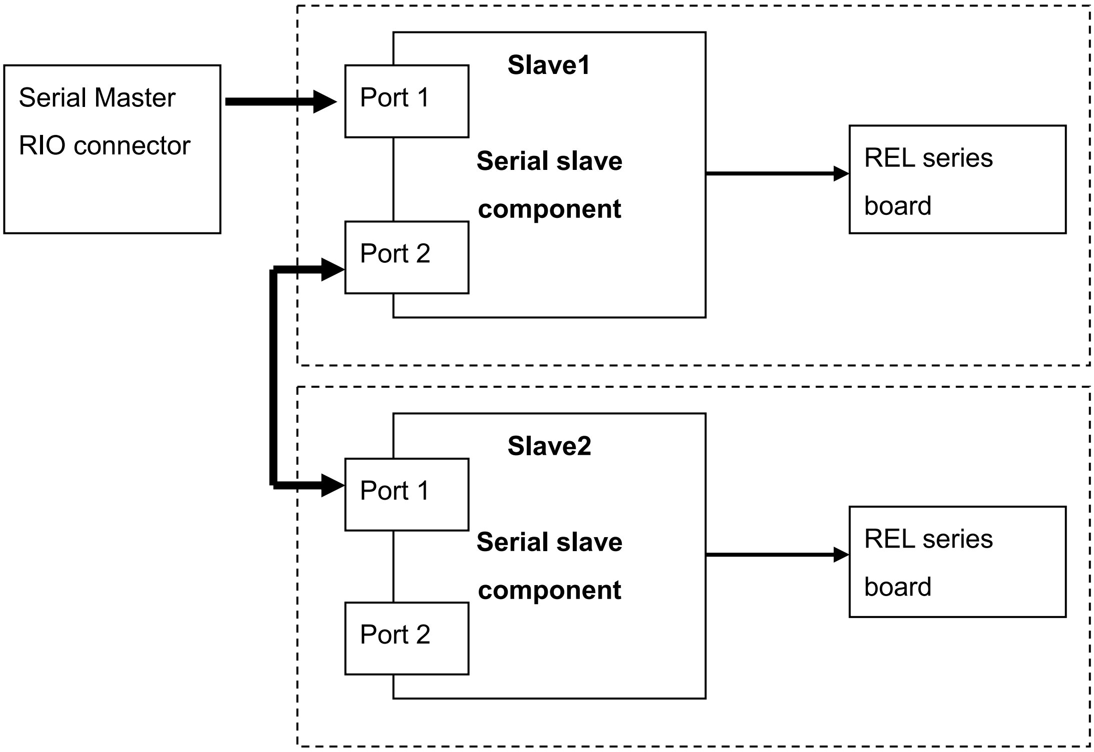
3.3.1 Serial I/O Module

Controller system of IO extension applies serial communication method, and there are maximum two I/O control ports for use which depends on master control hardware selection, so does the max. controlled channel of each I/O port.

Structure of serial I/O module is as below:



- Serial I/O extentsion connection method: (Every PORT can be connected to max. 2 sets of slaved components)



Instruction of serial I/O extension point:

1. Specification of every component:

Serial Master Control (MASTER)		
Hardware number	Number of extension I/O control port	Note
PCC-1620	2	

Serial Slaved Control (SLAVE ; every hardwareis available for serial extension)		
Hardware number	I/OControl point	Note
SIO-1540	40IN / 32OUT	
EIO-2000-1	40IN / 32OUT	
EIO-2000-2	60IN / 48OUT	
SIO-1520	40IN / 32OUT	Normally for OP panel use
OP-2520	64IN / 64OUT	Normally for OP panel use

User Interface		
Hardware number	I/O Used point	Note
REL-2840	20IN / 16OUT	

2. Calculating example of I/O Point：

(1) Master control hardware selects PCC-1620, collocate EIO-2000-2 and the max. I/O point number is

2(control port) × 2(EIO-2000-2) × 60 IN = 240IN point

2(control port) × 2(EIO-2000-2) × 48 OUT = 192 OUT point

(2) Master control hardware selects PCC-1620, collocate I/O module SIO-1540 and the max. I/O point is

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

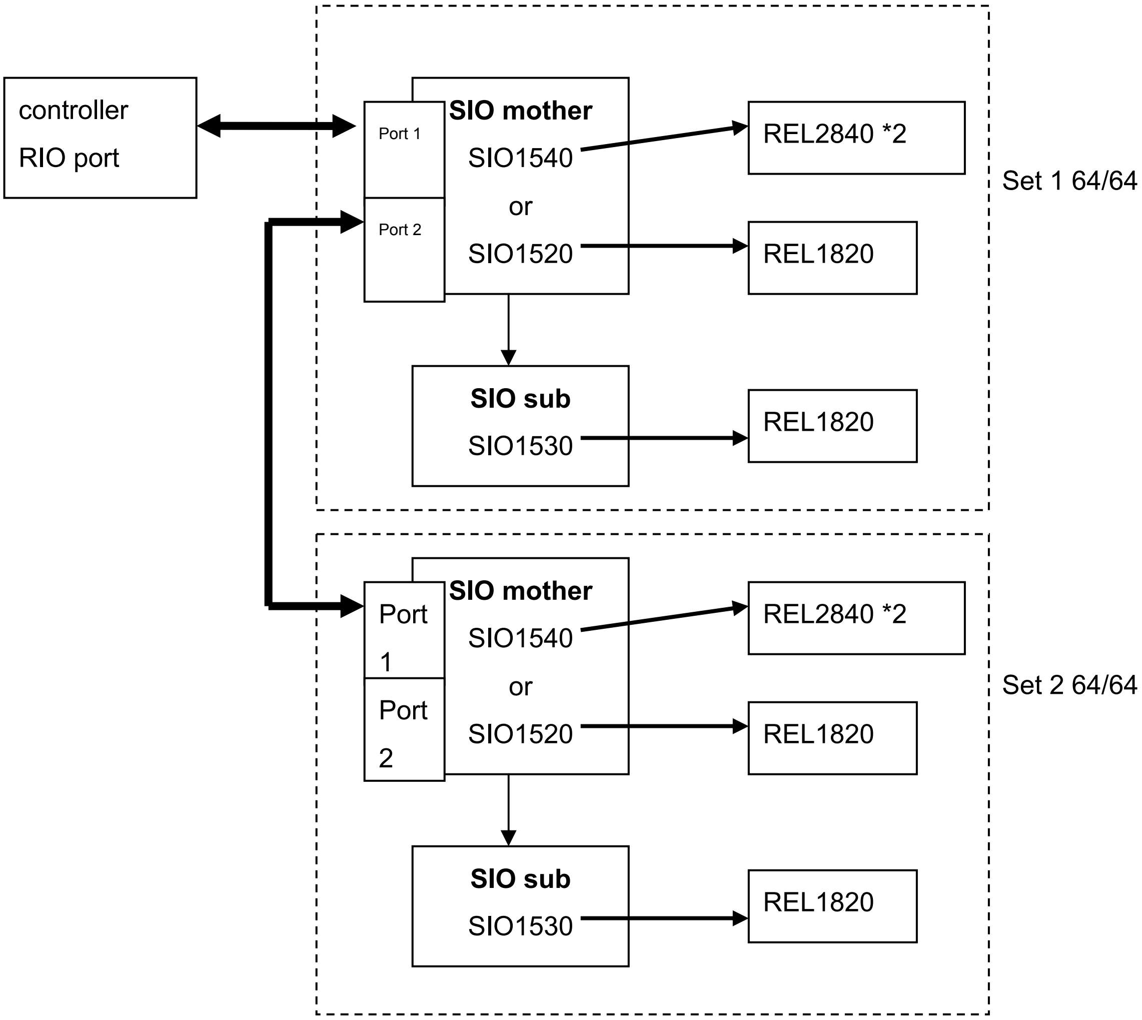
1(control port) × 2(SIO-1540) × 32 OUT = 64 OUT point

the rest can be caculated accordingly.

- Application method of hardware please refer to every module instruction.

3.3.2 I/O Card

Besides to 20 Input/16 Output, I/O module of this system can be extended to 128 Input/128 Output at most. Connecting chart shows as below:



Note. When string up 2 sets of SIO, please notice the jumper of SIO. (please refer to SIO instruction)

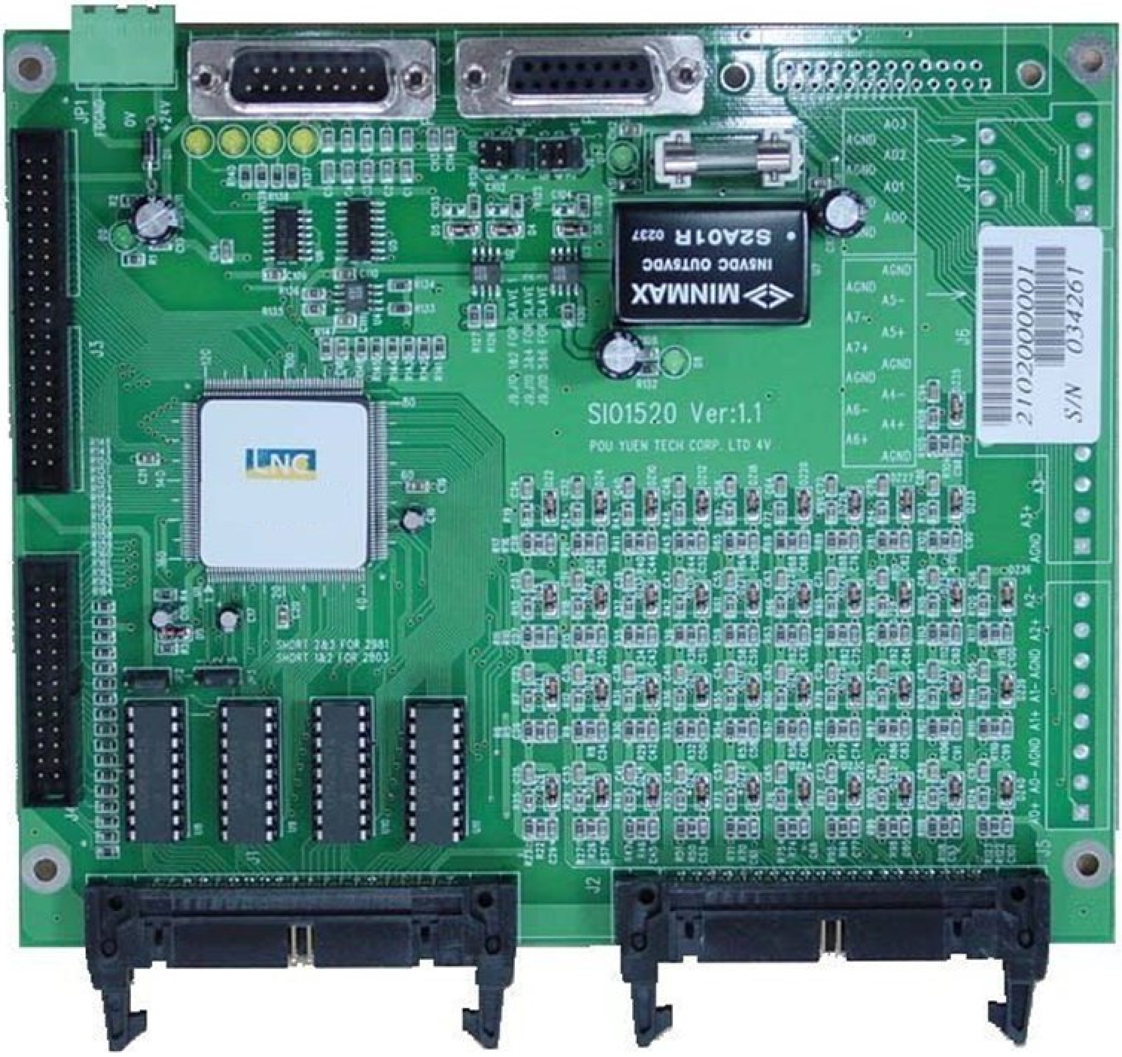
The output voltage of I/O card is 24V, the ability of each point is 100mA at most.The determination of input signals: the determination of High level(1)is 20 ~ 28V; the determination of Low level(0)is 0 ~ 4V with 10mA input。JPI of SLAVE master board inputted DC24V supply form outside.

3.3.3 I/O card SIO 1520 definition

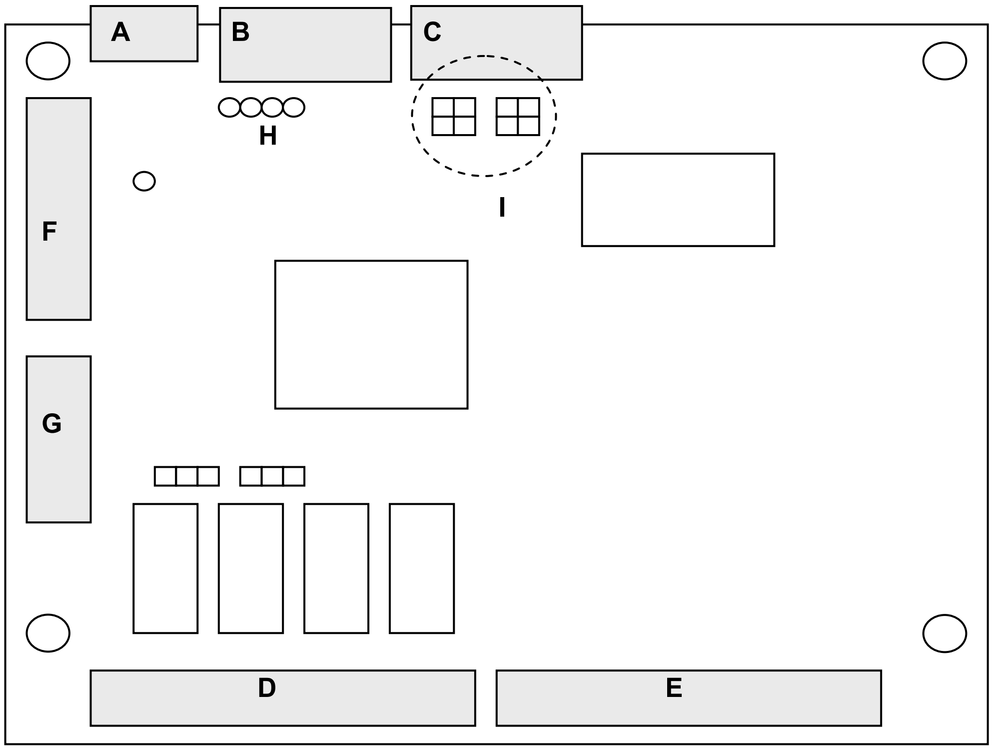
3.3.3.1 I/O card SPEC

To reduce IO cable, we can complete I/O transmission by motion control card with I/O card. An I/O card can be divided to SIO 1520 master board（or S1O 1540 master board）and SIO 1530 slave board.

One SIO card can offer 40 input and 32 output, and SIO 1530 extension cardcan offer 24 input and 32 output; in the other word, 1 set of I/O master board and slave board can offfer 64 input and 64 output totally. LNC-M650 can string up 2 set of SIO master board +SIO slave board by using RIO connecter, so it can offer 128 input and 128 output at most.



SIO1520 figure



SIO1520 diagram

A：3PIN 5.08 connecter, 24V supply input connecter to POWER SUPPLY

B：D_SUB15PIN（M）, I/O card controlled port, connect to RIO port

C：D_SUB15PIN（F）, connect to next IO master board

D：40PIN box header 1, for top 32 24V O output, to relay board OUT port

E：40PIN box header 2, for top 40 24V I input, to relay board IN port

F：40PIN box header, for bottom 32 O output, to SIO 1530

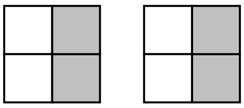
G：26PIN box header, for bottom 24 I input, to SIO 1530

H：The 4 yellow LEDs is the signal of serial I/O communication, when IO master board be connected to the motion control card (the motion control card set correctly and given 5V supply from outside), 2 LEDs in the left side will be turn on first, after the software be executed 2 LEDs in the right side will be turn on if the commnication is successful. In the othr words, all 4 LEDs be turn on means communication is correct. If not, please check motion control card, IO card, cable connecting, and supply.

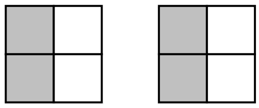
I：Determine the IO master board is first or second IO master board （SLAVE 1 or SLAVE 2）

Ex:

Refer to the direction of SIO 1520 figure, deep color means short circuit：



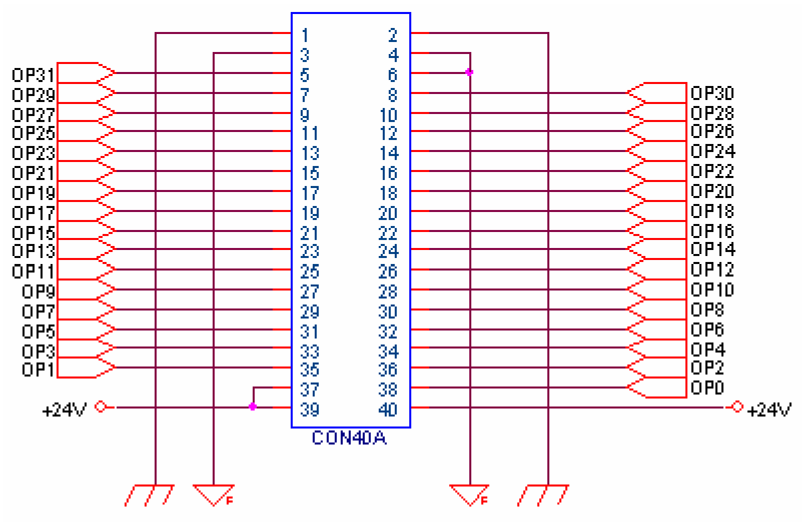
Set as first



Set as second

3.3.3.2 SIO 1520 port definition

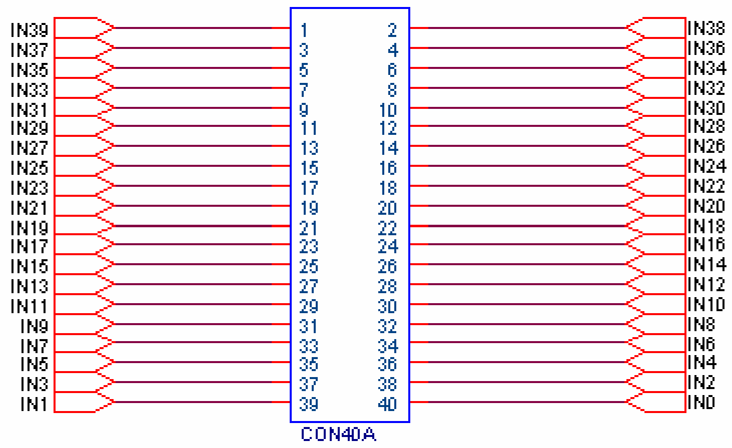
● 40PIN box header 1（D）pin definition



PIN	Definition	PIN	Definition	PIN	Definition
1	FG	15	OUT 21	29	OUT 7
2	FG	16	OUT 22	30	OUT 8
3	EGND	17	OUT 19	31	OUT 5
4	EGND	18	OUT 20	32	OUT 6
5	OUT 31	19	OUT 17	33	OUT 3
6	EGND	20	OUT 18	34	OUT 4
7	OUT 29	21	OUT 15	35	OUT 1
8	OUT 30	22	OUT 16	36	OUT 2
9	OUT 27	23	OUT 13	37	+24V
10	OUT 28	24	OUT 14	38	OUT 0
11	OUT 25	25	OUT 11	39	+24V
12	OUT 26	26	OUT 12	40	+24V
13	OUT 23	27	OUT 9		
14	OUT 24	28	OUT 10		

Note: FG：grounding；EGND：+24V gnd

- **40PIN box header 2（E）pin definition**

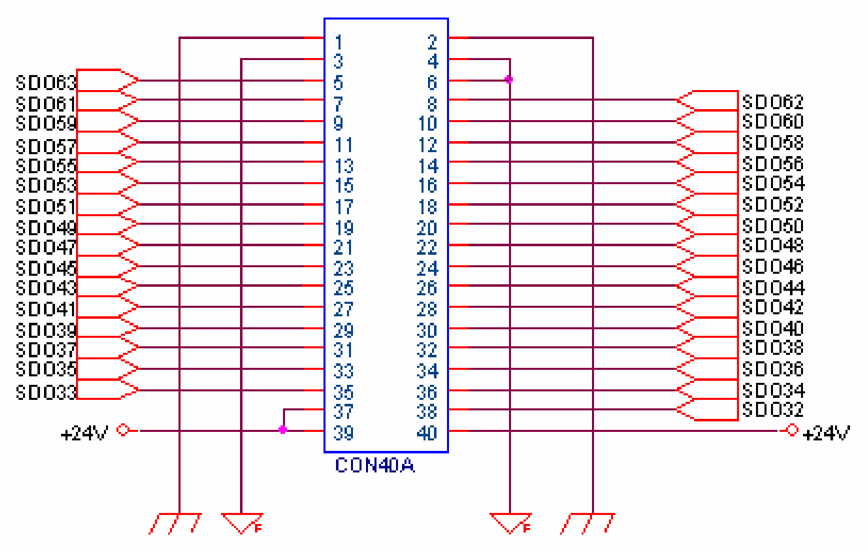


PIN	Definition	PIN	Definition	PIN	Definition
1	IN 39	15	IN 25	29	IN 11
2	IN 38	16	IN 24	30	IN 10
3	IN 37	17	IN 23	31	IN 9
4	IN 36	18	IN 22	32	IN 8
5	IN 35	19	IN 21	33	IN 7
6	IN 34	20	IN 20	34	IN 6
7	IN 33	21	IN 19	35	IN 5
8	IN 32	22	IN 18	36	IN 4
9	IN 31	23	IN 17	37	IN 3
10	IN 30	24	IN 16	38	IN 2
11	IN 29	25	IN 15	39	IN 1
12	IN 28	26	IN 14	40	IN 0
13	IN 27	27	IN 13		
14	IN 26	28	IN 12		

Note: FG：grounding；EGND：+24V gnd

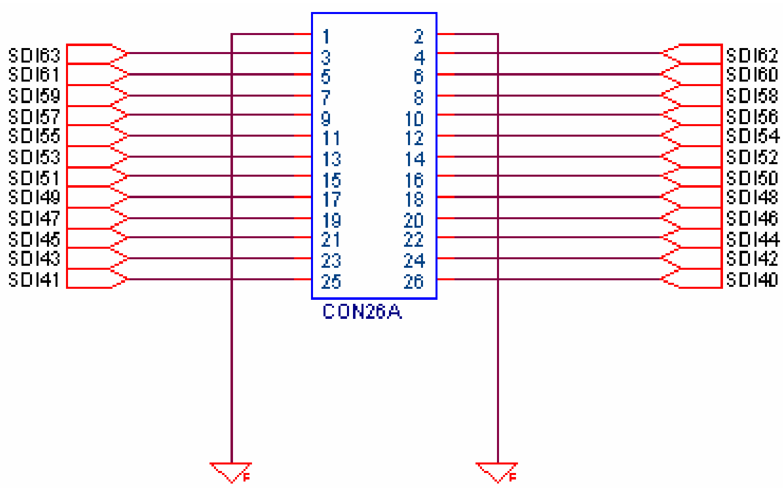
● 40PIN box header（F）

for bottom 32 O output, to SIO 1530



● 26PIN box header（G）

for bottom 24 I input, to SIO 1530

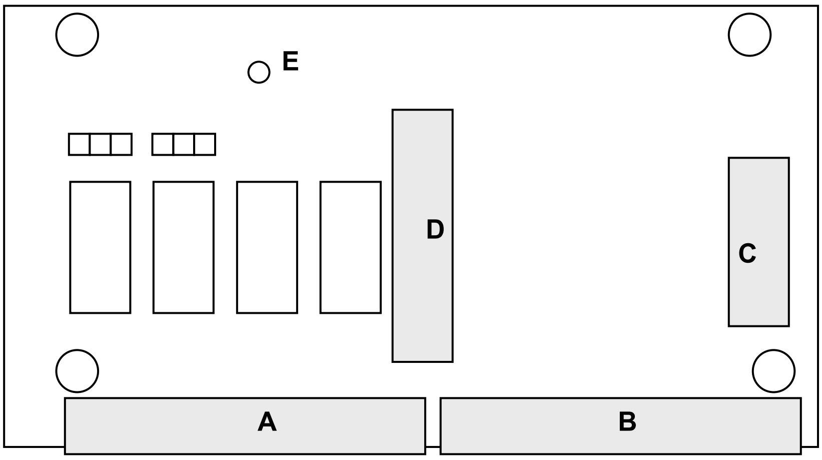


3.3.4 I/O card SIO 1530 definition

3.3.4.1 I/O card SPEC

SIO1530 sub card offers 24 input and 32 output, 24V I/O, but SIO1530 sub card must collocate SIO master board, can’t be connected to motion control card directly.

SIO 1530 slave board figure



SIO 1530 slave board diagram

A：40PIN box header 1, for bottom 32 O output port of each SLAVE set, to REL1820 output.

B：40PIN box header 2, for bottom 24 I output port of each SLAVE set, to REL1820.

C：26PIN box header, for bottom 24 I input, to SIO master board.

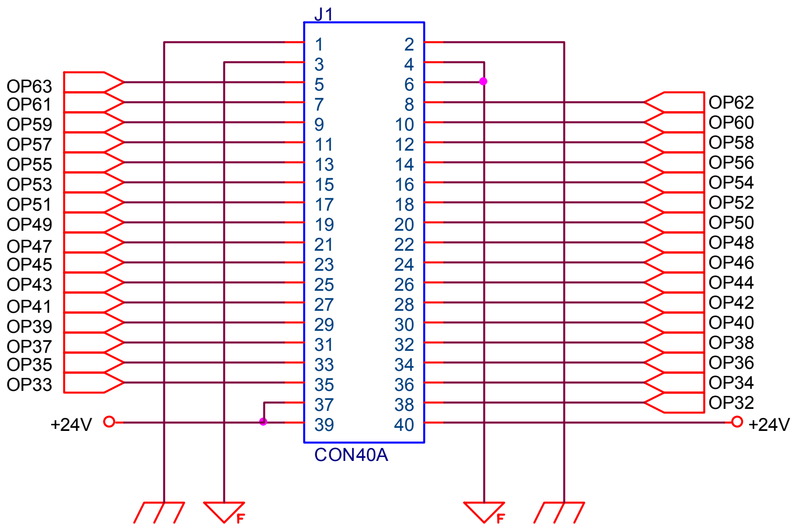
D：40PIN box header, for bottom 32 O output ,to SIO master board.

E：Green light is the signal of outside 24V supply, the I/O won’t work correctly without outside 24V supply.

3.3.4.2 SIO 1530 port definition

- **40PIN box header 1（A）**

for bottom 32 O output of each SLAVE set, to REL1820 output



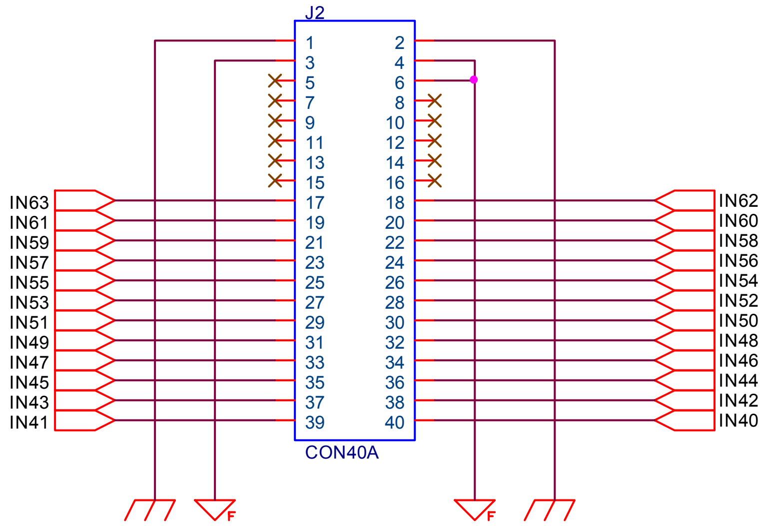
PIN	Definition	PIN	Definition	PIN	Definition
1	FG	15	OUT 53	29	OUT 39
2	FG	16	OUT 54	30	OUT 40
3	EGND	17	OUT 51	31	OUT 37
4	EGND	18	OUT 52	32	OUT 38
5	OUT 63	19	OUT 49	33	OUT 35
6	EGND	20	OUT 50	34	OUT 36
7	OUT 61	21	OUT 47	35	OUT 33
8	OUT 62	22	OUT 48	36	OUT 34
9	OUT 59	23	OUT 45	37	+24V
10	OUT 60	24	OUT 46	38	OUT 32
11	OUT 57	25	OUT 43	39	+24V
12	OUT 58	26	OUT 44	40	+24V
13	OUT 55	27	OUT 41		
14	OUT 56	28	OUT 42		

Note: FG：grounding

EGND：+24V GND

● 40PIN box header 2（B）

for bottom 24 I input of each SLAVE set, to REL 1820 input port.



PIN	Definition	PIN	Definition	PIN	Definition
1	FG	15	-	29	IN 51
2	FG	16	-	30	IN 50
3	EGND	17	IN 63	31	IN 49
4	EGND	18	IN 62	32	IN 48
5	-	19	IN 61	33	IN 47
6	EGND	20	IN 60	34	IN 46
7	-	21	IN 59	35	IN 45
8	-	22	IN 58	36	IN 44
9	-	23	IN 57	37	IN 43
10	-	24	IN 56	38	IN 42
11	-	25	IN 55	39	IN 41
12	-	26	IN 54	40	IN 40
13	-	27	IN 53		
14	-	28	IN 52		

Note: FG：grounding

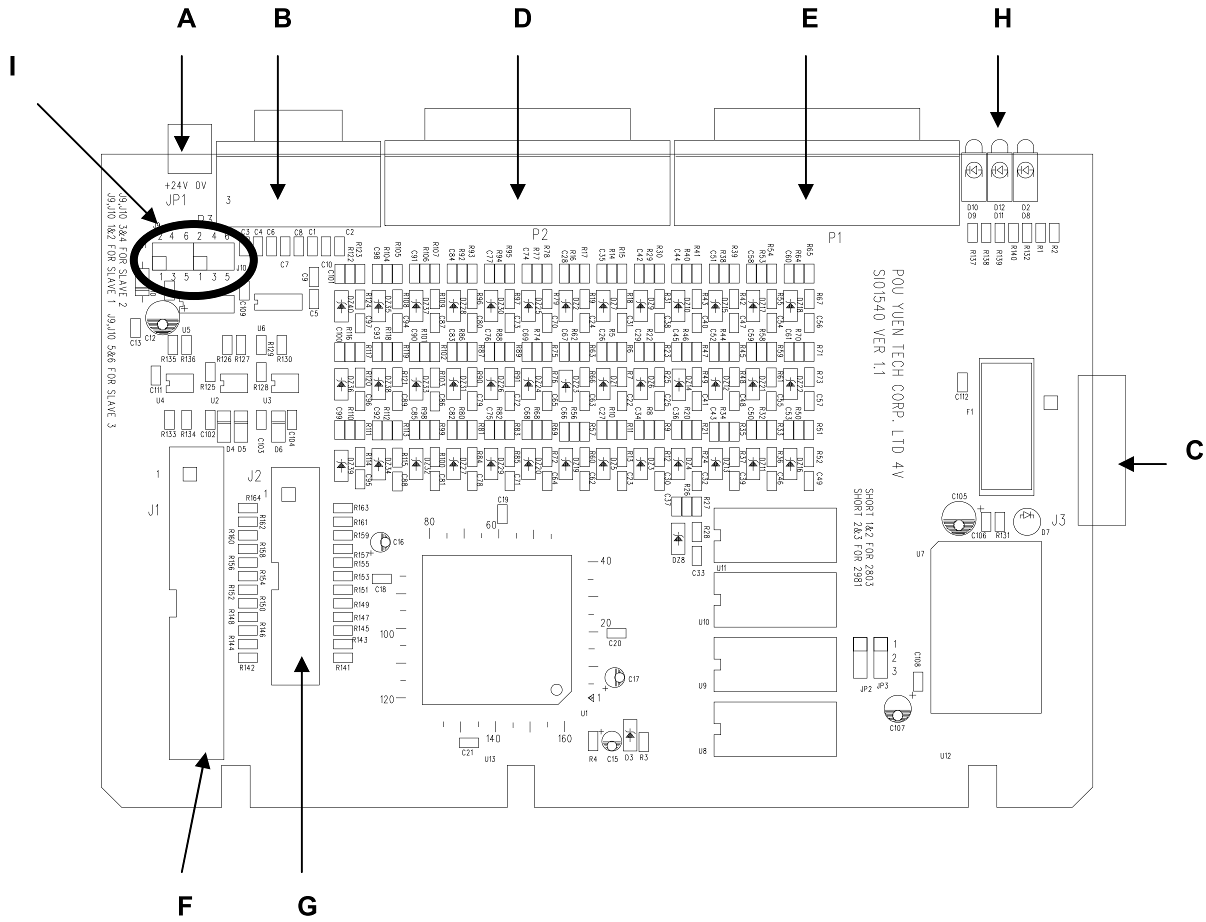
EGND：power GND

3.3.5 I/O card SIO 1540 definition

3.3.5.1 Specification:

1 SIO-1540 provides 40IN /32 OUT interface(other 24IN / 32 OUT is optional)。

3.3.5.2 Hardware Layout:



SIO 1540 diagram

3.3.5.3 Connector and Component Description：

Power			
Diagram	Component Type	Function	Instruction
A	3PIN 3.81mm connector	DC(24V) power input	Connect to POWER
Indicator			
Diagram	Component Type	Function	Instruction
H	E5V green LED	E5V Indicator	E5V is correct and then light up
	E24V green LED	E24V Indicator	E24V is correct and then light up
	CS yellow LED	Communication status indicator	Connected controller is power on and then light up
	DO yellow LED	Communication status indicator	Connected controller is power on and then light up
	DI yellow LED	Communication status indicator	Connected controller is power on and then light up
	LK yellow LED	Communication status indicator	Connected controller is power on and then light up
IO Connector			
Diagram	Component Type	Function	Instruction
B	D_SUB high density 15PIN female	Serial transmit port	Connect to controller RIO port
C	16PIN 2.54mm simple box header	Serial transmit port	Connect to controller RIO port
D	D_SUB high density 44PIN male	Botton 20 IN/16 OUT	Connect to REL series board
E	D_SUB high density 44PIN female	Top 20 IN/16 OUT	Connect to REL series board
F	40PIN 2.54 mm simple box header	Reserve 32 of O control point	Optional
G	26PIN 2.54 mm simple box header	Reserve 24of In control point	Optional
Setting			
Diagram	Component Type	Function	Instruction
I	2.54mm JUMPER	SLAVE No. designated	As following description

3.3.5.4 Application and Setting：

A：E24V Power Connector

◎ Description：This connector is for O output power. If it's damaged, O output will be abnormal. (it's no influence for IN point).

◎ Rated Capacity：E24V±0.5V (3A above)

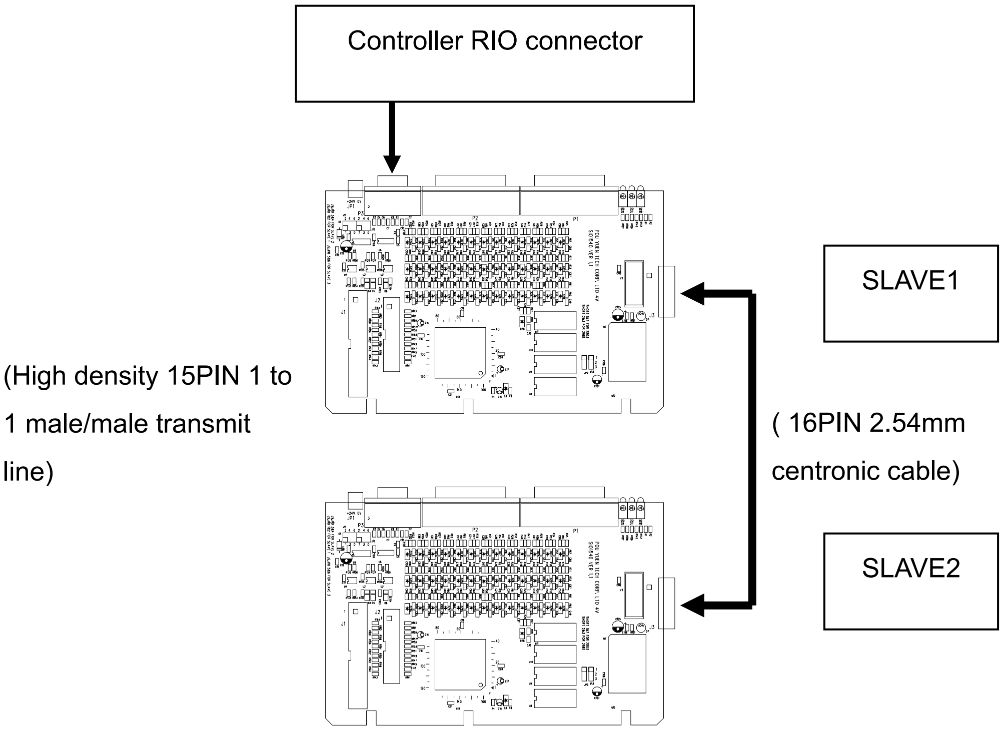
B、C：Serial Transmit Connector

◎ Description：1.B、C connector are serial transmit control connector and must connect to RIO port of controller.

2.B、C connector are parallel signals for serial extension.

◎ Example of serial extension:

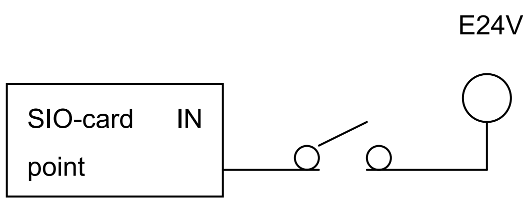
St ring 2 SIO-1540 boards



D、E：IO Connector

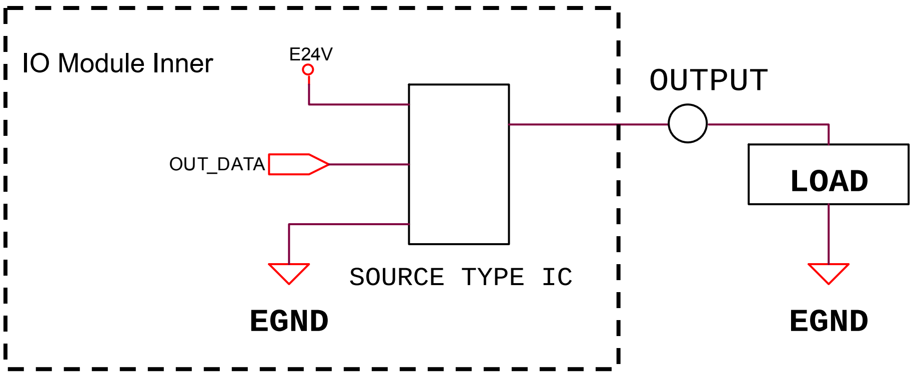
◎ Description：1.D、E connector connect to REL series board to do IO control, every connector can control 20IN/16OUT and collocate with REL series board for use.

◎ IN point Usage Instruction：(When not collocating with REL series board to use)



◎ O Point Usage Instruction：(When not collocating with REL series board to use)

O Point type is SOURCE TYPE, output E24V when in motion, the max. electric current is 60mA.



Attention points for use：

1. Please do not choose electric current over 60mA for loading, otherwise, it might cause component damage.

E24V/60 mA=400Ω ← loading resistance must not lower than this value.

2. Please note that if O point is grounding, IC will burn out immediately.

F、G：Reserve IO Connector

◎ Description：1 F、E connector reserved 32OUT and 24IN of IO『Control Interface』,it needs to be collocated with SIO-1530 card for use.

H：Communication/Power Indicator

◎ Description：

(1) E5V Indicator：After SIO-1540 module connect to master controller and master controller is power on, indicator will light up and it means module power is ready.

(2) CS、DO Indicator： If SIO-1540 module connect to master controller correctly and controller is power on, CS、DO lamps will light up; If these two lamps do not light up at the same time, it means error is existing and follow-up communcation will be abnormal.

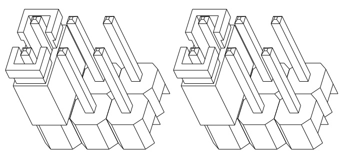
(3) LK、DI Indicator：After CS、DO indicators light up, if SLAVE number setting of SIO-1540 module matches with controller software/PLC and transmission is notrmal, LK、DI lamps will light up.

(4) E24V Indicator：E24V indicator lights up, it means O interface power is normal; if this lamp isn't on, O point will have no response.

I：SLAVE setting JUMPER

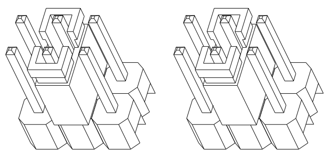
◎ Description：SLAVE number setting, it needs to collocate with softwaer、PIC after setting, then communication can work normal. Please do not change the setting.

◎ Setting Example：



1 1

Set as SLAVE1 ，JUMPER setting way

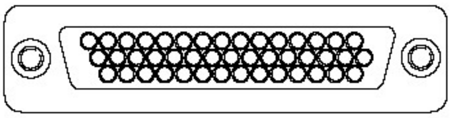


1 1

Set as SLAVE2 ，JUMPER setting way

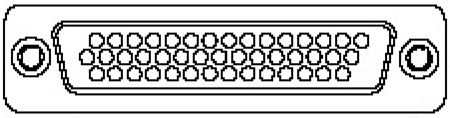
3.3.5.5 Connector PIN Definition

1. E：44 PIN high density connecter (F) pin definition



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	X
13	OUT 15	28	X	43	E24V
14	X	29	X	44	E24V
15	EGND	30	EGND	X	X

2. D：44 PIN high density connecter (M) pin definition



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	X
13	OUT 31	28	X	43	E24V
14	X	29	X	44	E24V
15	EGND	30	EGND	X	X

3.3.6 Transit Board (TRF2760) Module

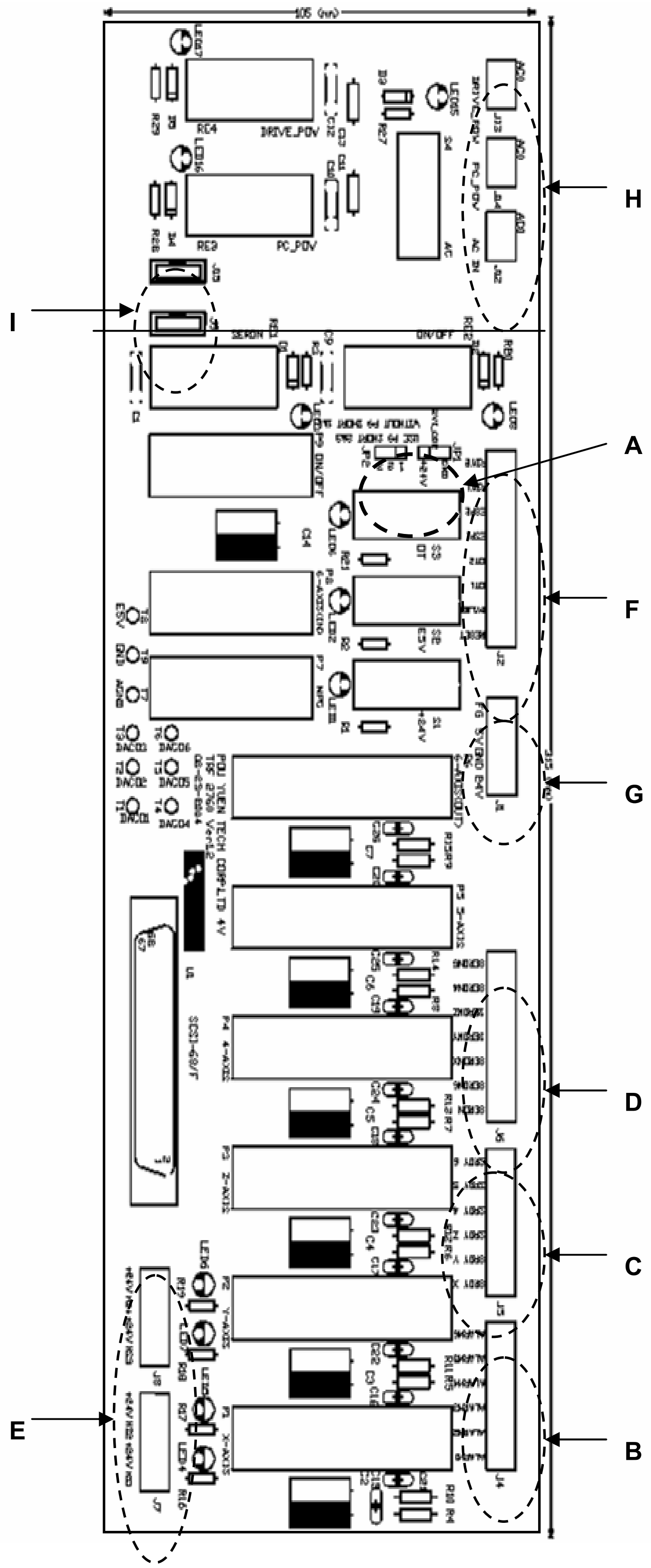
3.3.6.1 Specification

- For PCC1620V2.2 axis use; provides 6 axes(P/V CMD) transfer.
- MPG Transfer.
- Four axes 24V HOME SENSOR.
- 2 OT connectors.
- 2 EMG connectors.
- ON/OFF power control and EMG protection.
- Provides system E5V and 24V power transfer.
- Servo COM point setting.
- Every axis SERVO_ON connector (6 axes).
- 6 axes SERVO_RDY signal.
- 6 axes SERVO_ALM signal.

3.3.6.2 Transit Board Slots Definition

Motion Control			
Connecter	Type	Description	Wiring Instruction
P1 ~ P6	D_SUB 25PIN(F)	6 axisP / V CMD Control	To servo
P7	D_SUB 15PIN(F)	The 7th axis ENCODER	To MPG
P8	D_SUB 15PIN(M)	The 6th axis PULSE / ENCODER	To PCC 1620 V2.2
U1	SCSI-2 68PIN	Axis card control signal connector	To PCC 1620 V2.2
Power			
Connecter	Type	Description	Wiring Instruction
J1	4PIN 5.08mm	DC(24V、5V) supply input /FG	To POWER/ box
J12	2PIN 5.08mm	AC power input	To AC power
J13	2PIN 5.08mm	Controlled by RE4 AC power	To AC component
J14	2PIN 5.08mm	Controlled by RE3 AC power	To system center power
Servo Signal			
Connecter	Type	Description	Wiring Instruction
J4	6PIN 5.08mm	Servo alarm signal	To INPUT (REL)
J5	6PIN 5.08mm	Servo standny finish signal	To INPUT (REL)
J6	7PIN 5.08mm	Servo start signal 6 axes and COM point	
LOCAL I/O			
Connecter	Type	Description	Wiring Instruction
J7	4PIN 5.08mm	Rapid INPUT connector 1、2	PNP 24V input
J8	2PIN 5.08mm	Rapid INPUT connector 3、4	PNP 24V input
JUMPER Setting			
Connecter	Type	Description	Wiring Instruction
JP1	3PIN 2.54mm	Servo COM point setting	Set as GND or 24V
JP2	3PIN 2.54mm	LNC fixed OP use or not switch	Setting refer to use way

3.3.6.3 Hardware Component LAYOUT:



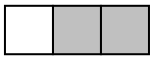
3.3.6.4 Usage/Setting and Lamps Description:

A：Setting of JP1 & JP2

◎ Set COM point mode of servo input from JP1

Example: The following diagram is COM point setting of servo INPUT, it can be set as GND or 24V according to different servo.

SVI_COM = GND



24V GND

SVI_COM = 24V

24V GND

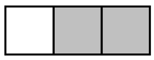
(This is DEFAULT value after manufacture)

Note：Coloring part is JUMPER location

◎ Correlation of JP2 setting and ON/OFF connector(P9)＞

When P9 uses LNC standard OP, please make grounding to PIN2 & PIN3 of JP2.(This is DEFAULT value after manufacture)

When not using P9, please make grounding to PIN1 and PIN2 of JP2.



3 2 1

Note: Coloring part is JUMPER location, incorrect setting will cause SERVO_ON disable.

B：Usage of J4 servo alarm signal contact

J4 connector provides 6 axes of servo alarm signal contact. Under the normal situation, when servo alarm occurs, the contact will output 24V and connect this signal to IN point to process servo alarm inspection.

C：Usage of J5 servo standby status singal contact

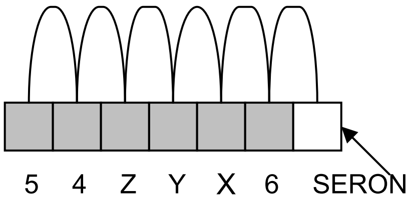
J5 connector provides 6 axes servo standby signal contact. Under the normal situation, when control power and main power of servo are ok, and there is no alarm occurring, the contact will be「Low」signal (servo status OK).Otherwise, output is 24V and connect this signal to IN point to process servo status inspection.

D：Usage of J6 servo start signal contact

J6 connector provides 6 axes of independent servo start signal contact and one servo start signal contact.

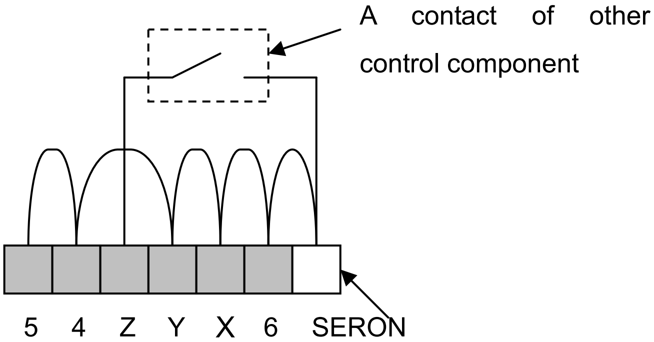
Example 1：

When 6 servo axes start simultaneously, please connect every contact to SERON point.



Example 2：

The connection when Z servo axis starts independently and other axes start simultaneously.

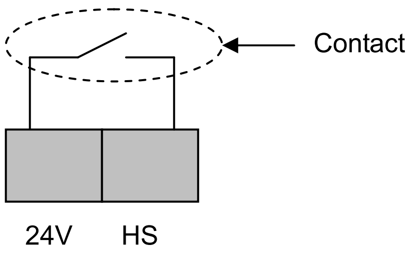


E：Usage of J7、J8 LOCAL IN contact

Input spec. of this LOCAL INPUT is 24V, and every IN point provides one 24V contact.

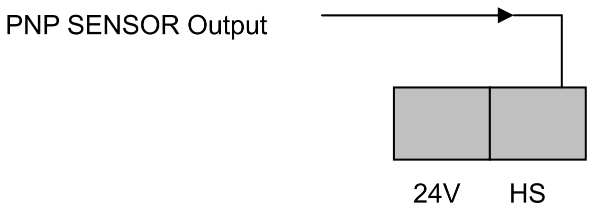
Example 1：

Contact type of INPUT Wiring Way



Example 2：

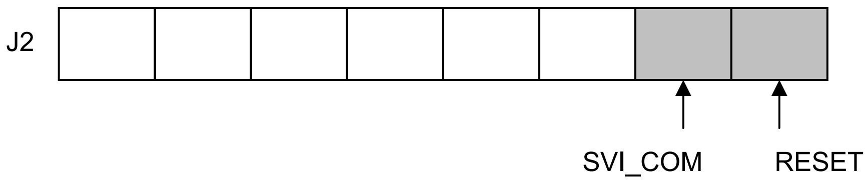
Use PNP SENSOR Wiring Way



F：Usage of J2 Contact

J2 contact provides 3 main functions---1 Server Reset/Clear 2 Server Safety Circuit 3 Server Start Contact，the instruction and usage method is as following:(Circuit diagram refer to attachment)

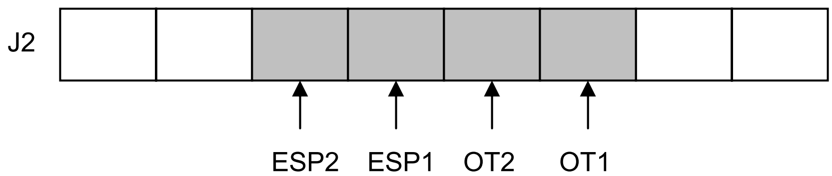
◎ Server Reset/Clear----



Explanation: The contact of J2 RESET connects with PIN9 of P1~P6 connector, which is able to provide simultaneously Reset/Clear or other status for 6 axes server.

Usage Method：Connect 2 contacts of SVI_COM and RESET can do Reset/Clear action. Related wiring and instruction information please refer to server operation manual.

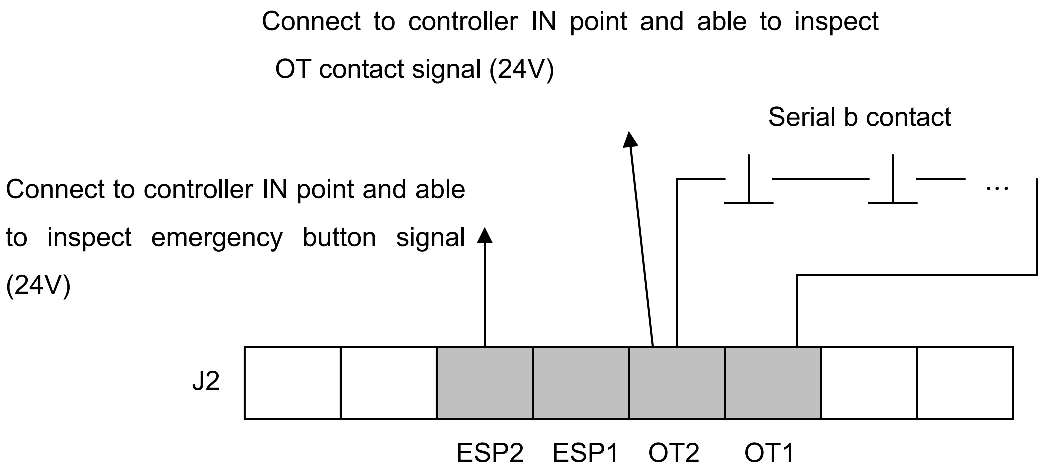
◎ Server Safety Circuit----



Explanation：OT1、OT2 are over-travel contacts. Connecting these 2 contacts is an essential condition for server start and for hardware safety. Due to only 2 contacts are provided, please use external wiring terminal「serial b connector」 for multi-axes protection. ESP1、ESP2 are the terminals of emergency button switch, connecting these 2 contacts is an essential condition for server start and for hardware safety. Please use b contact for ESP 1 & ESP2.

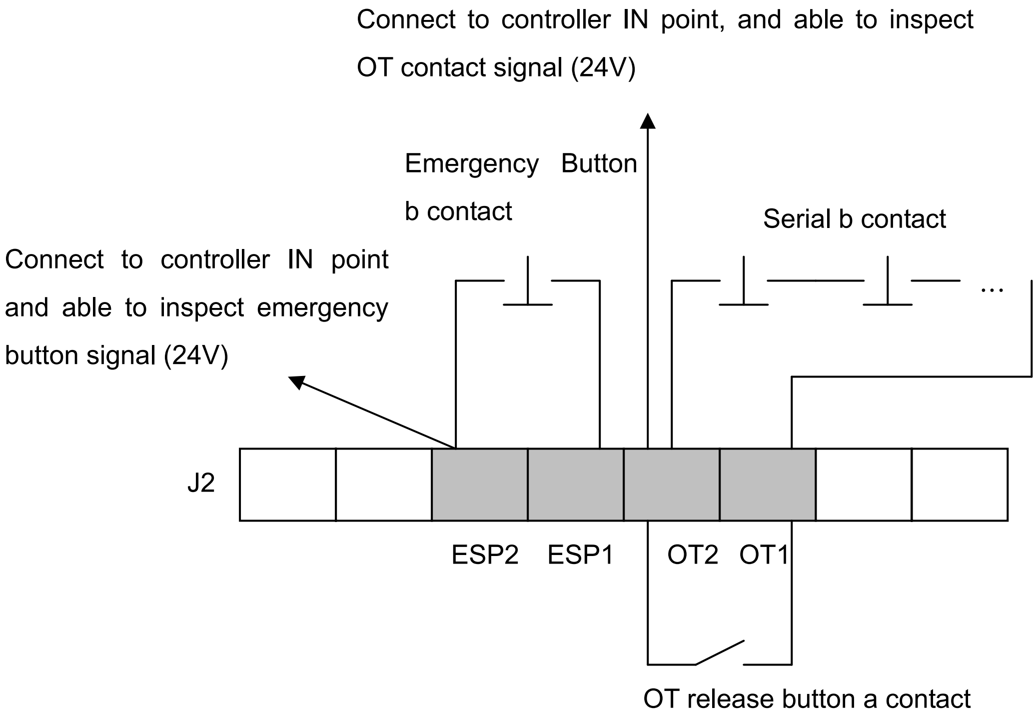
Usage Method：

Condition 1：Wiring way when using LNC standard OP panel for over-travel protection



Note: LNC OP has provided Emergency Button and OT release button.

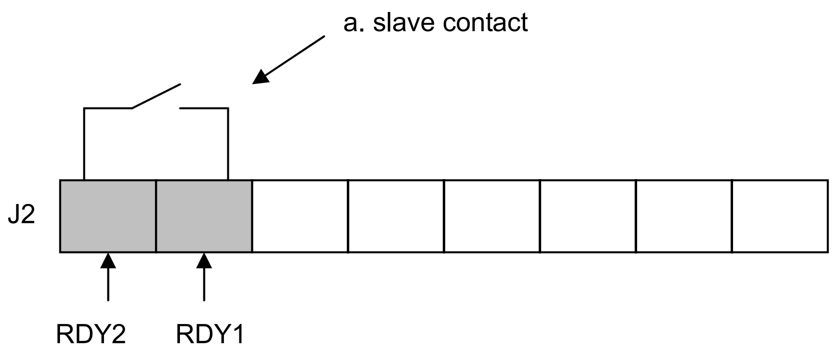
Condition 2：Wiring way when not using LNC standard OP



◎ Server Start Contact----

Explanation：RDY1、RDY2 are server start control terminal. Under the conditions of OT1 coneccts to OT2 and ESP1 connects to ESP2, then connection of RDY1 & RDY2 can drive relay RE1 to motion and start the server.

Usage Method:



G：Usage of J1 external IO D.C Power Contact

J1 contact leads into 24V power for start/safety circuit and 5V power for ENCODER/linear scale, and provides FG(box) grounding.

Attention of Usage:

1、This 5V power is for providing power to external ENCODER and linear scale, please select POWER SUPPLY according to self request. (Min. 2A when not using linear scale; please refer to linear scale spec. when using linear scale), <u>Please DO NOT share 5V power with system center.</u>

2、FG is box grounding terminal, please connect grounding line to this terminal, do not connect to power GND terminal.

3、Please check if the polar and specification of voltage is correct before power on. Incorrect wiring and specification will cause damages to relay board and back-end components (MPG, server…).

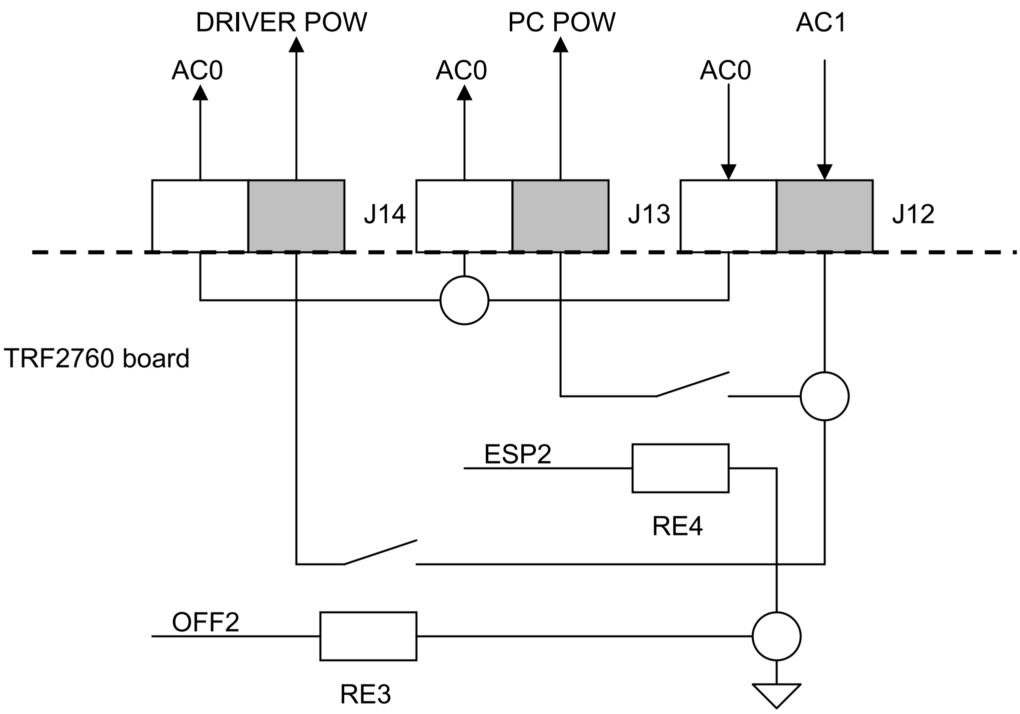
4、Power input spec: 5V/(2A~5A)，24V/(4A above). Please pay more attention to wiring length and route becasue of the D.C power here. The power for TRF2760 board must be 5V and 24V to avoid the problem of pressure drop/noise and cause abnormal control. (Please read the specification request of linear scale to 5V voltage)

H：Usgae of Alternating Current Power Contact

J12 contact leads into A.C. power; J14 can be the resource of system center power and take control via RE3 by ON/OFF connector; J13 can be a A.C. component master controlled point to connect OT & ESP contacts and is controlled by RE4.

Terminal Capacity：Max. 5A，240V AC

Control circuit diagram is as below:

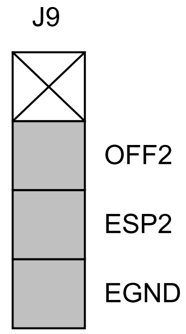


P1 pin description

I：Usage of Alternating Current Power Control Contact

J19 &J15 are one to one 4PIN 2.5mm contacts, mainly using for control A.C. RELAY RE3、RE4. When user self design A.C. circuit, J9 provides 2 safety & power switch control of ESP2 and OFF2 for user's planning.

Definition of contacts is as below:



3.3.6.5 Interface and Pin Definition:

(1) P1~P6 Pin Definition----Servo Axis Control Signal

Servo Axis Control Signal (P1~P6)					
Pin	**Signal**	**Description**	**Pin**	**Signal**	**Description**
1	/PB	The PULSE output differential signal output by spindle/B	14	/PA	The PULSE output differential signal output by spindle/A
2	PB	The PULSE output differential signal output by spindle B	15	PA	The PULSE output differential signal output by spindle A
3	E5V	E5V Power	16	SRDY	Servo standby
4	EGND	E24V/E5V gnd	17	DAC_OUT	Analog output of each axis
5	AGND	Analog output gnd	18	E24V	E24V supply
6	SERON	Output control signal of SERVO-ON	19	ALRAM	Alarm output of servo axis
7	EGND	E24V/E5V gnd	20	SVI_COM	COM of servo IN
8	SVI_COM	The COM spot of the servo IN	21	EGND	E24V/E5V gnd
9	SER_RESET	Servo Reset/Clear	22	×	×
10	C	Differential feedback in Z phase(INDEX) encoder signal C	23	/C	Differential feedback in Z phase (INDEX) encoder signal /C
11	A	Differential feedback in A phase encoder signal A	24	/A	Differential feedback in A phase encoder signal /A
12	B	Differential feedback in B phase encoder signal B	25	/B	Differential feedback in B phase encoder signal /B
13	FG	Box、gnd			

Description:

1、Please use cable with isolation fence to make connecting line, and make sure that isolation fence is connected with connector mental or the 13th PIN to avoid the wrong movement caused by noise interference.

(2) P7 Pin Definition----MPG Signal

MPG（P7）					
Pin	**Signal**	**Description**	**Pin**	**Signal**	**Description**
1	E24V	+24V output	9	EGND	(E24V，E5V)GND
2	×	×	10	FG	Box、Gnd
3	/B	MPG pulse /B input	11	B	MPG pulse B input
4	/A	MPG pulse /A input	12	A	MPG pulse A input
5	×	×	13	×	×
6	×	×	14	×	×
7	×	×	15	E5V	E5V power
8	E5V	E5V power			

Description：

1、E5V provides MPG PULSE output.

2、E24V provides MPG (axial direction/rate) output.

(3) P8 Pin Definition ----the 6th Axis Signal

6th Axis Signal(P8)		
PIN	**Signal**	**Description**
1	E5V	E5V supply
2	EGND	(E24V，E5V)GND
3	DAC_OUT	Analogue output
4	/A	Differential feedback in A phase encoder signal /A
5	/B	Differential feedback in B phase encoder signal /B
6	/C	Differential feedback in Z phase (INDEX) encoder signal /C
7	PA	The PULSE output differential signal output by spindle A
8	/PB	The PULSE output differential signal output by spindle/B
9	E5V	E5V supply
10	AGND	Analogue output GND
11	A	Differential feedback in A phase encoder signal A
12	B	Differential feedback in B phase encoder signal B
13	C	Differential feedback in Z phase (INDEX) encoder signal C
14	PA	The PULSE output differential signal output by spindle A
15	PB	The PULSE output differential signal output by spindle B

Description：

1. This Pin Signal will be connected by PCC1620 V2., when this pin didn't plug in, there will be no output signal.

2. Since this pin is upper cable, please reserve space for cables and pins when assembling.

(4) P9 Pin Definition----ON/OFF Connector

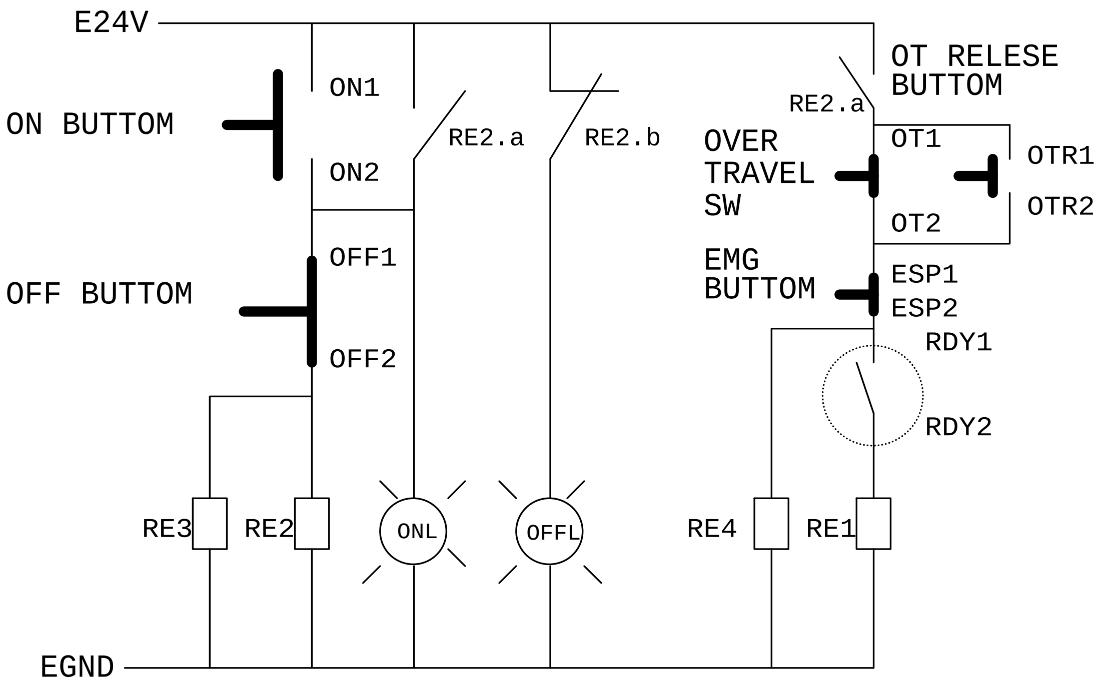
ON/OFF control connecter（P9）			
Pin	**Signal**	**Pin**	**Signal**
1	OT11	9	ESP1/OTR2
2	×	10	×
3	×	11	×
4	SERONL	12	OFFL
5	EGND	13	OFF2
6	ON2/OFF1	14	ESP2
7	ESP1/OT2	15	ON2/OFF1
8	ON1		

Description：

1、Definition of related contacts please refer to appendix 1.

Appendix 1:

Relation diagram of ON/OFF connector and related circuit & components of OP、TRF board:



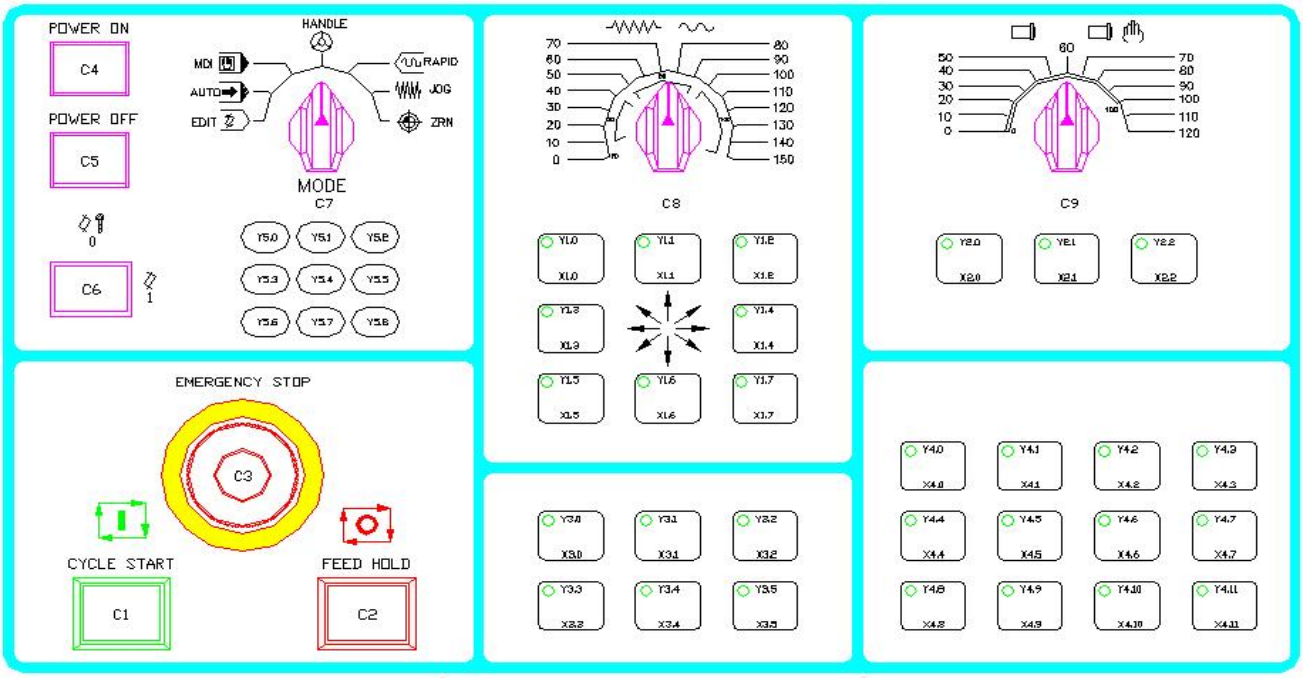
Circuit ON Instruction:

1. ON/OFF:These two buttons are on OP panel, when pressing ON, RE2、RE3；RE2 will be maintained; when pressing OFF, RE2、RE3、RE1、RE4 will be released at the same time.
2. After driving RE2, if OVER TRAVEL、EMG BUTTOM are all ON, we can drive RE4.
3. RDY is the control pin. When it was connected, if can drive RE1 and SERVO_ON.
4. After pressing EMG, or loosing OT, RE1、RE4 will be released, and SERVO_OFF. This is to protect hardware.

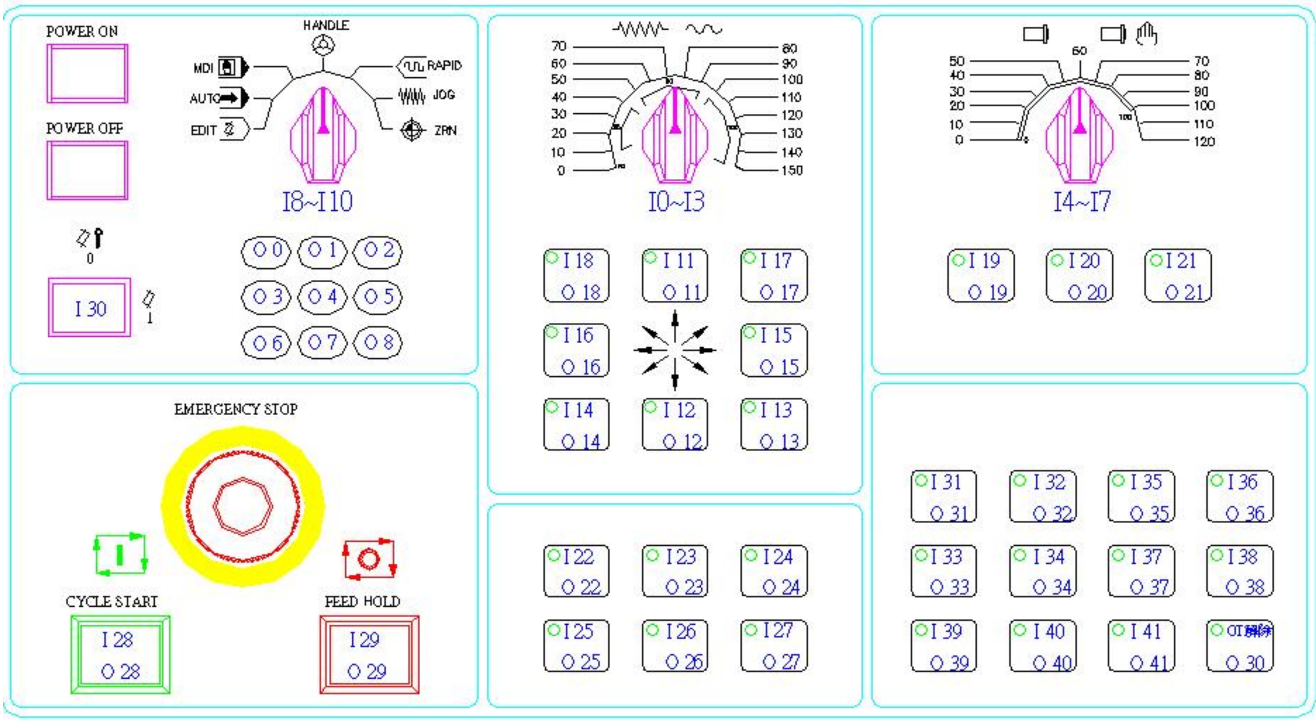
Componet Instruction:
1. ON/OFF is located on OP Panel and controls system power.
2. RE3 controls system power(controller power).
3. RE2 offer pin for power control.
4. OVER TRAVEL SW is on machine.
5. OT RELEASE is on OP panel.
6. EMG is on OP panel.
7. RE4 controls surrounding movement componet power.
8. RE1 controls SERVO_ON.

3.3.7 Operation Panel Module

3.3.7.1 New Operation Panel Arrangement Plan (OP2520)



3.3.7.2 The I/O chart of new operation panel（OP2520）



3.3.8 REL2840 SPEC

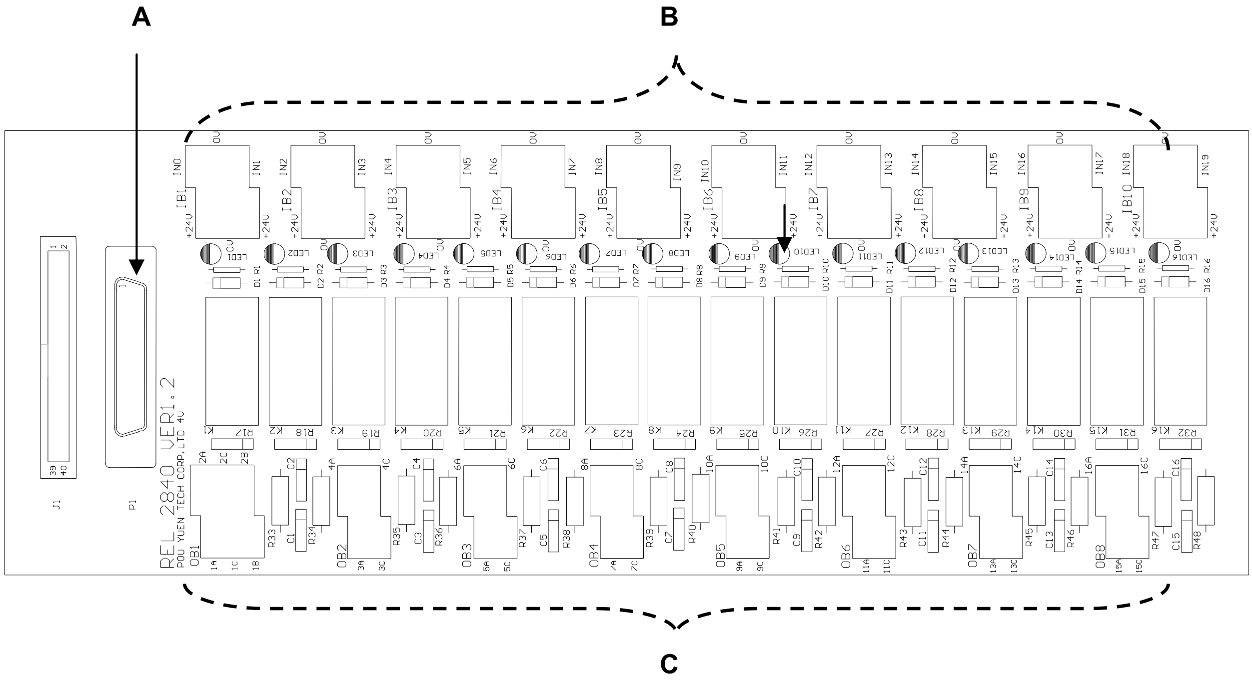
3.3.8.1 Specification:

(1) Providing 20 IN point and E24V/EGND pluggable type terminal blocks.

(2) The output end provides 2 sets of A、B、C contacts and 14 sets of A、C contacts, total 16 sets of output spots.

(3) The output point of contact capacity as the AC 6A/250 V

3.3.8.2 Hardware LAYOUT:



3.3.8.3 Connector、Component Description：

IO Connector			
Diagram	Component Type	Function	Instruction
A	44 PIN D-SUB high definition connecter	20 IN / 16 OUT control interface	SIO series board
B	5.08mm pluggable type terminal blocks	Input spot outward connect terminal	Connect to external component
C	5.08mm pluggable type terminal blocks	Output spot outward connect terminal	Connect to external component

Note 1：The pluggable type terminal block of B provides 20 connectors & inputs spots of EGND and 20 E24V to click the concert usage.

Note 2：Each relay has its corresponding red LED, relay after arousing the magnetic belt and workings because of the output spot, the LED will click then bright, the debugging of available this progress relay and output spot uses.

3.3.8.4 Usage/ setting:

A：IO control contacts

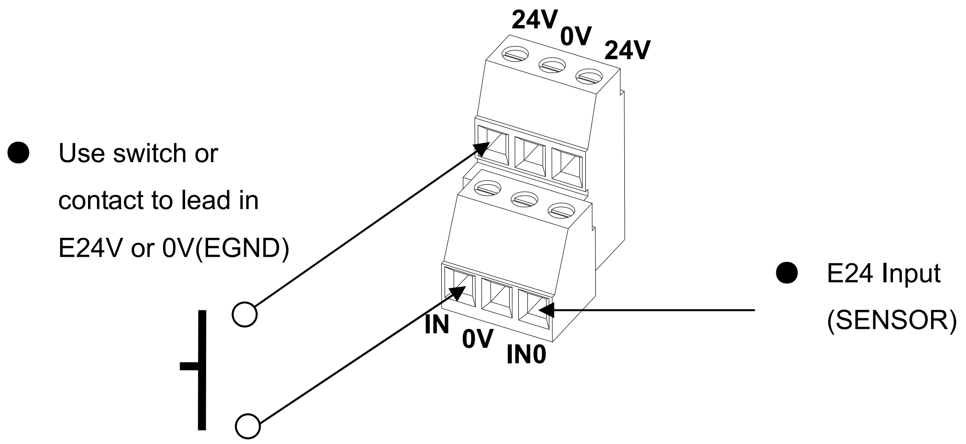
◎ This is 20IN/16OUT IO which connects to SIO or EIO card.

B：IN control contacts

◎ 1. Signals will connect by this pin, via IO control and connect to SIO and EIO card.

2. This pin has E24V and EGND(0V) and will be put on SIO/EIO I/O control card to connect with REL-2840.

◎ IN contact example:



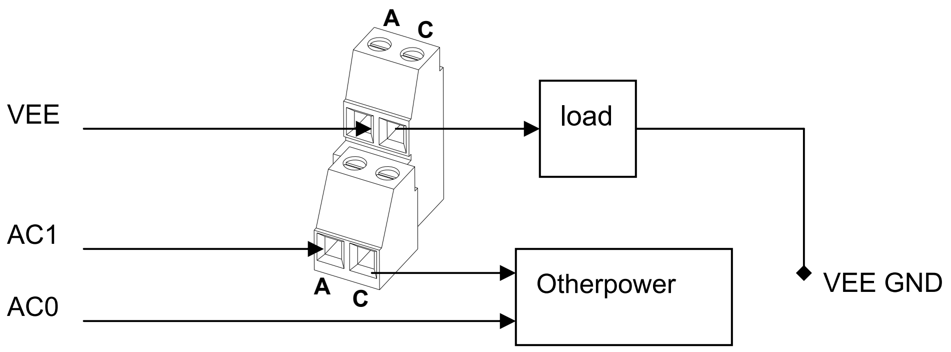
Notice:

1. When using NPN IN, please confirm SIO、EIO module support NPN mode.
2. Please follow instructions to connect to prevent E24V and EGNDshort circuit.

C：OUT control contacts

◎REL-2840 Output is on A and C, and for 6A / 250V。

◎OUT contact example:

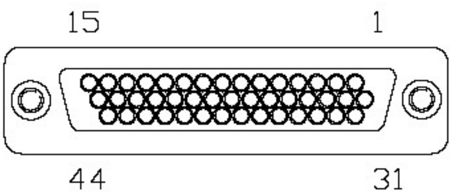


NOTICE:

1. OUT is mechanical contact, not suitable for high speed and frequent ON/OFF usage.
2. Please do not connect over contact's capacity.

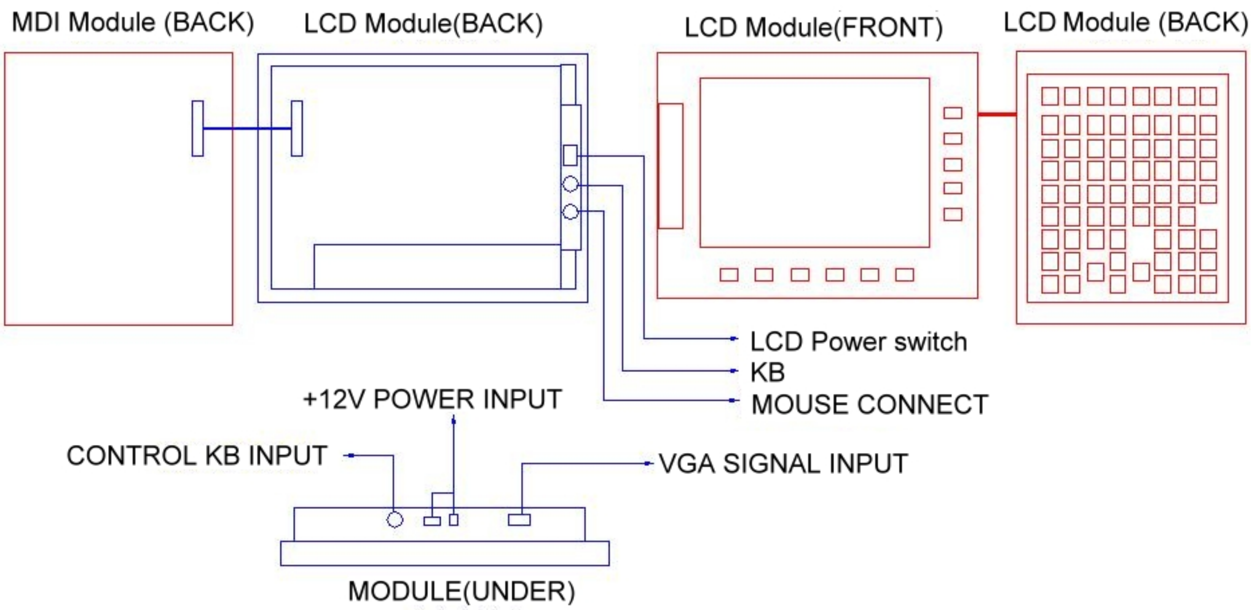
3.3.8.5 Pin definition:

A: 44 PIN High density jack definition.



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	-	-

3.3.8.6 LCD module



4 MLC Maintenance -- C﹐S Bits and Register

4.1 C Bits Definition

C BIT MLC→CNC

BIT #	SYMBOL	DESCRIPTION	PAGE
000	ST	CYCLE START	**62**
001	SP	FEED HOLD	**62**
003	PPROT	PROGRAM PROTECTION	**62**
004	MANRET	MANUAL RETURN	**62**
006	+X	SELECT AXIS & DIRECTION: ＋X	**63**
007	-X	SELECT AXIS & DIRECTION: －X	**63**
008	+Y	SELECT AXIS & DIRECTION: ＋Y	**63**
009	-Y	SELECT AXIS & DIRECTION: －Y	**63**
010	+Z	SELECT AXIS & DIRECTION: ＋Z	**63**
011	-Z	SELECT AXIS & DIRECTION: －Z	**63**
012	+4	+4 Axis Direction	**63**
013	-4	-4 Axis Direction	**63**
016	HX	SELECT MPG AXIS: X AXIS	**63**
017	HY	SELECT MPG AXIS: Y AXIS	**63**
018	HZ	SELECT MPG AXIS: Z AXIS	**63**
019	H4	Handle 4th Axis	**63**
020	MPGDRN	MPG DRY RUN	**63**
021	SCNSAV	QUIT SCREENSAVER	**63**
023	RT	RAPID TRAVEL	**64**
031	HOMEX	HOME DOG: X AXIS	**64**
032	HOMEY	HOME DOG: Y AXIS	**64**
033	HOMEZ	HOME DOG: Z AXIS	**64**
034	HOME4	4th Axis Home DOG Signal	**64**
036	ESP	EMERGENCY STOP	**64**
037	ERS	EXTERNAL RESET	**64**
038	FIN	M, S, T CODE FINISH	**64**
040	SBK	SINGLE BLOCK	**64**
041	BDT	OPTIONAL BLOCK SKIP	**65**
042	DRN	DRY RUN	**65**
043	MLK	MACHINE LOCK	**65**
044	OPS	M01 OPTIONAL STOP	**65**
045	ZNG	IGNORE SERVO AXIS: Z AXIS	**65**
046	AFL	AUXILIARY FUNCTION LOCK	**65**
049	4NG	SERVO AXIS IGNORE SERVO AXIS: THE 4TH AXIS	**65**
050	+LX	AXIS OVER TRAVEL: ＋X	**65**
051	-LX	AXIS OVER TRAVEL: －X	**77**
052	+LY	AXIS OVER TRAVEL: ＋Y	**77**
053	-LY	AXIS OVER TRAVEL: －Y	**77**
054	+LZ	AXIS OVER TRAVEL: ＋Z	**77**
055	-LZ	AXIS OVER TRAVEL: －Z	**77**
056	+L4	+4th Axis OT	**77**

BIT #	SYMBOL	DESCRIPTION	PAGE
057	-L4	-4th Axis OT	77
059	INTLKX	AXIS INTERLOCK: X AXIS	79
060	INTLKY	AXIS INTERLOCK: Y AXIS	79
061	INTLKZ	AXIS INTERLOCK: Z AXIS	79
062	INTLK4	4th Axis Interlock	79
064	WINRW	MLC WINDOW READ/WRITE	89
065	WINREQ	MLC WINDOW COMMAND	89
066	HIX	HANDLE INTERRUPT: X AXIS	80
067	HIY	HANDLE INTERRUPT: Y AXIS	80
068	HIZ	HANDLE INTERRUPT: Z AXIS	80
069	HI4	4th Axis: Select Axis Direction Signal of Handle INT	80
070	HI5	5 Axis: Select Axis Direction Signal of Handle INT	80
071	HI6	6 Axis: Select Axis Direction Signal of Handle INT	80
075	SVAX	SERVO ALARM: X AXIS	80
076	SVAY	SERVO ALARM: Y AXIS	80
077	SVAZ	SERVO ALARM: Z AXIS	80
078	SVA4	4th Axis Servo Alarm	80
082	S1CW	1st Spindle CW	67
083	S1CCW	1st Spindle CCW	67
085	ORT	Spindle Orientation	67
086	SPPULF	Spindle Command Type Changes to Pulse Type Under Spindle Orientation and Ridig Tapping Modes	81
089	MRX	ENABLE MIRROR: X AXIS	82
090	MRY	ENABLE MIRROR: Y AXIS	82
091	MRZ	ENABLE MIRROR: Z AXIS	82
092	MR4	4th Axis Servo Alarm	82
093	MR5	5th Axis Servo Alarm	82
094	MR6	6th Axis Servo Alarm	82
097	S1GR1	1st Spindle Gear #1	82
098	S1GR2	1st Spindle Gear #2	82
099	S1GR3	1st Spindle Gear #3	82
100	UI0	MACRO SYSTEM VARIABLE $200	83
101	UI1	MACRO SYSTEM VARIABLE $201	83
102	UI2	MACRO SYSTEM VARIABLE $202	83
103	UI3	MACRO SYSTEM VARIABLE $203	83
104	UI4	MACRO SYSTEM VARIABLE $204	83
105	UI5	MACRO SYSTEM VARIABLE $205	83
106	UI6	MACRO SYSTEM VARIABLE $206	83
107	UI7	MACRO SYSTEM VARIABLE $207	83
108	UI8	MACRO SYSTEM VARIABLE $208	83
109	UI9	MACRO SYSTEM VARIABLE $209	83
110	UI10	MACRO SYSTEM VARIABLE $210	83
111	UI11	MACRO SYSTEM VARIABLE $211	83
112	UI12	MACRO SYSTEM VARIABLE $212	83
113	UI13	MACRO SYSTEM VARIABLE $213	83
114	UI14	MACRO SYSTEM VARIABLE $214	83
115	UI15	MACRO SYSTEM VARIABLE $215	83
119	ZP2ZDC	MOTION PROHIBITION FOR AREA BELOW THE 2ND ZERO POINT OF Z AXIS	83
120	PMCGO	COMMAND SIGNAL OF PMC AXIS	83
124	RTFIN	Disable Sigal in Rigid Tapping	83
125	RTST	Enable Signal in Rigid Tapping	84
126	SWEN	Enable Signal of Spindle Motor Rotates in Gear-Shfiting Speed	84

BIT #	SYMBOL	DESCRIPTION	PAGE
127	SWFIN	Spindle Gear-Shifting Complete Signal	**85**
134	PRTCLR	CLEAR PART COUNT NUMBER	**85**
140	2NDSLX	THE 2ND SOFT-LIMIT: ＋X	**86**
141	2NDSLX	THE 2ND SOFT-LIMIT: －X	**86**
142	2NDSLY	THE 2ND SOFT-LIMIT: ＋Y	**86**
143	2NDSLY	THE 2ND SOFT-LIMIT: －Y	**86**
144	2NDSLZ	THE 2ND SOFT-LIMIT: ＋Z	**86**
145	2NDSLZ	THE 2ND SOFT-LIMIT: －Z	**86**
146	2NDSL4	2nd +4th Axis Software Limit Choice	**86**
147	2NDSL4	2nd -4th Axis Software Limit Choice	**86**
148	2NDSL5	2nd +5th Axis Software Limit Choice	**86**
149	2NDSL5	2nd -5th Axis Software Limit Choice	**86**
150	2NDSL6	2nd +6th Axis Software Limit Choice	**86**
151	2NDSL6	2nd -6th Axis Software Limit Choice	**86**
152	+5	+5 Axis Direction	**71**
153	-5	-5 Axis Direction	**71**
154	+6	+6 Axis Direction	**71**
155	-6	-6 Axis Direction	**71**
156	H5	Handle 5th Axis	**71**
157	H6	Handle 6th Axis	**71**
158	HOME5	5th Axis Home DOG Signal	**73**
159	HOME6	6th Axis Home DOG Signal	**73**
160	+L5	+5th Axis OT	**77**
161	-L5	-5th Axis OT	**77**
162	+L6	+6th Axis OT	**77**
163	-L6	-6th Axis OT	**77**
164	INTLK5	5th Axis Interlock	**79**
165	INTLK6	6th Axis Interlock	**79**
166	SVA5	5th Axis Servo Alarm	**80**
167	SVA6	6th Axis Servo Alarm	**80**
168	DT5	5th Axis Detach	**85**
169	DT6	6th Axis Detach	**85**
170	5NG	5th Axis Neglect	**76**
171	6NG	6th Axis Neglect	**76**
201	AERSTX	Absolute encoder Reset Ready Signal:X Axis	**87**
202	AERSTY	Absolute encoder Reset Ready Signal:Y Axis	**87**
203	AERSTZ	Absolute encoder Reset Ready Signal:Z Axis	**87**
204	AERST4	Absolute encoder Reset Ready Signal:4th Axis	**87**
205	AERST5	Absolute encoder Reset Ready Signal:5th Axis	**87**
206	AERST6	Absolute encoder Reset Ready Signal:6th Axis	**87**
207	AERDYX	Absolute Encoder Data Ready Signal:X Axis	**87**
208	AERDYY	Absolute Encoder Data Ready Signal:Y Axis	**88**
209	AERDYZ	Absolute Encoder Data Ready Signal:Z Axis	**88**
210	AERDY4	Absolute Encoder Data Ready Signal:4th Axis	**88**
211	AERDY5	Absolute Encoder Data Ready Signal:5th Axis	**88**
212	AERDY6	Absolute Encoder Data Ready Signal:6th Axis	**88**
213	AEB0X	Absolute Encoder Data Bit 0Transmitting Signal : X Axis	**88**
214	AEB0Y	Absolute Encoder Data Bit 0Transmitting Signal : Y Axis	**88**
215	AEB0Z	Absolute Encoder Data Bit 0Transmitting Signal : Z Axis	**88**
216	AEB04	Absolute Encoder Data Bit 0Transmitting Signal : 4th Axis	**88**
217	AEB05	Absolute Encoder Data Bit 0Transmitting Signal : 5th Axis	**88**
218	AEB06	Absolute Encoder Data Bit 0Transmitting Signal : 6th Axis	**88**
219	AEB1X	Absolute Encoder Bit 1 Transmit: X Axis	**89**

BIT #	SYMBOL	DESCRIPTION	PAGE
220	AEB1Y	Absolute Encoder Bit 1 Transmit: Y Axis	**89**
221	AEB1Z	Absolute Encoder Bit 1 Transmit: Z Axis	**89**
222	AEB14	Absolute Encoder Bit 1 Transmit: 4th Axis	**89**
223	AEB15	Absolute Encoder Bit 1 Transmit: 5th Axis	**89**
224	AEB16	Absolute Encoder Bit 1 Transmit: 6th Axis	**89**

4.2 S Bits Definition

S BIT CNC→MLC

BIT #	SYMBOL	DESCRIPTION	PAGE
000	STL	CYCLE START	**90**
001	SPL	FEED HOLD	**90**
002	EDITL	MODE: EDIT	**90**
003	MEML	MODE: MEM	**90**
004	MDIL	MODE: MDI	**90**
005	JOGL	MODE: JOG	**90**
006	INCJOG	MODE: INC JOG	**90**
007	MPGL	MODE: MPG	**90**
008	HOMEL	MODE: HOME	**90**
010	MREADY	MACHINE READY	**90**
011	MDIPRS	MDI KEYS	**90**
016	ZP1X	STATUS OF X AXIS AT THE 1ST ZERO POINT	**90**
017	ZP1Y	STATUS OF Y AXIS AT THE 1ST ZERO POINT	**90**
018	ZP1Z	STATUS OF Z AXIS AT THE 1ST ZERO POINT	**90**
019	ZP14	4th 1st Axis Point Return End	**90**
020	ZP2X	STATUS OF X AXIS AT THE 2ND ZERO POINT	**92**
021	ZP2Y	STATUS OF Y AXIS AT THE 2ND ZERO POINT	**92**
022	ZP2Z	STATUS OF Z AXIS AT THE 2ND ZERO POINT	**92**
023	ZP24	4th 2nd Axis Point Return End	**92**
024	ZP25	5th 2nd Axis Point Return End	**92**
025	ZP26	6th 2nd Axis Point Return End	**92**
026	ZP15	5th 1st Axis Point Return End	**90**
027	ZP16	6th 1st Axis Point Return End	**91**
028	WRN	SYSTEM ALARM	**92**
029	MF	M CODE STROBE	**92**
030	DEN	INTERPOLATION FINISH	**92**
031	AL	SYSTEM ALARM	**92**
032	RST	SYSTEM RESET	**92**
033	NCRDY	SYSTEM READY	**92**
035	X1000	STATUS OF MPG RATE: x1000	**94**
036	X1	STATUS OF MPG RATE: x1	**94**
037	X10	STATUS OF MPG RATE: x10	**94**
038	X100	STATUS OF MPG RATE: x100	**94**
039	PROGST	STATUS OF PROGRAM RESTART	**94**
040	SBKL	STATUS OF SINGLE BLOCK	**94**
041	BDTL	STATUS OF OPTIONAL BLOCK SKIP	**94**
042	DRNL	STATUS OF DRY RUN	**94**
043	MLKL	STATUS OF MACHINE LOCK	**94**
044	OPSL	STATUS OF OPTIONAL STOP	**95**
045	RTL	STATUS OF RAPID TRAVERSE	**95**
046	ZNGL	STATUS OF Z-AXIS NEGLECT	**96**
047	AFLL	STATUS OF AUXILIARY FUNCTION LOCK	**96**
054	S1STB	S CODE STROBE	**96**
061	SK2	SOFT PANEL KEY: Z-AXIS NEGLECT	**96**
062	SK3	SOFT KEY: MPG DRY RUN	**96**
063	SK4	SOFT KEY: AUXILIARY FUNCTION LOCK OF M, S, T CODE	**98**
068	MPGDRN	MPG DRY RUN	**98**
069	TSTB	T CODE STROBE	**98**

BIT #	SYMBOL	DESCRIPTION	PAGE
071	SK6	SOFT KEY: MACHINE LOCK	**98**
072	SK7	SOFT KEY: DRY RUN	**99**
073	SK8	SOFT KEY: OPTIONAL BLOCK SKIP	**99**
074	SK9	SOFT KEY: OPTIONAL STOP	**99**
079	MLCFN	MLC WINDOW COMPLETED	**107**
080	M00	M00 STROBE	**101**
081	M01	M01 STROBE	**101**
082	M02	M02 STROBE	**101**
083	M30	M30 STROBE	**101**
086	ORTFIN	FINISH SPINDLE ORIENTATION	**101**
088	S1SA	THE 1ST SPINDLE REACHES ROTATION SPEED	**101**
091	G80	STATUS OF G080 IN CANNEL CYCLE	**101**
092	S1ZSA	THE 1ST SPINDLE REACHES ZERO SPEED	**101**
093	PLSCR	SPINDLE SWITCHES TO PULSE COMMAND	**101**
094	GRCAR	SPINDLE MOTOR REACHES ROTATION SPEED AFTER GEAR CHANGE	**102**
100	UO0	MACRO VARIABLE $600	**103**
101	UO1	MACRO VARIABLE $601	**103**
102	UO2	MACRO VARIABLE $602	**103**
103	UO3	MACRO VARIABLE $603	**103**
104	UO4	MACRO VARIABLE $604	**103**
105	UO5	MACRO VARIABLE $605	**103**
106	UO6	MACRO VARIABLE $606	**103**
109	UO9	MACRO VARIABLE $609	**103**
112	UO12	MACRO VARIABLE $612	**103**
113	UO13	MACRO VARIABLE $613	**103**
114	UO14	MACRO VARIABLE $614	**103**
115	UO15	MACRO VARIABLE $615	**103**
120	PMCFIN	PMC AXIS	**103**
128	RTMODE	RIGID TAPPING	**103**
130	MOVX	MOTION STATUS OF SERVO AXIS: X AXIS	**103**
131	MOVY	MOTION STATUS OF SERVO AXIS: Y AXIS	**103**
132	MOVZ	MOTION STATUS OF SERVO AXIS: Z AXIS	**103**
133	MOV4	MOTION STATUS OF SERVO AXIS: THE 4TH AXIS	**103**
134	WPARV	Max Working Piece Arrival	**105**
135	MOV5	5th Axis Moving	**103**
136	MOV6	6th Axis Moving	**103**
150	SGRC1	SPINDLE GEAR SWITCH: THE 1ST GEAR	**105**
151	SGRC2	SPINDLE GEAR SWITCH: THE 2ND GEAR	**105**
152	SGRC3	SPINDLE GEAR SWITCH: THE 3RD GEAR	**105**
153	SGRC4	SPINDLE GEAR SWITCH: THE 4TH GEAR	**105**
154	MOVDX	MOTION DIRECTION OF SERVO AXIS: X AXIS	**106**
155	MOVDX	MOTION DIRECTION OF SERVO AXIS: Y AXIS	**106**
156	MOVDX	MOTION DIRECTION OF SERVO AXIS: Z AXIS	**106**
157	MOVDX	MOTION DIRECTION OF SERVO AXIS: THE 4TH AXIS	**106**
158	MOVDX	MOTION DIRECTION OF SERVO AXIS: THE 5TH AXIS	**106**
159	MOVDX	MOTION DIRECTION OF SERVO AXIS: THE 6TH AXIS	**106**
201	AETFX	Enter into Absolute Encoder Data Transmitting Mode:X Axis	**107**
202	AETFY	Enter into Absolute Encoder Data Transmitting Mode:Y Axis	**107**
203	AETFZ	Enter into Absolute Encoder Data Transmitting Mode:Z Axis	**107**
204	AETF4	Enter into Absolute Encoder Data Transmitting Mode:4th Axis	**107**
205	AETF5	Enter into Absolute Encoder Data Transmitting Mode:5th Axis	**107**
206	AETF6	Enter into Absolute Encoder Data Transmitting Mode:6th Axis	**107**
207	AETFRX	Absolute Encoder Data Transmitting:X Axis	**107**

BIT #	SYMBOL	DESCRIPTION	PAGE
208	AETFRY	Absolute Encoder Data Transmitting:Y Axis	**107**
209	AETFRZ	Absolute Encoder Data Transmitting:Z Axis	**107**
210	AETFR4	Absolute Encoder Data Transmitting:4th Axis	**107**
211	AETFR5	Absolute Encoder Data Transmitting:5th Axis	**107**
212	AETFR6	Absolute Encoder Data Transmitting:6th Axis	**107**
213	AERSTX	Absolute Encoder Reset:X Axis	**107**
214	AERSTY	Absolute Encoder Reset:Y Axis	**107**
215	AERSTZ	Absolute Encoder Reset:Z Axis	**107**
216	AERST4	Absolute Encoder Reset:4th Axis	**107**
217	AERST5	Absolute Encoder Reset:5th Axis	**107**
218	AERST6	Absolute Encoder Reset:6th Axis	**107**

4.3 Register Definition

REGISTER

BIT #	SYMBOL	DESCRIPTION	PAGE
001	M_CODE	M CODE	108
002	S_CODE	S CODE	108
003	T_CODE	T CODE	108
004	SPAS	ACTUAL ROTATION SPEED OF THE SPINDLE	108
013	OPMDOE	MODE SELECTION 1：EDIT，2：MEM，3：MDI，4：JOG，5：INCJOG，6：MPG，7：HOME	108
014	INCFED	MPG RATE　2: x10, 3: x100, OTHERS: x1 INCREMENTAL JOG OVERRIDE　2: x10, 3: x100, 4：x1000, OTHERS: x1	110
015	SPDOV	ROTATION SPEED OVERRIDE OF THE SPINDLE 0 ~ 12 REPRESENT 0% ~ 120%, RESPECTIVELY; OTHERS: SET VALUE × 0.01	110
016	FEEDOV	CUTTING OVERRIDE 0 ~ 20 REPRESENT 0% ~ 200%, RESPECTIVELY; OTHERS: SET VALUE × 0.001	111
017	JOGOV	JOG OVERRIDE 0 ~ 20 REPRESENT 0% ~ 200%, RESPECTIVELY; OTHERS: SET VALUE × 0.001	112
018	RTOV	RAPID TRAVERSE OVERRIDE 0, 1: F0, 2: 25%, 3: 50% ~ 4: 100%: OTHERS: SET VALUE × 0.001	112
021	PMCF	OVERRIDE OF PMC AXIS, UNIT: mm/min.	113
022	PMCC	PMC AXIS CONTROL	114
024	PMCXMM	MOTION COMMAND OF PMC AXIS: X AXIS, mm part	114
025	PMCXUM	MOTION COMMAND OF PMC AXIS: X AXIS, μm part	114
026	PMCYMM	MOTION COMMAND OF PMC AXIS: Y AXIS, mm part	114
027	PMCYUM	MOTION COMMAND OF PMC AXIS: Y AXIS, μm part	114
028	PMCZMM	MOTION COMMAND OF PMC AXIS: Z AXIS, mm part	114
029	PMCZUM	MOTION COMMAND OF PMC AXIS: Z AXIS, μm part	114
030	PMC4MM	PMC Function of 4th-Axis Command Amount, Unit=mm	114
031	PMC4UM	PMC Function of 4th-Axis Command Amount, Unit=μm	114
032	PMC5MM	PMC Function of 5th-Axis Command Amount, Unit=mm	114
033	PMC5UM	PMC Function of 5th-Axis Command Amount, Unit=μm	114
034	PMC6MM	PMC Function of 6th-Axis Command Amount, Unit=mm	114
035	PMC6UM	PMC Function of 6th-Axis Command Amount, Unit=μm	114
040	OPMES1	MLC ALARM	114
041	OPMES2	MLC ALARM	114
042	OPMES3	MLC ALARM	114
043	OPMES4	MLC ALARM	114
044	OPMES5	MLC ALARM	114
045	OPMES6	MLC ALARM	114
060	MLCFN	MLC WINDOW FUNCTION	116
061	MLCSF1	MLC WINDOW FUNCTION NO.1	116
062	MLCSF2	MLC WINDOW FUNCTION NO.2	116
063	MLCD1	MLC WINDOW READ/WRITE VALUE 1	116
064	MLCD2	MLC WINDOW READ/WRITE VALUE 2	116
065	MLCD3	MLC WINDOW READ/WRITE VALUE 3	116
066	MLCD4	MLC WINDOW READ/WRITE VALUE 4	116
067	MLCD5	MLC WINDOW READ/WRITE VALUE 5	116
068	MLCD6	MLC WINDOW READ/WRITE VALUE 6	116

BIT #	SYMBOL	DESCRIPTION	PAGE
069	MLCD7	MLC WINDOW READ/WRITE VALUE 7	**116**
070	MLCD8	MLC WINDOW READ/WRITE VALUE 8	**116**
071	MLCD9	MLC WINDOW READ/WRITE VALUE 9	**116**
072	MLCD10	MLC WINDOW READ/WRITE VALUE 10	**116**
073	MLCD11	MLC WINDOW READ/WRITE VALUE 11	**116**
074	MLCD12	MLC WINDOW READ/WRITE VALUE 12	**116**

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 006	SELECT AXIS & DIRECTION: ＋X
C Bit 007	SELECT AXIS & DIRECTION: －X
C Bit 008	SELECT AXIS & DIRECTION: ＋Y
C Bit 009	SELECT AXIS & DIRECTION: －Y
C Bit 010	SELECT AXIS & DIRECTION: ＋Z
C Bit 011	SELECT AXIS & DIRECTION: －Z
C Bit 012	+4 Axis Direction
C Bit 013	-4 Axis Direction
C Bit 152	+5 Axis Direction
C Bit 153	-5 Axis Direction
C Bit 154	+6 Axis Direction
C Bit 155	-6 Axis Direction

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

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

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

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

C Bit 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
C Bit 156	Handle 5th Axis
C Bit 157	Handle 6th 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 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 031	**HOME DOG: X AXIS**
C Bit 032	**HOME DOG: Y AXIS**
C Bit 033	**HOME DOG: Z AXIS**
C Bit 034	**4th Axis Home DOG Signal**
C Bit 158	**5th Axis Home DOG Signal**
C Bit 159	**6th Axis Home DOG Signal**

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

C Bit 036	**EMERGENCY STOP**

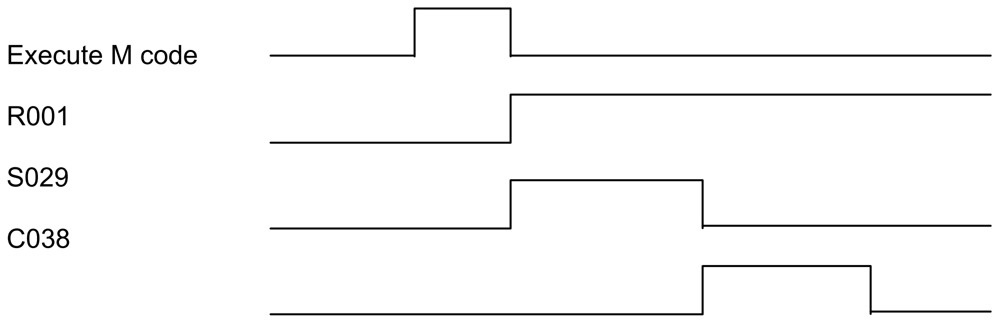
When C036 is ON, the system is reset, all motions stop, and the system status becomes NOT READY.

C Bit 037	**EXTERNAL RESET**

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

C Bit 038	**M, S, T CODE FINISH**

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



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

C Bit 040	**SINGLE BLOCK**

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

C Bit 041	OPTIONAL BLOCK SKIP

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

C Bit 042	DRY RUN

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

C Bit 043	MACHINE LOCK

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

C Bit 044	M01 OPTIONAL STOP

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

C Bit 045	IGNORE SERVO AXIS: Z AXIS

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

C Bit 046	AUXILIARY FUNCTION LOCK

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

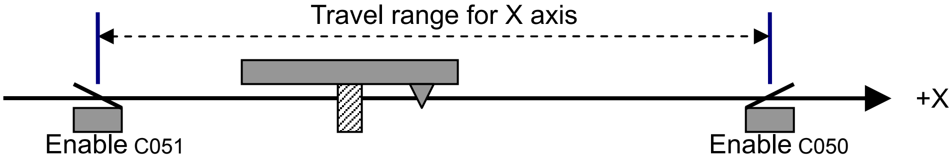
C Bit 049	SERVO AXIS IGNORE SERVO AXIS: THE 4TH AXIS
C Bit 170	5th Axis Neglect
C Bit 171	6th Axis Neglect

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

C Bit 050	AXIS OVER TRAVEL: ＋X
C Bit 051	AXIS OVER TRAVEL: －X
C Bit 052	AXIS OVER TRAVEL: ＋Y
C Bit 053	AXIS OVER TRAVEL: －Y
C Bit 054	AXIS OVER TRAVEL: ＋Z
C Bit 055	AXIS OVER TRAVEL: －Z
C Bit 056	+4th Axis OT
C Bit 057	-4th Axis OT
C Bit 160	+5th Axis OT
C Bit 161	-5th Axis OT
C Bit 162	+6th Axis OT
C Bit 163	-6th Axis OT

C050 ~ C057 are over travel signals for each axis. When some axis is over traveling, MLC 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	MLC travel limit of X axis's positive direction
51	MLC travel limit of X axis's negative direction
52	MLC travel limit of Y axis's positive direction
53	MLC travel limit of Y axis's negative direction
54	MLC travel limit of Z axis's positive direction
55	MLC travel limit of Z axis's negative direction
56	MLC travel limit of the 4th axis's positive direction
57	MLC travel limit of the 4th axis's negative direction



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

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

Discharge a(n) Warning/Alarm:
After some axis triggers the system alarm as mentioned above, the alarm will be discharged when the axis motions towards the opposite direction and PLC turns the corresponding C Bit

from ON to OFF.

In JOG/RAPID or MPG mode, if some warning message of PLC Travel Limit（OP 6001 ~ OP 6008） appears, to motion the axis towards the opposite direction until it leaves the over travel range will then discharge the warning message.

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

ALARM ID	Alarm Message
OP 1020	OVER PLC TRAVEL LIMIT

C Bit 059	**AXIS INTERLOCK: X AXIS**
C Bit 060	**AXIS INTERLOCK: Y AXIS**
C Bit 061	**AXIS INTERLOCK: Z AXIS**
C Bit 062	**4th Axis Interlock**
C Bit 164	**5th Axis Interlock**
C Bit 165	**6th Axis Interlock**

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

C Bit 066	**HANDLE INTERRUPT: X AXIS**
C Bit 067	**HANDLE INTERRUPT: Y AXIS**
C Bit 068	**HANDLE INTERRUPT: Z AXIS**
C Bit 069	**4th Axis: Select Axis Direction Signal of Handle INT**
C Bit 070	**5 Axis: Select Axis Direction Signal of Handle INT**
C Bit 071	**6 Axis: Select Axis Direction Signal of Handle INT**

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

C Bit 075	**SERVO ALARM: X AXIS**
C Bit 076	**SERVO ALARM: Y AXIS**
C Bit 077	**SERVO ALARM: Z AXIS**
C Bit 078	**4th Axis Servo Alarm**
C Bit 166	**5th Axis Servo Alarm**
C Bit 167	**6th Axis Servo Alarm**

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

C Bit 082	1st Spindle CW
C Bit 083	1st Spindle CCW

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

C Bit 085	Spindle Orientation

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

C Bit 086	Spindle Command Type Changes to Pulse Type Under Spindle Orientation and Ridig Tapping Modes

Signal of Spindle is in orientation mode and also finishes orientating.

C Bit 089	ENABLE MIRROR: X AXIS
C Bit 090	ENABLE MIRROR: Y AXIS
C Bit 091	ENABLE MIRROR: Z AXIS
C Bit 092	4th Axis Servo Alarm
C Bit 093	5th Axis Servo Alarm
C Bit 094	6th Axis Servo Alarm

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

C Bit 097	1st Spindle Gear #1
C Bit 098	1st Spindle Gear #2
C Bit 099	1st Spindle Gear #3

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

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

C Bit 100	MACRO SYSTEM VARIABLE $200
C Bit 101	MACRO SYSTEM VARIABLE $201
C Bit 102	MACRO SYSTEM VARIABLE $202
C Bit 103	MACRO SYSTEM VARIABLE $203
C Bit 104	MACRO SYSTEM VARIABLE $204
C Bit 105	MACRO SYSTEM VARIABLE $205
C Bit 106	MACRO SYSTEM VARIABLE $206
C Bit 107	MACRO SYSTEM VARIABLE $207
C Bit 108	MACRO SYSTEM VARIABLE $208
C Bit 109	MACRO SYSTEM VARIABLE $209
C Bit 110	MACRO SYSTEM VARIABLE $210
C Bit 111	MACRO SYSTEM VARIABLE $211
C Bit 112	MACRO SYSTEM VARIABLE $212
C Bit 113	MACRO SYSTEM VARIABLE $213
C Bit 114	MACRO SYSTEM VARIABLE $214
C Bit 115	MACRO SYSTEM VARIABLE $215

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

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

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

C Bit 120	COMMAND SIGNAL OF PMC AXIS

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

C Bit 124 **Disable Sigal in Rigid Tapping**

Milling disables rigid tapping.

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 126 **Enable Signal of Spindle Motor Rotates in Gear-Shfiting Speed**

Milling spindle changes rotational speed.

C Bit 127 **Spindle Gear-Shifting Complete Signal**

Milling gear-shifting completed signal.

C Bit 168 **5th Axis Detach**
C Bit 169 **6th 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 MLC to take the corresponding action; when MLC sends C134 back to NC, NC will clear the part count number and set it to 0.

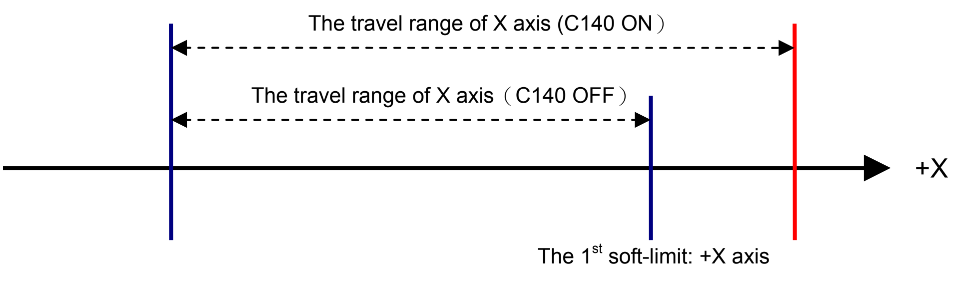
C Bit 140	**THE 2ND SOFT-LIMIT: ＋X**
C Bit 141	**THE 2ND SOFT-LIMIT: －X**
C Bit 142	**THE 2ND SOFT-LIMIT: ＋Y**
C Bit 143	**THE 2ND SOFT-LIMIT: －Y**
C Bit 144	**THE 2ND SOFT-LIMIT: ＋Z**
C Bit 145	**THE 2ND SOFT-LIMIT: －Z**
C Bit 146	**2nd +4th Axis Software Limit Choice**
C Bit 147	**2nd -4th Axis Software Limit Choice**
C Bit 148	**2nd +5th Axis Software Limit Choice**
C Bit 149	**2nd -5th Axis Software Limit Choice**
C Bit 150	**2nd +6th Axis Software Limit Choice**
C Bit 151	**2nd -6th Axis Software Limit Choice**

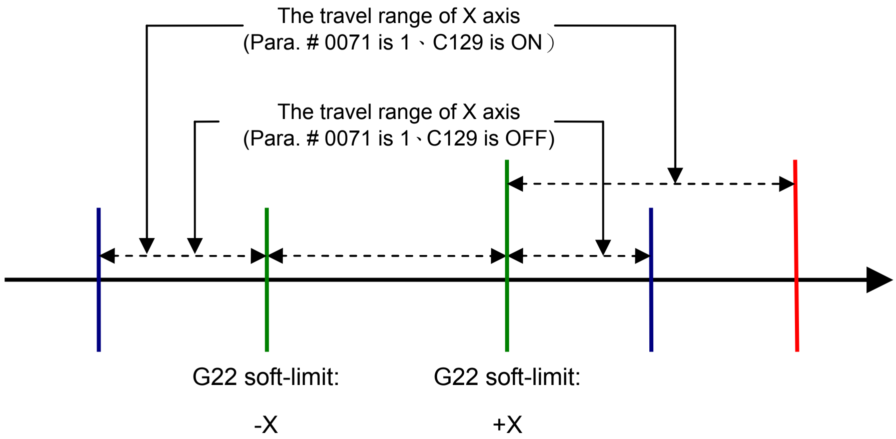
The 1st soft-limit：Set by Pr.1006 ~ Pr.1013. The values set by these parameters will be enabled only after Home return is executed. The default value of the positive axial soft-limit is 99999.999mm, and the negative default value is -99999.999mm.

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

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

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





C Bit 201	**Absolute encoder Reset Ready Signal:X Axis**
C Bit 202	**Absolute encoder Reset Ready Signal:Y Axis**
C Bit 203	**Absolute encoder Reset Ready Signal:Z Axis**
C Bit 204	**Absolute encoder Reset Ready Signal:4th Axis**
C Bit 205	**Absolute encoder Reset Ready Signal:5th Axis**
C Bit 206	**Absolute encoder Reset Ready Signal:6th Axis**

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

C Bit 207	**Absolute Encoder Data Ready Signal:X Axis**
C Bit 208	**Absolute Encoder Data Ready Signal:Y Axis**
C Bit 209	**Absolute Encoder Data Ready Signal:Z Axis**
C Bit 210	**Absolute Encoder Data Ready Signal:4th Axis**
C Bit 211	**Absolute Encoder Data Ready Signal:5th Axis**
C Bit 212	**Absolute Encoder Data Ready Signal:6th Axis**

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

C Bit 213	**Absolute Encoder Data Bit 0Transmitting Signal : X Axis**
C Bit 214	**Absolute Encoder Data Bit 0Transmitting Signal : Y Axis**
C Bit 215	**Absolute Encoder Data Bit 0Transmitting Signal : Z Axis**
C Bit 216	**Absolute Encoder Data Bit 0Transmitting Signal : 4th Axis**
C Bit 217	**Absolute Encoder Data Bit 0Transmitting Signal : 5th Axis**
C Bit 218	**Absolute Encoder Data Bit 0Transmitting Signal : 6th Axis**

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

C Bit 219	**Absolute Encoder Bit 1 Transmit: X Axis**
C Bit 220	**Absolute Encoder Bit 1 Transmit: Y Axis**
C Bit 221	**Absolute Encoder Bit 1 Transmit: Z Axis**
C Bit 222	**Absolute Encoder Bit 1 Transmit: 4th Axis**
C Bit 223	**Absolute Encoder Bit 1 Transmit: 5th Axis**
C Bit 224	**Absolute Encoder Bit 1 Transmit: 6th Axis**

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

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

Please refer to the description of 4.7 MLC Window Mechanism.

4.5 S Bits Desctiption

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**
S Bit 026	**5th 1st Axis Point Return End**
S Bit 027	**6th 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**
S Bit 024	**5th 2nd Axis Point Return End**
S Bit 025	**6th 2nd Axis Point Return End**

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

S Bit 028	**SYSTEM ALARM**

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

S Bit 029	**M CODE STROBE**

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

S Bit 030	**INTERPOLATION FINISH**

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

S Bit 031	**SYSTEM ALARM**

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

S Bit 032	**SYSTEM RESET**

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

S Bit 033	**SYSTEM READY**

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

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

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

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

S Bit 039 **STATUS OF PROGRAM RESTART**

When the system is in the status of PROGRAM RESTART, S039 is enabled (S39=ON). When the system finishes processing PROGRAM RESTART, S039 turns to OFF.

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

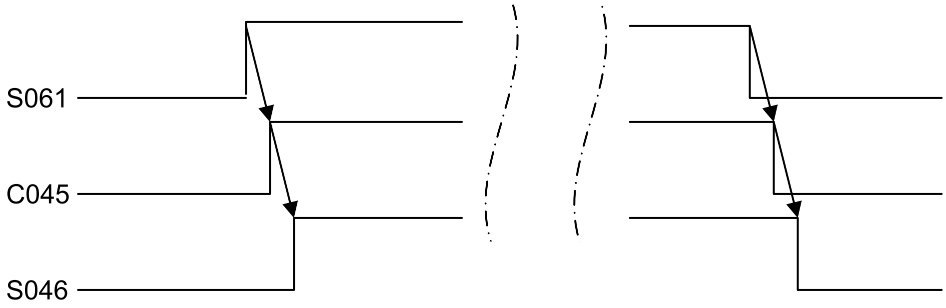
S047 refers to the status of Auxiliary Function Lock (AFL).

S Bit 054	S CODE STROBE

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.

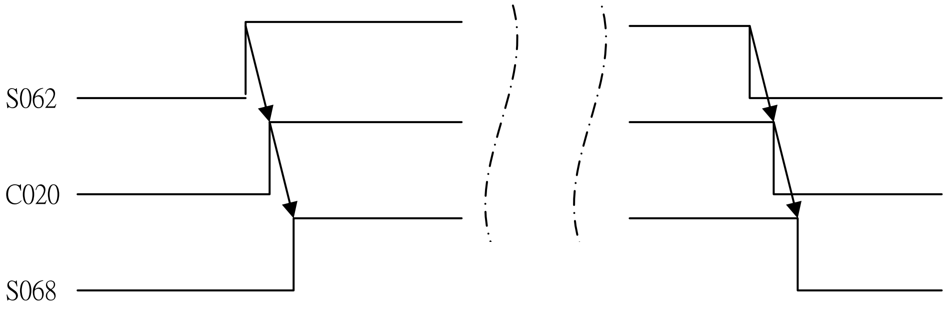
S Bit 061	SOFT PANEL KEY: Z-AXIS NEGLECT

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



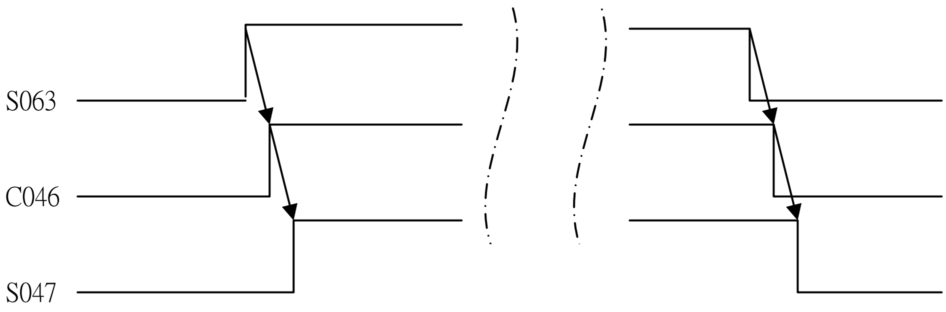
S Bit 062	SOFT KEY: MPG DRY RUN

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**

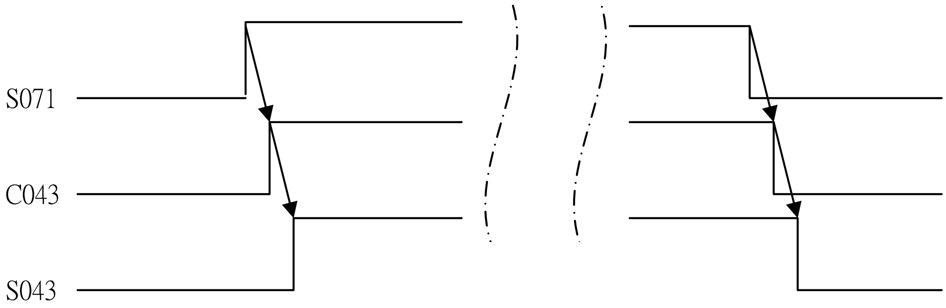
S068 indicates the corresponding status of MPG DRY RUN (MPGDRN).

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**

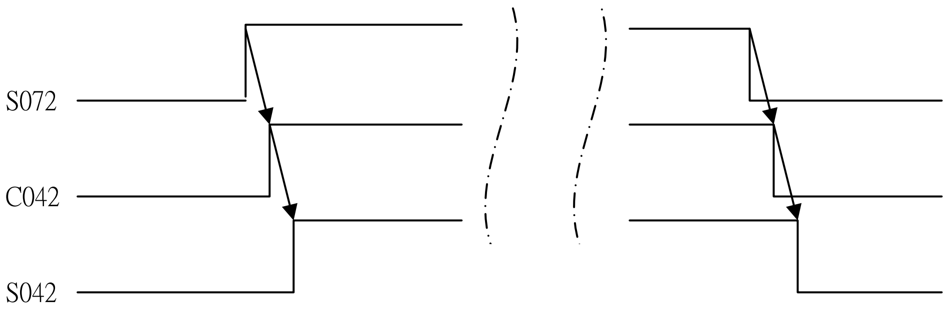
S071 notifies LADDER about the ON/OFF status of MACHINE LOCK key on the soft panel. The timing chart is as below:



S Bit 072

SOFT KEY: DRY RUN

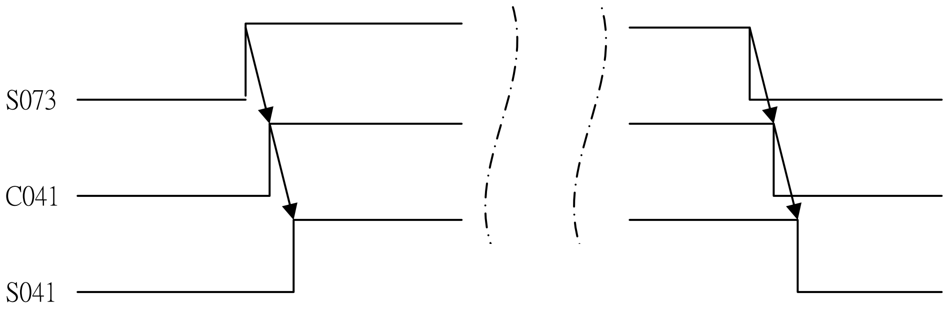
S072 notifies LADDER about the ON/OFF status of DRY RUN key on the soft panel. The timing chart is as below:



S Bit 073

SOFT KEY: OPTIONAL BLOCK SKIP

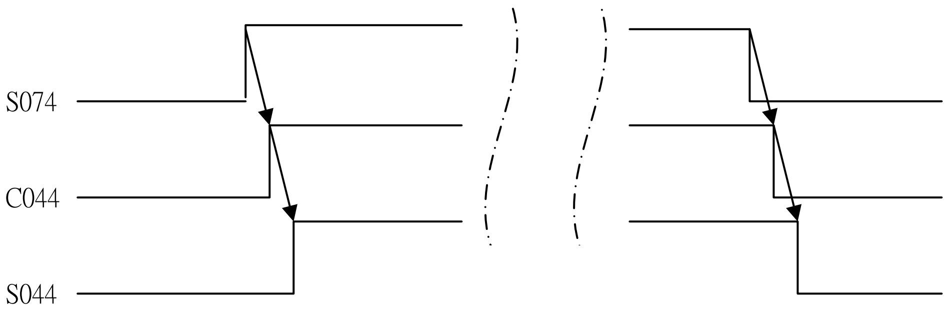
S073 notifies LADDER about the ON/OFF status of OPTIONAL BLOCK SKIP key on the soft panel. The timing chart is as below:



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 088 | **THE 1ST SPINDLE REACHES ROTATION SPEED**

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

S Bit 091 | **STATUS OF G080 IN CANNEL CYCLE**

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

S Bit 092 | **THE 1ST SPINDLE REACHES ZERO SPEED**

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

S Bit 093 | **SPINDLE SWITCHES TO PULSE COMMAND**

NC sends the signal S093 to notify PLC axis to prepare for switching to the position control mode, meanwhile the driver can make corresponding switch.

S Bit 094 | **SPINDLE MOTOR REACHES ROTATION SPEED AFTER GEAR CHANGE**

After the spindle changes the gear and reaches the expected rotation speed, S094 is ON.

S Bit 100	MACRO VARIABLE $600
S Bit 101	MACRO VARIABLE $601
S Bit 102	MACRO VARIABLE $602
S Bit 103	MACRO VARIABLE $603
S Bit 104	MACRO VARIABLE $604
S Bit 105	MACRO VARIABLE $605
S Bit 106	MACRO VARIABLE $606
S Bit 109	MACRO VARIABLE $609
S Bit 112	MACRO VARIABLE $612
S Bit 113	MACRO VARIABLE $613
S Bit 114	MACRO VARIABLE $614
S Bit 115	MACRO VARIABLE $615

S100 ~ S115 are equal to Macro variables $600 ~ $615, which are the output points that MACRO sends to LADDER. For example, set $600 to 1 in MACRO, and UO0 in LADDER will be ON. LADDER can use these MACRO signals to control the system externally.

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
S Bit 135	5th Axis Moving
S Bit 136	6th Axis Moving

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

S Bit 134	Max Working Piece Arrival

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

Application Description:

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

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

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

S Bit 150	SPINDLE GEAR SWITCH: THE 1ST GEAR
S Bit 151	SPINDLE GEAR SWITCH: THE 2ND GEAR
S Bit 152	SPINDLE GEAR SWITCH: THE 3RD GEAR
S Bit 153	SPINDLE GEAR SWITCH: THE 4TH GEAR

When S code is not in the present gear range, the system will send S150 ~ S153 to notify PLC to switch the corresponding gear:
1. S150: Switch the 1st gear of the spindle.
2. S151: Switch the 2nd gear of the spindle.
3. S152: Switch the 3rd gear of the spindle.
4. S153: Switch the 4th gear of the spindle.
The output voltage of the spindle remains unchanged.

S Bit 154	MOTION DIRECTION OF SERVO AXIS: X AXIS
S Bit 155	MOTION DIRECTION OF SERVO AXIS: Y AXIS
S Bit 156	MOTION DIRECTION OF SERVO AXIS: Z AXIS
S Bit 157	MOTION DIRECTION OF SERVO AXIS: THE 4TH AXIS
S Bit 158	MOTION DIRECTION OF SERVO AXIS: THE 5TH AXIS
S Bit 159	MOTION DIRECTION OF SERVO AXIS: THE 6TH AXIS

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

S Bit 201	Enter into Absolute Encoder Data Transmitting Mode:X Axis
S Bit 202	Enter into Absolute Encoder Data Transmitting Mode:Y Axis
S Bit 203	Enter into Absolute Encoder Data Transmitting Mode:Z Axis
S Bit 204	Enter into Absolute Encoder Data Transmitting Mode:4th Axis
S Bit 205	Enter into Absolute Encoder Data Transmitting Mode:5th Axis
S Bit 206	Enter into Absolute Encoder Data Transmitting Mode:6th Axis

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

S Bit 207	Absolute Encoder Data Transmitting:X Axis
S Bit 208	Absolute Encoder Data Transmitting:Y Axis
S Bit 209	Absolute Encoder Data Transmitting:Z Axis
S Bit 210	Absolute Encoder Data Transmitting:4th Axis
S Bit 211	Absolute Encoder Data Transmitting:5th Axis
S Bit 212	Absolute Encoder Data Transmitting:6th Axis

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

S Bit 213	Absolute Encoder Reset:X Axis
S Bit 214	Absolute Encoder Reset:Y Axis
S Bit 215	Absolute Encoder Reset:Z Axis
S Bit 216	Absolute Encoder Reset:4th Axis
S Bit 217	Absolute Encoder Reset:5th Axis
S Bit 218	Absolute Encoder Reset:6th Axis

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

S Bit 079	PLC WINDOW COMPLETED

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

4.6 Register Desctiption

R Bit 001 | **M CODE**

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

R Bit 002 | **S CODE**

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

R Bit 003 | **T CODE**

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

R Bit 004 | **ACTUAL ROTATION SPEED OF THE SPINDLE**

R004 indicates the actual rotation speed of the spindle.

R Bit 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

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

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

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

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

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

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

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

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

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

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

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

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

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

R021 sets the override of PMC axis.

R Bit 022	**PMC AXIS CONTROL**

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

R Bit 024	MOTION COMMAND OF PMC AXIS: X AXIS, mm part
R Bit 025	MOTION COMMAND OF PMC AXIS: X AXIS, μm part
R Bit 026	MOTION COMMAND OF PMC AXIS: Y AXIS, mm part
R Bit 027	MOTION COMMAND OF PMC AXIS: Y AXIS, μm part
R Bit 028	MOTION COMMAND OF PMC AXIS: Z AXIS, mm part
R Bit 029	MOTION COMMAND OF PMC AXIS: Z AXIS, μm part
R Bit 030	PMC Function of 4th-Axis Command Amount, Unit=mm
R Bit 031	PMC Function of 4th-Axis Command Amount, Unit=μm
R Bit 032	PMC Function of 5th-Axis Command Amount, Unit=mm
R Bit 033	PMC Function of 5th-Axis Command Amount, Unit=μm
R Bit 034	PMC Function of 6th-Axis Command Amount, Unit=mm
R Bit 035	PMC Function of 6th-Axis Command Amount, Unit=μm

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

R Bit 040	MLC ALARM
R Bit 041	MLC ALARM
R Bit 042	MLC ALARM
R Bit 043	MLC ALARM
R Bit 044	MLC ALARM
R Bit 045	MLC 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_ MLC.ERR. To clear the MLC alarm, simply set R40 to 0.

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

Please refer to the description of 4.7 MLC Window mechanism.

4.7 MLC Window Function

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

R register definition：

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

R Register	Definition	Remarks
66	Read/Write Value (different depends on R60~R62) R60：1，means Y axis absolute coordinate um part； R60：2，means Y axis machine coordinate um part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
67	Read/Write Value (different depends on R60~R62) R60：1，means Z axis absolute coordinate mm part； R60：2，means Z axis machine coordinate mm part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
68	Read/Write Value (different depends on R60~R62) R60：1，means Z axis absolute coordinate um part； R60：2，means Z axis machine coordinate um part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
69	Read/Write Value (different depends on R60~R62) R60：1，means 4th axis absolute coordinate mm part； R60：2，means 4th axis machine coordinate mm part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
70	Read/Write Value (different depends on R60~R62) R60：1，means 4th axis absolute coordinate um part； R60：2，means 4th axis machine coordinate um part； R60：3，means the present value of the1st macro global variable that is designated by R61 and R62. R60：4，means the value of 1st parameter that is designated by R61 and R62.	Please refer to Attention.
71	Read/Write Value (different depends on R60~R62) R60：1, means 5th axis absolute coordinate mm. R60：2, means 5th axis machine coordinate mm. R60：3, means the present value of the 9th macro global variable that is designated by R61 and R62. R60：4, means the value of 9th parameter that is designated by R61 and R62.	Please refer to Attention.
72	Read/Write Value (different depends on R60~R62) R60：1, means 5th axis absolute coordinate um. R60：2, means 5th axis machine coordinate um. R60：3, means the present value of the 10th macro global variable that is designated by R61 and R62. R60：4, means the value of 10th parameter that is designated by R61 and R62.	Please refer to Attention.

R Register	Definition	Remarks
73	Read/Write Value (different depends on R60~R62) R60：1, means 6th axis absolute coordinate mm. R60：2, means 6th axis machine coordinate mm. R60：3, means the present value of the 11st macro global variable that is designated by R61 and R62. R60：4, means the value of 11th parameter that is designated by R61 and R62.	Please refer to Attention.
74	Read/Write Value (different depends on R60~R62) R60：1, means 6th axis absolute coordinate um. R60：2, means 6th axis machine coordinate um. R60：3, means the present value of the12th macro global variable that is designated by R61 and R62. R60：4, means the value of 12th parameter that is designated by R61 and R62.	Please refer to Attention.

Timing Prodecure 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.

4.8 MLC Initial Setting Description（PLCIO.CFG）

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

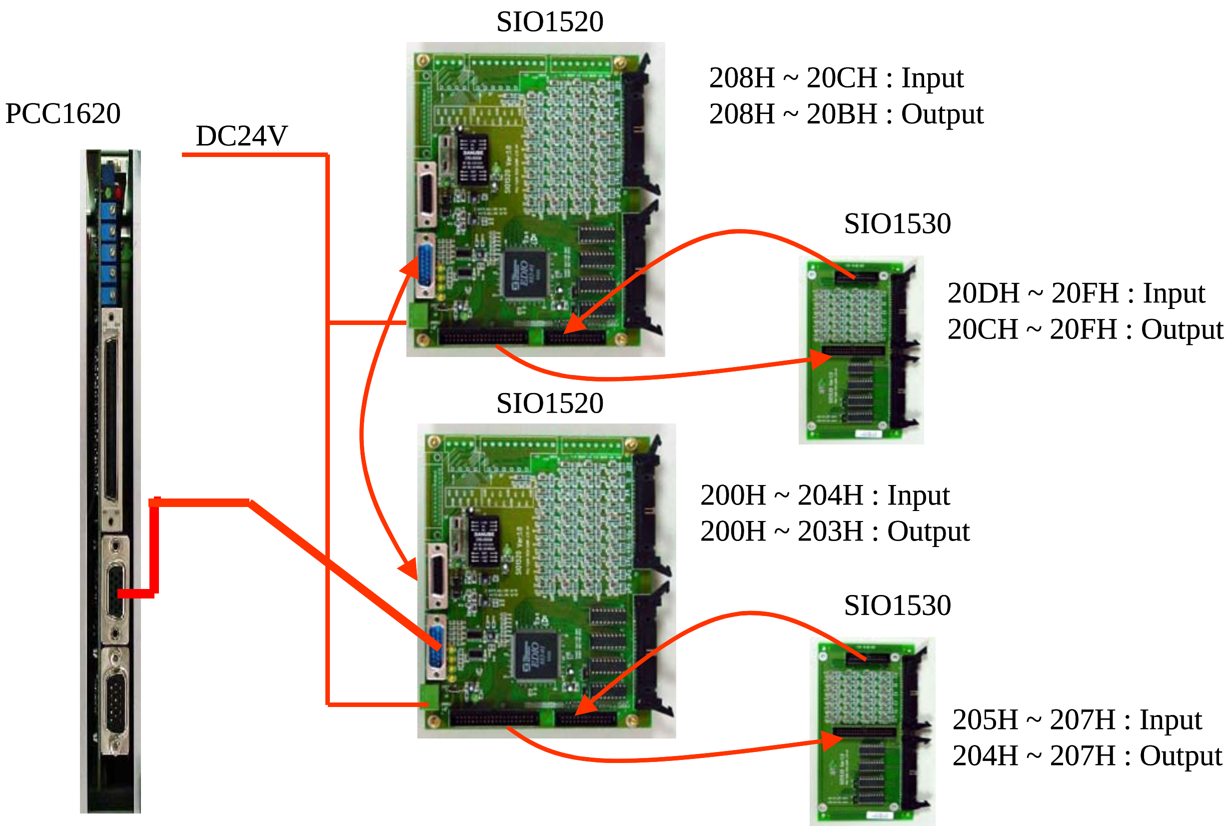
```
InputSignalInverse=0        // I point is reverse turning, 0=No , 1=Yes
OutputSignalInverse=0   // O point is reverse turning, 0=No , 1=Yes
BaseAddress=0x200       // pcc1620 base address
Set1Slave1=1                // whether to use Set1's Slave1, 0=No, 1=Yes
Set1Slave2=0                // whether to use Set1's Slave2, 0=No, 1=Yes
Set2Slave1=1                // whether to use Set2's Slave1, 0=No, 1=Yes
Set2Slave2=0                // whether to use Set2's Slave2, 0=No, 1=Yes
I   0   1   0x200           // column [I or O][NUMBER][SET][ADDRESS][able to add footnot]
I   8   1   0x201           // no empty space in between
I   16  1   0x202           // I or i is okay
I   24  1   0x203           // O or o is okay
I   32  1   0x204           // SET=1means SET1, SET=2 means SET2
I   40  2   0x200           // must starts from I0
O   0   1   0x200           // due to EPCIO factor, O point must be set as even number.
O   16  1   0x202
O   32  2   0x200
O   48  2   0x202
```

（Note）I0 1 0x200

Means the corresponding hardware address (the following explains how to set)

I0 ~ I15 to hardware SET1

means LADDER configures from I0 ~ I15



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 Parameter

Parameters seprated into 7 types: servo parameter, machine parameter, spindle parameter, MPG parameter, compensation parameter, original parameter, and operation parameter.

Note:

1. Four effective times due to different parameter setting values.

   a：Effective immediately

   b：Effective after RESET（R）

   c：Effective after rebooting（⊙）

   d：Effective after re-power on（ㄣ）

2. Two types of authorization status according to each parameter's functions. However, under【End-User】status, some parameter will NOT occur：

   a：End-user

   b：Machine maker

3. Some parameters use Bit method to set whether or not to enable a certain function. Usually, Bit0 corresponds X axis, Bit1 corresponds Y axis, Bit2 corresponds Z axis. The setting method is as below:

   Bit0：1 means 1 in 1, 2, 4, 8, 16, 32 and so on

   Bit1：1 means 2 in 1, 2, 4, 8, 16, 32 and so on；

   Bit2：1 means 4 in 1, 2, 4, 8, 16, 32 and so on；

   Bit3：1 means 8 in 1, 2, 4, 8, 16, 32 and so on；

   Bit4：1 means 12 in 1, 2, 4, 8, 16, 32 and so on；

   So, if want to set a certain Bit to 1, only need to adding up the corresponding value into the parameter. For example, if want to set both Bit1 and Bit3 to 1, the setting value of this parameter is 10（2 + 8）.

5.1 Parameter List

No	Group	Description	Effective	Level	Page
1	Servo	SYSTEM LOOP GAINS FOR V CMD	☉	Machine Maker	**117**
2	Servo	MAX. SERVO LAG OF X AXIS, μm	R	Machine Maker	**118**
3	Servo	MAX. SERVO LAG OF Y AXIS, μm	R	Machine Maker	**118**
4	Servo	MAX. SERVO LAG OF Z AXIS, μm	R	Machine Maker	**118**
5	Servo	MAX. SERVO LAG OF THE 4TH AXIS, μm	R	Machine Maker	**118**
6	Servo	IN-POSITION CHECK WINDOW OF X AXIS, μm	R	Machine Maker	**118**
7	Servo	IN-POSITION CHECK WINDOW OF Y AXIS, μm	R	Machine Maker	**118**
8	Servo	IN-POSITION CHECK WINDOW OF Z AXIS, μm	R	Machine Maker	**118**
9	Servo	IN-POSITION CHECK WINDOW OF THE 4TH AXIS, μm	R	Machine Maker	**118**
10	Servo	G00'S ACCEL./DECEL. TIME OF X AXIS, ms	☉	Machine Maker	**119**
11	Servo	G00'S ACCEL./DECEL. TIME OF Y AXIS, ms	☉	Machine Maker	**119**
12	Servo	G00'S ACCEL./DECEL. TIME OF Z AXIS, ms	☉	Machine Maker	**119**
13	Servo	G00'S ACCEL./DECEL. TIME OF THE 4TH AXIS, ms	☉	Machine Maker	**119**
14	Servo	G01 ACCEL./DECEL. TIME	☉	Machine Maker	**119**
15	MPG	CORRESPONDING MECHANICAL AXIS OF MPG SIMULATED AXIS	☉	Machine Maker	**156**
16	Spindle	ACCEL./DECEL. TIME PER KILO-REV. OF THE 1ST SPINDLE	R	Machine Maker	**134**
18	MPG	MPG RATE	R	Machine Maker	**157**
19	Zero Point	SOLUTIONS WHEN HOME IS ON DOG	R	Machine Maker	**168**
20	Zero Point	DEFAULT SETTING OF HOME RETURN BIT	☉	Machine Maker	**168**
21	Spindle	RPM OF THE 1ST SPINDLE'S ORIENTATION	R	Machine Maker	**134**
24	Servo	CORRESPONDING SERVO AXIS NUMBER OF X AXIS	☉	Machine Maker	**119**
25	Servo	CORRESPONDING SERVO AXIS NUMBER OF Y AXIS	☉	Machine Maker	**119**
26	Servo	CORRESPONDING SERVO AXIS NUMBER OF Z AXIS	☉	Machine Maker	**119**
27	Servo	CORRESPONDING SERVO AXIS NUMBER OF THE 4TH AXIS	☉	Machine Maker	**119**
28	MPG	MPG CONNECTION PORT OF X AXIS	☉	Machine Maker	**158**

No	Group	Description	Effective	Level	Page
29	Spindle	THE CORRESPONDING SERVO AXIS NUMBER OF THE 1ST SPINDLE	⊙	Machine Maker	**134**
30	Zero Point	OFFSET AMOUNT OF HOME RETURN: X AXISμm	R	Machine Maker	**169**
31	Zero Point	OFFSET AMOUNT OF HOME RETURN: Y AXIS μm	R	Machine Maker	**169**
32	Zero Point	OFFSET AMOUNT OF HOME RETURN: Z AXIS μm	R	Machine Maker	**169**
33	Zero Point	OFFSET AMOUNT OF HOME RETURN: THE 4TH AXIS μm	R	Machine Maker	**169**
34	Zero Point	IDLE DURATION FOR X AXIS TO SEARCH FOR ZERO POINT 10ms	R	Machine Maker	**169**
35	Zero Point	IDLE DURATION FOR Y AXIS TO SEARCH FOR ZERO POINT 10ms	R	Machine Maker	**169**
36	Zero Point	IDLE DURATION FOR Z AXIS TO SEARCH FOR ZERO POINT 10ms	R	Machine Maker	**169**
37	Zero Point	IDLE DURATION FOR THE 4TH AXIS TO SEARCH FOR ZERO POINT 10ms	R	Machine Maker	**169**
38	Compensation	BACKLASH COMPENSATION UNIT 0)PULSE 16)μm	⊙	Machine Maker	**159**
39	Operation	CANCEL G92 WHEN G54 ~ G59 CALL	R	User	**189**
40	Servo	G00'S LOWEST OVERRIDE AT F0	R	User	**120**
41	Operation	SYNCHRONIC MOTION OF G00 COMMAND 0)NO 1)YES	R	User	**190**
42	Operation	ANNOTATION TYPE 0) /*...*/ 1) (...)	R	User	**191**
43	Operation	IN-POSITION CHECK MODE OF INTERPOLATION BIT	R	User	**191**
44	Compensation	BACKLASH COMPENSATION AMOUNT OF X AXIS μm	R	Machine Maker	**159**
45	Compensation	BACKLASH COMPENSATION AMOUNT OF Y AXIS μm	R	Machine Maker	**159**
46	Compensation	BACKLASH COMPENSATION AMOUNT OF Z AXIS μm	R	Machine Maker	**159**
47	Compensation	BACKLASH COMPENSATION AMOUNT OF THE 4TH AXIS μm	R	Machine Maker	**159**
48	Zero Point	HOME SEARCH METHOD BIT	⊙	Machine Maker	**170**
49	Spindle	MOTOR'S TOOTH NUMBER OF THE 1ST SPINDLE IN 1ST GEAR	⊙	Machine Maker	**135**
50	Spindle	THE 1ST SPINDLE'S TEETH NUMBER IN 1ST GEAR	⊙	Machine Maker	**135**
51	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 2ND GEAR	⊙	Machine Maker	**136**
52	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE IN 2ND GEAR	⊙	Machine Maker	**136**
53	Servo	ENCODER FEEDBACK MULTIPLIER OF THE 4TH AXIS 1/2/4	⊙	Machine Maker	**120**
54	Servo	ENCODER FEEDBACK MULTIPLIER OF X AXIS 1/2/4	⊙	Machine Maker	**120**
55	Servo	ENCODER FEEDBACK MULTIPLIER OF Y AXIS 1/2/4	⊙	Machine Maker	**120**
56	Servo	ENCODER FEEDBACK MULTIPLIER OF Z AXIS 1/2/4	⊙	Machine Maker	**120**
57	Spindle	FEEDBACK RATE OF THE 1ST SPINDLE	⊙	Machine Maker	**137**

No	Group	Description	Effective	Level	Page
62	Machine	UNIT OF Pr.0104 ~ Pr.0107 0) METRIC 1) IMPERIAL	⊙	Machine Maker	**132**
63	Operation	SET RELATIVE COORDINATES ACCORDING TO ABSOLUTE COORIDNATES 0)NO 1)YES	R	User	**191**
64	Zero Point	HOME DOG SENSOR IS 0)NC 1)NO	⊙	Machine Maker	**170**
65	Servo	ABSOLUTE ENCODER (BIT)	⊙	Machine Maker	**121**
66	Servo	SET THE 4TH AXIS AS A 0)RATORY 1)LINEAR AXIS	⊙	Machine Maker	**121**
68	Machine	TOOTH NUMBER OF X AXIS MOTOR (DENOMINATOR IN GEAR RATIO)	⊙	Machine Maker	**132**
69	Machine	TOOTH NUMBER OF Y AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)	⊙	Machine Maker	**132**
70	Machine	TOOTH NUMBER OF Z AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)	⊙	Machine Maker	**132**
71	Operation	PATH CHECK G22 ADOPTS 0)OUTSIDE 1)INSIDE	R	User	**192**
72	Machine	TOOTH NUMBER OF THE 4TH AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)	⊙	Machine Maker	**132**
73	Operation	ACCELERATION/DECELERATION OF G31 0)NO 1)YES	⊙	Machine Maker	**192**
74	Operation	EXECUTE SINGLE BLOCK OF MACRO	R	User	**192**
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	**171**
77	Zero Point	G00 1)DISABLED 0) 1)EFFECTIVE	R	User	**171**
78	Operation	CUTTING LAG OF C AXIS 0)NO 122)YES	⊙	User	**193**
79	Zero Point	X AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG	R	Machine Maker	**172**
80	Zero Point	Y AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG	R	Machine Maker	**172**
81	Zero Point	Z AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG	R	Machine Maker	**172**
82	Zero Point	THE 4TH AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG	R	Machine Maker	**172**
83	Operation	G00 IS 0)DISABLED 1)EFFECTIVE IN DRY RUN	R	User	**193**
84	Spindle	THE 1ST SPINDLE ORIENTATION 0)SENSOR 1)ENCODER	R	Machine Maker	**137**
85	Servo	MAX. SERVO LAG: X100 BIT	R	Machine Maker	**121**
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	**194**
90	Spindle	THE 1ST SPINDLE DISPLAYS 0)COMMAND 1) SENSOR		Machine Maker	**138**

No	Group	Description	Effective	Level	Page
94	Operation	EDIBILITY OF 09XXX 0)NO 1)YES		Machine Maker	**194**
95	Spindle	MIN SPEED OF 1RD SPINDLE	R	Machine Maker	**138**
98	Spindle	VOLTAGE COMMAND'S OFFSET VALUE OF THE 1ST SPINDLE'S RPM	R	Machine Maker	**139**
100	Machine	BALL SCREW'S TOOTH NUMBER OF X AXIS (NUMERATOR IN GEAR RATIO)	⊙	Machine Maker	**133**
101	Machine	BALL SCREW'S TOOTH NUMBER OF Y AXIS (NUMERATOR IN GEAR RATIO)	⊙	Machine Maker	**133**
102	Machine	BALL SCREW'S TOOTH NUMBER OF Z AXIS (NUMERATOR IN GEAR RATIO)	⊙	Machine Maker	**133**
103	Machine	BALL SCREW'S TOOTH NUMBER OF THE 4TH AXIS (NUMERATOR IN GEAR RATIO)	⊙	Machine Maker	**133**
104	Machine	BALL SCREW PITCH. OF X AXIS	⊙	Machine Maker	**133**
105	Machine	BALL SCREW PITCH. OF Y AXIS	⊙	Machine Maker	**133**
106	Machine	BALL SCREW PITCH. OF Z AXIS	⊙	Machine Maker	**133**
107	Machine	BALL SCREW PITCH. OF THE 4TH AXIS	⊙	Machine Maker	**133**
108	Servo	RPM TO VOLTAGE RATIO FOR X AXIS RPM/1V	⊙	Machine Maker	**122**
109	Servo	RPM TO VOLTAGE RATIO FOR Y AXIS RPM/1V	⊙	Machine Maker	**122**
110	Servo	RPM TO VOLTAGE RATIO FOR Z AXIS RPM/1V	⊙	Machine Maker	**122**
111	Servo	RPM TO VOLTAGE RATIO FOR THE 4TH AXIS RPM/1V	⊙	Machine Maker	**122**
112	Compensation	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF X AXIS	⊙	Machine Maker	**160**
113	Compensation	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Y AXIS	⊙	Machine Maker	**160**
114	Compensation	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Z AXIS	⊙	Machine Maker	**160**
115	Compensation	TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF THE 4TH AXIS	⊙	Machine Maker	**160**
116	Servo	REVERSE MOTION DIRECTRION OF SERVO AXIS BIT	⊙	Machine Maker	**122**
117	Compensation	BACKLASH COMPENSATION FUNCTION BIT	R	Machine Maker	**160**
118	Compensation	DIRECTION OF PITCH ERROR COMPENSATION BIT	⊙	Machine Maker	**161**
119	Compensation	PITCH ERROR COMPENSATION FUNCTION BIT	⊙	Machine Maker	**161**
120	Zero Point	DIRECTION OF HOME RETURN FOR EACH AXIS BIT	⊙	Machine Maker	**172**
121	Operation	G76/G87 TOOL ESCAPE DIRECTION IN CANNED CYCLE	R	User	**194**
122	Operation	NAME THE 4TH AXIS (ABCUVW)	⊙	Machine Maker	**195**

No	Group	Description	Effective	Level	Page
123	Operation	UNIT SYSTEM 0)G21 METRIC 1)G20 IMPERIAL	⊙	User	**195**
124	Operation	INITIAL MOTION COMMAND 0)G00 1)G01	⊙	User	**195**
129	Operation	G02 G03 TOLERANCE OF COMMAND ERROR	R	User	**196**
130	Operation	UNIT OF INPUT VALUE	R	User	**196**
131	Operation	CUTTER COMPENSATION TYPE 0)A 1)B	R	Machine Maker	**196**
134	Operation	G83/G87 TOOL RETRACTION 0)START POINT 1)R POINT	R	User	**197**
135	Operation	DEFAULT COORDINATES 0)ABSOLUTE G90 1)INCREMENTAL G91	⊙	User	**197**
136	Operation	REDUCTION/ENLARGEMENT RATIO OF X AXIS 0)DISABLED 1)ENABLED	R	User	**197**
137	Operation	REDUCTION/ENLARGEMENT RATIO OF Y AXIS 0)DISABLED 1)ENABLED	R	User	**197**
138	Operation	REDUCTION/ENLARGEMENT RATIO OF Z AXIS 0)DISABLED 1)ENABLED	R	User	**197**
139	Operation	CUTTER COMPENSATION CODE 0)H 1)D	R	User	**197**
140	Operation	GLOBAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED	R	User	**198**
141	Operation	LOCAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED	R	User	**198**
142	Operation	ROTARY ANGLE OF COORDINATES COMMAND IS 0)ABSOLUTE 1)INCREMENTAL	R	User	**198**
143	Operation	ENLARGEMENT RATIO	R	User	**199**
145	Operation	DEFAULT PLANE 0)XY 1)ZX 2)YZ	⊙	Machine Maker	**199**
146	Operation	M CODE FOR MACRO O9001	R	Machine Maker	**199**
147	Operation	M CODE FOR MACRO O9002	R	Machine Maker	**199**
148	Operation	M CODE FOR MACRO O9003	R	Machine Maker	**199**
149	Operation	DEFAULT FEED RATE	⊙	User	**199**
150	Operation	TOOL ESCAPE AMOUNT IN DRILLING CYCLE	R	User	**200**
152	Operation	ROTARY PATH OF THE 4TH AXIS	R	User	**201**
155	Operation	FEEDRATE IS MM/REV OR MM/MIN	⊙	User	**201**
156	Servo	COMMAND TYPE OF X AXIS 0)AB 1)CW 2)PD 3)V	⊙	Machine Maker	**123**
157	Servo	COMMAND TYPE OF Y AXIS 0)AB 1)CW 2)PD 3)V	⊙	Machine Maker	**123**
158	Servo	COMMAND TYPE OF Z AXIS 0)AB 1)CW 2)PD 3)V	⊙	Machine Maker	**123**
159	Servo	COMMAND TYPE OF THE 4TH AXIS 0)AB 1)CW 2)PD 3)V	⊙	Machine Maker	**123**
161	Operation	M CODE FOR MACRO O9004	R	Machine Maker	**202**
162	Operation	M CODE FOR MACRO O9005	R	Machine Maker	**202**

No	Group	Description	Effective	Level	Page
163	Operation	M CODE FOR MACRO O9006	R	Machine Maker	**202**
164	Operation	M CODE FOR MACRO O9007	R	Machine Maker	**202**
165	Operation	M CODE FOR MACRO O9008	R	Machine Maker	**202**
166	Operation	G CODE FOR MACRO O9010	R	Machine Maker	**202**
167	Operation	G CODE FOR MACRO O9011	R	Machine Maker	**202**
168	Operation	G CODE FOR MACRO O9012	R	Machine Maker	**202**
169	Operation	T CODE CALLS O9020	R	Machine Maker	**202**
170	Operation	UPDATE MODAL AFTER SWITCH FROM MDI TO MEM 0)YES 1)NO	R	User	**202**
171	Spindle	INVERSE OF THE SPINDLE'S FEEDBACK SIGNAL BIT	⊙	Machine Maker	**140**
172	Servo	G00 ACCEL./DECEL. TYPE 1)LINE 2) CURVE	⊙	Machine Maker	**124**
173	Servo	G01 ACC. TYPE 0)LINE 1)S CURVE	⊙	Machine Maker	**125**
175	Zero Point	HOME DOG I POINT 0)LOCAL 1)REMOTE	⊙	Machine Maker	**173**
176	Operation	G31 SIGNAL SOURCE (HS1/HS2)	R	Machine Maker	**203**
177	Operation	G31 SIGNAL SOURCE TYPE 0)NC 1)NO	R	Machine Maker	**203**
178	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 3RD GEAR	⊙	Machine Maker	**140**
179	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE IN 3RD GEAR	⊙	Machine Maker	**141**
180	Operation	MANUAL RETURN	R	User	**203**
181	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE'S MOTOR IN 4TH GEAR	⊙	Machine Maker	**141**
182	Spindle	TOOTH NUMBER OF THE 1ST SPINDLE IN 4TH GEAR	⊙	Machine Maker	**142**
183	Spindle	COMMAND TYPE OF THE 1ST SPINDLE'S SPEED	⊙	Machine Maker	**143**
184	Spindle	LOCAL INPUT OF THE 1ST SPINDLE'S ORIENTATION	R	Machine Maker	**144**
185	Servo	INVERSE FEEDBACK SIGNAL OF SERVO AXIS BIT	⊙	Machine Maker	**126**
187	Operation	AUTO ARC FEED RATE CLAMP 0)NO 1)YES	R	User	**205**
188	Servo	POSITION LOOP GAIN OF SERVO AXIS IN PULSE COMMAND 1/sec.	R	Machine Maker	**126**
189	Spindle	DEFAULT INITIAL SPEED OF THE 1ST SPINDLE	⊙	User	**144**
190	Spindle	POSITION COMMAND TYPE OF THE 1ST SPINDLE	R	Machine Maker	**145**
191	Servo	ENCORDER SIGNAL TYPE OF X AXIS	⊙	Machine Maker	**127**
192	Servo	ENCORDER SIGNAL TYPE OF Y AXIS	⊙	Machine Maker	**127**

No	Group	Description	Effective	Level	Page
193	Servo	ENCORDER SIGNAL TYPE OF Z AXIS	⊙	Machine Maker	**127**
194	Servo	ENCORDER SIGNAL TYPE OF THE 4TH AXIS	⊙	Machine Maker	**127**
195	Spindle	SIGNAL TYPE OF THE 1ST SPINDLE'S ENCODER	⊙	Machine Maker	**146**
200	Operation	FEEDRATE DISPLAY 0)COMMAND 1)ACTUAL FEEDBACK	R	User	**205**
202	Operation	OPERATION LANGUAGE 0)ENGLISH 1)TRADITIONAL CHINESE 2)SIMPLIFIED CHINESE	⊙	User	**206**
204	Zero Point	ZERO POINT RECORDED BY NC BIT	R	Machine Maker	**174**
205	Operation	TOOL COMPENSATION 0)ABSOLUTE 1) RELATIVE INPUT	R	User	**206**
208	Zero Point	LINEAR SCALE WITH MULTIPLE REFERENCE MARKS	⊙	Machine Maker	**175**
209	Zero Point	MANUAL HOME RETURN BY A LINEAR SCALE WITH MULTIPLE REFERENCE MARKS	R	Machine Maker	**175**
210	Zero Point	ZERO POINT'S RELATIVE DIRECTIONS TO THE LINEAR SCALE WITH MULTIPLE REFERENCE MARKS	R	Machine Maker	**176**
211	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
212	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
213	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
214	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
215	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
216	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
217	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
218	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
219	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
220	Operation	STOP PRE-INTERPRETATION OF M CODE	R	User	**206**
221	Operation	DIGITAL FILTER FREQUENCY (KHZ)	⊙	Machine Maker	**207**
223	Operation	SELECT AXIS MANUAL RETURN (BIT)	R	Machine Maker	**207**
224	Spindle	THE 2ND SPINDLE REACHES RPM 0)ACTUAL SPEED 2) COMMAND	R	Machine Maker	**148**
225	Spindle	THE 3RD SPINDLE REACHES RPM 0)ACTUAL SPEED 2) COMMAND	R	Machine Maker	**148**
226	Spindle	INVERSE OUTPUT COMMAND OF THE SPINDLE BIT	⊙	Machine Maker	**146**
227	Operation	ENABLE A AXIS TANGENT FOLLOW	⊙	User	**208**

No	Group	Description	Effective	Level	Page
228	Operation	ENABLE A AXIS PATH FOLLOWING	⊙	User	**208**
229	Operation	ENABLE B AXIS TANGENT FOLLOW	⊙	User	**208**
230	Operation	ENABLE B AXIS PATH FOLLOWING	⊙	User	**208**
231	Operation	HIDE INFORMATION OF X AXIS		Machine Maker	**209**
232	Operation	HIDE INFORMATION OF Y AXIS		Machine Maker	**209**
233	Operation	HIDE INFORMATION OF Z AXIS		Machine Maker	**209**
234	Operation	HIDE INFORMATION OF THE 4TH AXIS		Machine Maker	**209**
235	Operation	AXIS 5TH INFORMATION HIDE		Machine Maker	**209**
236	Operation	AXIS 6TH INFORMATION HIDE		Machine Maker	**209**
240	Spindle	CLOSE LOOP GAIN OF THE 1ST SPINDLE’S ORIENTATION	R	Machine Maker	**146**
241	Spindle	CLOSE LOOP GAIN OF THE 1ST SPINDLE DURING RIGID TAPPING	R	Machine Maker	**146**
248	Spindle	UNIT OF OFFSET AMOUNT FOR THE 1ST SPINDLE’S ORIENTATION	⊙	Machine Maker	**147**
249	Operation	DISPLAY ABNORMALITY OF RAMDISK 0)OFF 1)ON	⊙	Machine Maker	**209**
250	Servo	MAX FOLLOWING ERROR 5TH AXIS μm	R	Machine Maker	**118**
251	Servo	MAX FOLLOWING ERROR 6TH AXIS μm	R	Machine Maker	**118**
252	Servo	5TH IN-POS WINDOWS BOUND μm	R	Machine Maker	**118**
253	Servo	6TH IN-POS WINDOWS BOUND μm	R	Machine Maker	**118**
254	Servo	G00 5TH ACC/DEC TIME	⊙	Machine Maker	**119**
255	Servo	G00 6TH ACC/DEC TIME	⊙	Machine Maker	**119**
256	Servo	CHANNEL NO FOR 5 AXIS	⊙	Machine Maker	**119**
257	Servo	CHANNEL NO FOR 6 AXIS	⊙	Machine Maker	**119**
258	Servo	FEEDBACK MUL FACTOR.5TH	⊙	Machine Maker	**120**
259	Servo	FEEDBACK MUL FACTOR.6TH	⊙	Machine Maker	**120**
260	Servo	5TH AXIS LINEAR/ROTARY TYPE	⊙	Machine Maker	**121**
261	Servo	6TH AXIS LINEAR/ROTARY TYPE	⊙	Machine Maker	**121**
262	Servo	MORTOR GAINS.5TH	⊙	Machine Maker	**122**
263	Servo	MORTOR GAINS.6TH	⊙	Machine Maker	**122**
264	Servo	CONTROL CMD FORMAT OF 5	⊙	Machine Maker	**123**

No	Group	Description	Effective	Level	Page
265	Servo	CONTROL CMD FORMAT OF 6	⊙	Machine Maker	**123**
266	Servo	ENCODER SIGNALE TYPE.5TH	⊙	Machine Maker	**127**
267	Servo	ENCODER SIGNALE TYPE.6TH	⊙	Machine Maker	**127**
268	Servo	RANGE.5TH FOR EXACT REACH μm	R	Machine Maker	**127**
269	Servo	RANGE.6TH FOR EXACT REACH μm	R	Machine Maker	**127**
270	Machine	DENOMINATOR GEAR RATIO.5	⊙	Machine Maker	**132**
271	Machine	DENOMINATOR GEAR RATIO.6	⊙	Machine Maker	**132**
272	Machine	NUMERATOR OF GEAR RATION.5	⊙	Machine Maker	**133**
273	Machine	NUMERATOR OF GEAR RATION.6	⊙	Machine Maker	**133**
274	Machine	SCREW PITCH.5	⊙	Machine Maker	**133**
275	Machine	SCREW PITCH.6	⊙	Machine Maker	**133**
276	MPG	MPG 5TH PORT	⊙	Machine Maker	**158**
277	MPG	MPG 6TH PORT	⊙	Machine Maker	**158**
278	Compensation	5TH BACKLASH μm	R	Machine Maker	**159**
279	Compensation	6TH BACKLASH μm	R	Machine Maker	**159**
280	Compensation	NUM.SECS OF 5TH.PICTH COMP	⊙	Machine Maker	**160**
281	Compensation	NUM.SECS OF 6TH.PICTH COMP	⊙	Machine Maker	**160**
282	Zero Point	OFFSET LENGTH OF 5.ORG μm	R	Machine Maker	**169**
283	Zero Point	OFFSET LENGTH OF 6.ORG μm	R	Machine Maker	**169**
284	Zero Point	PAUSE TIME.5 HOME SERACHING	R	Machine Maker	**169**
285	Zero Point	PAUSE TIME.6 HOME SERACHING	R	Machine Maker	**169**
286	Zero Point	ORG.5 AHEAD/BEHIND OF DOG	R	Machine Maker	**172**
287	Zero Point	ORG.6 AHEAD/BEHIND OF DOG	R	Machine Maker	**172**
288	Operation	NAME OF AXIX.5	⊙	Machine Maker	**195**
289	Operation	NAME OF AXIX.6	⊙	Machine Maker	**195**
290	Operation	5TH AXIS OPTIMAL	R	User	**213**
291	Operation	6TH AXIS OPTIMAL	R	User	**213**
292	Operation	CUTTING ROUTE LAG OF C AXIS 0)NO 1)YES	⊙	User	**193**

No	Group	Description	Effective	Level	Page
293	Zero Point	REFERENCE OF SERVO AXIS'S ZERO POINT	⊙	Machine Maker	**176**
294	Spindle	THE CORRESPONDING SERVO AXIS NUMBER OF THE 2ND SPINDLE	⊙	Machine Maker	**134**
295	Spindle	THE CORRESPONDING SERVO AXIS NUMBER OF THE 3RD SPINDLE	⊙	Machine Maker	**134**
296	Spindle	COMMAND TYPE OF THE 2ND SPINDLE'S SPEED	⊙	Machine Maker	**143**
297	Spindle	COMMAND TYPE OF THE 3RD SPINDLE'S SPEED	⊙	Machine Maker	**143**
298	Spindle	RPM REACHES SET RANGE OF THE 2ND SPINDLE	R	Machine Maker	**148**
299	Spindle	THE 2ND SPINDLE REACHES ZERO SPEED RPM	R	Machine Maker	**150**
300	Compensation	PITCH ERROR COMPENSATION OF 001 SESSION OF X AXIS μm	R	Machine Maker	**162**
349	Compensation	PITCH ERROR COMPENSATION OF 050 SESSION OF X AXIS μm	R	Machine Maker	**162**
350	Operation	JOG FEED RATE IN REFERENCE TO F CODE OF MDI	R	User	**209**
351	Operation	UNIT OF CUTTING OVERRIDE FEED RATE	⊙	Machine Maker	**209**
352	Operation	UNIT OF JOG OVERRIDE	⊙	Machine Maker	**210**
353	Operation	UNIT OF RAPID TRAVERSDE OVERRIDE	⊙	Machine Maker	**210**
354	Spindle	OVERRIDE UNIT OF THE 1ST SPINDLE'S RPM	⊙	Machine Maker	**147**
355	Spindle	OVERRIDE UNIT OF THE 2ND SPINDLE'S RPM	⊙	Machine Maker	**147**
356	Spindle	OVERRIDE UNIT OF THE 3RD SPINDLE'S RPM	⊙	Machine Maker	**147**
358	Compensation	THERMAL COMPENSATION FUNCTION 0)ON 1)OFF	⊙	Machine Maker	**162**
359	Compensation	MAX. THERMAL COMPENSATION INPUT AMOUNT		Machine Maker	**162**
360	Operation	SET OPERATION SCREEN COLOR (0~3)	⊙	User	**210**
361	Operation	SET THE NUMBER FOR BLACK (0~16)	⊙	User	**211**
362	Operation	SET THE NUMBER FOR BLUE (0~16)	⊙	User	**211**
363	Operation	SET THE NUMBER FOR GREEN (0~16)	⊙	User	**211**
364	Operation	SET THE NUMBER FOR CYAN (0~16)	⊙	User	**211**
365	Operation	SET THE NUMBER FOR RED (0~16)	⊙	User	**211**
366	Operation	SET THE NUMBER FOR PURPLE (0~16)	⊙	User	**211**
367	Operation	SET THE NUMBER FOR BROWN (0~16)	⊙	User	**211**
368	Operation	SET THE NUMBER FOR WHITE (0~16)	⊙	User	**211**
369	Operation	SET THE NUMBER FOR GRAY (0~16)	⊙	User	**211**
370	Operation	SET THE NUMBER FOR LIGHT BLUE (0~16)	⊙	User	**211**
371	Operation	SET THE NUMBER FOR LIGHT GREEN (0~16)	⊙	User	**211**
372	Operation	SET THE NUMBER FOR LIGHT CYAN (0~16)	⊙	User	**211**

No	Group	Description	Effective	Level	Page
373	Operation	SET THE NUMBER FOR LIGHT RED (0~16)	⊙	User	**211**
374	Operation	SET THE NUMBER FOR LIGHT PURPLE (0~16)	⊙	User	**211**
375	Operation	SET THE NUMBER FOR BLACK COLOR (0~16)	⊙	User	**211**
376	Operation	SET THE NUMBER FOR BRIGHT WHITE COLOR (0~16)	⊙	User	**211**
377	Operation	SET THE NUMBER FOR CURSOR (0~16)	⊙	User	**211**
378	Operation	SET THE NUMBER FOR HIGHLIGHT (0~16)	⊙	User	**211**
379	Operation	SET THE NUMBER FOR UPPER FRAME (0~16)	⊙	User	**211**
380	Operation	SET THE NUMBER FOR LOWER FRAME (0~16)	⊙	User	**211**
393	Spindle	GEAR CHANGE OF THE 1ST SPINDLE 0)AUTO 1)MANUAL	⊙	Machine Maker	**147**
394	Operation	SCREENSAVER WAIT TIME	⊙	User	**211**
450	Compensation	PITCH ERROR COMPENSATION OF 001 SESSION OF Y AXIS μm	R	Machine Maker	**163**
499	Compensation	PITCH ERROR COMPENSATION OF 050 SESSION OF Y AXIS μm	R	Machine Maker	**163**
600	Compensation	PITCH ERROR COMPENSATION OF 001 SESSION OF Z AXIS μm	R	Machine Maker	**163**
649	Compensation	PITCH ERROR COMPENSATION OF 050 SESSION OF Z AXIS μm	R	Machine Maker	**163**
650	Operation	PROGRAM RESTART DEFINITION		User	**212**
663	Spindle	ACCEL./DECEL. TIME OF THE 1ST SPINDLE'S ORIENTATION	⊙	Machine Maker	**147**
664	Spindle	MOTOR'S TOOTH NUMBER OF THE 2ND SPINDLE IN 1ST GEAR	⊙	Machine Maker	**135**
665	Spindle	THE 2ND SPINDLE'S TEETH NUMBER IN 1ST GEAR	⊙	Machine Maker	**135**
666	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 2ND GEAR	⊙	Machine Maker	**136**
667	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE IN 2ND GEAR	⊙	Machine Maker	**136**
668	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 3RD GEAR	⊙	Machine Maker	**140**
669	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE IN 3RD GEAR	⊙	Machine Maker	**141**
670	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE'S MOTOR IN 4TH GEAR	⊙	Machine Maker	**141**
671	Spindle	TOOTH NUMBER OF THE 2ND SPINDLE IN 4TH GEAR	⊙	Machine Maker	**142**
672	Spindle	MOTOR'S TOOTH NUMBER OF THE 3RD SPINDLE IN 1ST GEAR	⊙	Machine Maker	**135**
673	Spindle	THE 3RD SPINDLE'S TEETH NUMBER IN 1ST GEAR	⊙	Machine Maker	**135**
674	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 2ND GEAR	⊙	Machine Maker	**136**
675	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE IN 2ND GEAR	⊙	Machine Maker	**136**

No	Group	Description	Effective	Level	Page
676	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 3RD GEAR	⊙	Machine Maker	140
677	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE IN 3RD GEAR	⊙	Machine Maker	141
678	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE'S MOTOR IN 4TH GEAR	⊙	Machine Maker	141
679	Spindle	TOOTH NUMBER OF THE 3RD SPINDLE IN 4TH GEAR	⊙	Machine Maker	142
750	Compensation	PITCH ERROR COMPENSATION OF 001 SESSION OF THE 4TH AXIS μm	R	Machine Maker	163
799	Compensation	PITCH ERROR COMPENSATION OF 050 SESSION OF THE 4TH AXIS μm	R	Machine Maker	163
800	Servo	G00'S IN-POSITION CHECK WINDOW OF X AXIS, μm	R	Machine Maker	127
801	Servo	G00'S IN-POSITION CHECK WINDOW OF Y AXIS, μm	R	Machine Maker	127
802	Servo	G00'S IN-POSITION CHECK WINDOW OF Z AXIS, μm	R	Machine Maker	127
803	Servo	G00'S IN-POSITION CHECK WINDOW OF THE 4TH AXIS, μm	R	Machine Maker	127
806	Operation	MAXIMUM OFFSET TOLERANCE OF CORNER μm	R	User	212
808	Operation	CORNER DECELERATION FUNCTION	R	User	212
809	Operation	SPIKE OFFSET TOLERANCE μm	R	User	212
810	Operation	G101 ~ G105 RIGID TAPPING	R	User	213
811	Compensation	BALL BAR COMPENSATION G CODE 0)G2 G3 1) ALL	R	Machine Maker	164
812	Compensation	REVERSAL SPIKE COMPENSATION: ＋X	R	Machine Maker	164
813	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: ＋X	R	Machine Maker	164
814	Compensation	REVERSAL SPIKE LAG COMPENSATION: ＋X	R	Machine Maker	165
815	Compensation	REVERSAL SPIKE COMPENSATION: －X	R	Machine Maker	165
816	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: －X	R	Machine Maker	165
817	Compensation	REVERSAL SPIKE LAG COMPENSATION: －X	R	Machine Maker	166
818	Compensation	REVERSAL SPIKE COMPENSATION: ＋Y	R	Machine Maker	164
819	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: ＋Y	R	Machine Maker	164
820	Compensation	REVERSAL SPIKE LAG COMPENSATION: ＋Y	R	Machine Maker	165
825	Compensation	REVERSAL SPIKE COMPENSATION: －Y	R	Machine Maker	165
826	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: －Y	R	Machine Maker	165
827	Compensation	REVERSAL SPIKE LAG COMPENSATION: －Y	R	Machine Maker	166
828	Compensation	REVERSAL SPIKE COMPENSATION: ＋Z	R	Machine Maker	164

No	Group	Description	Effective	Level	Page
829	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: ＋Z	R	Machine Maker	**164**
830	Compensation	REVERSAL SPIKE LAG COMPENSATION: ＋Z	R	Machine Maker	**165**
831	Compensation	REVERSAL SPIKE COMPENSATION: －Z	R	Machine Maker	**165**
832	Compensation	DURATION OF REVERSAL SPIKE COMPENSATION: －Z	R	Machine Maker	**165**
833	Compensation	REVERSAL SPIKE LAG COMPENSATION: －Z	R	Machine Maker	**166**
834	Zero Point	READING DURATION OF ABSOLUTE ENCODER	R	Machine Maker	**177**
839	Spindle	TOLERANCE OF THE 1ST SPINDLE DURING ORIENTATION	R	Machine Maker	**148**
845	Servo	X AXIS IS A 0)LINEAR 1)ROTARY AXIS	⊙	Machine Maker	**128**
846	Servo	Y AXIS IS A 0)LINEAR 1)ROTARY AXIS	⊙	Machine Maker	**128**
847	Servo	Z AXIS IS A 0)LINEAR 1)ROTARY AXIS	⊙	Machine Maker	**128**
848	Operation	ROTARY PATH PROCESS OF X AXIS	R	User	**213**
849	Operation	ROTARY PATH PROCESS OF Y AXIS	R	User	**213**
850	Operation	ROTARY PATH PROCESS OF Z AXIS	R	User	**213**
874	Spindle	THE 1ST SPINDLE REACHES RPM 0)ACTUAL SPEED 2) COMMAND	R	Machine Maker	**148**
875	Spindle	PRESET INITIAL SPEED OF THE 2nd SPINDLE	⊙	User	**144**
876	Spindle	MAX. RPM OF THE 2nd SPINDLE	R	Machine Maker	**138**
877	Spindle	MIN. RPM OF THE 2nd SPINDLE	R	Machine Maker	**138**
878	Spindle	INITIAL RPM OF THE 3RD SPINDLE	⊙	User	**138**
879	Spindle	MAX. RPM OF THE 3RD SPINDLE	R	Machine Maker	**138**
880	Spindle	MIN. RPM OF THE 3RD SPINDLE	R	Machine Maker	**138**
881	Spindle	RPM REACHES SET RANGE OF THE 3RD SPINDLE	R	Machine Maker	**148**
882	Spindle	THE 3RD SPINDLE REACHES ZERO SPEED RPM	R	Machine Maker	**150**
883	Spindle	CORRESPONDING RPM OF THE 2nd SPINDLE MOTOR'S INPUT VOLTAGE 10V	R	Machine Maker	**138**
884	Spindle	VOLTAGE COMMAND'S OFFSET VALUE OF THE 2ND SPINDLE'S RPM	R	Machine Maker	**139**
885	Spindle	ACCEL./DECEL. TIME PER KILO-REV. OF THE 2ND SPINDLE	R	Machine Maker	**134**
886	Spindle	CORRESPONDING RPM OF THE 3RD SPINDLE MOTOR'S INPUT VOLTAGE 10V	R	Machine Maker	**138**
887	Spindle	VOLTAGE COMMAND'S OFFSET VALUE OF THE 3RD SPINDLE'S RPM	R	Machine Maker	**139**
888	Spindle	ACCEL./DECEL. TIME PER KILO-REV. OF THE 3RD SPINDLE	R	Machine Maker	**134**

No	Group	Description	Effective	Level	Page
889	Spindle	PPR OF THE 2ND SPINDLE'S ENCODER	⊙	Machine Maker	137
890	Spindle	FEEDBACK RATE OF THE 2ND SPINDLE	⊙	Machine Maker	137
891	Spindle	SIGNAL TYPE OF THE 2ND SPINDLE'S ENCODER	⊙	Machine Maker	146
892	Spindle	INSTALL THE 2ND SPINDLE'S ENCODER ONTO THE 0)SPINDLE 1)MOTOR	R	Machine Maker	139
893	Spindle	PPR OF THE 3RD SPINDLE'S ENCODER	⊙	Machine Maker	137
894	Spindle	FEEDBACK RATE OF THE 3RD SPINDLE	⊙	Machine Maker	137
895	Spindle	SIGNAL TYPE OF THE 3RD SPINDLE'S ENCODER	⊙	Machine Maker	146
896	Spindle	INSTALL THE 3RD SPINDLE'S ENCODER ONTO THE 0)SPINDLE 1)MOTOR	R	Machine Maker	139
897	Spindle	THE 2ND SPINDLE DISPLAYS 0)COMMAND 1) SENSOR	R	Machine Maker	138
898	Spindle	THE 3RD SPINDLE DISPLAYS 0)COMMAND 1) SENSOR	R	Machine Maker	138
899	Operation	APPLY CE REGULATIONS 0)NO 1)YES	R	Machine Maker	213
900	Compensation	PITCH 5 COMP.001 μm	R	Machine Maker	166
949	Compensation	PITCH 5 COMP.050 μm	R	Machine Maker	166
950	Compensation	PITCH 6 COMP.001 μm	R	Machine Maker	166
999	Compensation	PITCH 6 COMP.050 μm	R	Machine Maker	166
1000	Servo	G00 MAX. SPEED OF X AXIS IN RAPID TRAVERSE, μm/min	R	Machine Maker	128
1001	Servo	G00 MAX. SPEED OF Y AXIS IN RAPID TRAVERSE,μm/min	R	Machine Maker	128
1002	Servo	G00 MAX. SPEED OF Z AXIS IN RAPID TRAVERSE, μm/min	R	Machine Maker	128
1003	Servo	G00 MAX. SPEED OF THE 4TH AXIS IN RAPID TRAVERSE, μm/min	R	Machine Maker	128
1004	Servo	G01 MAX. SPEED OF LINEAR CUTTING, μm/min	R	Machine Maker	128
1006	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +X μm	R	Machine Maker	214
1007	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - X μm	R	Machine Maker	214
1008	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Y μm	R	Machine Maker	214
1009	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Y μm	R	Machine Maker	214
1010	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Z μm	R	Machine Maker	214
1011	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Z μm	R	Machine Maker	214

No	Group	Description	Effective	Level	Page
1012	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +THE 4TH μm	R	Machine Maker	**214**
1013	Operation	SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - THE 4TH AXIS μm	R	Machine Maker	**214**
1014	Zero Point	ABSOLUTE COORDINATES OF X AXIS AFTER RETURNING TO HOME POINT μm	R	Machine Maker	**177**
1015	Zero Point	ABSOLUTE COORDINATES OF Y AXIS AFTER RETURNING TO HOME POINT μm	R	Machine Maker	**177**
1016	Zero Point	ABSOLUTE COORDINATES OF Z AXIS AFTER RETURNING TO HOME POINT μm	R	Machine Maker	**177**
1017	Zero Point	ABSOLUTE COORDINATES OF THE 4TH AXIS AFTER RETURNING TO HOME POINT μm	R	Machine Maker	**177**
1018	Compensation	SESSION INTERVAL OF PITCH ERROR COMPENSATION: X AXIS μm	⊙	Machine Maker	**167**
1019	Compensation	SESSION INTERVAL OF PITCH ERROR COMPENSATION: Y AXIS μm	⊙	Machine Maker	**167**
1020	Compensation	SESSION INTERVAL OF PITCH ERROR COMPENSATION: Z AXIS μm	⊙	Machine Maker	**167**
1021	Compensation	SESSION INTERVAL OF PITCH ERROR COMPENSATION: THE 4TH AXIS μm	⊙	Machine Maker	**167**
1022	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**178**
1023	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**178**
1024	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**178**
1025	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**178**
1026	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**178**
1027	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**178**
1028	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**178**
1029	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**178**
1030	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	**179**

No	Group	Description	Effective	Level	Page
1031	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	179
1032	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	179
1033	Zero Point	THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm	R	Machine Maker	179
1034	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +X μm	R	Machine Maker	215
1035	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -X μm	R	Machine Maker	215
1036	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Y μm	R	Machine Maker	215
1037	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Y μm	R	Machine Maker	215
1038	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Z μm	R	Machine Maker	215
1039	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Z μm	R	Machine Maker	215
1040	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +4TH AXIS μm	R	Machine Maker	215
1041	Operation	SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -4TH AXIS μm	R	Machine Maker	215
1042	Servo	G31 PRESET FEED RATE	R	Machine Maker	129
1046	Compensation	START POSITION OF PITCH ERROR: X AXIS μm	⊙	Machine Maker	167
1047	Compensation	START POSITION OF PITCH ERROR: Y AXIS μm	⊙	Machine Maker	167
1048	Compensation	START POSITION OF PITCH ERROR: Z AXIS μm	⊙	Machine Maker	167
1049	Compensation	START POSITION OF PITCH ERROR: THE 4TH AXIS μm	⊙	Machine Maker	167
1054	Spindle	RPM REACHES SET RANGE OF THE 1ST SPINDLE	R	Machine Maker	148
1056	Spindle	OFFSET AMOUNT BETWEEN THE 1ST SPINDLE'S ZERO POINT AND THE CENTER	R	Machine Maker	149
1058	Spindle	MAX. SERVO LAG TOLERANCE OF THE 1ST SPINDLE DURING RIGID TAPPING μm	R	Machine Maker	149
1059	Spindle	ACCEL./DECEL. TIME PER KILO-REV. OF THE 1ST SPINDLE DURING RIGID TAPPING	R	Machine Maker	149
1060	Spindle	ACCELERATION OVERRIDE OF THE 1ST SPINDLE DURING RIGID TAPPING'S RETURNING	R	Machine Maker	149
1061	Servo	MAX. SPEED OF LATHE TAPPING	R	Machine Maker	129
1063	Spindle	THE 1ST SPINDLE REACHES ZERO SPEED RPM	R	Machine Maker	150

No	Group	Description	Effective	Level	Page
1064	Spindle	COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING	R	Machine Maker	**150**
1065	Spindle	COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S ACCELERATION DURING RIGID TAPPING	R	Machine Maker	**150**
1066	Spindle	COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING	R	Machine Maker	**150**
1070	Spindle	COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S ACCELERATION SPEED DURING RIGID TAPPING	R	Machine Maker	**151**
1071	Spindle	INVERSE OUTPUT OF THE 1ST SPINDLE DURING RIGID TAPPING 0)NO 1)YES	R	Machine Maker	**151**
1072	Servo	PULSE WIDTH μs	⊙	Machine Maker	**130**
1075	Spindle	TOLERANCE OF THE 1ST SPINDLE IN CONTROL MODE	R	Machine Maker	**151**
1076	Spindle	JOG RPM OF THE 2ND SPINDLE	R	Machine Maker	**152**
1077	Spindle	JOG RPM OF THE 3RD SPINDLE	R	Machine Maker	**152**
1091	Operation	DEFAULT ANGLE OF COORDINATE SYSTEM DURING ROTATION	R	User	**216**
1092	Operation	DEFAULT RATIO OF COORDINATE REDUCTION/ENLARGEMENT OF X AXIS	R	User	**216**
1093	Operation	DEFAULT RATIO OF COORDINATE REDUCTION/ENLARGEMENT OF Y AXIS	R	User	**216**
1094	Operation	DEFAULT RATIO OF COORDINATE REDUCTION/ENLARGEMENT OF Z AXIS	R	User	**216**
1096	Spindle	MAX. RPM OF THE 1ST SPINDLE	R	Machine Maker	**151**
1097	Spindle	CORRESPONDING RPM OF THE 1ST SPINDLE MOTOR'S INPUT VOLTAGE 10V	R	Machine Maker	**152**
1098	Zero Point	POSITION ERROR OF THE ABSOLUTE ENCODER	R	Machine Maker	**179**
1100	Servo	JOG SPEED FOR X AXIS μm/min	R	Machine Maker	**131**
1101	Servo	JOG SPEED FOR Y AXIS μm/min	R	Machine Maker	**131**
1102	Servo	JOG SPEED FOR Z AXIS μm/min	R	Machine Maker	**131**
1103	Servo	JOG SPEED FOR THE 4TH AXIS μm/min	R	Machine Maker	**131**
1104	Zero Point	HOME RETURN AT THE 1ST SPEED: X AXIS μm/min	R	Machine Maker	**180**
1105	Zero Point	HOME RETURN AT THE 1ST SPEED: Y AXIS μm/min	R	Machine Maker	**180**
1106	Zero Point	HOME RETURN AT THE 1ST SPEED: Z AXIS μm/min	R	Machine Maker	**180**
1107	Zero Point	HOME RETURN AT THE 1ST SPEED: THE 4TH AXIS μm/min	R	Machine Maker	**180**

No	Group	Description	Effective	Level	Page
1108	Zero Point	HOME RETURN AT THE 2ND SPEED: X AXIS μm/min	R	Machine Maker	**180**
1109	Zero Point	HOME RETURN AT THE 2ND SPEED: Y AXIS μm/min	R	Machine Maker	**180**
1110	Zero Point	HOME RETURN AT THE 2ND SPEED: Z AXIS μm/min	R	Machine Maker	**180**
1111	Zero Point	HOME RETURN AT THE 2ND SPEED: THE 4TH AXIS μm/min	R	Machine Maker	**180**
1112	Servo	PPR OF MOTOR ENCODER: X AXIS	⊙	Machine Maker	**120**
1113	Servo	PPR OF MOTOR ENCODER: Y AXIS	⊙	Machine Maker	**120**
1114	Servo	PPR OF MOTOR ENCODER: Z AXIS	⊙	Machine Maker	**120**
1115	Servo	PPR OF MOTOR ENCODER: THE 4TH AXIS	⊙	Machine Maker	**120**
1116	Spindle	PULSE/REV. OF THE 1ST SPINDLE ENCODER	⊙	Machine Maker	**152**
1118	Zero Point	INDEX PROTECTION	R	User	**181**
1119	Servo	ENCODER.5TH PULSES/ROTATION	⊙	Machine Maker	**120**
1120	Servo	ENCODER.6TH PULSES/ROTATION	⊙	Machine Maker	**120**
1121	Spindle	JOG RPM OF THE 1ST SPINDLE	R	Machine Maker	**152**
1122	Servo	MAX G00 SPEED.5TH μm/min	R	Machine Maker	**128**
1123	Servo	MAX G00 SPEED.6TH μm/min	R	Machine Maker	**128**
1124	Servo	JOG SPEED FOR 5TH AXIS μm/min	R	Machine Maker	**131**
1125	Servo	JOG SPEED FOR 6TH AXIS μm/min	R	Machine Maker	**131**
1126	Compensation	COMP DIST OF EACH SECTION.5 μm	⊙	Machine Maker	**167**
1127	Compensation	COMP DIST OF EACH SECTION.6 μm	⊙	Machine Maker	**167**
1128	Compensation	START.5 COMP POS μm	⊙	Machine Maker	**167**
1129	Compensation	START.6 COMP POS μm	⊙	Machine Maker	**167**
1130	Zero Point	ABS COORD.5 AFTER HOMING μm	R	Machine Maker	**177**
1131	Zero Point	ABS COORD.6 AFTER HOMING μm	R	Machine Maker	**177**
1132	Zero Point	5.OFF FOR ORG.2 REF TO ORG.1 μm	R	Machine Maker	**178**
1133	Zero Point	6.OFF FOR ORG.2 REF TO ORG.1 μm	R	Machine Maker	**178**
1134	Zero Point	5.OFF FOR ORG.3 REF TO ORG.1 μm	R	Machine Maker	**178**
1135	Zero Point	6.OFF FOR ORG.3 REF TO ORG.1 μm	R	Machine Maker	**178**
1136	Zero Point	5.OFF FOR ORG.4 REF TO ORG.1 μm	R	Machine Maker	**179**

No	Group	Description	Effective	Level	Page
1137	Zero Point	6.OFF FOR ORG.4 REF TO ORG.1 μm	R	Machine Maker	179
1138	Zero Point	1ST SPEED OF 5 HOMING μm/min	R	Machine Maker	180
1139	Zero Point	1ST SPEED OF 6 HOMING μm/min	R	Machine Maker	180
1140	Zero Point	2ST SPEED OF 5 HOMING μm/min	R	Machine Maker	180
1141	Zero Point	2ST SPEED OF 6 HOMING μm/min	R	Machine Maker	180
1142	Operation	1ST 5+ SOFT LIMIT μm	R	Machine Maker	214
1143	Operation	1ST 5- SOFT LIMIT μm	R	Machine Maker	214
1144	Operation	1ST 6+ SOFT LIMIT μm	R	Machine Maker	214
1145	Operation	1ST 6- SOFT LIMIT μm	R	Machine Maker	214
1146	Operation	2ND 5+ SOFT LIMIT μm	R	Machine Maker	215
1147	Operation	2ND 5- SOFT LIMIT μm	R	Machine Maker	215
1148	Operation	2ND 6+ SOFT LIMIT μm	R	Machine Maker	215
1149	Operation	2ND 6- SOFT LIMIT μm	R	Machine Maker	215
1150	Spindle	GEAR CHANGE RPM OF THE 1ST SPINDLE IN 1ST GEAR	R	Machine Maker	152
1151	Spindle	GEAR CHANGE RPM OF THE 1ST SPINDLE IN 2ND GEAR	R	Machine Maker	153
1152	Spindle	GEAR CHANGE RPG OF THE 1ST SPINDLE IN 3RD GEAR	R	Machine Maker	153
1153	Spindle	GEAR CHANGE RPM OF THE 1ST SPINDLE	R	Machine Maker	154
1154	Spindle	CHECK RANGE OF GEAR CHANGE RPM OF THE 1ST SPINDLE	R	Machine Maker	154
1155	Spindle	MAX. RPM OF THE 1ST SPINDLE IN 1ST GEAR	R	Machine Maker	154
1156	Spindle	MAX. RPM OF THE 1ST SPINDLE IN 2ND GEAR	R	Machine Maker	154
1157	Spindle	MAX. RPM OF THE 1ST SPINDLE IN 3RD GEAR	R	Machine Maker	155
1158	Operation	SHOW F2~F12 FOR FUN. KEY	⊙	User	216
1159	Operation	PROGRAM READING OVERTIME		User	217
1171	Zero Point	A INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: X AXIS μm	⊙	Machine Maker	182
1172	Zero Point	B INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: X AXIS μm	⊙	Machine Maker	182
1173	Zero Point	A INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: Y AXIS μm	⊙	Machine Maker	182

No	Group	Description	Effective	Level	Page
1174	Zero Point	B INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: Y AXIS μm	⊙	Machine Maker	182
1175	Zero Point	A INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: Z AXIS μm	⊙	Machine Maker	182
1176	Zero Point	B INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: Z AXIS μm	⊙	Machine Maker	182
1177	Zero Point	A INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: THE 4TH AXIS μm	⊙	Machine Maker	182
1178	Zero Point	B INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: THE 4TH AXIS μm	⊙	Machine Maker	182
1179	Zero Point	SPACE1 LINEAR SCALE OF 5TH AXIS μm	⊙	Machine Maker	182
1180	Zero Point	SPACE2 LINEAR SCALE OF 5TH AXIS μm	⊙	Machine Maker	182
1181	Zero Point	SPACE1 LINEAR SCALE OF 6TH AXIS μm	⊙	Machine Maker	182
1182	Zero Point	SPACE2 LINEAR SCALE OF 6TH AXIS μm	⊙	Machine Maker	182
1183	Zero Point	OFFSET BETWEEN THE ZERO POINTS OF X AXIS & LINEAR SCALE	R	Machine Maker	183
1184	Zero Point	OFFSET BETWEEN THE ZERO POINTS OF Y AXIS & LINEAR SCALE	R	Machine Maker	183
1185	Zero Point	OFFSET BETWEEN THE ZERO POINTS OF Z AXIS & LINEAR SCALE	R	Machine Maker	183
1186	Zero Point	OFFSET BETWEEN THE ZERO POINTS OF THE 4TH AXIS & LINEAR SCALE	R	Machine Maker	183
1187	Zero Point	OFFSET LINEAR SCALE OF 5TH AXIS	R	Machine Maker	183
1188	Zero Point	OFFSET LINEAR SCALE OF 6TH AXIS(UM)	R	Machine Maker	183
1196	Mechanics	MAX. ROTATE DIAMETER OF X AXIS(UM)	⊙	Machine Maker	162
1197	Mechanics	MAX. ROTATE DIAMETER OF Y AXIS(UM)	⊙	Machine Maker	162
1198	Mechanics	MAX. ROTATE DIAMETER OF Z AXIS(UM)	⊙	Machine Maker	162
1199	Mechanics	MAX. ROTATE DIAMETER OF C AXIS(UM)	⊙	Machine Maker	162
1200	Compensation	PITCH ERROR COMPENSATION OF 051 SESSION OF X AXIS μm	R	Machine Maker	162
1299	Compensation	PITCH ERROR COMPENSATION OF 150 SESSION OF X AXIS μm	R	Machine Maker	162
1300	Compensation	PITCH ERROR COMPENSATION OF 051 SESSION OF Y AXIS μm	R	Machine Maker	163
1399	Compensation	PITCH ERROR COMPENSATION OF 150 SESSION OF Y AXIS μm	R	Machine Maker	163
1400	Compensation	PITCH ERROR COMPENSATION OF 051 SESSION OF Z AXISμm	R	Machine Maker	163
1499	Compensation	PITCH ERROR COMPENSATION OF 150 SESSION OF Z AXIS μm	R	Machine Maker	163

No	Group	Description	Effective	Level	Page
1500	Compensation	PITCH ERROR COMPENSATION OF 051 SESSION OF THE 4TH AXIS μm	R	Machine Maker	**163**
1599	Compensation	PITCH ERROR COMPENSATION OF 150 SESSION OF THE 4TH AXIS μm	R	Machine Maker	**163**
1600	Compensation	PITCH 5 COMP.051 μm	R	Machine Maker	**166**
1699	Compensation	PITCH 5 COMP.150 μm	R	Machine Maker	**166**
1700	Compensation	PITCH 6 COMP.051 μm	R	Machine Maker	**166**
1799	Compensation	PITCH 6 COMP.150 μm	R	Machine Maker	**166**

5.2 Servo Parameter

1	SYSTEM LOOP GAINS FOR V CMD

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

This parameter is to set maximum following error amount of X axis (SERVO LAG). When the following error amount of X axis is over this parameter setting value, System Alarm【MOT 4006 : X Axis Servo LAG Over Para. # 0002 Setting Value】will occur.

lag = F/Kp

F is the feedrate, Kp is the position Loop incremental value.

From the above formula, the bigger the feedrate, the bigger the following error amount. So, user only need to key-in the X axis maximum speed into the above formula to get the maximum following error amount of X axis.

Example:

X axis position Loop incremental value is sec-1, speed of G00 is 20000mm/min. Moving is the constant speed under RAPID TRAVERSE and the following error amount is:

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

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

2	**MAX. SERVO LAG OF X AXIS, μm**
3	**MAX. SERVO LAG OF Y AXIS, μm**
4	**MAX. SERVO LAG OF Z AXIS, μm**
5	**MAX. SERVO LAG OF THE 4TH AXIS, μm**
250	**MAX FOLLOWING ERROR 5TH AXIS μm**
251	**MAX FOLLOWING ERROR 6TH AXIS μm**

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

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

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

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

6	**IN-POSITION CHECK WINDOW OF X AXIS, μm**
7	**IN-POSITION CHECK WINDOW OF Y AXIS, μm**
8	**IN-POSITION CHECK WINDOW OF Z AXIS, μm**
9	**IN-POSITION CHECK WINDOW OF THE 4TH AXIS, μm**
252	**5TH IN-POS WINDOWS BOUND μm**
253	**6TH IN-POS WINDOWS BOUND μm**

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

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

10	**G00'S ACCEL./DECEL. TIME OF X AXIS, ms**
11	**G00'S ACCEL./DECEL. TIME OF Y AXIS, ms**
12	**G00'S ACCEL./DECEL. TIME OF Z AXIS, ms**
13	**G00'S ACCEL./DECEL. TIME OF THE 4TH AXIS, ms**
254	**G00 5TH ACC/DEC TIME**
255	**G00 6TH ACC/DEC TIME**

Range： 1 ~ 1500
Effective： Effective After Reboot
Access level： Machine Maker
Default： 230
Unit： ms

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

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

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

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

24	**CORRESPONDING SERVO AXIS NUMBER OF X AXIS**
25	**CORRESPONDING SERVO AXIS NUMBER OF Y AXIS**
26	**CORRESPONDING SERVO AXIS NUMBER OF Z AXIS**
27	**CORRESPONDING SERVO AXIS NUMBER OF THE 4TH AXIS**
256	**CHANNEL NO FOR 5 AXIS**
257	**CHANNEL NO FOR 6 AXIS**

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

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

40	G00'S LOWEST OVERRIDE AT F0

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

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

53	ENCODER FEEDBACK MULTIPLIER OF THE 4TH AXIS 1/2/4
54	ENCODER FEEDBACK MULTIPLIER OF X AXIS 1/2/4
55	ENCODER FEEDBACK MULTIPLIER OF Y AXIS 1/2/4
56	ENCODER FEEDBACK MULTIPLIER OF Z AXIS 1/2/4
258	FEEDBACK MUL FACTOR.5TH
259	FEEDBACK MUL FACTOR.6TH

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

This parameter sets the encoder feedback multiplier of each axis. This parameter is valid only when the types of encoder feedback signals are A/B PHASE. If each axis's encoder feedback signals are the CW/CCW or PULSE/DIRECTION type (the set value is 1 or 2, respectively), then the encoder feedback multiplier would always be 1.

In Pulse Command mode, the product of this parameter multiplying the output pulse number for each motor encoder to make one revolution is equal to the pulse command amount that NC demands to enable each axial motor to make one revolution.

1112	PPR OF MOTOR ENCODER: X AXIS
1113	PPR OF MOTOR ENCODER: Y AXIS
1114	PPR OF MOTOR ENCODER: Z AXIS
1115	PPR OF MOTOR ENCODER: THE 4TH AXIS
1119	ENCODER.5TH PULSES/ROTATION
1120	ENCODER.6TH PULSES/ROTATION

Range：	1 ~ 99999999
Effective：	Effective After Reboot
Access level：	Machine Maker
Default：	2500
Unit：	pulse

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

65	ABSOLUTE ENCODER (BIT)

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

Bit 0：Set to 0, an incremental encoder is applied to X axis. Set to 1, an absolute encoder is applied to X axis.
Bit 1：Set to 0, an incremental encoder is applied to Y axis. Set to 1, an absolute encoder is applied to Y axis.
Bit 2：Set to 0, an incremental encoder is applied to Z axis. Set to 1, an absolute encoder is applied to Z axis.
Bit 3：Set to 0, an incremental encoder is applied to the 4^{th} axis. Set to 1, an absolute encoder is applied to the 4^{th} axis.
Bit 4：Set to 0, an incremental encoder is applied to the 5^{th} axis. Set to 1, an absolute encoder is applied to the 5^{th} axis.
Bit 5：Set to 0, an incremental encoder is applied to the 6^{th} axis. Set to 1, an absolute encoder is applied to the 6^{th} axis.

66	SET THE 4TH AXIS AS A 0)RATORY 1)LINEAR AXIS
260	5TH AXIS LINEAR/ROTARY TYPE
261	6TH AXIS LINEAR/ROTARY TYPE

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

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

85	MAX. SERVO LAG: X100 BIT

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

Bit 0：Set to 1, magnify 100 times of X axis's max. servo lag (Pr. 0002)
Bit 1：Set to 1, magnify 100 times of Y axis's max. servo lag (Pr. 0003)
Bit 2：Set to 1, magnify 100 times of Z axis's max. servo lag (Pr. 0004)
Bit 3：Set to 1, magnify 100 times of the 4^{th} axis's max. servo lag (Pr. 0005)
Bit 4：Set to 1, magnify 100 times of the 5^{th} axis's max. servo lag (Pr. 0250)
Bit 5：Set to 1, magnify 100 times of the 6^{th} axis's max. servo lag (Pr. 0251)

108	**RPM TO VOLTAGE RATIO FOR X AXIS RPM/1V**
109	**RPM TO VOLTAGE RATIO FOR Y AXIS RPM/1V**
110	**RPM TO VOLTAGE RATIO FOR Z AXIS RPM/1V**
111	**RPM TO VOLTAGE RATIO FOR THE 4TH AXIS RPM/1V**
262	**MORTOR GAINS.5TH**
263	**MORTOR GAINS.6TH**

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

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

116	**REVERSE MOTION DIRECTRION OF SERVO AXIS BIT**

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

BIT 0：Set to 1, motion direction of X axis must be reversed;
BIT 1：Set to 1, motion direction of Y axis must be reversed;
BIT 2：Set to 1, motion direction of Z axis must be reversed;
BIT 3：Set to 1, motion direction of the 4^{th} axis must be reversed;
BIT 4：Set to 1, motion direction of the 5^{th} axis must be reversed;
BIT 5：Set to 1, motion direction of the 6^{th} axis must be reversed;
"Timing"
Take X axis in JOG mode for example, if +X key on OP panel is pressed, but X axis travels towards the negative direction, this means the motor's clockwise rotation direction is on the contrary to +X direction. Therefore, please set this parameter's Bit0 to 1. If +X key on OP panel is pressed, and X axis travels towards the positive direction, please set this parameter's Bit 0 to 0; and so forth for the rest of other axes.

156	**COMMAND TYPE OF X AXIS 0)AB 1)CW 2)PD 3)V**
157	**COMMAND TYPE OF Y AXIS 0)AB 1)CW 2)PD 3)V**
158	**COMMAND TYPE OF Z AXIS 0)AB 1)CW 2)PD 3)V**
159	**COMMAND TYPE OF THE 4TH AXIS 0)AB 1)CW 2)PD 3)V**
264	**CONTROL CMD FORMAT OF 5**
265	**CONTROL CMD FORMAT OF 6**

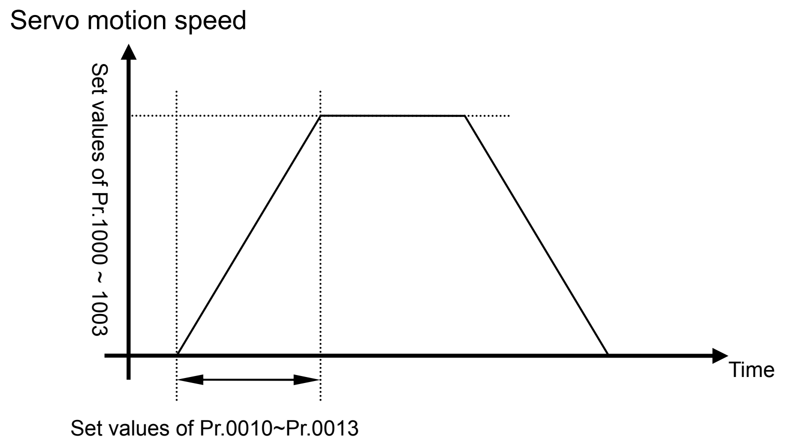
Range：	0 ~ 3
Effective：	Effective After Reboot
Access level：	Machine Maker
Default：	0
Unit：	Nul
	0：A/B PHASE；
	1：CW/CCW；
	2：PULSE/DIRECTION。

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

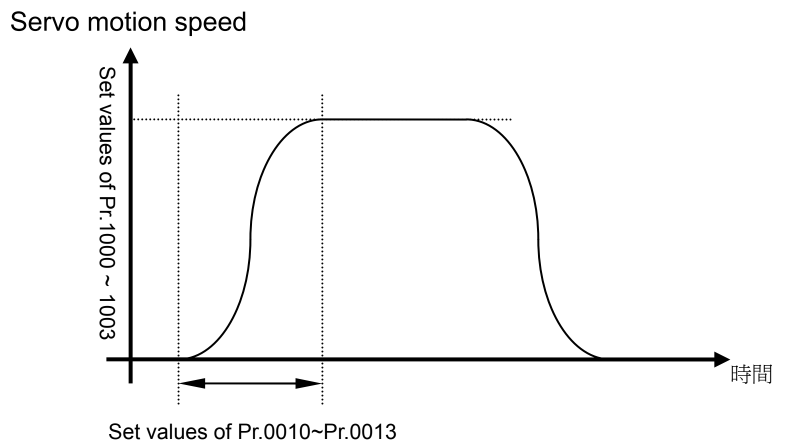
172	G00 ACCEL./DECEL. TYPE 1)LINE 2) CURVE

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

0：Linear acceleration/deceleration
1：S-curve acceleration/deceleration



Linear accel./decel. type

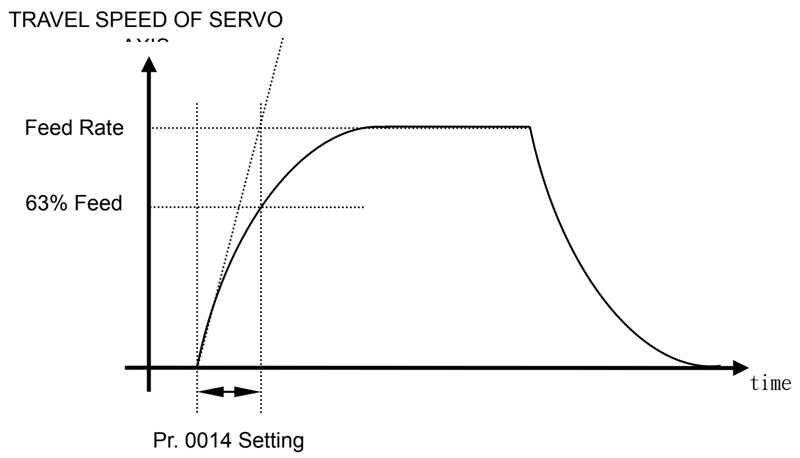


S curve accel./decel. type

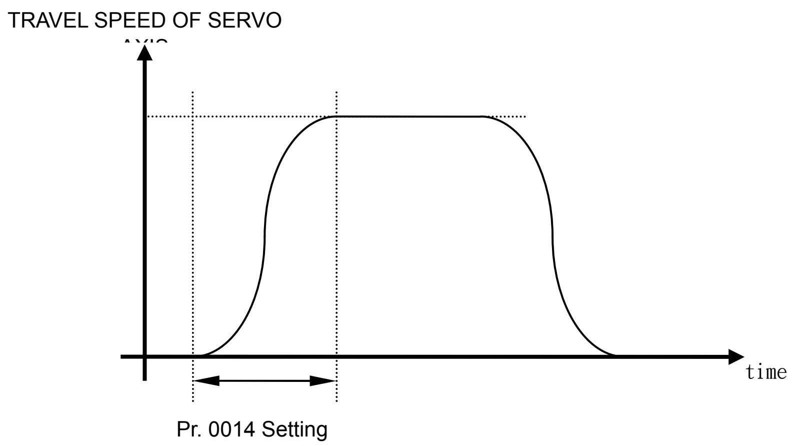
173	G01 ACC. TYPE 0)LINE 1)S CURVE

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

0：Expolantial acceleration/deceleration
1：S-curve acceleration/deceleration



Linear Accel./Decel.



S Curve Accel./Decel.

185	INVERSE FEEDBACK SIGNAL OF SERVO AXIS BIT

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

BIT 0：Set to 1, the encoder's feedback signal of X axis is inversed;
BIT 1：Set to 1, the encoder's feedback signal of Y axis is inversed;
BIT 2：Set to 1, the encoder's feedback signal of Z axis is inversed;
BIT 3：Set to 1, the encoder's feedback signal of the 4^{th} axis is inversed;
BIT 4：Set to 1, the encoder's feedback signal of the 5^{th} axis is inversed;
BIT 5：Set to 1, the encoder's feedback signal of the 6^{th} axis is inversed;

【Timing】

Take X axis for example, when +X key on OP panel is pressed, and X axis travels towards the positive direction; however, the value of system info No.000 is keeping increasing (X axis servo lag); furthermore, after +X key is released, the value does not drop to the range of ±1. This means the motor's clockwise rotation direction is on the contrary to +X direction. Therefore, please set this parameter's Bit 0 to 1. If +X key on OP panel is pressed, and X axis travels towards the positive direction, please set this parameter's Bit 0 to 0; and so forth for the rest of other axes.

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

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

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

191	**ENCORDER SIGNAL TYPE OF X AXIS**
192	**ENCORDER SIGNAL TYPE OF Y AXIS**
193	**ENCORDER SIGNAL TYPE OF Z AXIS**
194	**ENCORDER SIGNAL TYPE OF THE 4TH AXIS**
266	**ENCODER SIGNALE TYPE.5TH**
267	**ENCODER SIGNALE TYPE.6TH**

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.

268	**RANGE.5TH FOR EXACT REACH μm**
269	**RANGE.6TH FOR EXACT REACH μm**
800	**G00'S IN-POSITION CHECK WINDOW OF X AXIS, μm**
801	**G00'S IN-POSITION CHECK WINDOW OF Y AXIS, μm**
802	**G00'S IN-POSITION CHECK WINDOW OF Z AXIS, μm**
803	**G00'S IN-POSITION CHECK WINDOW OF THE 4TH AXIS, μm**

Range： 1 ~ 20000
Effective： Effective After RESET
Access level： Machine Maker
Default： 500
Unit： μm

This parameter sets the in-position check window of each axis when the exact stop function of rapid positioning is enabled. When some axis's | command position – actual position | ≦ this parameter's set value, this means that this axis has already completed rapid positioning and stopped.

845	**X AXIS IS A 0)LINEAR 1)ROTARY AXIS**
846	**Y AXIS IS A 0)LINEAR 1)ROTARY AXIS**
847	**Z AXIS IS A 0)LINEAR 1)ROTARY AXIS**

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

0: Set each axis as a linear axis; please set the ball screw's pitch according to the actual value.
1: Set each axis as a rotary axis; please set the ball screw's pitch to 360 (which indicates 360°).

1000	**G00 MAX. SPEED OF X AXIS IN RAPID TRAVERSE, μm/min**
1001	**G00 MAX. SPEED OF Y AXIS IN RAPID TRAVERSE,μm/min**
1002	**G00 MAX. SPEED OF Z AXIS IN RAPID TRAVERSE, μm/min**
1003	**G00 MAX. SPEED OF THE 4TH AXIS IN RAPID TRAVERSE, μm/min**
1122	**MAX G00 SPEED.5TH μm/min**
1123	**MAX G00 SPEED.6TH μm/min**

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 5000000
Unit： μm/min

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

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

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

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

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

1042	G31 PRESET FEED RATE
Range：	1 ~ 99999999
Effective：	Effective After RESET
Access level：	Machine Maker
Default：	2000
Unit：	μm/min

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

1061	MAX. SPEED OF LATHE TAPPING
Range：	1 ~ 99999999
Effective：	Effective After RESET
Access level：	Machine Maker
Default：	10000000
Unit：	μm

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

1072	PULSE WIDTH μs

Range： 1 ~ 50

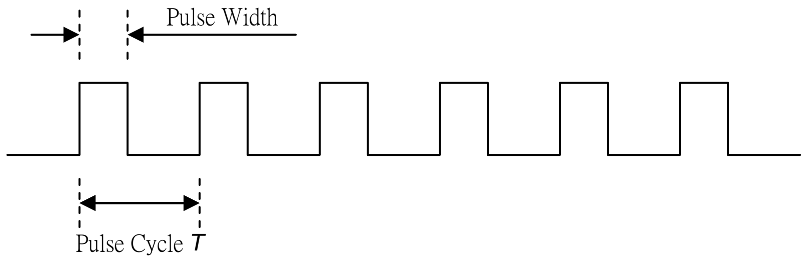
Effective： Effective After Reboot

Access level： Machine Maker

Default： 20

Unit： μs

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



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

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

Example：

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

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

And the pulse cycle would be：

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

Under this condition, the pulse width should be set as 7us to keep the pulse command as 50% of DURATION. If the set value of this parameter is too large, the pulse width might exceed the pulse cycle during high-speed motion, and the motor driver could not read the overlapping pulse command lines to actuate the motor’s rotation normally.

However, if the set value is too small, the motor driver might also be unable to identify the pulse command lines. Therefore, the max. value of this parameter should be set according to the max. width within which tolerance that pulse command lines do not overlap each other. And the min. value should be set according to the min. width within which tolerance the motor can identify pulse command lines.

1100	**JOG SPEED FOR X AXIS μm/min**
1101	**JOG SPEED FOR Y AXIS μm/min**
1102	**JOG SPEED FOR Z AXIS μm/min**
1103	**JOG SPEED FOR THE 4TH AXIS μm/min**
1124	**JOG SPEED FOR 5TH AXIS μm/min**
1125	**JOG SPEED FOR 6TH AXIS μm/min**

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

5.3 Machine Parameter

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

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

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

68	TOOTH NUMBER OF X AXIS MOTOR (DENOMINATOR IN GEAR RATIO)
69	TOOTH NUMBER OF Y AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)
70	TOOTH NUMBER OF Z AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)
72	TOOTH NUMBER OF THE 4TH AXIS'S MOTOR (DENOMINATOR IN GEAR RATIO)
270	DENOMINATOR GEAR RATIO.5
271	DENOMINATOR GEAR RATIO.6

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)**
272	**NUMERATOR OF GEAR RATION.5**
273	**NUMERATOR OF GEAR RATION.6**

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**
274	**SCREW PITCH.5**
275	**SCREW PITCH.6**

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

This parameter sets the ball screw pitch of each axis.

1196	**MAX. SERVO LAG OF X AXIS (UM)**
1197	**MAX. SERVO LAG OF Y AXIS (UM)**
1198	**MAX. SERVO LAG OF Z AXIS (UM)**
1199	**MAX. SERVO LAG OF C AXIS (UM)**

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

If only for certain axis, parameter value times feed rate will be cutting speed, but if the speed is quicker then the max cutting speed that Pr.1004 sets, CNC controller will need to adjust feed command, make cutting speed to correspond to Pr.1004. If for multi axis, need to consider about each axis' cutting speed. But if certain axis is linear one, set this parameter to be zero.

5.4 Spindle Parameter

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

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 1000
Unit： MS/KRPM

This parameter sets the corresponding output voltage of the spindle's rotation speed and also the acceleration/deceleration speed of pulse commands. When some spindle's rotation speed signal is output by voltage, the offset of the voltage output signal and the corresponding RPM of 10V must be set.

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

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

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

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

Range： 0 ~ 16
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

This parameter sets the feedback rate multiplier of some spindle's encoder and is only effective when the feedback signal type is AB PHASE (Pr.0195 is set to 0). If the feedback signal type of the spindle's encoder is CW/CCW or PULSE/DIRECTION (Pr.0195 is 1 or 2, respectively), the feedback rate multiplier would always be 1.

When the spindle's control mode is PULSE COMMAND (in SPINDLE ORIENTATION or RIGID TAPPING modes), the product of this parameter's set value and Pr.1116's set value (pulse/rev of the spindle motor's encoder) is the pulse command amount of NC to make one revolution of the spindle motor. If the spindle's control mode is V Command, the product of this parameter's set value and Pr.1116's set value is used to calculate the spindle's actual rotation speed only.

889	**PPR OF THE 2ND SPINDLE'S ENCODER**
893	**PPR OF THE 3RD SPINDLE'S ENCODER**

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

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

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

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

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

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

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

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

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

883	**CORRESPONDING RPM OF THE 2nd SPINDLE MOTOR'S INPUT VOLTAGE 10V**
886	**CORRESPONDING RPM OF THE 3RD SPINDLE MOTOR'S INPUT VOLTAGE 10V**

Range： 1 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 6000
Unit： RPM

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

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

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： RPM

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

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

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

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

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.

171	INVERSE OF THE SPINDLE'S FEEDBACK SIGNAL BIT

Range： 0 ~ 7
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

0 : No, the display value of the absolute coordinate is the program coordinate;
1 : Yes, the display value of the absolute coordinate is the program coordinate plus the tool's length compensation amount.

Example：Assume the length compensation of tool #1 is -50mm, and this parameter is set to 0:

Program Command	Absolute Coord. of Z Axis	Mechanical Coord. of Z Axis
G00 Z0.;	0.	0.
G43 H1;	0.	0.
G01 Z10. F1000.;	10.	-40.
…	…	…

If the set value of this parameter is 1:

Program Command	Absolute Coord. of Z Axis	Mechanical Coord. of Z Axis
G00 Z0.;	0.	0.
G43 H1;	0.	0.
G01 Z10. F1000.;	-40.	-40.
…	…	…

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

This parameter sets the tooth number of some spindle in 4^{th} gear, which equals to setting the numerator in gear ratio of some spindle in 4^{th} gear. When some spindle is in 4^{th} 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

Set Signal type output to driver at normal speed mode.

<table>
<tr><th>Set value</th><th>Output</th><th>Output axis Number.</th><th>Description</th></tr>
<tr><td>0</td><td>Voltage(0~10V)</td><td>Set by Pr.0029</td><td>(1) Spindle's CW/CCW will be switched by ladder on inventor's contacts.
(2) P16=0, speed will be controlled by inventor, P16= others, speed will be controlled by controller.</td></tr>
<tr><td>1</td><td>Pulseout (A/B Phase)</td><td>4</td><td rowspan="3">(1) Spindle direction is controlled by C82，C83.
(2) Speed up is controlled by P16.
(3) Output Axis will not be affected by Pr.29 （ Servo Number corresponding to Spindle）Fixed Axis is 4th. （ on TRF1720 P5(SPD AXIS)send pulse command）。
(4) Under speed control, NC will not check servo difference.</td></tr>
<tr><td>2</td><td>Pulseout (CW/CCW)</td><td>4</td></tr>
<tr><td>3</td><td>Pulseout (Pulse/Dir)</td><td>4</td></tr>
<tr><td>4</td><td>Voltage(-10V~10V)</td><td>Set by Pr.0029</td><td>(1) Spindle direction is controlled by C82，C83
(2) Speed up is controlled by P16.</td></tr>
<tr><td>5</td><td>Pulseout A/B Phase</td><td>Set by Pr.0029</td><td rowspan="3">(1) Spindle direction is controlled by C82，C83.
(2) Speed up is controlled by P16.
(3) Output Axis is under the control of Pr.29.（Servo Number corresponding to Spindle）
(4) Under speed control, NC will not check servo difference.</td></tr>
<tr><td>6</td><td>Pulseout CW/CCW</td><td>Set by Pr.0029</td></tr>
<tr><td>7</td><td>Pulseout Pulse/Dir</td><td>Set by Pr.0029</td></tr>
</table>

NOTE：
C82、C83 control
C82 = ON ,C83=OFF => spindle cw
C82 = OFF ,C83=ON => spindle ccw
others => spindle stop

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	PRESET INITIAL SPEED OF THE 2nd SPINDLE

Range： 0 ~ 99999
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： RPM

When the system is started, this parameter is the preset initial rotation speed of the spindle.

190 POSITION COMMAND TYPE OF THE 1ST SPINDLE

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

Set value	Signal type output to driver	Output axis Number.	Description
0	Pulse output (A/B Phase)	4	Usually applied to spindle drivers with a PG card ※ Applied to pulse commands output by the transit card TRF-1720 P5
1	Pulse output (CW/CCW)	4	
2	Pulse output (Pulse/Dir)	4	
3	V command Voltage command (-10V~10V) Controller's inner hardware loop control	Set by Pr.0029	Applied to axis driver with loop vector control that accepts ±10V voltage input control (positive voltage controls the positive axial direction, negative voltage controls the negative axial direction). Spindles output V command via P5 (SPD AXIS) of TRF-1720 and receive loop signals of a spindle encoder input from SPD ENC
4	Pulse output (A/B Phase)	Set by Pr.0029	Applied to spindles with a PG card
5	Pulse output (CW/CCW)	Set by Pr.0029	
6	Pulse output (Pulse/Dir)	Set by Pr.0029	

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

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

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

226	INVERSE OUTPUT COMMAND OF THE SPINDLE BIT

Range： 0 ~ 7
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

BIT 0：Set to 1, motion direction of the 1st spindle must be reversed;
BIT 1：Set to 1, motion direction of the 2nd spindle must be reversed;
BIT 2：Set to 1, motion direction of the 3rd spindle must be reversed;
Only valid when output command type of the spindle is Pulse.

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

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

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

241	CLOSE LOOP GAIN OF THE 1ST SPINDLE DURING RIGID TAPPING

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

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

248	UNIT OF OFFSET AMOUNT FOR THE 1ST SPINDLE'S ORIENTATION

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

Set to 0：The unit of offset amount between the spindle's zero point and the center (Pr.1056 & system info No.010) is pulse.
Set to 1：The unit of offset amount between the spindle's zero point and the center (Pr.1056 & system info No.010) is 0.001 degree.

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

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

Set to 0：The 1st (2nd & 3rd) spindle's rotation override speed = R015 (R019、R020) register value * 10%；
Set to 1：The 1st (2nd & 3rd) spindle's rotation override speed = R015 (R019、R020) register value* 1%。

393	GEAR CHANGE OF THE 1ST SPINDLE 0)AUTO 1)MANUAL

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

Choose either "automatic" or "manual" gear change method to be the spindle's gear change method
0：Automatic gear change
1：Manual gear change

663	ACCEL./DECEL. TIME OF THE 1ST SPINDLE'S ORIENTATION

Range： 0 ~ 1500
Effective： Effective After Reboot
Access level： Machine Maker
Default： 100
Unit： ms

This parameter sets the acceleration/deceleration of the spindle during orientation (including spindle adjustment).

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.

224	THE 2ND SPINDLE REACHES RPM 0)ACTUAL SPEED 2) COMMAND
225	THE 3RD SPINDLE REACHES RPM 0)ACTUAL SPEED 2) COMMAND
874	THE 1ST SPINDLE REACHES RPM 0)ACTUAL SPEED 2) COMMAND

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

0：Spindle RPM detection signal comes from Encoder feedback.
1：Spindle RPM detection signal comes from spindle RPM command.

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

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

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

1056	OFFSET AMOUNT BETWEEN THE 1ST SPINDLE'S ZERO POINT AND THE CENTER

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

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

1058	MAX. SERVO LAG TOLERANCE OF THE 1ST SPINDLE DURING RIGID TAPPING μm

Range： 1 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 3000
Unit： μm

During rigid tapping, if the lag time of Z axis exceeds this parameter's set value, the system will stop rigid tapping and activate the alarm "MOT4052 MOVE ERR OVER LIMIT IN RIGTAP." After machine adjustment is finished, please set this parameter to a smaller value to prevent machine damage caused by false actions. After rigid tapping adjustement is finished, multiply the value shown by system info No. 021 on DGNOS page by 5 ~ 10 times, and then enter the product into this parameter.

1059	ACCEL./DECEL. TIME PER KILO-REV. OF THE 1ST SPINDLE DURING RIGID TAPPING

Range： 1 ~ 32767
Effective： Effective After RESET
Access level： Machine Maker
Default： 500
Unit： ms

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

1060	ACCELERATION OVERRIDE OF THE 1ST SPINDLE DURING RIGID TAPPING'S RETURNING

Range： 1 ~ 400
Effective： Effective After RESET
Access level： Machine Maker
Default： 100
Unit： %

During the returning of rigid tapping, due to the needed cutting power is small, this parameter can be set to accelerate the returning speed. For example, if the parameter is set to 200, it means that during the returning process, spindle travels in x 2 RPM set by original command and Z-axis travels in x2 feedrate set by the original command. But, the faster the returning speed is, the bigger the Servo Lag of Z-axis will be. Besides, notify the limitation of spindle's max. RPM and the max. cutting speed of Z-axis.

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

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

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

1064	**COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING**

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

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

1065	**COMMAND COMPENSATION AMOUNT OF THE 1ST SPINDLE'S ACCELERATION DURING RIGID TAPPING**

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

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

1066	**COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S RPM DURING RIGID TAPPING**

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

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

1070 | **COMPENSATIVE FILTER INTENSITY OF THE 1ST SPINDLE'S ACCELERATION SPEED DURING RIGID TAPPING**

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

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

1071 | **INVERSE OUTPUT OF THE 1ST SPINDLE DURING RIGID TAPPING 0)NO 1)YES**

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

0: Not reverse.
1: Reverse.
If the spindle's rotation direction in Rigid Tapping mode is not the same as it is in modes other than Rigid Tapping, please set this parameter to 1. Please modify this parameter's set value during the adjustment of rigid tapping.

1075 | **TOLERANCE OF THE 1ST SPINDLE IN CONTROL MODE**

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

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

1096 | **MAX. RPM OF THE 1ST SPINDLE**

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 6000
Unit： RPM

This parameter sets the maximum RPM of the spindle. When RPM set by the spindle command is larger than this parameter's set value, the system will coercively use this parameter's set value to be the spindle RPM.

1097	CORRESPONDING RPM OF THE 1ST SPINDLE MOTOR’S INPUT VOLTAGE 10V

Range： 1 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 6000
Unit： RPM

This parameter sets the corresponding spindle motor’s RPM when the input voltage is 10V.

1116	PULSE/REV. OF THE 1ST SPINDLE ENCODER

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

Assume pulse/rev. of the spindle motor is 2500, set this parameter to 2500. Please also refer to the setting description of Pr.0057.

1076	JOG RPM OF THE 2ND SPINDLE
1077	JOG RPM OF THE 3RD SPINDLE
1121	JOG RPM OF THE 1ST SPINDLE

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 200
Unit： RPM

When C072 is ON, this parameter sets the spindle’s RPM.

1150	GEAR CHANGE RPM OF THE 1ST SPINDLE IN 1ST GEAR

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： RPM

This parameter sets if NC should execute gear change based on the spindle’s S code command or not:

1. When the spindle is in 1st gear, and the spindle S code command is larger than (not equal to) this parameter’s set value, the system will notify PLC to execute gear change (the spindle’s command RPM decides which gear to change to).
2. When the spindle is not in 1st gear, but the S code command set by users is smaller (or equal to) than this parameter’s set value, the system will notify PLC to change the gear to 1st gear.
3. If there is no need to change the spindle’s gear, the recommendation is to use 4th gear (C097 ~ C099 are all OFF) and also set this parameter to 0.

Please note that NC decides which gear to change to based on S code command set by users and then notify PLC to execute gear change. If the actual RPM exceeds the gear’s speed range due to the spindle RPM OVERRIDE, NC will not execute gear change.

1151 GEAR CHANGE RPM OF THE 1ST SPINDLE IN 2ND GEAR

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： RPM

This parameter sets if NC should execute gear change based on the spindle's S code command or not:

1. When the spindle is in 2nd gear, and the spindle S code command set by users is larger than (not equal to) this parameter's set value or smaller than (or equal to) Pr.1150's set value (the gear change RPM of the spindle in 1st gear), the system will notify PLC to execute gear change (the spindle's command RPM decides which gear to change to).
2. When the spindle is not in 2nd gear, and the spindle S code command set by users is smaller than (or equal to) this parameter's set value and also larger than (not equal to) Pr.1150's set value, the system will notify PLC to change the gear to 2nd gear.
3. If there is no need to change the spindle's gear, the recommendation is to use 4th gear (C097 ~ C099 are all OFF) and also set this parameter to 0.

Please note that NC decides which gear to change to based on S code command set by users and then notify PLC to execute gear change. If the actual RPM exceeds the gear's speed range due to the spindle RPM OVERRIDE, NC will not execute gear change.

1152 GEAR CHANGE RPG OF THE 1ST SPINDLE IN 3RD GEAR

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： RPM

This parameter sets if NC should execute gear change based on the spindle's S code command or not:

1. When the spindle is in 3rd gear, and the spindle S code command set by users is larger than (not equal to) this parameter's set value or smaller than (or equal to) than Pr.1151's set value, the system will notify PLC to execute gear change (the spindle's command RPM decides which gear to change to).
2. When the spindle is in not in 3rd gear, and the spindle S code command set by users is smaller than (or equal to) this parameter's set value and also larger than (not equal to) Pr.1151's set value (the gear change RPM of the spindle in 2nd gear), the system will notify PLC to change the gear to 3rd gear.
3. If there is no need to change the spindle's gear, the recommendation is to use 4th gear (C097 ~ C099 are all OFF) and also set this parameter to 0.

Please note that NC decides which gear to change to based on S code command set by users and then notify PLC to execute gear change. If the actual RPM exceeds the gear's speed range due to the spindle RPM OVERRIDE, NC will not execute gear change.

1153 GEAR CHANGE RPM OF THE 1ST SPINDLE

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 100
Unit： RPM

During gear change of the spindle, when C126 is ON, this parameter sets the spindle motor of RPM driver, and the spindle's RPM OVERRIDE is NOT effective.

1154 CHECK RANGE OF GEAR CHANGE RPM OF THE 1ST SPINDLE

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 50
Unit： RPM

During gear change of the spindle, when C126 is ON, if ｜The actual RPM of the spindle motor – Pr.1153's set value｜ ≦ this parameter's set value, the system will set S094 to ON.

1155 MAX. RPM OF THE 1ST SPINDLE IN 1ST GEAR

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 1000
Unit： RPM

In 1st gear, when the spindle's RPM (S command of the spindle * RPM OVERRIDE) exceeds this parameter's set value, the system will clamp this parameter as the spindle's RPM.

1156 MAX. RPM OF THE 1ST SPINDLE IN 2ND GEAR

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 2000
Unit： RPM

In 2nd gear, when the spindle RPM (the spindle S code command * RPM override) exceeds this parameter's set value, the system will clamp this parameter as the spindle RPM.

1157	MAX. RPM OF THE 1ST SPINDLE IN 3RD GEAR

Range： 0 ~ 99999
Effective： Effective After RESET
Access level： Machine Maker
Default： 3000
Unit： RPM

In 3rd gear, when the spindle RPM (the spindle S code command * RPM override) exceeds this parameter's set value, the system will clamp this parameter as the spindle RPM.

5.5 MPG Parameter

15	CORRESPONDING MECHANICAL AXIS OF MPG SIMULATED AXIS

Range： 1 ~ 19
Effective： Effective After Reboot
Access level： Machine Maker
Default： 7
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).

18 MPG RATE

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

When Pr.0018 is set to 0, the MPG rates of all servo axes are set by R014. The corresponding rates of R014 is listed as the chart below:

Servo axis	Register No.	Value	MPG rate
X axis Y axis Z axis 4th axis 5th axis 6th axis	14	1	X1
		2	X10
		3	X100
		Others	X1

When Pr.0018 is set to 1, different MPG rates are set by different registers. The corresponding register number and MPG rate for each servo axis is listed as the chart below:

Servo axis	Register No.	Value	MPG rate
X axis	14	1	X1
		2	X10
		3	X100
		Others	X1
Y axis	81	1	X1
		2	X10
		3	X100
		Others	X1
Z axis	82	1	X1
		2	X10
		3	X100
		Others	X1
4th axis	83	1	X1
		2	X10
		3	X100
		Others	X1
5th axis	84	1	X1
		2	X10
		3	X100
		Others	X1
6th axis	85	1	X1
		2	X10
		3	X100

28	**MPG CONNECTION PORT OF X AXIS**
75	**MPG CONNECTION PORT OF THE 4TH AXIS**
87	**MPG CONNECTION PORT OF Y AXIS**
88	**MPG CONNECTION PORT OF Z AXIS**
276	**MPG 5TH PORT**
277	**MPG 6TH PORT**

Range： 1 ~ 19
Effective： Effective After Reboot
Access level： Machine Maker
Default： 7
Unit： Nul

This parameter sets the MPG connection port's number of X axis in MPG mode.

5.6 Compensation Parameter

As for the parameter setting of backlash, pitch error compensation, and reversal spike compensation, you can refer to 7.2 Laser compensation action flowchart and 7.3 Double Ball bar description.

38	**BACKLASH COMPENSATION UNIT 0)PULSE 16)μm**

Range：	0 ~ 16
Effective：	Effective After Reboot
Access level：	Machine Maker
Default：	16
Unit：	Nul

This parameter sets the unit system used by the backlash parameters (Pr.0044 ~ Pr.0047) and also the pitch compensation parameters (Pr.0300 ~ Pr.0349, 0450 ~ 0499, 0600 ~ 0649, 0750 ~ 0799).

44	**BACKLASH COMPENSATION AMOUNT OF X AXIS μm**
45	**BACKLASH COMPENSATION AMOUNT OF Y AXIS μm**
46	**BACKLASH COMPENSATION AMOUNT OF Z AXIS μm**
47	**BACKLASH COMPENSATION AMOUNT OF THE 4TH AXIS μm**
278	**5TH BACKLASH μm**
279	**6TH BACKLASH μm**

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

This parameter sets the backlash compensation amount of each axis.

112	**TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF X AXIS**
113	**TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Y AXIS**
114	**TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF Z AXIS**
115	**TOTAL SESSION NUMBER OF PITCH ERROR COMPENSATION OF THE 4TH AXIS**
280	**NUM.SECS OF 5TH.PICTH COMP**
281	**NUM.SECS OF 6TH.PICTH COMP**

Range： 1 ~ 150
Effective： Effective After Reboot
Access level： Machine Maker
Default： 20
Unit： Nul

This parameter sets the total session number of ball screw's pitch error compensation for each axis. The product of this parameter's set value & Pr.1018 (1019, 1020, 1021, 1126, & 1127) is the total length of pitch error that should be compensated for each axis. The present maximum compensation – number of each axis is 150 sessions.

117	**BACKLASH COMPENSATION FUNCTION BIT**

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

Bit 0：Set to 1, Backlash Compensation function of X axis is activated; set to 0, not activated.
Bit 1：Set to 1, Backlash Compensation function of Y axis is activated; set to 0, not activated.
Bit 2：Set to 1, Backlash Compensation function of Z axis is activated; set to 0, not activated.
Bit 3：Set to 1, Backlash Compensation function of the 4th axis is activated; set to 0, not activated.
Bit 4：Set to 1, Backlash Compensation function of the 5th axis is activated; set to 0, not activated.
Bit 5：Set to 1, Backlash Compensation function of 6th axis is activated; set to 0, not activated.

118	DIRECTION OF PITCH ERROR COMPENSATION BIT

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

Bit 0：Set to 1, compensate pitch error towards the negative direction after X axis returns to zero point; set to 0, compensate pitch error towards the positive direction after X axis returns to zero point.
Bit 1：Set to 1, compensate pitch error towards the negative direction after Y axis returns to zero point; set to 0, compensate pitch error towards the positive direction after Y axis returns to zero point.
Bit 2：Set to 1, compensate pitch error towards the negative direction after Z axis returns to zero point; set to 0, compensate pitch error towards the positive direction after Z axis returns to zero point.
Bit 3：Set to 1, compensate pitch error towards the negative direction after the 4^{th} axis returns to zero point; set to 0, compensate pitch error towards the positive direction after the 4^{th} axis returns to zero point.
Bit 4：Set to 1, compensate pitch error towards the negative direction after the 5^{th} axis returns to zero point; set to 0, compensate pitch error towards the positive direction after the 5^{th} axis returns to zero point.
Bit 5：Set to 1, compensate pitch error towards the negative direction after the 6^{th} axis returns to zero point; set to 0, compensate pitch error towards the positive direction after the 6^{th} axis returns to zero point.

119	PITCH ERROR COMPENSATION FUNCTION BIT

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

Bit 0：Set to 1, Pitch Error Compensation function of X axis is activated; set to 0, not activated.
Bit 1：Set to 1, Pitch Error Compensation function of Y axis is activated; set to 0, not activated.
Bit 2：Set to 1, Pitch Error Compensation function of Z axis is activated; set to 0, not activated.
Bit 3：Set to 1, Pitch Error Compensation function of the 4^{th} axis is activated; set to 0, not activated.
Bit 4：Set to 1, Pitch Error Compensation function of the 5^{th} axis is activated; set to 0, not activated.
Bit 5：Set to 1, Pitch Error Compensation function of the 6^{th} axis is activated; set to 0, not activated.

300	**PITCH ERROR COMPENSATION OF 001 SESSION OF X AXIS μm**
349	**PITCH ERROR COMPENSATION OF 050 SESSION OF X AXIS μm**
1200	**PITCH ERROR COMPENSATION OF 051 SESSION OF X AXIS μm**
1299	**PITCH ERROR COMPENSATION OF 150 SESSION OF X AXIS μm**

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

358	**THERMAL COMPENSATION FUNCTION 0)ON 1)OFF**

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul
0：Turn off the thermal compensation function
1：Turn on the thermal compensation function

359	**MAX. THERMAL COMPENSATION INPUT AMOUNT**

Range： 1 ~ 1000
Effective： Instant Activity
Access level： Machine Maker
Default： 1000
Unit： μm
This parameter sets the maximum thermal compensation input amount allowed.

450	**PITCH ERROR COMPENSATION OF 001 SESSION OF Y AXIS μm**
499	**PITCH ERROR COMPENSATION OF 050 SESSION OF Y AXIS μm**
1300	**PITCH ERROR COMPENSATION OF 051 SESSION OF Y AXIS μm**
1399	**PITCH ERROR COMPENSATION OF 150 SESSION OF Y AXIS μm**

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

600	**PITCH ERROR COMPENSATION OF 001 SESSION OF Z AXIS μm**
649	**PITCH ERROR COMPENSATION OF 050 SESSION OF Z AXIS μm**
1400	**PITCH ERROR COMPENSATION OF 051 SESSION OF Z AXISμm**
1499	**PITCH ERROR COMPENSATION OF 150 SESSION OF Z AXIS μm**

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

750	**PITCH ERROR COMPENSATION OF 001 SESSION OF THE 4TH AXIS μm**
799	**PITCH ERROR COMPENSATION OF 050 SESSION OF THE 4TH AXIS μm**
1500	**PITCH ERROR COMPENSATION OF 051 SESSION OF THE 4TH AXIS μm**
1599	**PITCH ERROR COMPENSATION OF 150 SESSION OF THE 4TH AXIS μm**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Range： 0 ~ 200
Effective： Effective After RES80
ET
Access level： Machine Maker
Default： 0
Unit： μm

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

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

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

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

900	**PITCH 5 COMP.001 μm**
949	**PITCH 5 COMP.050 μm**
1600	**PITCH 5 COMP.051 μm**
1699	**PITCH 5 COMP.150 μm**

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

assumed pitch error on the nth section of 5^{th} axis is M (um), the parameter #(900+N – 1) is set as M, parameter 0038 is set as 16.

950	**PITCH 6 COMP.001 μm**
999	**PITCH 6 COMP.050 μm**
1700	**PITCH 6 COMP.051 μm**
1799	**PITCH 6 COMP.150 μm**

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

assumed pitch error on the nth section of 6^{th} axis is M (um), the parameter #(950+N – 1) is set as M, parameter 0038 is set as 16.

1018	**SESSION INTERVAL OF PITCH ERROR COMPENSATION: X AXIS μm**
1019	**SESSION INTERVAL OF PITCH ERROR COMPENSATION: Y AXIS μm**
1020	**SESSION INTERVAL OF PITCH ERROR COMPENSATION: Z AXIS μm**
1021	**SESSION INTERVAL OF PITCH ERROR COMPENSATION: THE 4TH AXIS μm**
1126	**COMP DIST OF EACH SECTION.5 μm**
1127	**COMP DIST OF EACH SECTION.6 μm**

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

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

1046	**START POSITION OF PITCH ERROR: X AXIS μm**
1047	**START POSITION OF PITCH ERROR: Y AXIS μm**
1048	**START POSITION OF PITCH ERROR: Z AXIS μm**
1049	**START POSITION OF PITCH ERROR: THE 4TH AXIS μm**
1128	**START.5 COMP POS μm**
1129	**START.6 COMP POS μm**

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

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

5.7 Zero Return parameter

About Zero Return parameter setting, you can refer to this chapter.

19	SOLUTIONS WHEN HOME IS ON DOG

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

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

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

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

20	DEFAULT SETTING OF HOME RETURN BIT

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

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

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

30	**OFFSET AMOUNT OF HOME RETURN: X AXISμm**
31	**OFFSET AMOUNT OF HOME RETURN: Y AXIS μm**
32	**OFFSET AMOUNT OF HOME RETURN: Z AXIS μm**
33	**OFFSET AMOUNT OF HOME RETURN: THE 4TH AXIS μm**
282	**OFFSET LENGTH OF 5.ORG μm**
283	**OFFSET LENGTH OF 6.ORG μm**

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

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

34	**IDLE DURATION FOR X AXIS TO SEARCH FOR ZERO POINT 10ms**
35	**IDLE DURATION FOR Y AXIS TO SEARCH FOR ZERO POINT 10ms**
36	**IDLE DURATION FOR Z AXIS TO SEARCH FOR ZERO POINT 10ms**
37	**IDLE DURATION FOR THE 4TH AXIS TO SEARCH FOR ZERO POINT 10ms**
284	**PAUSE TIME.5 HOME SERACHING**
285	**PAUSE TIME.6 HOME SERACHING**

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

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

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

48	HOME SEARCH METHOD BIT

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

Bit 0 : Set to 0, X axis searches for zero point by searching again DOG + Index; set to 1, X axis searches for zero point by a compulsive setting.
Bit 1 : Set to 0, Y axis searches for zero point by searching again DOG + Index; set to 1, Y axis searches for zero point by a compulsive setting.
Bit 2 : Set to 0, Z axis searches for zero point by searching again DOG + Index; set to 1, Z axis searches for zero point by a compulsive setting.
Bit 3 : Set to 0, the 4th axis searches for zero point by searching again DOG + Index; set to 1, the 4th axis searches for zero point by a compulsive setting.
Bit 4 : Set to 0, the 5th axis searches for zero point by searching again DOG + Index; set to 1, the 5th axis searches for zero point by a compulsive setting.
Bit 5 : Set to 0, the 6th axis searches for zero point by searching again DOG + Index; set to 1, the 6th axis searches for zero point by a compulsive setting.

64	HOME DOG SENSOR IS 0)NC 1)NO

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

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

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

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

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

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

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

In addition,

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

77 G00 1)DISABLED 0) 1)EFFECTIVE

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

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

79	**X AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG**
80	**Y AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG**
81	**Z AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG**
82	**THE 4TH AXIS'S ZERO POINT IS 0)AFTER 1)BEFORE DOG**
286	**ORG.5 AHEAD/BEHIND OF DOG**
287	**ORG.6 AHEAD/BEHIND OF DOG**

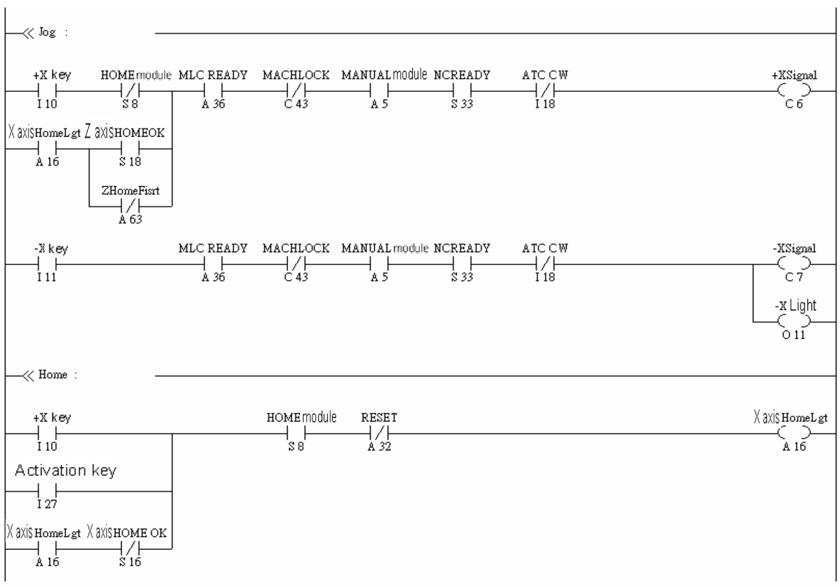
Range： 0 ~ 1
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： Nul

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.

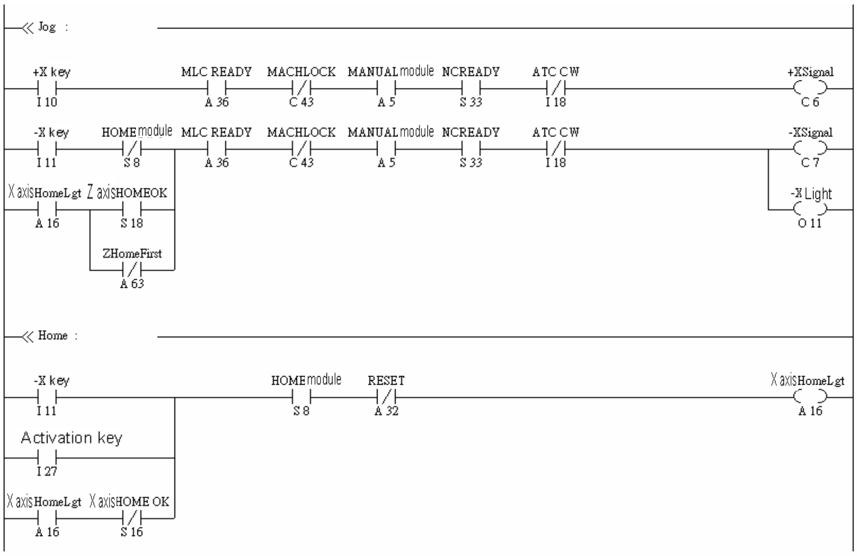
120	**DIRECTION OF HOME RETURN FOR EACH AXIS BIT**

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

In HOME mode,

Bit 0：Set to 0, X axis searches for zero point every time when HOME return is executed; set to 1, X axis uses the zero point recorded by NC when HOME return is executed.

Bit 1：Set to 0, Y axis searches for zero point every time when HOME return is executed; set to 1, Y axis uses the zero point recorded by NC when HOME return is executed.

Bit 2：Set to 0, Z axis searches for zero point every time when HOME return is executed; set to 1, Z axis uses the zero point recorded by NC when HOME return is executed.

Bit 3：Set to 0, the 4^{th} axis searches for zero point every time when HOME return is executed; set to 1, the 4^{th} axis uses the zero point recorded by NC when HOME return is executed.

Bit 4：Set to 0, the 5^{th} axis searches for zero point every time when HOME return is executed; set to 1, the 5^{th} axis uses the zero point recorded by NC when HOME return is executed.

Bit 5：Set to 0, the 6^{th} axis searches for zero point every time when HOME return is executed; set to 1, the 6^{th} axis uses the zero point recorded by NC when HOME return is executed.

208 LINEAR SCALE WITH MULTIPLE REFERENCE MARKS

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

For a servo axis that uses a linear scale with multiple reference marks, HOME return can be done manually by measuring the signal intervals between any 2 or 3 reference positions. (Please use Pr.0209 & Pr.0210 to set other relative actions).

Bit 0：1 Heidenhain's linear scale with multiple reference marks is used for position feedback of X axis; 0 means not used.
Bit 1：1 Heidenhain's linear scale with multiple reference marks is used for position feedback of Y axis; 0 means not used.
Bit 2：1 Heidenhain's linear scale with multiple reference marks is used for position feedback of Z axis; 0 means not used.
Bit 3：1 Heidenhain's linear scale with multiple reference marks is used for position feedback of the 4th axis; 0 means not used.
(Below is for 6-axis version)
Bit 4：1 Heidenhain's linear scale with multiple reference marks is used for position feedback of the 5th axis; 0 means not used.
Bit 5：1 Heidenhain's linear scale with multiple reference marks is used for position feedback of the 6th axis; 0 means not used.

209 MANUAL HOME RETURN BY A LINEAR SCALE WITH MULTIPLE REFERENCE MARKS

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

This parameter is only applicable to Heidenhain's linear scale with multiple reference marks. When executing zero return manually, please use BIT defined as below to set the numbers of reference mark signals that need to be checked for each axis.

0：In MANUAL mode, 3 reference marks must be checked to complete the zero return.
1：In MANUAL mode, only 2 reference marks have to be checked to complete the zero return. If this option is adopted, Pr.0210 must be set additionally.

210	ZERO POINT'S RELATIVE DIRECTIONS TO THE LINEAR SCALE WITH MULTIPLE REFERENCE MARKS

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

This parameter is only applicable to Heidenhain's linear scale with multiple reference marks. Please use BIT to set the relative position of each axis's machine zero point and the linear scale's zero point (Only valid when the relevant BIT value to Pr.0209 is set to 1).

0：Machine zero point is at the *positive* side of the linear scale's reference mark；

1：Machine zero point is at the *negative* side of the linear scale's reference mark.

293	REFERENCE OF SERVO AXIS'S ZERO POINT

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

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

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

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

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

834	READING DURATION OF ABSOLUTE ENCODER

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

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

1014	ABSOLUTE COORDINATES OF X AXIS AFTER RETURNING TO HOME POINT μm
1015	ABSOLUTE COORDINATES OF Y AXIS AFTER RETURNING TO HOME POINT μm
1016	ABSOLUTE COORDINATES OF Z AXIS AFTER RETURNING TO HOME POINT μm
1017	ABSOLUTE COORDINATES OF THE 4TH AXIS AFTER RETURNING TO HOME POINT μm
1130	ABS COORD.5 AFTER HOMING μm
1131	ABS COORD.6 AFTER HOMING μm

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

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

1022	**THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm**
1023	**THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm**
1024	**THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm**
1025	**THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 2ND ZERO POINT TO THE 1ST ZERO POINT μm**
1132	**5.OFF FOR ORG.2 REF TO ORG.1 μm**
1133	**6.OFF FOR ORG.2 REF TO ORG.1 μm**

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

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

1026	**THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm**
1027	**THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm**
1028	**THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm**
1029	**THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 3RD ZERO POINT TO THE 1ST ZERO POINT μm**
1134	**5.OFF FOR ORG.3 REF TO ORG.1 μm**
1135	**6.OFF FOR ORG.3 REF TO ORG.1 μm**

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

This parameter sets the corresponding offset amount of each axis's 3rd zero point to its 1st zero point. Assume the corresponding offset amount is 2000μm, set this parameter 2000.

1030	**THE CORRESPONDING OFFSET AMOUNT OF X AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm**
1031	**THE CORRESPONDING OFFSET AMOUNT OF Y AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm**
1032	**THE CORRESPONDING OFFSET AMOUNT OF Z AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm**
1033	**THE CORRESPONDING OFFSET AMOUNT OF THE 4TH AXIS'S 4TH ZERO POINT TO THE 1ST ZERO POINT μm**
1136	**5.OFF FOR ORG.4 REF TO ORG.1 μm**
1137	**6.OFF FOR ORG.4 REF TO ORG.1 μm**

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

This parameter sets the corresponding offset amount of each axis's 4th zero point to its 1st zero point. Assume the corresponding offset amount is 2000μm, set this parameter 2000.

1098	**POSITION ERROR OF THE ABSOLUTE ENCODER**

Range： 0 ~ 1000
Effective： Effective After RESET
Access level： Machine Maker
Default： 30
Unit： pulse

This parameter sets the maximum tolerance of the offset value between NC's internal encoder and the driver's absolute encoders. This parameter should be set within a reasonable range according to the difference of the values between each axis's absolute encoder and NC's internal value. The corresponding values for each axis and its NC internal values are listed below:

	X axis	Y axis	Z axis	The 4th axis
Value of the absolute encoder	41	42	43	44
NC's internal value	32	33	34	35

1104	**HOME RETURN AT THE 1ST SPEED: X AXIS μm/min**
1105	**HOME RETURN AT THE 1ST SPEED: Y AXIS μm/min**
1106	**HOME RETURN AT THE 1ST SPEED: Z AXIS μm/min**
1107	**HOME RETURN AT THE 1ST SPEED: THE 4TH AXIS μm/min**
1138	**1ST SPEED OF 5 HOMING μm/min**
1139	**1ST SPEED OF 6 HOMING μm/min**

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

During HOME return, each axis travels to its zero point at the speed set by this parameter (Pr.0120). If DOG is met, each axis searches for the motor's zero point according to the 1st speed set by Pr.1108 ~ Pr.1111, Pr.1140, and Pr.1141.

1108	**HOME RETURN AT THE 2ND SPEED: X AXIS μm/min**
1109	**HOME RETURN AT THE 2ND SPEED: Y AXIS μm/min**
1110	**HOME RETURN AT THE 2ND SPEED: Z AXIS μm/min**
1111	**HOME RETURN AT THE 2ND SPEED: THE 4TH AXIS μm/min**
1140	**2ST SPEED OF 5 HOMING μm/min**
1141	**2ST SPEED OF 6 HOMING μm/min**

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： Machine Maker
Default： 200000
Unit： μm/min

During HOME return, each axis travels to its zero point at the speed set by Pr.1104 ~ 1107, 1138, & 1139 (Set by Pr.0120). If DOG is met, each axis searches for the motor's zero point at the 2nd speed set by this parameter.

1118	INDEX PROTECTION

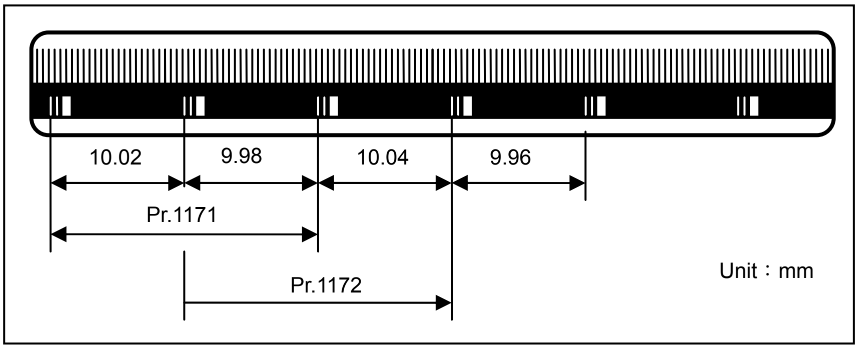
Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

When the distance between the 1st index and limit switch is less than 1/5 or more than 4/5 revolution of the encoder, grid protection function will activate so the next index mark will be used to make the distance between the 1st index and limit switch over 1/2 revolution of the encoder if the distance in-between is less than 1/2 revolution. This function ensures that the zero point is always the original one.

1171	**A INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: X AXIS μm**
1172	**B INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: X AXIS μm**
1173	**A INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: Y AXIS μm**
1174	**B INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: Y AXIS μm**
1175	**A INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: Z AXIS μm**
1176	**B INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: Z AXIS μm**
1177	**A INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: THE 4TH AXIS μm**
1178	**B INTERVAL OF LINEAR SCALE WITH MULTIPLE REFERENCE MARKS: THE 4TH AXIS μm**
1179	**SPACE1 LINEAR SCALE OF 5TH AXIS μm**
1180	**SPACE2 LINEAR SCALE OF 5TH AXIS μm**
1181	**SPACE1 LINEAR SCALE OF 6TH AXIS μm**
1182	**SPACE2 LINEAR SCALE OF 6TH AXIS μm**

Range： 0 ~ 99999999
Effective： Effective After Reboot
Access level： Machine Maker
Default： 20020
Unit： μm

This parameter is only applicable to Heidenhain's linear scale with multiple reference marks. Please refer to the diagram below for the setting method.



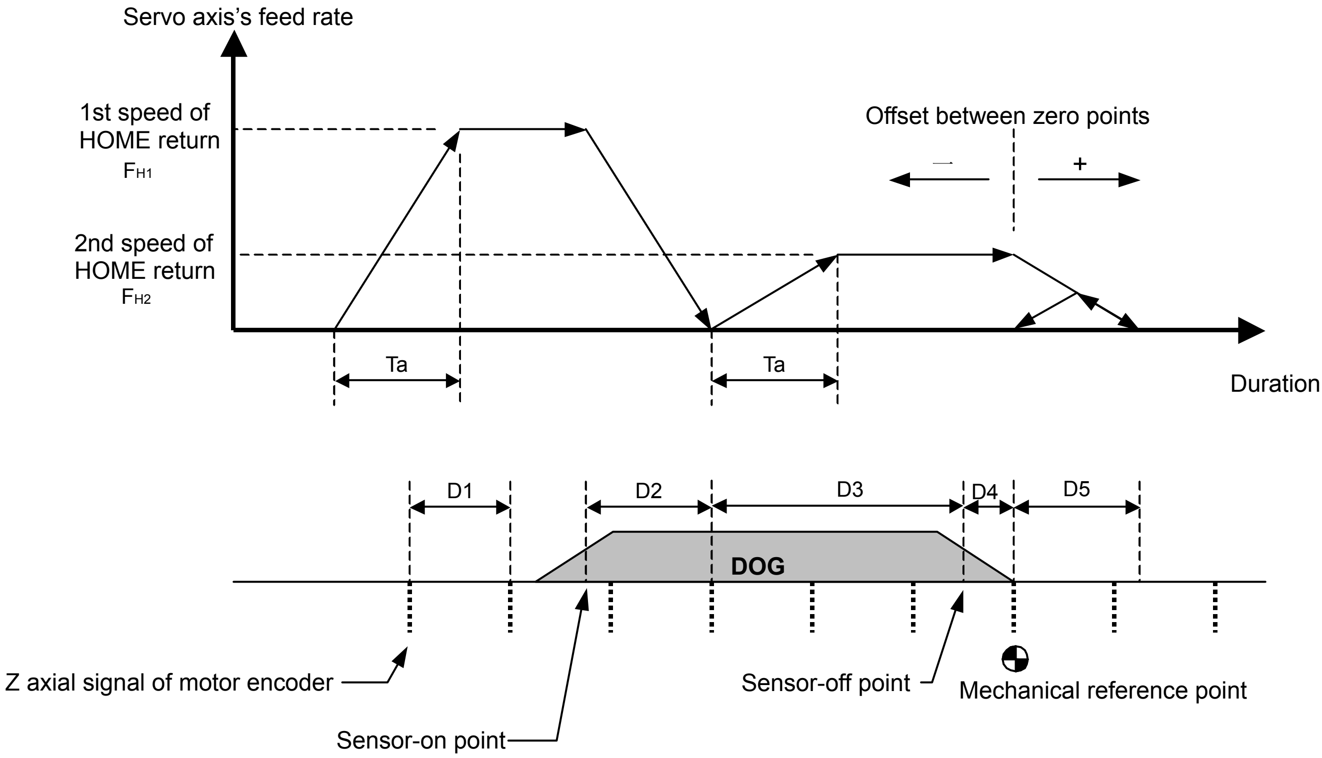
1183	OFFSET BETWEEN THE ZERO POINTS OF X AXIS & LINEAR SCALE
1184	OFFSET BETWEEN THE ZERO POINTS OF Y AXIS & LINEAR SCALE
1185	OFFSET BETWEEN THE ZERO POINTS OF Z AXIS & LINEAR SCALE
1186	OFFSET BETWEEN THE ZERO POINTS OF THE 4TH AXIS & LINEAR SCALE
1187	OFFSET LINEAR SCALE OF 5TH AXIS
1188	OFFSET LINEAR SCALE OF 6TH AXIS

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

This parameter is only applicable to Heidenhain's linear scale with multiple reference marks. To change the set value of this parameter, please press RESET and then execute zero return manually again. By measuring 2 or 3 signal intervals of the linear scale, NC can detect instantly the relative position between each axis's current position and the linear scale's zero point. If the two positions do not match each other, the shift between them must be defined by setting this parameter.

HOME RETURN

- **THE ZERO POINT IS AFTER DOG**



1. D1 is the interval between 2 successive Z axial signals of the servo motor's encoder.
2. D2 is the traveling distance of DOG signal from the entering point to decelerate the 1st ( ) speed until it stops, the formula is as below：

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

   In the formula above, Kp is the position loop gain of the servo axis (sec-1), Ta is the G00 acceleration/deceleration time of the servo axis. If the distance from the point when DOG enters to its disappearace is smaller than D2, the alarm "MOT 4027 HOME DOG TOO SHORT" will be triggered.

3. D3 is the traveling distance of the servo motor from zero point to accelerate until it reaches the 2nd () speed, and DOG disappears. In order to obtain Z axial signal at the constant speed, the distance of D3 must be long enough so the servo motor can reach the same speed () as the 2nd () speed. The formula is as below：

   D3 $\geqq \frac{F_{H2} \cdot T_a}{2}$，Ta is the G00 acceleration/deceleration duration of the servo axis.

   The length of DOG must be (D2 + D3) at least.
4. D4 is the internval of DOG from disappearing point to the appearance of next servo motor's ENCODER Z axial signal. To prevent confusion due to electric and mechanical delay, D4 should be approximately half length of D1, meaning, DOG's disappearing pint must be in the middle of two successive Z axial signals of the servo motor. If motor makes one revolution and does not find Z axial signal before DOG disappears, the alarm "MOT 4045 NO INDEX INTERRUPT" will be triggered to check if there is any mistakes of motor's wiring.
5. After DOG disappears, D5 is the traveling distance of the 1st Z axial signal of the servo motor from its entering to its stop point by acceleration at the 2nd () speed. The formula is as below：

   D5 ≒ servo lag + decelration distance ≒ $\frac{F_{H2}}{K_p} + \frac{F_{H2} \cdot T_a}{2}$

   In the formula, Kp is the position loop gain (sec-1) of the servo axis. Ta is the G00 acceleration/decelration duration of servo axis.

   The distance between the servo axis's mechanical zero point and over travel limit should be at least larger than D5, or the servo axis might trigger over travel limit during HOME return.

   The recommendation is to set the zero point's offset amount of the servo axis (Pr.0030 ~ Pr.0033) to be larger than D5 to prevent the servo axis from travel in the opposite direction.

Examples：

If the 1st speed of some servo motor to return to the zero point is 10m/min. the 2nd () speed is 200mm/min, G00 acceleration/deceleration distance is 150ms, position loop gain is 100sec^{-1}. When the zero point is after DOG, the shortest length required for DOG is calculated as below:

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

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

So the shortest length required by DOG would be:

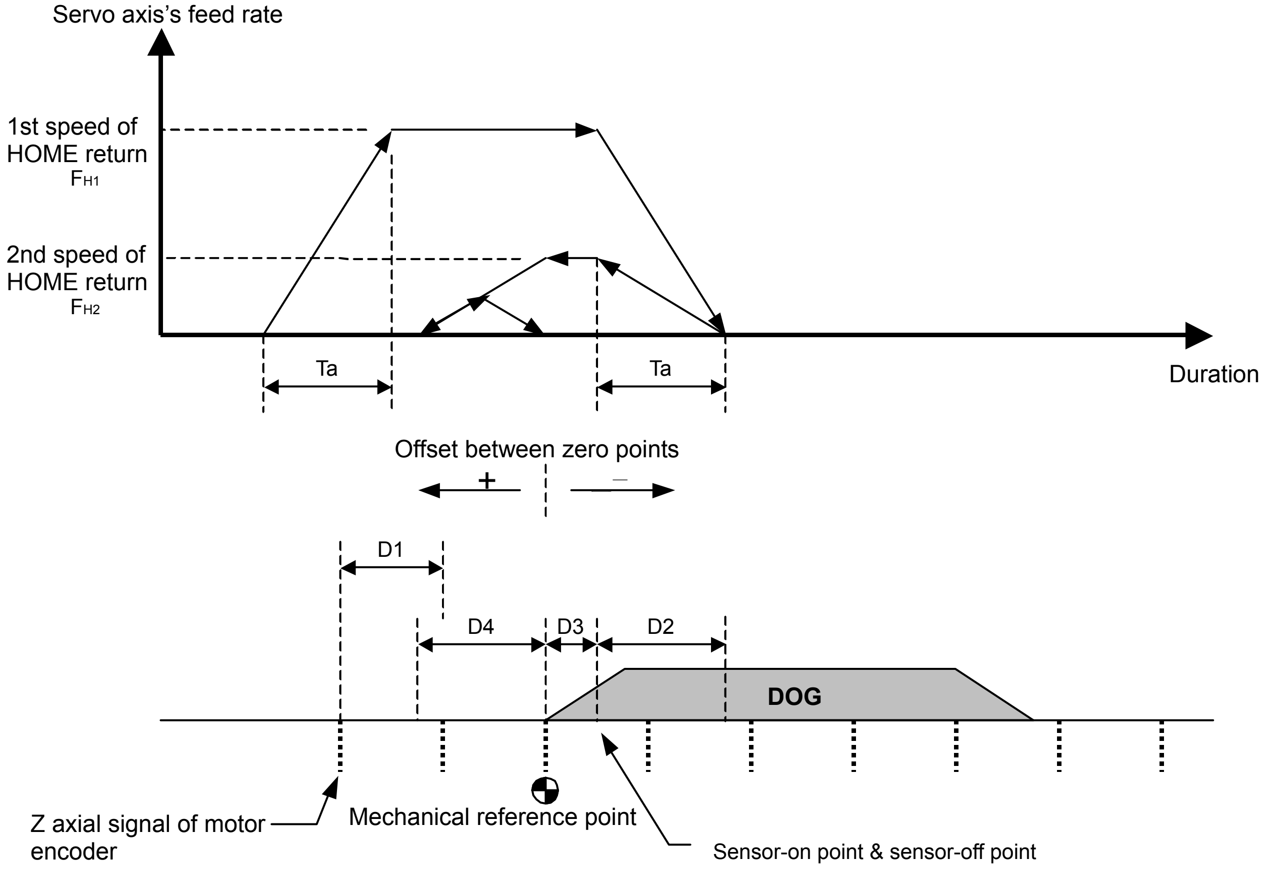
（D2 + D3） ≒ 14.42mm

Or

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

If the offset amount of some axis's zero point is set to be larger than 0.28mm, this would prevent that axis to motion in the negative direction before executing the last step of HOME RETURN.

- **ZERO POINT AHEAD DOG**



1. D1 is the interval between 2 consecutive Z axial signals of the servo motor's encoder.
2. D2 is the traveling distance of a DOG signal from the point when it is dectectd by the sensor (sensor-on point) to its final position when it decelerates at 1st speed until it fully stops (sensor-off point). The formula of D2 is as below：

   D2 ≒ Servo lag + Deceleration distance ≒ $\frac{F_{H1}}{K_p} + \frac{F_{H1} \cdot T_a}{2}$

   In the formula above, Kp is the position loop gain of the servo axis (sec-1), Ta is the G00 acceleration/deceleration time of the servo axis. If the distance between the sensor-on and sensor-off point is smaller than D2, the alarm "MOT 4027 HOME DOG TOO SHORT" will be triggered.

3. D2 is the traveling distance of a servo axis to accelerate from zero to the 2nd speed to arrive the sensor-off point. Generally speaking, the 2nd speed is slower than the 1st speed; therefore, the length of D2 is long enough to allow the servo motor to speed up and reach the constant rate same as the 2nd speed, which means that Z axial signals can be detected at a constant speed.
4. D3 is the distance between the sensor-off point and the next Z axial signal of a servo motor's encoder. To prevent interference caused by electric or mechanical delay, D3 should be approximately half length of D1, meaning, the sensor-off point should be around in the middie of two consecutive Z axial signals of the servo motor. If the motor makes one revolution but can not find a Z axial signal before DOG leaves the sensor area, the alarm "MOT 4045 NO INDEX INTERRUPT" will be triggered, in this case, please check if there is any mistakes about the motor's wiring.

   D4 is the traveling distance between the point when the servo motor's 1st Z axial signal is detected by sensor and the stop point of the servo axis when it decelerates at the 2nd speed to fully stop. The formula of D5 is as below：

   D4 ≒ servo lag + deceleration distance ≒ $\frac{F_{H2}}{K_p} + \frac{F_{H2} \cdot T_a}{2}$

   In the formula, Kp is the position loop gain (sec-1) of the servo axis. Ta is the G00 acceleration/decelration duration of the servo axis.

   The recommendation is to set the zero point's offset amount of the servo axis to be larger than D4 to prevent the servo axis from traveling in the opposite direction.

5.8 Operation Parameter

39	CANCEL G92 WHEN G54 ~ G59 CALL
Range：	0 ~ 1
Effective：	Effective After RESET
Access level：	User
Default：	0
Unit：	Nul

When coordinate system selection commands G54 ~ G59 are executed in a program, the previous coordinate offset caused by G92 command:

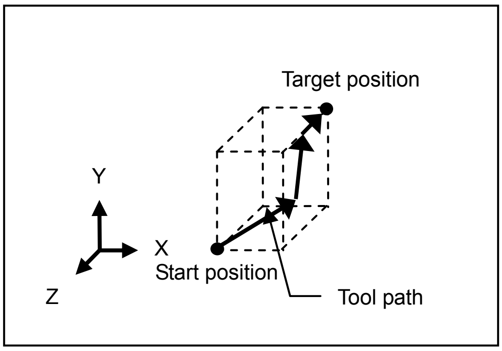
0：Will not be cancelled.

1：Will be cancelled.

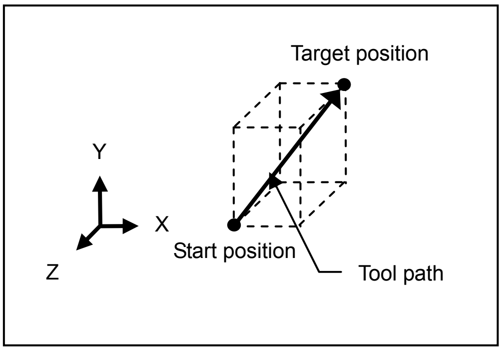
41	SYNCHRONIC MOTION OF G00 COMMAND 0)NO 1)YES

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

42	ANNOTATION TYPE 0) /*...*/ 1) (...)

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

Pr.0042 sets the annotation format for part programs. When Pr.0042 is set to 0, the annotation format is /*……*/, and the functional format can either be (…) or […]. When Pr.0042 is set to 1, the annotation format can be either /*……*/ or (………), but the functional format must be […].

43	IN-POSITION CHECK MODE OF INTERPOLATION BIT

Range： 0 ~ 127
Effective： Effective After RESET
Access level： User
Default： 16
Unit： Nul

Bit 0：Set to 1, In-position Check function of linear cutting (G01) of X axis is cancelled.
Bit 1：Set to 1, In-position Check function of linear cutting (G01) of Y axis is cancelled.
Bit 2：Set to 1, In-position Check function of linear cutting (G01) of Z axis is cancelled.
Bit 3：Set to 1, In-position Check function of linear cutting (G01) of the 4th axis is cancelled.
Bit 4：Set to 1, In-position Check function of RAPID TRAVERSE (G00) is enabled.
Bit 5：Set to 1, In-position Check function of linear cutting (G01) of the 5th axis is cancelled.
Bit 6：Set to 1, In-position Check function of linear cutting (G01) of the 6th axis is cancelled.

For linear cutting command (G01), if In-position Check function is to be enabled, except for setting the corresponding Bit of this parameter, G09 command (In-position command, effective for blocks) or G61 command (In-position mode, always effective, must be cancelled by G64 command) should be enabled additionally.
Once In-position Check function of G01 command is enabled, and any interpolation of G01 command is finished, NC will wait until the actual position of each enabled servo axis has entered the in-position check windows (Pr. 0006, 0009, 0252, 0253) before executing the next block.
For Rapid Traverse command G00, setting this parameter's Bit 4 1 will activate In-position Check function. When In-position function of Rapid Traverse command is enabled, and any interpolation of Rapid Traverse command is finished, NC will wait until the actual positions of all servo axes have entered the range of in-position check window (Pr.0268, 0269, 0800 ~ 0803) before executing the next block. However, if both the blocks before and after some Rapid Traverse command are Rapid Traverse commands, that Rapid Traverse command will not execute In-position Check.

63	SET RELATIVE COORDINATES ACCORDING TO ABSOLUTE COORIDNATES 0)NO 1)YES

Range： 0 ~ 1
Effective： Effective After RESET

Access level： User
Default： 1
Unit： Nul

The effective range of this parameter's set value is as below:
a. Display value of initial coordinates;
b. Display value of coordinates after HOME return is finished;
c. G54 ~ G59 commands (Coordinate system selection);
d. G92 command (Set coordinate values).

71	PATH CHECK G22 ADOPTS 0)OUTSIDE 1)INSIDE

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

0：The path check set by G22 is in the outside forbidden area, and tools can only travel inside the assigned check range. If there is any command that tries to motion some tool to the area outside the assigned check range, the system alarm will be triggered.

1：The path check set by G22 is in the inside forbidden area, and tools can only travel outside the assigned check range. If there is any command that tries to motion some tool to the area inside the assigned check range, the system alarm will be triggered.

Please refer to the description of the warning messages MOT 4058、9009 ~ 9014 for the relative system alarms.

73	ACCELERATION/DECELERATION OF G31 0)NO 1)YES

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

0：No, after G31 Skip signal is detected, do not decelerate or stop.

1：Yes, after G31 Skip signal is detected, decelerate according to the acceleration/deceleration duration set by Pr.0014.

74	EXECUTE SINGLE BLOCK OF MACRO

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

0：MACRO commands (not NC commands) will not be executed by single block.

1：MACRO commands (not NC commands) will be executed by single block.

78	CUTTING LAG OF C AXIS 0)NO 122)YES
292	CUTTING ROUTE LAG OF C AXIS 0)NO 1)YES

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

When this function is enabled, the motion angle of C axis will follow the cutting direction of XY.

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

<table>
<tr><td rowspan="4"></td><td colspan="4">Pr.0083</td></tr>
<tr><td colspan="2">0</td><td colspan="2">1</td></tr>
<tr><td colspan="2">Pr.0041</td><td colspan="2">Pr.0041</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>RAPID mode</td><td colspan="4">（1）</td></tr>
<tr><td>G00 or commands equal to G00 in MEM, MDI mode</td><td>（2）</td><td>（3）</td><td>（1）</td><td>（4）</td></tr>
<tr><td rowspan="2">G00, G53 commands of PMC axis function</td><td>C23 is OFF：（1）</td><td>C23 is OFF：（3）</td><td rowspan="2">（1）</td><td rowspan="2">（4）</td></tr>
<tr><td>C23 is ON：（1）</td><td>C23 is ON：（4）</td></tr>
</table>

（1） Each axis travels at G00 speed set respectively for each axis;
（2） Each axis travels at JOG speed set respectively for each axis;
（3） Each axis travels no faster than JOG speed set respectively for each axis;
（4） Each axis travels no faster than G00 speed set respectively for each axis.

89	SET M CODE COMMAND OF PART COUNT BY USER

Range： 1 ~ 99
Effective： Effective After RESET
Access level： User
Default： 99
Unit： Nul

In addition to M02 & M30, users can also set M code commands for part count by using this parameter. Please refer to Programming Manual for the detail list of M code commands.
When the program meets this M code, the part count number on POS page will accumulate, and machining time will automatically turn to zero. If the accumulated part count number exceeds the preset maximum part count number, NC will send S134 to notify PLC to take the corresponding action.

94	EDIBILITY OF 09XXX 0)NO 1)YES

Range： 0 ~ 1
Effective： Instant Activity
Access level： Machine Maker
Default： 0
Unit： Nul

Set the edibility of files No. O9000~O9999, etc.

121	G76/G87 TOOL ESCAPE DIRECTION IN CANNED CYCLE

Range： 0 ~ 3
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

G76/G87 Tool escape direction in canned cycle

	G17	G18	G19
0	+X	+Z	+Y
1	-X	-Z	-Y
2	+Y	+X	+Z
3	-Y	-X	-Z

122	NAME THE 4TH AXIS 0-5 (ABCUVW)
288	NAME THE 5TH AXIS 0-5 (ABCUVW)
289	NAME THE 6TH AXIS 0-5 (ABCUVW)

Range： 0 ~ 5
Effective： Effective After Reboot
Access level： Machine Maker
Default： 1
Unit： Nul

Set to 0, the 4th axis is referred as A.
Set to 1, the 4th axis is referred as B.
Set to 2, the 4th axis is referred as C.
Set to 3, the 4th axis is referred as U.
Set to 4, the 4th axis is referred as V.
Set to 5, the 4th axis is referred as W.

123	UNIT SYSTEM 0)G21 METRIC 1)G20 IMPERIAL

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

This parameter sets the default unit system after the system starts. Users can switch between the two unit systems by G20(imperial) & G21(metric).

124	INITIAL MOTION COMMAND 0)G00 1)G01

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

This parameter sets the default motion commands after NC starts. In MEM or MDI mode, users execute the commands below for the first time:

G91 X100. Y100. Z100.;
When this parameter is set to 0, the command above is the same as:

G91 G00 X100. Y100. Z100.;
When this parameter is set to 0, the command above is the same as:

G91 G01 X100. Y100. Z100.;

129 | **G02 G03 TOLERANCE OF COMMAND ERROR**

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： User
Default： 5
Unit： μm

When part programs execute G02 or G03, the system will check if the terminal position of an arc is on the circle described by the starting point coordinates and the center point coordinates. If the offset between the arc's terminal position and the circle exceeds the range set by Pr.0129, the system will send a warning signal as “3132 Illegal Radius.”
When this parameter is set to 0, the range to be checked is set to 5um.

130 | **UNIT OF INPUT VALUE**

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

Examples: In metric system, if this parameter is set to 0, and the commands as below are set in MDI mode：
G90 G00 X100. F1000.;
X axis travels at the rate of 1mm/min to the position at 0.1mm.
G90 G00 X100. F1000.;
X axis travels at the rate of 1000mm/min to the position at 100mm.

If this parameter is set to 1：
G90 G00 X100. F1000.;
X axis travels at the rate of 1000mm/min to the position at 100mm.
G90 G00 X100. F1000.;
X axis travels at the rate of 1000mm/min to the position at 100mm.

131 | **CUTTER COMPENSATION TYPE 0)A 1)B**

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

0：Use type A cutter compensation.
1：Use type B cutter compensation.
Please refer to Programming Manual for the description of types.

134	G83/G87 TOOL RETRACTION 0)START POINT 1)R POINT

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul
0：Start point.
1：R point.

135	DEFAULT COORDINATES 0)ABSOLUTE G90 1)INCREMENTAL G91

Range： 0 ~ 1
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul
The system's default coordinate type is:
0：Absolute coordinates (G90)
1：Incremental coordinates (G91)

136	REDUCTION/ENLARGEMENT RATIO OF X AXIS 0)DISABLED 1)ENABLED
137	REDUCTION/ENLARGEMENT RATIO OF Y AXIS 0)DISABLED 1)ENABLED
138	REDUCTION/ENLARGEMENT RATIO OF Z AXIS 0)DISABLED 1)ENABLED

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

139	CUTTER COMPENSATION CODE 0)H 1)D

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul
0：H code.
1：D code.
This parameter sets the cutter compensation number to be H code or D code.
If set to 0, the cutter compensation command is: G41 H1;
If set to 1, the cutter compensation command is: G41 D1.

140	GLOBAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED

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

There are 500 GLOBAL MACROs in total, and all layers share these global variables. Among these MACROs, the default value of @1 ~ @400 is VACANT. This parameter sets whether @1 ~ @400 turns back to VACANT after RESET. The values of @401 ~ @500 will remain the same after RESET is pressed and also remain in the system after power off. @0 is always set to VACANT.

141	LOCAL VARIABLES AFTER RESET 0)DELETED 1)PRESERVED

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

There are 33 MACROs in total; within each layer of a program has its own 33 local variables separately. As long as some layer of a program is finished, its local MACRO variables will be deleted. However, as pressing RESET will enable the system to go back to the main program’s layer, users must use this parameter to set if to delete the local MACRO variables in the main program’s layer. If the system restarts, then all the local variables will be deleted no matter in which layer they are. #0 is always set to VACANT.

142	ROTARY ANGLE OF COORDINATES COMMAND IS 0)ABSOLUTE 1)INCREMENTAL

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

0：Absolute value(s)
1：Incremental value(s)
Please refer to the description in Programming Manual.

143	ENLARGEMENT RATIO

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

0: Reduction/enlargement ratios for X, Y, and Z axis are set by P code only.
1: Reduction/enlargement ratios for X, Y, and Z axis are set by I, J, and K code, respectively. In this case, the default reduction/enlargement ratio of each axis can be set by Pr.1092 ~ Pr.1094.
Please refer to the relative description in Programming Manual.

145	DEFAULT PLANE 0)XY 1)ZX 2)YZ

Range： 0 ~ 2
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

0: Default plane is XY (G17).
0: Default plane is ZX (G18).
0: Default plane is YZ (G19).

146	M CODE FOR MACRO O9001
147	M CODE FOR MACRO O9002
148	M CODE FOR MACRO O9003

Range： 0 ~ 99
Effective： Effective After RESET
Access level： Machine Maker
Default： 0
Unit： Nul

When NC executes some M code set by these parameters in a part program, NC will call and execute MACRO programs O0001 ~ O9003. If the parameter is set to 0, this function is disabled. Among the MACRO programs called by G, M, or T codes, all M codes set by the parameter are regarded as general M codes, which can not call a MACRO program.
Please refer to Programming Manual for the detail of M code list.

149	DEFAULT FEED RATE

Range： 0 ~ 32767
Effective： Effective After Reboot
Access level： User
Default： 1000
Unit： mm/min

This parameter sets the default feed rate in MEM or MDI mode.

150	TOOL ESCAPE AMOUNT IN DRILLING CYCLE

Range： 0 ~ 32767

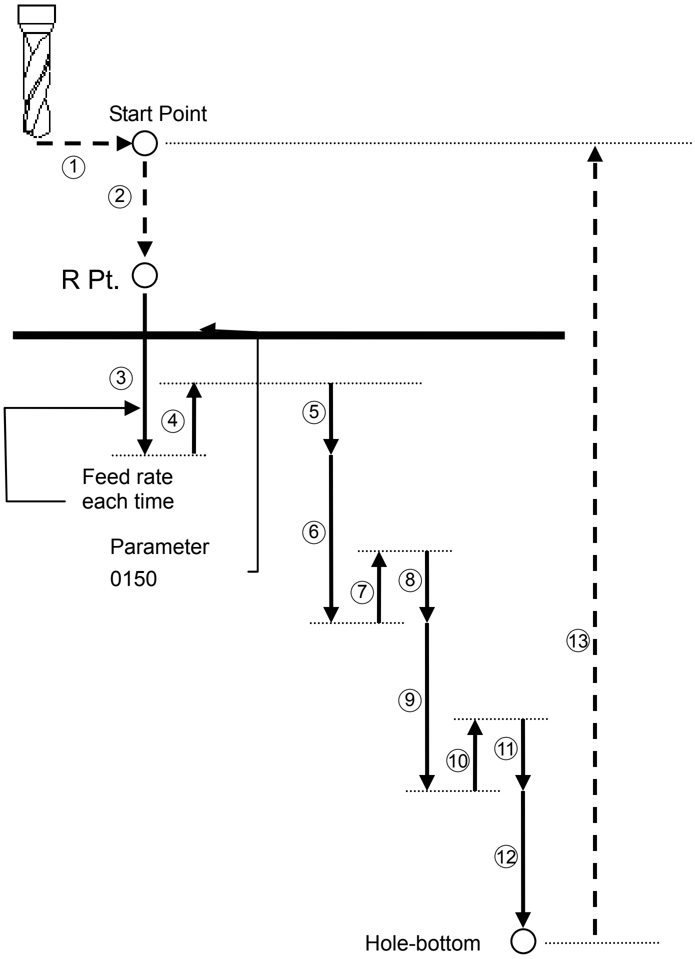
Effective： Effective After RESET

Access level： User

Default： 200

Unit： μm

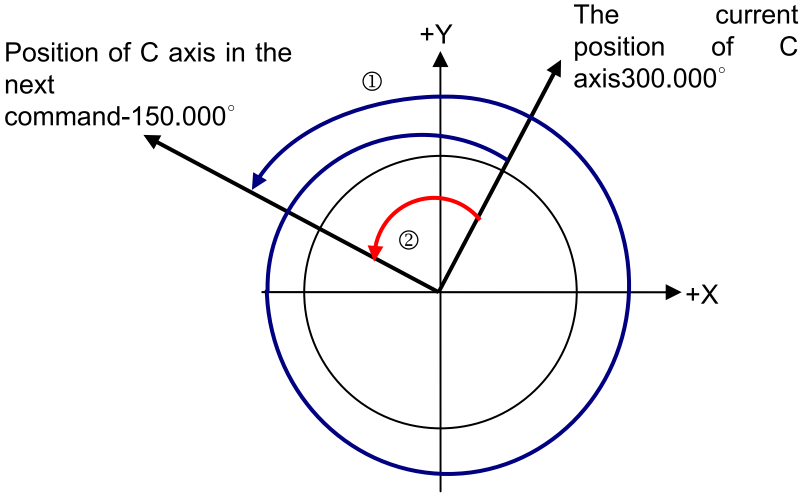
This parameter sets the return distance of Z axis in G73 Peak command. The return distance is used to clean the chips. The motion diagram of Peak command is as below:



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.



155	FEEDRATE IS MM/REV OR MM/MIN

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

This parameter sets the default unit system of cutting feed rate in MEM or MDI mode; however, this parameter is invalid for G00 command.

0：Adopt G95 mode, in metric system mm/rev is applied; in imperial system, inch/rev is applied. In this case, cutting commands (G01/G02/G03) are only effective when cooperating with the rotation of spindle.

1：Adopt G94 mode, in metric system the unit mm/min is applied; in imperial system, inch/min is applied.

161	**M CODE FOR MACRO O9004**
162	**M CODE FOR MACRO O9005**
163	**M CODE FOR MACRO O9006**
164	**M CODE FOR MACRO O9007**
165	**M CODE FOR MACRO O9008**
166	**G CODE FOR MACRO O9010**
167	**G CODE FOR MACRO O9011**
168	**G CODE FOR MACRO O9012**
169	**T CODE CALLS O9020**

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

When NC executes the M code set by this parameter, NC will call and execute MACRO program O9004 (O9005 ~ O9008, O9010 ~ O9012, O9020); users can write the content of that MACRO by themselves by copying the file to the MACRO program table assigned by the system (the preset table is C:\“system table”\MACRO). The set value of this parameter is not applicable to M codes for general purposes. Please refer to Programming Manual for M code list in detai.

170	**UPDATE MODAL AFTER SWITCH FROM MDI TO MEM 0)YES 1)NO**

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

0：Yes, the modals changed in MDI mode are invalid. All modes will return to the preset values.
1：No, the modals changed in MDI mode are also applicable to MEM mode.

Example: Assume Pr.0135 is set to 0 (the default system coordinate system is G90 mode), if G92 command is keyed in and executed in MDI mode, and then the system switches from MDI to MEM mode, when this parameter is set to 0, and the following command is executed :
G01 X100. F1000.;
And X axis will travel at the rate of 1000mm/min to the position of 100mm.

When this parameter is set to 1, and the following command is executed:
G01 X100. F1000.;
And X axis will travel in the positive direction at the rate of 1000mm/min to the position of 100mm.

176	G31 SIGNAL SOURCE (HS1/HS2)

Range： 1 ~ 2
Effective： Effective After RESET
Access level： Machine Maker
Default： 1
Unit： Nul

1：The signal G31 SKIP is connected to the first LOCAL INPUT point (HS1 on a transit card)
2：The signal G31 SKIP is connected to the second LOCAL INPUT point (HS2 on a transit card)

Because the single block stop function of G31 SKIP needs LOCAL INPUTs to latch the values of the absolute position recoder for each axis, therefore only the first or second LOCAL INPUT can be applied.

177	G31 SIGNAL SOURCE TYPE 0)NC 1)NO

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

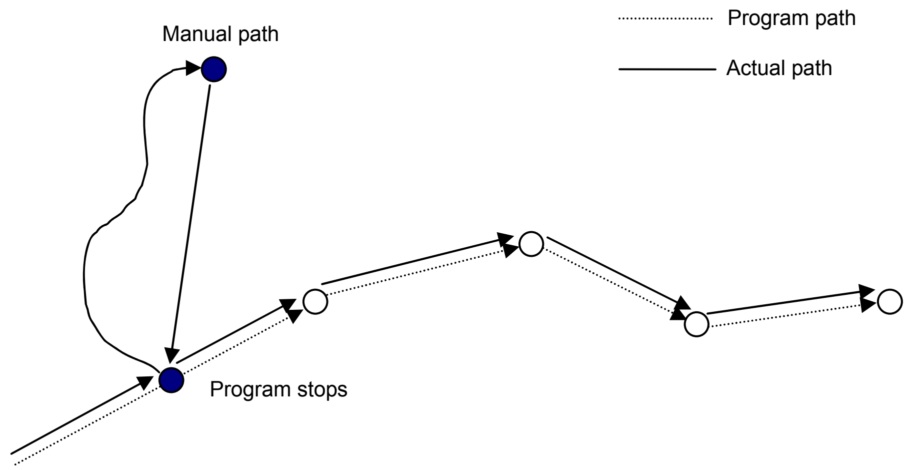
0：The signal G31SKIP is normal close (NC). When this SKIP signal turns from 1 to 0, the G31 block will stop at once and the next block will be executed.
1：The signal G31SKIP is normal open (NO). When this SKIP signal turns from 0 to 1, the G31 block will stop at once and the next block will be executed.

180	MANUAL RETURN

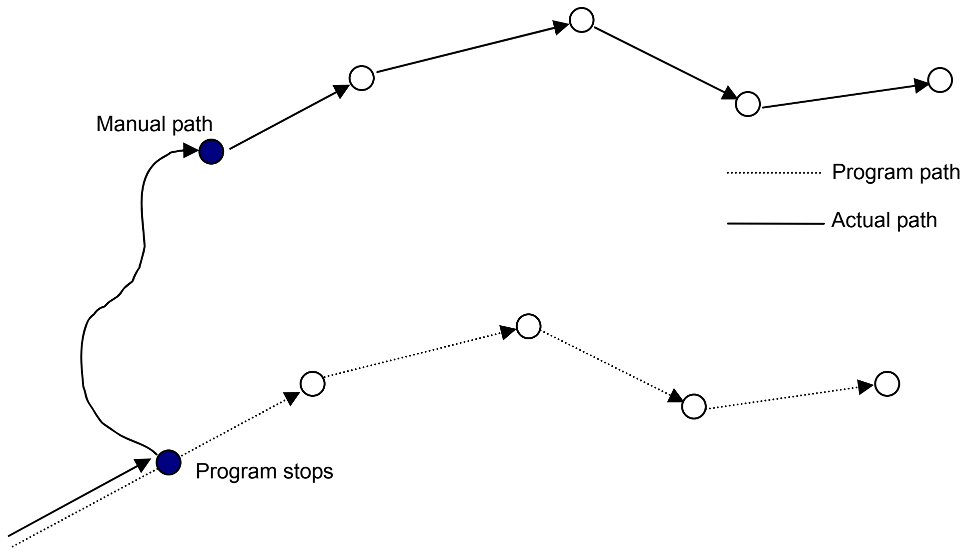
Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

In the middle of executing a part program in MEM or MDI mode, if switching to MANUAL modes such as JOG, MPG, or RAPID, etc., the system will enter FEED HOLD status. If moving the machine manually away from its last position in MEM or MDI mode, there are two options to return to MEM or MDI mode and resume the unfinished program:

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



Enable Manual Return



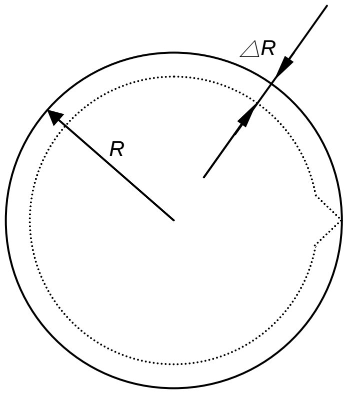
Disable Manual Return

Manual Return function can be set either by this parameter or by C004.
When C004 is ON, Manual Return function is enabled.
When C004 is OFF, Manual Return function is disabled.
If Pr.0180 is set to 1, Manual Return function will be enabled no matter C004 is ON or OFF; if Pr.0180 is set to 0, use C004 to set if to enable this function.

187	AUTO ARC FEED RATE CLAMP 0)NO 1)YES

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul
0：No
1：Yes

In acceleration/deceleration after interpolation law, there will be an offset amount ΔR between Arc command and the actual path.



The formula is ：$\Delta R = (\frac{1}{2K_p^2 R} + \frac{T^2}{24R})V^2$ is the offset caused by servo lag.

$\frac{T^2}{24R}$ is the offset caused by command lag (If pre-acceleration/deceleration is adopted, then $\frac{T^2}{24R}$ is not calculated). K_p is position loop gain; T is the constant number of acceleration/deceleration time; R is arch radius; and V is the assigned feed rate. This formula is only applicable when the responding rate of speed loop is 3 ~ 10 times faster than (that of) position loop.

When ARC FEED RATE AUTO CLAMP function is enabled, the system will adjust the actual feed rate based on the assigned maximum tolerance of path error (Pr.0809).
Please also refer to the relative parameters: Pr.0188 & Pr.0809.

200	FEEDRATE DISPLAY 0)COMMAND 1)ACTUAL FEEDBACK

Range： 0 ~ 1
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul
0：Show the command value of feed rate on HMI.
1：The system calculates feed back values by using each axis's motor encoder (or the linear scale) and shows the value on HMI.

202	OPERATION LANGUAGE 0)ENGLISH 1)TRADITIONAL CHINESE 2)SIMPLIFIED CHINESE

Range： 0 ~ 2
Effective： Effective After Reboot
Access level： User
Default： 1
Unit： Nul

0：English
1：Traditional Chinese
2：Simplified Chinese

205	TOOL COMPENSATION 0)ABSOLUTE 1) RELATIVE INPUT

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

This parameter sets whether the tool compensation value set on OFFSET page is an absolute or a relative value.

211	STOP PRE-INTERPRETATION OF M CODE
212	STOP PRE-INTERPRETATION OF M CODE
213	STOP PRE-INTERPRETATION OF M CODE
214	STOP PRE-INTERPRETATION OF M CODE
215	STOP PRE-INTERPRETATION OF M CODE
216	STOP PRE-INTERPRETATION OF M CODE
217	STOP PRE-INTERPRETATION OF M CODE
218	STOP PRE-INTERPRETATION OF M CODE
219	STOP PRE-INTERPRETATION OF M CODE
220	STOP PRE-INTERPRETATION OF M CODE

Range： 0 ~ 299
Effective： Effective After RESET
Access level： User
Default： 209
Unit： Nul

If some M code must wait for external signals, it must be registered here to prevent any false action caused by pre-interpretation of part programs.

221 DIGITAL FILTER FREQUENCY (KHZ)

Range： 0 ~ 6666
Effective： Effective After Reboot
Access level： Machine Maker
Default： 0
Unit： Nul

Please refer to the chart below for the valid ranges of digital filter frequency. If the frequency is set between two ranges, NC will use the closest value as the filter frequency. For example, Pr.0221 is set as 250 KHz while the actual filter frequency is 256 KHz.

Filter Freq. (KHz)	Filter Freq. (KHz)	Filter Freq. (KHz)	Filter Freq. (KHz)	Filter Freq. (KHz)	Filter Freq. (KHz)
6667	256	131	81	53	28
3333	247	128	80	52	27
2222	238	126	79	51	26
1667	230	123	78	50	
1333	222	121	77	49	
1111	215	119	76	48	
952	208	117	75	47	
833	202	115	74	46	
741	196	113	73	45	
667	190	111	72	44	
606	185	109	71	43	
556	180	108	67	42	
513	175	106	66	41	
476	171	104	63	40	
444	167	101	65	39	
417	163	100	64	38	
392	159	98	63	37	
370	155	95	62	36	
351	152	94	61	35	
333	148	93	60	34	
317	145	90	59	33	
303	142	88	58	32	
290	139	85	57	31	
278	136	83	56	30	
267	133	82	54	29	

223 SELECT AXIS MANUAL RETURN (BIT)

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

Bit 0：Enable Manual Return function of X axis.
Bit 1：Enable Manual Return function of Y axis.
Bit 2：Enable Manual Return function of Z axis.
Bit 3：Enable Manual Return function of the 4th axis.
Bit 4：Enable Manual Return function of the 5th axis.
Bit 5：Enable Manual Return function of the 6th axis.
Preset as 0: Enable Manual Return function of all axes.

227	ENABLE A AXIS TANGENT FOLLOW 0)NO 1)YES
Range：	0 ~ 1
Effective：	Effective After Reboot
Access level：	User
Default：	0
Unit：	Nul
	Enable cutting lag of A axis.

228	ENABLE A AXIS PATH FOLLOWING 0)NO 1)YES
Range：	0 ~ 1
Effective：	Effective After Reboot
Access level：	User
Default：	0
Unit：	Nul
	Enable cutting route lag of A axis.

229	ENABLE B AXIS TANGENT FOLLOW 0)NO 1)YES
Range：	0 ~ 1
Effective：	Effective After Reboot
Access level：	User
Default：	0
Unit：	Nul
	Enable cutting lag of B axis.

230	ENABLE B AXIS PATH FOLLOWING 0)NO 1)YES
Range：	0 ~ 1
Effective：	Effective After Reboot
Access level：	User
Default：	0
Unit：	Nul
	Enable cutting route lag of B axis.

231	HIDE INFORMATION OF X AXIS
232	HIDE INFORMATION OF Y AXIS
233	HIDE INFORMATION OF Z AXIS
234	HIDE INFORMATION OF THE 4TH AXIS
235	AXIS 5TH INFORMATION HIDE
236	AXIS 6TH INFORMATION HIDE

Range： 0 ~ 3
Effective： Instant Activity
Access level： Machine Maker
Default： 0
Unit： Nul

The corresponding HMI information of X (Y, Z, the 4th, the 5th, the 6th) axis is:
0：Shown
1：Hidden
2：Set by C181(C182、C183、C184、C185、C186). OFF: Shown；ON: Hidden.

249	DISPLAY ABNORMALITY OF RAMDISK 0)OFF 1)ON

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

0：When there is any abnormality of RAMDISK, do not show warning messages.
1：When there is any abnormality of RAMDISK, show warning messages.

350	JOG FEED RATE IN REFERENCE TO F CODE OF MDI

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

0：In JOG mode, the speed of each axis is *always* defined by this parameter.
1：In JOG mode, the speed of each axis is *preset* by this parameter. If executing some F code in MDI mode, the F code replaces JOG speed to set the speed of each axis until RESET is pressed. However, in JOG mode, the highest speed of each axis is still set by this parameter.

351	UNIT OF CUTTING OVERRIDE FEED RATE

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

0：Cutting override feed rate = R016 register value* 10%；
1：Cutting override feed rate = R016 register value* 1%。

352	**UNIT OF JOG OVERRIDE**

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

0：JOG override = R017 register value* 10%；
1：JOG override = R017 register value* 1%。

353	**UNIT OF RAPID TRAVERSDE OVERRIDE**

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

0：RAPID TRAVERSE override are F0, 25%, 50%, & 100%, respectively,
1：RAPID TRAVERSE override = R018 register value* 1%.

360	**SET OPERATION SCREEN COLOR (0~3)**

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

0：Screen color setting is not applied.
1：Screen color setting is white words over a black background
2：Screen color setting is black words over a white background
3：Screen color setting is customized by users.

361	**SET THE NUMBER FOR BLACK (0~16)**
362	**SET THE NUMBER FOR BLUE (0~16)**
363	**SET THE NUMBER FOR GREEN (0~16)**
364	**SET THE NUMBER FOR CYAN (0~16)**
365	**SET THE NUMBER FOR RED (0~16)**
366	**SET THE NUMBER FOR PURPLE (0~16)**
367	**SET THE NUMBER FOR BROWN (0~16)**
368	**SET THE NUMBER FOR WHITE (0~16)**
369	**SET THE NUMBER FOR GRAY (0~16)**
370	**SET THE NUMBER FOR LIGHT BLUE (0~16)**
371	**SET THE NUMBER FOR LIGHT GREEN (0~16)**
372	**SET THE NUMBER FOR LIGHT CYAN (0~16)**
373	**SET THE NUMBER FOR LIGHT RED (0~16)**
374	**SET THE NUMBER FOR LIGHT PURPLE (0~16)**
375	**SET THE NUMBER FOR BLACK COLOR (0~16)**
376	**SET THE NUMBER FOR BRIGHT WHITE COLOR (0~16)**
377	**SET THE NUMBER FOR CURSOR (0~16)**
378	**SET THE NUMBER FOR HIGHLIGHT (0~16)**
379	**SET THE NUMBER FOR UPPER FRAME (0~16)**
380	**SET THE NUMBER FOR LOWER FRAME (0~16)**

Range： 0 ~ 16
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul

Only effective when Pr.0360 is set to 3.
0：Not applied.
1~16：Applied and change to the selected color.

394	**SCREENSAVER WAIT TIME**

Range： 0 ~ 9999
Effective： Effective After Reboot
Access level： User
Default： 0
Unit： Nul

1. When this parameter is set to 0, the screensaver is not applied.
2. When this parameter is not 0, the screensaver activates automatically after the system is not operated for a specified amount of time (time length set by the parameter). If screensaver has not activated and some key is pressed, wait time will be counted from the last keystroke. If screensaver already activates, pressing any key will immediately terminate it, and wait time will be counted from zero.

650	PROGRAM RESTART DEFINITION

Range： 0 ~ 1
Effective： Instant Activity
Access level： User
Default： 0
Unit： Nul

0：Program restart definition 1st .
1：Program restart definition 2nd. (Call O9888)

806	MAXIMUM OFFSET TOLERANCE OF CORNER μm

Range： 0 ~ 32767
Effective： Effective After RESET
Access level： User
Default： 50
Unit： μm

This parameter influences the precision of machining. The smaller the set value is, the more the semblance is closer to the part program, nevertheless, the time required for machining is relatively longer. Also, because of some factors such as the fabrication of the machine, friction, etc., it is possible that the machine position could not reach the preset checking range, and hence the system could not finish the execution of the block in the part program. The recommended minimum value of this parameter is around 10μm.

808	CORNER DECELERATION FUNCTION

Range： 0 ~ 2
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

It the corner deceleration function is enabled, the system will accelerate/decelerate the corner between tool paths automatically to make path offset remain within the preset tolerance.

809	SPIKE OFFSET TOLERANCE μm

Range： 1 ~ 32767
Effective： Effective After RESET
Access level： User
Default： 30
Unit： μm

This parameter influences the precision of spike. The smaller the set value is, the better the spike effect is, nevertheless, the time required for machining is relatively longer. Please set this parameter according to the offset range acceptable for the setting of arc sizes in actual practice. The recommended minimum set value of this parameter is around 10μm.

810	G101 ~ G105 RIGID TAPPING

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

When multi-hole drilling compound G codes (G101 ~105) are applied, use this parameter to set the tapping function.
1：Rigid tapping is activated;
0：Tapping is activated. (Default)

290	5TH AXIS OPTIMAL
291	6TH AXIS OPTIMAL
848	ROTARY PATH PROCESS OF X AXIS
849	ROTARY PATH PROCESS OF Y AXIS
850	ROTARY PATH PROCESS OF Z AXIS

Range： 0 ~ 3
Effective： Effective After RESET
Access level： User
Default： 0
Unit： Nul

This parameter is only effective when the motion axis is a rotary axis.
Bit 0 Display selection of coordinates
0：Displayed by the linear method.
1：Displayed by one revolution 0.000~360.000

Bit 1 When coordinate display method is set to be 0 ~ 360 cycle(s) (Bit 0 = 1), set if the absolute command is to choose the shortest path.
0：To calculate the shortest motion path.
1：The axis travels according to the command value.
Note: Incremental commands do not select the shortest path.

899	APPLY CE REGULATIONS 0)NO 1)YES

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

0：CE regulations are not applied.
1：CE regulations are applied.

1006	**SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +X μm**
1008	**SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Y μm**
1010	**SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +Z μm**
1012	**SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: +THE 4TH μm**
1142	**1ST 5+ SOFT LIMIT μm**
1144	**1ST 6+ SOFT LIMIT μm**

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

This parameter sets the travel limit value of the 1st soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999μm will be applied. If this parameter's set value is smaller than the negative X-axis software travel limit, the system alarm "MOT 4005, SET FIRST SOFELIMIT ERROR" will be triggered. The positive 1st and 2nd soft travel limit for each axis can be switched from each other by using the corresponding C Bit. When these parameters are enabled, if some axis is about to exceed the travel limit, the system alarm "MOT 9001 X AXIS OVER SOFTLIMIT (+)" or "MOT 4058 OVER SOFTLIMIT" will be triggered. Please refer to the description of the warning messages.

1007	**SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - X μm**
1009	**SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Y μm**
1011	**SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - Z μm**
1013	**SOFT PROTECTION OF THE 1ST TRAVEL LIMIT: - THE 4TH AXIS μm**
1143	**1ST 5- SOFT LIMIT μm**
1145	**1ST 6- SOFT LIMIT μm**

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

This parameter sets the travel limit value of the 1st soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999μm will be applied. If this parameter's set value is smaller than the positive X-axis software travel limit), the system alarm "MOT 4005, SET FIRST SOFELIMIT ERROR" will be triggered. The positive 1st and 2nd soft travel limit for each axis can be switched from each other by using the corresponding C Bit. When these parameters are enabled, if some axis is about to exceed the travel limit, the system alarm "MOT 9002/4/6 X/Y/Z AXIS OVER SOFTLIMIT (+)" or "MOT 4058 OVER SOFTLIMIT" will be triggered. Please refer to the description of the warning messages.

1034	**SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +X μm**
1036	**SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Y μm**
1038	**SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +Z μm**
1040	**SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: +4TH AXIS μm**
1146	**2ND 5+ SOFT LIMIT μm**
1148	**2ND 6+ SOFT LIMIT μm**

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

This parameter sets the travel limit value of the 1st soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999μm will be applied. If this parameter's set value is smaller than Pr.1007 (negative X-axis software travel limit), the system alarm “MOT 4005, SET FIRST SOFELIMIT ERROR” will be triggered. The positive 1st and 2nd soft travel limit for each axis can be switched from each other by using the corresponding C Bit. When these parameters are enabled, if some axis is about to exceed the travel limit, the system alarm “MOT 9001 X AXIS OVER SOFTLIMIT (+)” or “MOT 4058 OVER SOFTLIMIT” will be triggered. Please refer to the description of the warning messages.

1035	**SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -X μm**
1037	**SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Y μm**
1039	**SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -Z μm**
1041	**SOFT PROTECTION OF THE 2ND TRAVEL LIMIT: -4TH AXIS μm**
1147	**2ND 5- SOFT LIMIT μm**
1149	**2ND 6- SOFT LIMIT μm**

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

This parameter sets the travel limit value of the 1st soft path for each axis. It is effective only when each axis has executed HOME return, otherwise the initial value 99999.999μm will be applied. If this parameter's set value is smaller than Pr.1007 (negative X-axis software travel limit), the system alarm “MOT 4005, SET FIRST SOFELIMIT ERROR” will be triggered. The positive 1st and 2nd soft travel limit for each axis can be switched from each other by using the corresponding C Bit. When these parameters are enabled, if some axis is about to exceed the travel limit, the system alarm “MOT 9001 X AXIS OVER SOFTLIMIT (+)” or “MOT 4058 OVER SOFTLIMIT” will be triggered. Please refer to the description of the warning messages.

1091	DEFAULT ANGLE OF COORDINATE SYSTEM DURING ROTATION

Range： -360000 ~ 360000
Effective： Effective After RESET
Access level： User
Default： 0
Unit： μm

This parameter sets the default angle of G68 coordinate rotation command.

1092	DEFAULT RATIO OF COORDINATE REDUCTION/ENLARGEMENT OF X AXIS

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

When Pr.0143 is set to 1 (the reduction/enlargement ratio of X, Y, & Z axis is set by I, J, & K of G51 the reduction/enlargement ratio command, respectively), this parameter sets the reduction/enlargement ratio of X axis.

1093	DEFAULT RATIO OF COORDINATE REDUCTION/ENLARGEMENT OF Y AXIS

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

When Pr.0143 is set to 1 (the reduction/enlargement ratio of X, Y, & Z axis is set by I, J, & K of G51 the reduction/enlargement ratio command, respectively), this parameter sets the reduction/enlargement ratio of Y axis.

1094	DEFAULT RATIO OF COORDINATE REDUCTION/ENLARGEMENT OF Z AXIS

Range： 1 ~ 99999999
Effective： Effective After RESET
Access level： User
Default： 1
Unit： Nul

When Pr.0143 is set to 1 (the reduction/enlargement ratio of X, Y, & Z axis is set by I, J, & K of G51 the reduction/enlargement ratio command, respectively, this parameter sets the reduction/enlargement ratio of Z axis.

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.

6 SYSTEM ALARM and WARNING

When the system alarm message (ALARM) occurs, operation will stop. User must check the whole machine according to the alarm message. If able to solve problems, then only need to click RESET again to clear the condition. (However, if need to change parameter, then must exit the system software and then re-enter for the system to work.)

Three types of alarm message which are MOT (MOTION) ALARM, OP (OPERATION) ALARM or INT(INTERPREATATION) ALARM. Definitions of the above alarm message are as following:

6.1 OP OPERATION RELATED ALARM

OP 1001：X SERVO ALARM

（1）Alarm message from X SERVO driver.

（2）Please check ERROR message from the SERVO driver to know the cause.

（3）Please re-booting.

OP 1002：Y SERVO ALARM

（1）Warning message from Y SEVOR driver.

（2）Please check ERROR message from the SERVO driver to know the cause.

（3）Please re-booting.

OP 1003：Z SERVO ALARM

（1）Warning message from Z SERVO driver.

（2）Please check ERROR message from the SERVO driver to know the cause.

（3）Please re-booting.

OP 1004：4TH SERVO ALARM

（1）Warning message from 4th SERVO driver.

（2）Please check ERROR message from the SERVO driver to know the cause.

（3）Please re-booting

OP 1005：X OVER TRAVEL （+）

（1）X over travel (+) limit.

（2）Click and hold OT（OVER TRAVEL）RELEASE and then use JOG to take away machine from the travel limit.

OP 1006：X OVER TRAVEL （-）

（1）X over travel (-) limit.

（2）Click and hold OT（OVER TRAVEL）RELEASE and then use JOG to take away machine from the travel limit.

OP 1007：Y OVER TRAVEL （+）

（1） Y over travel (+) limit.

（2）Click and hold OT（OVER TRAVEL） RELEASE and then use JOG to take away machine from the travel limit.

OP 1008：Y OVER TRAVEL （-）

（1） Y over travel (-) limit.

（2）Click and hold OT（OVER TRAVEL） RELEASE and then use JOG to take away machine from the travel limit.

OP 1009：Z OVER TRAVEL （+）

（1） Z over travel (+) limit.

（2）Click and hold OT（OVER TRAVEL） RELEASE and then use JOG to take away machine from the travel limit.

OP 1010：Z OVER TRAVEL （-）

（1） Z over travel (-) limit.

（2）Click and hold OT（OVER TRAVEL） RELEASE and then use JOG to take away machine from the travel limit.

OP 1011：4^{TH} OVER TRAVEL （+）

（1） 4^{th} over travel (+) limit.

（2）Hold OT（OVER TRAVEL） RELEASE and then use JOG to take away machine from the travel limit.

OP 1012：4^{TH} OVER TRAVEL （-）

（1） 4^{th} over travel (-) limit.

（2）Hold OT（OVER TRAVEL） RELEASE and then use JOG to take away machine from the travel limit.

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 C-AXIS AS MOVING

OP 1017：LNC SYSTEM EXPIRED

OP 1018：DESIRED MACRO VARIABLES NOT EXIST

OP 1019：DESIRED MACRO VARIABLES OVER RANGE

OP 1020：OVER MLC TRAVEL LIMITE

OP 1021：GEAR SIGNAL ERROR

OP 1022：DESIRED PARAMETER VARIABLES OVER RANGE

OP 1023：DESIRED PARAMETER VARIABLES NOT EXISTED

6.2 OP OPERATION RELATED 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 （-）

6.3 INT INTERPRETATION RELATED 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 grammar error.

（2）Modify program error.

（3）Press RESET to clear the wrong warning message.

INT 3003：OUT OF NODE MEMORY

（1）MACRO grammar has too complicat showing program such as too many brackets.

（2）Simplify complexity degree

（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 3050：TOOL DIAMETER IS 0

INT 3051：ILLEGAL RPM GIVEN

INT 3052：ILLEGAL FEEDRATE GIVEN

INT 3053：（D）EACH CUT DOWN DEPTH IS 0

INT 3054：（H）TOTAL DEPTH IS 0

INT 3055：ESCAPE LOWER START POINT.Z

INT 3056：（W）EACH CUT WIDTH IS 0

INT 3060：HOLES TOO DENSITY

INT 3061：HOLES COUNT MUST>=2

INT 3062：R MUST > Z

INT 3070：WRONG DATA：R=0

INT 3071：WRONG DATA：2R<=PHI

INT 3072：WRONG DATA：V>PHI

INT 3073：WRONG DATA：Q=0

INT 3074：WRONG DATA：V>=Q

INT 3075：WRONG DATA：（PHI+2Q）>=2R

INT 3076：WRONG DATA：I（J）=0

INT 3077：WRONG DATA：I（J）-2R<=0

INT 3078：WRONG DATA：2Q+PHI>=I（J）

INT 3079：WRONG DATA：2V+PHI>I（J）

INT 3080：DISTANCE OF TWO CENTER IS 0

INT 3081：WRONG DATA：2（R-V）<PHI

INT 3082：WRONG DATA：2（R-V）<=PHI

INT 3083：WRONG DATA：2V+PHI>=I（J）

INT 3084：WRONG DATA：0.414*PHI+I<=2C

INT 3085：WRONG DATA：0.414*PHI+J<=2C

INT 3090：T COMMAND ERROR

INT 3100：ILLEGAL G CODE

（1）Illegal G code in part program.
（2）Delete illegal G code.
（3）Press RESET to clear wrong warning message.

INT 3101：PFM INITIAL ERROR

INT 3102：TRANS INITIAL ERROR

INT 3103：TABLE INITIAL ERROR

INT 3104：POST INITIAL ERROR

INT 3110：FETCH ERROR

INT 3111：LACK OF FILENAME（P ADDRESS IS NOT ENTERED）

（1）Lock of filenames in part program. (P address is not entered.）
（2）Increase number of filenames.
（3）Press RESET to clear wrong warning message.

INT 3112：ILLEGAL FILENAME

（1）Illegal filename in part program.
（2）Modify filename.
（3）Press RESET to clear wrong warning message.

INT 3113：FILE NOT FOUND

（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

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 the 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 the 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 message error.

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 3130：COORDINATE ERROR

INT 3131：UNKNOWN PLANE

INT 3132：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 3140：SEND TABLE 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：CC R RETURN

（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 3155：ILLEGAL PROFILE PATH

（1）Illegal profile path in CANNED CYCLE (i.e., over cutting)

（2）Please modify illegal profile path 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：DNC：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：LOSS DATA PACKET

INT 3162：DNC：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 3170：CUTTING LENGTH IN Z TOO SHORT

INT 3171：CUT DOWN CHAMFER OVER RANGE

INT 3172：CUT UP CHAMFER OVER RANGE

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 3204：COMP LINE DET 0

（1）DETERMINE values is 0.

（2）Check part program.

（3）System error, please contact supplier.

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 3207：COMP NO INTERSECTION

（1）Not able to find the intersect points while calculating compensation value.

（2）Decrease compensation radius or modify part program pathway.

(3) Press RESET to clear wrong warning message.

6.4 MOT MOTION RELATED ALARM

MOT 4001：X-AXIS ERROR COUNTER OVERFLOW

（1）Motion board X- 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 4002：Y-AXIS ERROR COUNTER OVERFLOW

（1）Motion board Y-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 4003：Z-AXIS ERROR COUNTER OVERFLOW

（1）Motion board Z-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 4004：4TH-AXIS ERROR COUNTER OVERFLOW

（1）Motion board 4th-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.

（2）Clicking RESET to set new parameter.

（3）After changing the parameter, please reboot.

MOT 4006：X AXIS SERVO LAG OVERFLOW

（1）X Axis servo lag over parameter 0002 setting value.

（2）Check whether the setting speed is too fast or the parameter 0002 setting value is too small.

（3）Clicking RESET to continue operating.

（4）If reset parameter, must reboot.

MOT 4007：Y AXIS SERVO LAG OVERFLOW

（1）Y Axis servo lag over parameter 0003 setting value.

（2）Check whether the setting speed is too fast or the parameter 0003 setting value is too small.

（3）Clicking RESET to continue operating.

（4）If reset parameter, must reboot.

MOT 4008：Z AXIS SERVO LAG OVERFLOW

（1）Z Axis servo lag over parameter 0004 setting value.

（2）Check whether the setting speed is too fast or the parameter 0004 setting value is too small.

（3）Clicking RESET to continue operating.

（4）If reset parameter, must reboot.

MOT 4009：4TH AXIS SERVO LAG OVERFLOW

（1）4th Axis servo lag over parameter 0005 setting value.

（2）Check whether the setting speed is too fast or the parameter 0005 setting value is too small.

（3）Clicking RESET to continue operating.

（4）If reset parameter, must reboot.

MOT 4010：SPINDLE FEED FUNCTION ERROR

（1）Checking spindle G25/G26 rotation speed.

（2）Checking whether or not the setting values of parameter 57, 61 and 92 are correct.

（3）Checking whether or not the spindle is working normally.

（4）Clicking RESET to continue operating.

（5）If change the parameter, need to reboot for the new setting parameter to be effective.

MOT 4011：SPINDLE SPEED ERROR

（1）Spindle shaking value is grater than parameter 97 setting value.

（2）Checking whether or not the setting values of parameter 57, 61, 92, and 97 are correct.

（3）Checking whether or not the spindle is working normally.

（4）Clicking RESET to continue operating.

（5）If change the parameter, need to reboot for the new setting parameter to be effective.

MOT 4012：NO FINAL LINE

MOT 4013：NO BLOCK

MOT 4014：X AXIS ON HOME DOG

（1）X Axis on HOME DOG.

（2）Clicking RESET, use JOG to take the machine away from HOME DOG then will be able to return to the reference point.

MOT 4015：Y AXIS ON HOME DOG

（1）Y Axis on HOME DOG.

（2）Clicking RESET, use JOG to take the machine away from HOME DOG then will be able to return to the reference point.

MOT 4016：Z AXIS ON HOME DOG

（1）Z Axis on HOME DOG.

（2）Clicking RESET, use JOG to take the machine away from HOME DOG then will be able to return to the reference point.

MOT 4017：4TH AXIS ON HOME DOG

（1）4th Axis on HOME DOG.

（2）Clicking RESET, use JOG to take the machine away from HOME DOG then will be able to return to the reference point.

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 4019：OVER TRAVEL

（1）Machine over travel problem.

（2）Solving the problem according to alarm message (OP 005~0012).

MOT 4020：NO RESIDUE DATA

MOT 4021：STOP POSITION ERROR

MOT 4022：FIRST SOFT LIMIT ERROR

（1）Over 1st soft limit. (Please refer to G10 in program manual.)

（2）Please checking setting values of parameters 1006 ~ 1013.

（3）Clicking RESET to continue operating from the reverse direction.

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.

（3）Reset parameter and then reboot.

MOT 4024：SECOND SOFT LIMIT ERROR

（1）Over 2nd soft limit.

（2）Checking parameters 1034~1041.

（3）Click RESET to continue operating.

MOT 4025：G10 P RANGE ERROR

（1）P value is over range.

（2）Please checking the part program.

MOT 4026：ENCODER A、B PHASE ERROR

（1）ENCODER disconnect or 5V power problem

（2）Checking whether or not the ENCODER or power port is connected.

MOT 4027：HOME DOG TOO SHORT

（1）Check whether or not HOME DOG is too short or the speed is too fast.

（2）Extend DOG or slow down the zero return speed.

MOT 4028：SET PARAM 39 ERROR

MOT 4029：SET PARAM 23 ERROR

MOT 4030：SET PARAM 14 ERROR

（1）Parameter #14 setting error.

（2）Re-set parameter and re-boot.

MOT 4031：SET PARAM 10 ERROR

（1）Parameter #10setting error.

（2）Re-set parameter and re-boot.

MOT 4032：SET PARAM 11 ERROR

（1）Parameter # 11 setting error.

（2）Re-set parameter and re-boot.

MOT 4033：SET PARAM 12 ERROR

（1）Parameter # 12 setting error.

（2）Re-set parameter and re-boot.

MOT 4034：SET PARAM 13 ERROR

（1）Parameter # 13 setting error.

（2）Re-set parameter and re-boot.

MOT 4035：SET CMR ERROR

（1）Setting CMR error

（2）Checking Para. # 0053 ~ 0056，0067 ~ 0070，0072，0100 ~ 0107，1112 ~ 1115.

（3）Re-setting parameter and re-booting.

MOT 4036：SET IN POSITION CHECK ERROR

（1）Setting position check error.

（2）Checking Para. # 0006 ~ 0009.

（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 53~57 range.

（3）Re-setting parameter and re-booting.

MOT 4038：SET ENCODER PULSE/REV ERROR

（1）Setting motor ENCODER pulse/rev error.

（2）Checking whether or not the setting value is over setting parameter 1112~1115 range.

（3）Re-setting parameter and re-booting.

MOT 4039：HOME LOW SPEED ERROR

（1）2^{nd} home speed setting error.

（2）Checking whether or not the setting value is over setting parameter 1108-1111 range.

（3）Re-setting parameter and re-booting.

MOT 4040：X CMP NO. ERROR

（1）Pitch compensation section setting error.
（2）Checking Parameter # 0112 range.
（3）Re-setting parameter and re-booting.

MOT 4041：Y CMP NO. ERROR

（1）Pitch compensation section setting error.
（2）Checking Parameter # 0113 range.
（3）Re-setting parameter and re-booting.

MOT 4042：Z CMP NO. ERROR

（1）Pitch compensation section setting error.
（2）Checking Parameter # 0114 range.
（3）Re-set parameter and re-boot.

MOT 4043：4TH CMP NO. ERROR

（1）Pitch compensation section setting error.
（2）Checking Parameter # 0115 range.
（3）Re-setting parameter and re-booting.

MOT 4044：CMP INTERVAL ERROR

（1）Pitch compensation section setting error.
（2）Checking Parameter # 0114 range.
（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）Checking connection for motor to servo.

MOT 4046：RETURN HOME FAILURE

（1）Checking whether nor not machine lock or other machine problems.
（2）Press RESET to clear the condition.

MOT 4047：I/O COMMUNICATION ERROR

（1）Checking I/O board
（2）Checking all connectors on I/O board.

MOT 4048：SPINDLE ORITENTATION SIGNAL NOT RELEASE

Assumed executing machine adjustment and orientation. If initially, the spindle is positioned on the sensor, the spindle will move away automatically. After the orientation signal is off, user will be able to execute machine adjustment or orientation. However, if the spindle already rotates one cycle but the orientation signal has not been released, then this alarm message will occur.

（1）Checking whether or not there is connection problem on the spindle orientation sensor.

（2）Checking whether or not the spindle orientation sensor signal and type setting is correct (Parameter # 184).

（3）Checking whether or not the spindle orientation sensor is broken.

MOT 4049：SPINDLE ORITENTATION FLAUT

When executing spindle orientation, the spindle is NOT able to reach the correct orientation point.

（1）Please go to DGNOS page. If the data system NO. 10 is changing, but the spindle is not rotating. Then, it means the spindle motor ENCDER signal has external distribution that makes the system misunderstood.

（2）Please check whether or not the setting orientation rate is too high by parameter NO. 21 that makes spindle motor has missing step in the Pulse Mode.

MOT 4050：SPINDLE ORITENTATION SIGNAL NOT FOUND

Assumed the spindle has rotated one time already but it hasn't found the orientation position sensor while executing machine adjustment or while orientation program is running. The following alarm messages will occur.

（1）Checking whether or not there is connection problem on the spindle orientation sensor

（2）Checking whether or not the spindle orientation sensor signal and type setting is correct (Parameter # 184).

（3）Checking whether or not the spindle orientation sensor is broken.

MOT 4051：NO SPINDLE SPEED DEFINE

No spindle speed definition. So please define rotary command in rigid tapping. Please key-in rotational speed command S before tapping command.

MOT 4052：MOVE ERR OVER LIMIT IN RIGTAP

（1）Please check whether or not the procedure of rigid machine adjustment is completed.

（2）Please check whether not the setting value of Parameter 1058 is too small.

MOT 4053：SPD SPEED WILL OVER LIMIT

（1）Please check whether or not the setting spindle rotational speed is over the maximum speed that this gear spindle can handle.

（2）Please check whether or not the setting of Parameter NO. 1060 for the spindle return accelerating speed is too big under rigid tapping. Unless necessary, recommend setting to 100.

MOT 4054：Z AXIS FEEDRATE WILL OVER LIMIT

Z axis cutting feedrate speed of rigid tapping is larger than the maximum cutting speed that is set by Parameter 1004.

（1）Checking whether or not Parameter NO. 1060 has set the spindle returning accelerating speed too large under rigid tapping. If speed starts to accelerate while returning (i.e., P1060 > 1000), then speed of cutting spindle will accelerate too. Unless necessary, recommend to set 100.

MOT 4055：SPD SERROLAG OVER LIMIT IN RT

（1）Please check whether or not ladder has error.

（2）Please check whether or to the spindle is rotating in rigid tapping procedure. If not, please check whether or not there is problem for the spindle driver setting.

（3）Please check whether or not the spindle Encoder line is discount or fall.

（4）Please check whether or not the setting of Parameter 1075 is too small.

MOT 4056：SET PAR 18 ERROR

MOT 4057：SPINDLE SPEED CAN'T ARRIVE

MOT 4058：OVER SOFTLIMIT

MOT 4061：THREAD CUT FEED OVERLIMIT

MOT 4062：X-AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

When X Axis re-start to search zero point, Nc will demand X Axis' absolute encoder to return zero. After complete, NC will re-read absolute encorder's value to make sure it has returned to zero. If this new value substract current NC Value is over Pr.1098, Alarm. (MITSUBISHI servo motor:when you want to re-read Absolute Encoder, you need to set servo motor as servo off, wait for more then 20ms and set servo on. During this time, NC will update coordinates according to changes of X Axis encoder. Later's comparison also uses update coordinates)（Sytem info No.41）

（1）Check the value of Pr.1098 is correct.

（2）Check Absolute Encoder of X Axis has complete clear return zero.

MOT 4063：X AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

When NC is processing X Axis Absolute Encoder reading, if it didn’ t complete within the time that Pr.0834 sets, Alarm.

（1）Check if servo driver is the Absolute Encoder.

（2）Check hardware wiring.

（3）Check X Axis’ Ladder program.(MITSUBISHI servo motor:when you want to re-read Absolute Encoder, you need to set servo motor as servo off, wait for more then 20ms and set servo on, and check if the CS bit is correct.)。

（4）Check the time that Pr.0834 sets is enough for absolute encoder to read all.

MOT 4064：X AXIS ABSOLUTE ENCODER CHECK SMM ERROR

Absolute Encoder of X Axis has CHECK SMM.

（1）Check hardware wiring.

（2）Check Ladder program of X Axis.

MOT 4065：Y-AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

When Y Axis re-start to search zero point, Nc will demand Y Axis’ absolute encoder to return zero. After complete, NC will re-read absolute encorder’s value to make sure it has returned to zero. If this new value substract current NC Value is over Pr.1098, Alarm. (MITSUBISHI servo motor:when you want to re-read Absolute Encoder, you need to set servo motor as servo off, wait for more then 20ms and set servo on. During this time, NC will update coordinates according to changes of Y Axis encoder. Later’s comparison also uses update coordinates)（Sytem info No.41）

（1）Check the value of Pr.1098 is correct.

（2）Check Absolute Encoder of X Axis has complete clear return zero.

MOT 4066：Y AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

When NC is processing Y Axis Absolute Encoder reading, if it didn’ t complete within the time that Pr.0834 sets, Alarm.

（1）Check if servo driver is the Absolute Encoder.

（2）Check hardware wiring.

（3）Check Y Axis’ Ladder program.(MITSUBISHI servo motor:when you want to re-read Absolute Encoder, you need to set servo motor as servo off, wait for more then 20ms and set servo on, and check if the CS bit is correct.)。

（4）Check the time that Pr.0834 sets is enough for absolute encoder to read all.

MOT 4067：Y AXIS ABSOLUTE ENCODER CHECK SMM ERROR

Absolute Encoder of Y Axis has CHECK SMM.

（1）Check hardware wiring.

（2）Check Ladder program of Y Axis.

MOT 4068：Z-AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

When Z Axis re-start to search zero point, Nc will demand X Axis' absolute encoder to return zero. After complete, NC will re-read absolute encorder's value to make sure it has returned to zero. If this new value substract current NC Value is over Pr.1098, Alarm. (MITSUBISHI servo motor:when you want to re-read Absolute Encoder, you need to set servo motor as servo off, wait for more then 20ms and set servo on. During this time, NC will update coordinates according to changes of Z Axis encoder. Later's comparison also uses update coordinates)（Sytem info No.41）

（1）Check the value of Pr.1098 is correct.

（2）Check Absolute Encoder of X Axis has complete clear return zero.

MOT 4069：Z AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

When NC is processing Z Axis Absolute Encoder reading, if it didn't complete within the time that Pr.0834 sets, Alarm.

（1）Check if servo driver is the Absolute Encoder.

（2）Check hardware wiring.

（3）Check Z Axis' Ladder program.(MITSUBISHI servo motor:when you want to re-read Absolute Encoder, you need to set servo motor as servo off, wait for more then 20ms and set servo on, and check if the CS bit is correct.)。

（4）Check the time that Pr.0834 sets is enough for absolute encoder to read all.

MOT 4070：Z AXIS ABSOLUTE ENCODER CHECK SMM ERROR

Absolute Encoder of Z Axis has CHECK SMM.

（1）Check hardware wiring.

（2）Check Ladder program of Z Axis.

MOT 4071：4TH-AXIS ABSOLUTE ENCODER VALUE OUT OF TOLERANCE

When 4th Axis re-start to search zero point, Nc will demand X Axis' absolute encoder to return zero. After complete, NC will re-read absolute encorder's value to make sure it has returned to zero. If this new value substract current NC Value is over Pr.1098, Alarm. (MITSUBISHI servo motor:when you want to re-read Absolute Encoder, you need to set servo motor as servo off, wait for more then 20ms and set servo on. During this time, NC will update coordinates according to changes of 4th Axis encoder. Later's comparison also uses update coordinates)（Sytem info No.41）

（1）Check the value of Pr.1098 is correct.

（2）Check Absolute Encoder of X Axis has complete clear return zero.

MOT 4072：4TH AXIS ABSOLUTE ENCODER TRANSMISSION OVER TIME

When NC is processing 4th Axis Absolute Encoder reading, if it didn't complete within the time that Pr.0834 sets, Alarm.

（1）Check if servo driver is the Absolute Encoder.

（2）Check hardware wiring.

（3）Check 4th Axis' Ladder program.(MITSUBISHI servo motor:when you want to re-read Absolute Encoder, you need to set servo motor as servo off, wait for more then 20ms and set servo on, and check if the CS bit is correct.)。

（4）Check the time that Pr.0834 sets is enough for absolute encoder to read all.

MOT 4073：4TH AXIS ABSOLUTE ENCODER CHECK SMM ERROR

Absolute Encoder of 4th Axis has CHECK SMM.

（1）Check hardware wiring.

（2）Check the Ladder program of 4th Axis is correct or not.

MOT 4074：M CODE REPEAT ASSIGN,CHECK PARAMETER 89,835,836,837

MOT 4075：TOUCH DIRECTION SIGNAL READ ERROR

MOT 4076：TOUCH SIGNAL IS TRIGGERED IN MANUAL MEASURE STATUS

MOT 4077：NO SEMI-FIXED M CODE

MOT 4101：TOOL POSITION INTERFERENCE

（1）In OPR mode, tool position and setting value NOT match.

（2）Moving away tool or re-enter data

（3）Pressing RESET.

MOT 4102：INPUT DIGTS RANGE ERROR

MOT 4103：AUTHORIZATION CHECK FAILURE

Please contact technical person.

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 4125：SPINDLE POSITIONING ACC/DCC TIME SETTING ERROR

MOT 4901：SYSTEM ALARM

MOT 4902：SYSTEM ALARM

MOT 4903：SYSTEM ALARM

MOT 4950：SYSTEM ALARM

MOT 4951：SYSTEM ALARM

6.5 MOT Motion 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 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 （-）

MOT 9015：OVER CUTTING FEED START SIGNAL WAITTING

7 Machine Adjustment

7.1 Milling Rigid Tapping Commanding

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）;　　　　// To 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_;

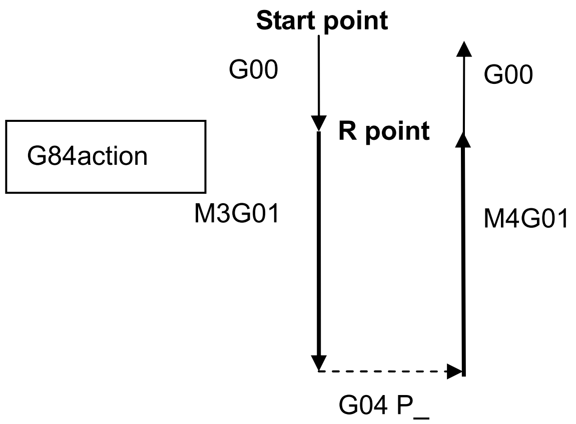
G80;　　　　// or Group 0 commands（G00、G01、G02、G03）, disable rigid mode.

- Returning acceleration function

  Setting parameter 1060, which will be able to accelerate the Z axis returning speed

- Override

  Under rigid tapping, Feed Override and Spindle Speed Override will be disabled.



- MLC Rigid Tapping C BIT

C BIT	SYMBOL	Description
C125	**RT START**	When C125 is ON, it will inform NC to start rigid tapping mode. MLC needs to wait until NC S128 = ON and then to disable C125.
C124	**RT STOP**	Disable rigid tapping mode. Under normal situation, rigid tapping mode will be disabled automatically after reading G80 or Group 1's G code. If there is special need, please set bit to ON and then rigid tapping will be disabled automatically.
S128	**RT STATE**	Rigid Tapping Mode Status When NC enters into the rigid tapping mode, S128 remains ON until it exits rigid tapping mode. If user press RESET under rigid tapping, NC will set S128 OFF.

Notice: When user press RESET, please disable rigid tapping mode in order to prevent any unpredicted situation.

- **Rigid Tapping System Information**

Rigid Tapping System Information #	Description
#21	Max error in rigid tapping travel
#22	Estimate value of rigid tapping 1st speed compensation value
#23	Estimate value of rigid tapping 1st acceleration speed compensation value
#24	Estimate value of rigid tapping 2nd speed compensation value
#25	Estimate value of rigid tapping 2nd acceleration compensation value
#26	Rigid tapping spindle following error

- **Rigid Tapping Machine Adjustment Procedure**
  1. Please increase the maximum allowable following error of Z axis direction (Para. # 1058 is approximately set to 3000). Also increase the maximum servo error of the spindle (Para. # 1075 is approximately set to encoder size per rotation of the spindle*10) in order to prevent warning when doing machine adjustment.
  2. Confirm Spindle Rotational Direction（Para. # 1071）

     Executing the following program：

     M29S500

     G91G84R-10Z-50F500

     M28

     M30

     Check whether or not the spindle rotational direction is the same direction as M3 direction under non-rigid tapping mode. If not the same, please set Para. # 1071 to 1.
  3. Acc/Deceleration Time Adjustment

     To adjust acc/deceleration time (parameter 1059) and execute the following program:

     M29S2500 ; rotational speed setting is the maximum rigid tapping speed.

     G91G84R-10Z-50F2500

     M28

     M30

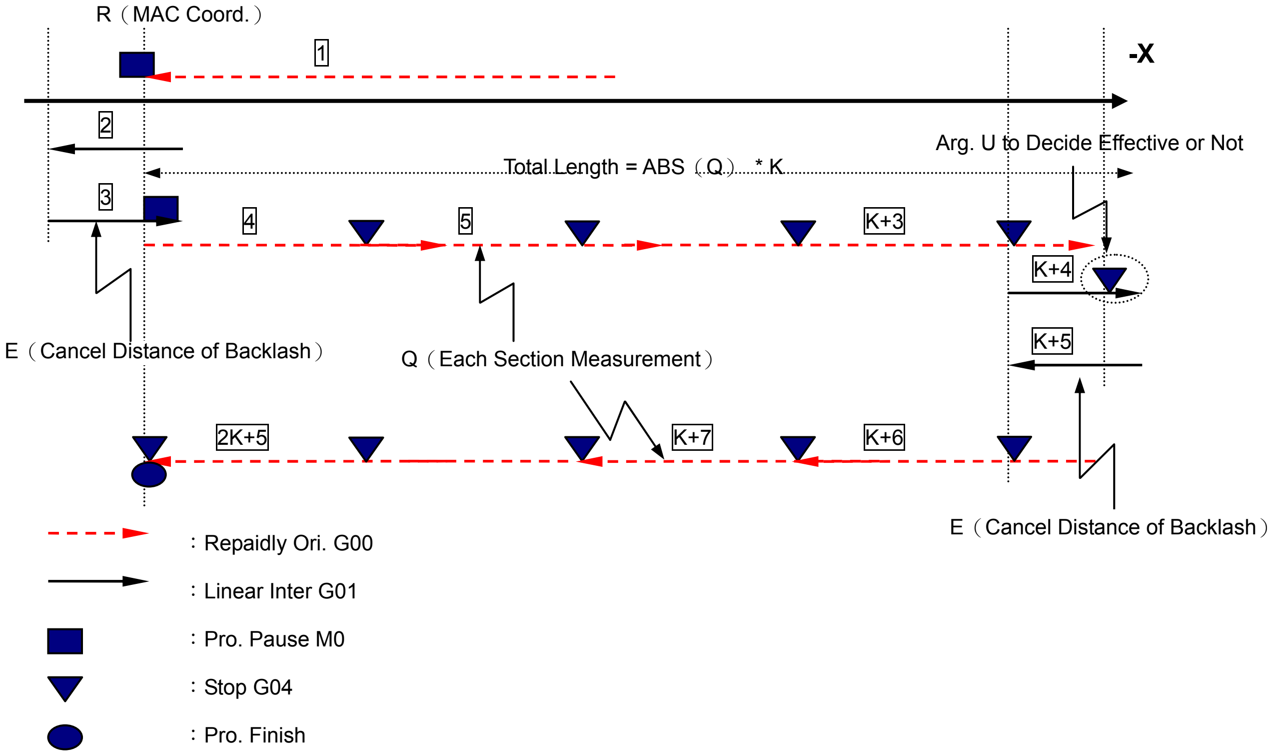
     During executing, must make the spindle drive device’s current lower than the saturation value, and make the spindle to turn smoothly.

     Please pay attention to whether or not the needed maximum rotational speed can be reached at the upper enter frequency limit of the spindle. Using Toshiba as an example, adjust Para. # 373, 425, 426, 427, and 428.

     If the spindle rotational speed is not smooth in high rotational speed, please refer to Para. # 371.

4. Speed Compensation
   a. Please set parameters 1064、1065、1073、1074 to zero and reboot the system after modifying.
   b. Executing the following program in dry run one time (no need to put on any material)
      M29S2500
      G91G84R-10Z-50 F2500 P1000
      M28
      M30
      To observe system data #22, and to enter this value into speed compensation parameter 1064. This value should be between 100~8000. After entering system data #24 into parameter 1073（S22 → P1064，S24→P1073）, reboot the system.
   c. Executing the above part program again. If there is any shaking, please adding parameter 1066 from 0 to 20 in order to decrease shaking. This value shouldn't be as too big as possible, or the following error will increase. Recommending value is between 3~5.
5. Acceleration Speed Compensation
   a. Executing Step 4 program one more time, enter system data # 23 and #25 separately into acceleration speed compensation parameter 1065 and 1074 and then reboot the system. This value should be between 100~8000.
   b. If shaking occurs, please adding parameter 1070 from 0 to 20 in order to decrease shaking. Recommending value is 10~15.
   c. After completed, please observe system data #21. This is the biggest error of Z axis direction during tapping.
6. Servo Error Amount Checking
   a. Reset Para. # 1058 as the allowable error amount and it must be larger than system data #21. Recommend setting this value as 5 – 10 times larger than system parameter 21. During rigid tapping, when the error is over this setting value, tapping will stop.
   b. Using the same principle to set Para. # 1075 as the allowable error amount for the spindle servo. Recommend to set this value as 5-10 times larger than the system parameter #26. During rigid tapping, when the error is over this setting value, tapping will stop.

7.2 Laser Compensation Procedure



Program Argument Description

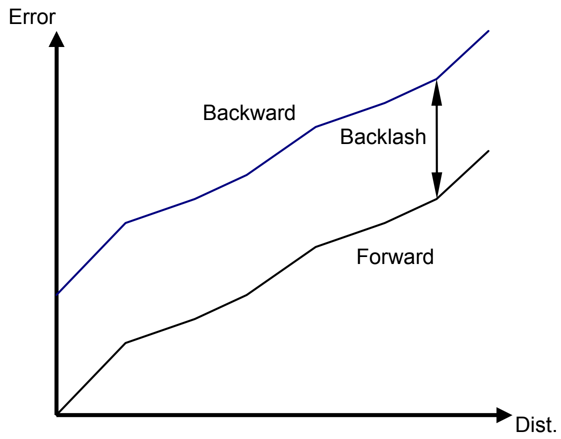
1. A：Axis direction, 1 means X axis, 2 means Y axis and 3 means Z axis.
2. E：Delete backlash moving distance. If it is a positive value, at beginning of measuring, the program should move ABS（E）distance toward this axis positive direction. Then moving ABS（E）distance toward negative direction (Step 2 and Step 3 from the above Diagram). After measuring forward direction, first moving ABS（E）distance toward negative direction and then moving ABS（E）distance toward positive direction (Steps K+4 and K+5 from the above diagram). If it is a negative value, then using the opposite method. So, if this axis pitch error compensation direction is positive, then this argument must be set as negative value. 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.

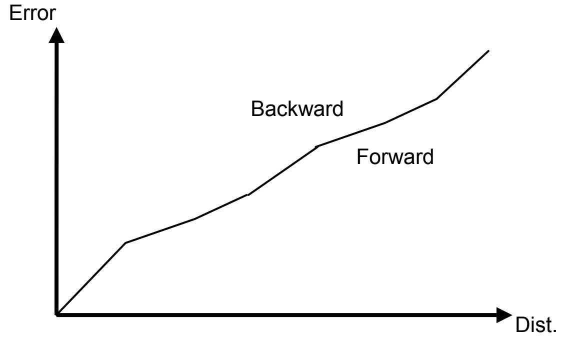
Executing Steps

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:



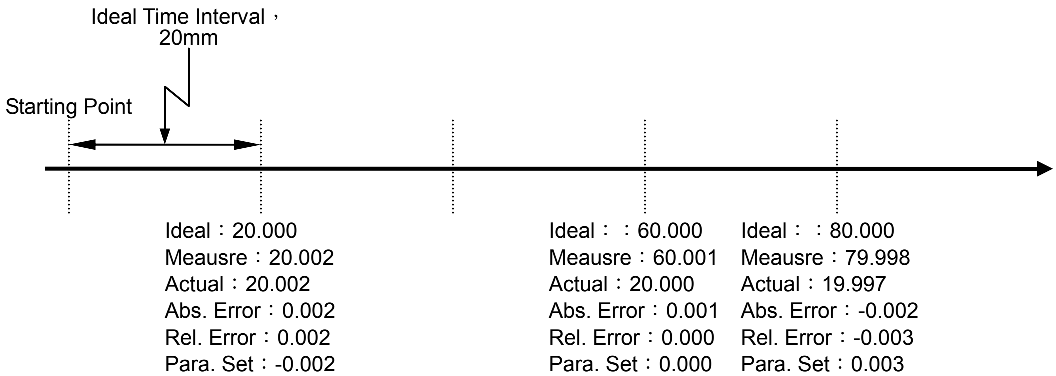
6. Putting the measured backlash（From the upper diagram, the vertical difference between two lines）into NC parameter（Parameters 0044 ~ 0047）, and enable the backlash function（Parameter 0117）; reboot the system.

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 Nth section relative error = the Nth section absolute error – the (N-1)th section absolute error；
The Nth section compensation setting value = -ive Nth section relative error.

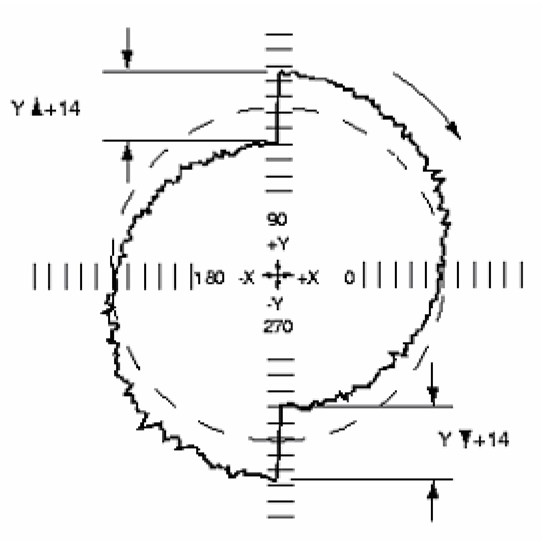


9. After rebooting the system, re-executing Step 7 until the compensation effect is within the acceptable range.

7.3 Double Ball Bar Measure – Backlash or Circular Spike

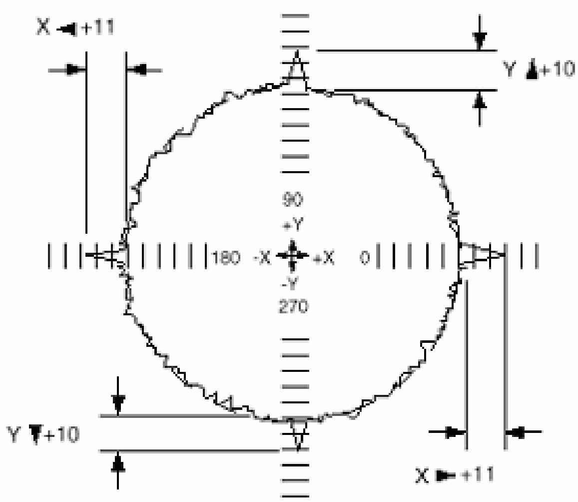
- **Backlash**

  Using DOUBLE BALL BAR to measure backlash, the result analyzing diagram is as following (only the Y axis part, which is called Positive Backlash). Able to see the Y axis backlash is 14um from the diagram. So please set this value (i.e., 14um) into Para. # 0045 and set BIT1 of Para. # 0117 to 1 in order to enable Y axis backlash compensation function.



- **Reversal Spikes**

  Using DOUBLE BALL BAR to executing canned cycle testing, the result analyzing diagram is as below. In the diagram, the sticking out path in the direction changing area of each axis is called the circular spikes phenomenon.



Using +ive X axis direction as an example, each related parameter setting for circular spikes compensation value is as following:

1. Parameter 0812：+ X Axis Direction of Reversal Spikes Value

   Unit：um

   Description: This parameter is to set the circular compensation value of +ive X axis direction. Using the above diagram as an example. The +ive X axis direction circular spike is 11. So based on the principle, the parameter setting value is 11. However, since the present LNC series controller is using PULSE COMMAND control mode (spike compensation is added to CURRENT LOOP value), there will be some delay between the actual corresponding of servo motor and the commanding value. Based on past experience, the circular compensation value should be set as 8-9 times of the actual value. So according to the result from the above diagram, the recommend setting value for this parameter is 90. If this parameter setting value is 0, it means not to enable the + X axis spike compensation function.

2. Parameter 0813: Reversal Spikes Time Interval of +ive X Axis Direction

   Unit: disconnecting time interval

   486IPC is 10.6ms

   586IPC is 3.6ms

   Description: To use this parameter to set the maintaining time of +ive X axis direction spike compensation. The corresponding +ive X axis spike maintaining time (spindle width) is displayed on the result analyzing diagram. The measure software will provide each measured Sampling Rate. Using RENISHAW as an example,【Sample: 7.81 per sec information will be displayed on the left side of analysis diagram. This means the time interval for two closing points is $\frac{1}{7.81} = 128ms$.

   Need at least 3 points (during time $2 \times 128 = 256ms$) if want the analysis diagram to display multiple-angle sharp. Under this requirement, the parameter setting value is $\frac{256}{3.6} = 71$（586IPC）.

   If this parameter setting value is zero, this means not to enable the +ive X axis spike compensation function.

3. Parameter 0814: Reversal Spikes Delay Time of +ive X axis

   Unit: discounting time interval

   486IPC is 10.6ms

   586IPC is 3.6ms

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

7.4 SPINDLE POSITIONING ADJUSTMENT

- **Design Purpose**

  This adjustment is a preparation for M19 spindle positioning. The purpose is to set a correct location for spindle positoning. Afer setting, NC will automatically move spindle location to this setting when you want to execute M19 spindle positioning.

- **Positioning Adjustment Steps**

1. After turning on, make sure system is on“ prepare complete”.
2. Confirm if every parameter is correct.

   Pr.0021: Spindle Positioning rotation speed (rpm)。

   When you execute spindle positioning at the first time, we suggest that you can slow down positioning speed to 100-200rpm. After movement gets smoother, you can enlarge parameter’s value and re-do the adjustment again. In order to prevent any errors or mistakes of different rotation speed, after adjustment, please do not change this parameter value again.

   Pr.0663: Spindle positioning speed up/down time. (ms)

   Pr.0084: Spindle positioning standard point.

   0: Spindle positioning standard point uses external positioning sensor. This sensor’ s signal needs to be connected to HS1 or HS2 of RELAY. Usually it will be transmission design between spindle and motor.

   1: Spindle positioning standard point uses motor encorder Z signal, it doesn’ t need extra cables. Usually it will be 1:1 convey transmission design between spindle and motor.

   Pr.0184: Spindle external positioning sensor contact and format.This value only works when Pr.0084 as 0.

   Pr.0190: Spindle location control command format

   If you use KEB, DELTA inventer positioning card(PG card), the command format is AB phase; if you use Toshiba inventer positioning card, the command format is CW/CCW. As for others, please set as exact situation.

   Pr.0057: Spindle encoder feedback factor.

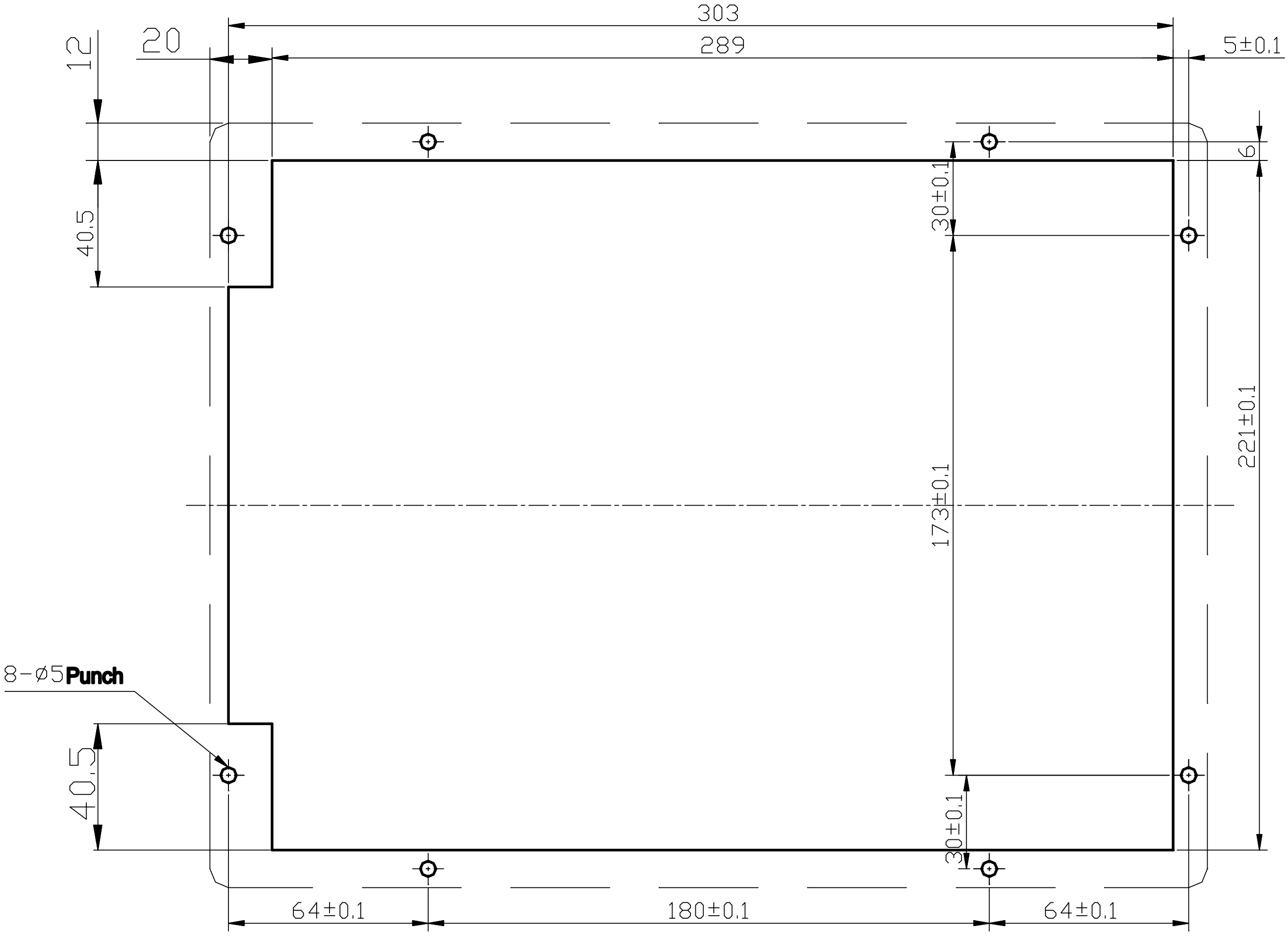
   Pr.0195: Spindl encorder feedback signal format.

   This two values can be tested by executing M3S1000. If you use Toshiba inventer, usually we will make Pr.0057 as 1, and Pr.0195 as 1024.

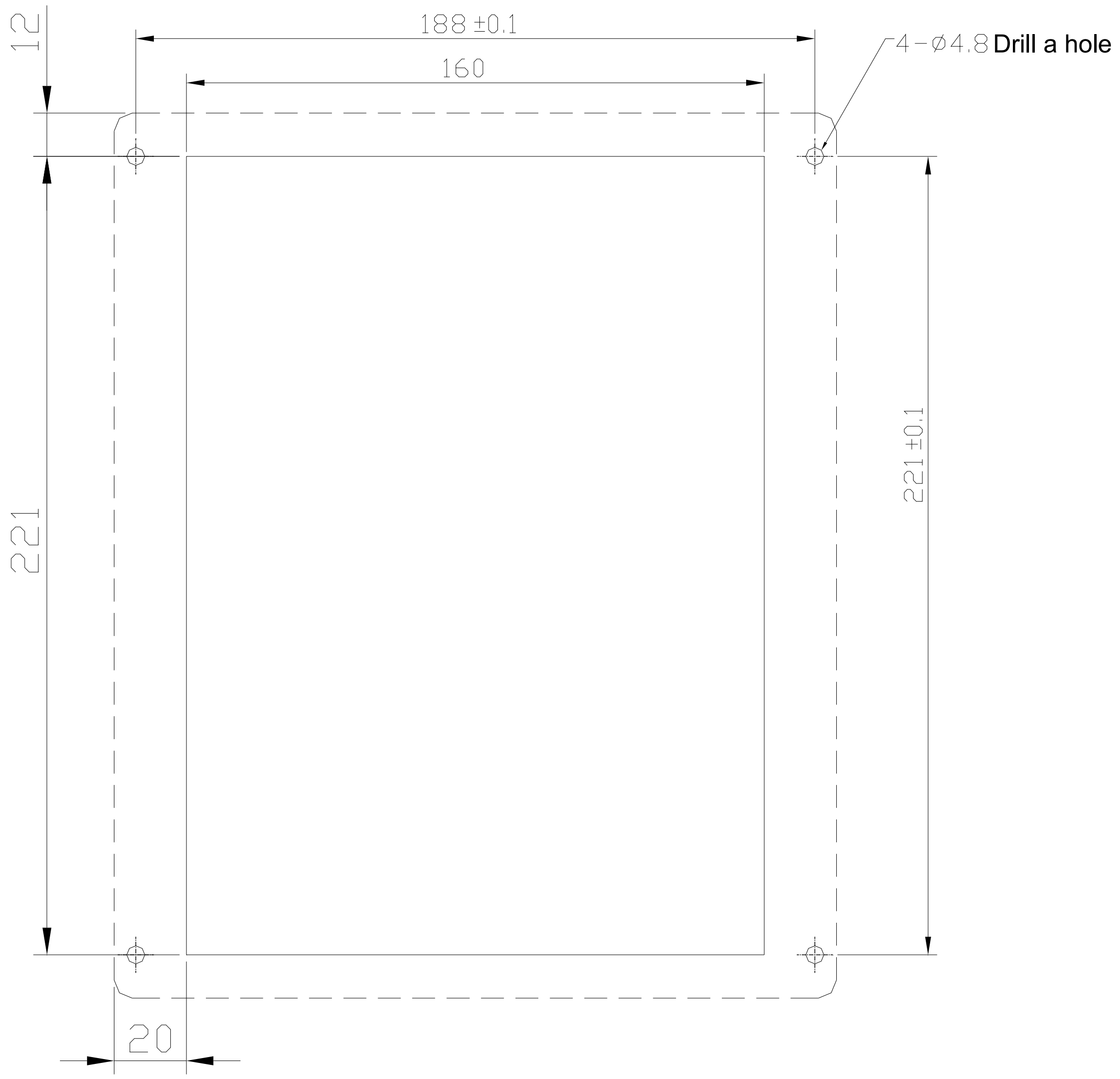
8 Dimension

The following is the dimension chart for each installation position. The linear part is the cutting line and the cycle part is the position of a drilling hole, and the dotted-line part is the range after the installation is completed.

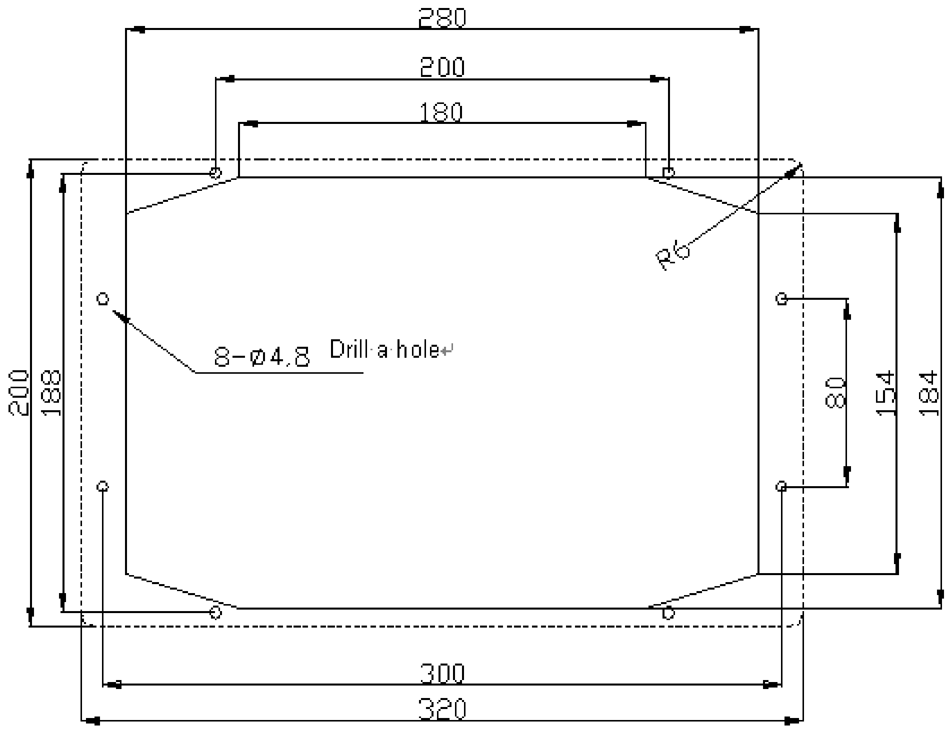
8.1 LCD Module Installation Position



8.2 MDI Dimension

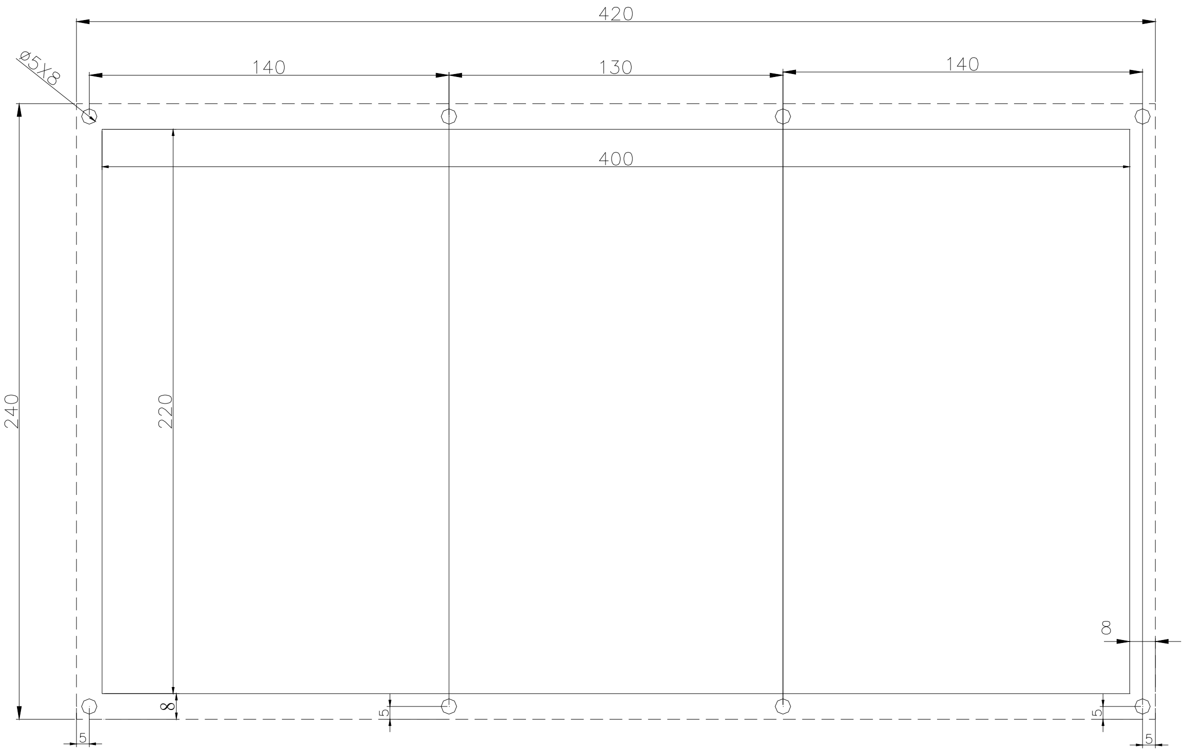


8.3 Operational Panel Dimension



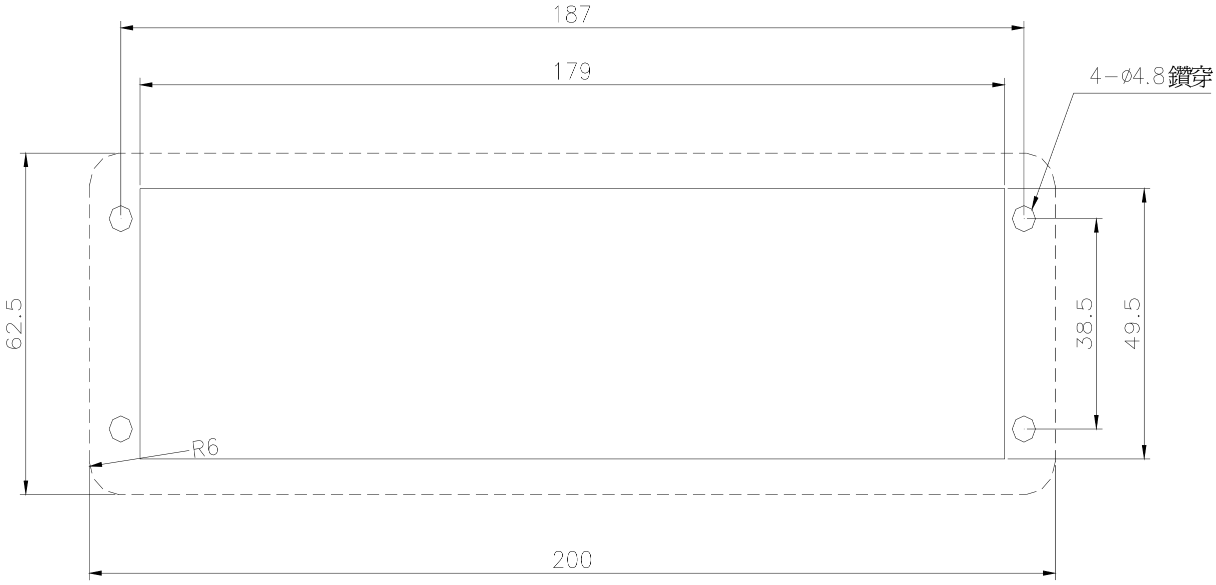
8.4 Push-button Operational Panel Dimension

To set up, use M4 screw with nut to lock up, the length is depend on the location. (OP panel is 5mm in depth)

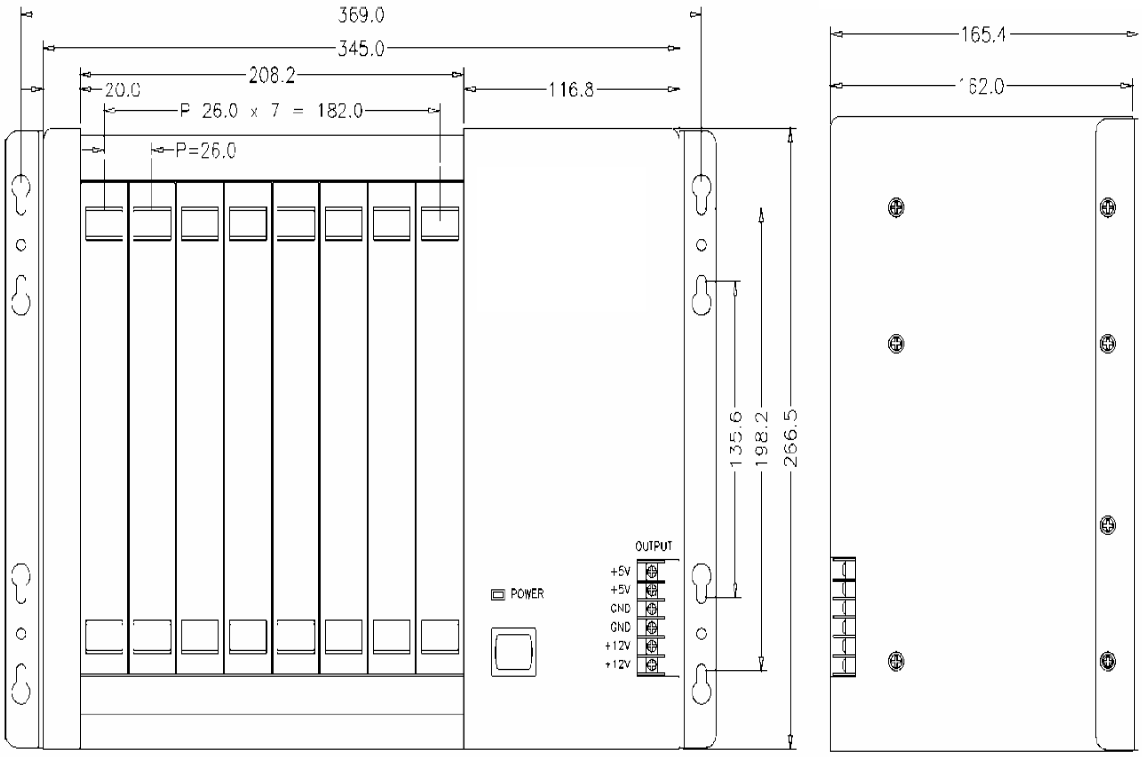


UNIT: mm

8.5 THREE IN ONE MODULE(FLOPPY+ETHERNET+RS232)



8.6 Controller Dimension

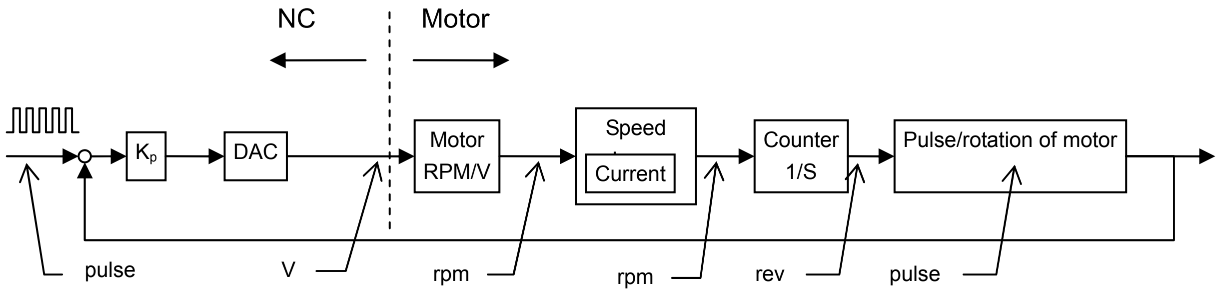


UNIT:mm

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：

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

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）.

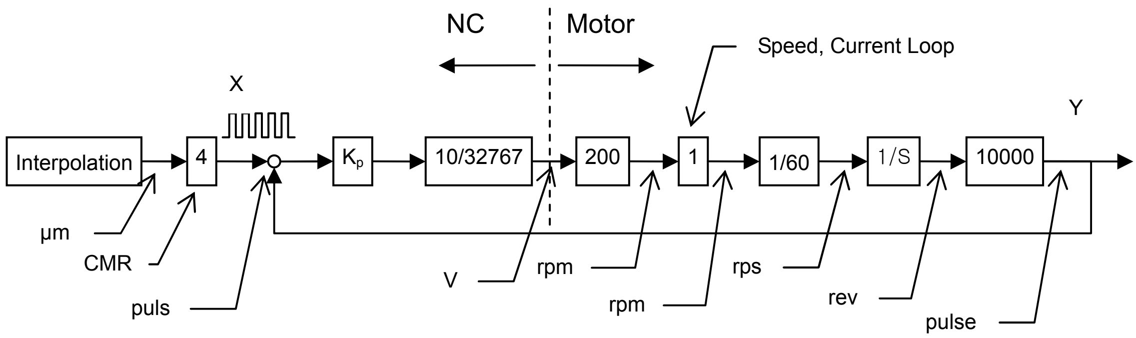
Parameter #0156：3（X axis control commanding mode）.

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:

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

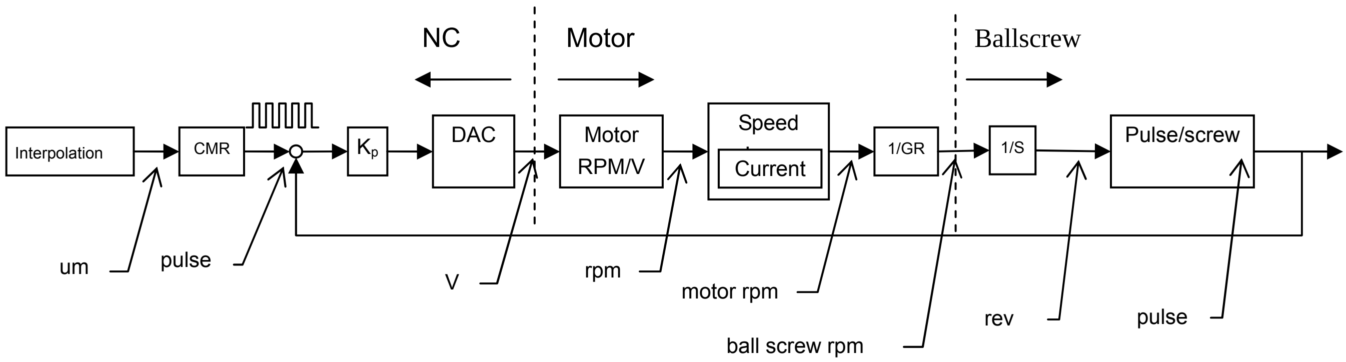
At this time, the position feedback loop gain is $10.17284K_p$. Since the user requires the desired position loop gain is 30, so the K_p value needs to be set as $\frac{30}{10.17284} = 2.949$[i] on motion control board.

Testing Method:

$e = \frac{F}{K}$，e is the following error under stable condition（X axis reaches equal speed），please check system data # 000, unit is the smallest unit of the system; F is the feedrate; K is the position feedback loop gain. In this example, when K is 30 and under the condition that feedrate is 2000mm/min, following error should be $e = \frac{2000000/60}{30} = 1111$ when X axis is in equal speed. When X axis is already in equal speed and the value of system data #000 is 1111 (or close to this number, sometimes there will be some difference due to moving forward one space), it means the parameter setting is correct.

A2 Parameter Adjustment when Encoder is installed besides Ball Screw

1. Connecting ball screw encoder feedback signal to NC, using it as position control.
2. Connecting motor encoder feedback signal to motor driver, using it as speed (velocity) and voltage control.



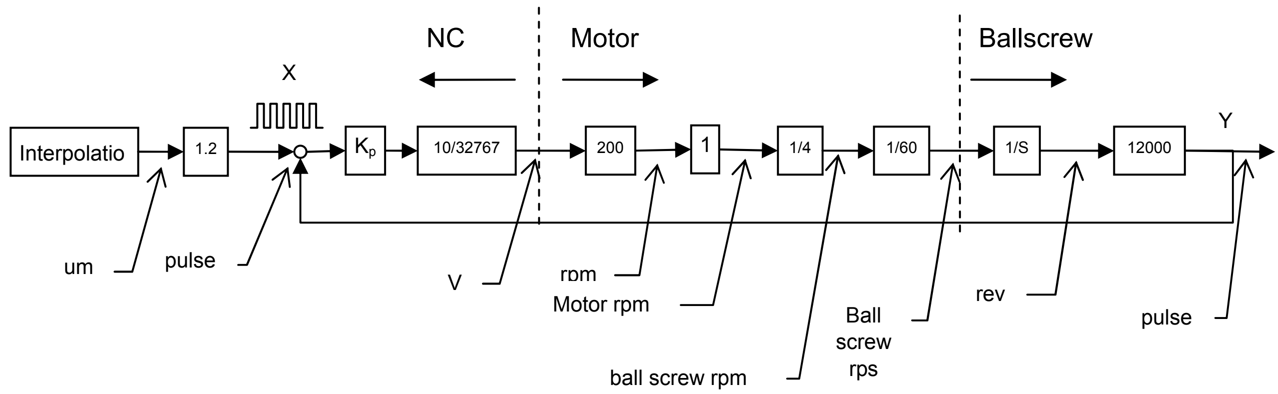
3. Since the position feedback signal is returning back from ball screw at this time, must set gear ratio to 1 even there is gear ratio is between motor and ball screw. Putting the gear ratio factor into the position control feedback.
4. Assumed the initial parameter # 1112 is to set the encoder total output pulse value per rotation of motor. At this time, changing it to as the encoder total output pulse value per rotation of ball screw.

Example：X axis selects 2000rpm/10V motor，encoder total output pulse value per rotation of motor is 2500; for machine structure, gear ratio is 4, pitch is 10mm, Please to install an additional 3000pulses/rev encoder on the ball screw side and also to connect the feedback signal to NC for position control. Under the condition that V command control method and the system loop gain is 30, how to set the related parameters?

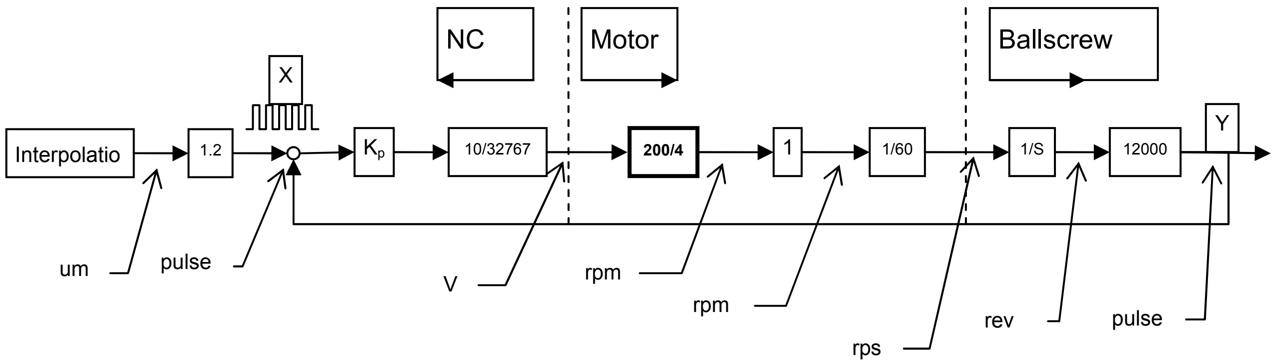
Answer：Parameter #0001：30（system feedback loop gain）.
Parameter #0054：4（X axis multiple feedback factor）.
Parameter #1112：3000（encoder total output pulse value per rotation of X axis ball screw）.
Parameter #0108：????（X axis motor loop gain）→explain later.
Parameter #0156：3（X axis control commanding mode）.
Parameter #0068：1（denominator of X axis motor）.
Parameter #0100：1（numerator of X axis ball screw）.
Parameter #0104：10000（Pitch of X axis ball screw）.

$CMR = \frac{3000*4}{10000} = 1.2\, pulses/um$, which means 1um on X axis is correspond to 1.2 pulses that is the encoder total output signal of ball screw.

Control Loop is as below:



But, since there is no extra parameters for GR factor setting in position feedback, modification is as following:



Input and Output Relationship:

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

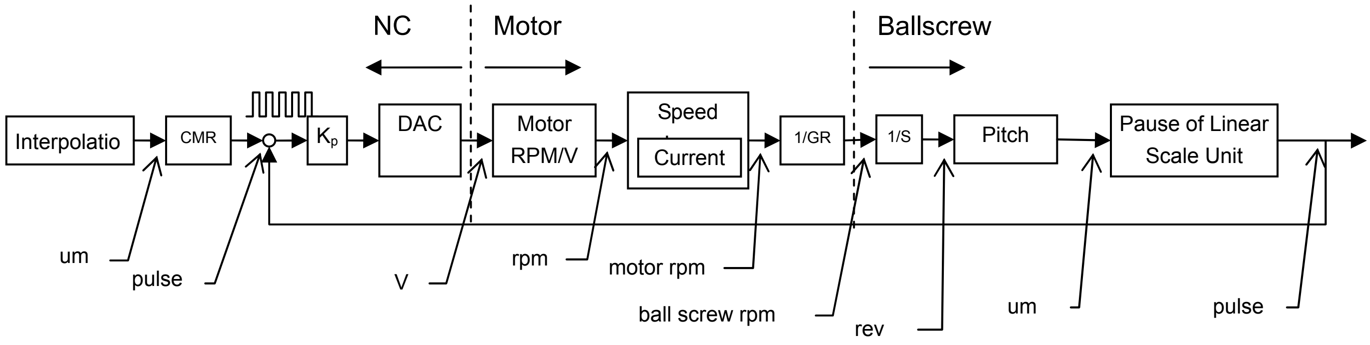
$$= \frac{K_p \cdot 10/32767 \cdot 200/4 \cdot 1/60 \cdot 1/S \cdot 12000}{1 + K_p \cdot 10/32767 \cdot 200/4 \cdot 1/60 \cdot 1/S \cdot 12000} X = \frac{3.05185K_p}{S + 3.05185K_p} X$$

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

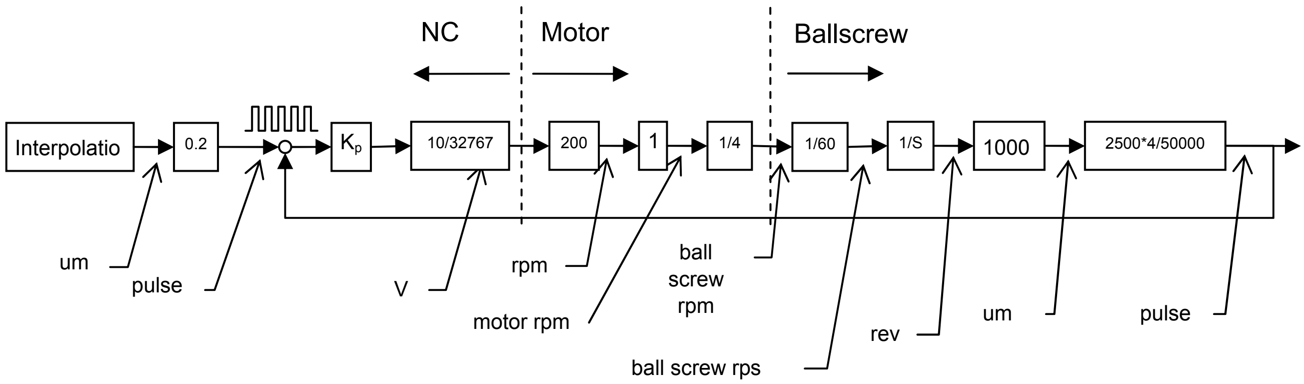
50 mm linear scale will produce one Z phase pulse, every 20 um will produce one A/B pulse set, so the pulse value that is produced by linear scale between each index is 50 * 1000 / 20 = 2500 → the setting value of Parameter #1112 is 2500.

For linear scale, every 20 um will produce one A/B pulse set. This means every 5um will produce one pulse after 4 ratio so the CMR = 1 / 5 = 0.2. But for NC,

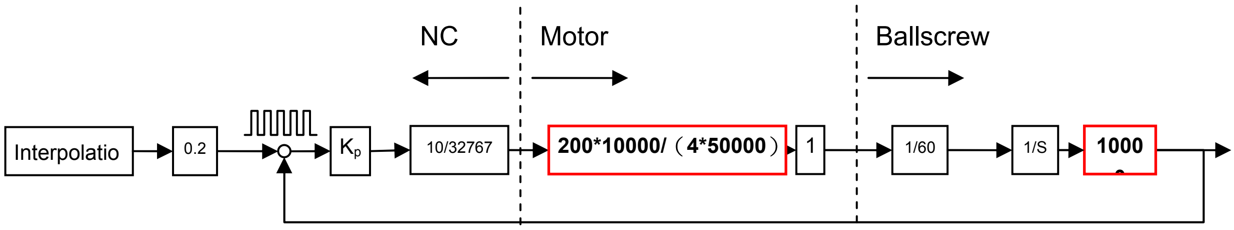
$$CMR = \frac{P0058 \times P0054}{P0104} \times \frac{P100}{P68}$$

Since Parameter #1112 is to set the pulse value, which is produced by linear scale, between each index, Parameter #0104 must set the distance between each linear scale index in order to make the CMR in NC the same as that in linear scale. In this example, Parameter #0104 must be set as 50000.

Control Loop is as following:



Since there is no extra parameter for pitch and numerator of X axis ball screw setting, the control loop is modified as following:



Output and Input Relationship:

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

$$= \frac{K_p \cdot 10/32767 \cdot (200 \cdot 10000)/(4 \cdot 50000) \cdot 1/60 \cdot 1/S \cdot 10000}{1 + K_p \cdot 10/32767 \cdot (200 \cdot 10000)/(4 \cdot 500000) \cdot 1/60 \cdot 1/S \cdot 10000} X = \frac{0.50864}{S + 0.50864 K_p} X$$

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

$$\frac{30}{0.50864} = 58.9808 \text{ on PCC1620 Motion Control Board.}$$

Weakness: Under current structure, when Parameter 0108 cannot be an integrate number, please enter the closest integrate number. At this time, there will be some difference between the whole position loop gain and parameter 0001, but the position control will not have any problem. Strength: able to clear backlash error and pitch error.

Appendix B：Servo Connection Example

B1 Yaskawa Servo Connection Example

YASKAWA Servo Motor Machine Adjustment Description

Parameter	Description	Value	Note
Pn000	Control Mode Select: 0:speed control 1:position control	1	_ _1_
Pn100	Speed circuit gain	Depend on motor type	
Pn101	Speed Loop Integral Time Constant	Depend on motor type	
Pn102	Position Loop Gain	Depend on motor type	
Pn200	Pulse Type	4	_ _ _4
Pn201	PG Dividing Ratio	Depend on motor type	
Pn202	Electronic Gear Ratio (Numerator)	Depend on motor type	
Pn203	Electronic Gear Ratio (Denominator)	Depend on motor type	

_ : means this value has no such setting.

YASKAWA Σ-II Series electron gear ratio formula

NC output pulse/rev→ $\dfrac{\text{CMX(Pn202)}}{\text{CDV(Pn203)}}$ →driver pulse/rev

feedack

Encoder output pulses(Pn201x4）

Model example

SGMPH-01 A $\boxed{\text{A}}$ A 2 S

SGMPH-01 A $\boxed{\text{A}}$ 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, (1 μ =1pulse）：

5MM<PITCH>=5000 μ =5000pulse
Because Pn201<motor ENCODER PULES per rotate>X4<NC multiple>=5000 pulse
So Pn201=1250
NC parameter<<0058、0060>>：to set X-Axis and Z-Axis ENCODER(P/Rev.)=1250。

$$\frac{\text{Pn203}}{\text{Pn203}}=\frac{2048_{\langle\text{13-BIT}\rangle}\text{X4}_{\langle\text{x4 multiplier}\rangle}}{1250_{\langle\text{NC Para.: X-Axis/Z-Zxis ENCODER(P/Rev.)}\rangle}\text{X4}_{\langle\text{x4 multiplier}\rangle}}=\xrightarrow{\text{reduce}}\frac{1024}{625}$$

Servo motor parameter:
Pn201：1250 Pn202：1024 Pn203：625

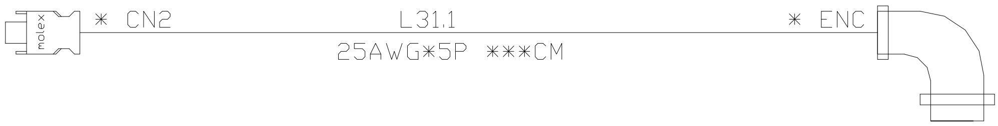
Ex: using motor that Code=1 or B, PITCH=10MM，(1 μ =1pulse)：

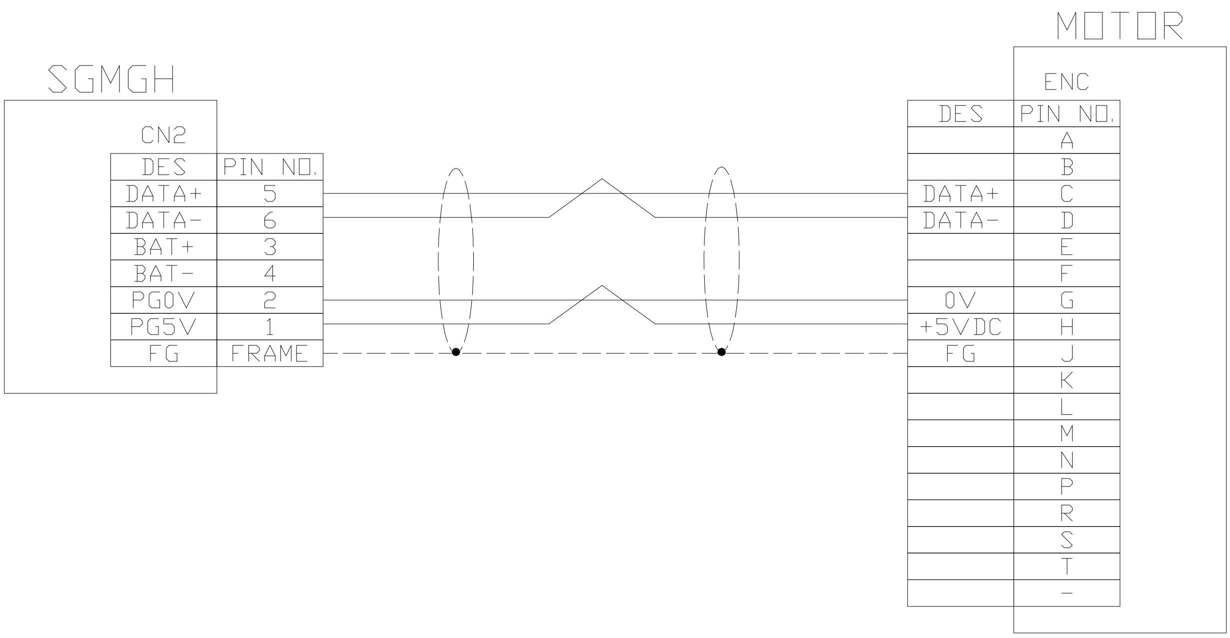
10MM<PITCH>=10000 μ =10000pulse
Because Pn201< motor ENCODER PULES per rotate >X4< NC multiple >=10000 pulse
So Pn201=2500
NC parameter <<0058、0060>>：X-Axis and Z-Axis ENCODER(P/Rev.)=2500

$$\frac{\text{Pn203}}{\text{Pn203}}=\frac{16384_{\langle\text{16-BIT}\rangle}\text{X4}_{\langle\text{x4 multiplier}\rangle}}{2500_{\langle\text{NC Para.: X-Axis/Z-Zxis ENCODER(P/Rev.)}\rangle}\text{X4}_{\langle\text{x4 multiplier}\rangle}}=\xrightarrow{\text{reduce}}\frac{4096}{625}$$

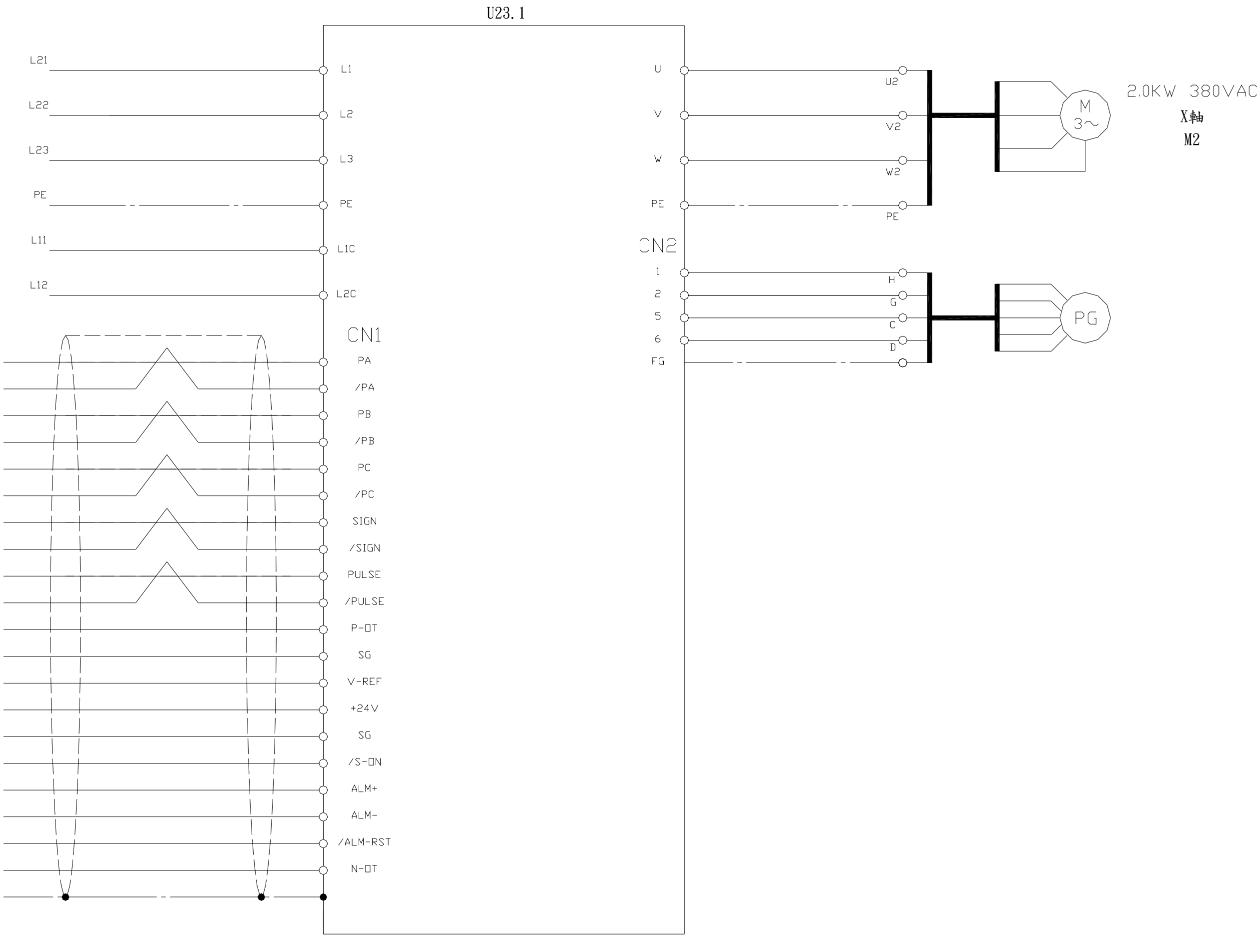
Servo motor parameter: X-Axis and Z-Axis ENCODER(P/Rev.)=2500
Pn201：2500 Pn202：4096 Pn203：625

Ex：using Code=2 or C type motor, PITCH=10MM，(1 μ =1pulse)：
10MM<PITCH>=10000 μ =10000pulse Pn201 < motor ENCODER P/Rev. > X4 <NC multiple>=10000 pulse So Pn201=2500 NC para. : <<0058、0060>> : X-Axis and Z-Axis ENCODER(P/Rev.)=2500 $\frac{Pn203}{Pn203} = \frac{32768_{\langle 17\text{-}BIT\rangle} X4_{\langle x4\ multiplier\rangle}}{2500_{\langle NC\ Para.:\ X\text{-}Axis/Z\text{-}Zxis\ ENCODER(P/Rev.)\rangle} X4_{(x4\ multiplier)}} = \xrightarrow{約分後} \frac{8192}{625}$ Servo motor parameters: Pn201：2500　　Pn202：8192　　Pn203：625

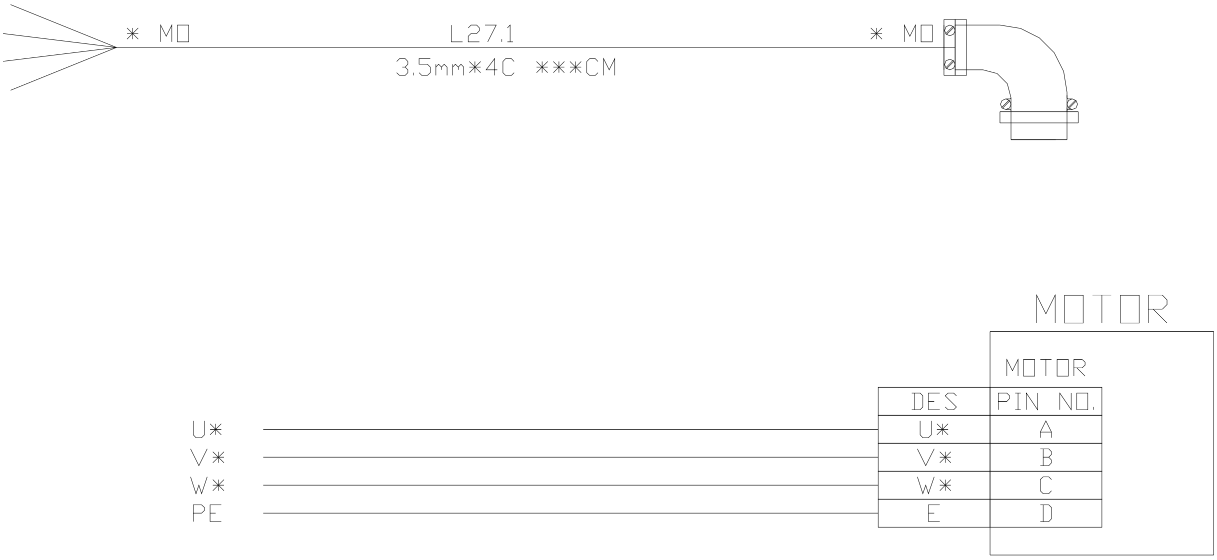




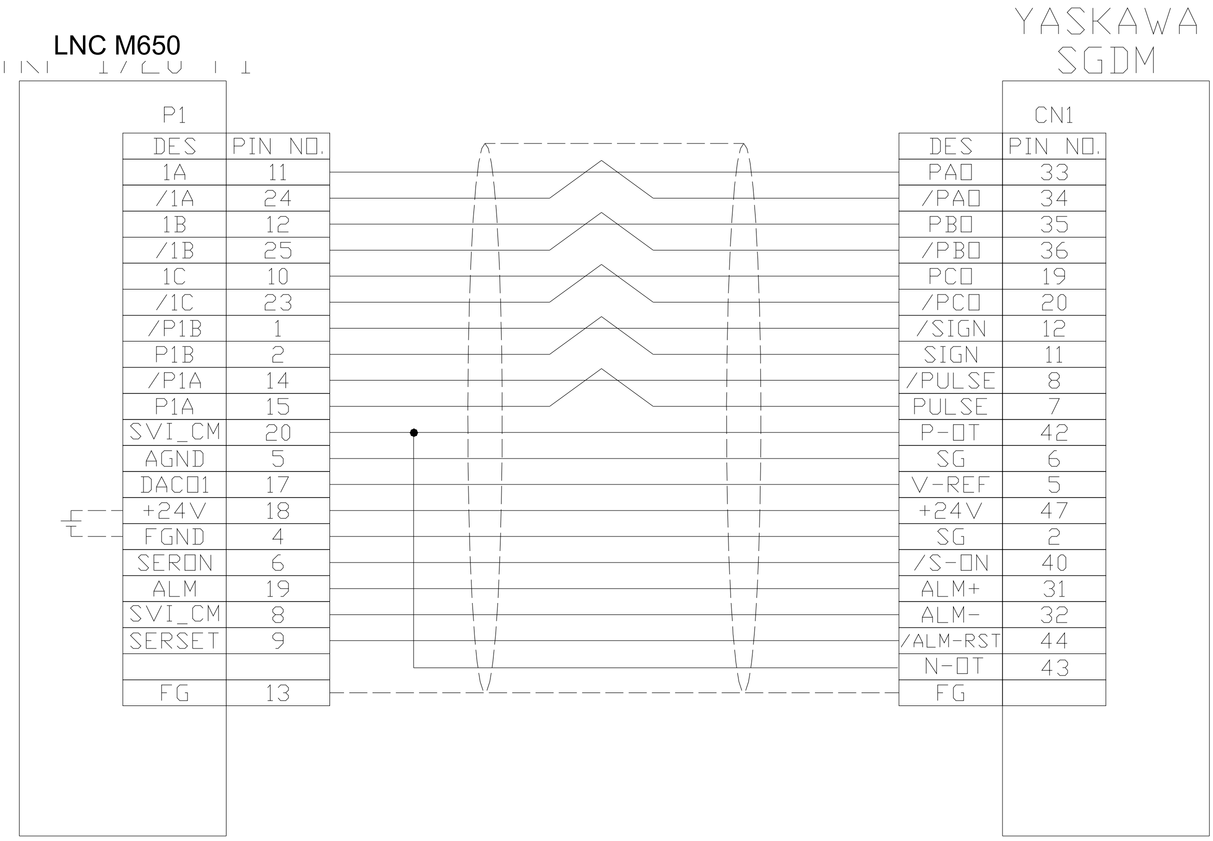
ENCODER-Connection Diagram



MOTOR-Connection Diagram#1



MOTOR-Connection Diagram#2



P1 Connection Diagram

B2 Panasonic Servo Connection Example

Panasonic Servo Motor Adjust Parameters

A TYPE			
Para.	Description	Value	Note
Pr 02 *	To set control mode Control mode:0: position 1: speed	0	
Pr10	Position Loop Gain	According to motor type	
Pr11	Speed Loop Gain	According to motor type	
Pr12	Loop Integral Time Constant	According to motor type	
Pr40 *	Control pulse multiple	4(default）	Use if resolution been changed
Pr44 *	Number of output pulse per rotation	2500(default）	Use if resolution been changed
Pr46	electronic gear ratio numerator	10000(default）	Use if resolution been changed
Pr4A	electronic gear ratio numerator$\times 2^n$	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 Control mode:0: position 1: speed	0	
Pr03	Speed Loop Gain	According to motor type	
Pr04	Loop Integral Time Constant	According to motor type	
Pr20	Position Loop Gain	According to motor type	

Panasonic electron gear ratio formula

NC output pulse/rev→

$$\frac{\mathrm{CMX(Pr46)} \times 2^{\mathrm{Pr4A}}}{\mathrm{CDV(Pr4B)}}$$

→driver pulse/rev

feedback

Encoder output pulses(Pr44xPr40）

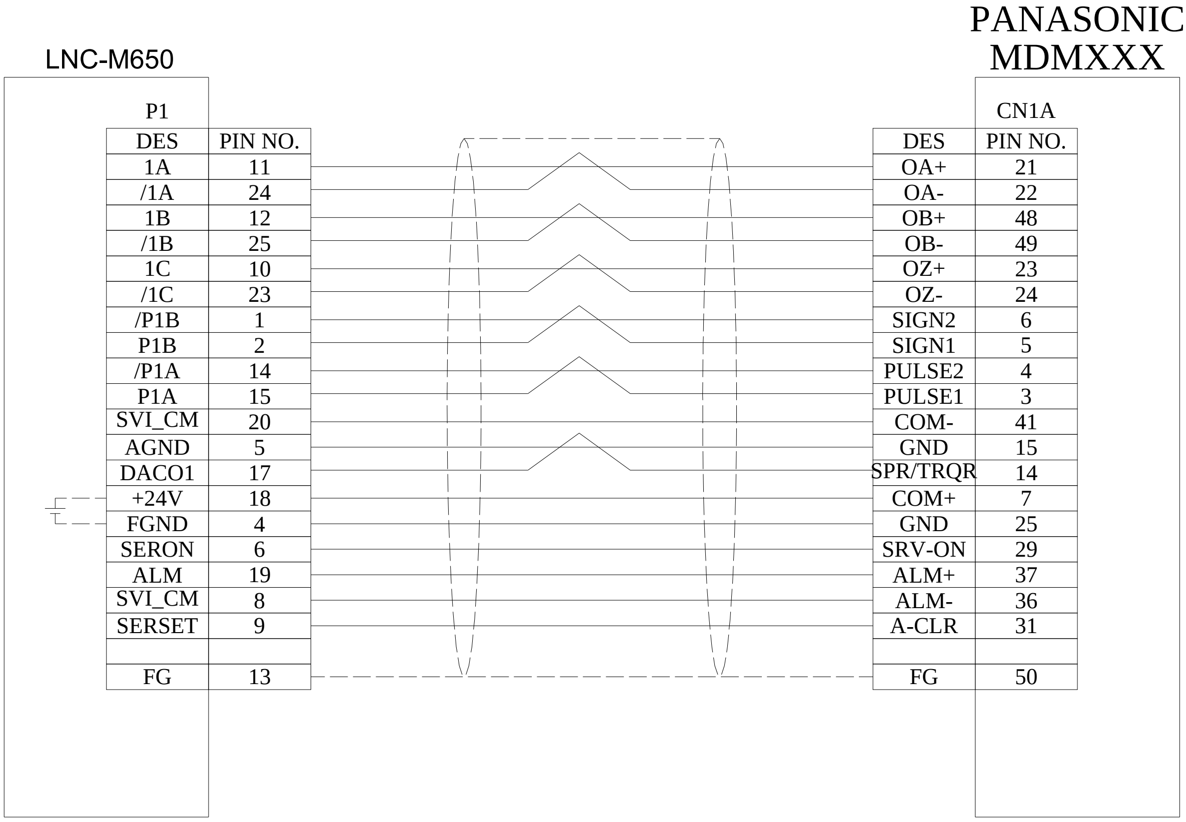
NC pulse output must equal to driver feedback pulse(ENR) formula:

$$\mathrm{Pr\,44} \times \mathrm{Pr\,40} \times \frac{\mathrm{Pr\,46} \times 2^{\mathrm{Pr\,4A}}}{\mathrm{Pr\,4B}}$$

Pr40=4(default）
Pr44=2500(default）
Pr46=10000(default）
Pr4A=0(default）
Pr4B=10000(default）

Ex: if want resolution of motor up to 10000pulse/rev

$$2500\langle Pr\,44\rangle \times 4(Pr\,40) \times \frac{10000(Pr\,46) \times 2^{0(Pr\,4A)}}{10000(Pr\,4B)} = 10000\,pulse/rev$$



DES	PIN NO.	DES	PIN NO.
1A	11	OA+	21
/1A	24	OA-	22
1B	12	OB+	48
/1B	25	OB-	49
1C	10	OZ+	23
/1C	23	OZ-	24
/P1B	1	SIGN2	6
P1B	2	SIGN1	5
/P1A	14	PULSE2	4
P1A	15	PULSE1	3
SVI_CM	20	COM-	41
AGND	5	GND	15
DACO1	17	SPR/TRQR	14
+24V	18	COM+	7
FGND	4	GND	25
SERON	6	SRV-ON	29
ALM	19	ALM+	37
SVI_CM	8	ALM-	36
SERSET	9	A-CLR	31
FG	13	FG	50

P1 Connection Diagram

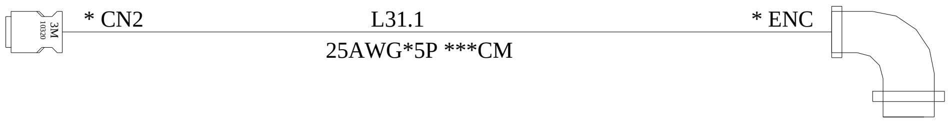
B3 Mitsubishi Servo Example

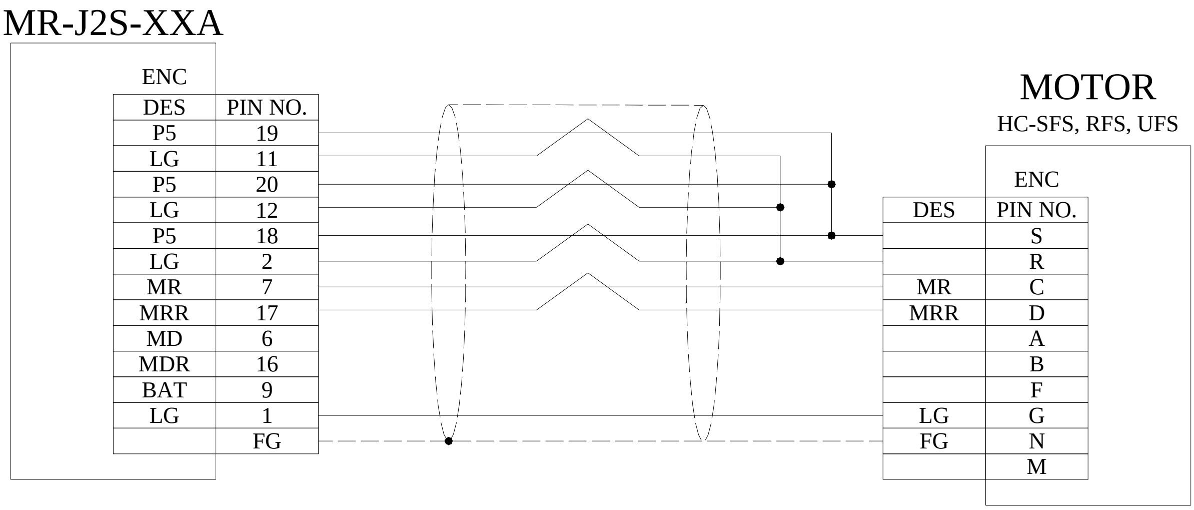
Mitsubishi Servo Motor Adjust Parameter

classification	Para. #	Symbol	Name and function	Default	Setting value	Unit	Control mode
Basic parameter	19	*BLK	Parameter write function setting:	0000	000E		P.S.T
	0	*STY	Control mode selection: 0：position control 2：speed control Please refer to 5-5	0000	0000		P.S.T
	2	ATU	Auto-tuning: Please refer to 5-6	0105	0405		P.S
	3	CMX	electronic gear ratio numerator	1	8192		P
	4	CDV	electronic gear ratio denominator	1	625		P
	21	*OP	Function 3（command pulse selection）	0000	0012		P
Extended parameter 1	25	VCM	Max. Feedback Speed of Analogy Speed： Setting Analogy Speed Command（VC）. Key-in the feedback speed of maximum voltage（10V）. The setting value is 0 as the constant rotational speed.	0	3000	Rpm/min	S.T
	27	*ENC	Checking Output PLUSE： Output PLUSE = Analogy Degree/REV of Servo Motor Please also refer to Section 5-15.	4000	10000	Pulse/rev	P.S.T
	29	VCO	Analogy Speed Command OFFSET： Setting Voltage OFFSET value of Analogy Speed Command（VC）.	According to servo driver		Millivolt	
	37	VG2	Speed Incremental 2 Adjusting effort is more obvious than that of Speed Incremental 1.	817	1000	Rad/s	

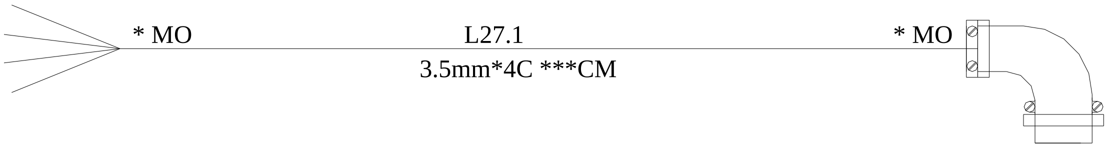
Mitsubishi electron gear ratio formula
Ex: Setting ENCODER output value（NO.27）to 10000:

$$\frac{CMX\langle \text{Command pulse numerator}\rangle}{CDV\langle \text{Command pulse denominator}\rangle} = \frac{131072X4}{10000X4} = \xrightarrow{\text{Reduction}} \frac{8192}{625} = \frac{\text{parameter3}}{\text{parameter4}}$$





ENCODER Connection Diagram

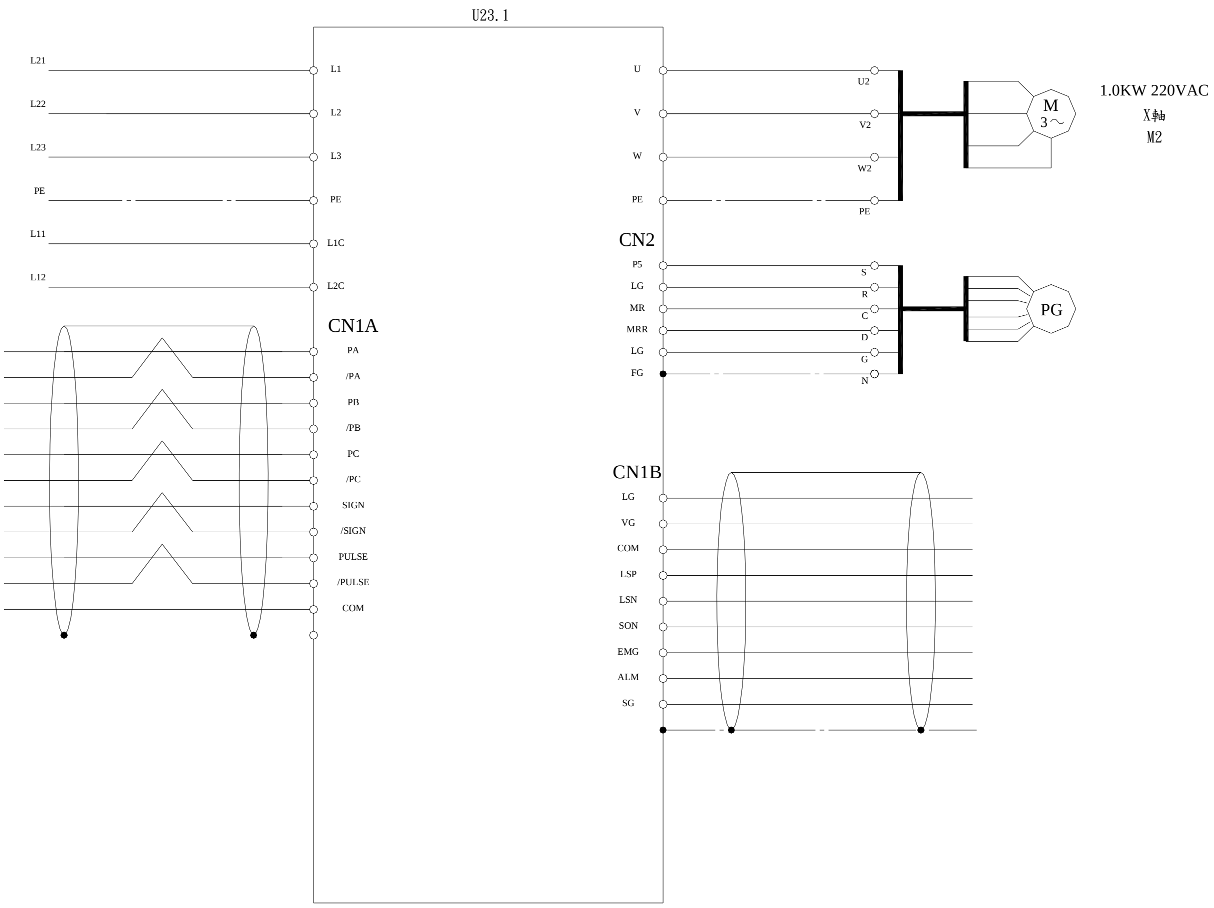


MOTOR

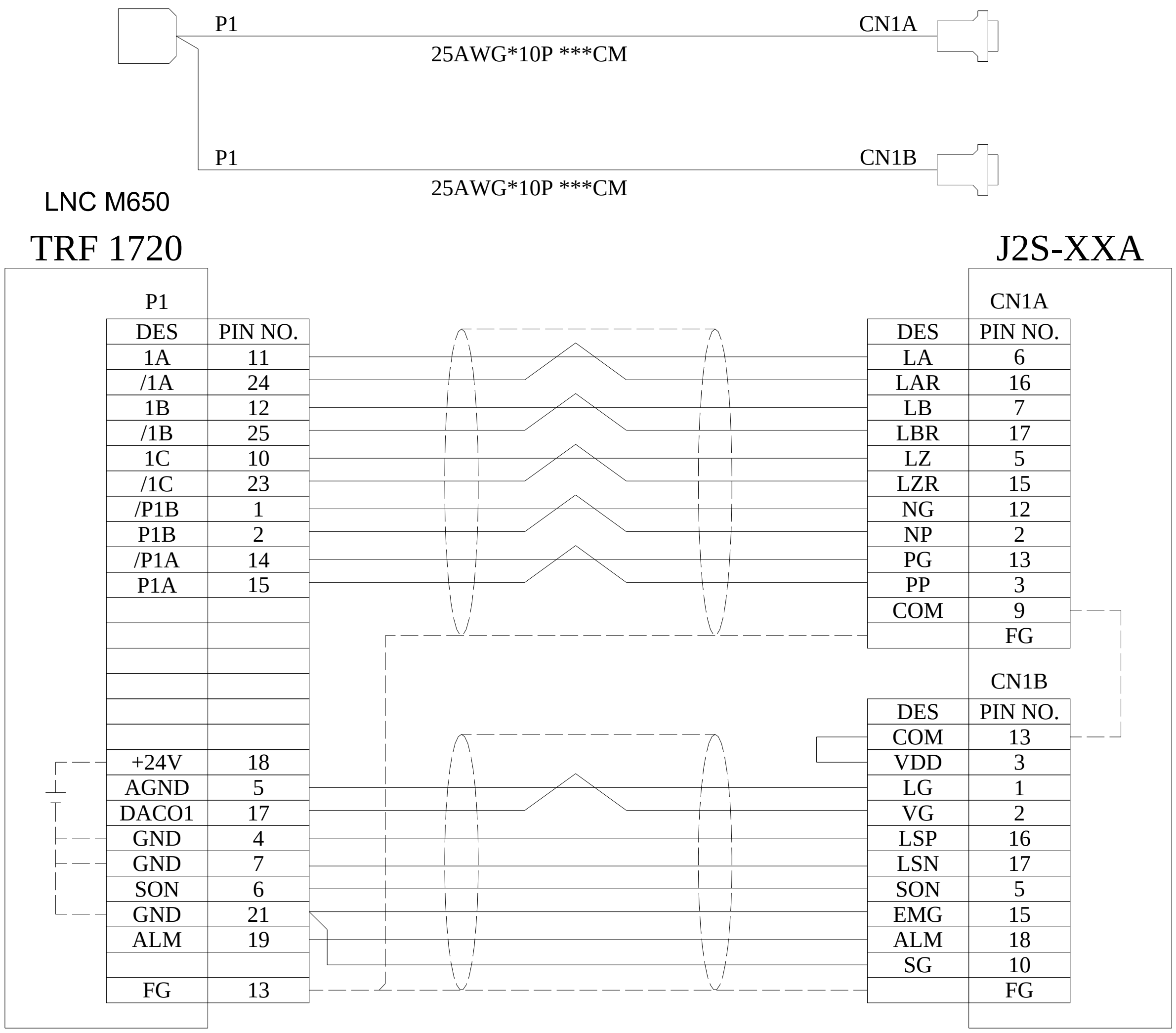
HC-SFS, RFS, UFS

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

MOTOR Connection Diagram #1



MOTOR Connection Diagram #2

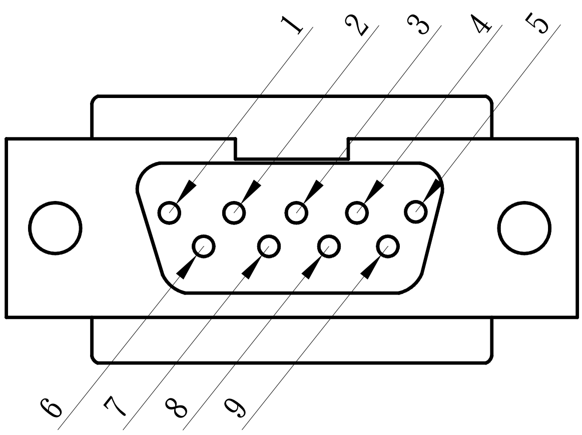


P1 Connection Diagram

Appendix C：RS232 Connection Description

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

The electronic feature of RS232 belongs to the in-balance transmittion method. So the transmittion distance is a little bit short, approximate 15m, due to the anti-interference function is weak. According to the RS-232C standard, connector circuit must be the physical D type connector. D type connector has 25 cords (short name is DB25). But, it can be 9 cords (short name is DB9). Most of PC use DB9, like the diagram show below:



PIN	Abb.	Meaning
Pin1	CD	Carrier Detect
Pin2	RXD	Receive
Pin3	TXD	Transmit
Pin4	DTR	Data Terminal Ready
Pin5	GND	Ground
Pin6	DSR	Data Set Ready
Pin7	RTS	Request To Send
Pin8	CTS	Clear To Send
Pin9	RI	Ring Indicator

- **Transmitting Cable Production**

  There are two types of Pin for a normal type remote port. One is 9 Pin and the other one is 25 Pin. Usually the NC side has 9Pin male port. But, the PC side has either 9Pin or 25Pin. male port.

  The method to connect NC and PC is to do the transmitting via jumper cable. If users equipment is 9Pin, then please use the 9Pin connector. Actually, 9Pin is very useful for other controller system application. Sometimes, 3Pin can have the same control function. So the simplest 3Pin is to use the 2nd, the 3rd and the 5th pins to receive and transmit.

NC COM1（9 pin Female） to PC COM1（9 pin Female）	NC PC ------------------------------ pin2（RD） --- pin3（TD） pin3（TD） --- pin2（RD） pin5（SG） --- pin5（SG）
NC COM1（9 pin Female） to PC COM2（25 pin Female）	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:

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.”)

Modify network configuration of the controller. There are two ways to make the modifications: by DOS or by the operating interface of LNC software.

Method 1: By DOS

A. Modify the file “C：\config.sys” of the controller.

Modify

`REM device=C：\NET\ifshlp.sys`

into

`device=C：\NET\ifshlp.sys`

B. Edit “C:\Net\2net.bat.” Modify this line according to your needs:

`C：\NET\net△use△N：△\\PCNET\share△12345△YES`

Below are the definitions for each field in the line.

a. △ represents a blank character.

b. ”PCNET” is the computer name in the Network, and “share” is the folder name shared by the computer.

c. ”N” is the (virtual) disk of N: which is mapping to the sharing resource “\\PCNET\ share“ in the network. (Please do not use “D:” which is used for different purposes; using “D:” will cause errors.)

d. “12345” indicates the password to log on PC. Passwords may or may not be required for different operating systems.

- Window98：For this system, instead of adding a new account, users can connect some network disk by sharing a folder with each other. Therefore, users must log on with the same password as set by PC for “folder-sharing” function.

- Window2000 & 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).
- 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`.

C. 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
 :
```

a. "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.

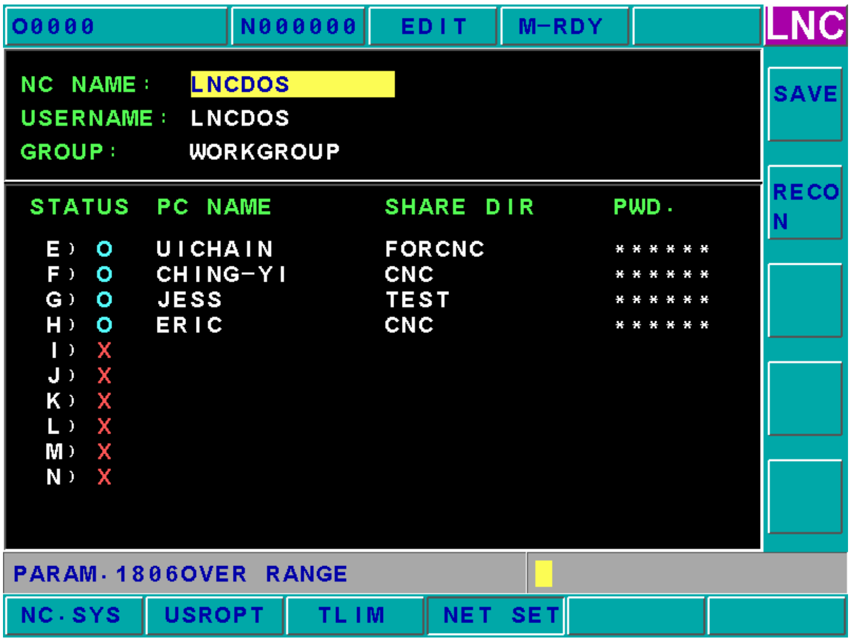
b. "username=" is the controller name to log on PC. Except for Window98, all other operating systems require PC side to add a new user with the same name at the same time unless access permission is open to guests. The default user name is LNCDOS. Since a user can use the same name to log on repeatedly, there is no need to modify this name even if there is more than one controller in a domain.

c. "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."

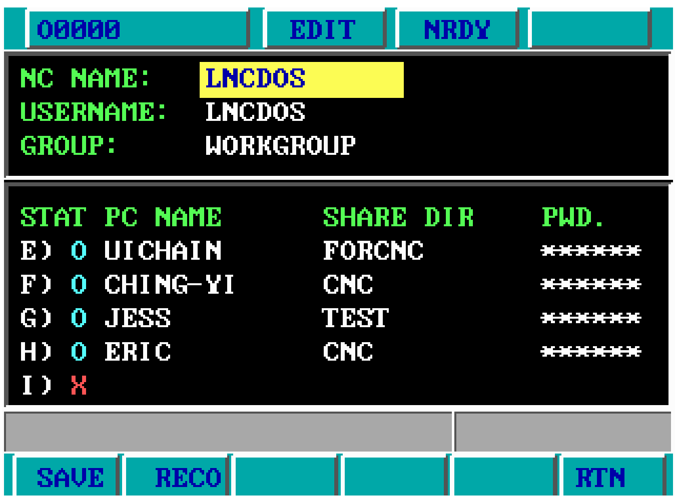
d. "logondomain=" is the domain name of the controller when logging on the internet. Please set this value according to the domain that the controller belongs to. The setting method is basically the same as that of "WORKGROUP."

Method 2. By the operating interface of LNC software

A. For 600 & 520 Series, the path to go to the configuration interface is <PARAM> → **NET SET**; for 500i/510i & 300i/310i Series, it is < PARAM > →**NET**, as shown in the figures below.



Networking configuration screen for 600 & 520 Series



Networking configuration screen for 500i/510i & 300i/310i Series

B. FIELD DEFINITIONS：

a. NC NAME: “computername” in the `C:\Net\system.ini` file. One name should not be used twice in the same domain. The default name is LNCDOS.

b. USERNAME: “username” in the `C:\Net\system.ini` file. This is the user to log on PC. The default name is LNCDOS.

c. GROUP: “workgroup” in the `C:\Net\system.ini` file. This is the work group name of the controller when logging on the internet. The default name is WORKGROUP.

d. STATUS(for 600 & 520 Series) or STAT (for 500i/510i & 300i/310i Series):

- Disk codes are used in `C:\Net\2net.bat` when logging on the internet.
- Disk codes start from “E” to “N.” There are 10 codes in total.
- The drive codes are assigned by the system; users are not allowed to set the codes by themselves.
- ◯ & X after drive codes indicate the network status of the drive. X means off-line; ◯ means on-line.
- Disk codes other than E ~ N existing before network setting is configured will be deleted after networking configuration is finished.

e. PC NAME: Enter the full computer name for the controller to get connected with PC. The maximum length allowed is 12 characters.

f. SHARE DIR: Enter the share folder name for the controller to get connected with PC. The maximum length allowed is 12 characters.

g. PWD.: Set the password to get connected with PC. The content of the password is visible when being entered, but it will be converted into “******” as soon as “Enter” key is pressed. The maximum length allowed is 12 characters.

C. DEFINITIONS OF FUNCTION KEYS

a. Press the keys **UP**, **DOWN**, **LEFT**, & **RIGHT** to move cursor to the desired field.

b. Enter the information in the input text box, then press **INPUT** to upload the information to the field assigned by cursor.

c. Pressing **INPUT** without any information in the input text box will delete the original information in the field.

d. Press **PageUp** & **PageDown** to switch between pages.

e. CANCEL:leace this page without saving.

f. ESC: the same to CANCEL

g. SAVE: press SAVE to save update data, due to this is the Ethernet setting, you need reboot PC.

※ Due to connectivity issues, sometimes the controller fails to log on the network. If this happens when the above functions are in use, the controller will try to connect to the same disk for 3 times before connecting to the next disk. After all connections are tried, the controller will then enter the system.

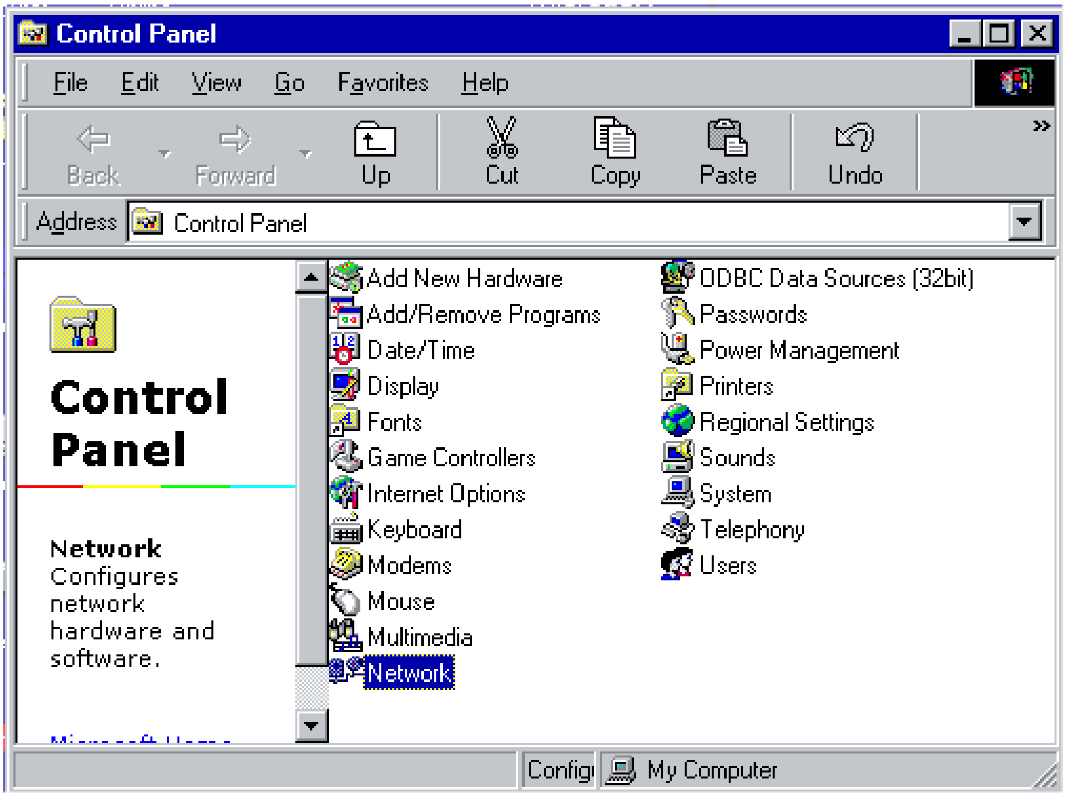
2. NETWORK SETTINGS AT PC SIDE

Network Settings for Windows 98

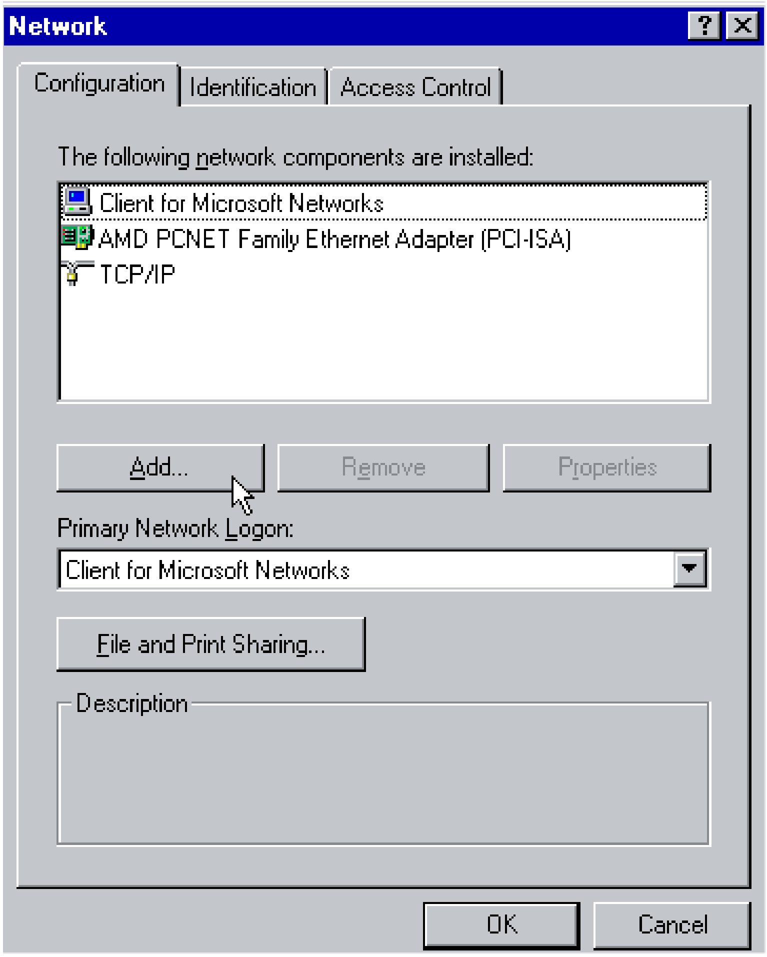
A. Verify if the network card, internet cables, and relative protocols have been installed properly.
Verify if the “NetBEUI” protocol & the “File and printer sharing for Microsoft Networks” service have been installed. (Caution: DO NOT activate the network protocol “NWlink NetBIOS” which would cause network connection to fail.)

a. Click **Start** → **Settings** → **Control Panel**.

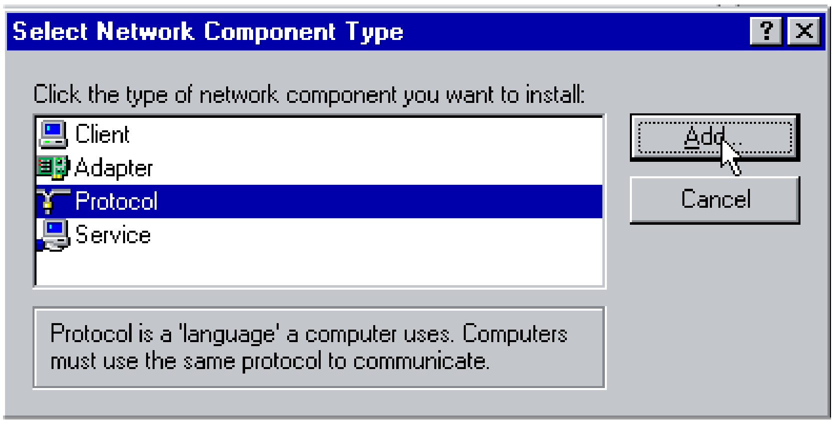
b. Double-click on the **Network** icon to configure network settings.



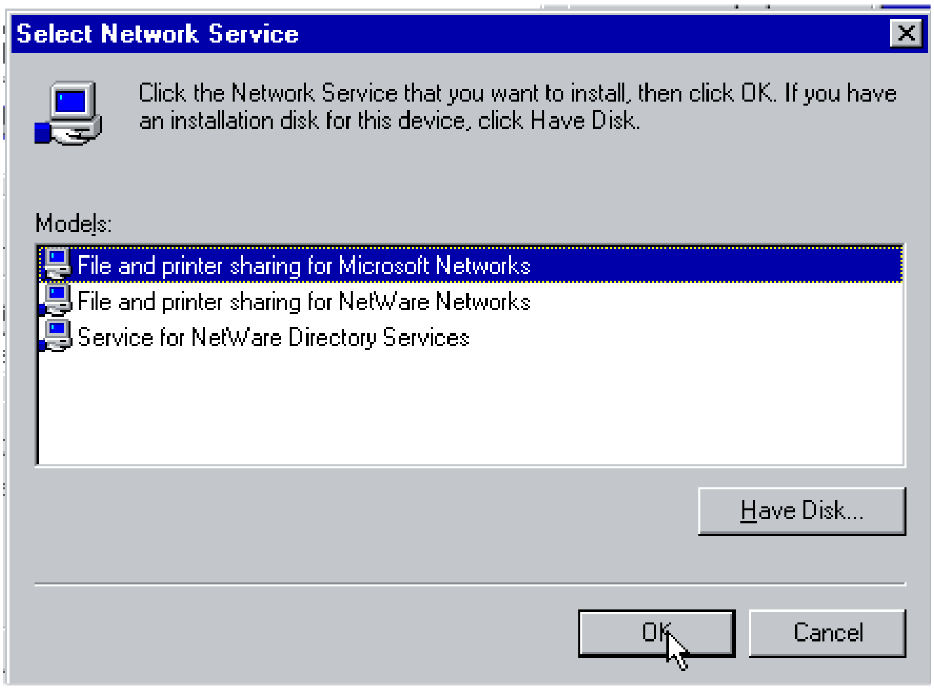
c. If the two network protocols "File and Printer Sharing for Microsoft Networks" & "NetBEUI" are not installed, please press **Add**.



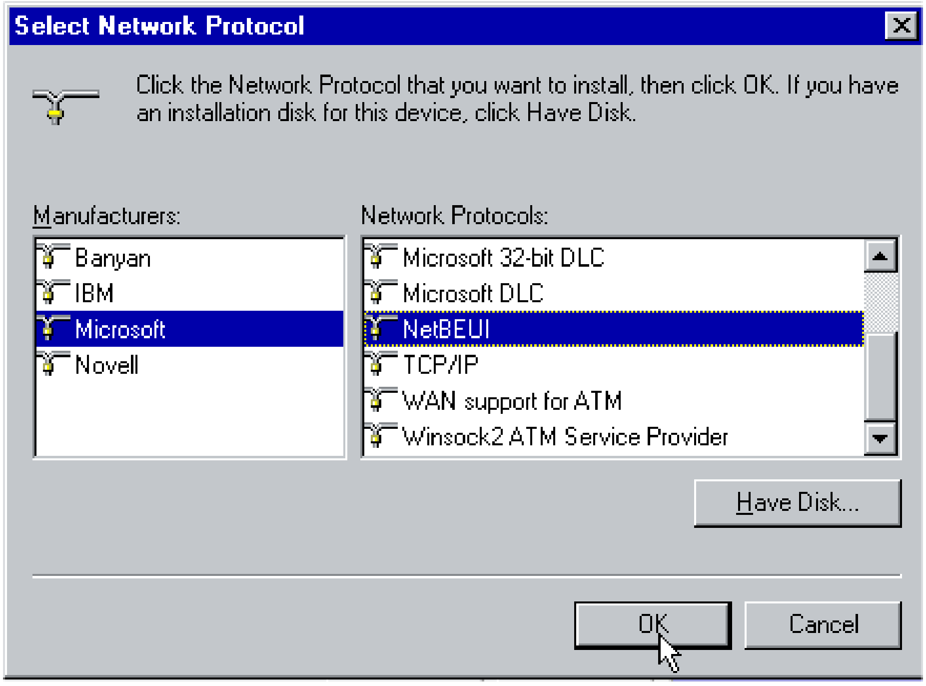
d. If "File and Printer Sharing for Microsoft Networks" is not installed, please select **Service**; if "NetBEUI" protocol is not installed, please select **Protocol**. Then click **Add**.



e. If "File and Printer Sharing for Microsoft Networks" is not installed, highlight it on the service menu then click **OK** to complete installation.



f. If the network protocol “NetBEUI” is not installed, please highlight it on the menu as shown in the diagram below then click **OK** to complete installation.



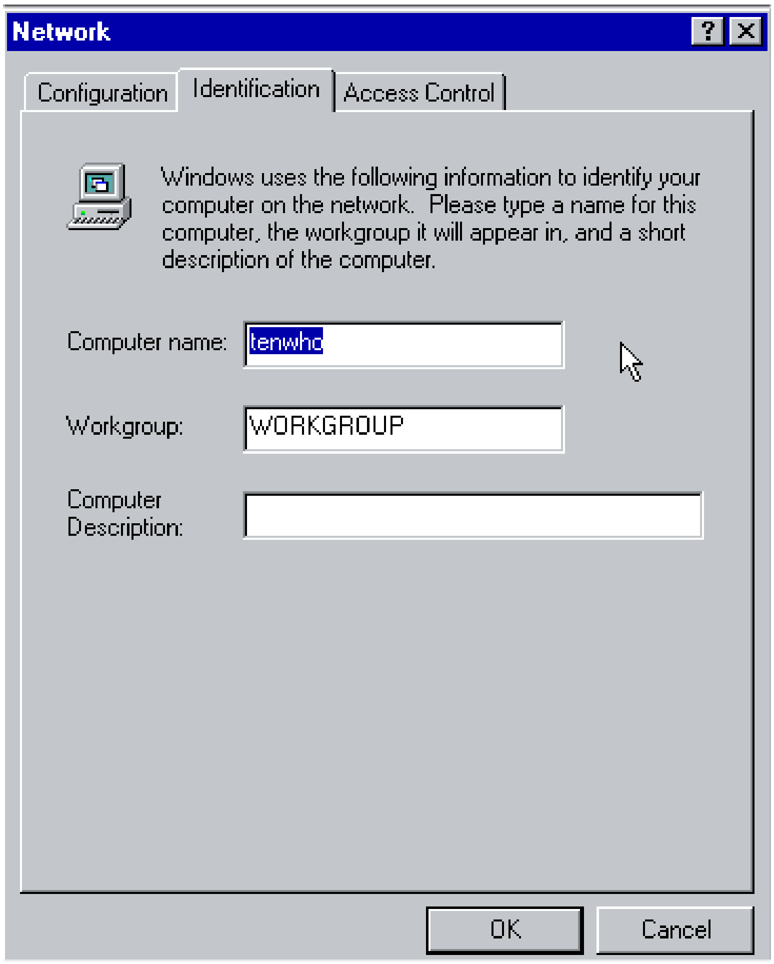
B. Verify if Computer Name & Workgroup are set correctly.

（The setting of workgroup and logondomain in `C：\net\system.ini` must be the same as those at PC side. The computername in `C:\net\2net.bat` must be the same as PC’s computer name.）

a. Select Start → Settings → Control Panel.

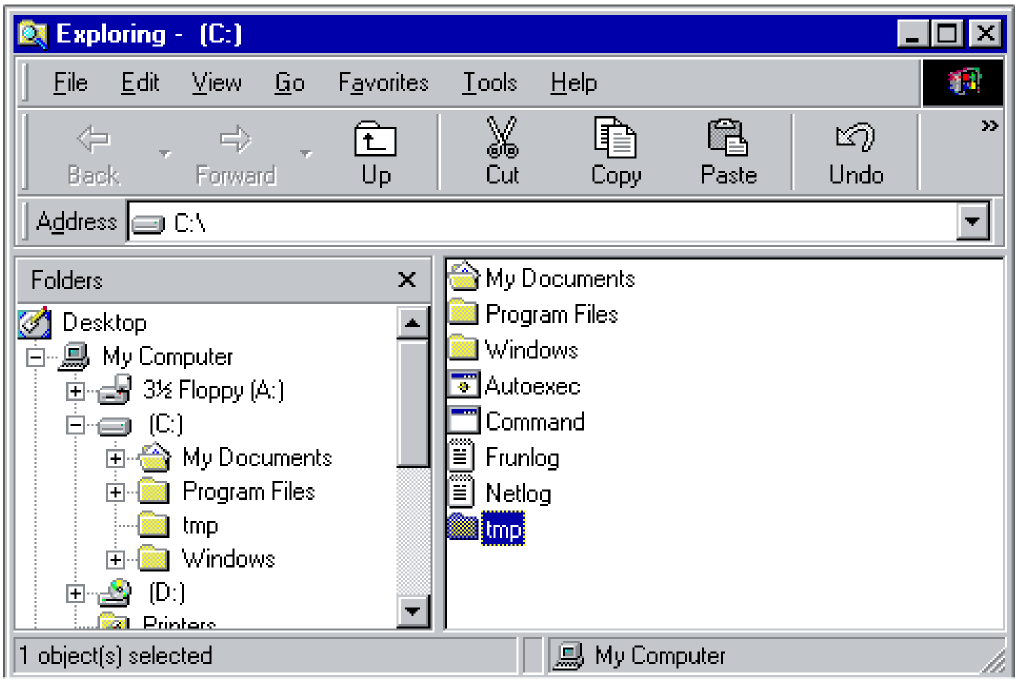
b. Double-click on the Network icon.

c. Verify if the settings of Computer Name & Workgroup are the same as those in `C:\NET\2net.bat` & `C:\NET\system.ini`. (Take the diagram below as an example, computername of `2net.bat` should be set to “tenwho”；workgroup of `system.ini` should be set to “Workgroup”).



C. Share a directory at PC side

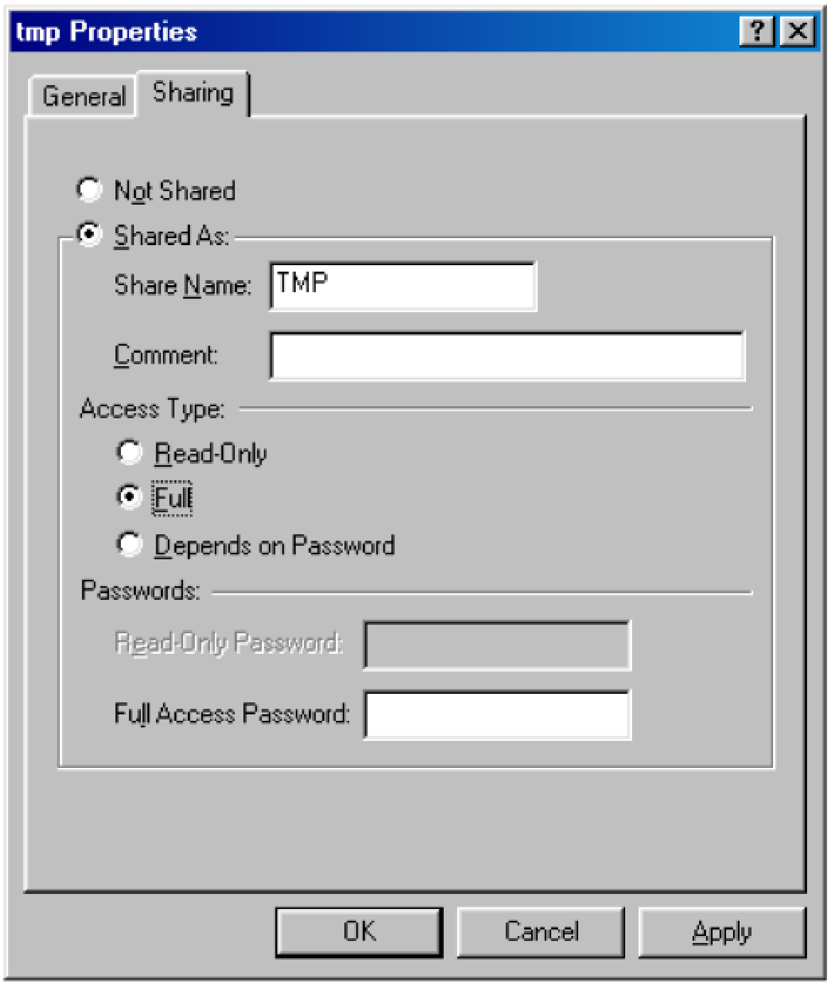
a. Go to **Windows Explorer** and create a new folder with the name "tmp" (The folder can be named differently by users).



b. Left-click to select the “tmp” folder, then right-click and choose **Sharing**.

c. Please follow the steps below for configuration:

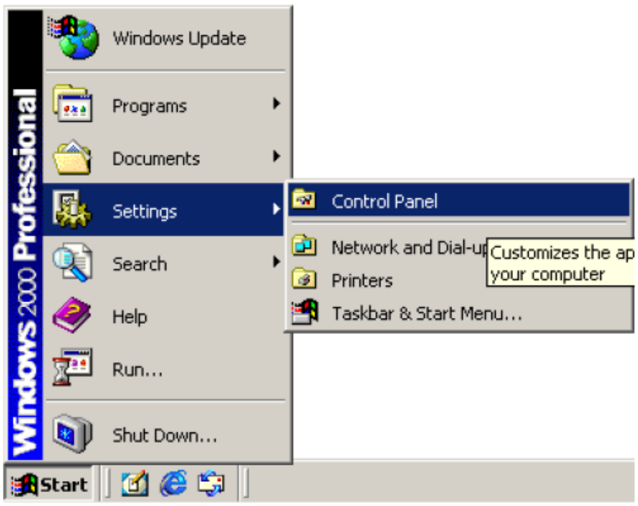
- Click the **Sharing** tab.
- By default, the **Share** Name and the newly-created folder are the same.
- Users can change name of the new folder, but it must be the same as the folder name in `2net.bat`.
- Verify the box of **Full** for **Access Type**.
- You can choose either to set a password or not. If set, the password must be the same as that in `2net.bat`.



NETWORK SETTING FOR WINDOWS 2000

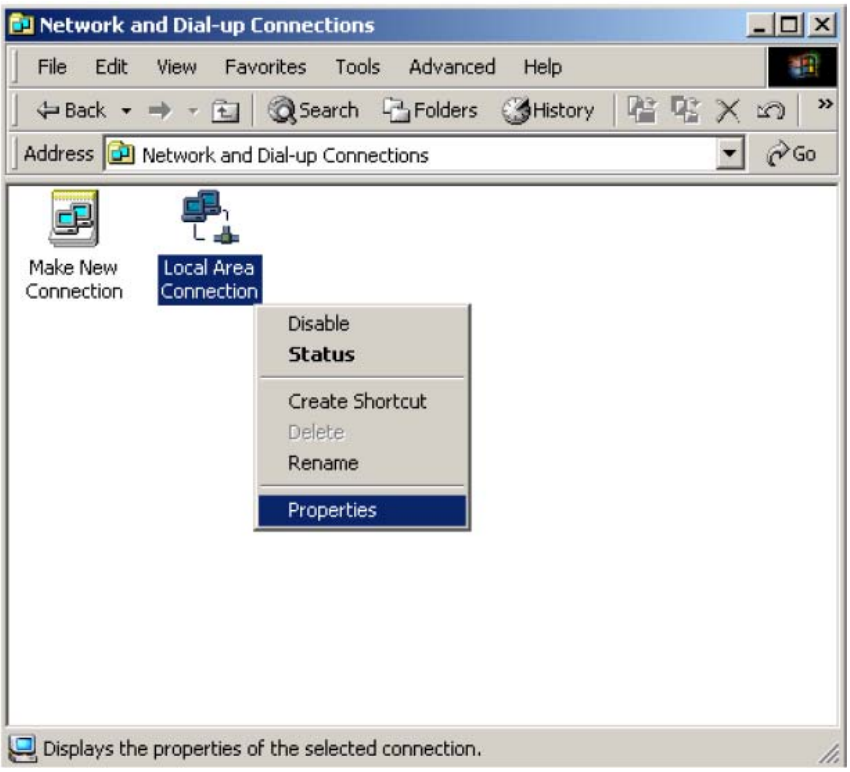
A. Verify if a network card, internet cables, and the relative protocols have been installed properly. Verify if the "NetBEUI" protocol & the "File and printer sharing for Microsoft Networks" service have been installed. (Caution: DO NOT activate the network protocol "Nwlink NetBIOS" which would cause network connection to fail.)

a. Select Start → Settings → Control Panel.

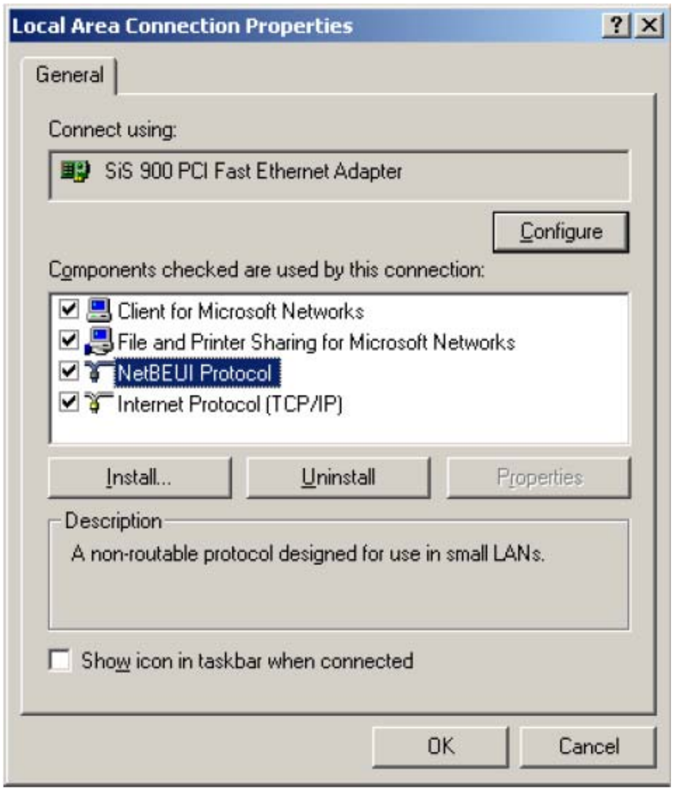


b. Double-click on the Network and Dial-up Connections icon.

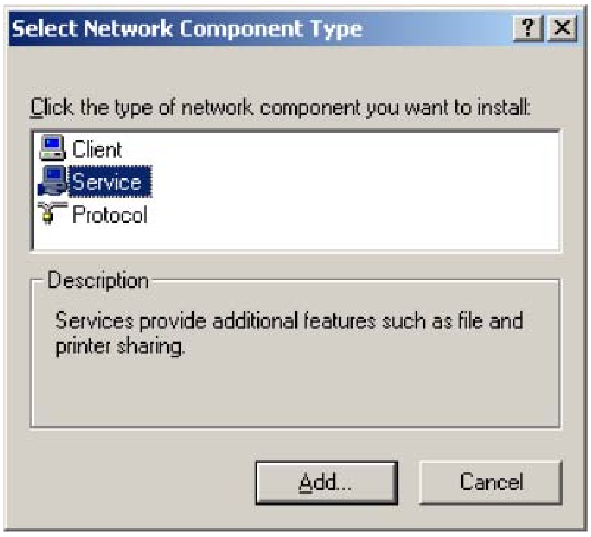
c. Right-click on the **Local Area Connection** icon and left-click properties.



d. If the two network protocols “File and Printer Sharing for Microsoft Networks” & “NetBEUI Protocol” are not installed, verify the boxes and press **Install** to install them.

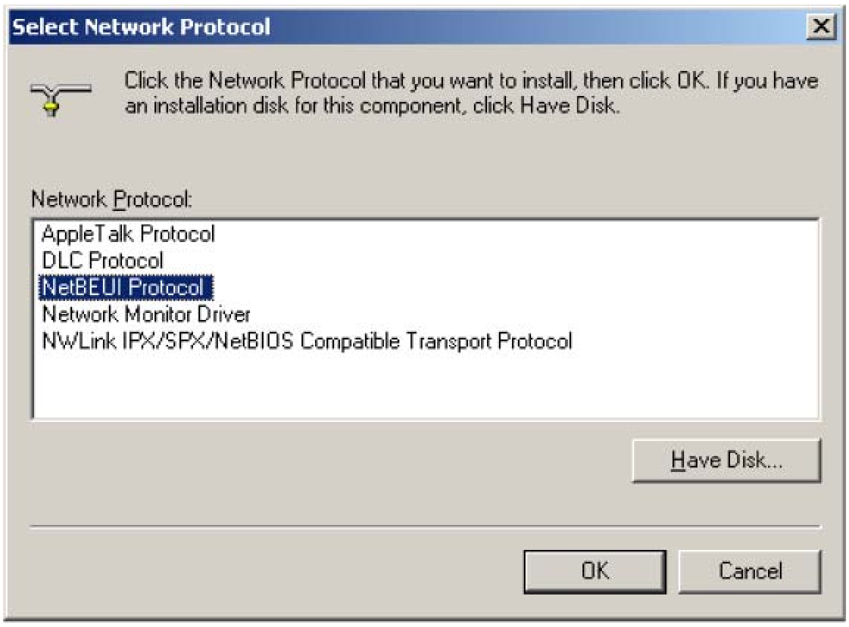


e. If “File and Printer Sharing for Microsoft NetWorks” is not installed, please select **Service**; if “NetBEUI Protocol” is not installed, please select **Protocol**. Then click **Add**.



f. If “File and Printer Sharing for Microsoft Networks” is not installed, highlight it on the menu then click **OK** to complete the installation.

g. If “NetBEUI Protocol” is not installed, highlight it on the menu then click **OK** to complete the installation.



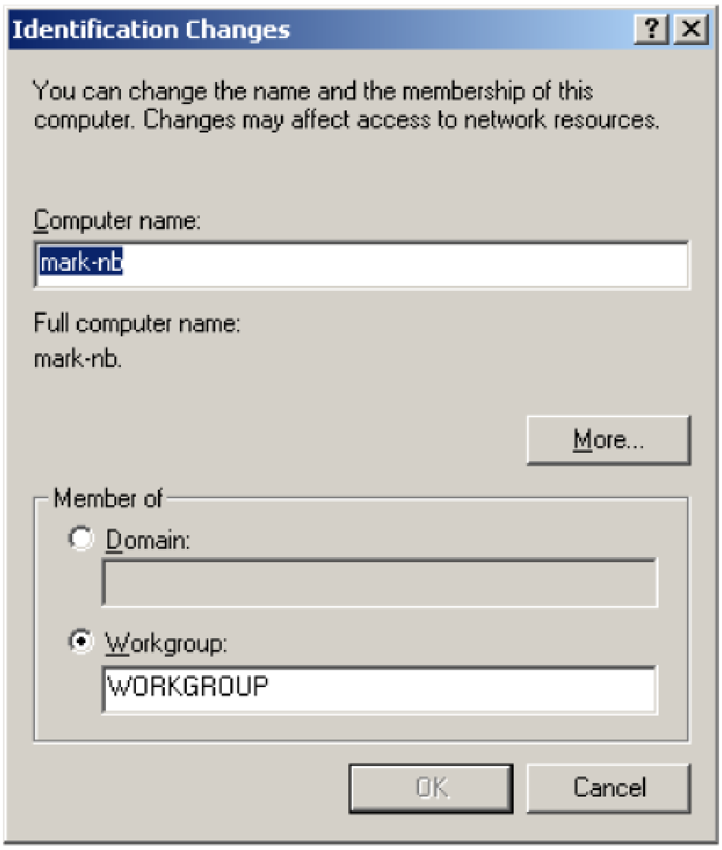
B. Verify if “computername” & “workgroup” are set correctly.

（The setting of workgroup and logondomain in `C：\net\system.ini` must be the same as those at PC side. The computername in `C:\net\2net.bat` must be the same as PC’s computer name.）

a. Right-click on “My Computer” icon on the desktop then left-click properties.

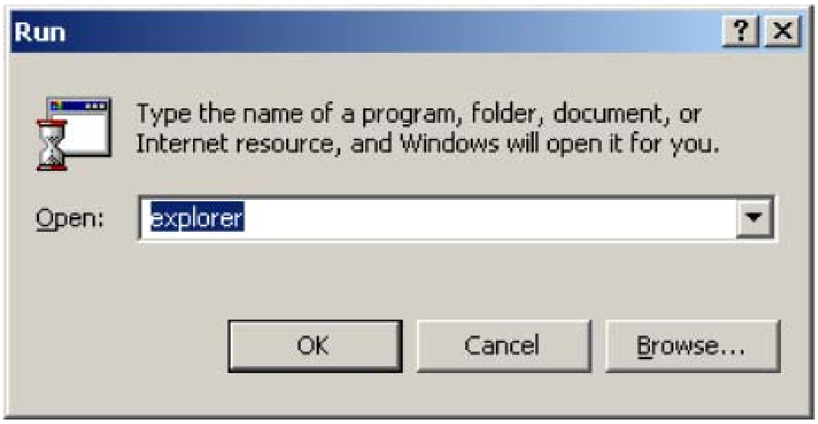
b. Select the **Network Identification** tab. Verify if the settings of **Full computer name** & **Workgroup** are the same as those in `C:\NET\2net.bat` & `C:\NET\system.ini`. (Take the diagram below as an example, computername of `2net.bat` should be set to “mark-nb”；workgroup of `system.ini` should be set to “WORKGROUP”). Press **Properties** to change **Full computer name** & **Workgroup.**

c. To change a computer or workgroup name, modify it directly in the corresponding text box.

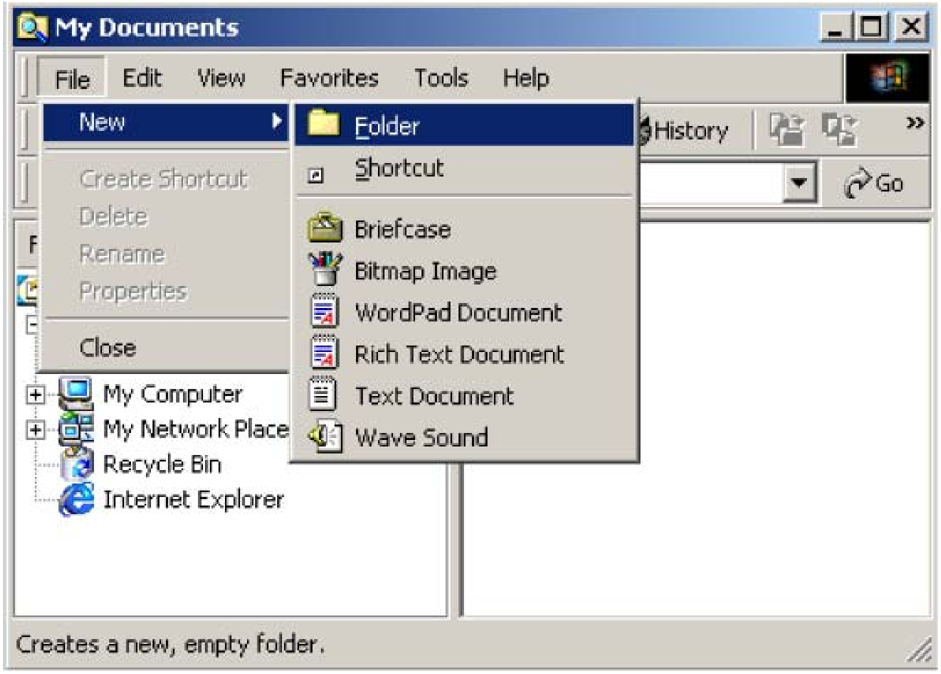


C. Share a directory at PC side

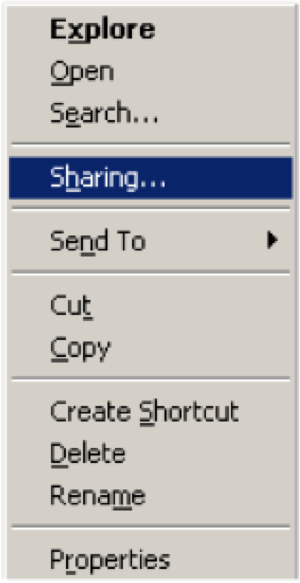
a. Press **Start** → **Run**, enter "explorer," and press **OK** to open **explorer**.



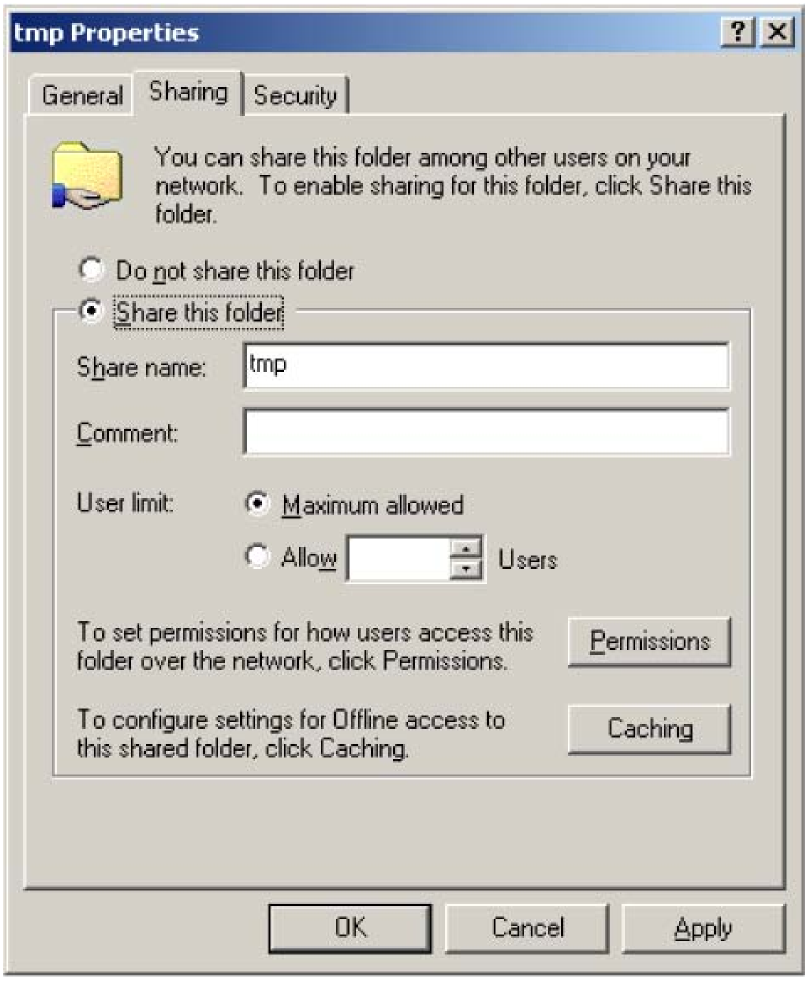
b. Create a new folder for sharing.



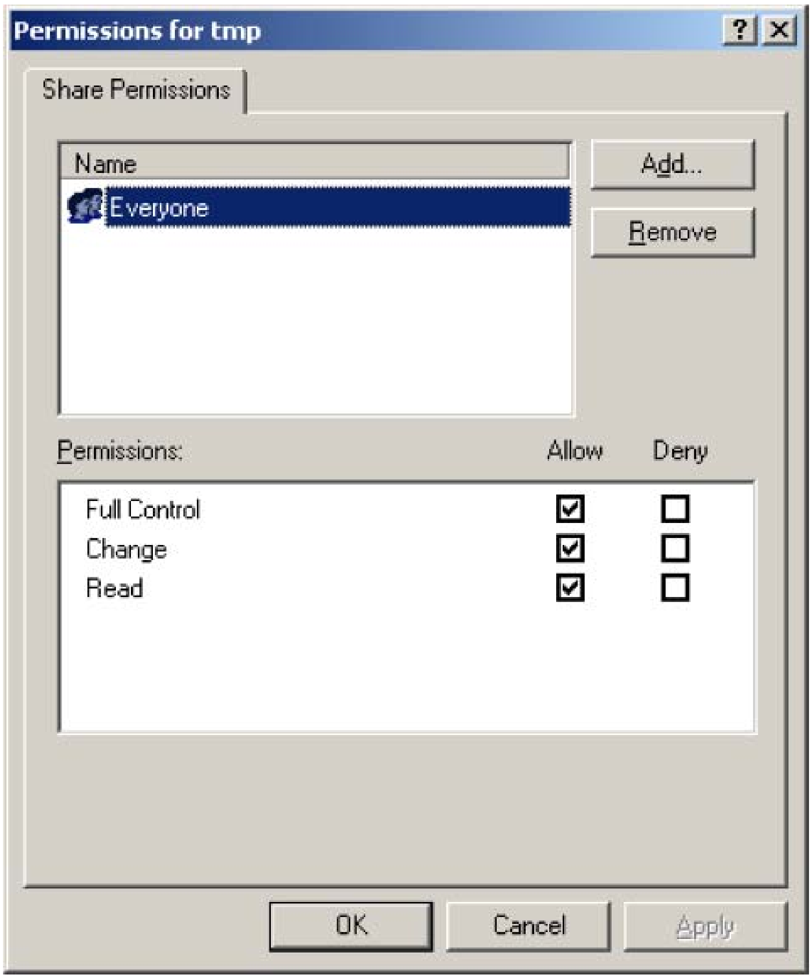
c. Left-click the new folder, and then right-click **Sharing.**



d. Click the **Sharing** tab, click to select **Share this folder**, and verify if the name in the **Share name** text box is the same as that in the `2net.bat` file. Then click **Permissions**.



e. Select “Everyone” in the **Share Permissions** section, and check all the **Allow** boxes in the **Permissions** section. Then press **OK**.



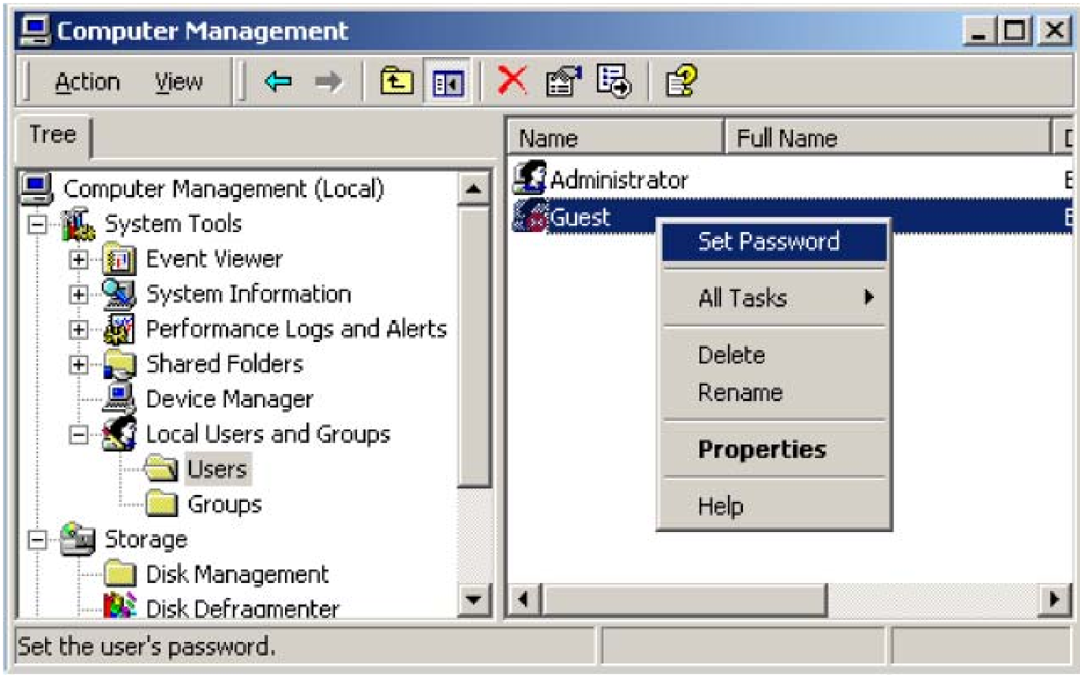
D. ENABLE USER ACCESS:

There are two ways to enable user access. Please choose either one according to your need. The advantage of method 1 (recommended) is its convenience for installation, and there is no need to add a new user if each controller has its own username; however, the disadvantage is that its security level is low. On the contrary, the second method has a higher security level. But if there are different user names for different controllers, users are required to add a new user each time. Depending on the types of operating systems, there are different steps for setup as listed below:

Method 1:

a. Right -click the **My Computer** icon on the desktop, and Left-click **Manage**.

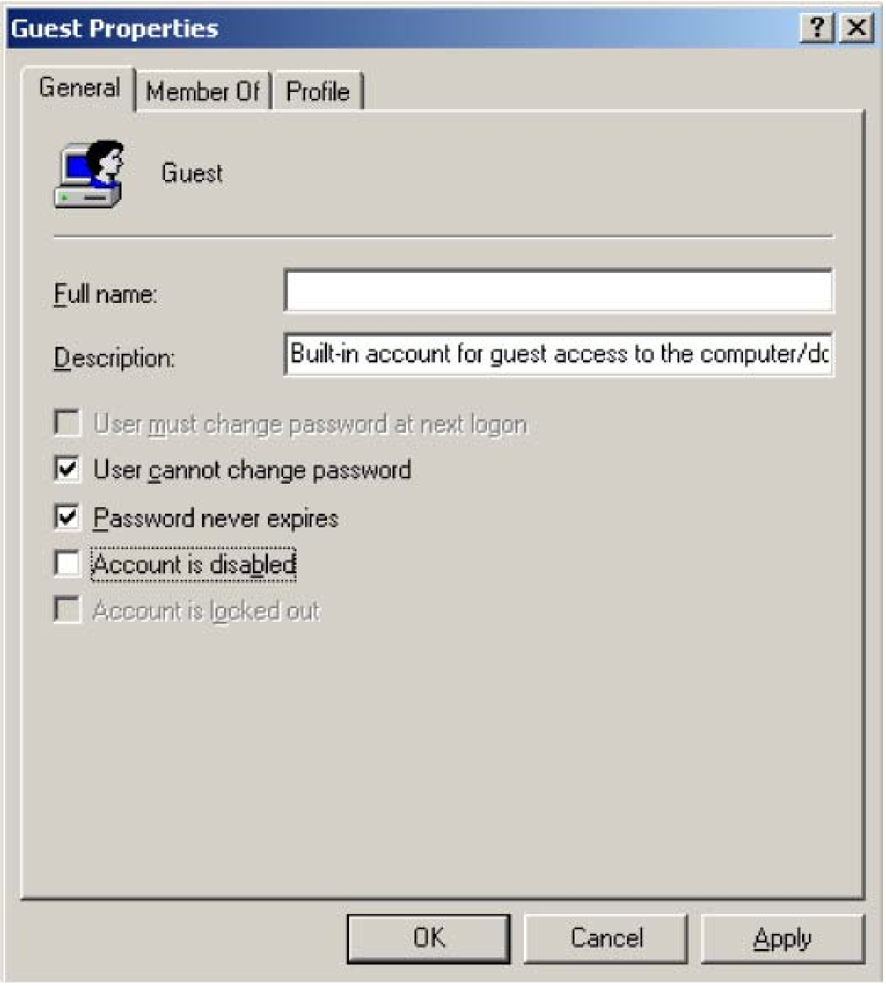
b. In the **Manage** pop-up menu, in the **Users** folder, left-click **Guest**, right-click,and then left -click "Set Password."



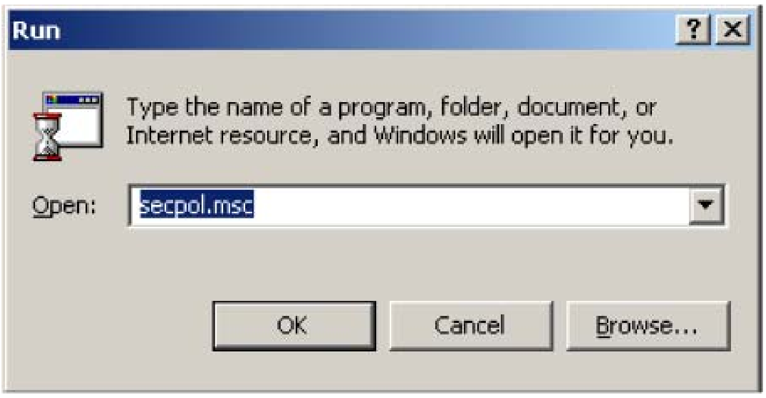
c. Leave the password boxes blank, and press **OK**.

d. Press **OK** again, and finish the procedure of password modification.

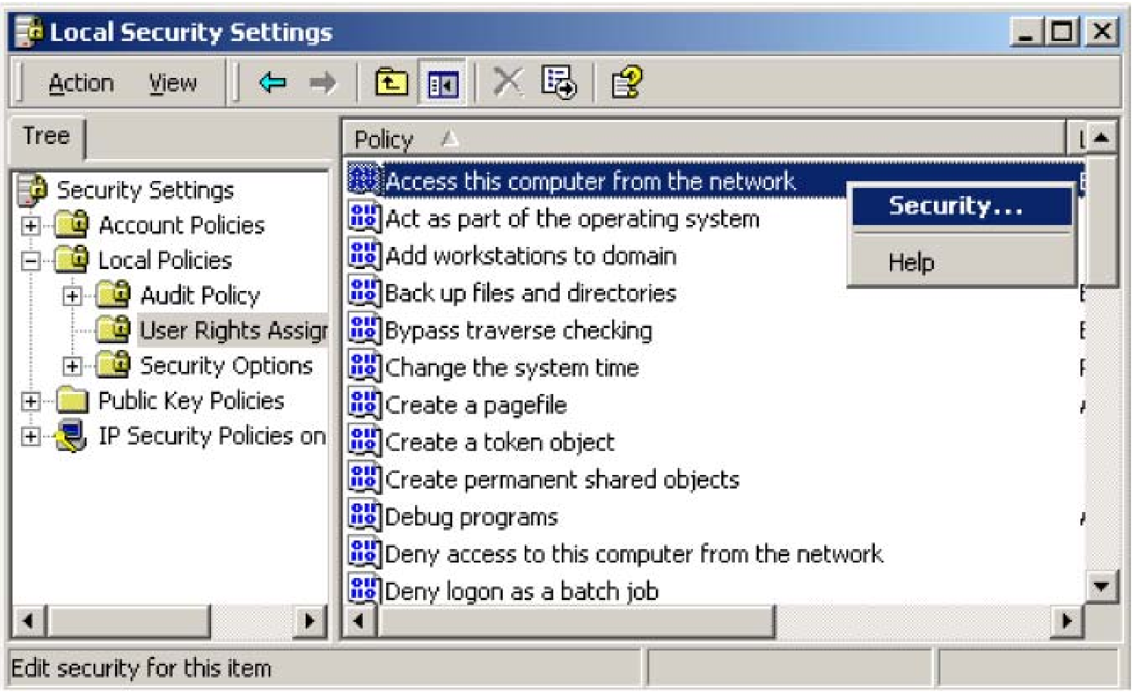
e. If there is a red cross over the Guest icon in the **Users** folder, right-click on **Guest** and select **Properties**. A dialogue box will appear as the figure below, check the boxes of “User cannot change password” & “Password never expires” and uncheck the box of “Account is disabled.”



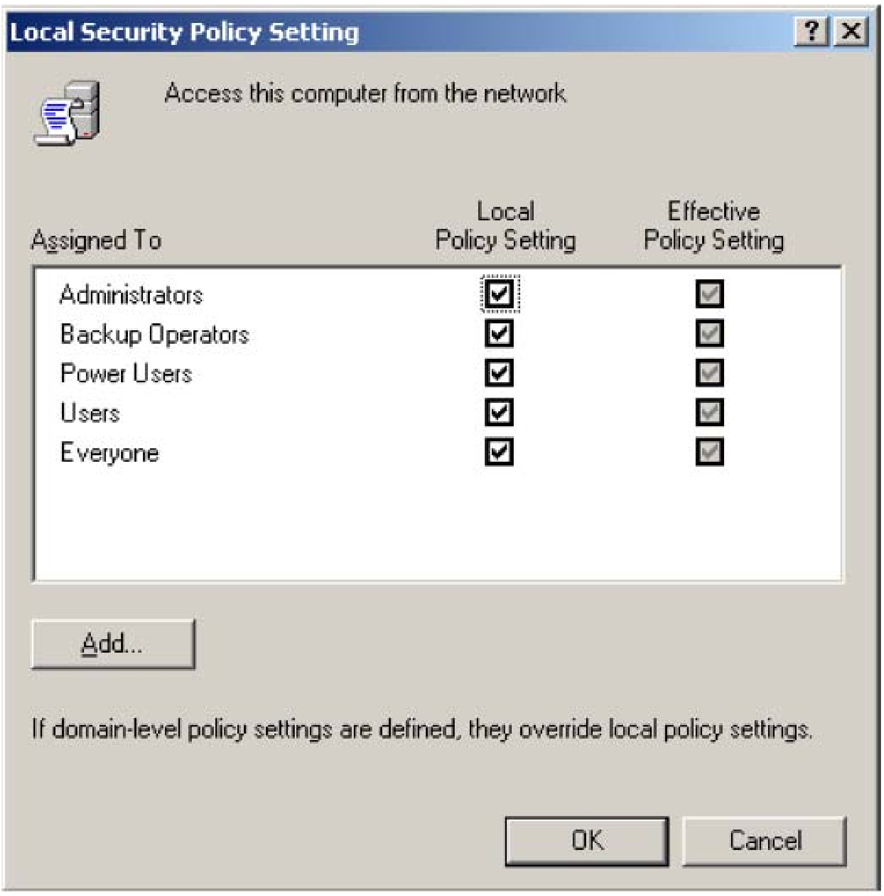
f. Next, set a higher access level for Guest. To do so, click **Start** → **Run**, and enter **secpol.msc** in the text box. Then press **OK**.



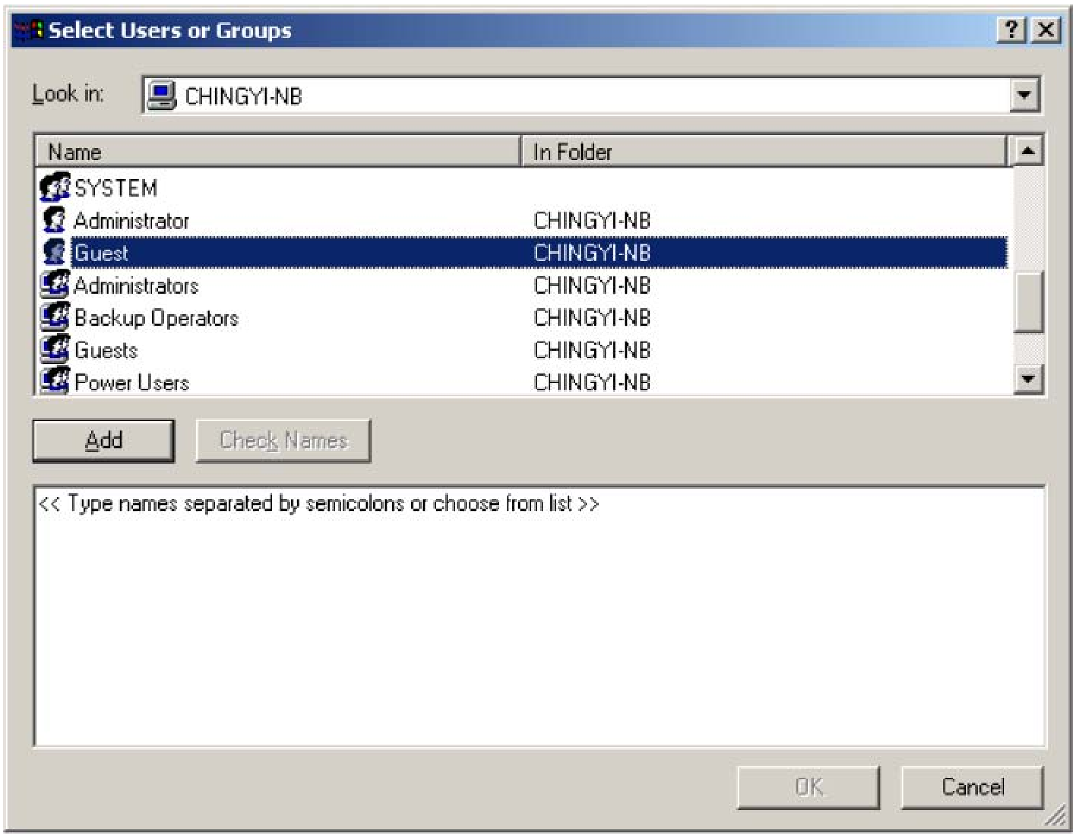
g. Click Local Policies → User Rights Assignment. Right-click the Access this computer from the network method, and then left-click Security.



h. Click the **Add** button.



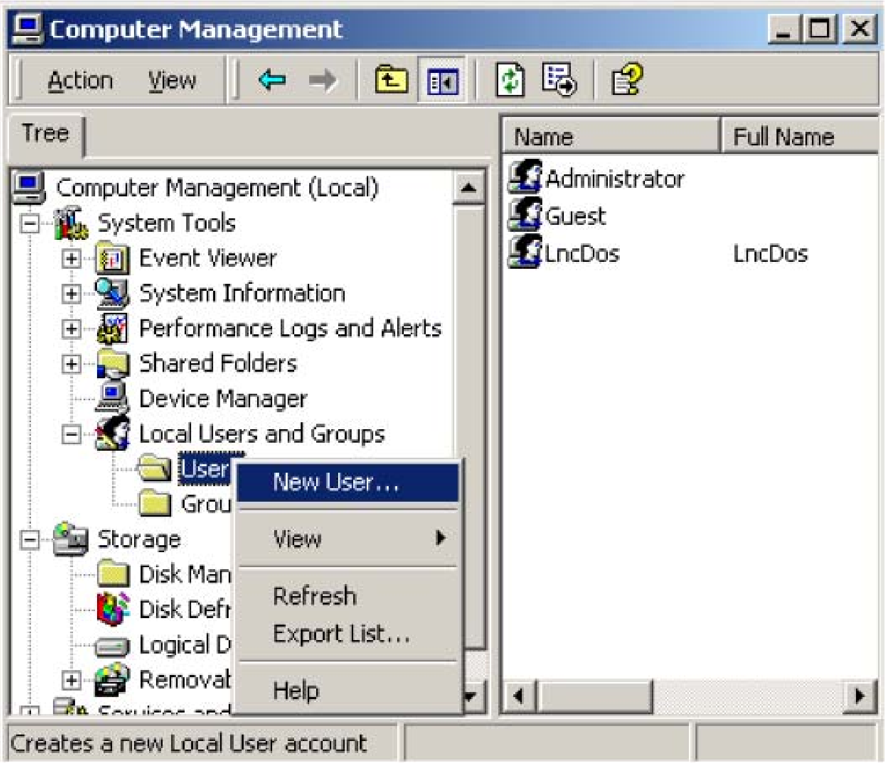
i. After **Add** is clicked, a new dialog box will appear as the figure below. Click **Guests**, click **Add**, and press **OK**. Then the procedure to enable guest access is finished.



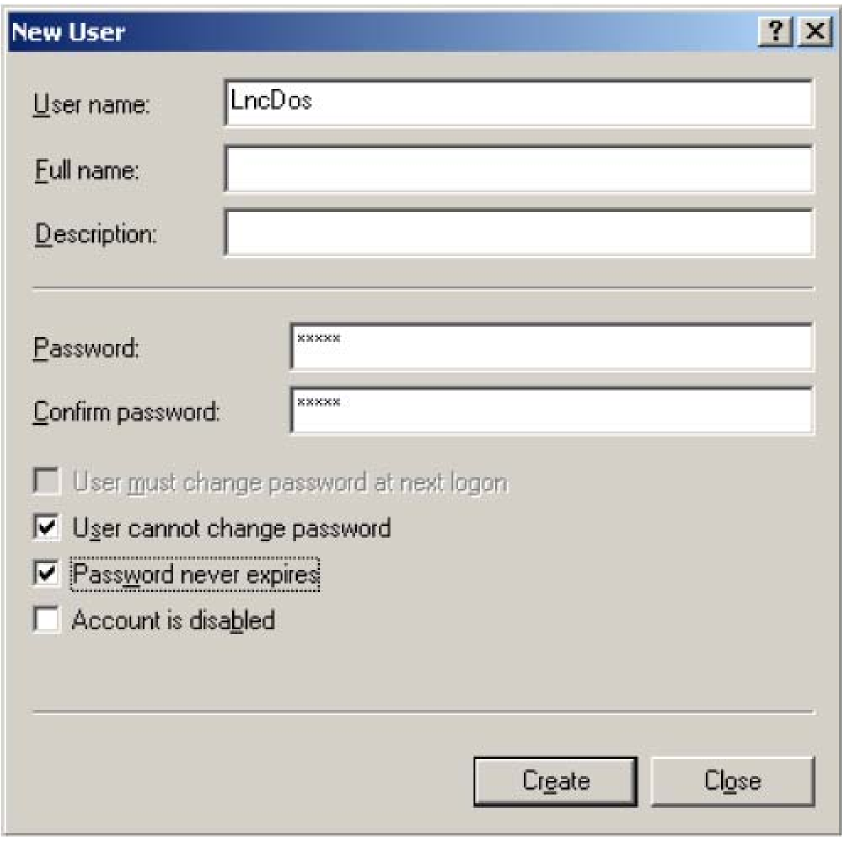
Method 2:

a. Right-click the **My Computer** icon on the desktop, and Left-click **Manage**.

b. Right-click the **User** folder, and left-click **New User**.



c. A dialog box will appear as the figure below. Please enter the username same as that in the `system.ini` file, and enter the password same as that in the **2net.bat** file. Check the boxes as the figure shown below, and then press **Create** to finish the procedure of enabling user access.



Network Settings for Windows XP Professional

A. Verify if a network card, internet cables, and the relative protocols have been installed properly. Verify if the “NetBEUI Protocol” & the “File and printer sharing for Microsoft Networks” service have been installed. (Caution: DO NOT activate the network protocol “NWlink NetBIOS” which would cause network connection to fail.)

Because Microsoft does not support the network protocol “NetBIOS” (NetBEUI) in Windows XP, users must install the network protocol NetBEUI additionally from the Windows XP CD. Please follow the steps below for installation:

1. Insert the Windows XP CD-ROM into the CD-ROM drive. Browse the `Valueadd\MSFT\Net\NetBEUI` folder.
2. Copy **Nbf.sys** to the directory `%SYSTEMROOT%\System32\Drivers`.
3. Copy Netnbf.inf to the hidden directory %SYSTEMROOT%\Inf.

Note: To make the hidden directory visible, execute the following steps:

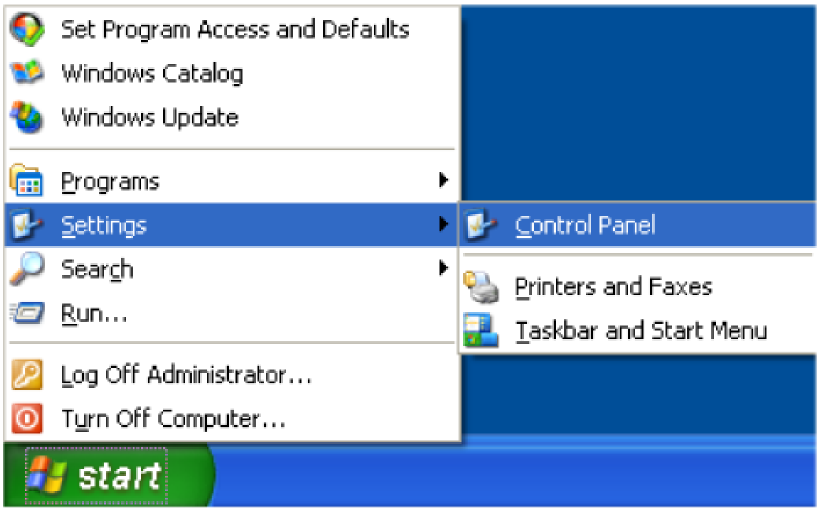
*Click Start, click Run, enter “explorer” in the text box, and then press ENTER.

*Click Tools, click Folder Options, then click the View tab.

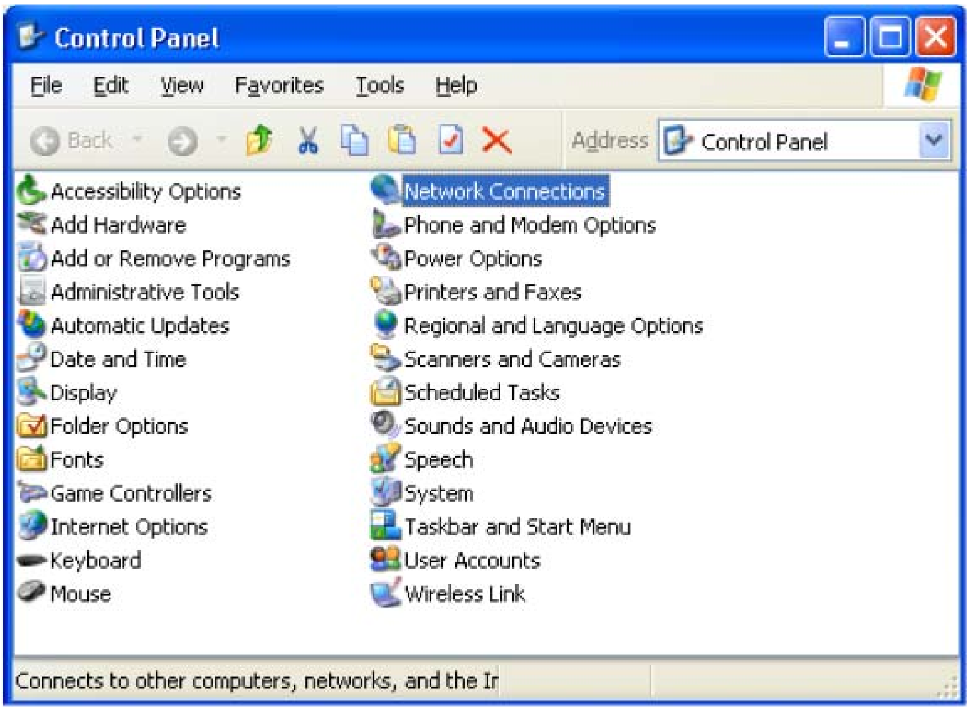
*Under Advanced Settings, and under Hidden files and folders, click Show hidden files and folders.

Note: **%SYSTEMROOT%** is a Windows environment variable for discerning the directory installed in Windows XP (Ex. C:\Windows). If users want to view the relative values of **%SYSTEMROOT%** or other environment variables, please enter “set” in the Command Prompt window, then press “ENTER.”

d. Click Start → Control Panel.

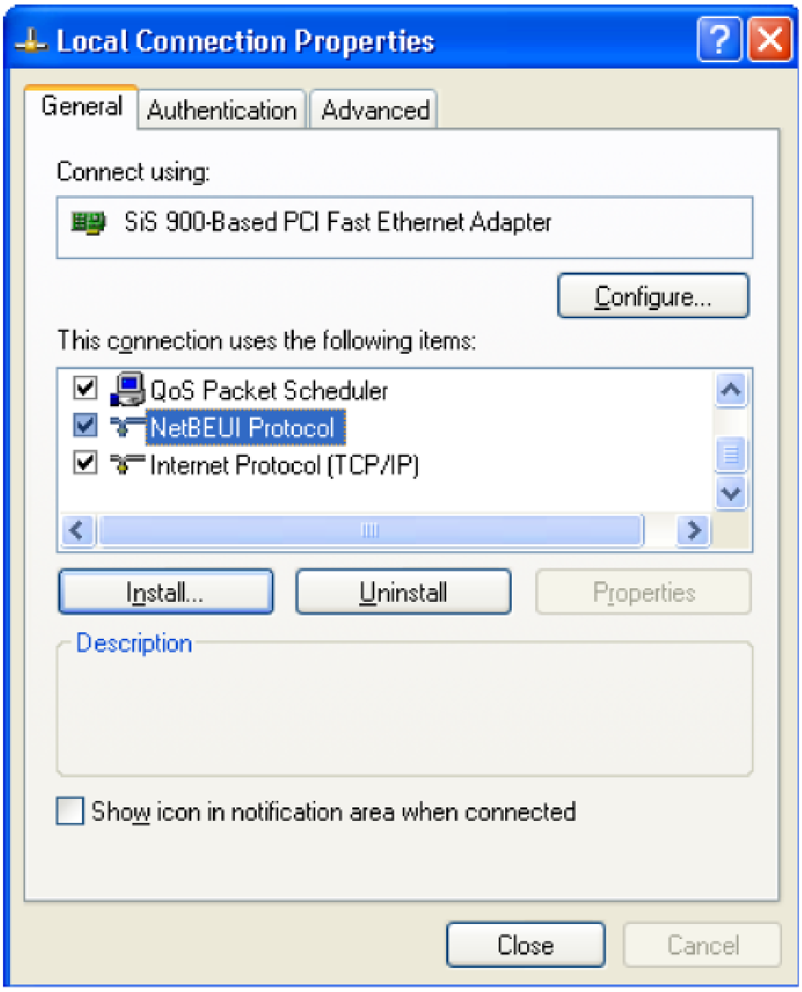


e. Double-click Network Connections.

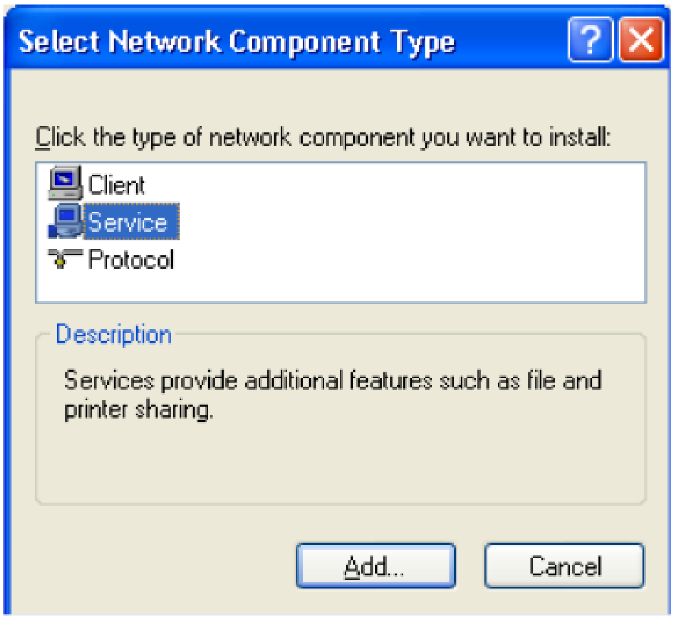


f. Right -click the **Local Connection** icon, then left-click properties.

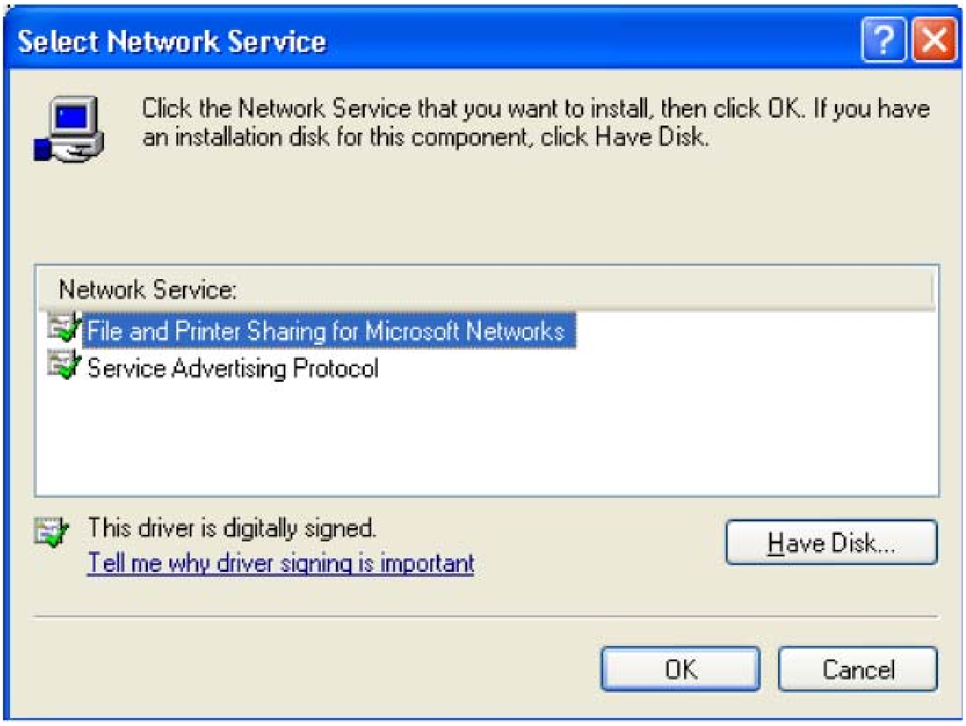
g. If the two network protocols “File and Printer Sharing for Microsoft Networks” & “NetBEUI Protocol” are not installed, please press **Install** for installation.



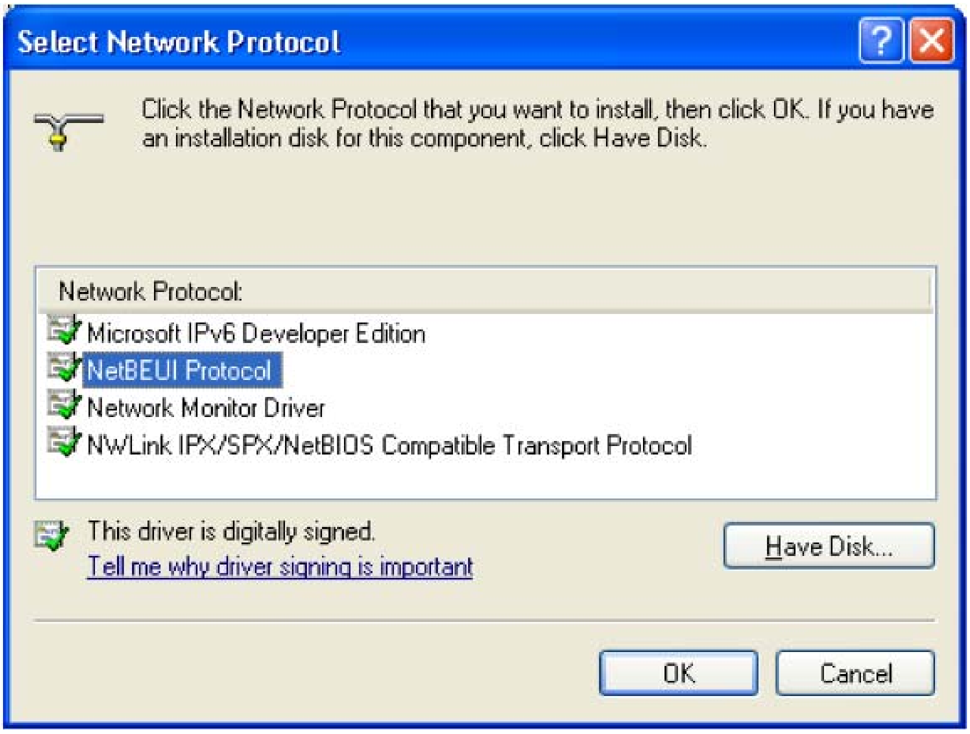
h. If "File and Printer Sharing for Microsoft Networks" is not installed, please select **Service**.



i. If "File and Printer Sharing for Microsoft Networks" is not installed, highlight it on the service menu then click **OK** to complete installation.



j. If the “NetBEUI Protocol” is not installed, please highlight it on the menu as shown in the diagram below then click **OK** to complete the installation. To validate the configuration, please reboot the system.

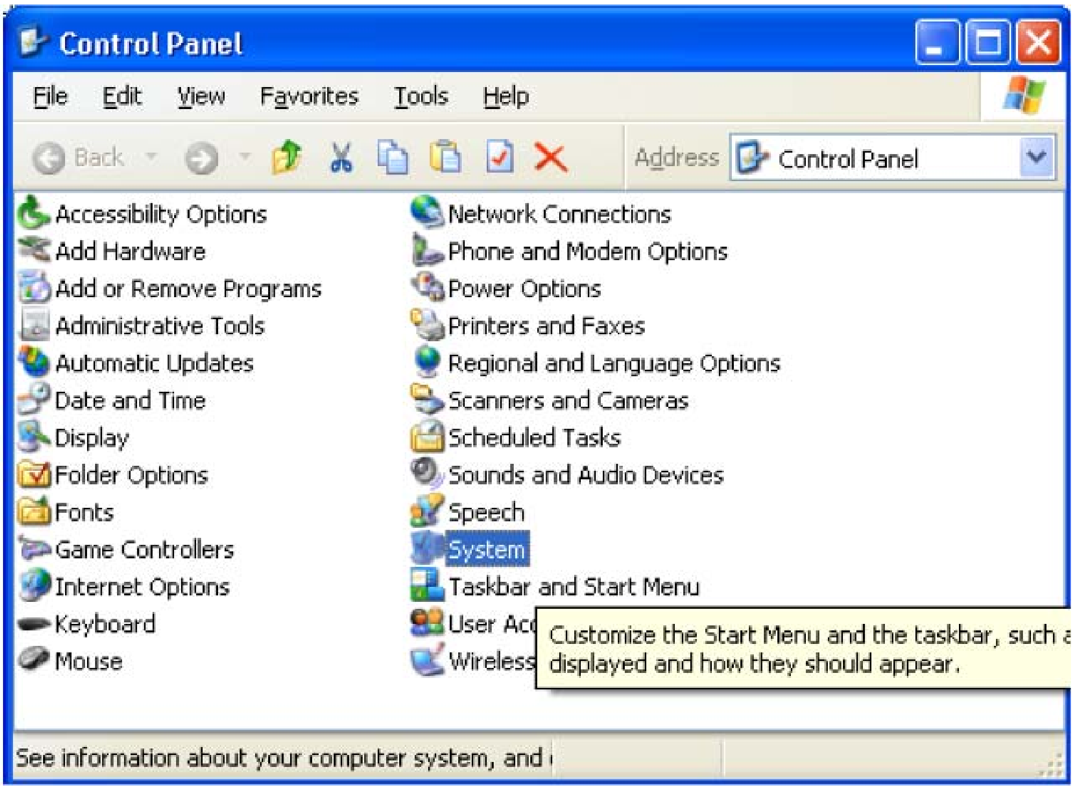


B. Verify if Computer name & Workgroup are set correctly.

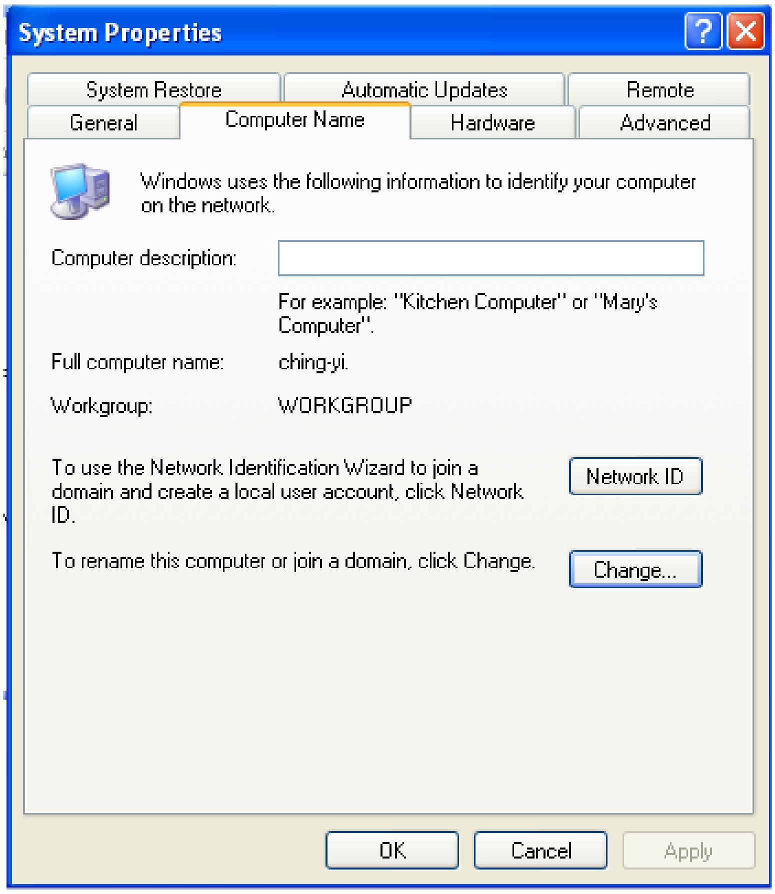
（The settings of workgroup & logondomain in `C:\net\system.ini` must be the same as those at PC side. The computername in `C:\net\2net.bat` must be the same as PC's computer name.）

a. Click **Start → Control Panel**.

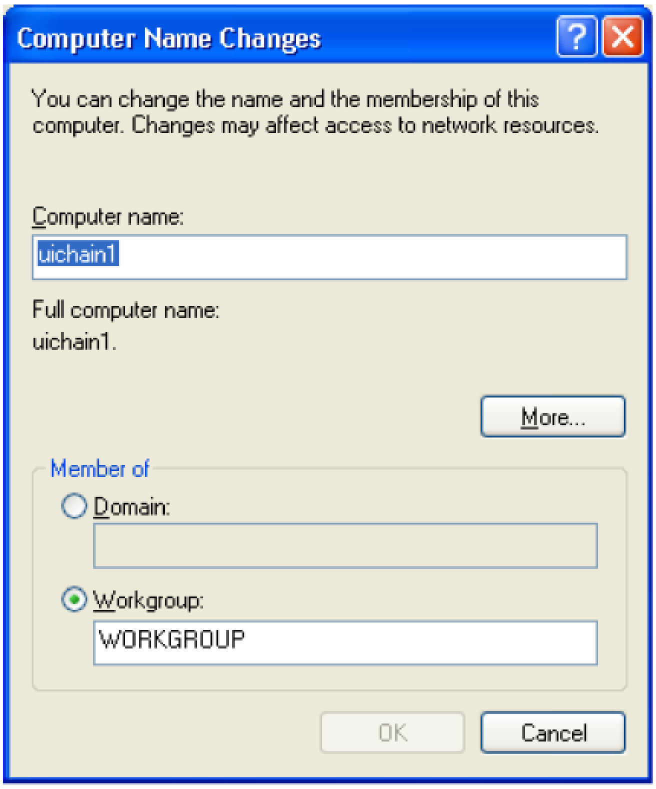
b. Double-click **System**.



c. Select the **Computer Name** tab, and verify if the settings of **Full computer name** & **Workgroup** are the same as those in `C:\NET\2net.bat` & `C:\NET\system.ini` at the controller side. (Take the figure below for example, computername of `2net.bat` must be set to "uichain1," and workgroup of `system.ini` must be set to "WORKGROUP." If you need to change the computer name or workgroup name, click **Change** to modify it.

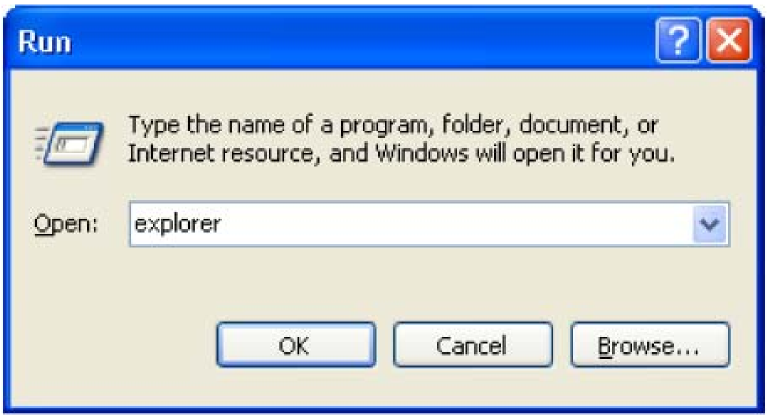


d. To modify the computer name or workgroup name, make the revision directly in the corresponding text box.

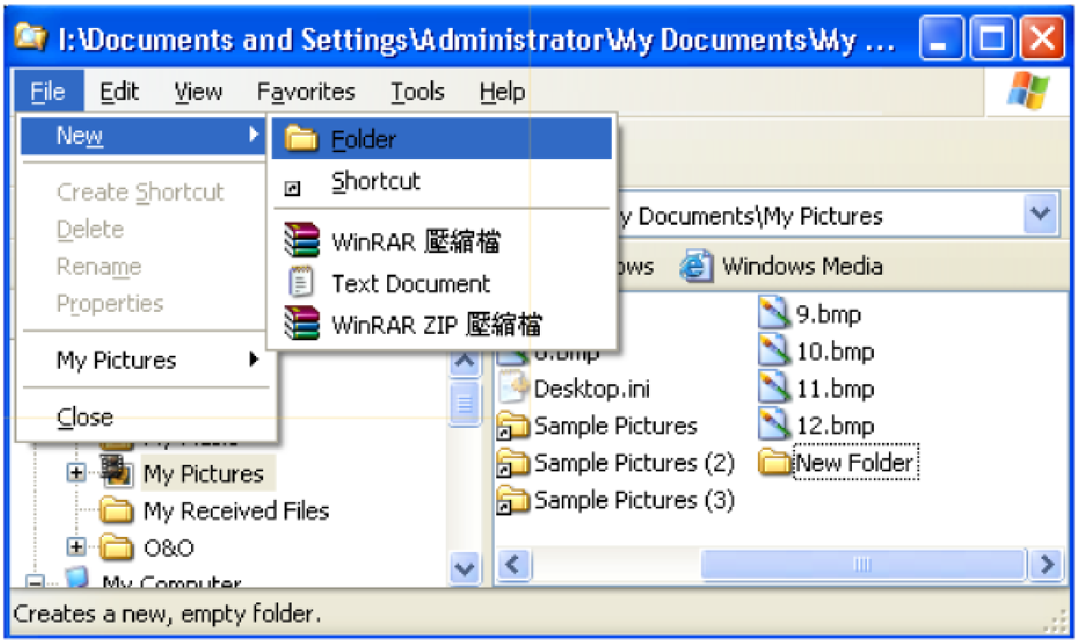


C. Share a directory at PC side

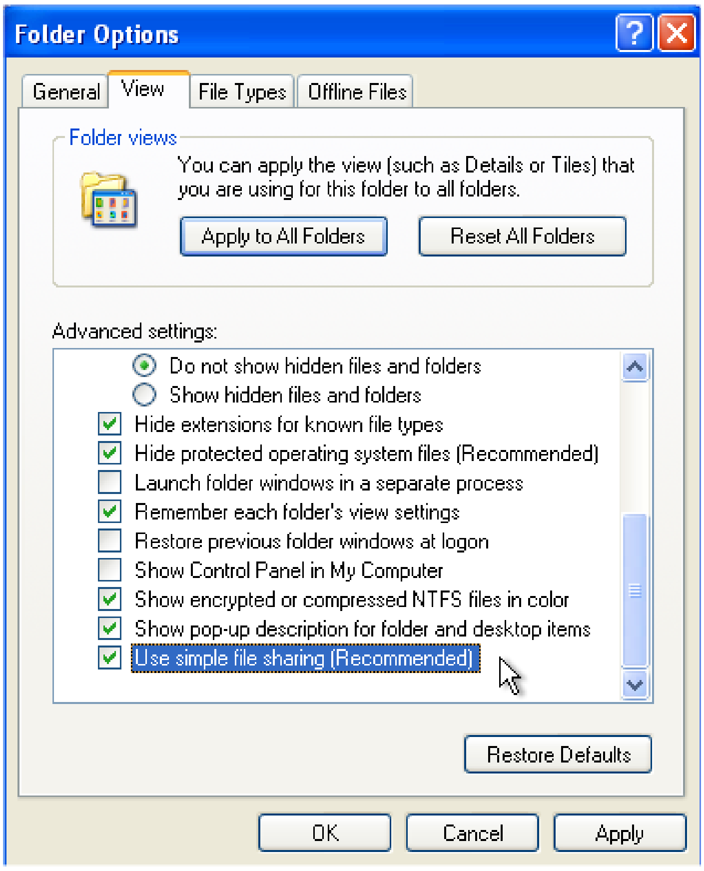
a. Click **Start** → **Run**, enter “explorer” in the text box, and then press **OK**.



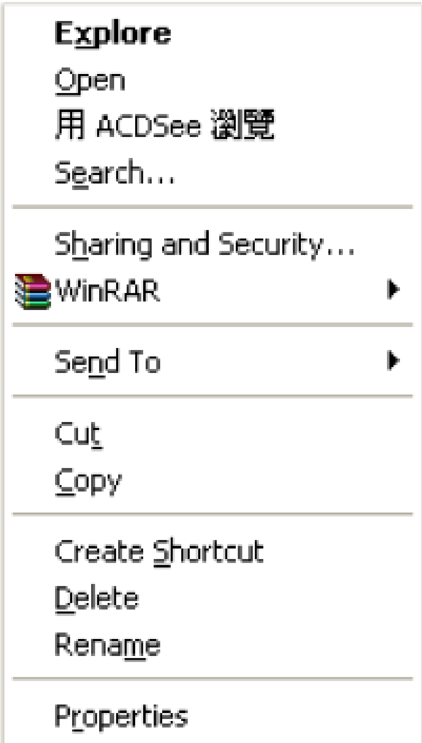
b. In **Windows Explorer**, select **File** → **New** → **Folder**. Name the new folder after the corresponding folder at the controller side such as **share**, **pcscan**, and so on.



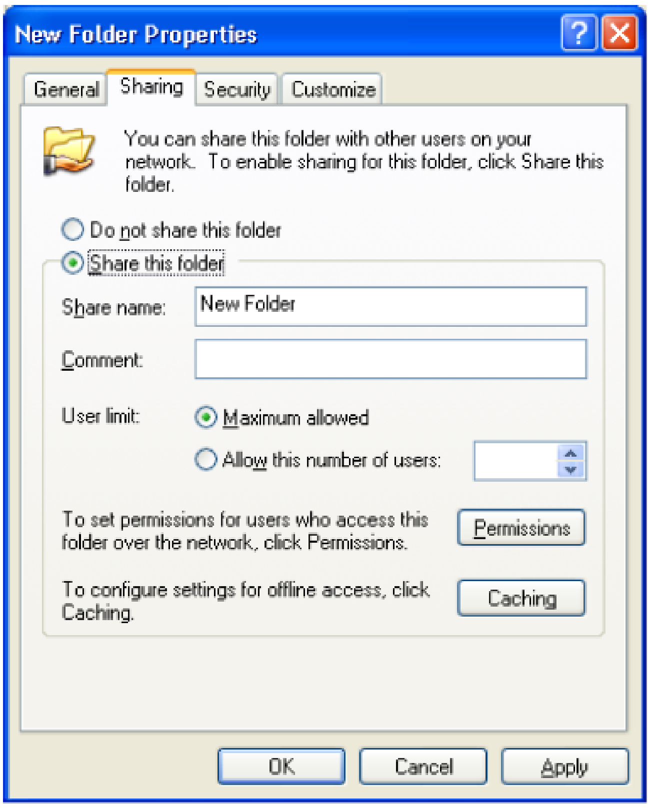
c. Uncheck Use simple file sharing mode. In Windows Explorer, select Tools→Folder Options, click the View tab, and uncheck the box of Use simple file sharing.



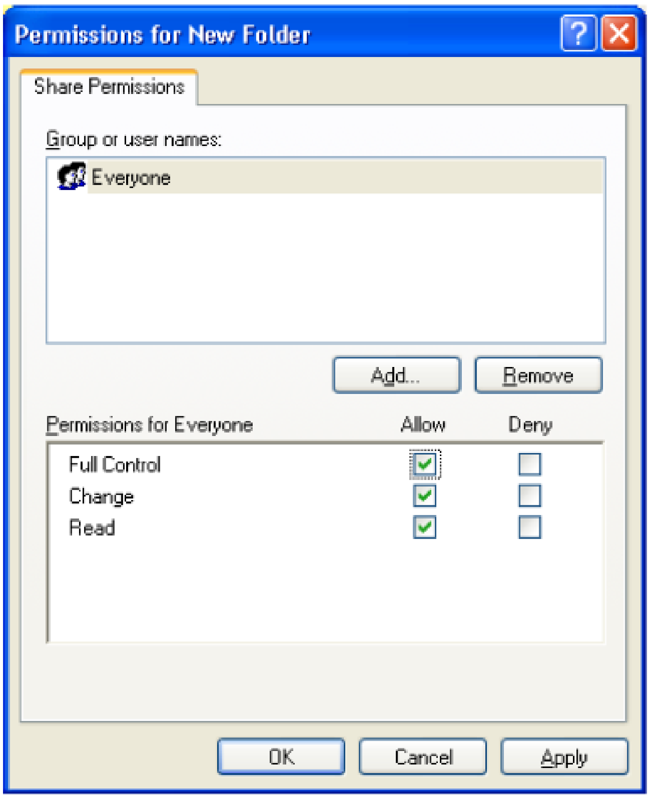
d. Right-click the new folder, and left-click **Sharing and Security**.



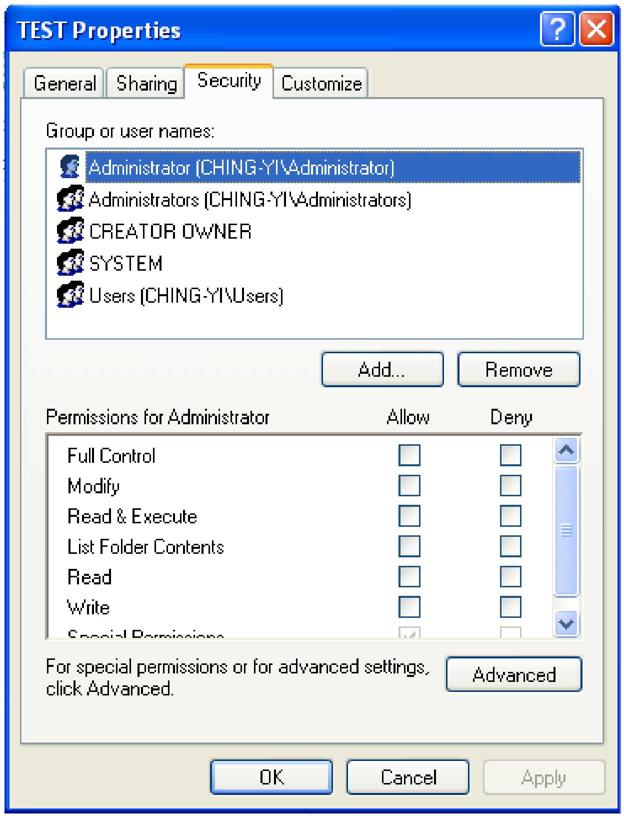
e. Click the **Sharing** tab, check the box of **Share this folder**, and verify if the name in the **Share name** text box is the same as that in the `2net.bat` file. Then click [Permissions].



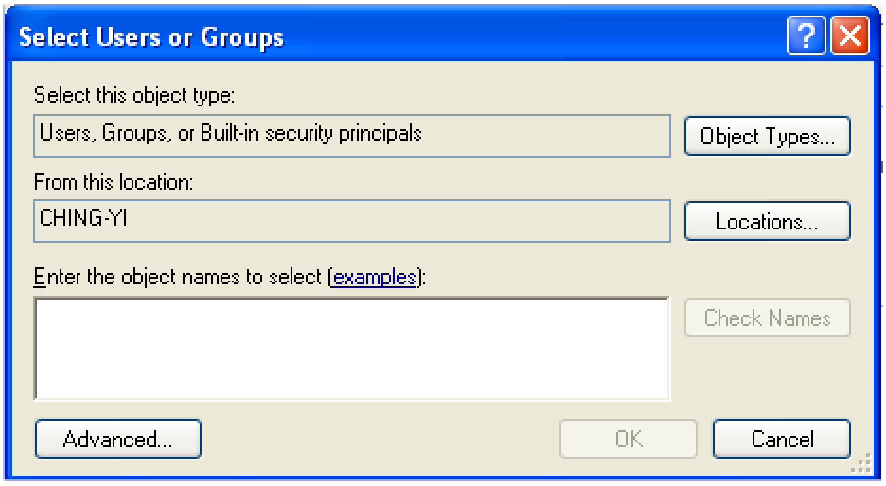
f. Select “Everyone” as Group or user names, and check all the **Allow** boxes in the **Permissions for Everyone** section.



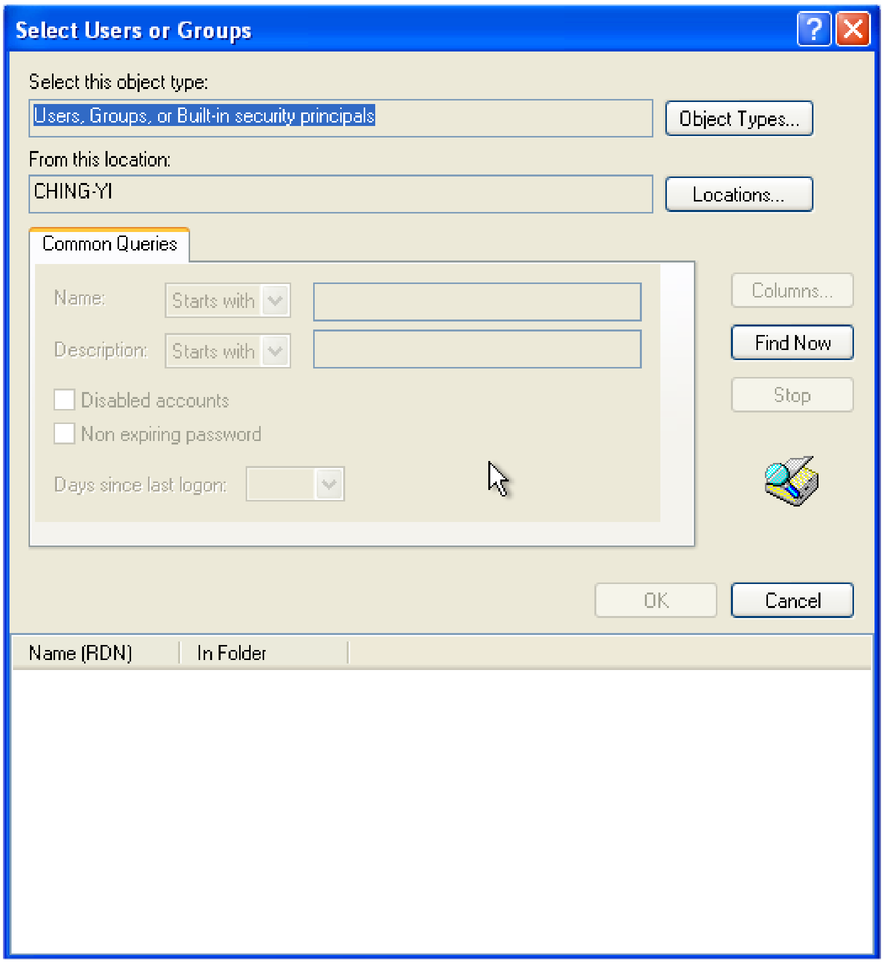
g. If there is no **Security** tab in the dialog box, the steps for folder sharing is then finished. If there is, please click the **Security** tab, and the following figure is shown:



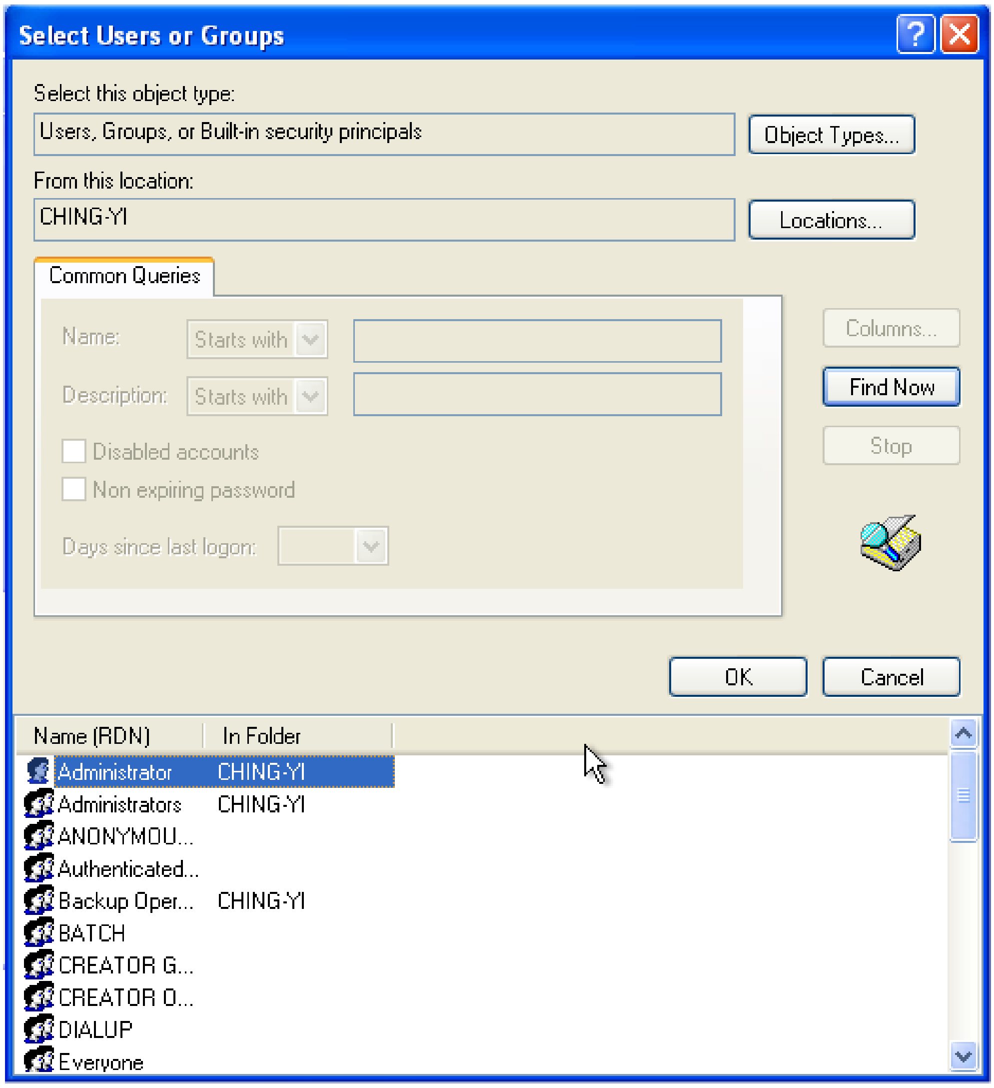
h. Click the **Add** button, and the **Select users or Groups** dialog box will appear as the figure below:



i. Click the **Advanced** button, and the following dialog box will be shown:



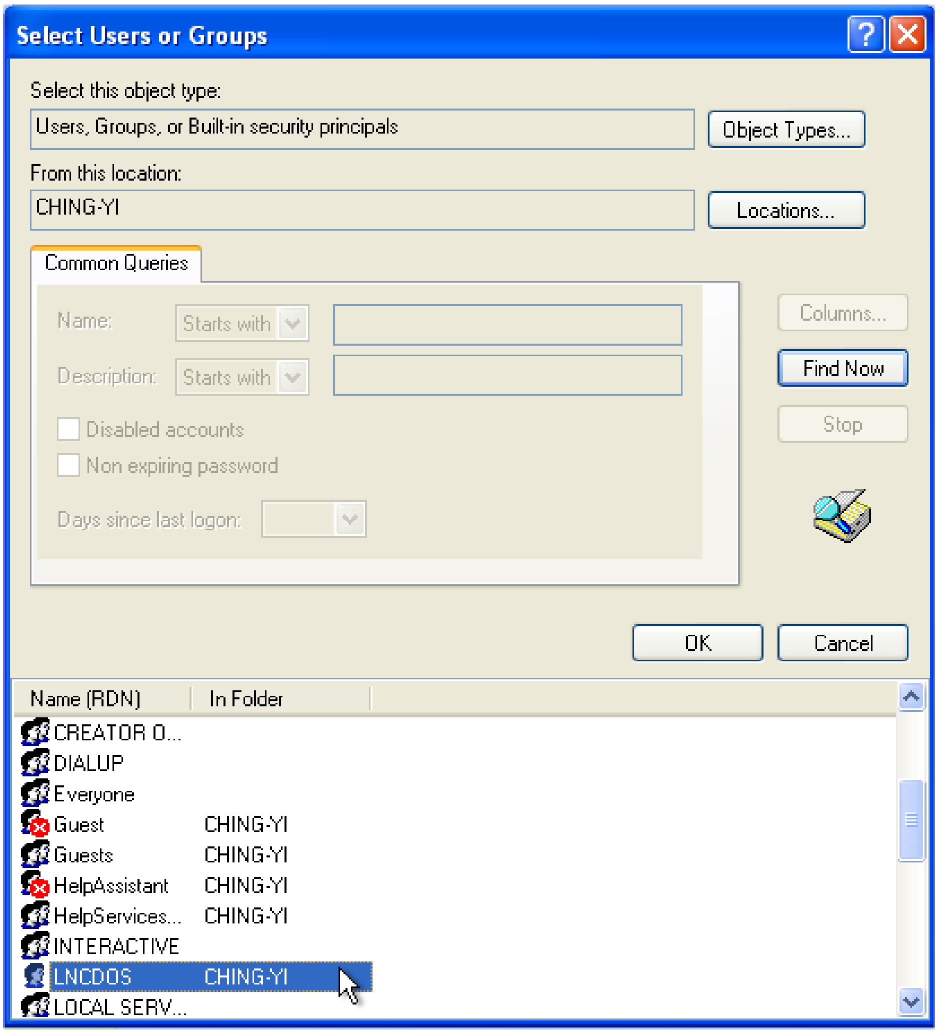
j. Press the Find Now button, and a list of users will appear in the bottom section of the dialog as shown below:



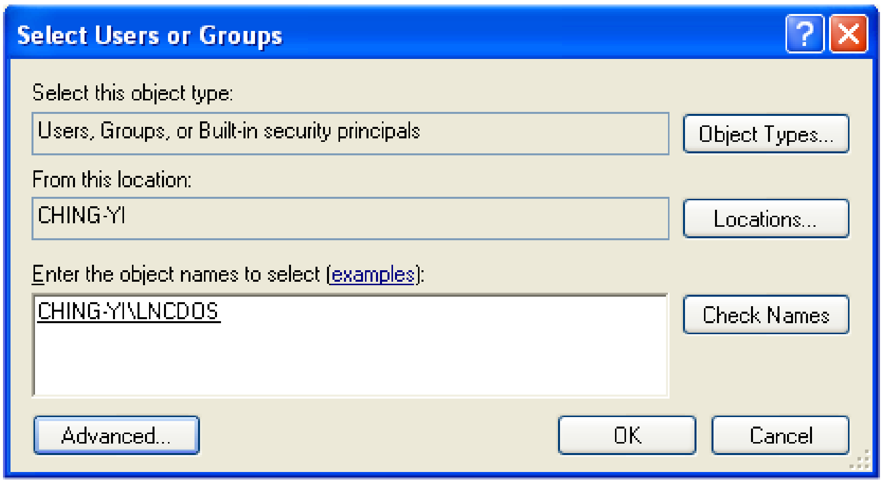
k. Click to select in the list the user that needs to be added. There are two ways to do this:

Method 1：Open permissions to Everyone by selecting Everyone in the menu.

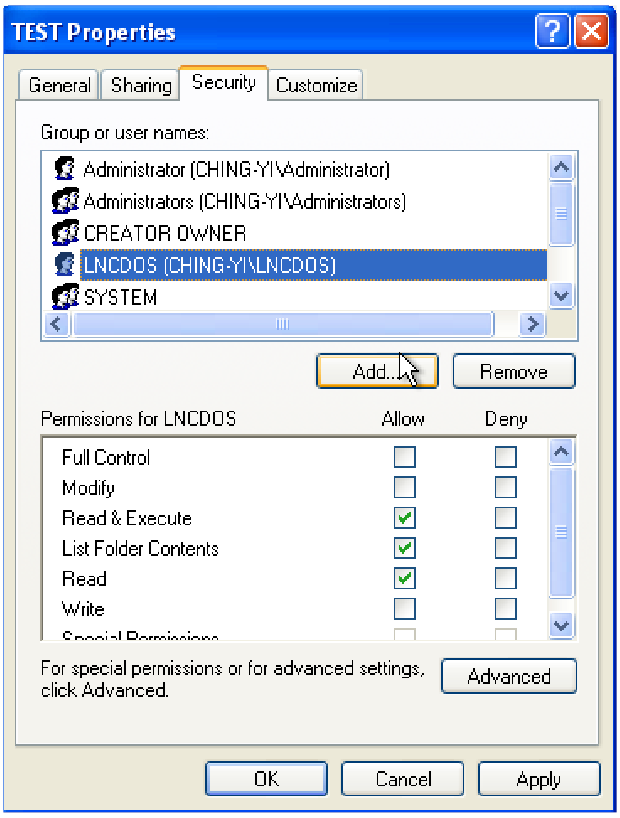
Method 2：Add the user “lncdos” as assigned by 〝username=lncdos〞 in the `c:\net\system.ini` file. The username may not be “lncdos;” for its setting, please refer to the setting in `system.ini`.


Select Users or Groups
Select this object type:
Users, Groups, or Built-in security principals
Object Types...
From this location:
CHING-YI
Locations...
Common Queries
Name:
Starts with
Description:
Starts with
Disabled accounts
Non expiring password
Days since last logon:
Columns...
Find Now
Stop
OK
Cancel
Name (RDN)
In Folder
CREATOR O...
DIALUP
Everyone
Guest CHING-YI
Guests CHING-YI
HelpAssistant CHING-YI
HelpServices... CHING-YI
INTERACTIVE
LNCDOS CHING-YI
LOCAL SERV...

l. Take the example of adding the new user "lncdos," after clicking to select the new user in the list, press **OK**, and the following figure will be shown:



m. Press **OK** again, and the following dialog box will appear. Please check the box of **Full Control**, and then press **OK** to complete the procedure of adding a new folder.



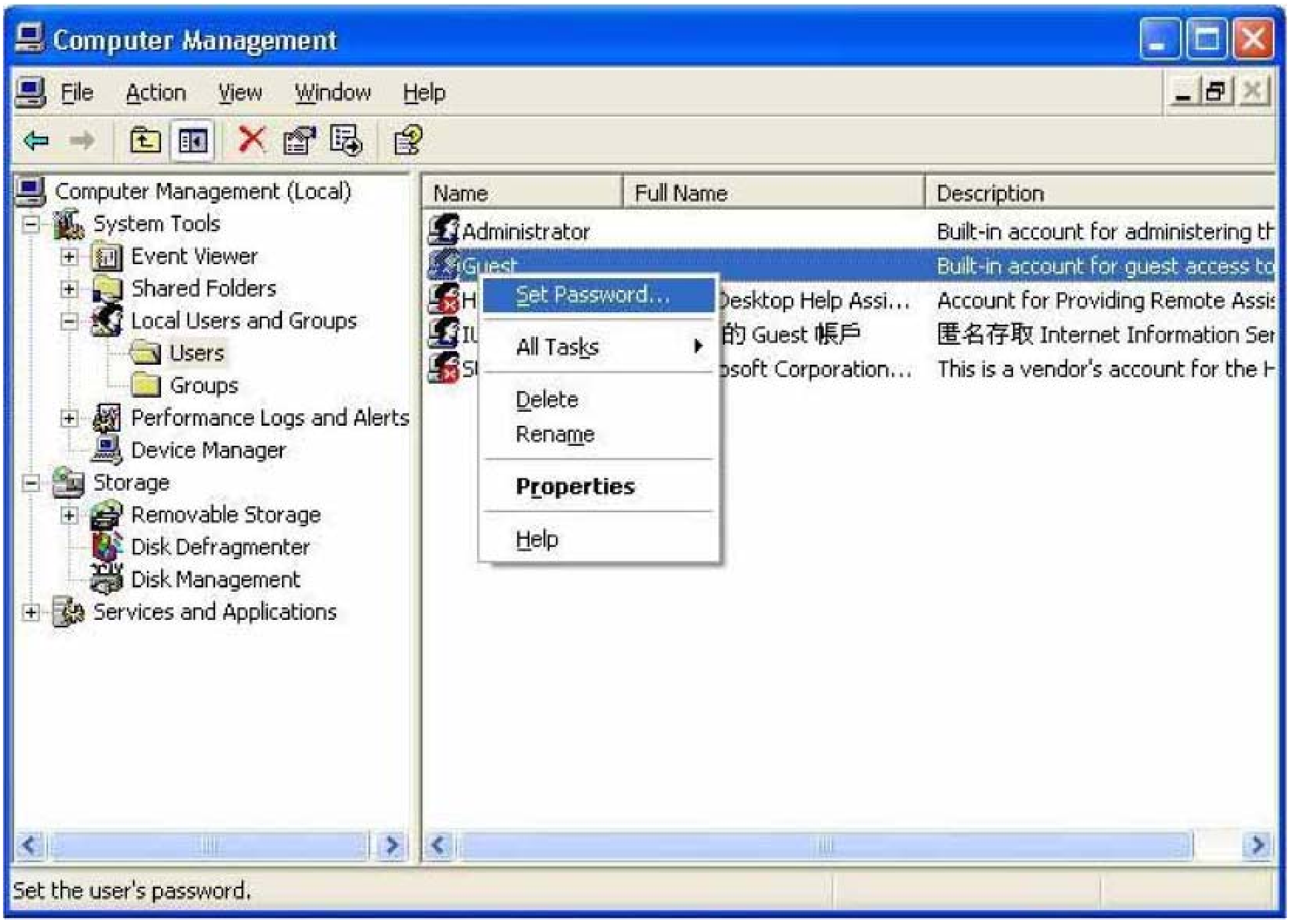
D. ENABLE USER ACCESS:

There are two ways to enable user access. Please choose either one according to your need. The advantage of method 1 (recommended) is its convenience for configuration, and there is no need to add a new user for controllers with different usernames; however, it has the disadvantage of a low security level. On the contrary, the second method has a higher security level. But if there are multiple controllers with different names, users are required to add a new user for each controller separately. Depending on the types of operating systems, there are different steps for setup as listed below:

Method 1：

a. Press Start → My Computer → Manage.

b. Click to select the folder **Local Users and Group → Users**, Right-click **Guest**, and then left-click **Set Password**.

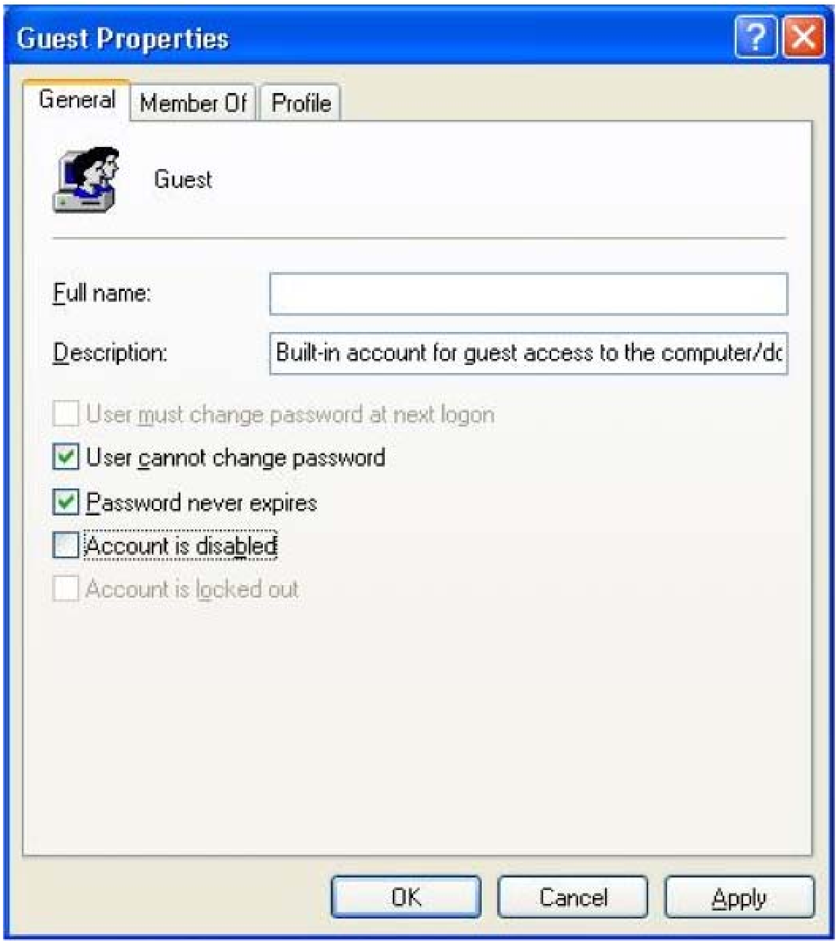


c. The following dialog box will appear, press the **Proceed** button to close the dialog box.

d. Leave the password boxes blank, and press **OK**.

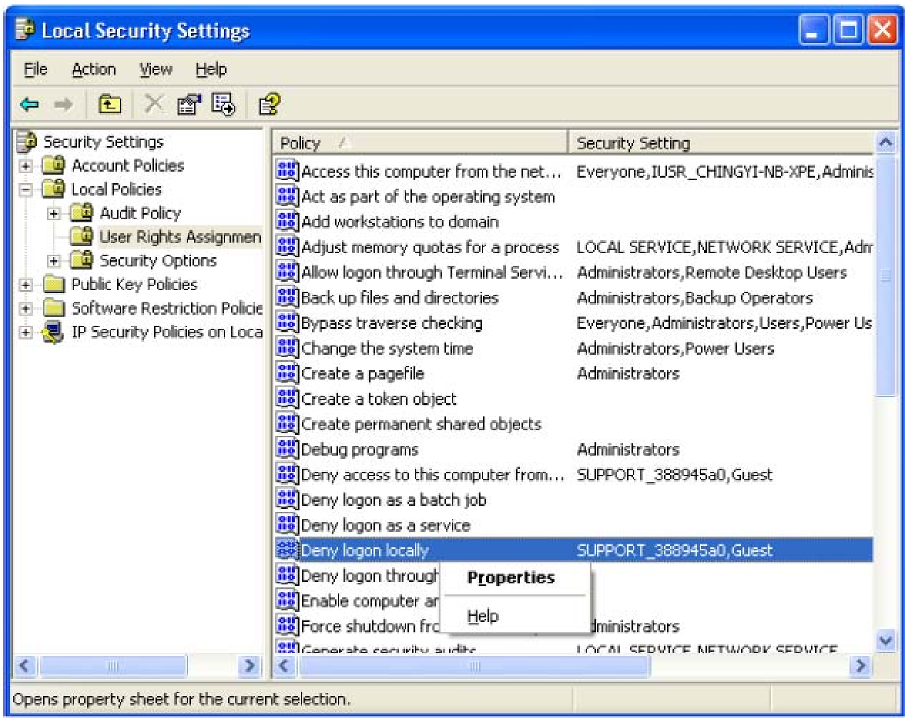
e. Press **OK** again to finish password modification.

f. If there is a red cross over the **Guest** icon in the **Users** folder, right-click on **Guest** and select **Properties**. A dialogue box will appear as the figure below, check the boxes of **User cannot change password** & **Password never expire**s and uncheck the box **Account is disabled**.

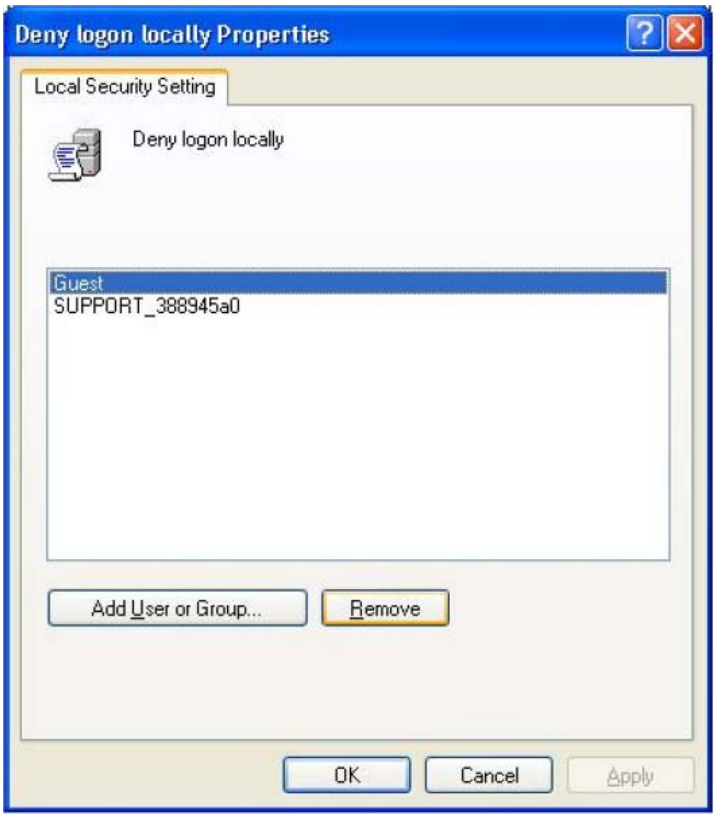


g. Next, set a higher access level for **Guest**. To do so, click **Start** → **Run**, and enter **secpol.msc** in the text box. Then press **OK**.

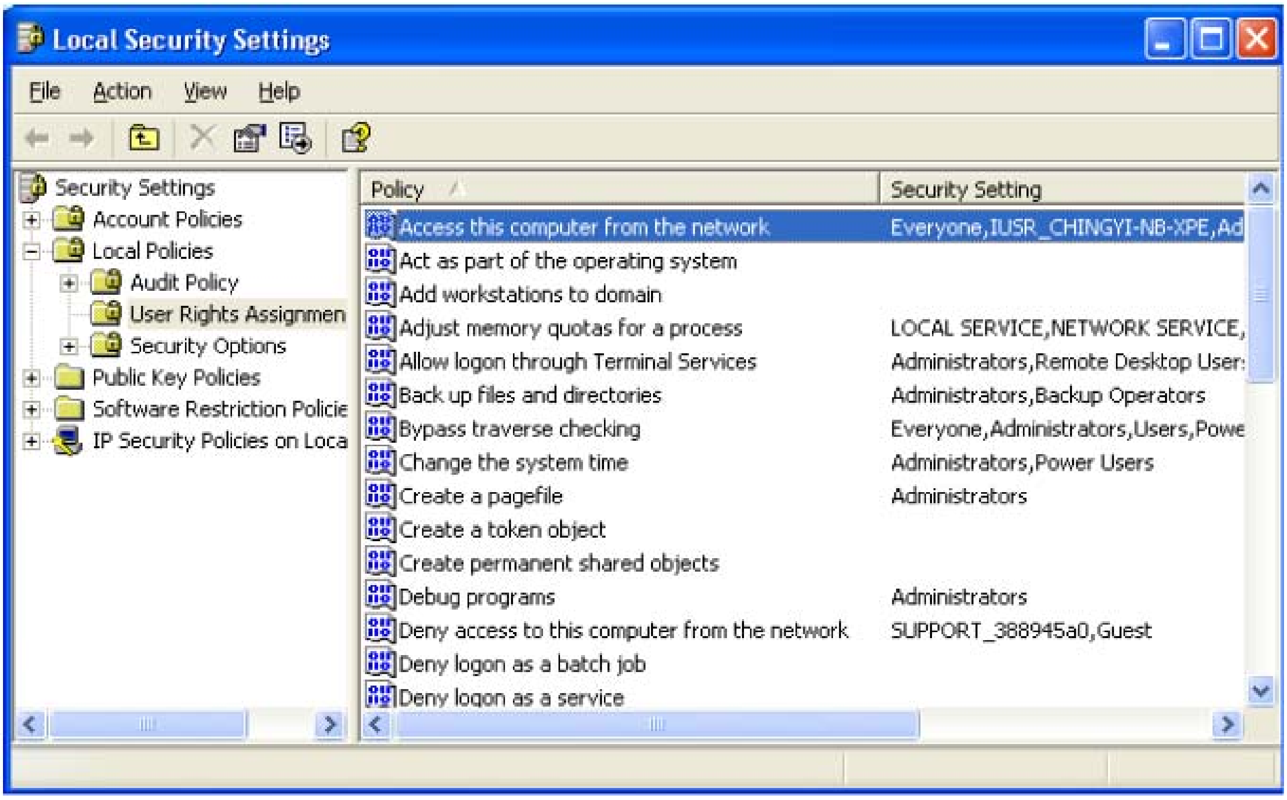
h. Click **Local Policies → User Rights Assignment**, right-click the **Deny logon locally** policy, and then left-click properties.



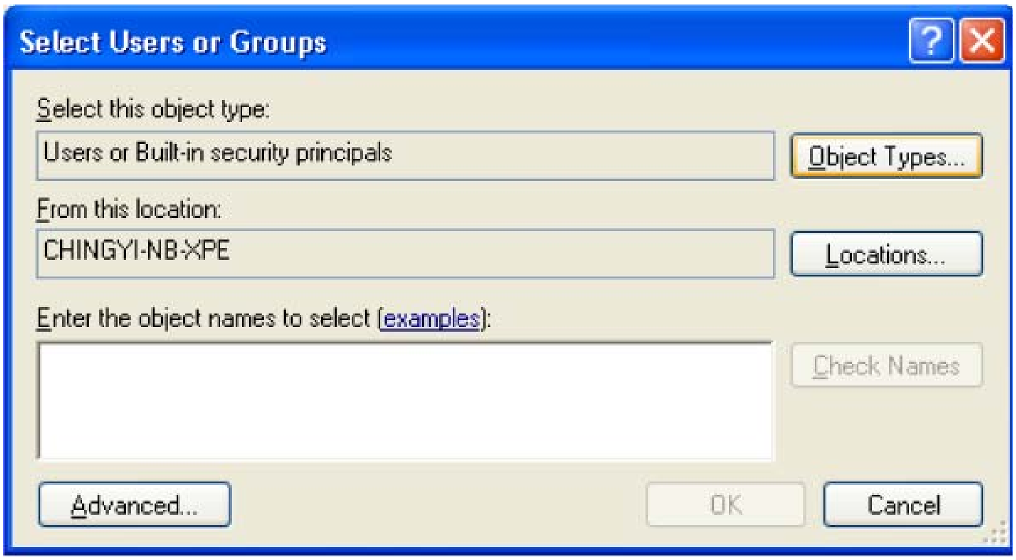
i. Left-click **Guest**, and press the **Remove** button. After the access permission for **Guest** is open, press **OK** to close the dialog box.



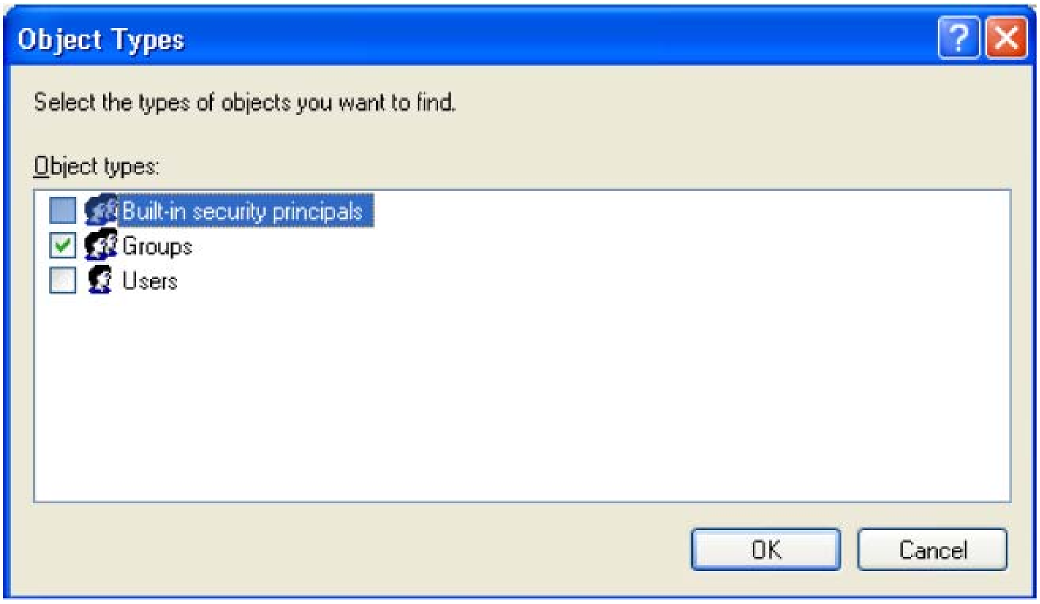
j. Right -click the **Access this computer from the network** policy, left-click properties.



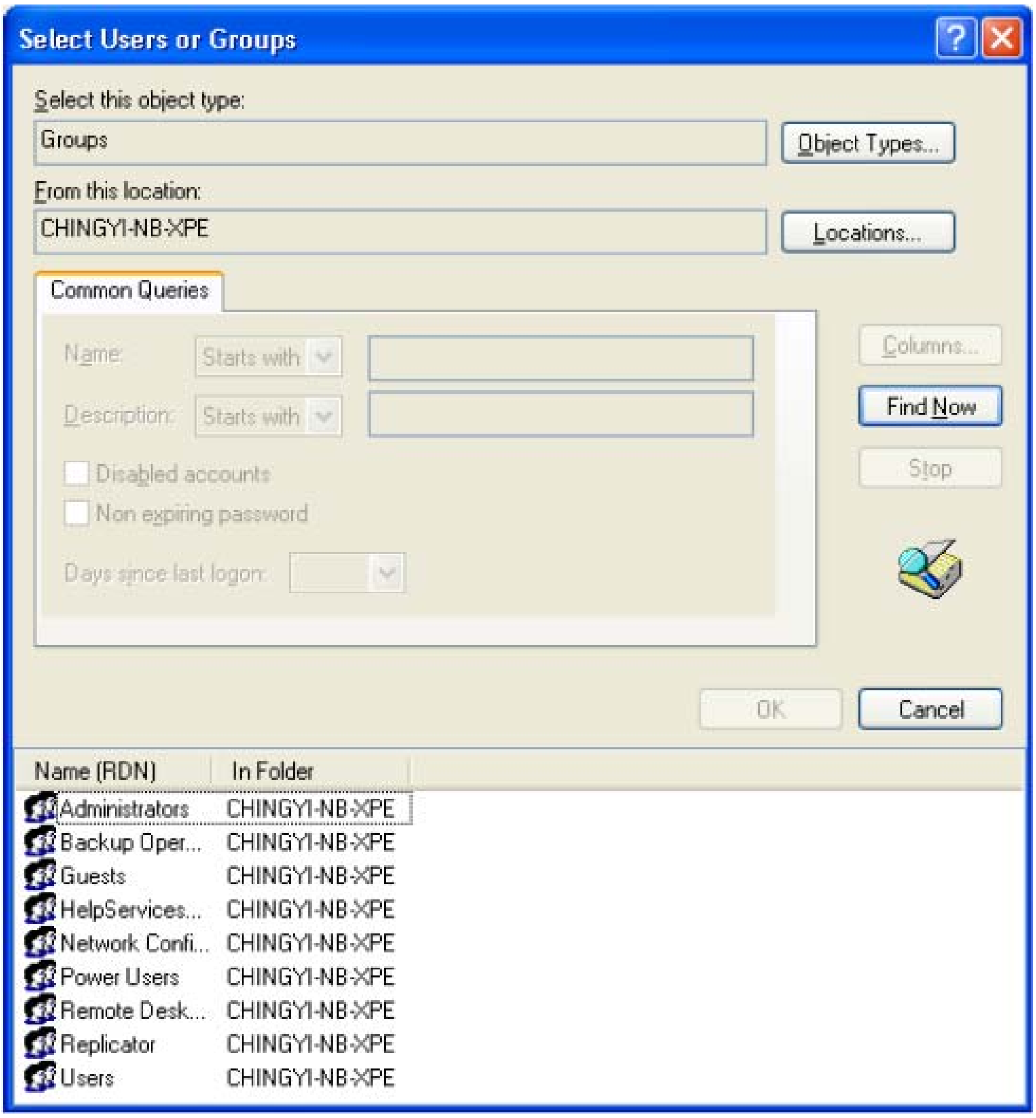
k. Click the **Object Types** button.



I. Check the box of **Groups**, and then press **OK**.



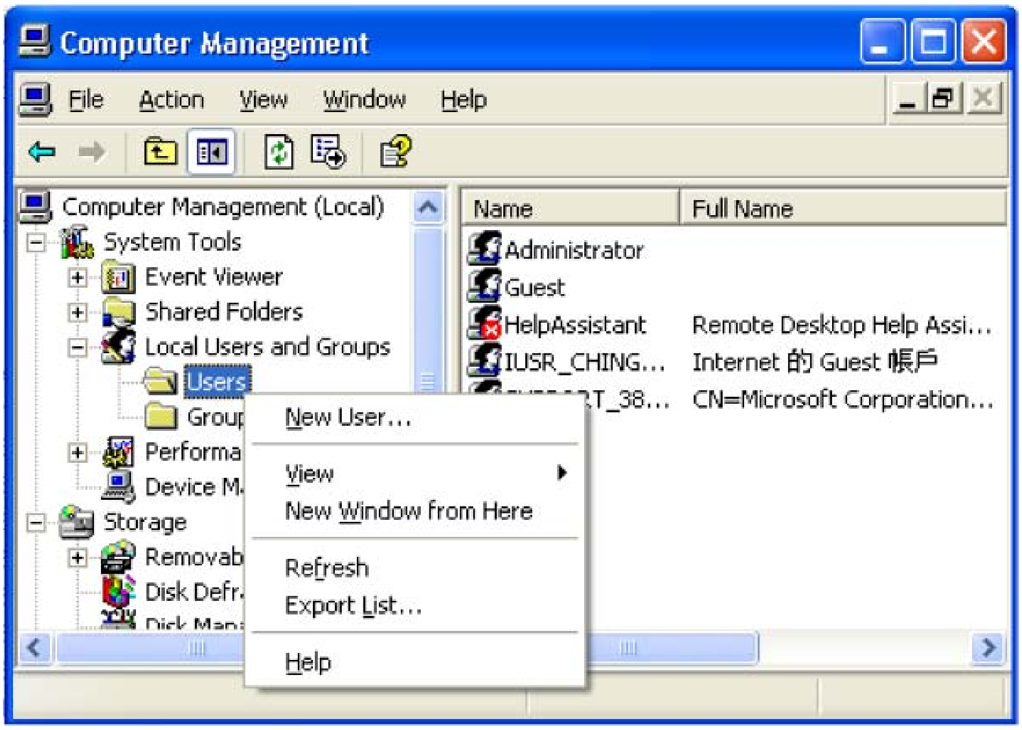
m.Press the **Advanced** button, press the **Find Now** button, and a list of users will be shown in the bottom section of the dialog box. Select **Guests** in the list, and press **OK** to complete the procedure of enabling guest access.



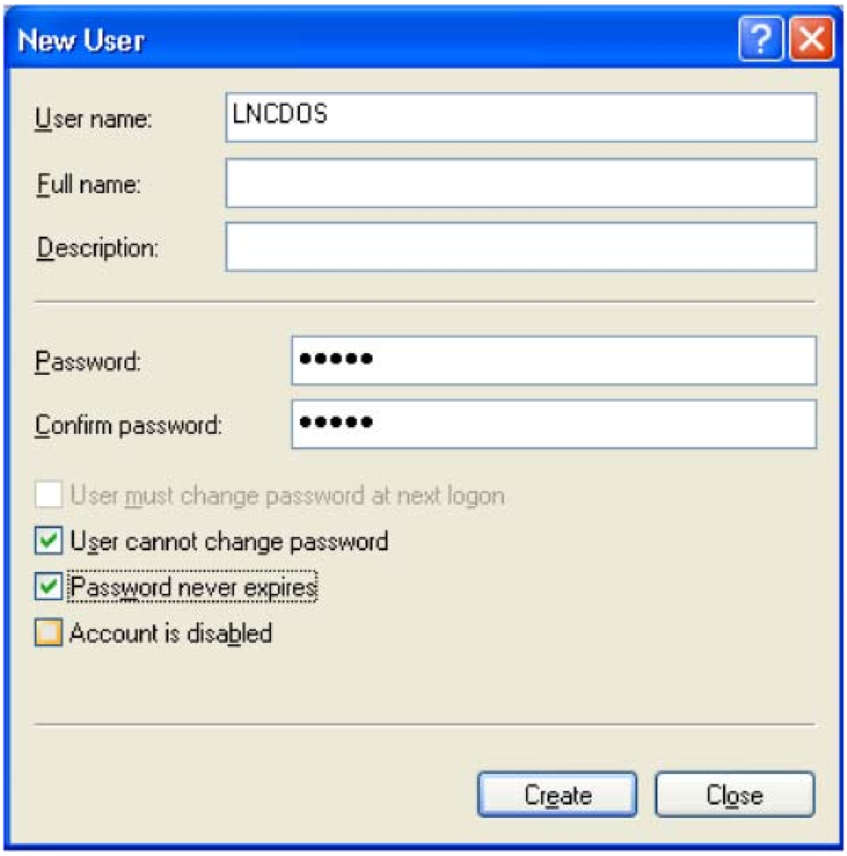
Method 2:

a. Click Start → My Computer → Manage.

b. Right-click the Users folder, and left-click New User.



c. A dialog box will appear as the figure below. Please enter the username same as that in the `system.ini` file, and enter the password same as that in the `2net.bat` file. Verify the boxes as the figure shown below, and then press **Create** to finish the procedure of enabling guess access.



Network Settings for Windows XP HOME Edition

A. Verify if the network card, internet cables, and relative protocols have been installed properly.

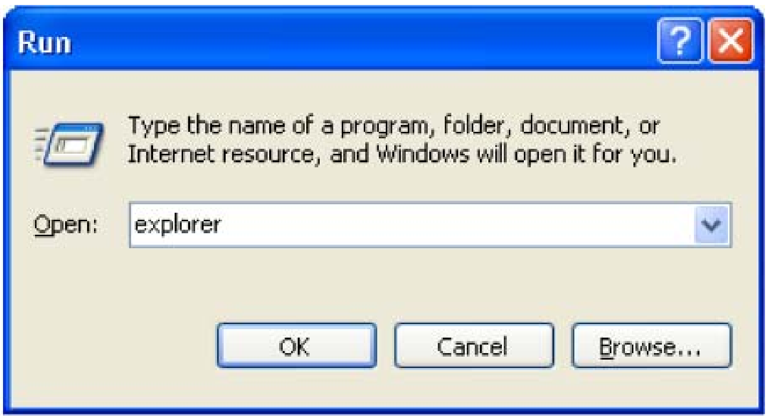
For this section, please refer to the above setting procedure of Windows XP Professional.

B. Verify if Computer name and Workgroup have been set correctly.

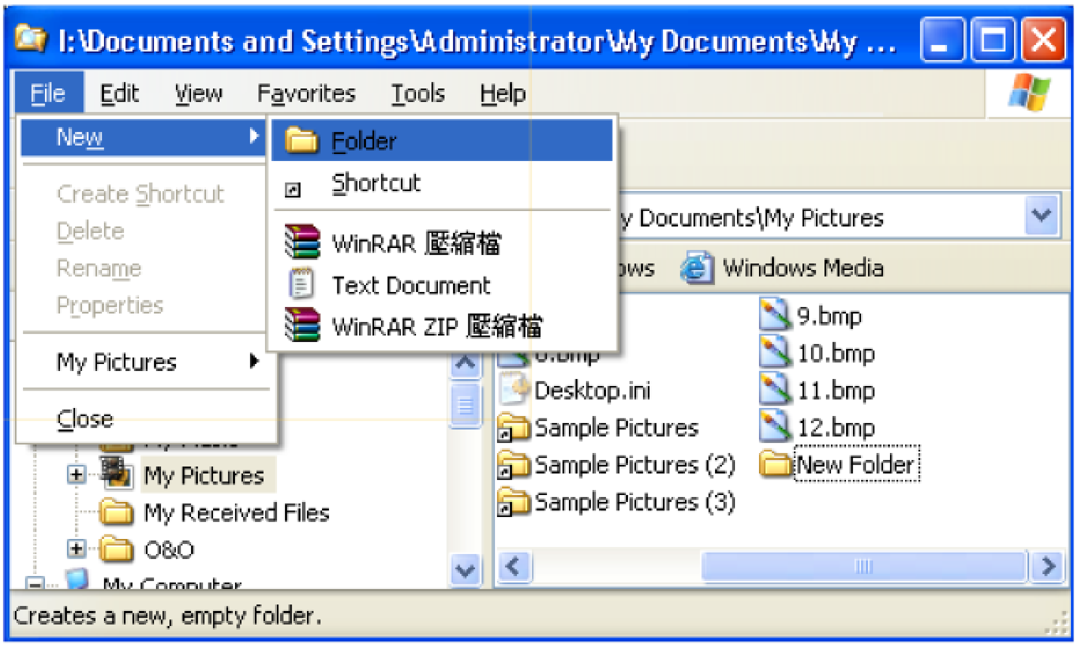
For this section, please refer to the above setting procedure of Windows XP Professional.

C. Share a directory at PC side.

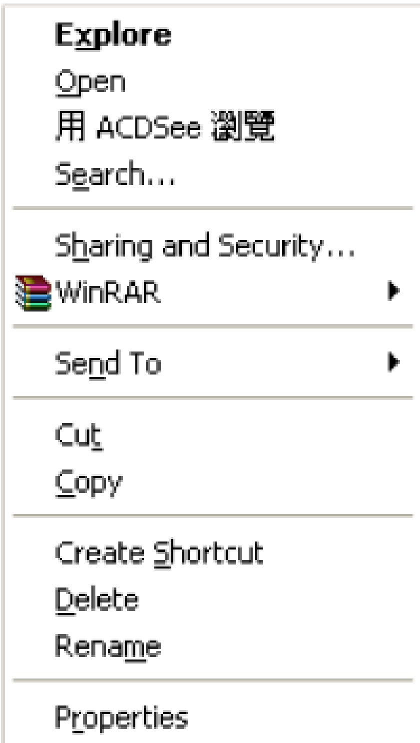
a. Click **Start → Run**, enter “explorer” in the text box, and then press **OK**.



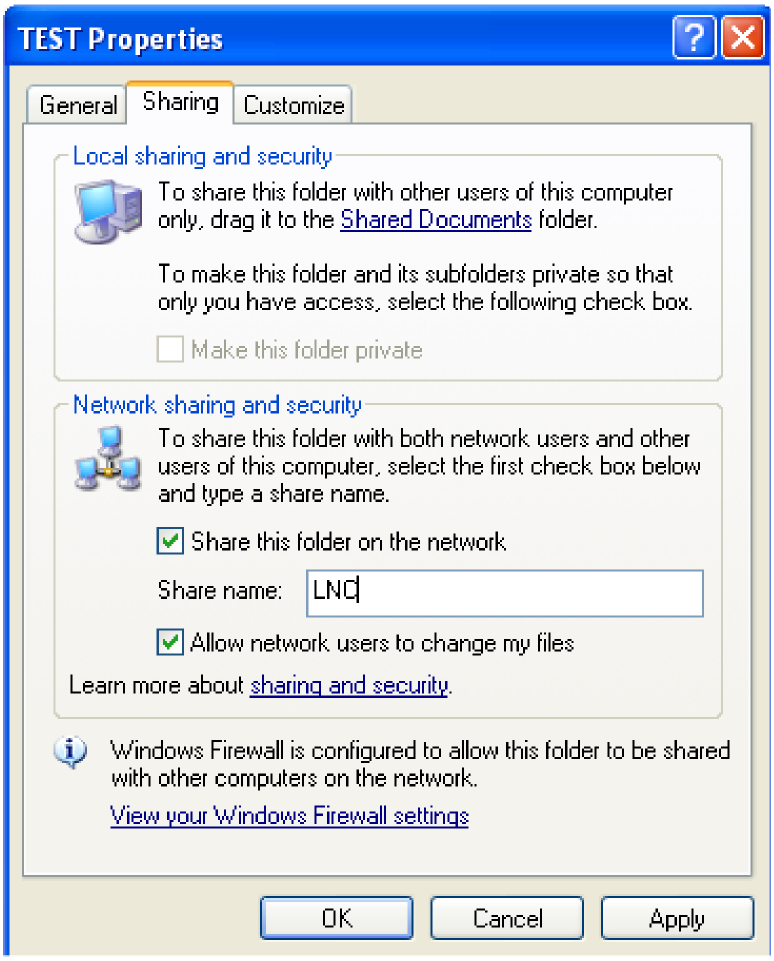
b. In **Windows Explorer**, select **File** → **New** → **Folder**. Name the new folder after the corresponding folder at the controller side such as **share**, **pcscan**, and so on.



c. Right-click the new folder, and left-click **Sharing and Security**.

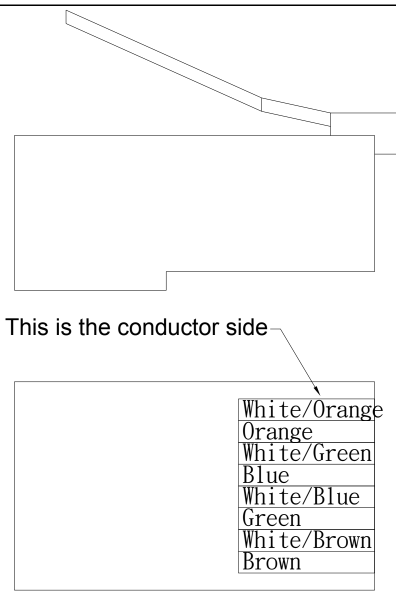
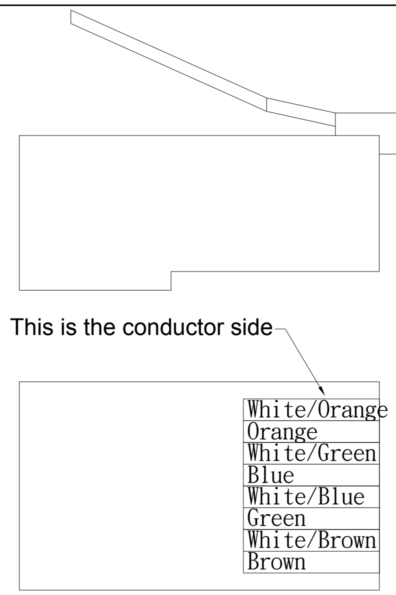


d. Click the **Sharing** tab, and verify the boxes of **Share this folder on the network** & **Allow network users to change my files**. Check that the name in the **Share name** text box is the same as that in the `2net.bat` file, and then press **OK** to complete the procedure of file-sharing.

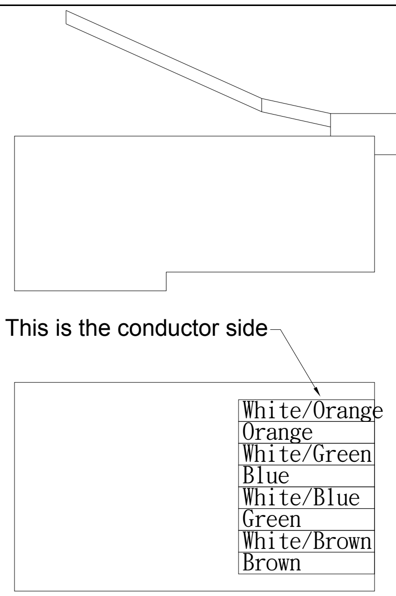
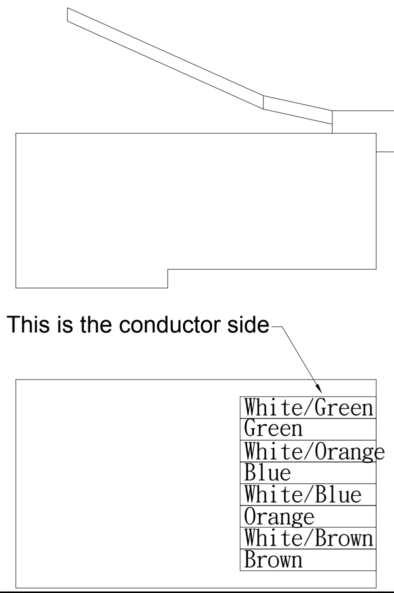


NETWORK WIRING: STEPS TO WIRE A CONNECTOR WITH CABLE

Network cable from controller to HUB:

<table>
<tr><th colspan="2">Internal network wiring</th></tr>
<tr><th>PC side</th><th>Controller side</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

Network cable from the controller to PC

<table>
<tr><th colspan="2">One to one network wiring</th></tr>
<tr><th>PC side</th><th>Controller side</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

DISCONNECTION & IDLE TIME-OUT SETTINGS

There are two possible causes for users to experience a disconnection problem for “over idle time-out limit” when sharing a folder with network disks on-line:

A. Operating system: For the operating system at PC side that is Windows 2000 or Windows XP, by default, the idle time-out limit is set to 15 minutes.

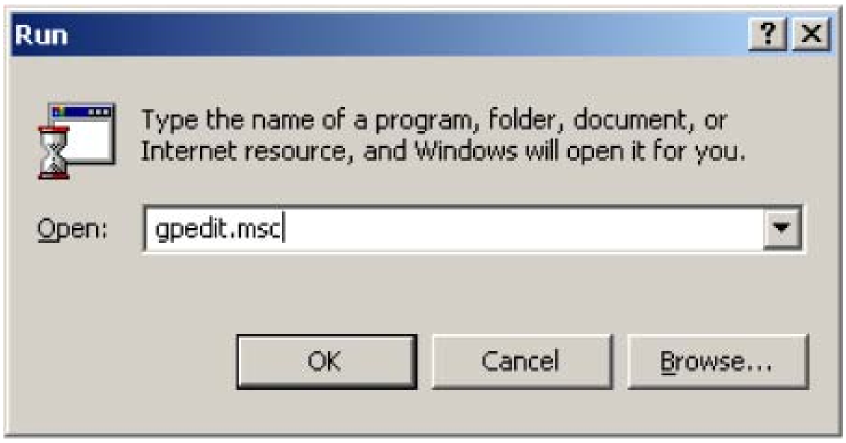
B. Network card: PC side automatically shuts down the power of network cards. This usually happens for laptop users.

Below are the procedures to disable idle time-out limit.

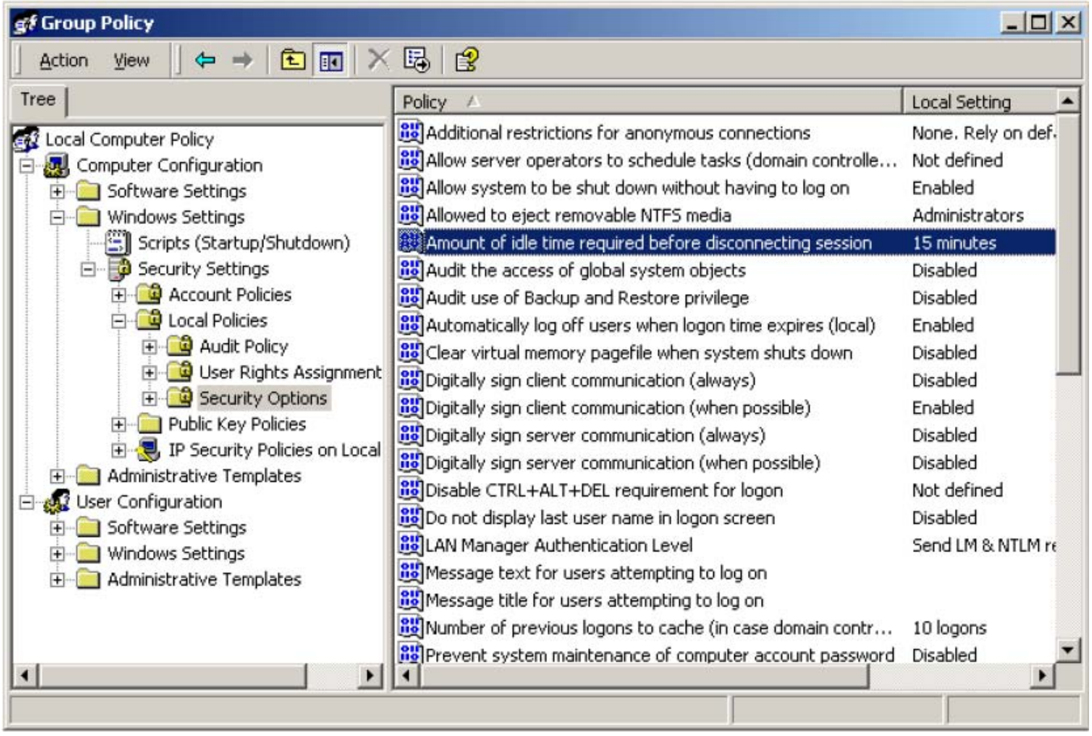
- OPERATING SYSTEMS

  For Windows 2000：

  a. Click **Start** → **Run**, enter “gpedit.msc” in the text box, and press **OK** to open the **Group Policy** configuration dialog box.



  b. Set the policy Amount of idle time required before disconnecting session in Computer Configuration\ Windows Settings\ Security Settings\ Local Policies\ Security Options.



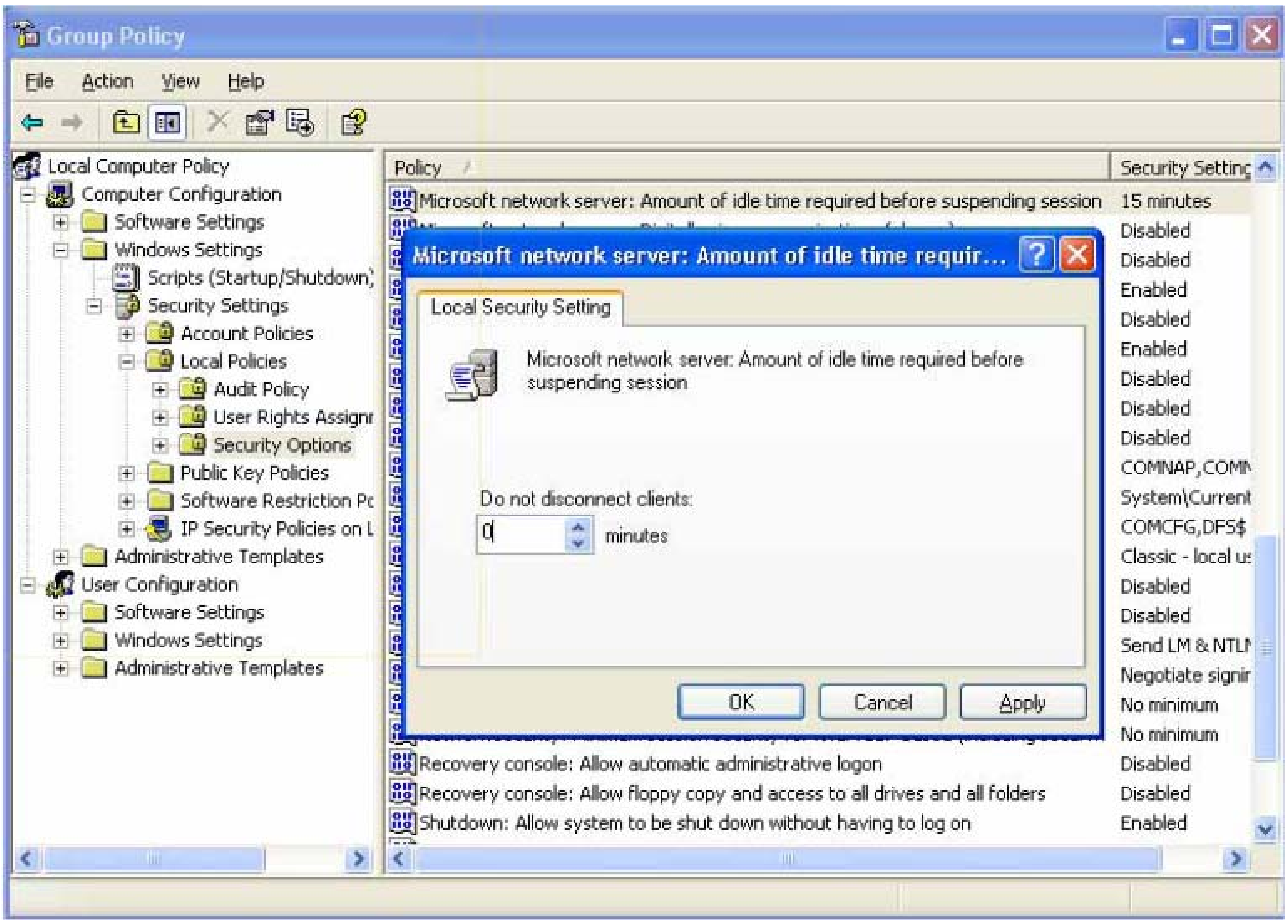
c. Double-click on the principle, and a dialog box will appear as the figure below. Enter “0” in the text box, which means no disconnection at all time. To validate the configuration, please reboot the system.

For Windows XP：

a. Click **Start** → **Run**, enter “gpedit.msc” in the text box, and press **OK** to open the **Group Policy** configuration dialog box.

b. Set the policy Miscrosoft network server: Amount of idle time required before suspending session in Computer Configuration\ Windows Settings\ Security Settings\ Local Policies\ Security Options.

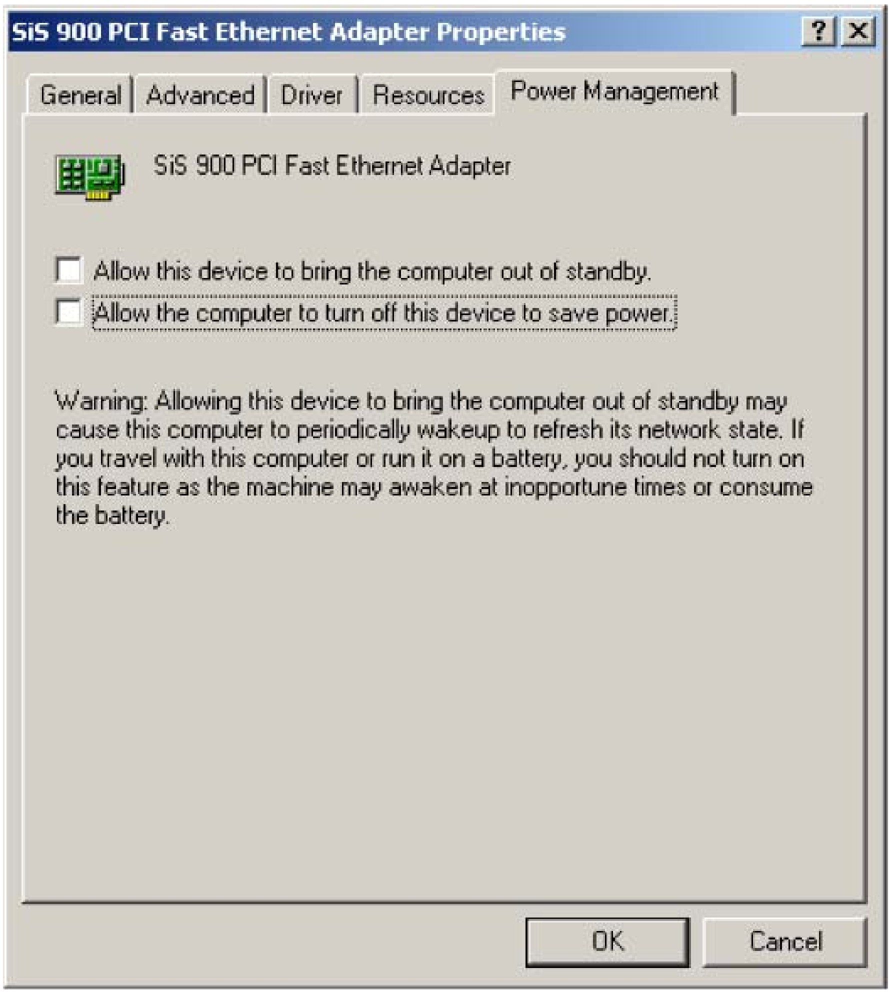
c. Double-click on the principle, and a dialog box will appear as the figure below. Enter “0” in the text box, which means no disconnection at all time. To validate the configuration, please reboot the system.



- **NETWORK CARD**

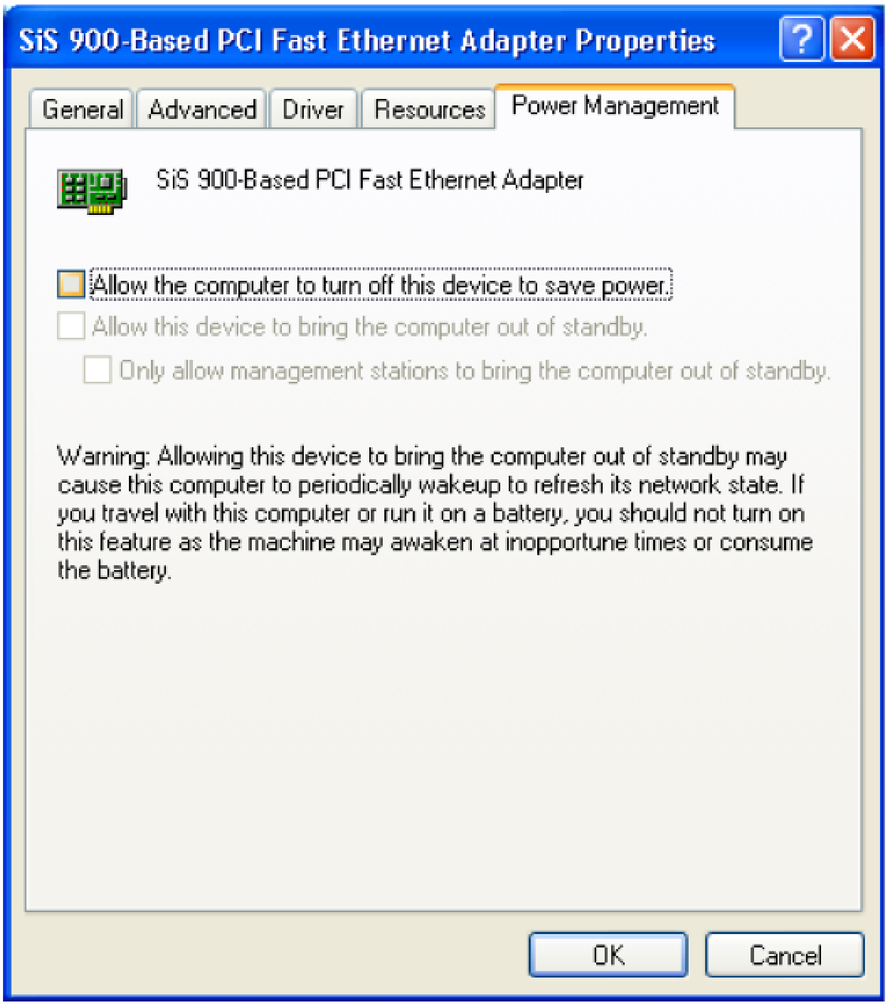
For Windows 2000：

Click My Network Places → Right-click properties → Local Area Connection → Right-click properties → Click the Configure button of General tab → Click the Power Management tab, and uncheck the box of Allow the computer to turn off this device to save power as the figure below:



For Windows XP：

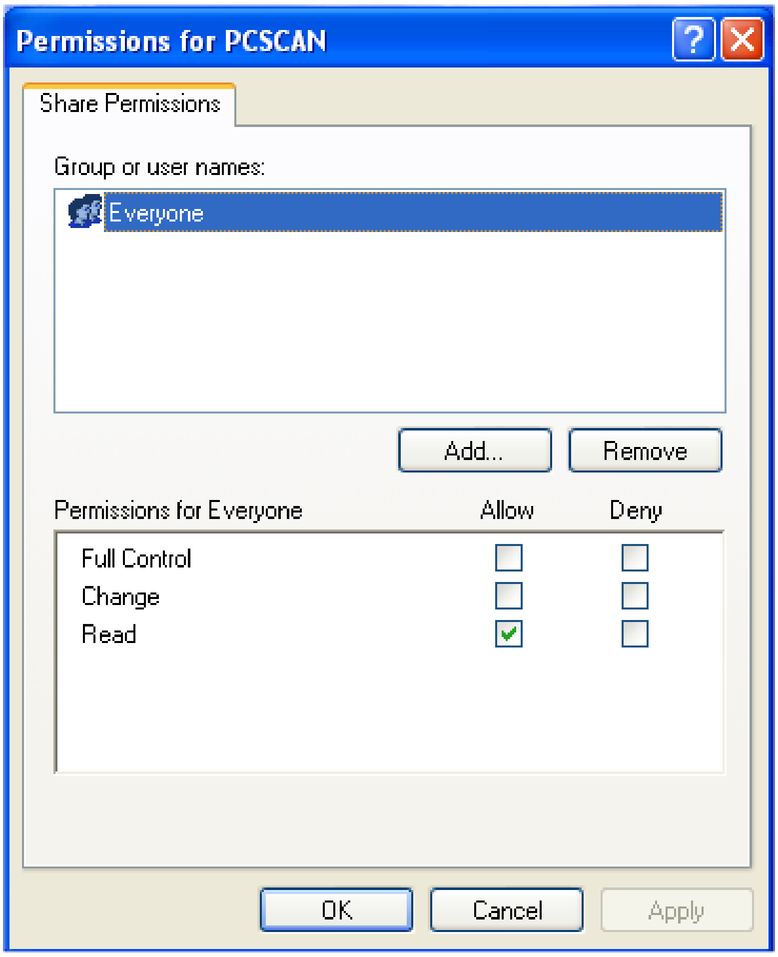
Click **My Network Places** → Right-click properties → **Local Area Connection** → Right-click properties → Click the **Configure** button of **General** tab → Click the **Power Management** tab, and uncheck the box of **Allow the computer to turn off this device** to save power as the figure below:



VIRUS SCAN BY A NETWORK DRIVE

If the controller is infected with a virus, enter the system and scan for virus. If the virus cannot be removed, you can try to scan the virus by a network drive. The setting procedure is as below:

1. Follow the installation method of the virus scan program to install the program in the `C:\PCSCAN` directory at PC side. Or, double-click the `PCSCAN.EXE` file in the directory of network settings to decompress and move the files automatically to the `C:\PCSCAN` directory.
2. Please set access permission of the **PCSCAN** file to "read-only."



3. Make an emergency boot disk.
   A. Insert a disk into the PC drive.
   B. Double-click the program NRC1.0.exe.
   C. “1.0” of NRC1.0.exe indicates the version of the program.

4. Modify the following contents in the boot disk:
   A. A:\NET\SYSTEM.INI
   B. The shared file **PCSCAN** in **`A:\NET\2NET.BAT`**.

   For example A:\net\net use u: **\\uichain1\pcscan** /yes

   For further details, please refer to Appendix D “Networking Settings.”

5. After the boot disk has been reconfigured and set to “read-only,” insert the disk into the controller drive and reboot the system. Please change the system configuration to boot off by a disk; in so doing, the controller will connect to network disks at the same time as entering the system.

6. During initial connection, because the disk is set to “read-only” and the network drive cannot write to the disk, the message “Write protect error writing drive A, Abort, Retry, Fail?” will appear. When this occurs, please press “f” to discharge the message and continue to connect to the network.

7. When the connection is successful, switch manually to the **pcscan** directory. For the above example, switch to U disk (`U:\\pcscan`).

8. Execute `pcscan.exe`.

COMMON PROBLEMS OF NETWORK DISKS

Common network errors at the controller side:

- **Error 5: Access has been denied.**

  Definition: Access has been denied.

  Troubleshooting:

  a. Verify if there is any new username in the `system.ini` file at PC side; and also verify if guest access of the file is enabled.
  b. Verify if the file names at PC side and in the `2net.bat` file are the same.

- **Error 52: Duplicate workgroup or computer name exists on the network.**

  Definition: Duplicate workgroup or computer name exists on the network.

  Troubleshooting: Change the computer name of the controller; meaning, change "computername" in the **system.ini** file.

- **Error 53: The computer name specified in the network path cannot be located.**

  Definition: The specified computer name does not exist or is not open for access.

  Troubleshooting:

  a. Verify if the network connection light of network cable has turn on.
  b. Verify if the NetBEUI Protocol has been installed.
  c. Verify if the contents of computername and workgroup are the same as those in `2net.bat` & `system.ini` at the controller side.
  d. Reboot the system with the emergency boot disk to connect to a network disk and scan the system by using the connected disk.

- **Error 55: This resource does not exist on the network.**

  Definition: The share file does not exist, or the share file at the controller side does not have authority to access.

  Troubleshooting:

  a. Verify if the file names at PC side and in the `2net.bat` file at the controller side are the same.
  b. Verify if the file at PC side is open for access, and the access method is set to full control.
  c. Verify if the user password at PC side has expired. To verify, reset the user password and check the box of Password never expires. Then reconnect to see if the connection works.

- **Error 58: The network has responded incorrectly.**

  Definition: Incorrect response of the network.

  Troubleshooting:

  a. Verify if the user password at PC side has expired.

  b. Verify if the user password at PC side is the same as that in the `2net.bat` file at the controller side.

- **Error 67: The specified shared directory cannot be found.**

  Definition: The specified share directory cannot be found.

  Troubleshooting:

  a. Verify if the file of PC side has the permission for file sharing.

  b. Verify if the file names at PC side and in the `2net.bat` file are the same.

- **Error 85: The local device name is already in use.**

  Definition: The local device name is already in use.

  Troubleshooting: Verify if there is any duplicate disk code in the 2net.bat file at the controller side.

- **Error 2184: The service has not been started.**

  This error message can be ignored.

- **Error 3658: The `IFSHLP.SYS` driver is not installed.**

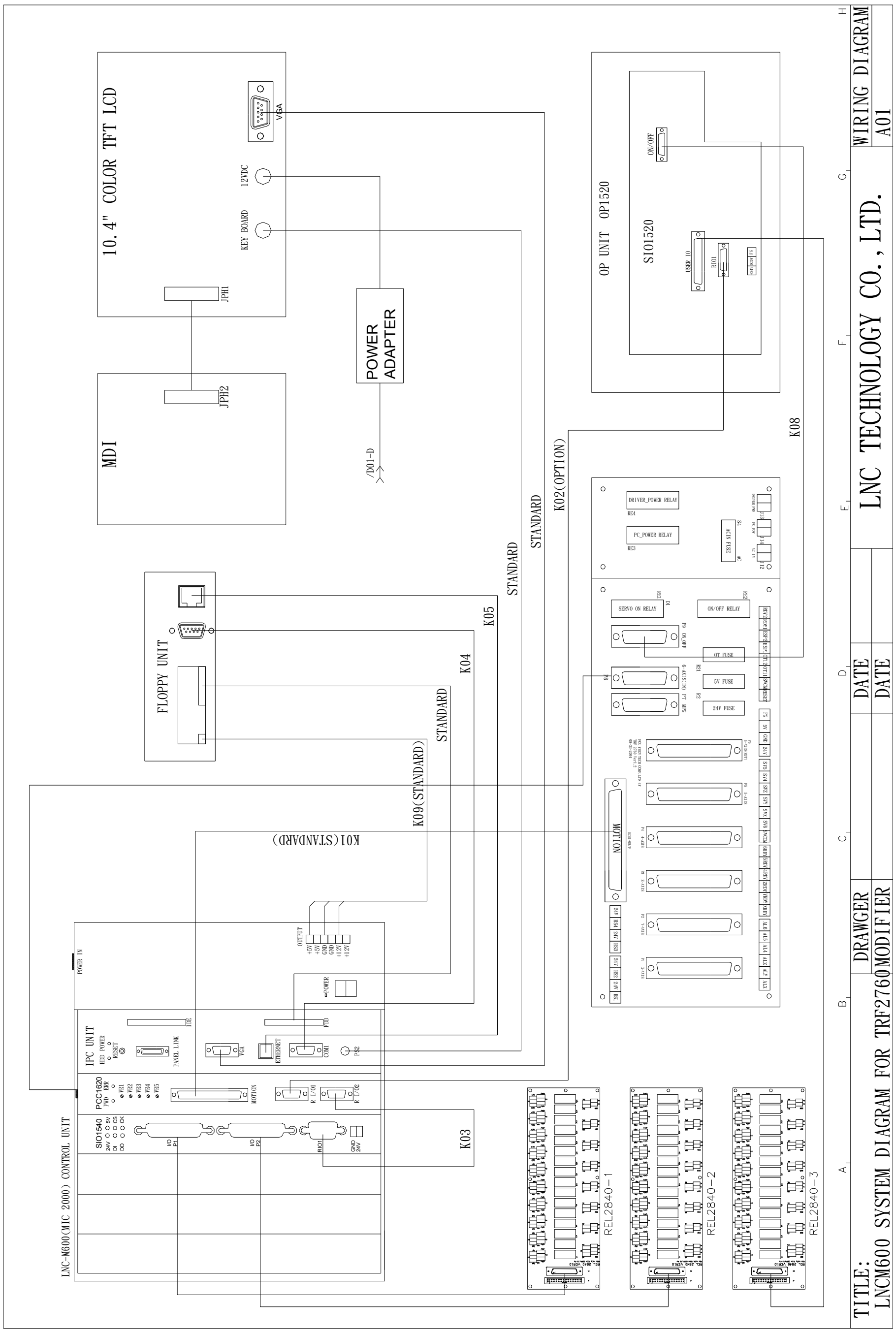
  Definition: The `IFSHLP.SYS` driver is not installed.

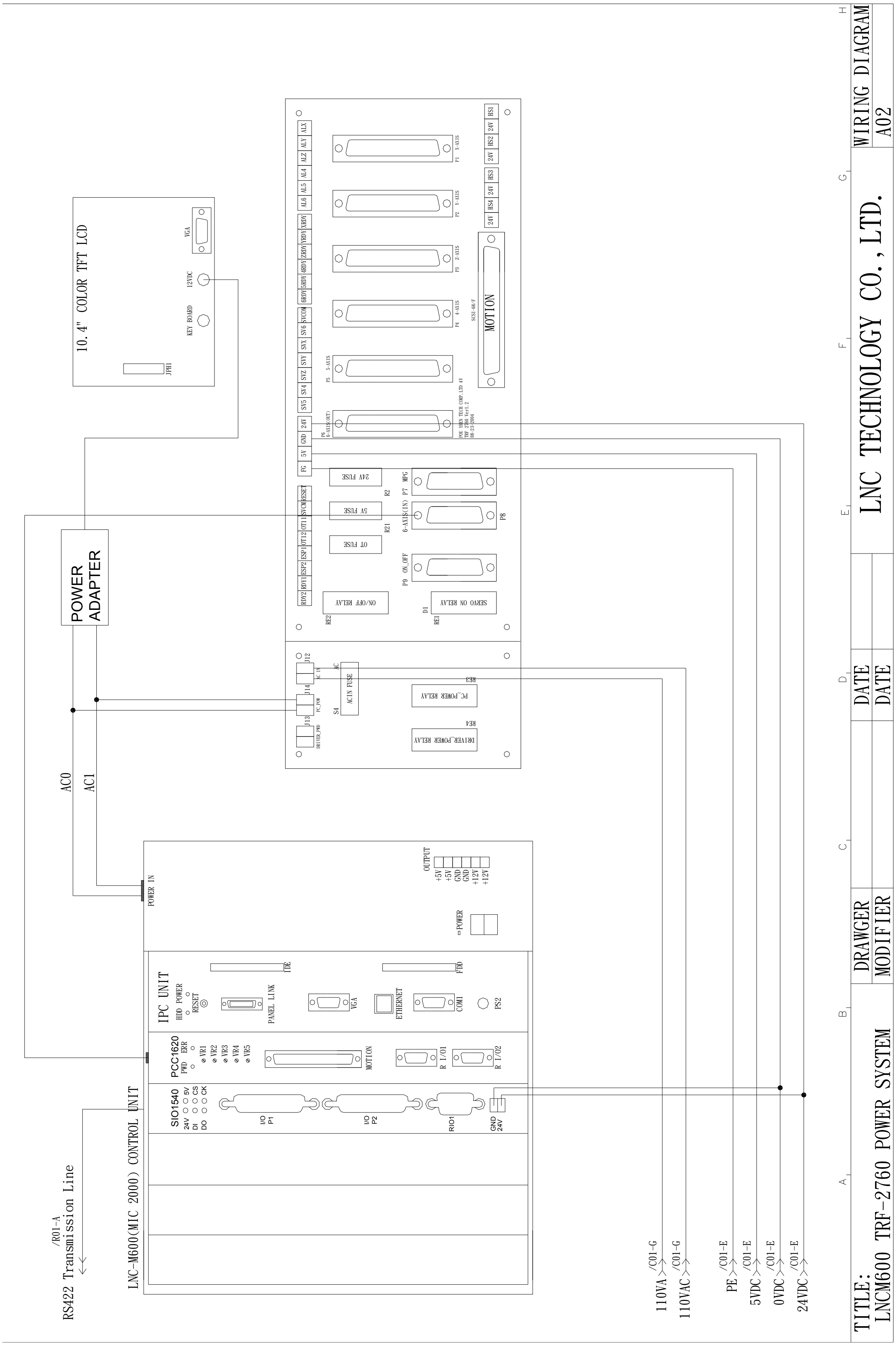
Troubleshooting: Verify if "rem" of `rem device=C:\NET\ifshlp.sys` in the `C:\config.sys` file has been deleted.

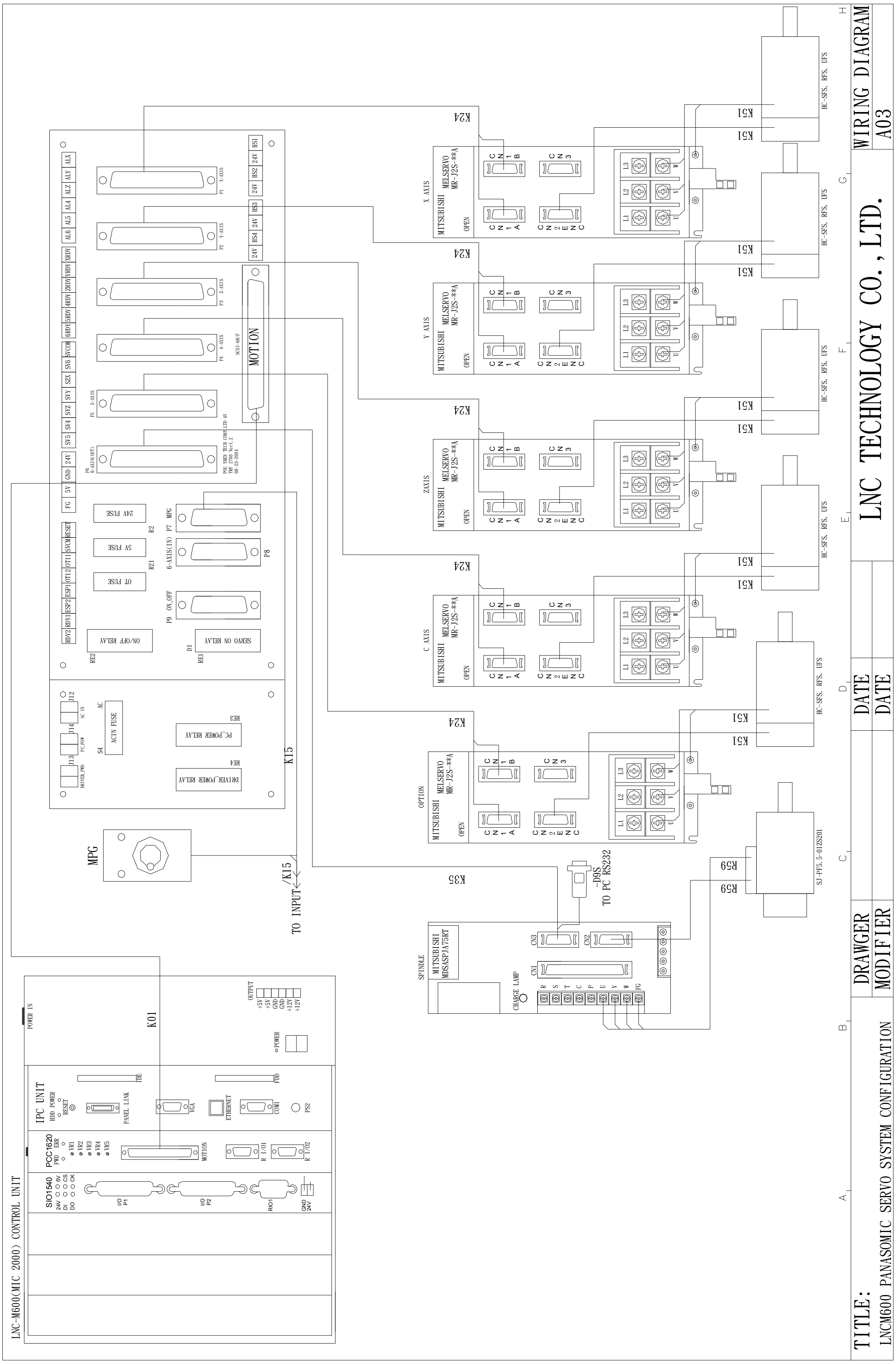
APPENDIX E：WIRING EXAMPLE

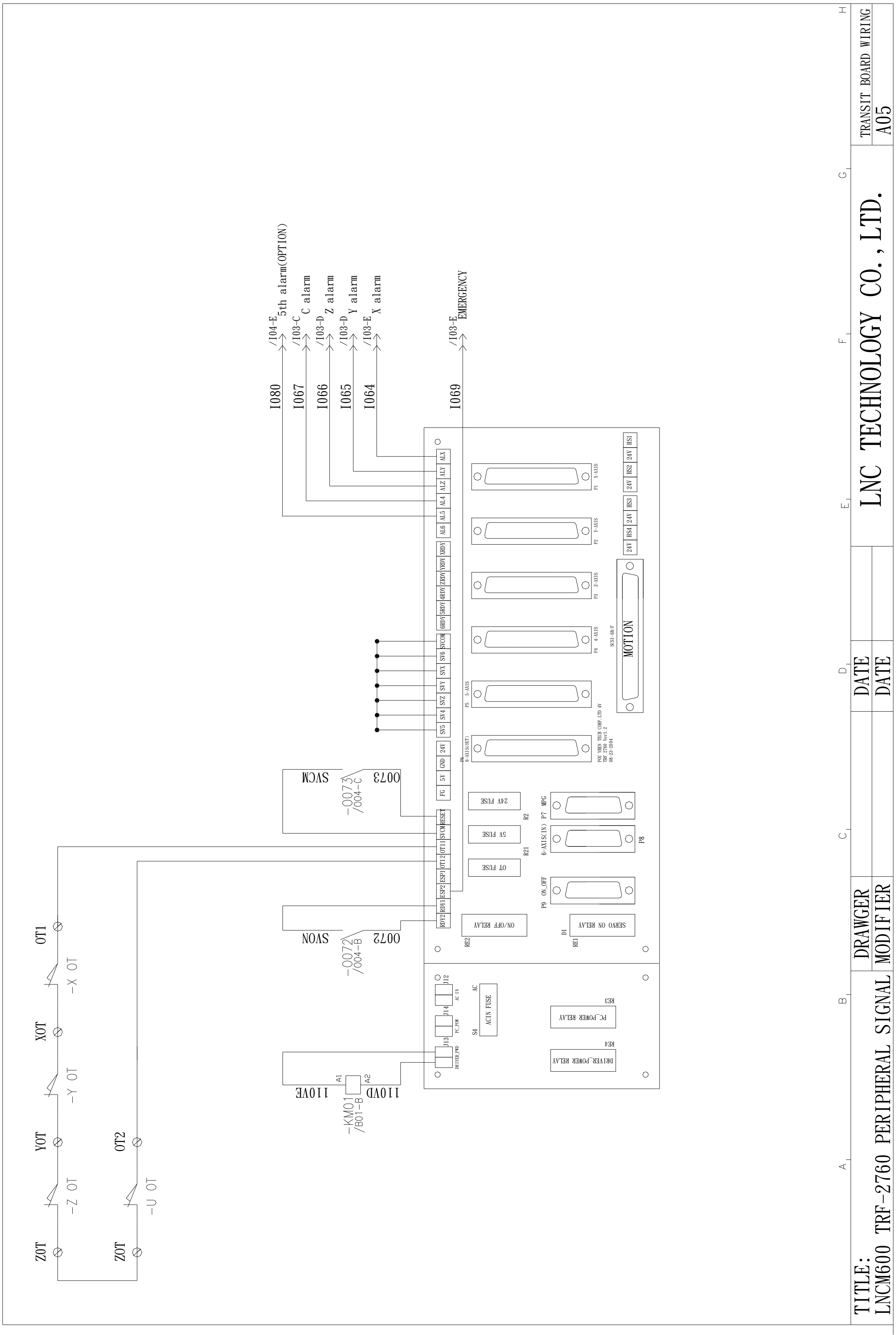
MIC2000

A-System Diagram-2760

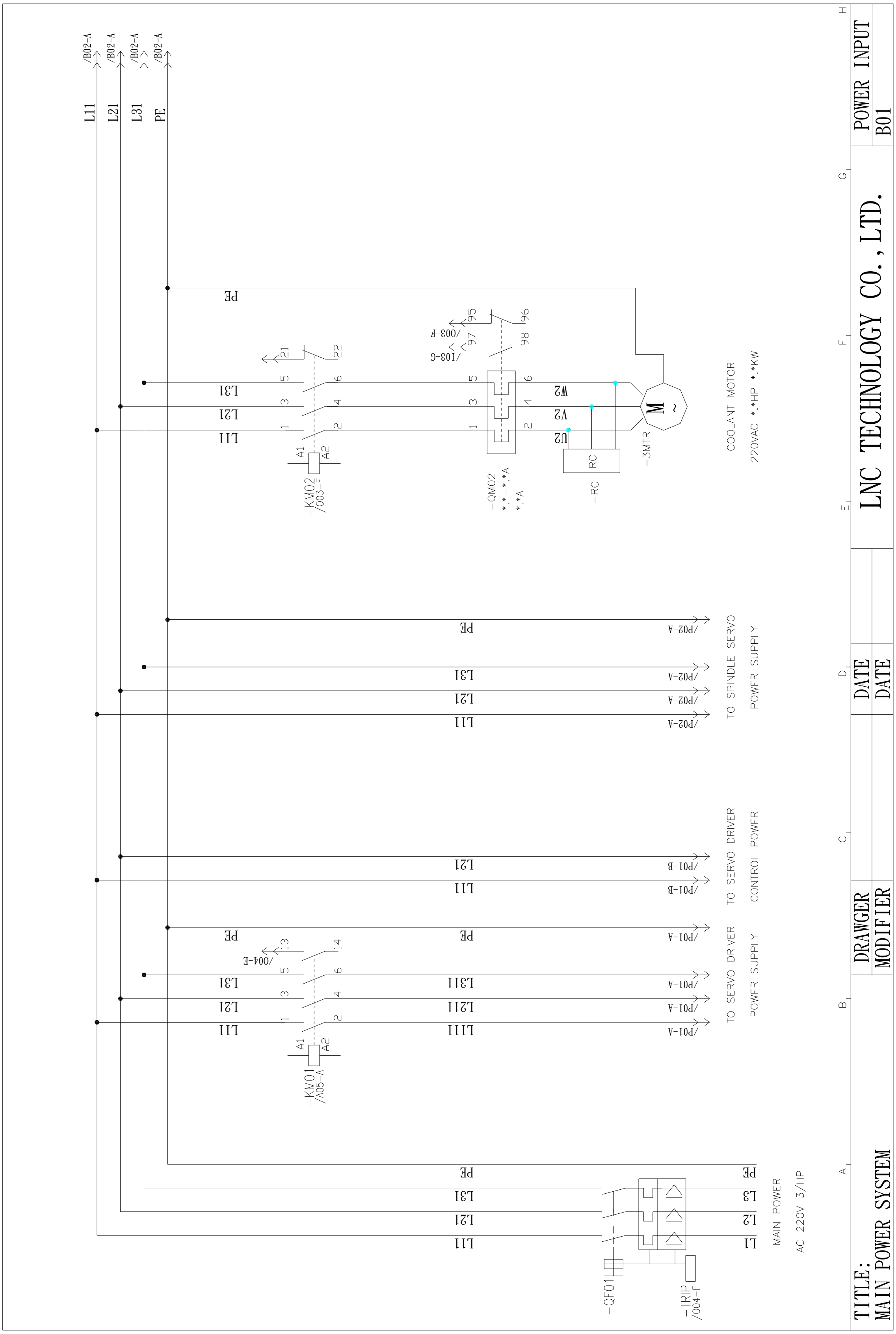


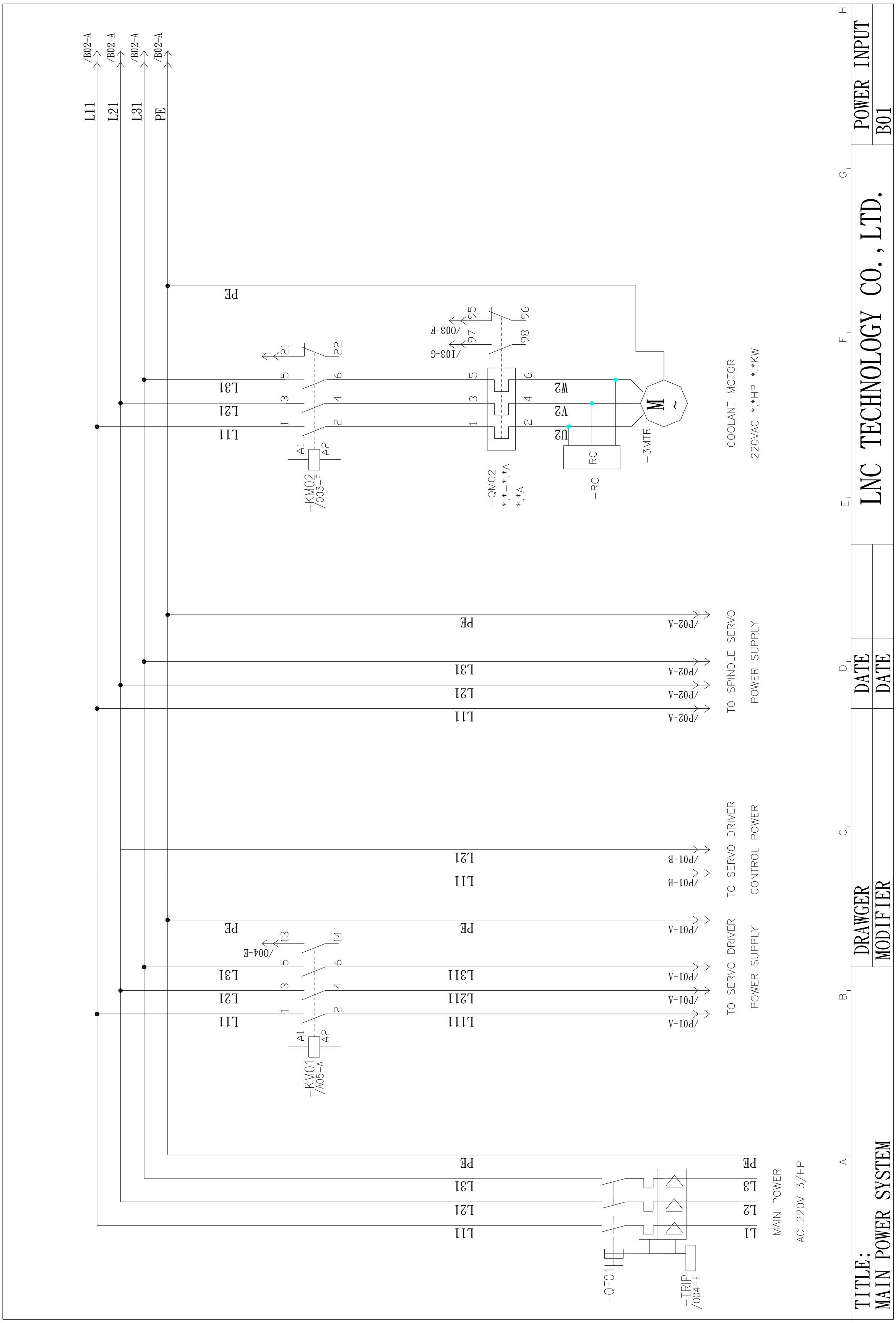

10.4" COLOR TFT LCD
VGA
12VDC
KEY BOARD
JPH1
POWER ADAPTER
AC0
AC1
MOTION
SERVO ON RELAY
ON/OFF RELAY
PC_POWER RELAY
DRIVER_POWER RELAY
ACIN FUSE
24V FUSE
5V FUSE
OT FUSE
POWER IN
OUTPUT
IPC UNIT
PANEL LINK
ETHERNET
COM1
PS2
PCC1620
SIO1540
LNC-M600(MIC 2000) CONTROL UNIT
RS422 Transmission Line
/R01-A
110VA
110VAC
PE
5VDC
0VDC
24VDC
/C01-G
/C01-E
WIRING DIAGRAM
A02
LNC TECHNOLOGY CO., LTD.
DATE
DRAWGER
MODIFIER
TITLE:
LNCM600 TRF-2760 POWER SYSTEM

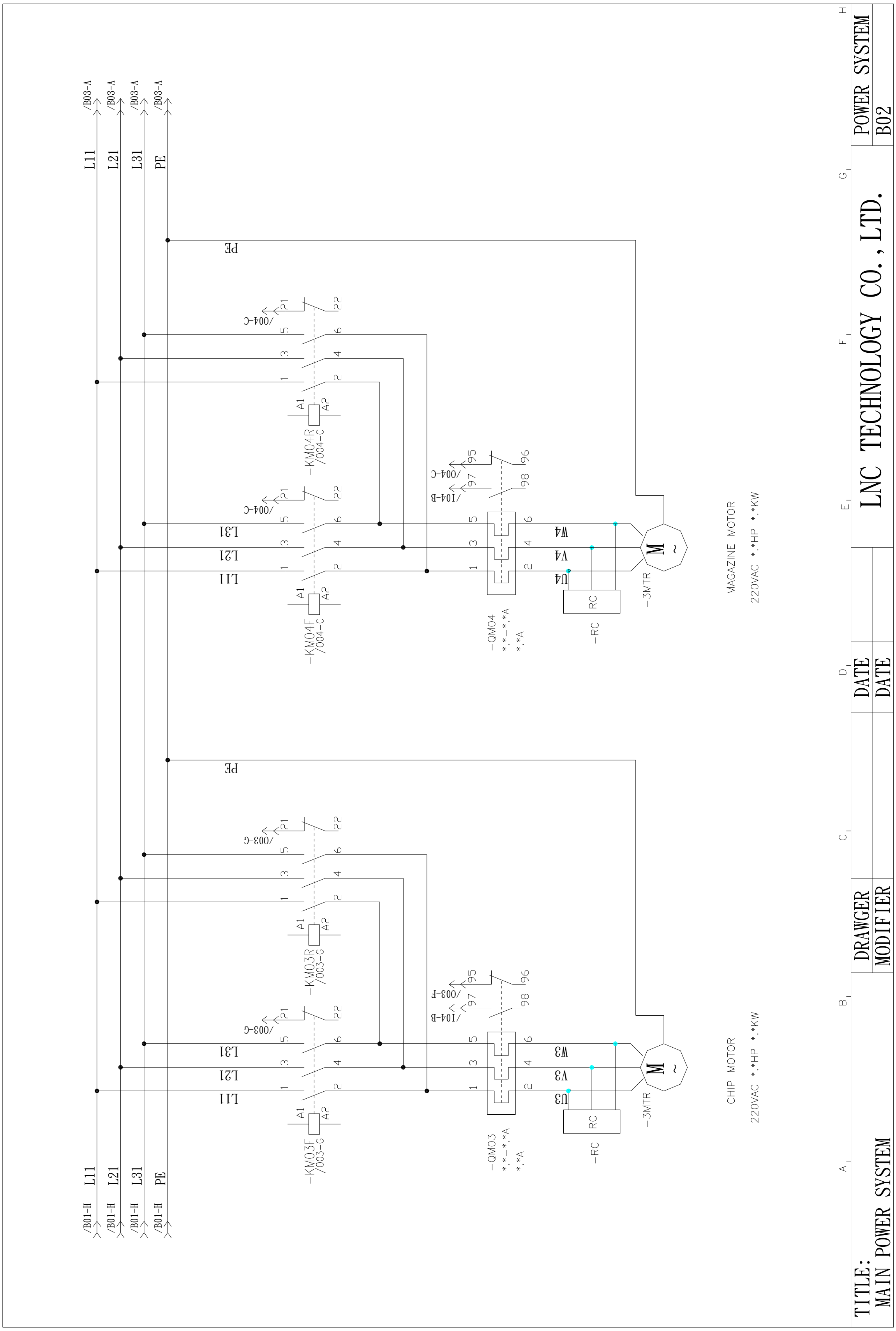

WIRING DIAGRAM
A03
LNC TECHNOLOGY CO., LTD.
TITLE:
LNCM600 PANASONIC SERVO SYSTEM CONFIGURATION
DRAWGER
MODIFIER
DATE
DATE
LNC-M600(MIC 2000) CONTROL UNIT
IPC UNIT
PCC1620
SIO1540
K01
MPG
TO INPUT
K15
MOTION
X AXIS
Y AXIS
Z AXIS
C AXIS
OPTION
MITSUBISHI MELSERVO MR-J2S-**A
SPINDLE
MITSUBISHI MDSASPJA75RT
K24
K51
K35
K59
-D9S
TO PC RS232
HC-SFS, RFS, UFS
SJ-PF5.5-01ZS201

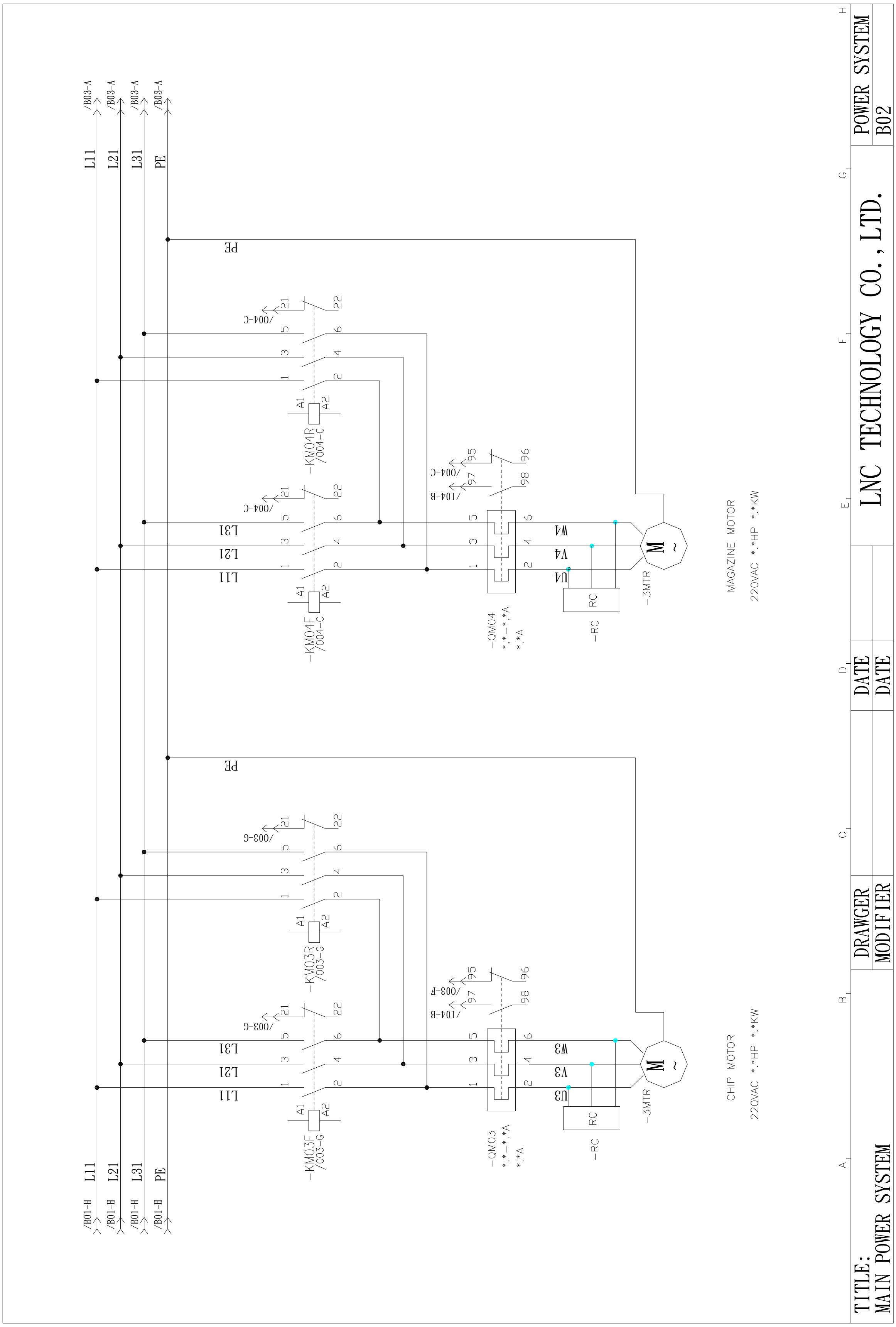

TITLE:
LNCM600 TRF-2760 PERIPHERAL SIGNAL
LNC TECHNOLOGY CO., LTD.
TRANSIT BOARD WIRING
A05
DRAWGER
MODIFIER
DATE
DATE
I080
I067
I066
I065
I064
I069
5th alarm(OPTION)
C alarm
Z alarm
Y alarm
X alarm
EMERGENCY
SVCM
O073
SVON
O072
110VE
110VD
-KM01
OT1
XOT
YOT
ZOT
OT2
-X OT
-Y OT
-Z OT
-U OT
MOTION

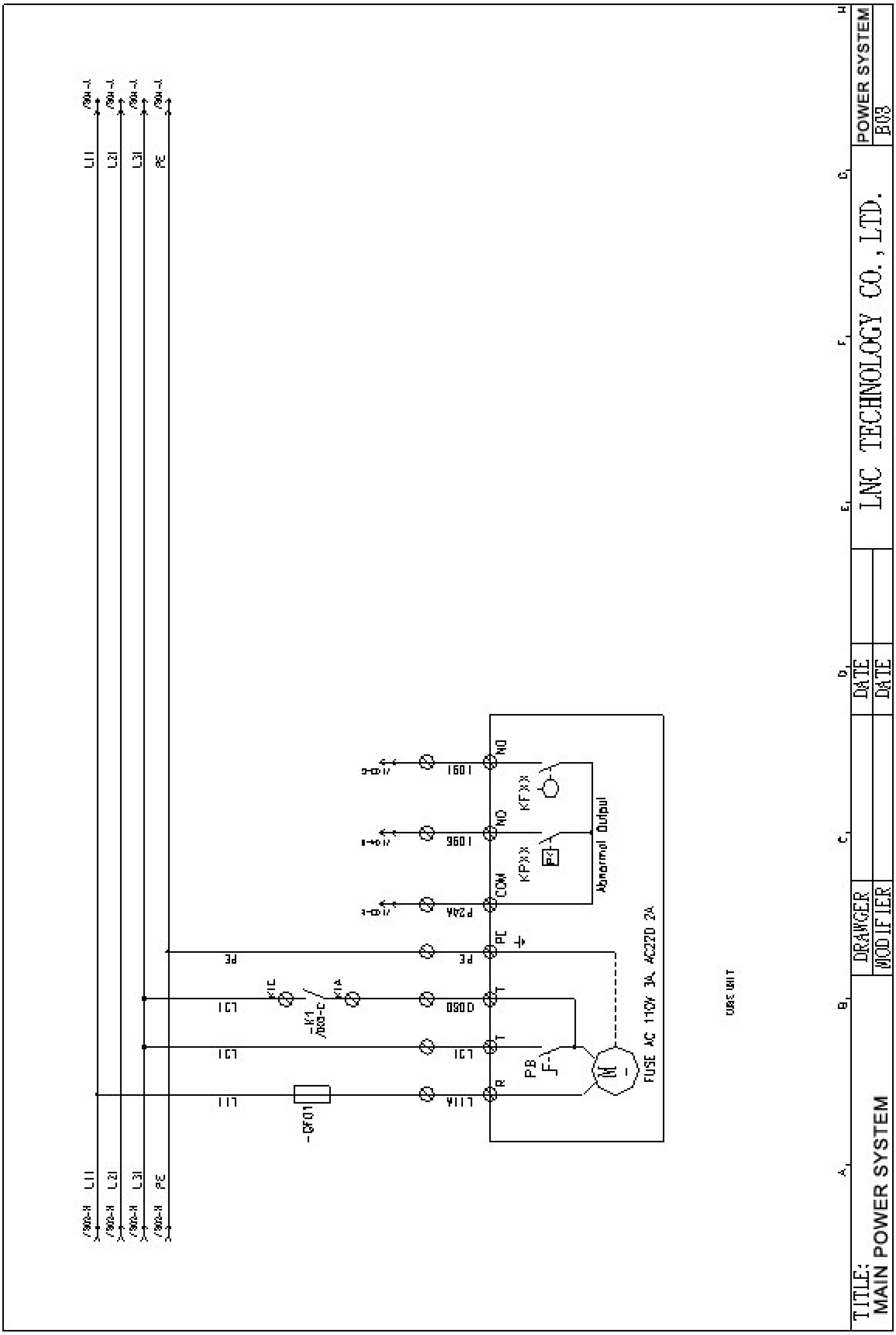
B-Main Power

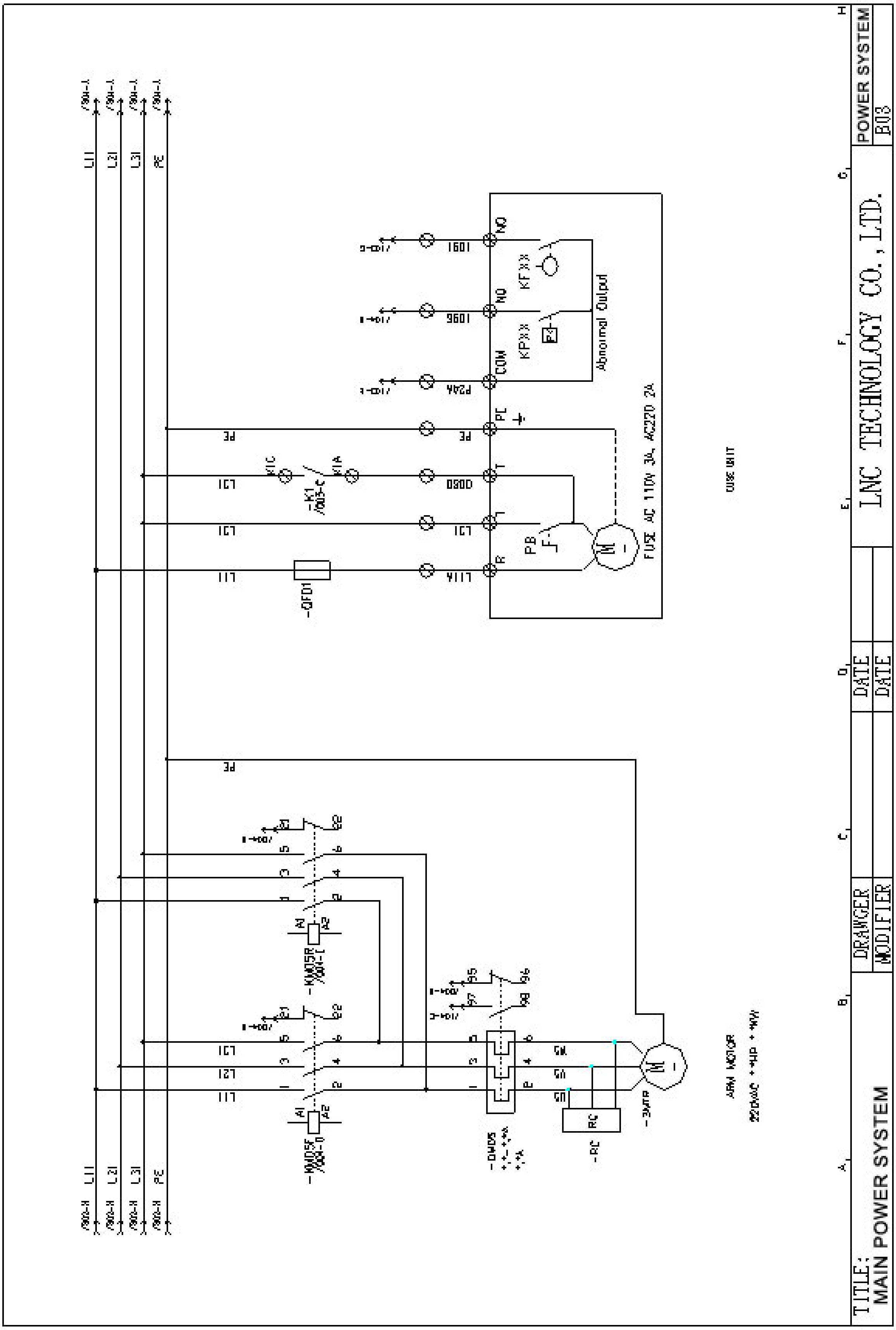

TITLE:
MAIN POWER SYSTEM
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
POWER INPUT
B01
MAIN POWER
AC 220V 3/HP
TO SERVO DRIVER
POWER SUPPLY
TO SERVO DRIVER
CONTROL POWER
TO SPINDLE SERVO
POWER SUPPLY
COOLANT MOTOR
220VAC *.*HP *.*KW
-QF01
-TRIP
/004-F
-KM01
/A05-A
-KM02
/003-F
-QM02
-RC
-3MTR
L11
L21
L31
PE
L111
L211
L311
U2
V2
W2

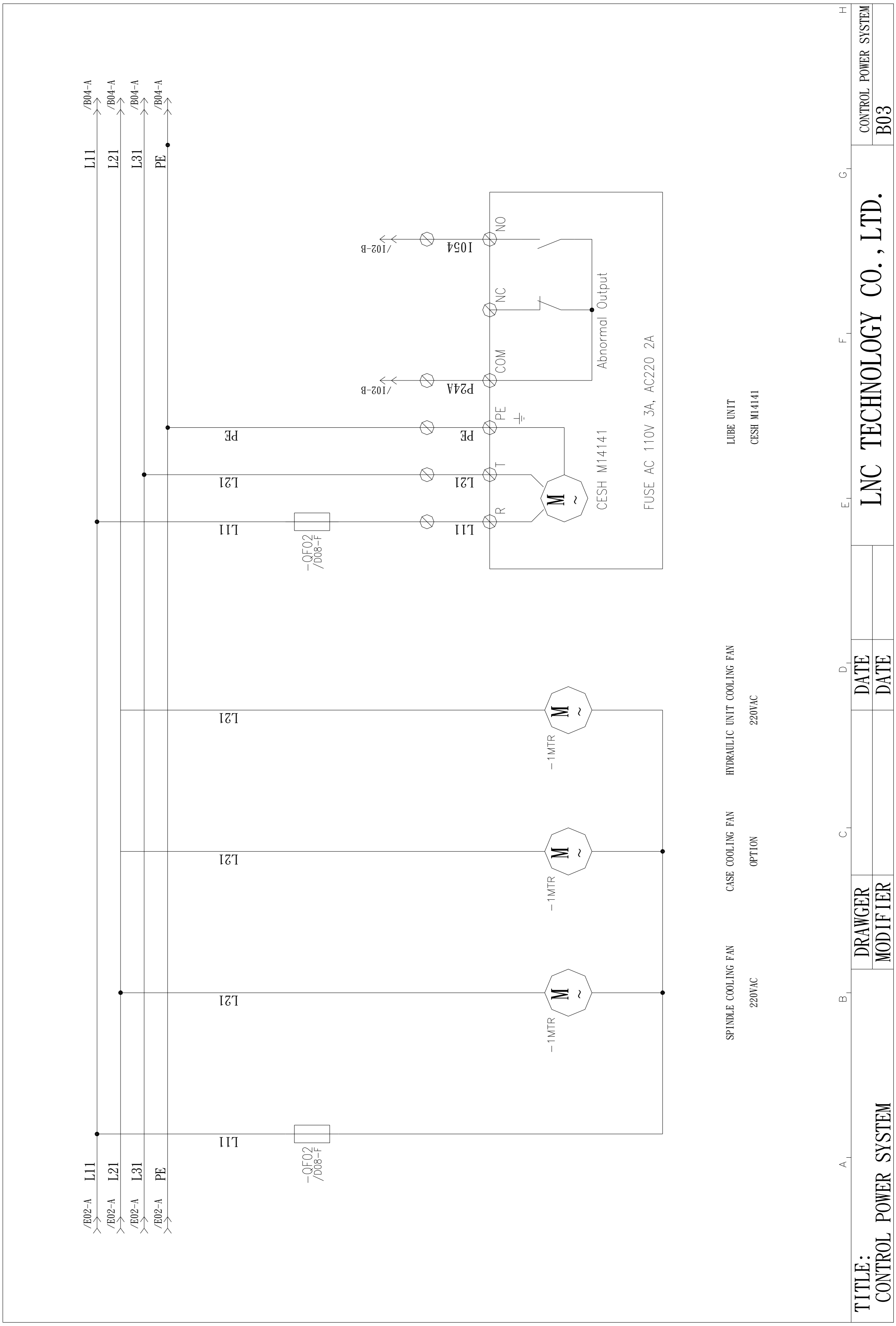

TITLE:
MAIN POWER SYSTEM
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
POWER INPUT
B01
MAIN POWER
AC 220V 3/HP
TO SERVO DRIVER
POWER SUPPLY
TO SERVO DRIVER
CONTROL POWER
TO SPINDLE SERVO
POWER SUPPLY
COOLANT MOTOR
220VAC *.*HP *.*KW
-QF01
-TRIP
/004-F
-KM01
/A05-A
-KM02
/003-F
-QM02
-RC
-3MTR
L11
L21
L31
PE

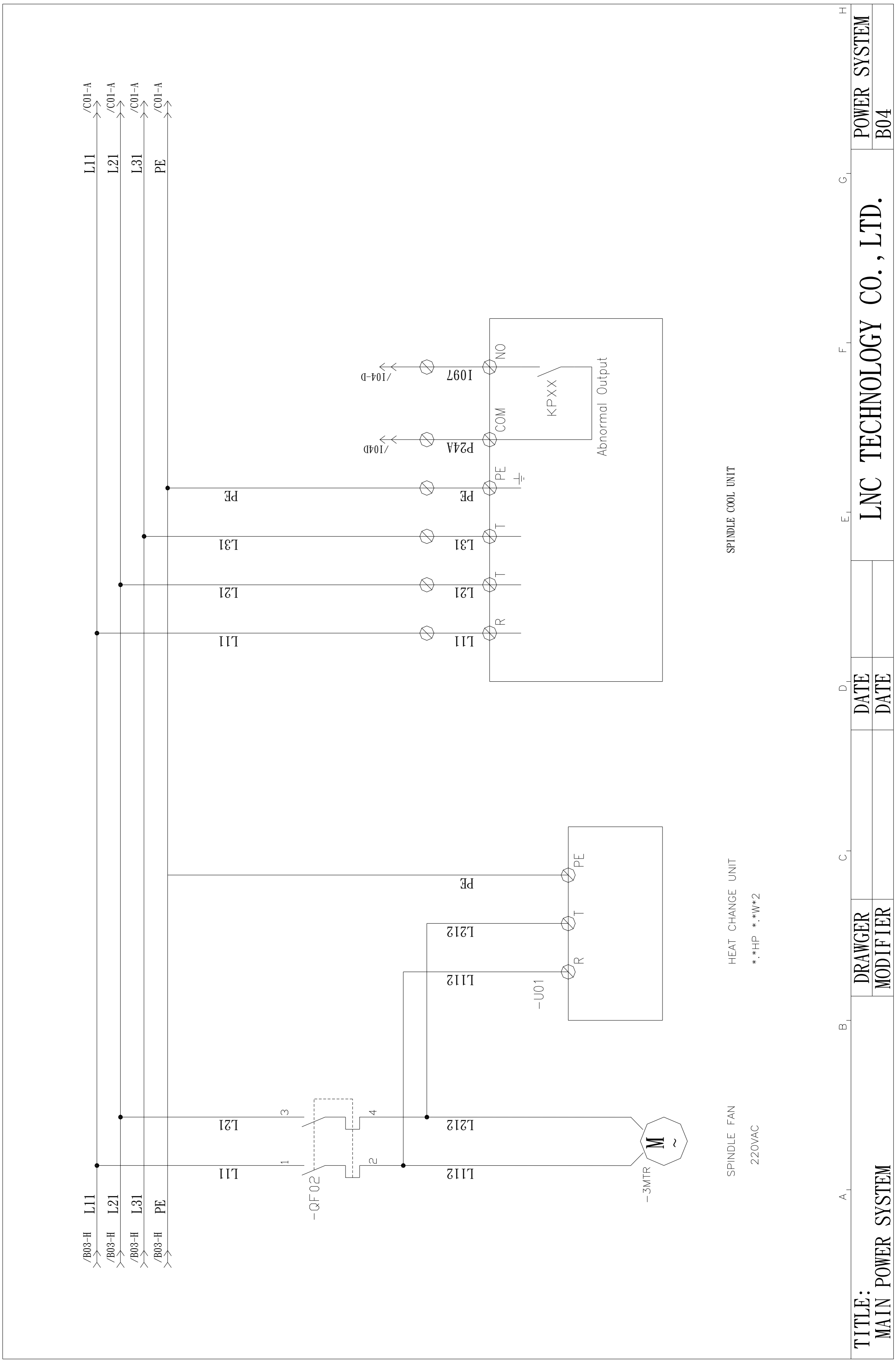

TITLE:
MAIN POWER SYSTEM
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
POWER SYSTEM
B02
MAGAZINE MOTOR
220VAC *.*HP *.*KW
CHIP MOTOR
220VAC *.*HP *.*KW
-KM04F
-KM04R
-KM03F
-KM03R
-QM04
-QM03
-3MTR
-RC
L11
L21
L31
PE

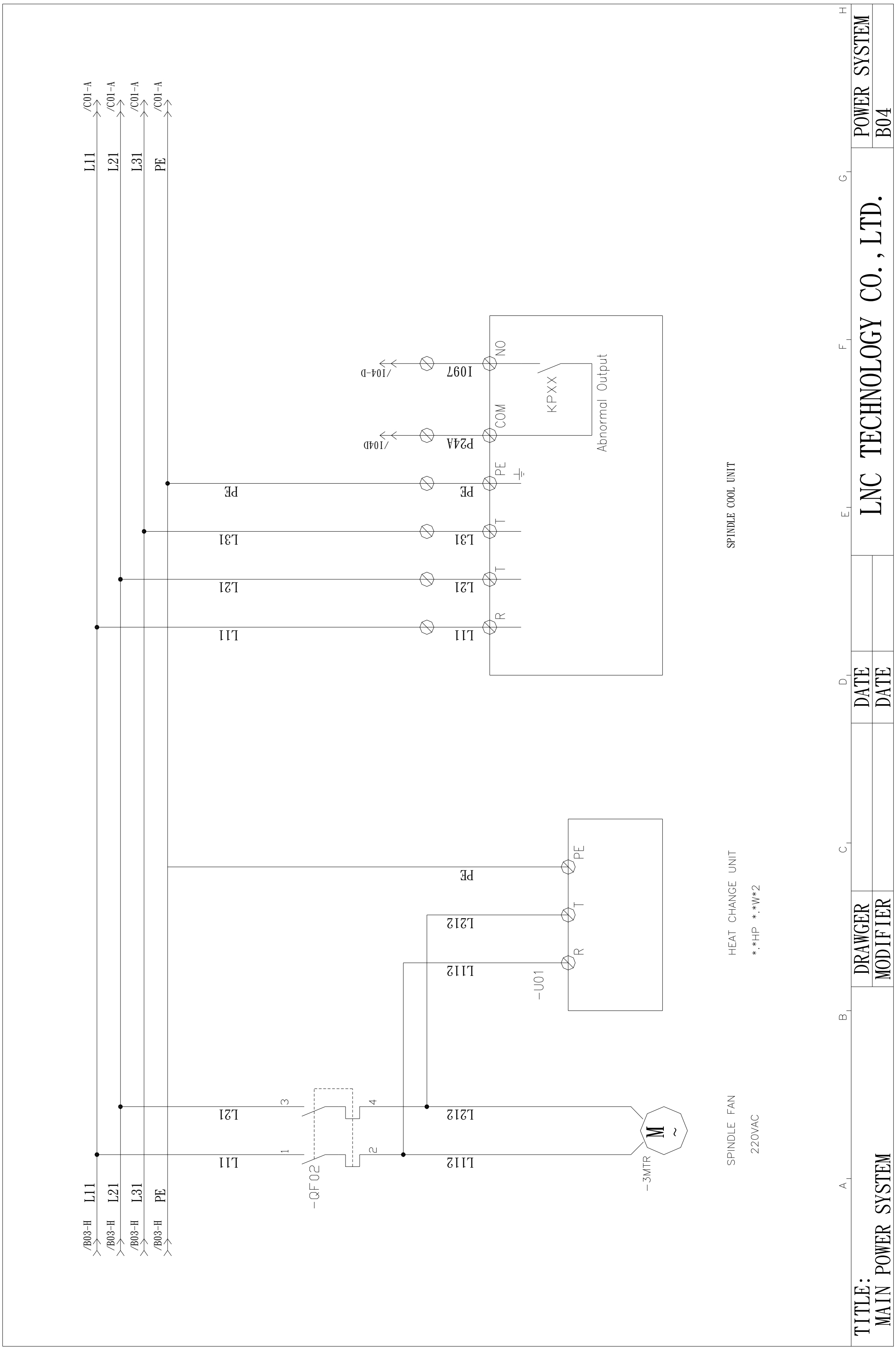

L11
L21
L31
PE
/B03-A
/B01-H
-KM03F
/003-G
-KM03R
-KM04F
/004-C
-KM04R
-QM03
-QM04
-RC
RC
-3MTR
U3
V3
W3
U4
V4
W4
/104-B
/003-F
CHIP MOTOR
220VAC *.*HP *.*KW
MAGAZINE MOTOR
220VAC *.*HP *.*KW
TITLE:
MAIN POWER SYSTEM
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
POWER SYSTEM
B02

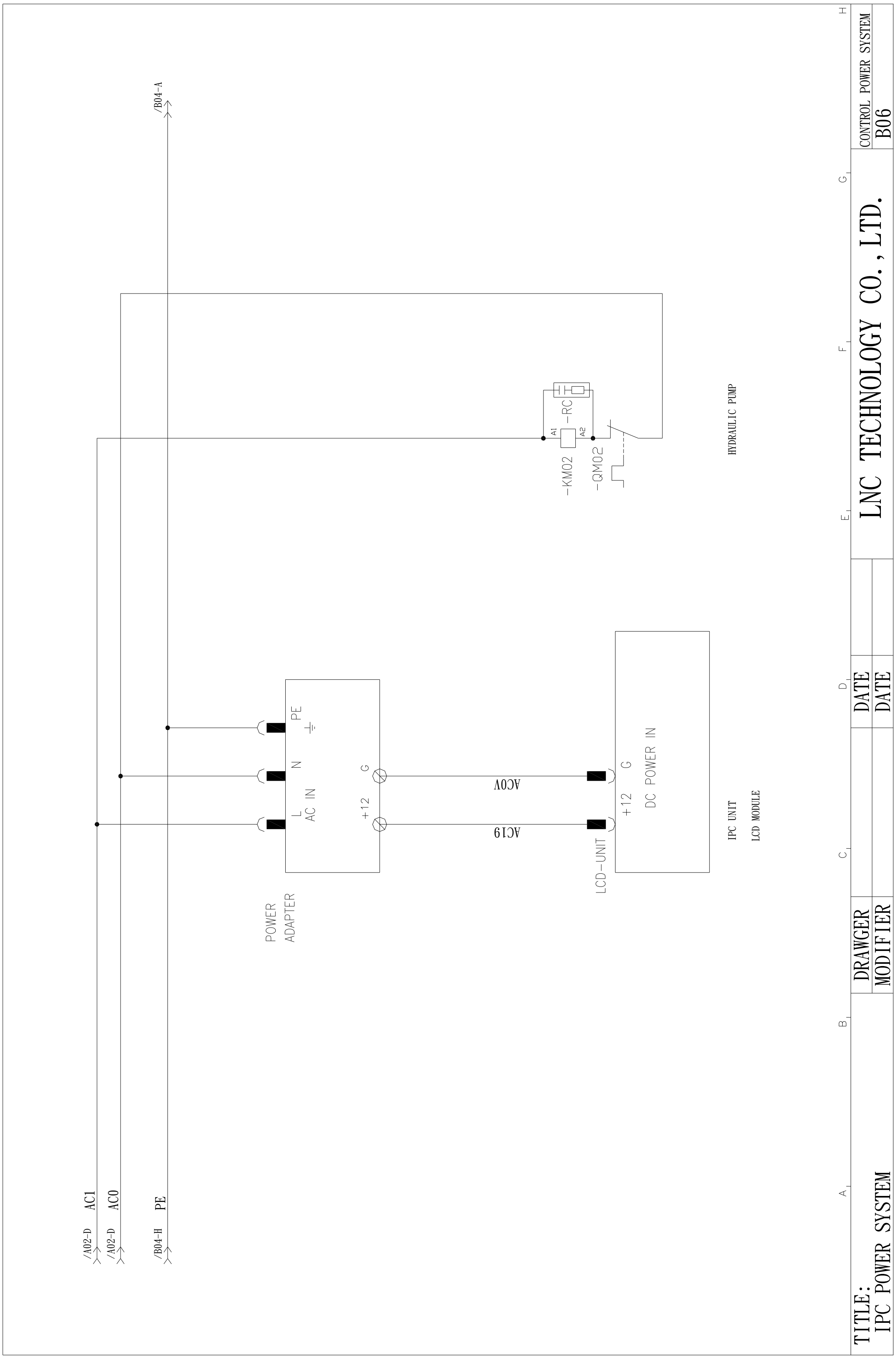

TITLE:
MAIN POWER SYSTEM
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
POWER SYSTEM
B03
FUSE AC 110V 3A AC220 2A
Abnormal Output
L11
L21
L31
PE
-QF01
COM
NO
NO
PE
PB


TITLE:
MAIN POWER SYSTEM
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
POWER SYSTEM
B03
ARM MOTOR
FUSE AC 110V 3A, AC220 2A
Abnormal Output
L11
L21
L31
PE
-QF01
COM
NO

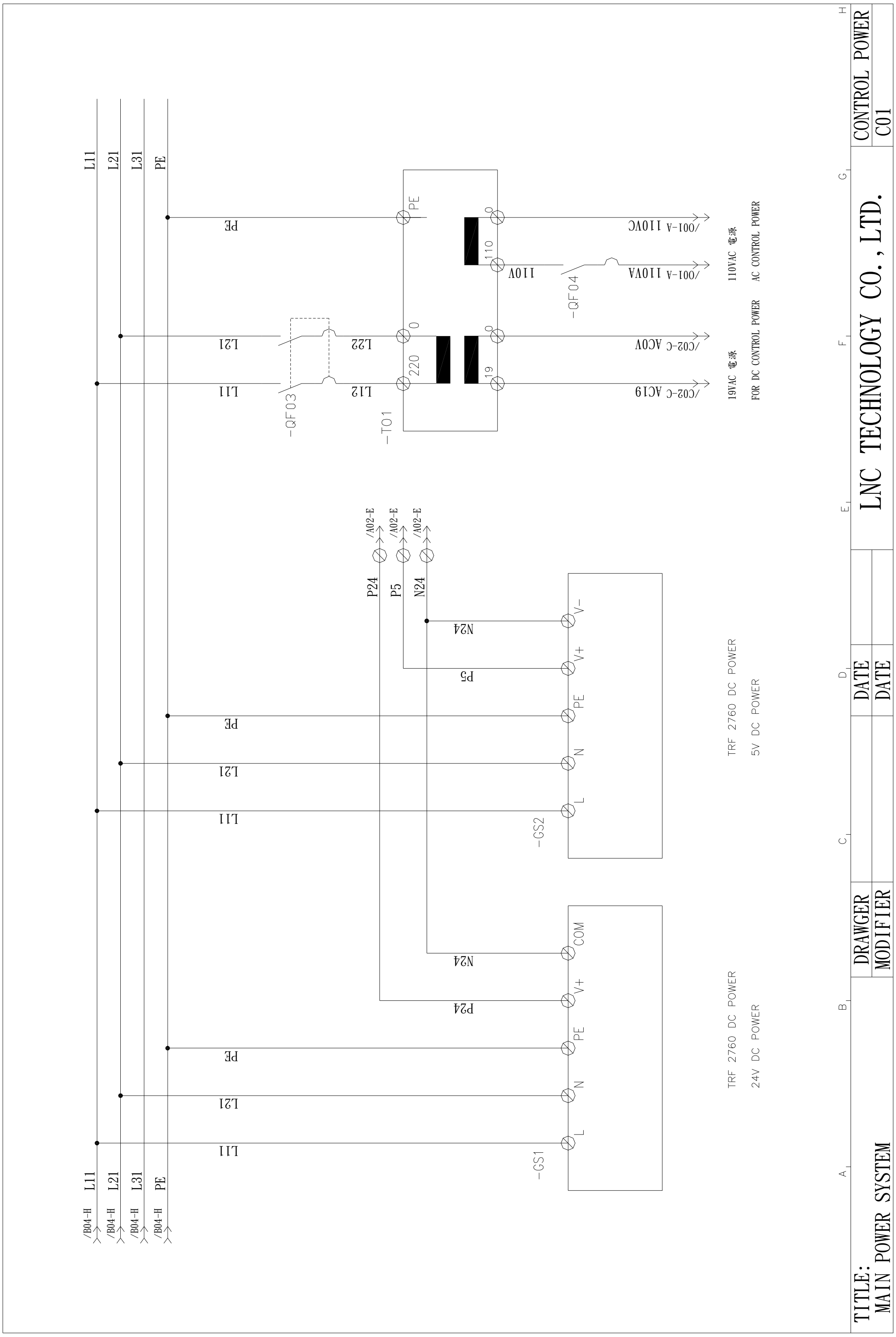

L11
L21
L31
PE
/B04-A
/E02-A
-QF02
/D08-F
I054
/I02-B
P24A
NO
NC
COM
PE
T
R
Abnormal Output
CESH M14141
FUSE AC 110V 3A, AC220 2A
LUBE UNIT
CESH M14141
HYDRAULIC UNIT COOLING FAN
220VAC
CASE COOLING FAN
OPTION
SPINDLE COOLING FAN
220VAC
-1MTR
M
LNC TECHNOLOGY CO., LTD.
CONTROL POWER SYSTEM
B03
DATE
DATE
DRAWGER
MODIFIER
TITLE:
CONTROL POWER SYSTEM

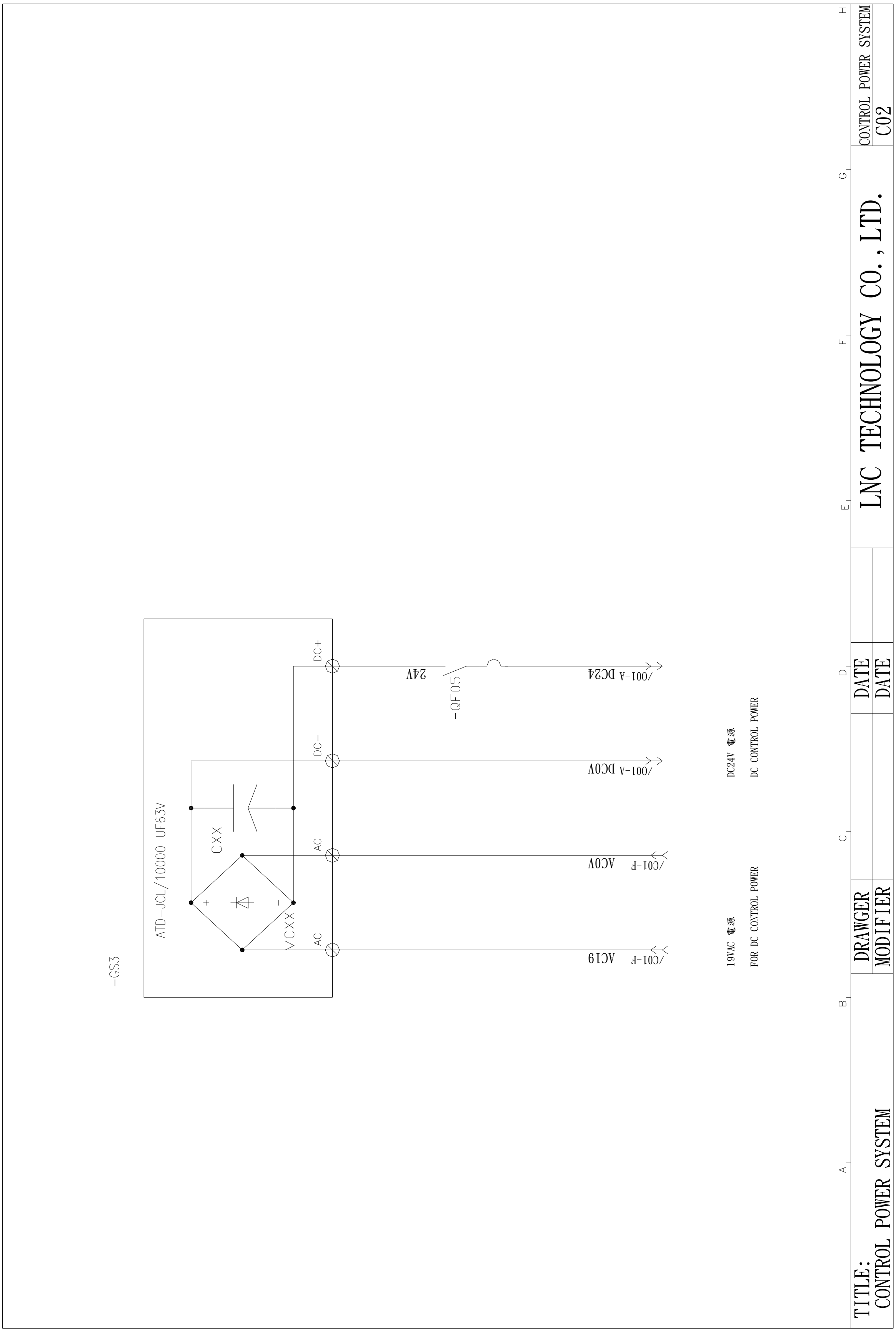

TITLE:
MAIN POWER SYSTEM
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
POWER SYSTEM
B04
SPINDLE COOL UNIT
KPXX
Abnormal Output
HEAT CHANGE UNIT
*.*HP *.*W*2
-U01
SPINDLE FAN
220VAC
-3MTR
-QF02
L11
L21
L31
PE
L112
L212
P24A
I097
/C01-A
/B03-H
/104D
/104-D


L11
L21
L31
PE
/C01-A
/B03-H
-QF02
-3MTR
-U01
L112
L212
P24A
I097
/104D
/104-D
NO
COM
R
T
KPXX
Abnormal Output
SPINDLE COOL UNIT
HEAT CHANGE UNIT
*.*HP *.*W*2
SPINDLE FAN
220VAC
TITLE:
MAIN POWER SYSTEM
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
POWER SYSTEM
B04

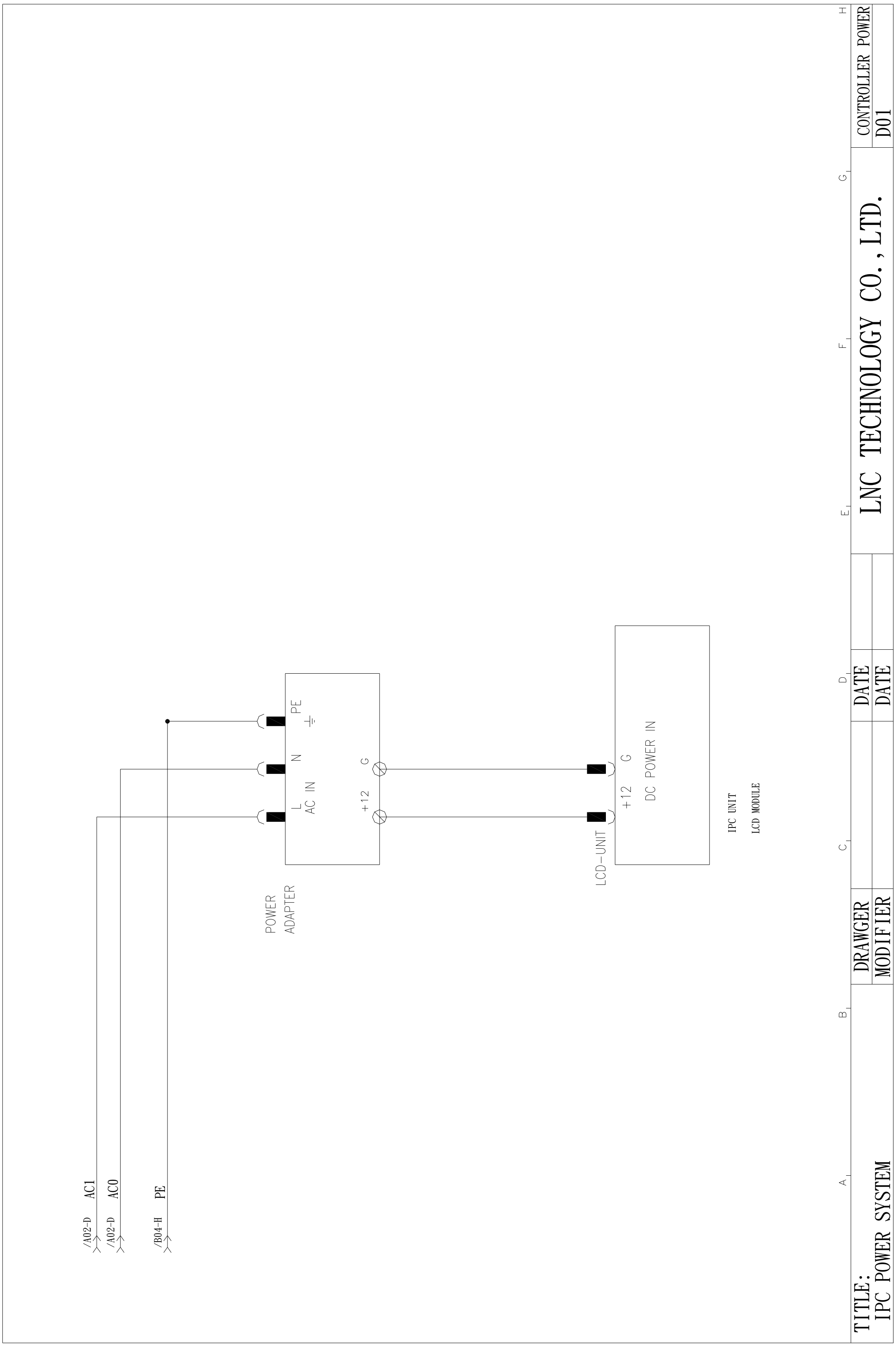

/B04-A
/A02-D AC1
/A02-D AC0
/B04-H PE
POWER ADAPTER
L
N
PE
AC IN
+12
G
AC19
AC0V
LCD-UNIT
+12
G
DC POWER IN
IPC UNIT
LCD MODULE
-KM02
A1
A2
-RC
-QM02
HYDRAULIC PUMP
CONTROL POWER SYSTEM
B06
LNC TECHNOLOGY CO., LTD.
DATE
DATE
DRAWGER
MODIFIER
TITLE:
IPC POWER SYSTEM

C-Control Circuit

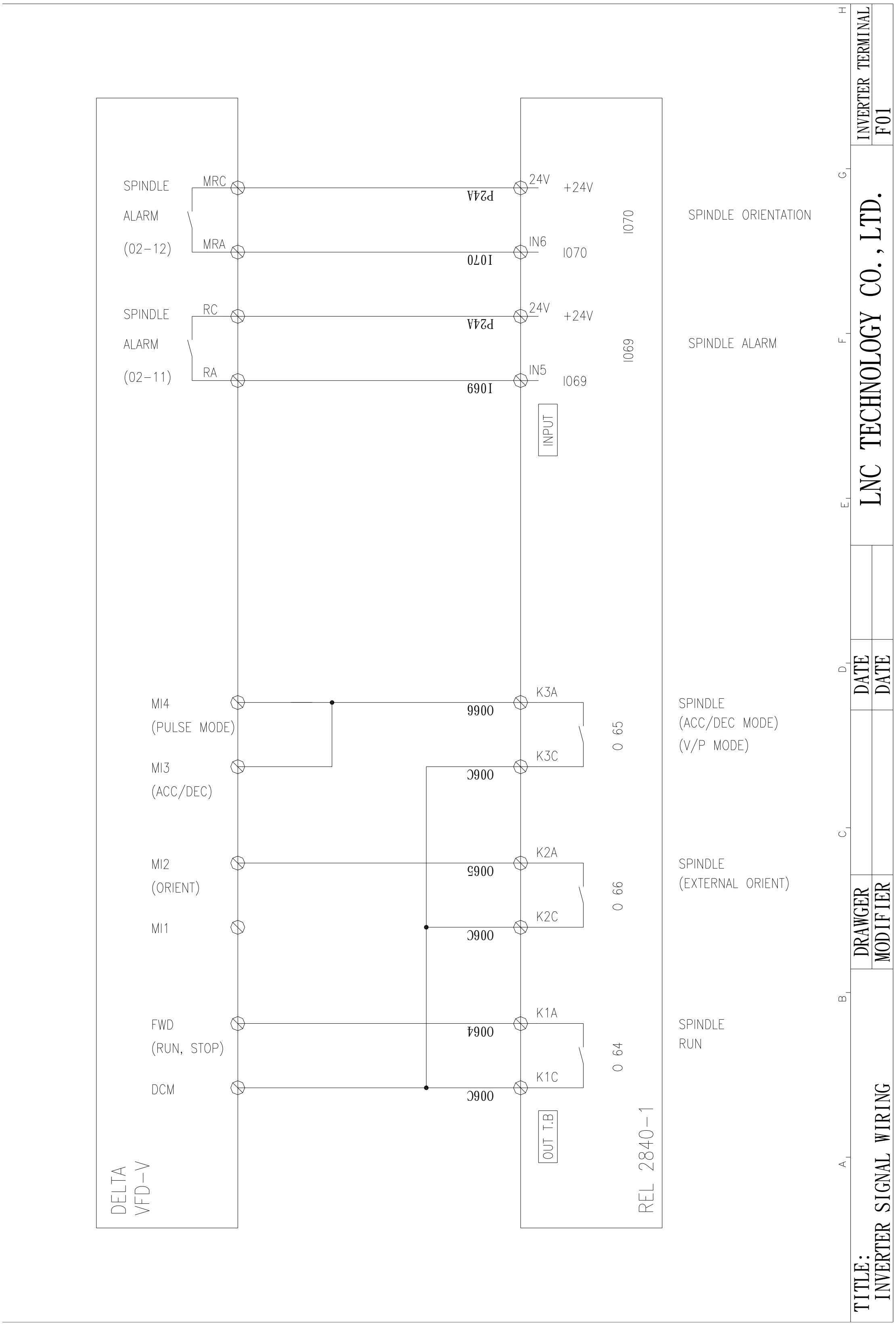



CONTROL POWER SYSTEM
C02
LNC TECHNOLOGY CO., LTD.
DATE
DATE
DRAWGER
MODIFIER
TITLE:
CONTROL POWER SYSTEM
-GS3
ATD-JCL/10000 UF63V
CXX
VCXX
DC+
DC-
AC
AC
24V
-QF05
/001-A DC24
/001-A DC0V
/C01-F AC0V
/C01-F AC19
DC24V 電源
DC CONTROL POWER
19VAC 電源
FOR DC CONTROL POWER

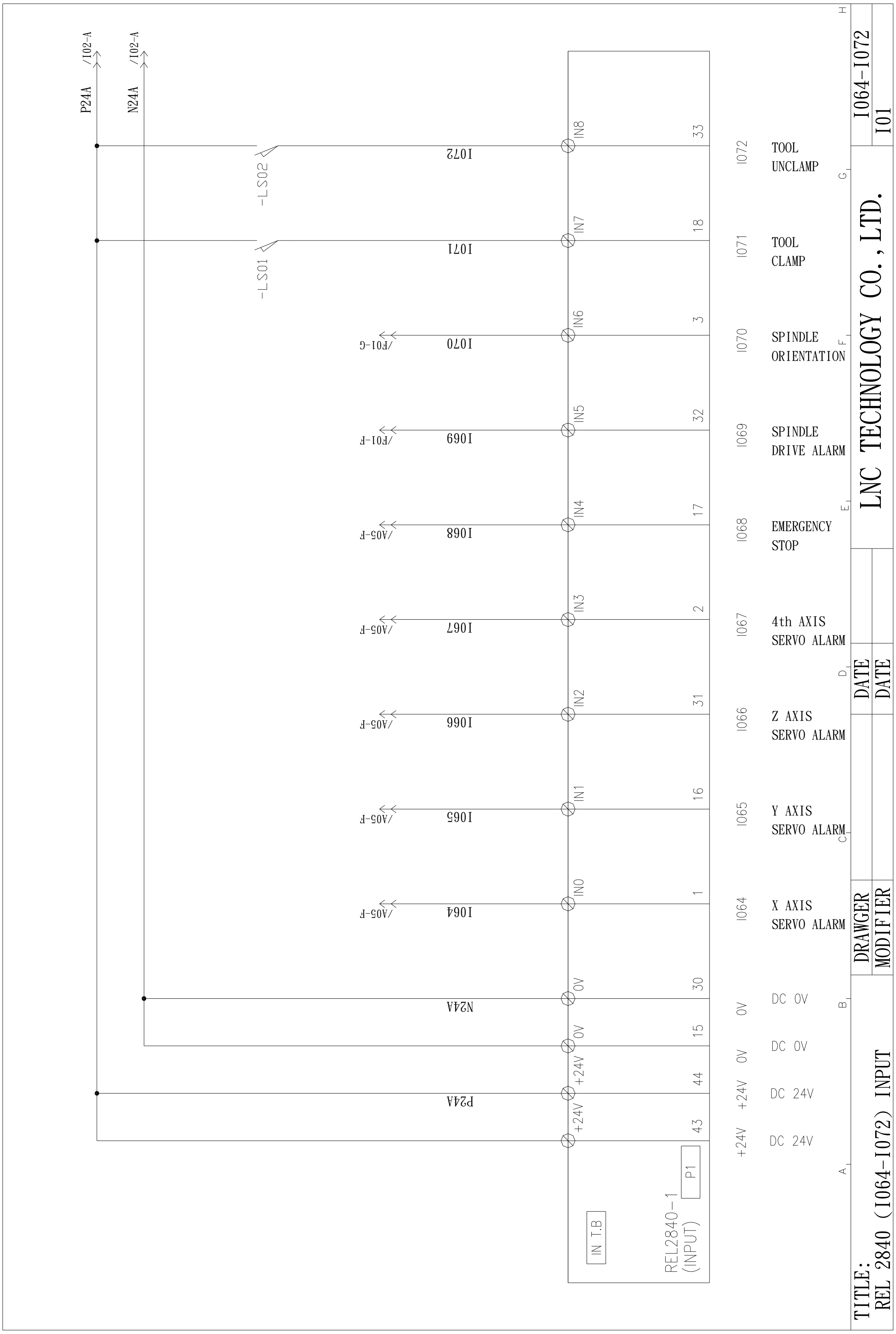
D-IPC Power

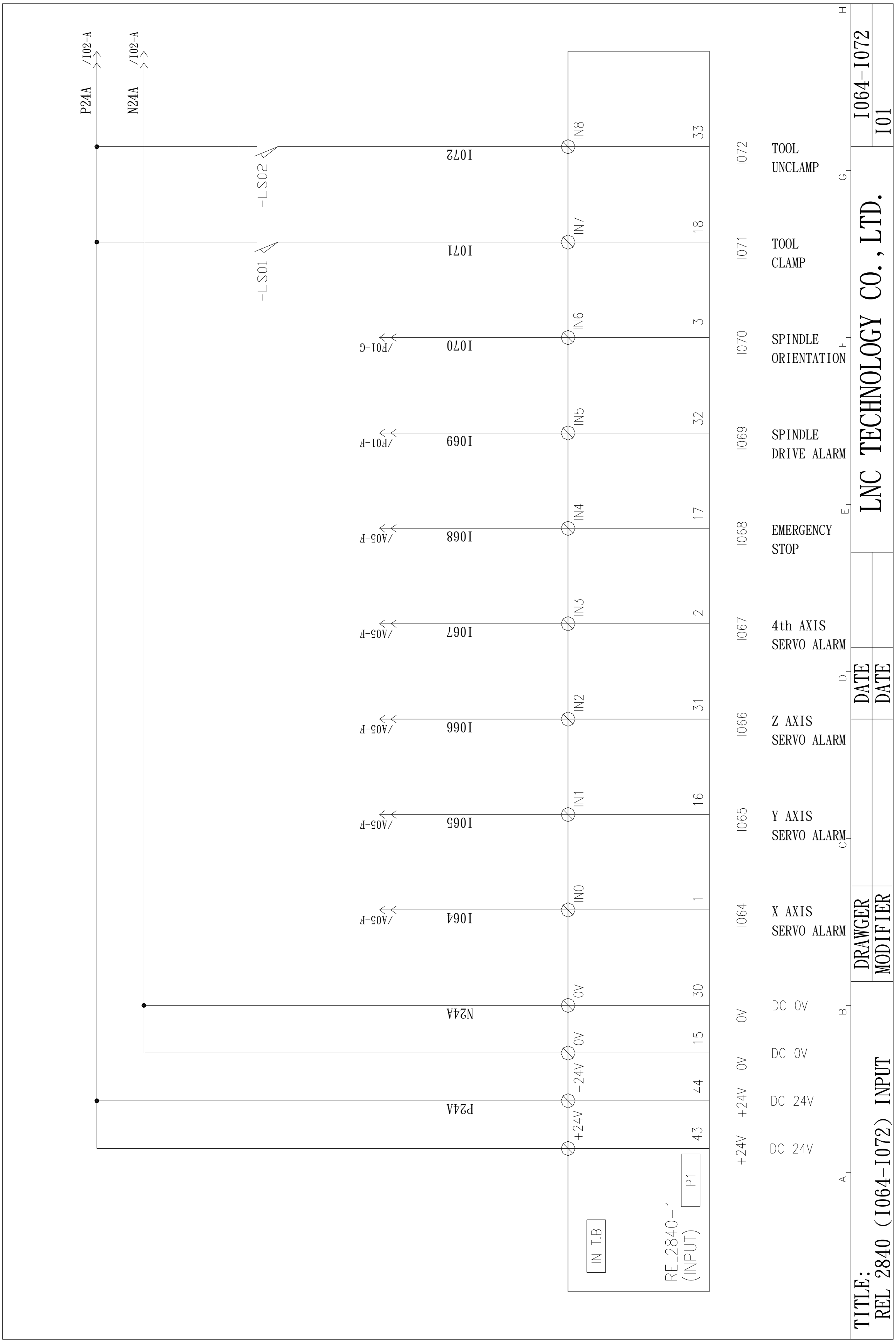

TITLE:
IPC POWER SYSTEM
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
CONTROLLER POWER
D01
/A02-D AC1
/A02-D AC0
/B04-H PE
POWER
ADAPTER
L
N
PE
AC IN
+12
G
LCD-UNIT
+12
G
DC POWER IN
IPC UNIT
LCD MODULE

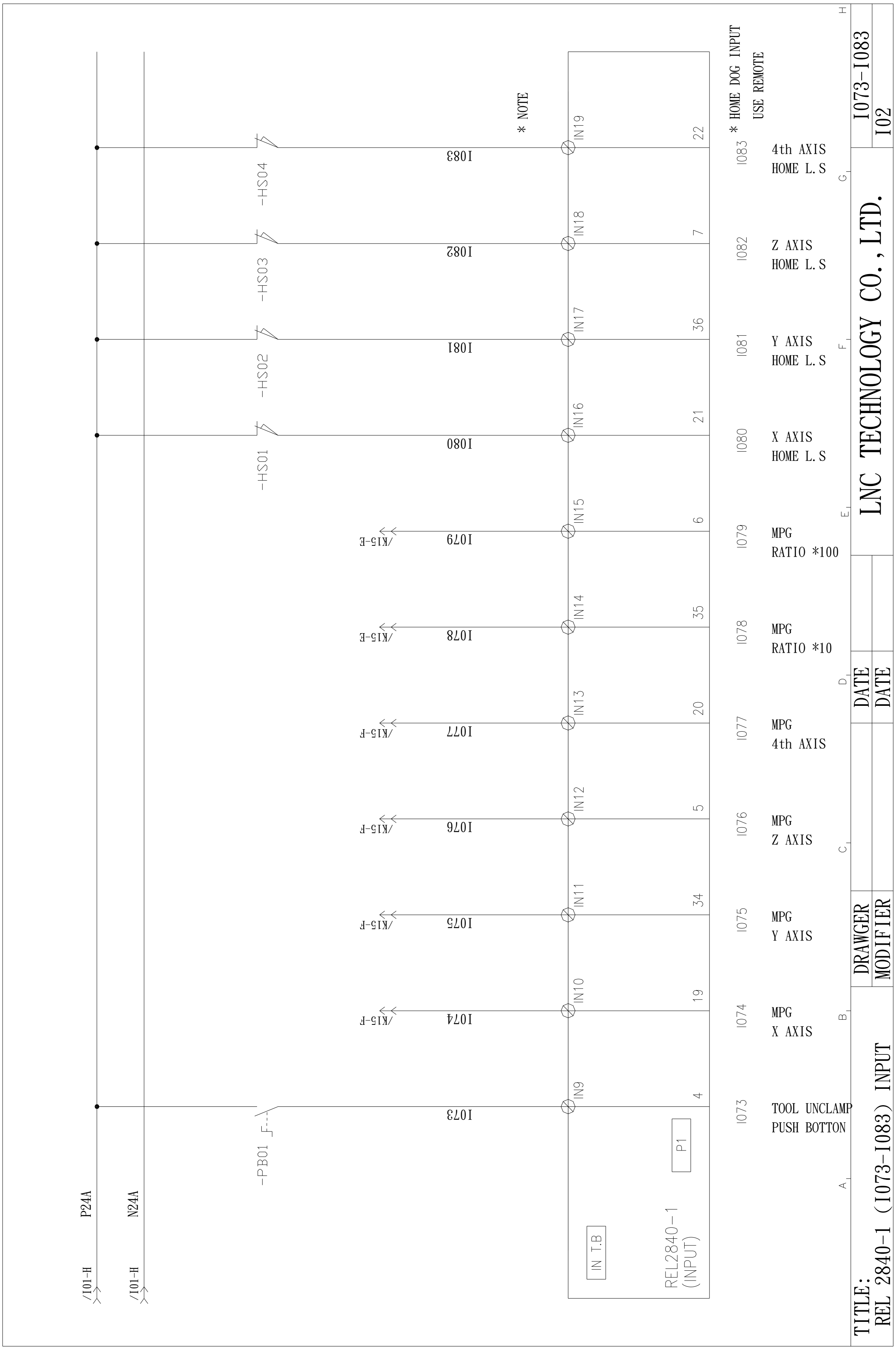
F-Spindle Terminal Interface

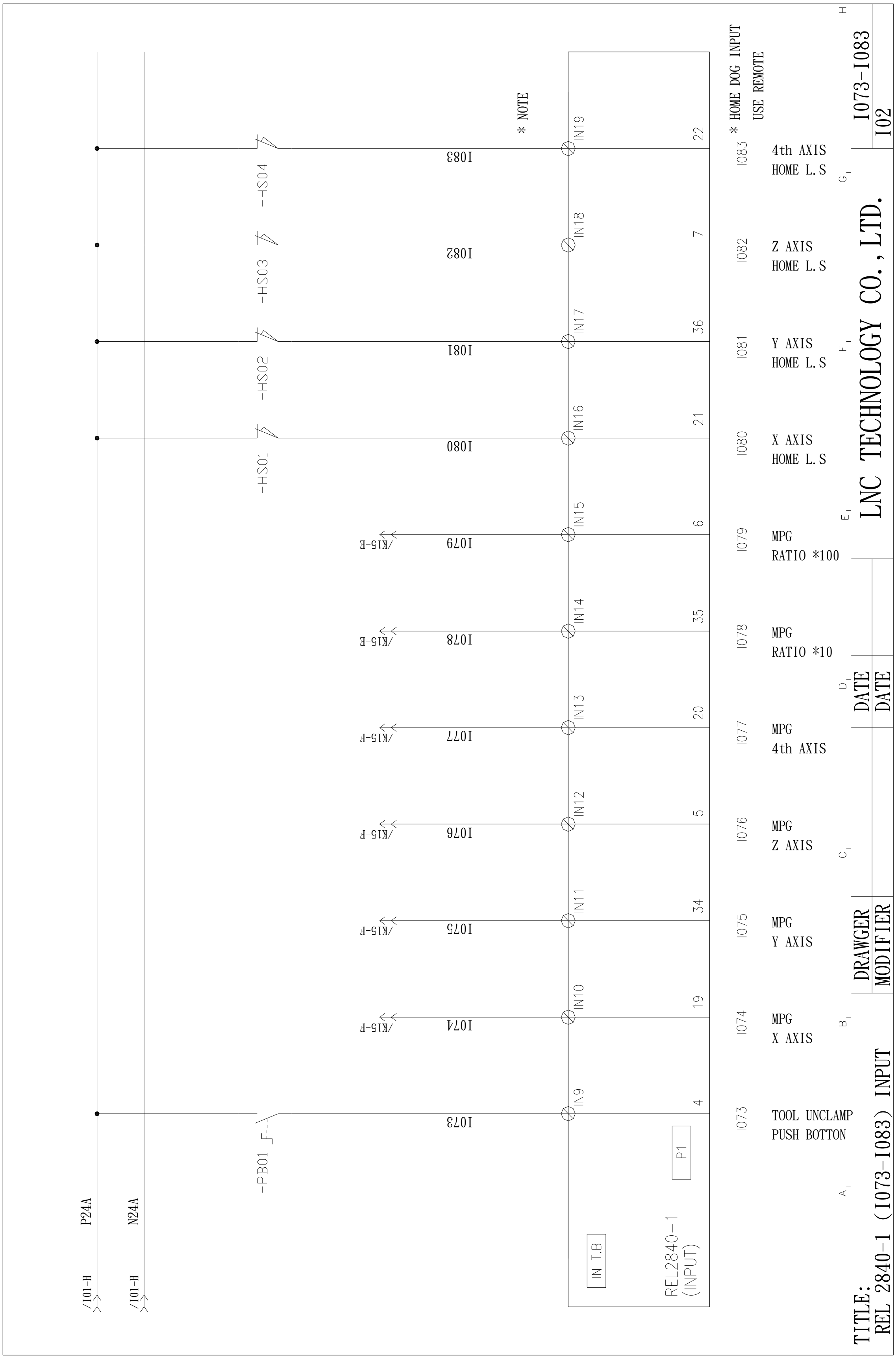


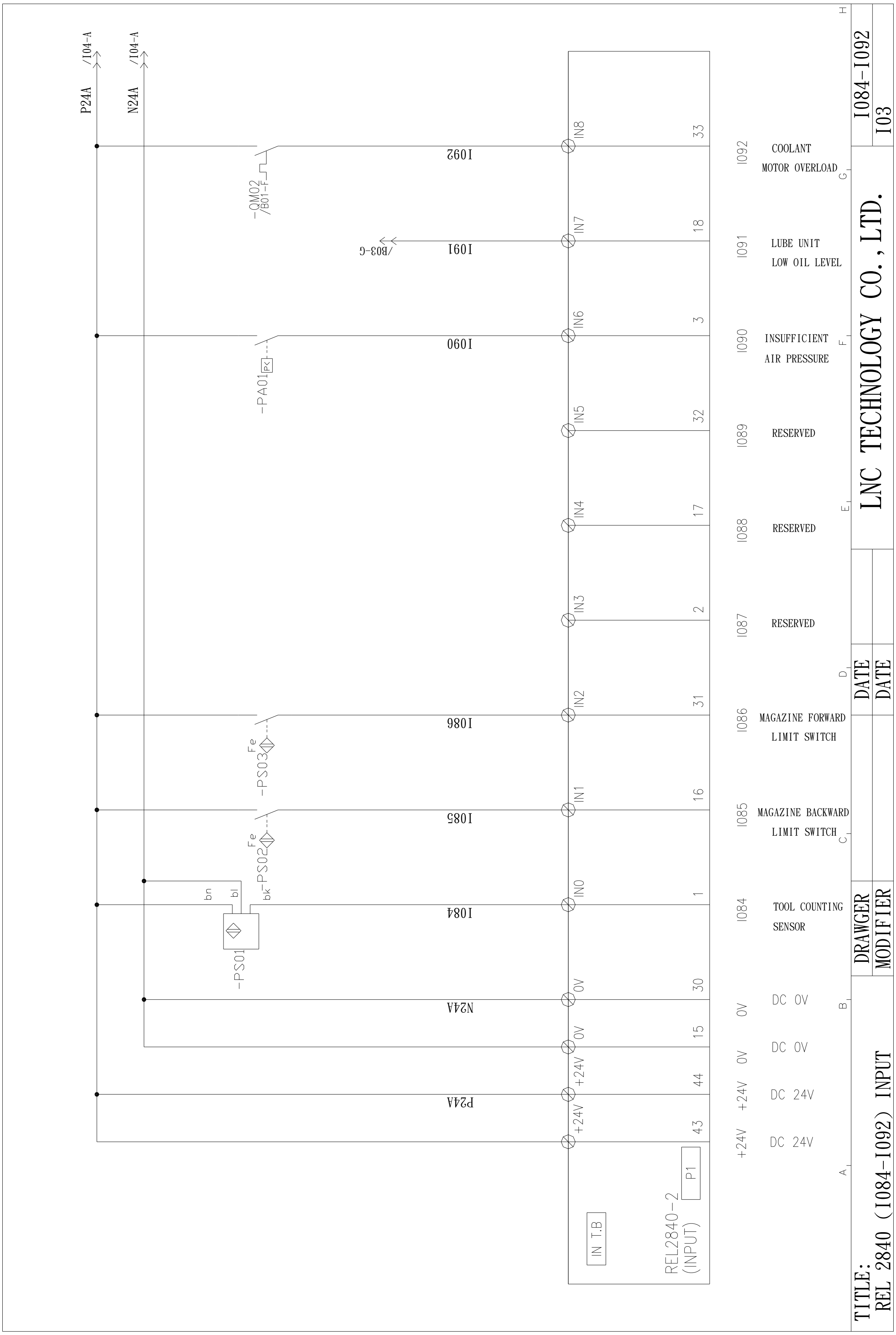
I-Input Wiring

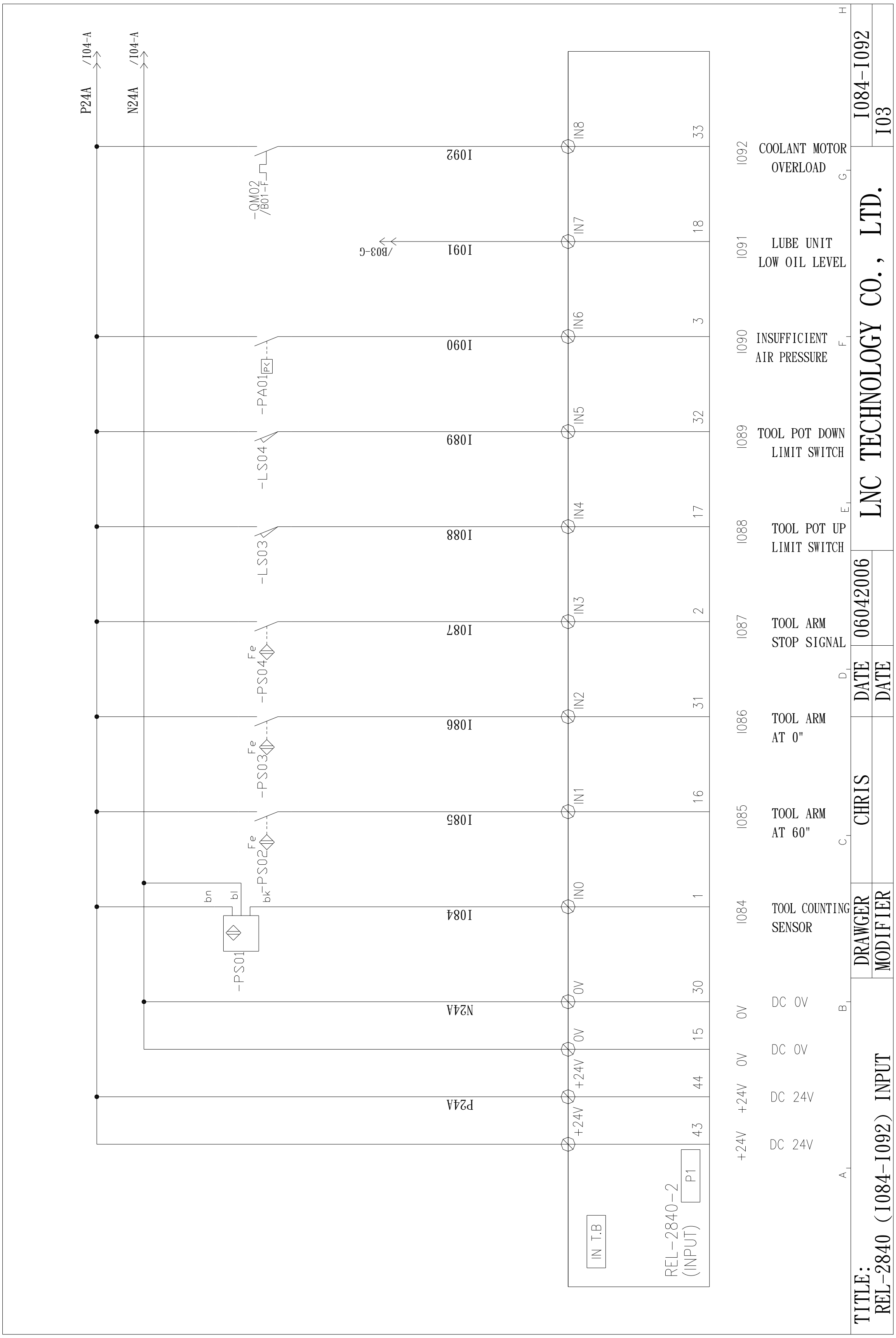


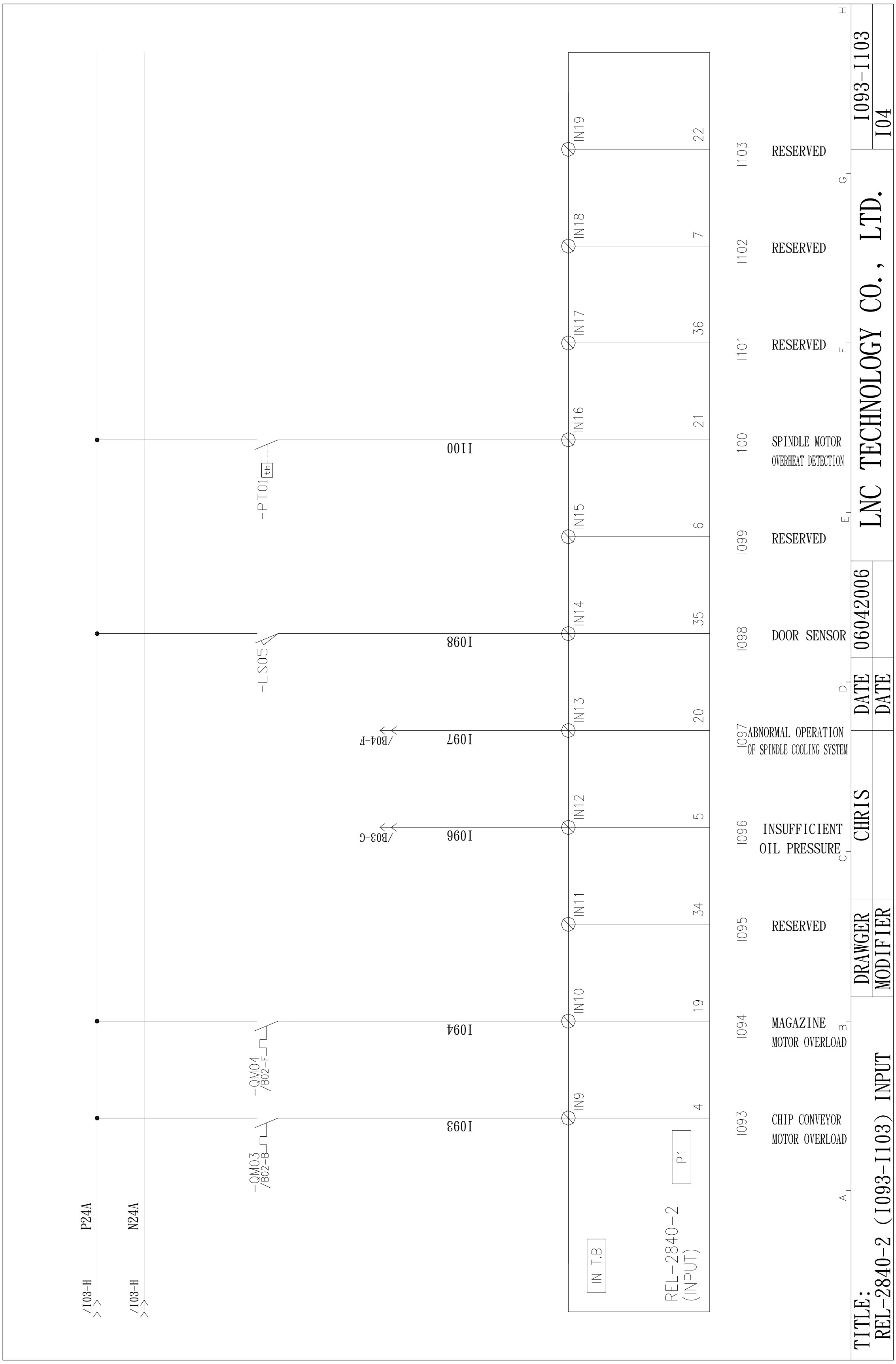

P24A
N24A
/I02-A
-LS02
-LS01
I072
I071
I070
I069
I068
I067
I066
I065
I064
N24A
P24A
/F01-G
/F01-F
/A05-F
IN8
IN7
IN6
IN5
IN4
IN3
IN2
IN1
IN0
0V
+24V
33
18
3
32
17
2
31
16
1
30
15
44
43
IN T.B
REL2840-1
(INPUT)
P1
TOOL UNCLAMP
TOOL CLAMP
SPINDLE ORIENTATION
SPINDLE DRIVE ALARM
EMERGENCY STOP
4th AXIS SERVO ALARM
Z AXIS SERVO ALARM
Y AXIS SERVO ALARM
X AXIS SERVO ALARM
DC 0V
DC 24V
I064-I072
I01
LNC TECHNOLOGY CO., LTD.
DATE
DRAWGER
MODIFIER
TITLE:
REL 2840（I064-I072）INPUT

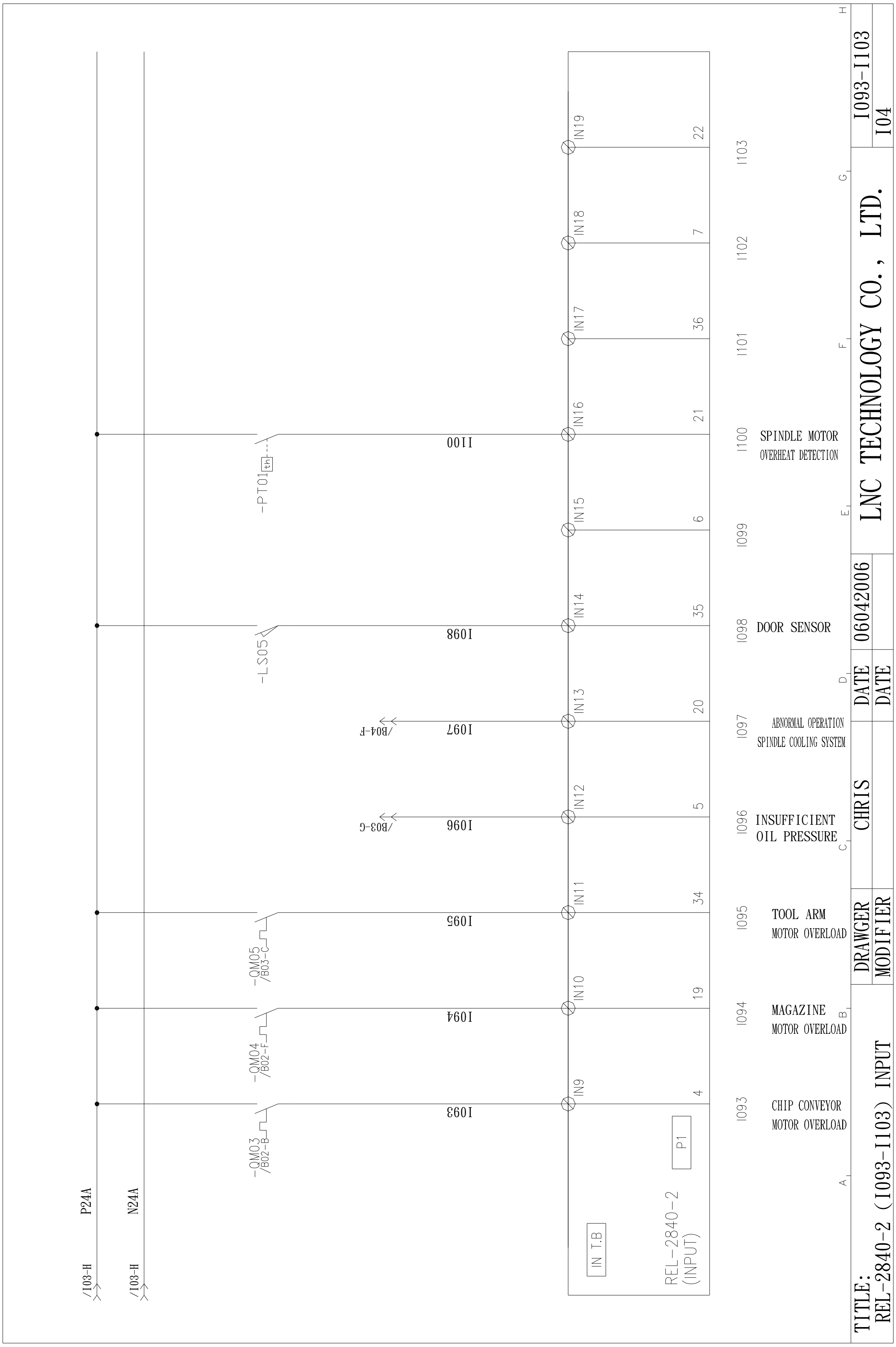

TITLE:
REL 2840-1（I073-I083）INPUT
LNC TECHNOLOGY CO., LTD.
I073-I083
I02
DRAWGER
MODIFIER
DATE
DATE
/I01-H
/I01-H
P24A
N24A
IN T.B
REL2840-1
(INPUT)
P1
-PB01
-HS01
-HS02
-HS03
-HS04
/K15-F
/K15-E
* NOTE
I073
I074
I075
I076
I077
I078
I079
I080
I081
I082
I083
IN9
IN10
IN11
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
4
19
34
5
20
35
6
21
36
7
22
TOOL UNCLAMP
PUSH BOTTON
MPG
X AXIS
MPG
Y AXIS
MPG
Z AXIS
MPG
4th AXIS
MPG
RATIO *10
MPG
RATIO *100
X AXIS
HOME L.S
Y AXIS
HOME L.S
Z AXIS
HOME L.S
4th AXIS
HOME L.S
* HOME DOG INPUT
USE REMOTE


P24A
N24A
/I01-H
-PB01
-HS01
-HS02
-HS03
-HS04
I073
I074
I075
I076
I077
I078
I079
I080
I081
I082
I083
/K15-F
/K15-E
* NOTE
IN9
IN10
IN11
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
4
19
34
5
20
35
6
21
36
7
22
P1
IN T.B
REL2840-1
(INPUT)
TOOL UNCLAMP
PUSH BOTTON
MPG
X AXIS
MPG
Y AXIS
MPG
Z AXIS
MPG
4th AXIS
MPG
RATIO *10
MPG
RATIO *100
X AXIS
HOME L.S
Y AXIS
HOME L.S
Z AXIS
HOME L.S
4th AXIS
HOME L.S
* HOME DOG INPUT
USE REMOTE
TITLE:
REL 2840-1（I073-I083）INPUT
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
I073-I083
I02

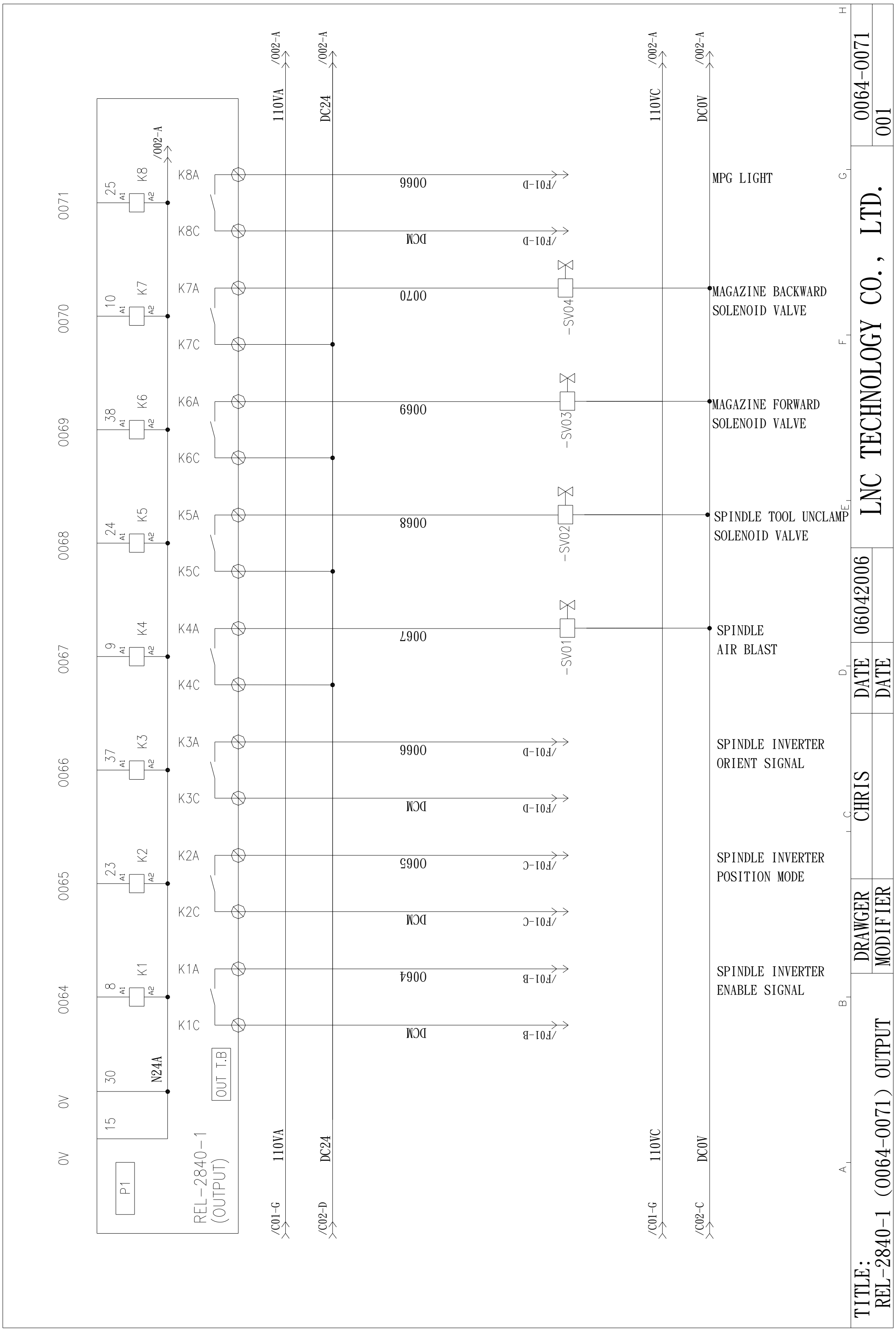

P24A /I04-A
N24A /I04-A
-QM02 /B01-F
I092
I091 /B03-G
-PA01
I090
-PS03
I086
-PS02
I085
-PS01
I084
N24A
P24A
IN8
IN7
IN6
IN5
IN4
IN3
IN2
IN1
IN0
0V
0V
+24V
+24V
33 18 3 32 17 2 31 16 1 30 15 44 43
IN T.B
REL2840-2 (INPUT)
P1
I092 COOLANT MOTOR OVERLOAD
I091 LUBE UNIT LOW OIL LEVEL
I090 INSUFFICIENT AIR PRESSURE
I089 RESERVED
I088 RESERVED
I087 RESERVED
I086 MAGAZINE FORWARD LIMIT SWITCH
I085 MAGAZINE BACKWARD LIMIT SWITCH
I084 TOOL COUNTING SENSOR
0V DC 0V
0V DC 0V
+24V DC 24V
+24V DC 24V
I084-I092
I03
LNC TECHNOLOGY CO., LTD.
DATE
DATE
DRAWGER
MODIFIER
TITLE:
REL 2840（I084-I092）INPUT

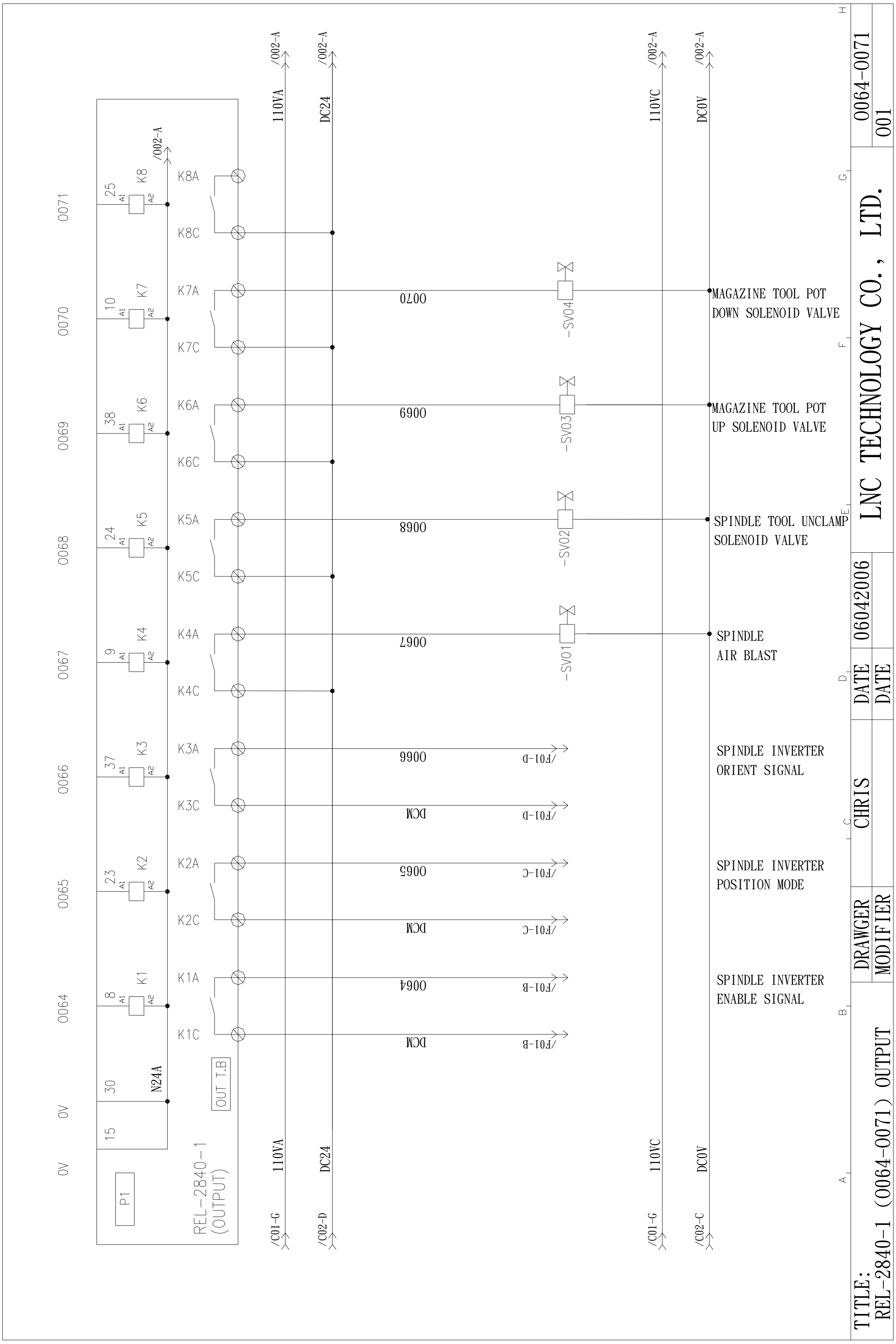

P24A
N24A
/I04-A
/I04-A
-QM02
/B01-F
/B03-G
-PA01
-LS04
-LS03
-PS04
-PS03
-PS02
-PS01
Fe
bn
bl
bk
I092
I091
I090
I089
I088
I087
I086
I085
I084
N24A
P24A
IN8
IN7
IN6
IN5
IN4
IN3
IN2
IN1
IN0
0V
+24V
33
18
3
32
17
2
31
16
1
30
15
44
43
IN T.B
REL-2840-2
(INPUT)
P1
COOLANT MOTOR OVERLOAD
LUBE UNIT LOW OIL LEVEL
INSUFFICIENT AIR PRESSURE
TOOL POT DOWN LIMIT SWITCH
TOOL POT UP LIMIT SWITCH
TOOL ARM STOP SIGNAL
TOOL ARM AT 0"
TOOL ARM AT 60"
TOOL COUNTING SENSOR
DC 0V
DC 0V
DC 24V
DC 24V
I084-I092
I03
LNC TECHNOLOGY CO., LTD.
06042006
DATE
DATE
CHRIS
DRAWGER
MODIFIER
TITLE:
REL-2840 (I084-I092) INPUT


TITLE:
REL-2840-2（I093-I103）INPUT
DRAWGER
MODIFIER
CHRIS
DATE
DATE
06042006
LNC TECHNOLOGY CO.， LTD.
I093-I103
I04
P24A
N24A
/I03-H
/I03-H
-QM03
/B02-B
-QM04
/B02-F
-LS05
-PT01
/B03-G
/B04-F
I093
I094
I096
I097
I098
I100
IN T.B
P1
REL-2840-2
(INPUT)
IN9
IN10
IN11
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
4
19
34
5
20
35
6
21
36
7
22
I093 CHIP CONVEYOR MOTOR OVERLOAD
I094 MAGAZINE MOTOR OVERLOAD
I095 RESERVED
I096 INSUFFICIENT OIL PRESSURE
I097 ABNORMAL OPERATION OF SPINDLE COOLING SYSTEM
I098 DOOR SENSOR
I099 RESERVED
I100 SPINDLE MOTOR OVERHEAT DETECTION
I101 RESERVED
I102 RESERVED
I103 RESERVED

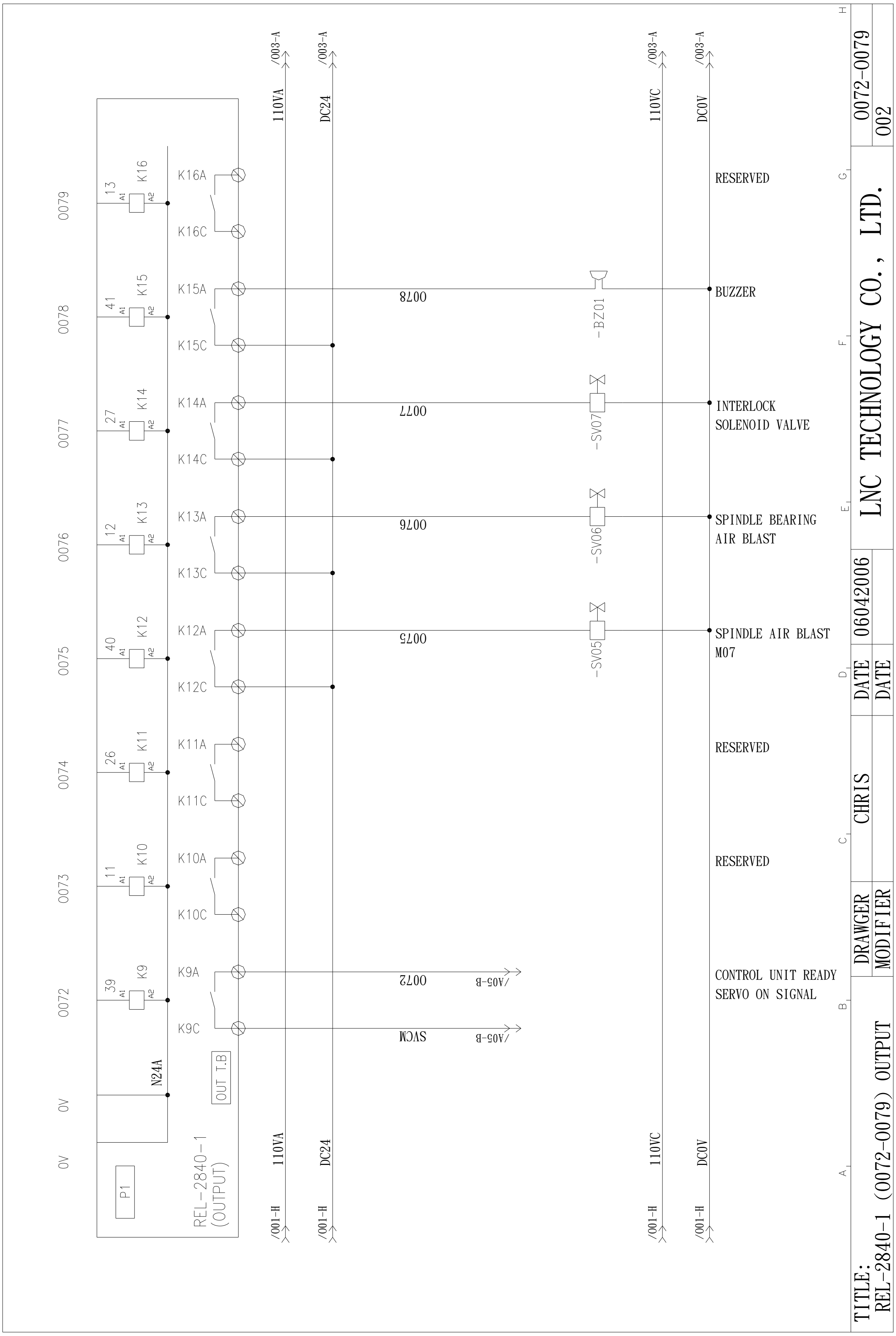

P24A
N24A
/103-H
/103-H
-QM03 /B02-B
-QM04 /B02-F
-QM05 /B03-C
-LS05
-PT01
I093
I094
I095
I096
I097
I098
I100
/B03-G
/B04-F
IN T.B
REL-2840-2 (INPUT)
P1
IN9
IN10
IN11
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
4
19
34
5
20
35
6
21
36
7
22
I093 CHIP CONVEYOR MOTOR OVERLOAD
I094 MAGAZINE MOTOR OVERLOAD
I095 TOOL ARM MOTOR OVERLOAD
I096 INSUFFICIENT OIL PRESSURE
I097 ABNORMAL OPERATION SPINDLE COOLING SYSTEM
I098 DOOR SENSOR
I099
I100 SPINDLE MOTOR OVERHEAT DETECTION
I101
I102
I103
TITLE: REL-2840-2（I093-I103）INPUT
DRAWGER
MODIFIER
CHRIS
DATE
DATE
06042006
LNC TECHNOLOGY CO., LTD.
I093-I103
I04

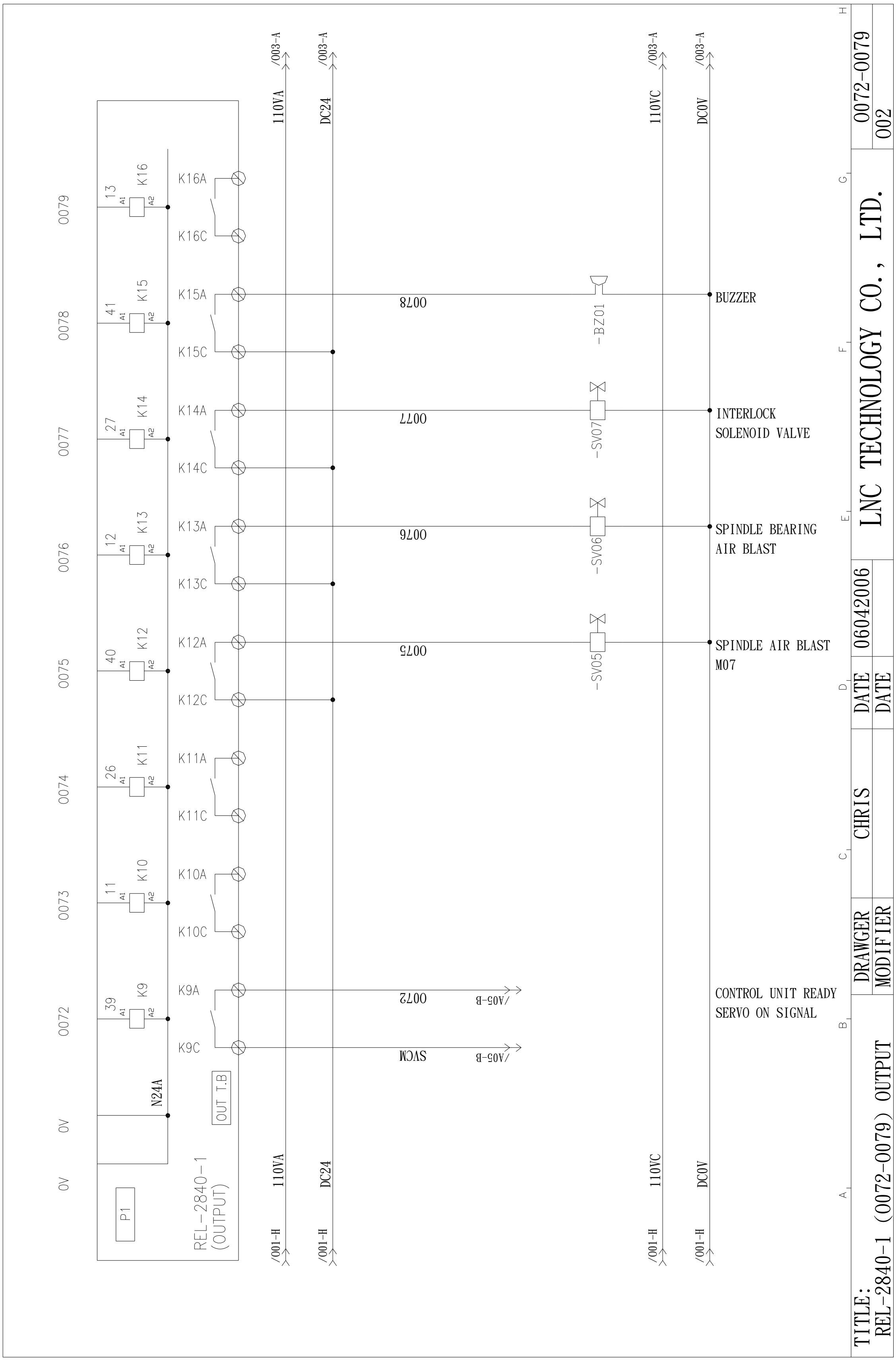
O-Output Wiring

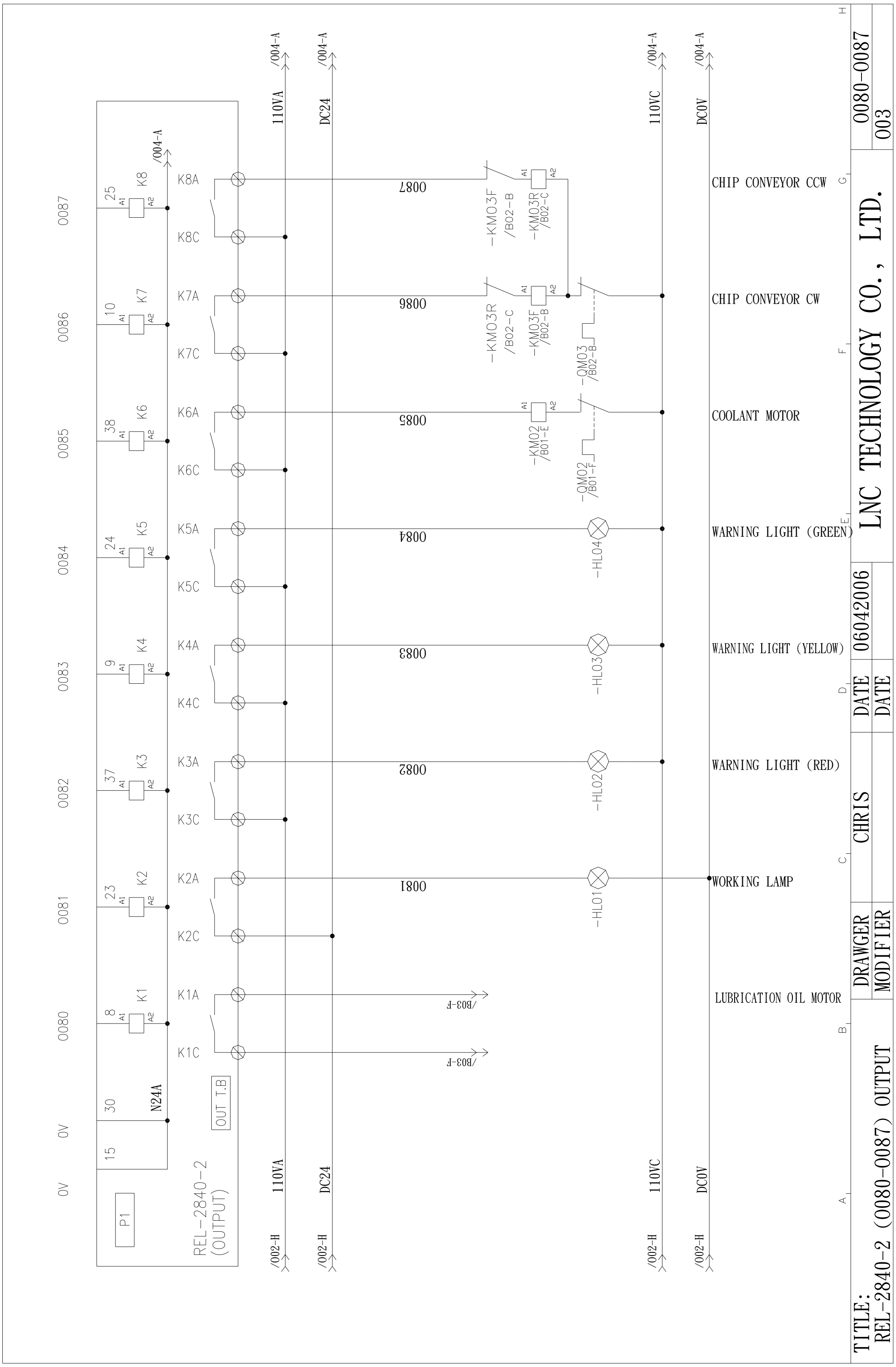


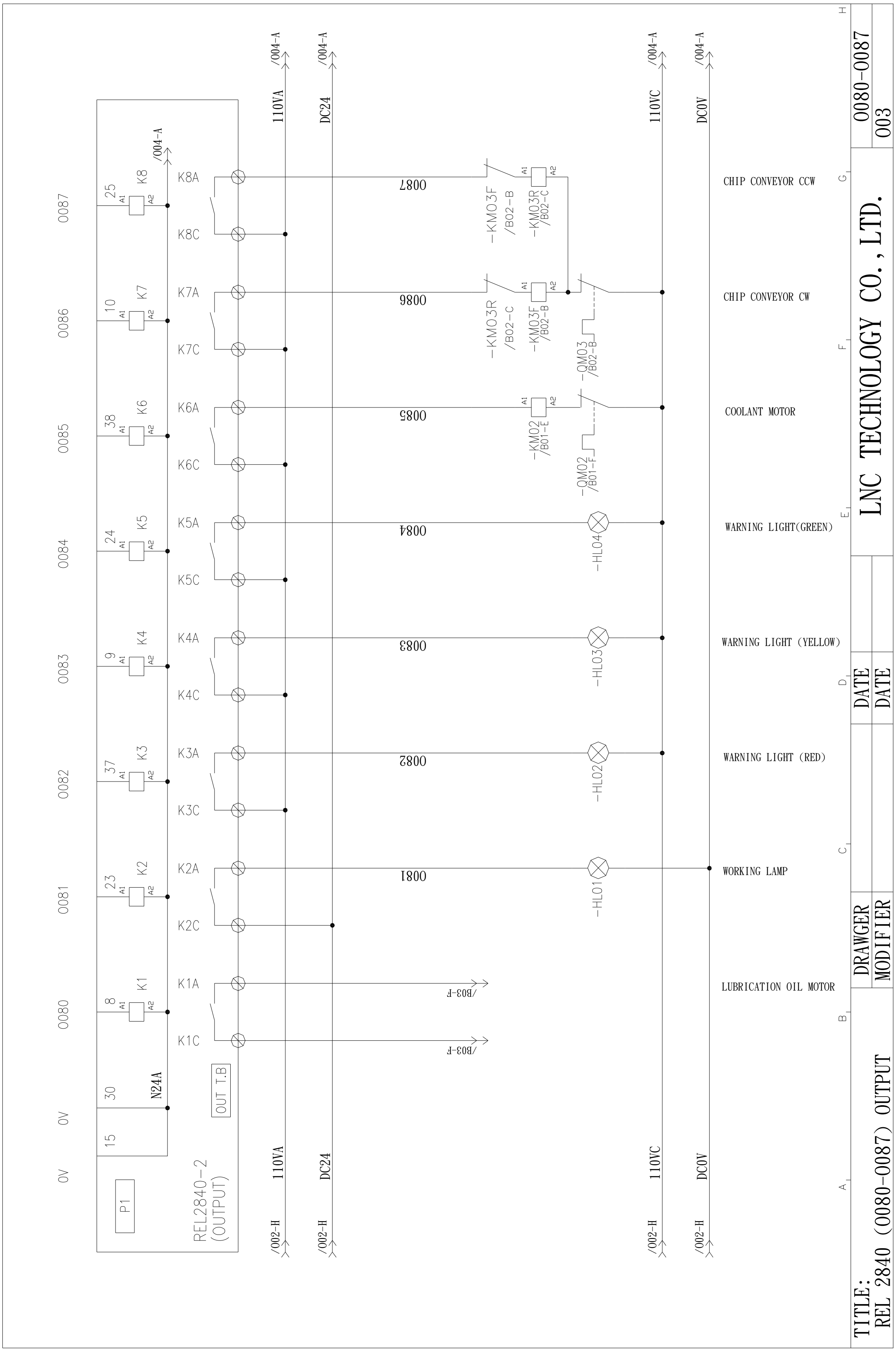


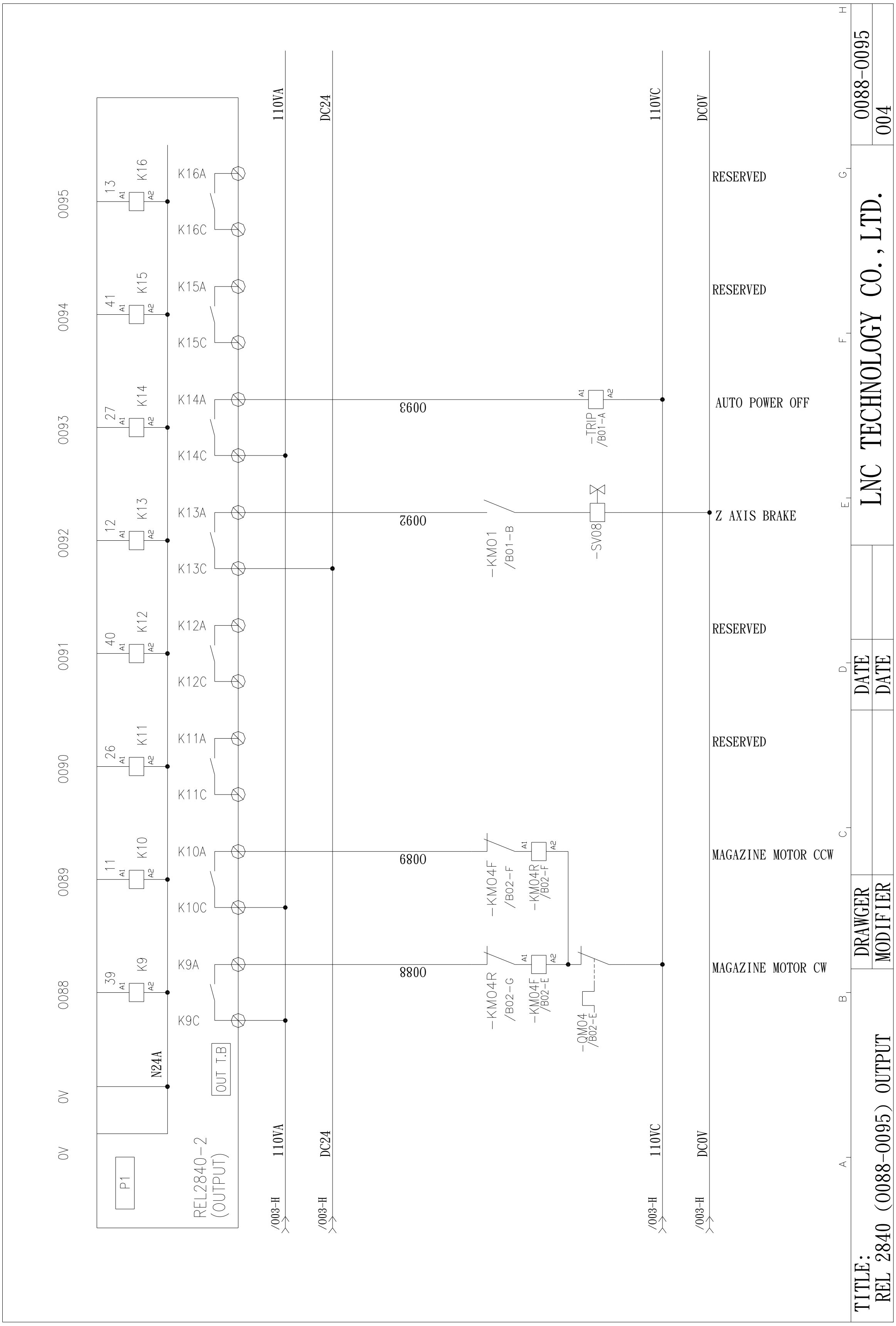
0064 0065 0066 0067 0068 0069 0070 0071
0V 0V
15 30 8 23 37 9 24 38 10 25
N24A
K1 K2 K3 K4 K5 K6 K7 K8
/O02-A
K1C K1A K2C K2A K3C K3A K4C K4A K5C K5A K6C K6A K7C K7A K8C K8A
OUT T.B
P1
REL-2840-1
(OUTPUT)
110VA
DC24
110VC
DC0V
/C01-G
/C02-D
/C02-C
DCM
0064
0065
0066
0067
0068
0069
0070
/F01-B
/F01-C
/F01-D
-SV01
-SV02
-SV03
-SV04
SPINDLE INVERTER ENABLE SIGNAL
SPINDLE INVERTER POSITION MODE
SPINDLE INVERTER ORIENT SIGNAL
SPINDLE AIR BLAST
SPINDLE TOOL UNCLAMP SOLENOID VALVE
MAGAZINE TOOL POT UP SOLENOID VALVE
MAGAZINE TOOL POT DOWN SOLENOID VALVE
TITLE:
REL-2840-1（0064-0071）OUTPUT
DRAWGER
MODIFIER
CHRIS
DATE
DATE
06042006
LNC TECHNOLOGY CO., LTD.
0064-0071
001

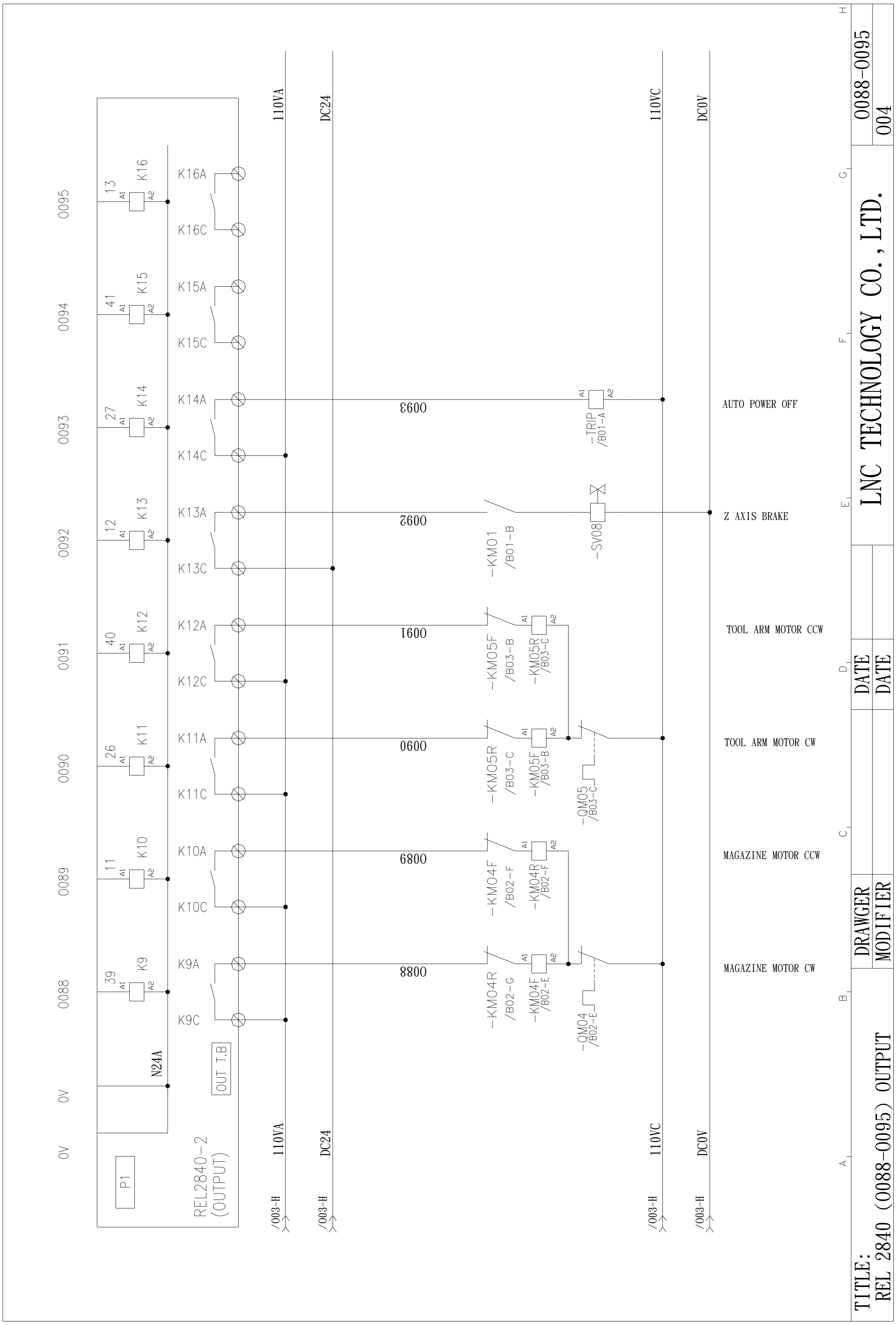

TITLE:
REL-2840-1 (0072-0079) OUTPUT
DRAWGER
MODIFIER
CHRIS
DATE
DATE
06042006
LNC TECHNOLOGY CO., LTD.
0072-0079
002
RESERVED
BUZZER
INTERLOCK
SOLENOID VALVE
SPINDLE BEARING
AIR BLAST
SPINDLE AIR BLAST
M07
RESERVED
RESERVED
CONTROL UNIT READY
SERVO ON SIGNAL
REL-2840-1
(OUTPUT)
OUT T.B
P1
110VA
DC24
110VC
DC0V
-BZ01
-SV07
-SV06
-SV05
SVCM
N24A


TITLE:
REL-2840-1 (0072-0079) OUTPUT
DRAWGER
MODIFIER
CHRIS
DATE
DATE
06042006
LNC TECHNOLOGY CO., LTD.
0072-0079
002
REL-2840-1
(OUTPUT)
P1
OUT T.B
N24A
0V
0V
0072
0073
0074
0075
0076
0077
0078
0079
K9
K10
K11
K12
K13
K14
K15
K16
K9A
K9C
K10A
K10C
K11A
K11C
K12A
K12C
K13A
K13C
K14A
K14C
K15A
K15C
K16A
K16C
110VA
DC24
110VC
DC0V
/001-H
/003-A
/A05-B
SVCM
-SV05
-SV06
-SV07
-BZ01
BUZZER
INTERLOCK
SOLENOID VALVE
SPINDLE BEARING
AIR BLAST
SPINDLE AIR BLAST
M07
CONTROL UNIT READY
SERVO ON SIGNAL

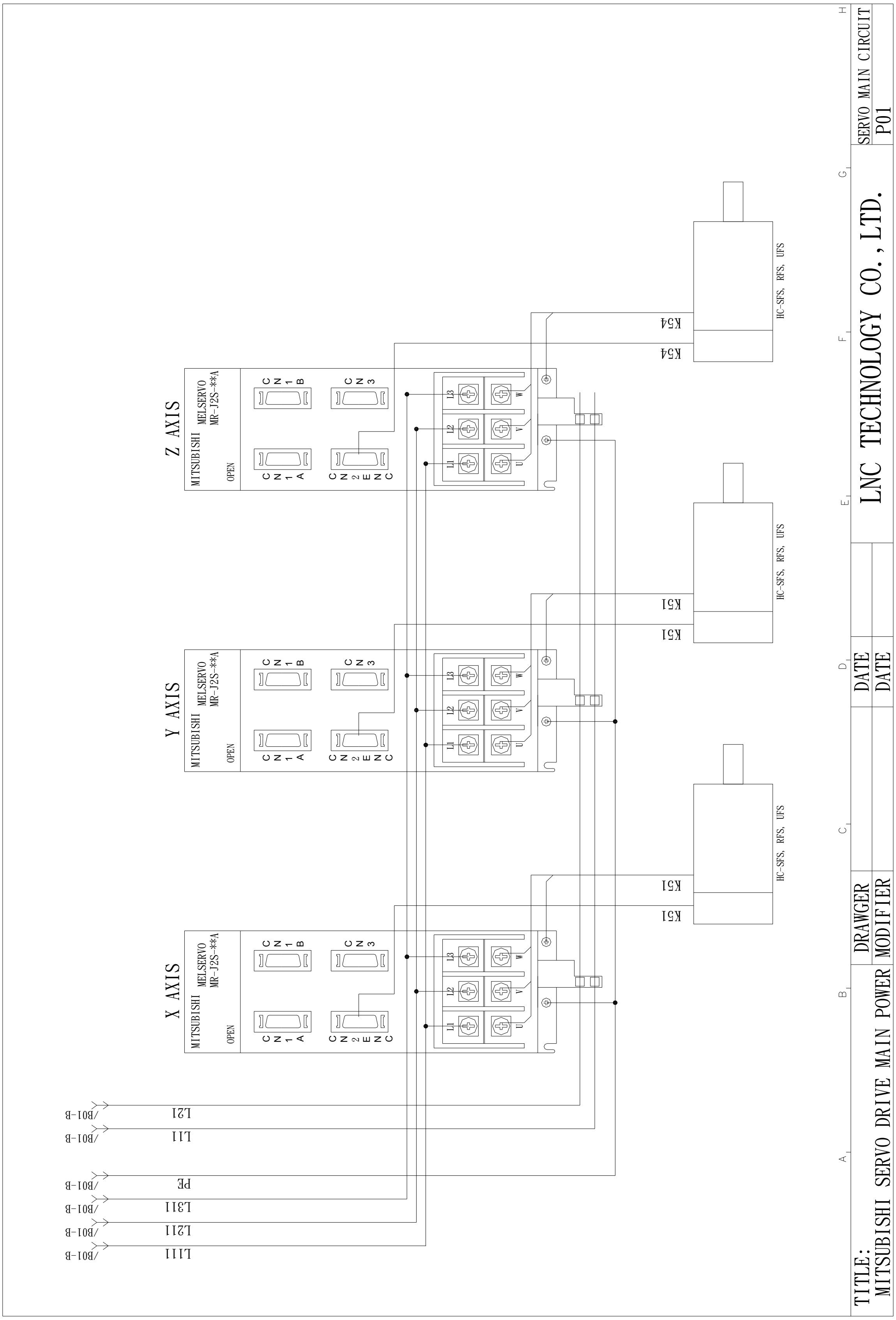

CHIP CONVEYOR CCW
CHIP CONVEYOR CW
COOLANT MOTOR
WARNING LIGHT (GREEN)
WARNING LIGHT (YELLOW)
WARNING LIGHT (RED)
WORKING LAMP
LUBRICATION OIL MOTOR
REL-2840-2 (OUTPUT)
OUT T.B
110VA
DC24
110VC
DC0V
N24A
LNC TECHNOLOGY CO., LTD.
0080-0087
003
06042006
DATE
DATE
CHRIS
DRAWGER
MODIFIER
TITLE:
REL-2840-2 (0080-0087) OUTPUT

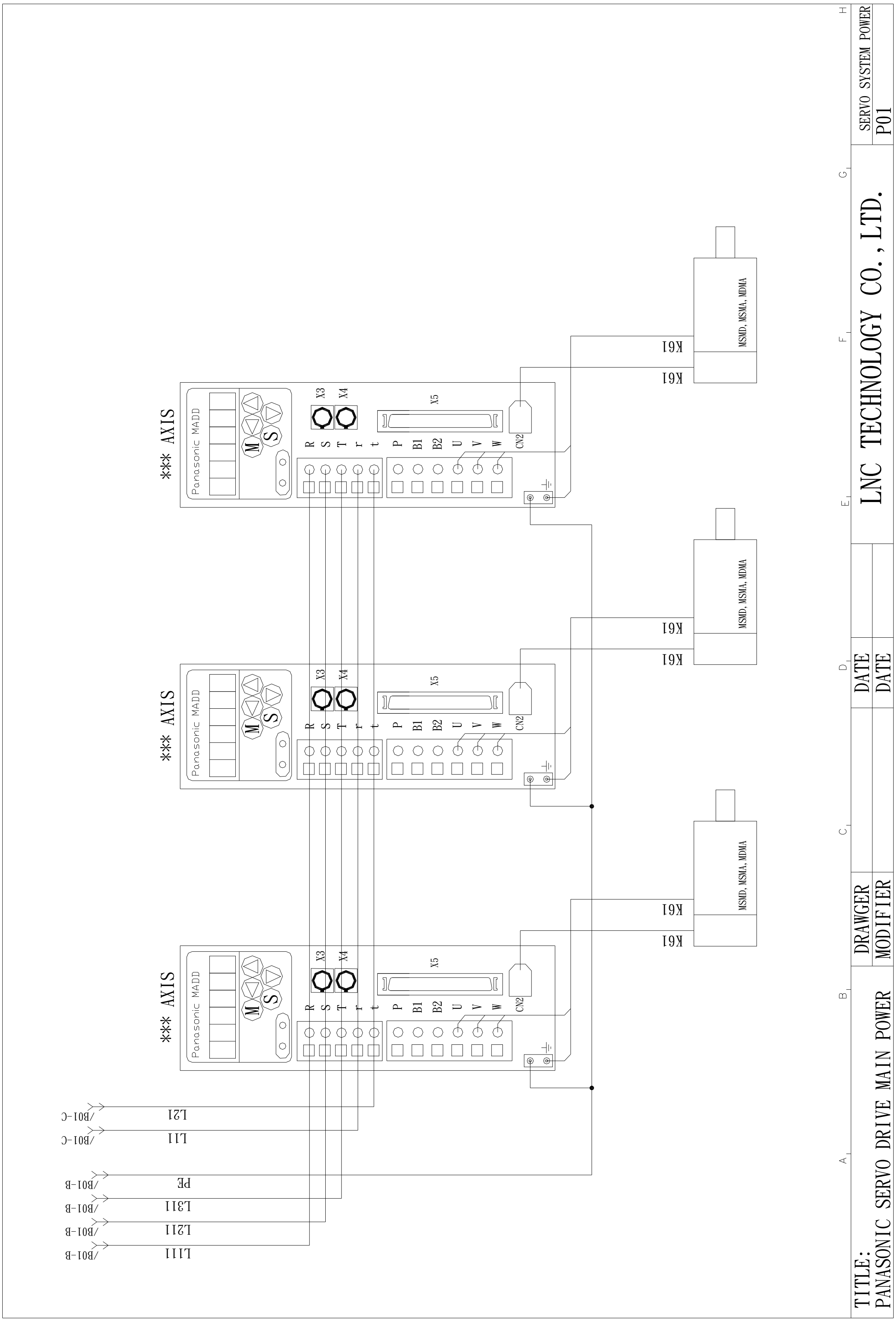

TITLE:
REL 2840（0080-0087）OUTPUT
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
0080-0087
003
REL2840-2
(OUTPUT)
OUT T.B
N24A
110VA
DC24
110VC
DC0V
LUBRICATION OIL MOTOR
WORKING LAMP
WARNING LIGHT (RED)
WARNING LIGHT (YELLOW)
WARNING LIGHT(GREEN)
COOLANT MOTOR
CHIP CONVEYOR CW
CHIP CONVEYOR CCW
-HL01
-HL02
-HL03
-HL04
-KM02
-QM02
-QM03
-KM03F
-KM03R

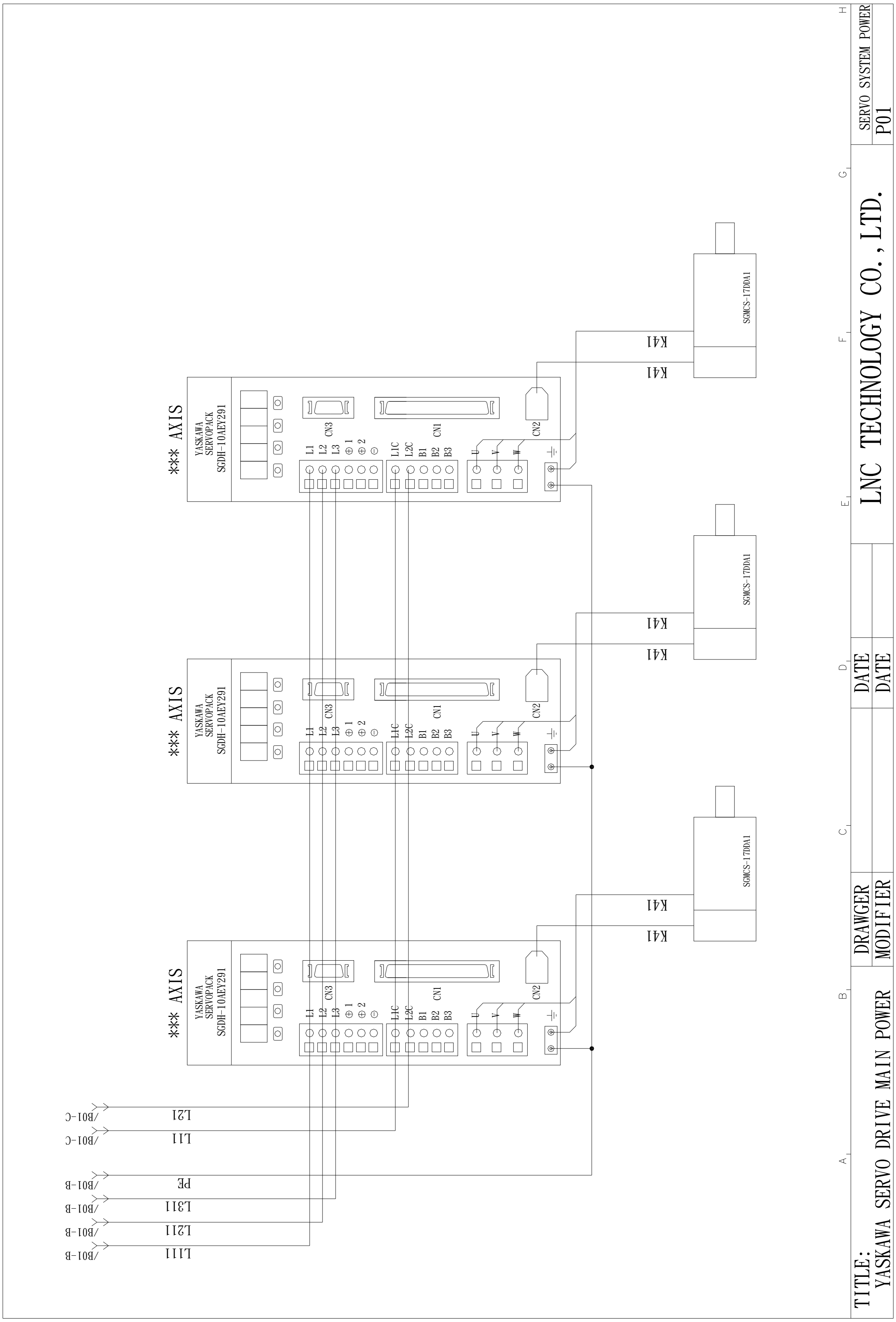

TITLE:
REL 2840 (0088-0095) OUTPUT
LNC TECHNOLOGY CO., LTD.
0088-0095
004
DRAWGER
MODIFIER
DATE
DATE
REL2840-2
(OUTPUT)
P1
OUT T.B
N24A
0V
0V
0088
0089
0090
0091
0092
0093
0094
0095
39
11
26
40
12
27
41
13
K9
K10
K11
K12
K13
K14
K15
K16
K9A
K9C
K10A
K10C
K11A
K11C
K12A
K12C
K13A
K13C
K14A
K14C
K15A
K15C
K16A
K16C
110VA
DC24
110VC
DC0V
/003-H
0088
0089
0092
0093
-KM04R
/B02-G
-KM04F
/B02-E
-QM04
/B02-E
-KM04F
/B02-F
-KM04R
/B02-F
-KM01
/B01-B
-SV08
-TRIP
/B01-A
A1
A2
MAGAZINE MOTOR CW
MAGAZINE MOTOR CCW
RESERVED
Z AXIS BRAKE
AUTO POWER OFF
A
B
C
D
E
F
G
H

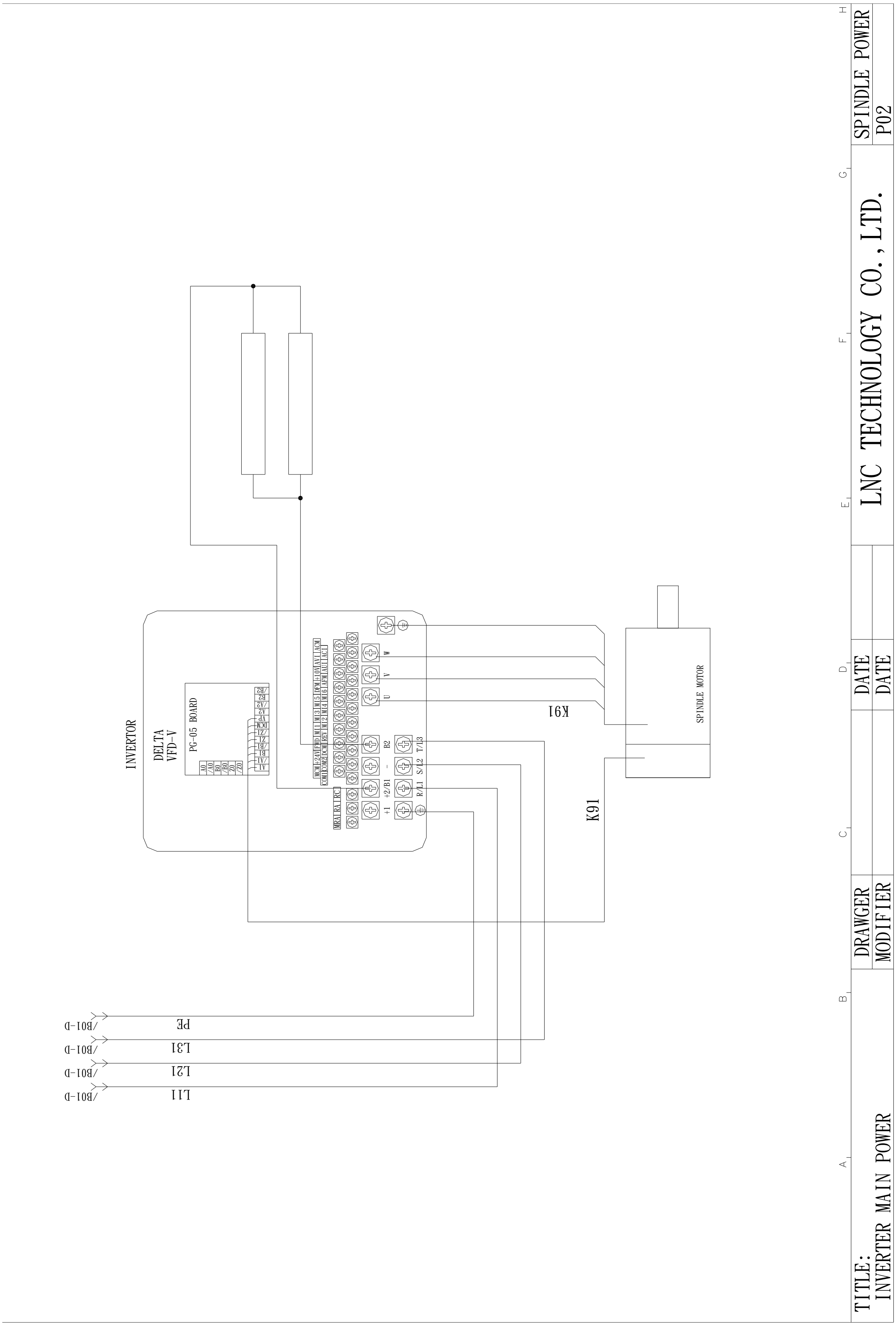

0088-0095
004
LNC TECHNOLOGY CO., LTD.
DATE
DATE
DRAWGER
MODIFIER
TITLE:
REL 2840 (0088-0095) OUTPUT
AUTO POWER OFF
Z AXIS BRAKE
TOOL ARM MOTOR CCW
TOOL ARM MOTOR CW
MAGAZINE MOTOR CCW
MAGAZINE MOTOR CW
110VA
DC24
110VC
DC0V
REL2840-2
(OUTPUT)
OUT T.B
P1
N24A
0V
0V
0088
0089
0090
0091
0092
0093
0094
0095
K9
K10
K11
K12
K13
K14
K15
K16
K9A
K9C
K10A
K10C
K11A
K11C
K12A
K12C
K13A
K13C
K14A
K14C
K15A
K15C
K16A
K16C
-TRIP
/B01-A
-SV08
-KM01
/B01-B
-KM05F
/B03-B
-KM05R
/B03-C
-KM04F
/B02-F
-KM04R
/B02-G
/B02-E
-QM05
/B03-C
-QM04
/B02-E
/003-H

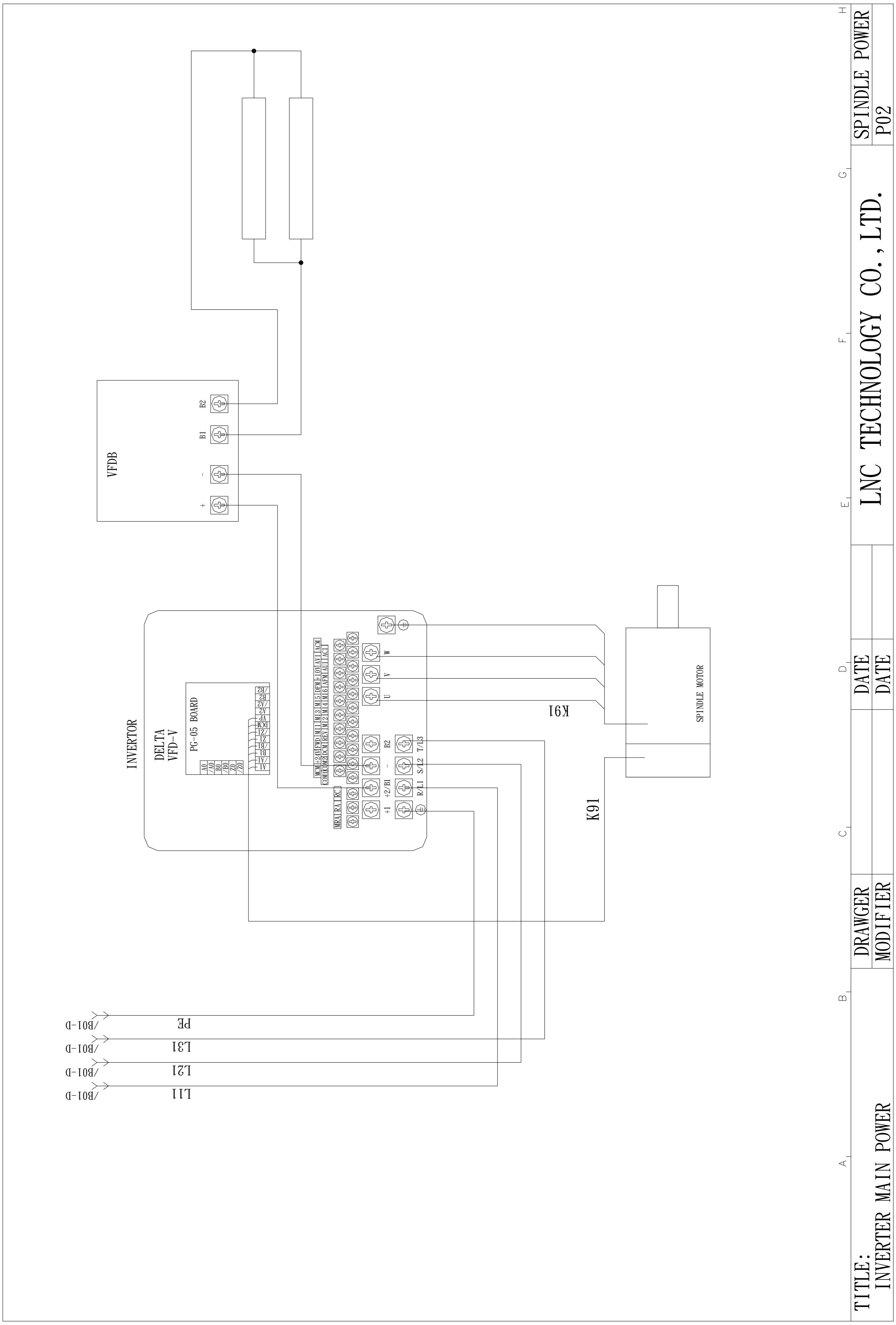
P-Servo Main Power

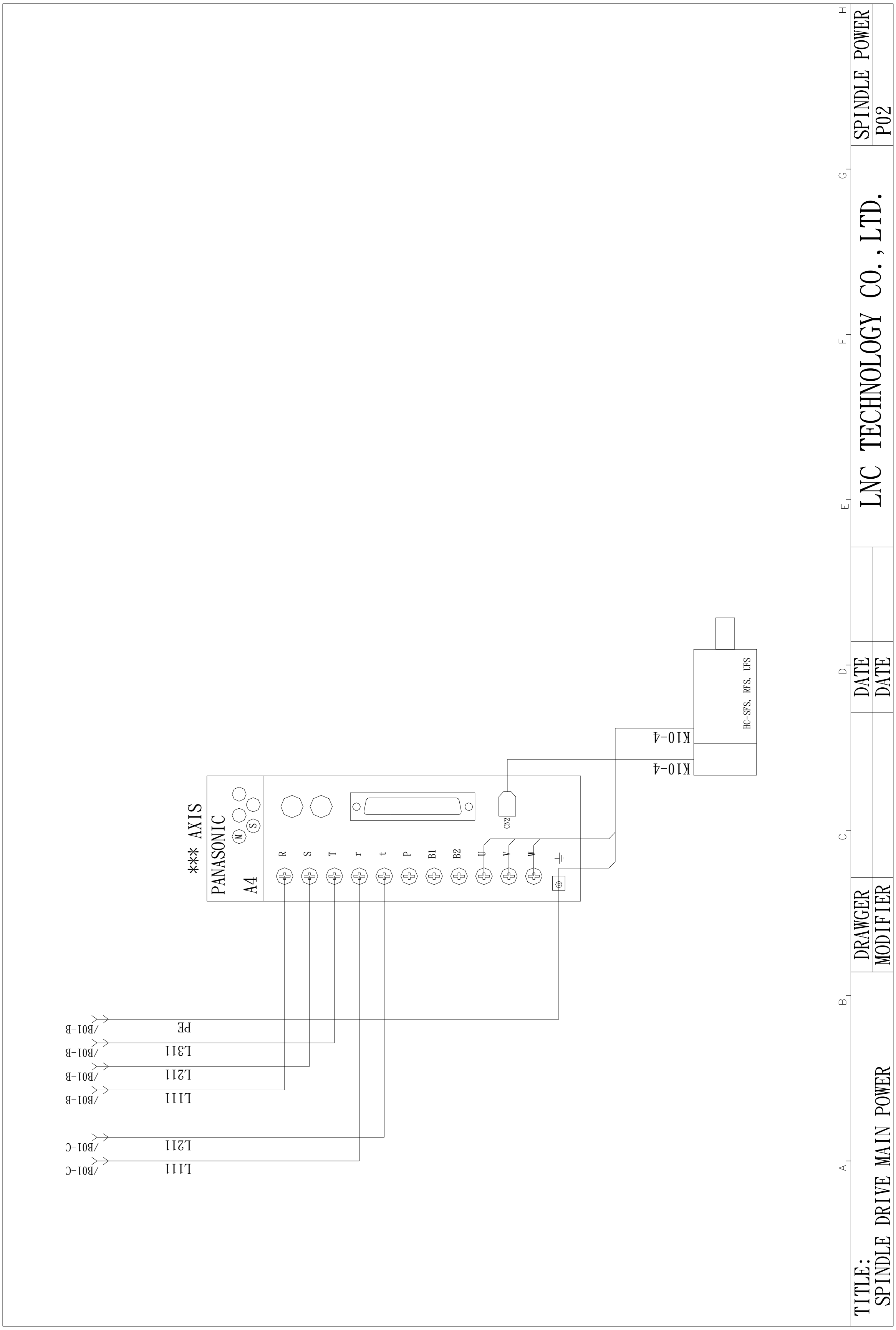



TITLE:
PANASONIC SERVO DRIVE MAIN POWER
DRAWGER
MODIFIER
DATE
DATE
LNC TECHNOLOGY CO., LTD.
SERVO SYSTEM POWER
P01
** AXIS
** AXIS
** AXIS
Panasonic MADD
MSMD, MSMA, MDMA
MSMD, MSMA, MDMA
MSMD, MSMA, MDMA
K61
X3
X4
X5
CN2
R
S
T
r
t
P
B1
B2
U
V
W
L21
L11
PE
L311
L211
L111
/B01-C
/B01-B


SERVO SYSTEM POWER
P01
LNC TECHNOLOGY CO., LTD.
DATE
DATE
DRAWGER
MODIFIER
TITLE:
YASKAWA SERVO DRIVE MAIN POWER
** AXIS
YASKAWA
SERVOPACK
SGDH-10AEY291
CN1
CN2
CN3
L1
L2
L3
L1C
L2C
B1
B2
B3
U
V
W
SGMCS-17DDA1
K41
L21
L11
PE
L311
L211
L111
/B01-C
/B01-B


SPINDLE POWER
P02
LNC TECHNOLOGY CO., LTD.
DATE
DATE
DRAWGER
MODIFIER
TITLE:
INVERTER MAIN POWER
INVERTOR
DELTA
VFD-V
PG-05 BOARD
SPINDLE MOTOR
K91
K91
PE
L31
L21
L11
/B01-D
/B01-D
/B01-D
/B01-D


SPINDLE POWER
P02
LNC TECHNOLOGY CO., LTD.
DATE
DATE
DRAWGER
MODIFIER
TITLE:
INVERTER MAIN POWER
VFDB
B2
B1
INVERTOR
DELTA
VFD-V
PG-05 BOARD
SPINDLE MOTOR
K91
K91
PE
L31
L21
L11


SPINDLE POWER
P02
LNC TECHNOLOGY CO., LTD.
DATE
DATE
DRAWGER
MODIFIER
TITLE:
SPINDLE DRIVE MAIN POWER
*** AXIS
PANASONIC
A4
CN2
R
S
T
r
t
P
B1
B2
U
V
W
K10-4
K10-4
HC-SFS, RFS, UFS
PE
L311
L211
L111
L211
L111
/B01-B
/B01-B
/B01-B
/B01-B
/B01-C
/B01-C

T-IO List

OPERATOR PENAL

INPUT	DESCRIPTION	Remarke
I000	FEEDRATE OVERRIDE BIT0	
I001	FEEDRATE OVERRIDE BIT1	
I002	FEEDRATE OVERRIDE BIT2	
I003	FEEDRATE OVERRIDE BIT3	
I004	SPINDLE OVERRIDE BIT0	
I005	SPINDLE OVERRIDE BIT1	
I006	SPINDLE OVERRIDE BIT2	
I007	SPINDLE OVERRIDE BIT3	
I008	MOLD SELECT BIT0	
I009	MOLD SELECT BIT1	
I010	MOLD SELECT BIT2	
I011	+Z AXIS PUSH BUTTON	
I012	−Z AXIS PUSH BUTTON	
I013	−4th AXIS PUSH BUTTON	
I014	+Y AXIS PUSH BUTTON	
I015	−X AXIS PUSH BUTTON	
I016	+X AXIS PUSH BUTTON	
I017	−Y AXIS PUSH BUTTON	
I018	+4th AXIS PUSH BUTTON	
I019	SPINDLE CW PUSH BUTTON	
I020	SPINDLE STOP PUSH BUTTON	
I021	SPINDLE CCW PUSH BUTTON	
I022	OPTION SKIP (B.D.T)	
I023	Z AXIS LOCK	
I024	SINGLE BLOCK (S.B.K)	
I025	OPTIONAL STOP (M01)	
I026	MACHINE LOCK (M.L.K)	
I027	MPG DRY RUN (MPG DRY)	
I028	CYCLE START	
I029	FEED HOLD	
I030	KEY LOCK (EDIT PROTECT)	
I031	MAGAZINE CW	

OPERATOR PENAL

INPUT	DESCRIPTION	Remarke
I032	MAGAZINE CCW	
I033	CHIP CONVEYOR CW	
I034	CHIP CONVEYOR CCW	
I035	SPINDLE ORIENT	
I036	AIR BLOW ON/OFF (M07)	
I037	COOLANT ON/OFF (M08)	
I038	WORK LAMP ON/OFF	
I039	F1	
I040	F2	
I041	F3	
I042		
I043		
I044	USER I/O (RAPID BIT0)	RAPID TYPE
I045	USER I/O (RAPID BIT1)	RAPID TYPE
I046	USER I/O	
I047	USER I/O	
I048	USER I/O	
I049	USER I/O	
I050	USER I/O	
I051	USER I/O	
I052	USER I/O	
I053	USER I/O	
I054	USER I/O	
I055	USER I/O	
I056	USER I/O	
I057	USER I/O	
I058	USER I/O	
I059	USER I/O	
I060	USER I/O	
I061	USER I/O	
I062	USER I/O	
I063	USER I/O	

TITLE: OP2520 OPERATION PANEL INPUT SIGNAL LIST	DRAWGER		DATE	LNC TECHNOLOGY CO., LTD.	OP2520 IN
	MODIFIER		DATE		T01

OPERATOR PENAL

OUTPUT	DESCRIPTION	Remarke
O000	X AXIS HOME LED	
O001	Y AXIS HOME LED	
O002	Z AXIS HOME LED	
O003	4 AXIS HOME LED	
O004	RESERVE	
O005	IO READY LED	
O006	NC ALARM LED	
O007	PLC ALARM LED	
O008	OIL ALARM LED	
O009	RESERVE	
O010	RESERVE	
O011	+Z AXIS LED	
O012	−Z AXIS LED	
O013	−4th AXIS LED	
O014	+Y AXIS LED	
O015	−X AXIS LED	
O016	+X AXIS LED	
O017	−Y AXIS LED	
O018	+4th AXIS LED	
O019	SPINDLE CW LED	
O020	SPINDLE STOP LED	
O021	SPINDLE CCW LED	
O022	OPTION SKIP (B.D.T) LED	
O023	Z AXIS LOCK LED	
O024	SINGLE BLOCK (S.B.K) LED	
O025	OPTIONAL STOP (M01) LED	
O026	MACHINE LOCK (M.L.K) LED	
O027	MPG DRY RUN (MPG) LED	
O028	CYCLE START LED	
O029	FEED HOLD LED	
O030	OVER TRAVEL LED	
O031	MAGAZINE CW LED	

OPERATOR PENAL

OUTPUT	DESCRIPTION	Remarke
O032	MAGAZINE CCW LED	
O033	CHIP CONVEYOR CW LED	
O034	CHIP CONVEYOR CCW LED	
O035	SPINDLE ORIENT LED	
O036	AIR BLOW LED	
O037	COOLANT ON LED	
O038	WORK LAMP LED	
O039	F1 LED	
O040	F2 LED	
O041	F3 LED	
O042		
O043		
O044		
O045		
O046		
O047		
O048	USER I/O	
O049	USER I/O	
O050	USER I/O	
O051	USER I/O	
O052	USER I/O	
O053	USER I/O	
O054	USER I/O	
O055	USER I/O	
O056	USER I/O	
O057	USER I/O	
O058	USER I/O	
O059	USER I/O	
O060	USER I/O	
O061	USER I/O	
O062	USER I/O	
O063	USER I/O	

A B C D E F G H

TITLE:	DRAWGER		DATE		LNC TECHNOLOGY CO., LTD.	OP2520 OUT
OP2520 OPERATION PANEL OUTPUT SIGNAL LIST	MODIFIER		DATE			T02

EXTERNAL INPUT

INPUT	DESCRIPTION	REMARK
I064	X AXIS ALARM	IN0
I065	Y AXIS ALARM	IN1
I066	Z AXIS ALARM	IN2
I067	4th AXIS ALARM	IN3
I068	EMERGENCY STOP	IN4
I069	SPINDLE INVERTER ALARM	IN5
I070	SPINDLE ORIENT COMPLETED (DELTA MRA-MRC)	IN6
I071	SPINDLE TOOL CLAMP LIMIT SWITCH	IN7
I072	SPINDLE TOOL UNCLAMP LIMIT SWITCH	IN8
I073	SPINDLE TOOL UNCLAMP BUTTON	IN9
I074	MPG SELECT X AXIS	IN10
I075	MPG SELECT Y AXIS	IN11
I076	MPG SELECT Z AXIS	IN12
I077	MPG SELECT 4th AXIS	IN13
I078	MPG SELECT *10	IN14
I079	MPG SELECT *100	IN15
I080	X AXIS HOME L.S	IN16
I081	Y AXIS HOME L.S	IN17
I082	Z AXIS HOME L.S	IN18
I083	4th AXIS HOME L.S	IN19

EXTERNAL INPUT

INPUT	DESCRIPTION	REMARK
I084	TOOL COUNTING SENSOR	IN0
I085	TURRET BACKWARD	IN1
I086	TURRET FORWARD	IN2
I087	RESERVED	IN3
I088	RESERVED	IN4
I089	RESERVED	IN5
I090	INSUFFICIENT AIR PRESSURE	IN6
I091	LUBE UNIT LOW OIL LEVEL	IN7
I092	COOLANT MOTOR OVERLOAD	IN8
I093	CHIP CONVEYOR MOTOR OVERLOAD	IN9
I094	MAGAZINE MOTOR OVERLOAD	IN10
I095	RESERVED	IN11
I096	INSUFFICIENT OIL PRESSURE	IN12
I097	ABNORMAL OPERATION OF SPINDLE COOLING SYSTEM	IN13
I098	DOOR SENSOR	IN14
I099	RESERVED	IN15
I100	SPINDLE MOTOR OVERHEAT DETECTION	IN16
I101		IN17
I102		IN18
I103		IN19

TITLE: REL-2840 (I064-I103) INPUT	DRAWGER	CHRIS	DATE	06042006	LNC TECHNOLOGY CO., LTD.	EXTERNAL IN64
	MODIFIER		DATE			T03

EXTERNAL INPUT

INPUT	DESCRIPTION	REMARK
I064	X AXIS ALARM	IN0
I065	Y AXIS ALARM	IN1
I066	Z AXIS ALARM	IN2
I067	4th AXIS ALARM	IN3
I068	EMERGENCY STOP	IN4
I069	SPINDLE INVERTER ALARM	IN5
I070	SPINDLE ORIENT COMPLETED (DELTA MRA-MRC)	IN6
I071	SPINDLE TOOL CLAMP LIMIT SWITCH	IN7
I072	SPINDLE TOOL UNCLAMP LIMIT SWITCH	IN8
I073	SPINDLE TOOL UNCLAMP BUTTON	IN9
I074	MPG SELECT X AXIS	IN10
I075	MPG SELECT Y AXIS	IN11
I076	MPG SELECT Z AXIS	IN12
I077	MPG SELECT 4th AXIS	IN13
I078	MPG SELECT *10	IN14
I079	MPG SELECT *100	IN15
I080	X AXIS HOME L.S	IN16
I081	Y AXIS HOME L.S	IN17
I082	Z AXIS HOME L.S	IN18
I083	4th AXIS HOME L.S	IN19

EXTERNAL INPUT

INPUT	DESCRIPTION	REMARK
I084	TOOL COUNTING SENSOR	IN0
I085	TOOL ARM AT 60"	IN1
I086	TOOL ARM AT 0"	IN2
I087	TOOL ARM STOP SIGNAL	IN3
I088	TOOL POT UP SENSOR	IN4
I089	TOOL POT DOWN SENSOR	IN5
I090	INSUFFICIENT AIR PRESSURE	IN6
I091	LUBE UNIT LOW OIL LEVEL	IN7
I092	COOLANT MOTOR OVERLOAD	IN8
I093	CHIP CONVEYOR MOTOR OVERLOAD	IN9
I094	MAGAZINE MOTOR OVERLOAD	IN10
I095	TOOL ARM MOTOR OVERLOAD	IN11
I096	INSUFFICIENT OIL PRESSURE	IN12
I097	ABNORMAL OPERATION OF SPINDLE COOLING SYSTEM	IN13
I098	DOOR SENSOR	IN14
I099		IN15
I100	SPINDLE MOTOR OVERHEAT DETECTION	IN16
I101		IN17
I102		IN18
I103		IN19

A B C D E F G H

TITLE: REL-2840 (I064-I103) INPUT	DRAWGER	CHRIS	DATE	06042006	LNC TECHNOLOGY CO., LTD.	EXTERNAL IN64
	MODIFIER		DATE			T03

*NOTE: SPINDLE INTERNAL CYCLING AIR

EXTERNAL OUTPUT

OUTPUT	DESCRIPTION	REMARK
0064	SPINDLE ENABLE SIGNAL (DELTA FWD)	K1
0065	SPINDLE INVERTER POSITION MODE (DELTA MI3,MI4)	K2
0066	SPINDLE ORIENT SIGNAL (DELTA MI2)	K3
0067	SPINDLE AIR BLAST (TOOL UNCLAMP)	K4
0068	SPINDLE TOOL UNCLAMP SOLENOID VALVE	K5
0069	MAGAZINE FORWARD SOLENOID VALVE	K6
0070	MAGAZINE BACKWARD SOLENOID VALVE	K7
0071	MPG LIGHT	K8
0072	SERVO ON SIGNAL (TO TRANSIT BOARD "SV ON")	K9
0073	RESERVED	K10
0074	RESERVED	K11
0075	SPINDLE AIR BLAST (M07)	K12
0076	SPINDLE BEARING AIR BLAST *NOTE	K13
0077	INTERLOCK SOLENOID VALVE	K14
0078	BUZZER	K15
0079	RESERVED	K16

EXTERNAL OUTPUT

OUTPUT	DESCRIPTION	REMARK
0080	LUBE MOTOR	K1
0081	WORKING LAMP	K2
0082	WARNING LIGHT RED	K3
0083	WARNING LIGHT YELLOW	K4
0084	WARNING LIGHT GREEN	K5
0085	COOLANT MOTOR	K6
0086	CHIP CONVEYOR CW	K7
0087	CHIP CONVEYOR CCW (OPTIONAL)	K8
0088	MAGAZINE MOTOR CW	K9
0089	MAGAZINE MOTOR CCW	K10
0090	RESERVED	K11
0091	RESERVED	K12
0092	Z AXIS BRAKE	K13
0093	AUTO POWER OFF	K14
0094	RESERVED	K15
0095	RESERVED	K16

A B C D E F G H

TITLE: REL-2840 (0064-0095) OUTPUT	DRAWGER	CHRIS	DATE	06042006	LNC TECHNOLOGY CO., LTD.	EXTERNAL OUT64
	MODIFIER		DATE			T04

EXTERNAL OUTPUT

*NOTE: SPINDLE INTERNAL CYCLING AIR

OUTPUT	DESCRIPTION	REMARK
O064	SPINDLE ENABLE SIGNAL (DELTA FWD)	K1
O065	SPINDLE INVERTER POSITION MODE (DELTA MI3,MI4)	K2
O066	SPINDLE ORIENT SIGNAL (DELTA MI2)	K3
O067	SPINDLE AIR BLAST (TOOL UNCLAMP)	K4
O068	SPINDLE TOOL UNCLAMP SOLENOID VALVE	K5
O069	TOOL POT UP SOLENOID VALVE	K6
O070	TOOL POT DOWN SOLENOID VALVE	K7
O071	MPG LIGHT	K8
O072	SERVO ON SIGNAL (TO TRANSIT BOARD "SV ON")	K9
O073		K10
O074		K11
O075	SPINDLE AIR BLAST (M07)	K12
O076	SPINDLE BEARING AIR BLAST *NOTE	K13
O077	INTERLOCK SOLENOID VALVE	K14
O078	BUZZER	K15
O079		K16

EXTERNAL OUTPUT

OUTPUT	DESCRIPTION	REMARK
O080	LUBE MOTOR	K1
O081	WORKING LAMP	K2
O082	WARNING LIGHT RED	K3
O083	WARNING LIGHT YELLOW	K4
O084	WARNING LIGHT GREEN	K5
O085	COOLANT MOTOR	K6
O086	CHIP CONVEYOR CW	K7
O087	CHIP CONVEYOR CCW (OPTIONAL)	K8
O088	MAGAZINE MOTOR CW	K9
O089	MAGAZINE MOTOR CCW	K10
O090	TOOL ARM MOTOR CW	K11
O091	TOOL ARM MOTOR CCW	K12
O092	Z AXIS BRAKE	K13
O093	AUTO POWER OFF	K14
O094		K15
O095		K16

A B C D E F G H

TITLE: REL-2840 (O064-O095) OUTPUT	DRAWGER	CHRIS	DATE	06042006	LNC TECHNOLOGY CO., LTD.	EXTERNAL OUT64
	MODIFIER		DATE			T04

Spindle Wiring Diagram